

Public

All Recipients of the Serviced Grid Code

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THE SERVICED GRID CODE – ISSUE 6 REVISION 44

INCLUSION OF REVISED SECTION

- Glossary & Definitions
- Planning Code
- Operating Code 5
- Operating Code 6
- Data Registration Code

SUMMARY OF CHANGES

These changes arise from the implementation of: [GC0139: Enhanced Planning-Data Exchange to Facilitate Whole System Planning](#).

Many thanks,

Code Administrator

National Energy System Operator

THE GRID CODE

ISSUE 6

REVISION 44

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GLOSSARY & DEFINITIONS

(GD)

GD.1

In the Grid Code the following words and expressions shall, unless the subject matter or context otherwise requires or is inconsistent therewith, bear the following meanings:

Access Group	A group of Connection Points within which a User declares under the Planning Code (a) An interconnection and/or (b) A need to redistribute Demand between those Connection Points either pre-fault or post-fault Where a single Connection Point does not form part of an Access Group in accordance with the above, that single Connection Point shall be considered to be an Access Group in its own right.
Access Period	A period of time in respect of which each Transmission Interface Circuit is to be assessed as whether or not it is capable of being maintained as derived in accordance with PC.A.4.1.4. The period shall commence and end on specified calendar weeks.
Act	The Electricity Act 1989.
Active Control Based Droop Power	The Active Control Based Power output supplied by a Grid Forming Plant through controlled means (be it manual or automatic). For GBGF-I this is equivalent to a Synchronous Generating Unit with a traditional governor coupled to its prime mover. Active Control Based Droop Power is used by The Company to control System Frequency changes through the instruction of Primary Response and Secondary Response.
Active Control Based Power	The Active Power output supplied by a Grid Forming Plant through controlled means (be it manual or automatic) of the positive phase sequence Root Mean Square Active Power produced at fundamental System Frequency by the control system of a Grid Forming Unit. For GBGF-I, this is equivalent to a Synchronous Generating Unit with a traditional governor coupled to its prime mover. Active Control Based Power includes Active Power changes that results from a change to the Grid Forming Plant Owners available set points that have a 5 Hz limit on the bandwidth of the provided response. Active Control Based Power also includes Active Power components produced by the normal operation of a Grid Forming Plant that comply with the Engineering Recommendation P28 limits. These Active Power components do not have a 5 Hz limit on the bandwidth of the provided response. Active Control Based Power does not include Active Power components proportional to System Frequency, slip or deviation that provide damping power to emulate the natural damping function provided by a real Synchronous Generating Unit.

Active Damping Power	The Active Power naturally injected or absorbed by a Grid Forming Plant to reduce Active Power oscillations in the Total System. More specifically, Active Damping Power is the damped response of a Grid Forming Plant to an oscillation between the voltage at the Grid Entry Point or User System Entry Point and the voltage of the Internal Voltage Source of the Grid Forming Plant. For the avoidance of doubt, Active Damping Power is an inherent capability of a Grid Forming Plant that starts to respond naturally, within less than 5ms to low frequency oscillations in the System Frequency.
Active Energy	The electrical energy produced, flowing or supplied by an electric circuit during a time interval, being the integral with respect to time of the instantaneous power, measured in units of watt-hours or standard multiples thereof, ie: 1000 Wh = 1 kWh 1000 kWh = 1 MWh 1000 MWh = 1 GWh 1000 GWh = 1 TWh
Active Frequency Response Power	The injection or absorption of Active Power by a Grid Forming Plant to or from the Total System during a deviation of the System Frequency away from the Target Frequency. For a GBGF-I this is very similar to Primary Response but with a response time to achieve the declared service capability (which could be the Maximum Capacity or Registered Capacity) within 1 second. For GBGF-I this can rapidly inject or absorb Active Power in addition to the phase-based Active Inertia Power to provide a system with desirable NFP plot characteristics. Active Frequency Response Power can be produced by any viable control technology.
Active Inertia Power	The injection or absorption of Active Power by a Grid Forming Plant to or from the Total System during a System Frequency change. The transient injection or absorption of Active Power from a Grid Forming Plant to the Total System as a result of the ROCOF value at the Grid Entry Point or User System Entry Point. This requires a sufficient energy storage capacity of the Grid Forming Plant to meet the Grid Forming Capability requirements specified in ECC.6.3.19. For the avoidance of doubt, this includes the rotational inertial energy of the complete drive train of a Synchronous Generating Unit. Active Inertia Power is an inherent capability of a Grid Forming Plant to respond naturally, within less than 5 ms, to changes in the System Frequency. For the avoidance of doubt, the Active Inertia Power has a slower frequency response compared with Active Phase Jump Power.

Active Phase Jump Power	The transient injection or absorption of Active Power from a Grid Forming Plant to the Total System as a result of changes in the phase angle between the Internal Voltage Source of the Grid Forming Plant and the Grid Entry Point or User System Entry Point. In the event of a disturbance or fault on the Total System, a Grid Forming Plant will instantaneously (within 5 ms) inject or absorb Active Phase Jump Power to the Total System as a result of the phase angle change. For GBGF-I as a minimum value this is up to the Phase Jump Angle Limit Power. Active Phase Jump Power is an inherent capability of a Grid Forming Plant that starts to respond naturally, within less than 5 ms and can have frequency components of over 1000 Hz.
Active Power	The product of voltage and the in-phase component of alternating current measured in units of watts and standard multiples thereof, ie: 1000 Watts = 1 kW 1000 kW = 1 MW 1000 MW = 1 GW 1000 GW = 1 TW
Active ROCOF Response Power	The Active Inertia Power developed from a Grid Forming Plant plus the Active Frequency Response Power that can be supplied by a Grid Forming Plant when subject to a rate of change of the System Frequency.
Additional BM Unit	Has the meaning as set out in the BSC
Affiliate	In relation to any person, any holding company or subsidiary of such person or any subsidiary of a holding company of such person, in each case within the meaning of Section 736, 736A and 736B of the Companies Act 1985 as substituted by section 144 of the Companies Act 1989 and, if that latter section is not in force at the Transfer Date, as if such section were in force at such date.
AF Rules	Has the meaning given to “allocation framework” in section 13(2) of the Energy Act 2013.
Agency	As defined in the ESO Licence.
Aggregator	A BM Participant who controls one or more Additional BM Units or Secondary BM Units.
Aggregated Energy Source	The aggregation of Energy Sources as defined in PC.G.8.1.
Aggregator Impact Matrix	Defined for an Additional BM Unit or a Secondary BM Unit. Provides data allowing The Company to model the result of a Bid-Offer Acceptance on each of the Grid Supply Points within the GSP Group over which the Additional BM Unit or Secondary BM Unit is defined.
Alternate Member	Shall mean an alternate member for the Panel Members elected or appointed in accordance with this GR.7.2(a) or (b).

Anchor	Plant , owned and operated by a Restoration Contractor which can Start-Up from Shutdown and energise a part of the Total System upon instruction from The Company or a Network Operator or a relevant Transmission Licensee within a defined time period, without an external electrical power supply from the Total System .
Anchor DC Converter Test	A test carried out by an Anchor DC Converter Owner on an Anchor DC Converter while the Anchor DC Converter is disconnected from all external electrical power supplies from the Total System .
Anchor Generating Unit Test	A test carried out on an Anchor Generating Unit or a CCGT unit or a Power Generating Module , as the case may be, at an Anchor Power Station while the Anchor Power Station remains energised from the Total System .
Anchor HVDC System Test	A test carried out by an Anchor HVDC System Owner while the Anchor HVDC System is disconnected from all external electrical power supplies from the Total System .
Anchor Plant Capability	The ability of a Restoration Contractor's Plant to Start-Up from Shutdown and to energise and maintain a part of the Total System upon instruction from The Company or Relevant Transmission Licensee (in Scotland) or relevant Network Operator , within a defined time period, without an external electrical power supply from the Total System . In the case of a Local Joint Restoration Plan the defined period of time is within 2 hours of an instruction from The Company or Relevant Transmission Licensee . In the case of a Distribution Restoration Zone Plan , the defined period of time is within 8 hours of an instruction from relevant Network Operator .
Anchor Plant Test	A test conducted on Plant to confirm it is capable of meeting the requirements of an Anchor Restoration Contract .
Anchor Power Station Test	A test carried out by an Anchor Generator at an Anchor Power Station while that Anchor Power Station is disconnected from all external electrical power supplies from the Total System .
Anchor Restoration Contract	In the case of a Local Joint Restoration Plan or Offshore Local Joint Restoration Plan , a contract between The Company and an Anchor Restoration Contractor for the provision of an Anchor Plant Capability . In the case of a Distribution Restoration Zone Plan is an agreement between The Company and relevant Network Operator and Anchor Restoration Contractor for the provision of an Anchor Plant Capability .
Anchor Restoration Contractor	A Restoration Contractor with an Anchor Restoration Contract .
Anchor Plant Unit Test	A test carried out on a Generating Unit or a CCGT Unit or a Power Generating Module , or a HVDC System or a DC Converter as the case may be, at the site of an Anchor Plant while the Anchor Plant is supplied from all external power supplies.
Ancillary Service	A System Ancillary Service and/or a Commercial Ancillary Service , as the case may be. An Ancillary Service may include one or more Demand Response Services .

Ancillary Services Agreement	An agreement between a User and The Company for the payment by The Company to that User in respect of the provision by such User of Ancillary Services .
Annual Average Cold Spell Conditions or ACS Conditions	A particular combination of weather elements which gives rise to a level of peak Demand within a Financial Year which has a 50% chance of being exceeded as a result of weather variation alone.
Apparatus	Other than in OC8 , means all equipment in which electrical conductors are used, supported or of which they may form a part. It includes Users' equipment which imposes Demand on the System . In OC8 , it means High Voltage electrical circuits forming part of a System on which Safety Precautions may be applied to allow work and/or testing to be carried out on a System .
Apparent Power	The product of voltage and of alternating current measured in units of voltamperes and standard multiples thereof, ie: 1000 VA = 1 kVA 1000 kVA = 1 MVA
Approved Fast Track Proposal	Has the meaning given in GR.26.7, provided that no objection is received pursuant to GR.26.12.
Approved Grid Code Self-Governance Proposal	Has the meaning given in GR.24.10.
Approved Modification	Has the meaning given in GR.22.7
Assimilated Law	Has the same meaning as that given by section 6(7) of the European Union (Withdrawal) Act 2018
Authorised Certifier	An entity that issues Equipment Certificates and Power Generating Module Documents and whose accreditation is given by the United Kingdom Accreditation Service or such other body as may be established from time to time to carry out the function of accreditation.
Authorised Electricity Operator	Any person (other than The Company) who is authorised under the Act to generate, participate in the transmission of, distribute or supply electricity which shall include any Interconnector Owner or Interconnector User .
Authority-Led Modification	A Grid Code Modification Proposal in respect of a Significant Code Review , raised by the Authority pursuant to GR.17
Authority-Led Modification Report	Has the meaning given in GR.17.4.
Authority for Access	An authority which grants the holder the right to unaccompanied access to sites containing exposed HV conductors.
Authority Guidance on Code Modification Prioritisation	Authority Guidance on Code Modification Prioritisation means the guidance published by the Authority from time to time on code modification prioritisation.
Authority, The	The Authority established by section 1 (1) of the Utilities Act 2000.

Automatic Voltage Regulator or AVR	The continuously acting automatic equipment controlling the terminal voltage of a Synchronous Generating Unit or Synchronous Power Generating Module by comparing the actual terminal voltage with a reference value and controlling by appropriate means the output of an Exciter , depending on the deviations.
Auxiliaries	Any item of Plant and/or Apparatus not directly a part of the boiler plant or Power Generating Module or Generating Unit or DC Converter or HVDC Equipment or Power Park Module , but required for the boiler plant's or Power Generating Module's or Generating Unit's or DC Converter's or HVDC Equipment's or Power Park Module's functional operation.
Auxiliary Diesel Engine	A diesel engine driving a Power Generating Module or Generating Unit which can supply a Unit Board or Station Board , which can start without an electrical power supply from outside the Power Station within which it is situated.
Auxiliary Energy Supplies	An electricity supply (which could be derived from an Auxiliary Diesel Engine or Auxiliary Gas Turbine or other source of energy) that is necessary to power the auxiliary and ancillary equipment on which a Power Generating Module or HVDC System or DC Converter or other item of Plant relies for it to be capable of generating Active or Reactive Power and which is generally supplied via a Unit Board or Station Board , or equivalent. Auxiliary Energy Supplies must be available without an external electrical power supply from the Total System . Auxiliary Energy Supplies do not include the mains-independent light current supplies necessary to operate Critical Tools and Facilities .
Auxiliary Gas Turbine	A Gas Turbine Unit , which can supply a Unit Board or Station Board , which can start without an electrical power supply from outside the Power Station within which it is situated.
Average Conditions	That combination of weather elements within a period of time which is the average of the observed values of those weather elements during equivalent periods over many years (sometimes referred to as normal weather).
Back-Up Protection	A Protection system which will operate when a system fault is not cleared by other Protection .
Balancing and Settlement Code or BSC	The code of that title as from time to time amended.
Balancing Code or BC	That portion of the Grid Code which specifies the Balancing Mechanism process.
Balancing Mechanism	Has the meaning set out in the ESO Licence .
Balancing Mechanism Reporting Agent or BMRA	Has the meaning set out in the BSC .
Balancing Mechanism Reporting Service or BMRS	Has the meaning set out in the BSC .

Balancing Principles Statement	A statement prepared by The Company in accordance with condition C9 of the ESO Licence .
Balancing Mechanism Window Period	Has the meaning set out in the BSC .
Baseline Forecast	Has the meaning given to the term 'baseline forecast' in Section G of the BSC .
Bid Acceptance	An acceptance by a BM Unit of a Bid-Offer Acceptance to decrease its export onto, or increase its import from, the National Electricity Transmission System , where in this context import and export are as defined in the BSC .
Bid-Offer Acceptance	(a) A communication issued by The Company in accordance with BC2.7; or (b) an Emergency Instruction to the extent provided for in BC2.9.2.3.
Bid-Offer Data	Has the meaning set out in the BSC .
Bilateral Agreement	Has the meaning set out in the CUSC .
Bilateral Embedded Generation Agreement (BEGA)	Has the meaning set out in the CUSC .
Block Loading Capability	The Active Power step and the time between steps (from no load to Rated MW), which a Generating Unit or Power Generating Module or Power Park Module or HVDC System or DC Converter Station (including Plant and Apparatus owned and operated by a Restoration Contractor) can instantaneously supply without causing it to trip or go outside the Frequency range of 47.5 Hz – 52 Hz assuming the Plant is initially operating at a nominal System Frequency of 50 Hz (or an otherwise agreed Frequency range).
BM Participant	A person who is responsible for and controls one or more BM Units or where a Bilateral Agreement specifies that a User is required to be treated as a BM Participant for the purposes of the Grid Code. For the avoidance of doubt, it does not imply that they must be active in the Balancing Mechanism .
BM Unit	Has the meaning set out in the BSC , except that for the purposes of the Grid Code the reference to "Party" in the BSC shall be a reference to User .
BM Unit Data	The collection of parameters associated with each BM Unit , as described in Appendix 1 of BC1 .
Boiler Time Constant	Determined at Registered Capacity or Maximum Capacity (as applicable), the boiler time constant will be construed in accordance with the principles of the IEEE Committee Report "Dynamic Models for Steam and Hydro Turbines in Power System Studies" published in 1973 which apply to such phrase.
British Standards or BS	Those standards and specifications approved by the British Standards Institution.

BSCCo	Has the meaning set out in the BSC .
BSC Panel	Has meaning set out for “Panel” in the BSC .
Business Day	Any week day (other than a Saturday) on which banks are open for domestic business in the City of London.
Cancellation of National Electricity Transmission System Warning	The notification given to Users when a National Electricity Transmission System Warning is cancelled.
Capacity Market Documents	The Capacity Market Rules , The Electricity Capacity Regulations 2014 and any other Regulations made under Chapter 3 of Part 2 of the Energy Act 2013 which are in force from time to time.
Capacity Market Rules	The rules made under section 34 of the Energy Act 2013 as modified from time to time in accordance with that section and The Electricity Capacity Regulations 2014.
Cascade Hydro Scheme	Two or more hydro-electric Generating Units , owned or controlled by the same Generator , which are located in the same water catchment area and are at different ordnance datums and which depend upon a common source of water for their operation, known as: (a) Moriston (b) Killin (c) Garry (d) Conon (e) Clunie (f) Beaully which will comprise more than one Power Station .
Cascade Hydro Scheme Matrix	The matrix described in Appendix 1 to BC1 under the heading Cascade Hydro Scheme Matrix .
Category 1 Intertripping Scheme	A System to Generator Operational Intertripping Scheme arising from a Variation to Connection Design following a request from the relevant User which is consistent with the criteria specified in the Security and Quality of Supply Standard .

Category 2 Intertripping Scheme	A System to Generator Operational Intertripping Scheme which is:- (i) required to alleviate an overload on a circuit which connects the Group containing the User's Connection Site to the National Electricity Transmission System; and (ii) installed in accordance with the requirements of the planning criteria of the Security and Quality of Supply Standard in order that measures can be taken to permit maintenance access for each transmission circuit and for such measures to be economically justified, and the operation of which results in a reduction in Active Power on the overloaded circuits which connect the User's Connection Site to the rest of the National Electricity Transmission System which is equal to the reduction in Active Power from the Connection Site (once any system losses or third party system effects are discounted).
Category 3 Intertripping Scheme	A System to Generator Operational Intertripping Scheme which, where agreed by The Company and the User, is installed to alleviate an overload on, and as an alternative to, the reinforcement of a third party system, such as the Distribution System of a Public Distribution System Operator.
Category 4 Intertripping Scheme	A System to Generator Operational Intertripping Scheme installed to enable the disconnection of the Connection Site from the National Electricity Transmission System in a controlled and efficient manner in order to facilitate the timely restoration of the National Electricity Transmission System.
Caution Notice	A notice conveying a warning against interference with Safety Precautions, which shall be attached (or affixed) at all Points of Isolation.
CENELEC	European Committee for Electrotechnical Standardisation.
Citizens Advice	Means the National Association of Citizens Advice Bureaux.
Citizens Advice Scotland	Means the Scottish Association of Citizens Advice Bureaux.
CfD Counterparty	A person designated as a "CfD counterparty" under section 7(1) of the Energy Act 2013.
CfD Documents	The AF Rules, The Contracts for Difference (Allocation) Regulations 2014, The Contracts for Difference (Definition of Eligible Generator) Regulations 2014 and The Contracts for Difference (Electricity Supplier Obligations) Regulations 2014 and any other regulations made under Chapter 2 of Part 2 of the Energy Act 2013 which are in force from time to time.

CfD Settlement Services Provider	means any person: (i) appointed for the time being and from time to time by a CfD Counterparty; or (ii) who is designated by virtue of Section C1.2.1B of the Balancing and Settlement Code, in either case to carry out any of the CFD settlement activities (or any successor entity performing CFD settlement activities).
CCGT Module Matrix	The matrix described in Appendix 1 to BC1 under the heading CCGT Module Matrix .
CCGT Module Planning Matrix	A matrix in the form set out in Appendix 2 of OC2 showing the combination of CCGT Units within a CCGT Module which would be running in relation to any given MW output.
Closed Distribution System or CDSO	A distribution system classified as a Closed Distribution System by the Authority which distributes electricity within a geographically confined industrial, commercial or shared services site and does not supply household Customers , without prejudice to incidental use by a small number of households located within the area served by the System and with employment or similar associations with the owner of the System .
Common Information Model or CIM	An abstract information model that describes and organises electricity power system data. Such a model provides a standard way of representing assets owned and / or operated by relevant parties and facilitates the integration of independently developed power system modelling applications.
CIM Standard	A standard published by a standards body (e.g., IEC, BSI) which utilises CIM concepts. CIM Standards describe various facets of CIM and its use: the underlying information model, data exchange and serialisation.
CM Administrative Parties	The Secretary of State , the CM Settlement Body , and any CM Settlement Services Provider .
CM Settlement Body	The Electricity Settlements Company Ltd or such other person as may from time to time be appointed as Settlement Body under regulation 80 of the Electricity Capacity Regulations 2014.
CM Settlement Services Provider	Any person with whom the CM Settlement Body has entered into a contract to provide services to it in relation to the performance of its functions under the Capacity Market Documents .
Code Administration Code of Practice	Means the code of practice approved by the Authority and: (a) developed and maintained by the code administrators in existence from time to time; and (b) amended subject to the Authority's approval from time to time; and (c) re-published from time to time;
Code Administrator	Means The Company carrying out the role of Code Administrator in accordance with the General Conditions.

Combined Cycle Gas Turbine Module or CCGT Module	A collection of Generating Units (registered as a CCGT Module (which could be within a Power Generating Module) under the PC) comprising one or more Gas Turbine Units (or other gas based engine units) and one or more Steam Units where, in normal operation, the waste heat from the Gas Turbines is passed to the water/steam system of the associated Steam Unit or Steam Units and where the component units within the CCGT Module are directly connected by steam or hot gas lines which enable those units to contribute to the efficiency of the combined cycle operation of the CCGT Module .
Combined Cycle Gas Turbine Unit or CCGT Unit	A Generating Unit within a CCGT Module .
Commercial Ancillary Services	Ancillary Services , other than System Ancillary Services , utilised by The Company in operating the Total System if a User (or other person such as a Demand Response Provider) has agreed to provide them under an Ancillary Services Agreement or under a Bilateral Agreement with payment being dealt with under an Ancillary Services Agreement or in the case of Externally Interconnected System Operators or Interconnector Users , under any other agreement (and in the case of Externally Interconnected System Operators and Interconnector Users includes Ancillary Services equivalent to or similar to System Ancillary Services).
Commercial Boundary	Has the meaning set out in the CUSC
Committed Level	The expected Active Power output from a BM Unit after accepting a Bid- Offer Acceptance or RR Instruction or a combination of Bid-Offer Acceptances and RR Instructions .
Committed Project Planning Data	Data relating to a User Development once the offer for a CUSC Contract is accepted.
Common Collection Busbar	A busbar within a Power Park Module to which the higher voltage side of two or more Power Park Unit generator transformers are connected.
Competitively Appointed Transmission Licensee	A person granted a Transmission Licence (as defined in Section 6(1)b of the Act) to own and operate an Onshore Transmission System on the basis of competitive tendering undertaken pursuant to Section 6C of the Electricity Act 1989.
Competitively Appointed Transmission Licensee Interface Point	The electrical point of connection between a Transmission System owned by a Competitively Appointed Transmission Licensee and the assets of another Transmission Licensee .
Completion Date	Has the meaning set out in the Bilateral Agreement with each User to that term or in the absence of that term to such other term reflecting the date when a User is expected to connect to or start using the National Electricity Transmission System . In the case of an Embedded Medium Power Station or Embedded DC Converter Station or Embedded HVDC System having a similar meaning in relation to the Network Operator's System as set out in the Embedded Development Agreement .

Complex	A Connection Site together with the associated Power Station and/or Network Operator substation and/or associated Plant and/or Apparatus , as appropriate.
Compliance Processes or CP	That portion of the Grid Code which is identified as the Compliance Processes .
Compliance Statement	A statement completed by the relevant User confirming compliance with each of the relevant Grid Code provisions, and the supporting evidence in respect of such compliance, of its: Generating Unit(s); or, Power Generating Modules (including DC Connected Power Park Modules and/or Electricity Storage Modules); or, CCGT Module(s); or, Power Park Module(s); or, DC Converter(s); or HVDC Systems; or Plant and Apparatus at an EU Grid Supply Point owned or operated by a Network Operator; or Network Operator's entire distribution System where such Network Operator's distribution System comprises solely of Plant and Apparatus procured on or after 7 September 2018 and was connected to the National Electricity Transmission System on or after 18 August 2019. In this case, all connections to the National Electricity Transmission System would comprise only of EU Grid Supply Points; or Plant and Apparatus at an EU Grid Supply Point owned or operated by a Non-Embedded Customer where such Non-Embedded Customer is defined as an EU Code User; In the form provided by The Company to the relevant User or another format as agreed between the User and The Company.
Configuration 1 AC Connected Offshore Power Park Module	One or more Offshore Power Park Modules that are connected to an AC Offshore Transmission System and that AC Offshore Transmission System is connected to only one Onshore substation and which has one or more Transmission Interface Points .
Configuration 2 AC Connected Offshore Power Park Module	One or more Offshore Power Park Modules that are connected to a meshed AC Offshore Transmission System and that AC Offshore Transmission System is connected to two or more Onshore substations at its Transmission Interface Points .
Configuration 1 DC Connected Power Park Module	One or more DC Connected Power Park Modules that are connected to an HVDC System or Transmission DC Converter and that HVDC System or Transmission DC Converter is connected to only one Onshore substation and which has one or more Transmission Interface Points .

Configuration 2 DC Connected Power Park Module	One or more DC Connected Power Park Modules that are connected to an HVDC System or Transmission DC Converter and that HVDC System or Transmission DC Converter is connected to more than one Onshore substation at its Transmission Interface Points .
Connection Conditions or CC	That portion of the Grid Code which is identified as the Connection Conditions being applicable to GB Code Users .
Connection Entry Capacity	Has the meaning set out in the CUSC .
Connected Planning Data	Data which replaces data containing estimated values assumed for planning purposes by validated actual values and updated estimates for the future and by updated forecasts for Forecast Data items such as Demand .
Connection Point	A Grid Supply Point or Grid Entry Point , as the case may be.
Connection Site	A Transmission Site or User Site , as the case may be.
Construction Agreement	Has the meaning set out in the CUSC
Consumer Representative	Means the person appointed by the Citizens Advice or the Citizens Advice Scotland (or any successor body) representing all categories of customers, appointed in accordance with GR.4.2(b)
Contingency Reserve	The margin of generation over forecast Demand which is required in the period from 24 hours ahead down to real time to cover against uncertainties in Large Power Station availability and against both weather forecast and Demand forecast errors.
Control Based Reactive Power	The Reactive Power supplied by a Grid Forming Plant through controlled means based on operator adjustment selectable setpoints (these may be manual or automatic).
Control Calls	Telephone calls whose destination and/or origin is a Control Centre or Control Point , either from dedicated control desk telephone systems or dedicated telephone handsets, and which, for the purpose of Control Telephony , have the right to exercise priority over (ie. disconnect) a call of a lower status.
Control Centre	A location used for the purpose of control and operation of the National Electricity Transmission System or DC Converter Station owner's System or HVDC System Owner's System or a User System other than a Generator's System or an External System .
Control Engineer	A person nominated by the relevant party for the control of its Plant and Apparatus .
Control Person	The term used as an alternative to " Safety Co-ordinator " on the Site Responsibility Schedule only.
Control Phase	The Control Phase follows on from the Programming Phase and covers the period down to real time.

Control Point	The point from which:- (a) A Non-Embedded Customer's Plant and Apparatus is controlled; or (b) A BM Unit at a Large Power Station or at a Medium Power Station or representing a Cascade Hydro Scheme or with a Demand Capacity with a magnitude of: (i) 50 MW or more in NGET's Transmission Area; or (ii) 30 MW or more in SPT's Transmission Area; or (iii) 10 MW or more in SHETL's Transmission Area, (iv) 10 MW or more which is connected to an Offshore Transmission System is physically controlled by a BM Participant; or (c) In the case of any other BM Unit or Generating Unit (which could be part of a Power Generating Module), data submission is co-ordinated for a BM Participant and instructions are received from The Company, as the case may be. For a Generator, this will normally be at a Power Station but may be at an alternative location agreed with The Company. In the case of a DC Converter Station or HVDC System, the Control Point will be at a location agreed with The Company. In the case of a BM Unit of an Interconnector User, the Control Point will be the Control Centre of the relevant Externally Interconnected System Operator.
Control Telephony	The principal method by which a User's Responsible Engineer/Operator, the relevant Transmission Licensees' Control Engineers and The Company's Control Engineers speak to one another for the purposes of control of the Total System in both normal and emergency operating conditions.
Core Industry Document	As defined in the ESO Licence.
Core Industry Document Owner	In relation to a Core Industry Document, the body(ies) or entity(ies) responsible for the management and operation of procedures for making changes to such document

Critical Tools and Facilities	Apparatus and tools required in relation to System Restoration: a) In the case of The Company include, but are not limited to: i) Tools for operating and monitoring the Transmission System including but not limited to state estimation, the Balancing Mechanism, Load and System Frequency control, alarms, real time system operation and operational security analysis including off line transmission analysis; ii) The ability to control, protect and monitor transmission assets including switchgear, tap changers and other Transmission System equipment including where available auxiliary equipment and to ensure the safe operation of Plant and Apparatus and the safety of personnel; iii) Control Telephony systems as provided for in CC.6.5.1 – CC.6.5.5 and ECC.6.5.1 – ECC.6.5.5; iv) Operational telephony as provided for in STCP 04-5; and v) Tools and communications systems to facilitate cross border operations. b) In the case of Generators, HVDC System Owners, DC Converter Station Owners, Defence Service Providers and Restoration Contractors: i) Tools for monitoring relevant Plant and Apparatus; ii) The ability to control, protect and monitor their Plant and Apparatus necessary for System Restoration including as applicable primary Plant, switchgear, tap changers and other auxiliary equipment and to ensure the safe operation of Plant and personnel; and iii) Control Telephony as provided for in CC.6.5.1 – CC.6.5.5 and ECC.6.5.1 – ECC.6.5.5. c) In the case of BM Participants and Virtual Lead Parties who are not Generators, HVDC System Owners, DC Converter Station owners, Defence Service Providers or Restoration Contractors as provided for in item b) above: i) Tools for monitoring relevant Plant and Apparatus (excluding Plant and Apparatus not owned by the BM Participant or Virtual Lead Party); and ii) Control Telephony as provided for in CC.6.5.1 – CC.6.5.5 and ECC.6.5.1 – ECC.6.5.5 d) In the case of Network Operators: i) Control room Apparatus and tools for monitoring their System including but not limited to, alarms, real time system operation and operational security analysis including off line network analysis; ii) The ability to control, protect and monitor those assets necessary for System Restoration including switchgear, tap changers and other network equipment including where available auxiliary equipment and to ensure the safe operation of Plant and personnel; and iii) Control Telephony as provided for in CC.6.5.1 – CC.6.5.5 and ECC.6.5.1 – ECC.6.5.5. e) In the case of Non-Embedded Customers: i) Tools for monitoring their System including but not limited to, alarms and real time system operation;

	ii) The ability to control, protect and monitor those assets necessary for System Restoration including switchgear, tap changers and other network equipment including where available auxiliary equipment and to ensure the safe operation of Plant and personnel; and iii) Control Telephony as provided for in CC.6.5.1 – CC.6.5.5 and ECC.6.5.1 – ECC.6.5.5.
CUSC	Has the meaning set out in the ESO Licence .
CUSC Contract	One or more of the following agreements as envisaged in condition E2 of the ESO Licence: (a) the CUSC Framework Agreement; (b) a Bilateral Agreement; (c) a Construction Agreement or a variation to an existing Bilateral Agreement and/or Construction Agreement;
CUSC Framework Agreement	Has the meaning set out in the ESO Licence .
CUSC Party	As defined in the ESO Licence and “CUSC Parties” shall be construed accordingly.
Customer	A person to whom electrical power is provided (whether or not they are the same person as the person who provides the electrical power).
Customer Demand Management	Reducing the supply of electricity to a Customer or disconnecting a Customer in a manner agreed for commercial purposes between a Supplier and its Customer .
Customer Demand Management Notification Level	The level above which a Supplier has to notify The Company of its proposed or achieved use of Customer Demand Management which is 12 MW in England and Wales and 5 MW in Scotland.
Customer Generating Plant	A Power Station or Generating Unit or Power Generating Module of a Customer to the extent that it operates the same exclusively to supply all or part of its own electricity requirements, and does not export electrical power to any part of the Total System .
Damping Factor (ζ)	The ratio of the actual damping to critical damping. For a GBGF-I the open loop phase angle, for an open loop gain of one, is measured from the systems Nichols Chart. This angle is used to define the system’s equivalent Damping Factor that is the same as the Damping Factor of a second order system with the same open loop phase angle. Alternatively, the Damping Factor refers to the damping of a specific oscillation mode that is associated with the second order system created by the power to angle transfer function as shown in Figure PC.A.5.8.1(a) and PCA.5.8.1(b).
Data Freeze Date	The date at which the Structural Data of a Network Operator’s Solved PSM reflects the Network Operator’s System .

Data Publisher	The person providing a reporting service, in relation to data which is submitted to the reporting service under OC2.3.2.3 or a Transmission Licensee , in relation to data which the Transmission Licensee is required to publish.
Data Registration Code or DRC	That portion of the Grid Code which is identified as the Data Registration Code .
Data Validation, Consistency and Defaulting Rules	The rules relating to validity and consistency of data, and default data to be applied, in relation to data submitted under the Balancing Codes , to be applied by The Company under the Grid Code as set out in the document "Data Validation, Consistency and Defaulting Rules" - Issue 8, dated 25 th January 2012. The document is available on The Company's website or upon request from The Company .
DC Connected Power Park Module	A Power Park Module that is connected to one or more HVDC Interface Points .
DC Converter	Any Onshore DC Converter or Offshore DC Converter as applicable to GB Code User's .
DC Converter Station	An installation comprising one or more Onshore DC Converters connecting a direct current interconnector: to the National Electricity Transmission System ; or, (if the installation has a rating of 50 MW or more) to a User System , and it shall form part of the External Interconnection to which it relates.
DC Network	All items of Plant and Apparatus connected together on the direct current side of a DC Converter or HVDC System .
DCUSA	The Distribution Connection and Use of System Agreement approved by the Authority and required to be maintained in force by each Electricity Distribution Licence holder.
Defence Service Provider	A User with a legal or contractual obligation to provide a service contributing to one or several measures of the System Defence Plan or a party with a contract to meet one or more measures of the System Defence Plan .
Defined Active Damping Power	The Active Damping Power supplied by a GBGF-I when it is operating at the Grid Oscillation Value defined in Table PC.A.5.8.2.
De-Load	The condition in which a Genset has reduced or is not delivering electrical power to the System to which it is Synchronised .
Δf	Deviation from Target Frequency .
Demand	The demand of MW and MVar of electricity (i.e. both Active and Reactive Power), unless otherwise stated.
Demand Aggregation	A process where one or more Demand Facilities or Closed Distribution Systems can be controlled by a Demand Response Provider either as a single facility or Closed Distribution System for the purposes of offering one or more Demand Response Services .

Demand Capacity	Has the meaning as set out in the BSC .
Demand Control	Any or all of the following methods of achieving a Demand reduction: (a) Customer voltage reduction initiated by Network Operators (other than following an instruction from The Company); (b) Customer Demand reduction by Disconnection initiated by Network Operators (other than following an instruction from The Company); (c) Demand reduction instructed by The Company; (d) automatic low Frequency Demand Disconnection; (e) emergency manual Demand Disconnection.
Demand Control Notification Level	The level above which a Network Operator has to notify The Company of its proposed or achieved use of Demand Control which is 12 MW in England and Wales and 5 MW in Scotland.
Demand Facility	A facility which consumes electrical energy and is connected at one or more Grid Supply Points to the National Electricity Transmission System or connection points to a Network Operator's System . A Network Operator's System and/or auxiliary supplies of a Power Generating Module do not constitute a Demand Facility .
Demand Facility Owner	A person who owns or operates one or more Demand Units within a Demand Facility . A Demand Facility Owner who owns or operates a Demand Facility which is directed connected to the Transmission System shall be treated as a Non-Embedded Customer .
Demand Response Active Power Control	Demand within a Demand Facility or Closed Distribution System that is available for modulation by The Company or Network Operator or Relevant Transmission Licensee , which results in an Active Power modification.
Demand Response Provider	A party (other than The Company) who owns, operates, controls or manages Main Plant and Apparatus (excluding storage equipment) which was first connected to the Total System on or after 18 August 2019 and who had placed Purchase Contracts for its Main Plant and Apparatus on or after 7 September 2018 or is the subject of a Substantial Modification on or after 18 August 2019 and has an agreement with The Company to provide a Demand Response Service(s) . The party may be one or more Customers , a Network Operator or Non-Embedded Customer or EU Code User contracting bilaterally with The Company for the provision of services, or may be a third party providing Demand Aggregation from many individual Customers .
Demand Response Reactive Power Control	A Demand Response Service derived from Reactive Power or Reactive Power compensation devices in a Demand Facility or Closed Distribution System that are available for modulation by The Company or Network Operator or Relevant Transmission Licensee .
Demand Response Transmission Constraint Management	A Demand Response Service derived from Demand within a Demand Facility or Closed Distribution System that is available for modulation by The Company or Network Operator or Relevant Transmission Licensee to manage transmission constraints within the System .

Demand Response Service	A Demand Response Service includes one of more of the following services: (a) Demand Response Active Power Control; (b) Demand Response Reactive Power Control; (c) Demand Response Transmission Constraint Management; (d) Demand Response System Frequency Control; (e) Demand Response Very Fast Active Power Control. The above Demand Response Services are not exclusive and do not preclude Demand Response Providers from negotiating other services for demand response capability with The Company. Where such services are negotiated they would still be treated as a Demand Response Service.
Demand Response Services Code (DRSC)	That portion of the Grid Code which is identified as the Demand Response Services Code being applicable to Demand Response Providers .
Demand Response System Frequency Control	A Demand Response Service derived from a Demand within one or more Demand Facilities or Closed Distribution Systems that is available for the reduction or increase in response to Frequency fluctuations, made by an autonomous response from those Demand Facilities or Closed Distribution Systems to diminish these fluctuations.
Demand Response Unit Document (DRUD)	A document, issued either by the Non-Embedded Customer , Demand Facility Owner or the CDSO to The Company or the Network Operator (as the case may be) for Demand Units with demand response and providing a Demand Response Service which confirms the compliance of the Demand Unit with the technical requirements set out in the Grid Code and provides the necessary data and statements, including a statement of compliance.
Demand Response Very Fast Active Power Control	A Demand Response Service derived from a Demand within a Demand Facility or Closed Distribution System that can be modulated very fast in response to a Frequency deviation, which results in a very fast Active Power modification.
Demand Unit	An indivisible set of installations containing equipment which can be actively controlled at one or more sites by a Demand Response Provider , Demand Facility Owner , CDSO or by a Non Embedded Customer , either individually or commonly as part of Demand Aggregation through a third party who has agreed to provide Demand Response Services .
Designated Information Exchange System	A facsimile machine or, as agreed between each User with respect to their Control Centre , Trading Point or Control Point and The Company , an Electronic Communication Platform that facilitates the exchange of information between a User and The Company .
Designed Minimum Operating Level	The output (in whole MW) below which a Genset or a DC Converter at a DC Converter Station (in any of its operating configurations) has no High Frequency Response capability.

De-Synchronise	(a) The act of taking a Power Generating Module (including a DC Connected Power Park Module), Generating Unit, Power Park Module, HVDC System or DC Converter off a System to which it has been Synchronised, by opening any connecting circuit breaker; or (b) The act of ceasing to consume electricity at an importing BM Unit; and the term "De-Synchronising" shall be construed accordingly.
De-synchronised Island Procedure	A formal procedure as set out in OC9.5.4 for the purpose of Synchronising Power Islands
Detailed Planning Data	Detailed additional data which The Company requires under the PC in support of Standard Planning Data , comprising DPD I and DPD II .
Detailed Planning Data Category I or DPD I	The Detailed Planning Data categorised as such in the DRC , and submitted in accordance with PC.4.4.2 or PC.4.4.4 as applicable.
Detailed Planning Data Category II or DPD II	The Detailed Planning Data categorised as such in the DRC , and submitted in accordance with PC.4.4.2 or PC.4.4.4 as applicable.
Diagram Data	Data in a PSM enabling Structural Data to be displayed graphically, including a Single Line Diagram .
Disconnection	The physical separation of Users (or Customers) from the National Electricity Transmission System or a User System as the case may be.
Discrimination	The quality where a relay or protective system is enabled to pick out and cause to be disconnected only the faulty Apparatus .
Disputes Resolution Procedure	The procedure described in the CUSC relating to disputes resolution.
Distribution Code	The distribution code required to be drawn up by each Electricity Distribution Licence holder and approved by the Authority , as from time to time revised with the approval of the Authority .
Distribution Restoration Contract	An agreement between an Anchor Plant Owner or Top Up Restoration Contractor and The Company and a Network Operator under which the Anchor Restoration Contractor or Top Up Restoration Contractor , on instruction, provides a service to energise and/or contribute to the establishment of a Distribution Restoration Zone .
Distribution Restoration Zone	Part of a Network Operator's System which is capable of being energised by an Anchor Plant following a Total System Shutdown or Partial System Shutdown . The Distribution Restoration Zone shall contain an Anchor Plant and may also include one or more Top Up Restoration Contractor's Plants . The Distribution Restoration Zone primarily comprises part of the Network Operator's System but may include relevant parts of the National Electricity Transmission System in which case Relevant Transmission Licensees would be party to the Distribution Restoration Zone Plan .

Distribution Restoration Zone Control System (DRZCS)	A mains-independent automatic control and supervisory system which assesses the status and operational conditions of part of a Network Operator's System and where relevant, part of the Transmission System for the purposes of operating Restoration Contractor's Plant and Apparatus and/or modulating Restoration Contractors' Demand in addition to operating items of the Network Operator's Plant and Apparatus and relevant Transmission Licensee's Plant and Apparatus for the purposes of establishing and operating a Distribution Restoration Zone .
Distribution Restoration Zone Plan	A plan produced and agreed by a Network Operator, The Company, Restoration Contractors and in certain situations a Transmission Licensees under OC9.4.7.7, detailing the agreed method and procedure by which a Network Operator will instruct a Restoration Contractor with an Anchor Plant to energise, part of a Network Operator's System Total System within 8 hours of that instruction, and subsequently meet complementary blocks of local Demand so as to form a Power Island. A Distribution Restoration Zone Plan may require the use of Top Up Restoration Plant. A Distribution Restoration Zone Plan is distinct from and falls outside the provisions of a Local Joint Restoration Plan.
Droop	The ratio of the per unit steady state change in speed (or Frequency), to the per unit steady state change in Active Power output. Whilst not mandatory, it is often common practice to express Droop in percentage terms.
Dynamic Parameters	Those parameters listed in Appendix 1 to BC1 under the heading BM Unit Data – Dynamic Parameters .
Dynamic Reactive Compensation Equipment	Plant and Apparatus capable of injecting or absorbing Reactive Power in a controlled manner which includes but is not limited to Synchronous Compensators, Static Var Compensators (SVC), or STATCOM devices.
E&W Offshore Transmission System	An Offshore Transmission System with an Interface Point in England and Wales.
E&W Offshore Transmission Licensee	A person who owns or operates an E&W Offshore Transmission System pursuant to a Transmission Licence .
E&W Transmission System	Collectively NGET's Transmission System , any Competitively Appointed Transmission Licensee's Transmission System with Plant and Apparatus located in NGET's Transmission Area and any E&W Offshore Transmission Systems .
E&W User	A User in England and Wales or any Offshore User who owns or operates Plant and/or Apparatus connected (or which will at the OTSUA Transfer Time be connected) to an E&W Offshore Transmission System .

Earth Fault Factor	At a selected location of a three-phase System (generally the point of installation of equipment) and for a given System configuration, the ratio of the highest root mean square phase-to-earth power Frequency voltage on a sound phase during a fault to earth (affecting one or more phases at any point) to the root mean square phase-to-earth power Frequency voltage which would be obtained at the selected location without the fault.
Earthing	A way of providing a connection between conductors and earth by an Earthing Device which is either: (a) Immobilised and Locked in the earthing position. Where the Earthing Device is Locked with a Safety Key, the Safety Key must be secured in a Key Safe and the Key Safe Key must be, where reasonably practicable, given to the authorised site representative of the Requesting Safety Co-ordinator and is to be retained in safe custody. Where not reasonably practicable the Key Safe Key must be retained by the authorised site representative of the Implementing Safety Co-ordinator in safe custody; or (b) maintained and/or secured in position by such other method which must be in accordance with the Local Safety Instructions of NGET or the Safety Rules of the Relevant Transmission Licensee or that User, as the case may be.
Earthing Device	A means of providing a connection between a conductor and earth being of adequate strength and capability.
Elected Panel Members	Shall mean the following Panel Members elected in accordance with GR4.2(a): (a) the representative of the Suppliers; (b) the representative of the Onshore Transmission Licensees; (c) the representative of the Offshore Transmission Licensees; and (d) the representatives of the Generators
Electrical Standard	A standard listed in the Annex to the General Conditions .
Electricity Balancing Regulation	as defined in the CUSC .
Electricity Council	That body set up under the Electricity Act, 1957.
Electricity Distribution Licence	The licence granted pursuant to Section 6(1) (c) of the Act .
Electricity Regulation	As defined in the ESO Licence .
Electricity Storage	The conversion of electrical energy into a form of energy which can be stored, the storing of that energy, and the subsequent reconversion of that energy back into electrical energy.

Electricity Storage Module	Is either one or more Synchronous Electricity Storage Unit(s) or Non-Synchronous Electricity Storage Unit(s) which could also be part of a Power Generating Module . For the avoidance of doubt, Non-Controllable Electricity Storage Equipment would not be considered to be classed as an Electricity Storage Module or as an Electricity Storage Unit .
Electricity Storage Unit	A Synchronous Electricity Storage Unit or Non-Synchronous Electricity Storage Unit .
Electricity Supply Industry Arbitration Association	The unincorporated members' club of that name formed inter alia to promote the efficient and economic operation of the procedure for the resolution of disputes within the electricity supply industry by means of arbitration or otherwise in accordance with its arbitration rules.
Electricity Supply Licence	The licence granted pursuant to Section 6(1) (d) of the Act .
Electricity System Operator Licence or ESO Licence	Means a licence granted or treated as granted under section 6(1)(da) of the Act .
Electricity System Restoration Standard	As defined in Special Condition 2.2 of The Company's Transmission Licence.
Electricity Ten Year Statement	A statement of network development information, prepared annually by The Company in accordance with the terms of the ESO Licence condition C12 for each of the nine succeeding financial years.
Electromagnetic Compatibility Level	Has the meaning set out in Engineering Recommendation G5 .
Electronic Communication Platform	An information exchange platform established, provided, and maintained by The Company that facilitates the exchange of information between a User and The Company .
Electronic Power Converter	Electrical Plant and Apparatus which uses switched solid state power electronic devices to produce a real voltage waveform, that has a fundamental component with harmonics.
Embedded	Having a direct connection to a User System or the System of any other User to which Customers and/or Power Stations are connected, such connection being either a direct connection or a connection via a busbar of another User or of a Relevant Transmission Licensee (but with no other connection to the National Electricity Transmission System).
Embedded Development	Has the meaning set out in PC.4.4.3(a).
Embedded Development Agreement	An agreement entered into between a Network Operator and an Embedded Person , identifying the relevant site of connection to the Network Operator's System and setting out other site specific details in relation to that use of the Network Operator's System .

Embedded Generation Control	Any or all of the following methods by which a Network Operator can achieve a reduction in the Active Power output of Embedded Power Stations to implement an instruction issued by The Company: (a) Embedded Generation De-energisation; or (b) where this is achievable in a suitable timescale to comply with an instruction, arranging to reduce the Active Power output of Embedded Power Stations or Embedded Generator Unit(s) connected to their System.
Embedded Generation Deenergisation	The de-energisation by Network Operators of one or more Embedded Power Stations or Embedded Generating Units from their System as part of an Embedded Generation Control action.
Embedded Customer Import	Import to a Customer's site Embedded in a Network Operator's System where the primary purpose is other than that of an Embedded Power Station. When establishing the primary purpose, the Network Operator will consider factors including: - the maximum export capacity relative to the maximum import capacity; - whether the Customer has a generation licence or licence exemption; and whether the Customer is categorised as having a demand connection or generation connection as defined in DCUSA Schedule 22.
Embedded Power Station Import	Import to a Customer's site Embedded in a Network Operator's System where the primary purpose of that site is wholly or mainly that of an Embedded Power Station. When establishing the primary purpose, the Network Operator will consider factors including: - the maximum export capacity relative to the maximum import capacity; - whether the Customer has a generation licence or licence exemption; and - whether the Customer is categorised as having a demand connection or generation connection as defined in DCUSA Schedule 22.
Embedded Power Station Export	Export from an Embedded Power Station .
Embedded Person	The party responsible for a Medium Power Station not subject to a Bilateral Agreement or DC Converter Station not subject to a Bilateral Agreement or HVDC System not subject to a Bilateral Agreement connected to or proposed to be connected to a Network Operator's System .
Emergency Deenergisation Instruction	An Emergency Instruction issued by The Company to De-Synchronise a Power Generating Module (including a DC Connected Power Park Module), Generating Unit , Power Park Module , HVDC System or DC Converter in circumstances specified in the CUSC .

Emergency Instruction	An instruction issued by The Company in emergency circumstances, pursuant to BC2.9, to the Control Point of a User . In the case of such instructions applicable to a BM Unit , it may require an action or response which is outside the Dynamic Parameters or Other Relevant Data , and may include an instruction to trip a Genset .
EMR Administrative Parties	Has the meaning given to “administrative parties” in The Electricity Capacity Regulations 2014 and each CfD Counterparty and CfD Settlement Services Provider .
EMR Documents	The Energy Act 2013, The Electricity Capacity Regulations 2014, the Capacity Market Rules , The Contracts for Difference (Allocation) Regulations 2014, The Contracts for Difference (Definition of Eligible Generator) Regulations 2014, The Contracts for Difference (Electricity Supplier Obligations) Regulations 2014, The Electricity Market Reform (General) Regulations 2014, the AF Rules and any other regulations or instruments made under Chapter 2 (contracts for difference), Chapter 3 (capacity market) or Chapter 4 (investment contracts) of Part 2 of the Energy Act 2013 which are in force from time to time.
EMR Functions	Has the meaning given to “EMR functions” in Chapter 5 of Part 2 of the Energy Act 2013.
Energy Source	Any of the sources of energy listed in PC.G.8 used in the production of electricity.
Engineering Recommendations	The documents referred to as such and issued by the Energy Networks Association or the former Electricity Council.
Engineering Recommendation G5	Means Engineering Recommendation G5/5.
Energisation Operational Notification or EON	A notification (in respect of Plant and Apparatus (including OTSUA) which is directly connected to the National Electricity Transmission System) from The Company to a User confirming that the User can in accordance with the Bilateral Agreement and/or Construction Agreement , energise such User’s Plant and Apparatus (including OTSUA) specified in such notification.
Equipment Certificate	A document issued by an Authorised Certifier for equipment used by a Power Generating Module , Demand Unit , Network Operators System , Non-Embedded Customers System , Demand Facility or HVDC System . The Equipment Certificate defines the scope of its validity at a national level. For the purpose of replacing specific parts of the compliance process, the Equipment Certificate may include models or equivalent information that have been verified against actual test results.
Estimated Registered Data	Those items of Standard Planning Data and Detailed Planning Data which either upon connection will become Registered Data , or which for the purposes of the Plant and/or Apparatus concerned as at the date of submission are Registered Data , but in each case which for the nine succeeding Financial Years will be an estimate of what is expected.

EU Code User	A User who is any of the following:- (a) A Generator in respect of a Power Generating Module (excluding a DC Connected Power Park Module) or OTSDUA (in respect of an AC Offshore Transmission System) whose Main Plant and Apparatus is connected to the System on or after 27 April 2019 and who concluded Purchase Contracts for its Main Plant and Apparatus on or after 17 May 2018. (b) A Generator in respect of any Type C or Type D Power Generating Module which is the subject of a Substantial Modification which is effective on or after 27 April 2019. (c) A Generator in respect of any DC Connected Power Park Module whose Main Plant and Apparatus is connected to the System on or after 8 September 2019 and who had concluded Purchase Contracts for its Main Plant and Apparatus on or after 28 September 2018. (d) A Generator in respect of any DC Connected Power Park Module which is the subject of a Substantial Modification which is effective on or after 8 September 2019. (e) An HVDC System Owner or OTSDUA (in respect of a DC Offshore Transmission System including a Transmission DC Converter) whose Main Plant and Apparatus is connected to the System on or after 8 September 2019 and who had concluded Purchase Contracts for its Main Plant and Apparatus on or after 28 September 2018. (f) An HVDC System Owner or OTSDUA (in respect of a DC Offshore Transmission System including a Transmission DC Converter) whose HVDC System or DC Offshore Transmission System including a Transmission DC Converter is the subject of a Substantial Modification on or after 8 September 2019. (g) A User which the Authority has determined should be considered as an EU Code User. (h) A Network Operator whose entire distribution System was first connected to the National Electricity Transmission System on or after 18 August 2019 and who had placed Purchase Contracts for its Main Plant and Apparatus in respect of its entire distribution System on or after 7 September 2018. For the avoidance of doubt, a Network Operator will be an EU Code User if its entire distribution System is connected to the National Electricity Transmission System at EU Grid Supply Points only. (i) A Non-Embedded Customer whose Main Plant and Apparatus at each EU Grid Supply Point was first connected to the National Electricity Transmission System on or after 18 August 2019 and who had placed Purchase Contracts for its Main Plant and Apparatus at each EU Grid Supply Point on or after 7 September 2018 or is the subject of a Substantial Modification on or after 18 August 2019. (j) A Storage User in respect of an Electricity Storage Module whose Main Plant and Apparatus is connected to the System on or after 20 May 2020 and who concluded Purchase

	Contracts for its Main Plant and Apparatus on or after 20 May 2019.
EU Generator	A Generator or OTSDUA who is also an EU Code User .
EU Grid Supply Point	A Grid Supply Point where either:- (i) (a) the Network Operator or Non-Embedded Customer had placed Purchase Contracts for all of its Plant and Apparatus at that Grid Supply Point on or after 7 September 2018, and (b) All of the Network Operator's or Non-Embedded Customer's Plant and Apparatus at that Grid Supply Point was first connected to the Transmission System on or after 18 August 2019; or (ii) the Network Operator's or Non-Embedded Customer's Plant and Apparatus at a Grid Supply Point is the subject of a Substantial Modification which is effective on or after 18 August 2019.
EU Transparency Availability Data	Such relevant data as Customers and Generators are required to provide under Articles 7.1(a) and 7.1(b) and Articles 15.1(a), 15.1(b), 15.1(c), 15.1(d) of Assimilated Law (Commission Regulation (EU) 543/2013), and which also forms part of DRC Schedule 6 (Users' Outage Data).
European Compliance Processes or ECP	That portion of the Grid Code which is identified as the European Compliance Processes .
European Connection Conditions or ECC	That portion of the Grid Code which is identified as the European Connection Conditions being applicable to EU Code Users .
European Specification	A common technical specification, a British Standard implementing a European standard or a European technical approval. The terms "common technical specification", "European standard" and "European technical approval" shall have the meanings respectively ascribed to them in the Regulations .
Evaluation of Transmission Impact	As defined in the CUSC .
Event	An unscheduled or unplanned (although it may be anticipated) occurrence on, or relating to, a System (including Embedded Power Stations) including, without limiting that general description, faults, incidents and breakdowns and adverse weather conditions being experienced.
Exciter	The source of the electrical power providing the field current of a synchronous machine.
Excitation System	The equipment providing the field current of a machine, including all regulating and control elements, as well as field discharge or suppression equipment and protective devices.

Excitation System No-Load Negative Ceiling Voltage	The minimum value of direct voltage that the Excitation System is able to provide from its terminals when it is not loaded, which may be zero or a negative value.
Excitation System Nominal Response	Shall have the meaning ascribed to that term in IEC 34-16-1:1991 [equivalent to British Standard BS4999 Section 116.1: 1992]. The time interval applicable is the first half-second of excitation system voltage response.
Excitation System On-Load Positive Ceiling Voltage	Shall have the meaning ascribed to the term 'Excitation system on load ceiling voltage' in IEC 34-16-1:1991 [equivalent to British Standard BS4999 Section 116.1: 1992].
Excitation System No-Load Positive Ceiling Voltage	Shall have the meaning ascribed to the term 'Excitation system no load ceiling voltage' in IEC 34-16-1:1991 [equivalent to British Standard BS4999 Section 116.1: 1992].
Exemptable	Has the meaning set out in the CUSC .
Existing AGR Plant	The following nuclear advanced gas cooled reactor plant (which was commissioned and connected to the Total System at the Transfer Date):- (a) Dungeness B (b) Hinkley Point B (c) Heysham 1 (d) Heysham 2 (e) Hartlepool (f) Hunterston B (g) Torness
Existing AGR Plant Flexibility Limit	In respect of each Genset within each Existing AGR Plant which has a safety case enabling it to so operate, 8 (or such lower number which when added to the number of instances of reduction of output as instructed by The Company in relation to operation in Frequency Sensitive Mode totals 8) instances of flexibility in any calendar year (or such lower or greater number as may be agreed by the Nuclear Installations Inspectorate and notified to The Company) for the purpose of assisting in the period of low System NRAPM and/or low Localised NRAPM provided that in relation to each Generating Unit each change in output shall not be required to be to a level where the output of the reactor is less than 80% of the reactor thermal power limit (as notified to The Company and which corresponds to the limit of reactor thermal power as contained in the "Operating Rules" or "Identified Operating Instructions" forming part of the safety case agreed with the Nuclear Installations Inspectorate).
Existing Gas Cooled Reactor Plant	Both Existing Magnox Reactor Plant and Existing AGR Plant .

Existing Magnox Reactor Plant	The following nuclear gas cooled reactor plant (which was commissioned and connected to the Total System at the Transfer Date):- (a) Calder Hall (b) Chapelcross (c) Dungeness A (d) Hinkley Point A (e) Oldbury-on-Severn (f) Bradwell (g) Sizewell A (h) Wylfa
Export and Import Limits	Those parameters listed in Appendix 1 to BC1 under the heading BM Unit Data – Export and Import Limits .
External Interconnection	Apparatus for the transmission of electricity to or from the National Electricity Transmission System or a User System into or out of an External System . For the avoidance of doubt, a single External Interconnection may comprise several circuits operating in parallel.
External Interconnection Circuit	Plant or Apparatus which comprises a circuit and which operates in parallel with another circuit and which forms part of the External Interconnection .
Externally Interconnected System Operator or EISO	A person who operates an External System which is connected to the National Electricity Transmission System or a User System by an External Interconnection .
External System	In relation to an Externally Interconnected System Operator means the transmission or distribution system which it owns or operates which is located outside the National Electricity Transmission System Operator Area any Apparatus or Plant which connects that system to the External Interconnection and which is owned or operated by such Externally Interconnected System Operator .
Fast Fault Current	A current delivered by a Power Park Module or HVDC System during and after a voltage deviation caused by an electrical fault within the System with the aim of identifying a fault by network Protection systems at the initial stage of the fault, supporting System voltage retention at a later stage of the fault and System voltage restoration after fault clearance.
Fault Current Interruption Time	The time interval from fault inception until the end of the break time of the circuit breaker (as declared by the manufacturers).
Fault Ride Through	The capability of Power Generating Modules (including DC Connected Power Park Modules) and HVDC Systems to be able to remain connected to the System and operate through periods of low voltage at the Grid Entry Point or User System Entry Point caused by secured faults.
Fast Start	A start by a Genset with a Fast Start Capability .

Fast Start Capability	The ability of a Genset to be Synchronised and Loaded up to full Load within 5 minutes.
Fast Track Criteria	A proposed Grid Code Modification Proposal that, if implemented, (a) would meet the Self-Governance Criteria; and (b) is properly a housekeeping modification required as a result of some error or factual change, including but not limited to: (i) updating names or addresses listed in the Grid Code; (ii) correcting any minor typographical errors; (iii) correcting formatting and consistency errors, such as paragraph numbering; or (iv) updating out of date references to other documents or paragraphs
Final-Balancing Compliance Notification	A notification from The Company to an EU Generator in respect of an Embedded Small Power Station with a Bilateral Embedded Generation Agreement with The Company, with a Completion Date on or after 05-09-2024, confirming that the Generator has demonstrated compliance with: (a) Engineering Recommendation G99 supported by the final operational notification from the relevant Network Operator, (b) the relevant sections of the Grid Code as applicable, and (c) the Bilateral Embedded Generation Agreement, and that all the items in the schedule of Unresolved Issues have been completed to The Company's satisfaction.
Final Generation Outage Programme	An outage programme as agreed by The Company with each Generator and each Interconnector Owner at various stages through the Operational Planning Phase and Programming Phase which does not commit the parties to abide by it, but which at various stages will be used as the basis on which National Electricity Transmission System outages will be planned.
Final Operational Notification or FON	A notification from The Company to a Generator or DC Converter Station owner or HVDC System Owner or Network Operator or Non-Embedded Customer confirming that the User has demonstrated compliance: (a) with the Grid Code, (or where they apply, that relevant derogations have been granted), and (b) where applicable, with Appendices F1 to F5 of the Bilateral Agreement, in each case in respect of the Plant and Apparatus specified in such notification.
Final Physical Notification Data	Has the meaning set out in the BSC .
Final Report	A report prepared by the Test Proposer at the conclusion of a System Test for submission to The Company (if it did not propose the System Test) and other members of the Test Panel .

Financial Year	As defined in the ESO Licence .
Fixed Proposed Implementation Date	The proposed date(s) for the implementation of a Grid Code Modification Proposal or Workgroup Alternative Grid Code Modification such date to be a specific date by reference to an assumed date by which a direction from the Authority approving the Grid Code Modification Proposal or Workgroup Alternative Grid Code Modification is required in order for the Grid Code Modification Proposal or any Workgroup Alternative Grid Code Modification , if it were approved, to be implemented by the proposed date.
Flicker Severity (Long Term)	A value derived from 12 successive measurements of Flicker Severity (Short Term) (over a two hour period) and a calculation of the cube root of the mean sum of the cubes of 12 individual measurements, as further set out in Engineering Recommendation P28 as current at the Transfer Date .
Flicker Severity (Short Term)	A measure of the visual severity of flicker derived from the time series output of a flickermeter over a 10 minute period and as such provides an indication of the risk of Customer complaints.
Forecast Data	Those items of Standard Planning Data and Detailed Planning Data which will always be forecast.
Frequency	The number of alternating current cycles per second (expressed in Hz) at which a System is running.
Frequency Containment Reserves (FCR)	means, in the context of Balancing Services , the Active Power reserves available to contain System Frequency after the occurrence of an imbalance.
Frequency Response Deadband	An interval used intentionally to make the Frequency control unresponsive. In the case of mechanical governor systems, the Frequency Response Deadband is the same as Frequency Response Insensitivity .
Frequency Response Insensitivity	The inherent feature of the control system specified as the minimum magnitude of change in the Frequency or input signal that results in a change of output power or output signal.
Frequency Restoration Reserves (FRR)	Means, in the context of Balancing Services , the Active Power reserves available to restore System Frequency to the nominal Frequency .
Frequency Sensitive AGR Unit	Each Generating Unit in an Existing AGR Plant for which the Generator has notified The Company that it has a safety case agreed with the Nuclear Installations Inspectorate enabling it to operate in Frequency Sensitive Mode , to the extent that such unit is within its Frequency Sensitive AGR Unit Limit . Each such Generating Unit shall be treated as if it were operating in accordance with BC3.5.1 provided that it is complying with its Frequency Sensitive AGR Unit Limit .

Frequency Sensitive AGR Unit Limit	In respect of each Frequency Sensitive AGR Unit , 8 (or such lower number which when added to the number of instances of flexibility for the purposes of assisting in a period of low System or Localised NRAPM totals 8) instances of reduction of output in any calendar year as instructed by The Company in relation to operation in Frequency Sensitive Mode (or such greater number as may be agreed between The Company and the Generator), for the purpose of assisting with Frequency control, provided the level of operation of each Frequency Sensitive AGR Unit in Frequency Sensitive Mode shall not be outside that agreed by the Nuclear Installations Inspectorate in the relevant safety case.
Frequency Sensitive Mode	A Genset , or Type C Power Generating Module or Type D Power Generating Module or DC Connected Power Park Module or HVDC System operating mode which will result in Active Power output changing, in response to a change in System Frequency , in a direction which assists in the recovery to Target Frequency , by operating so as to provide Primary Response and/or Secondary Response and/or High Frequency Response .
Fuel Security Code	The document of that title designated as such by the Secretary of State , as from time to time amended.
Future State of Energy (FSOE)	For each Electricity Storage Module, this is a series of MWh figures and associated times, which is calculated by The Company using the data provided under BC1.A.11.1, making up an estimated profile of the energy stored in that Electricity Storage Module.
Gas System Planner Licence or GSP Licence	Means a licence granted or treated as granted under section 7AA(1) of the Gas Act 1986 .
Gas Turbine Unit	A Generating Unit driven by a gas turbine (for instance by an aero-engine).
Gas Zone Diagram	A single line diagram showing boundaries of, and interfaces between, gas-insulated HV Apparatus modules which comprise part, or the whole, of a substation at a Connection Site (or in the case of OTSDUW Plant and Apparatus, Transmission Interface Site), together with the associated stop valves and gas monitors required for the safe operation of the National Electricity Transmission System or the User System , as the case may be.
Gate Closure	Has the meaning set out in the BSC .
GB CIM Governance Group	A GB standing group of technical experts who are responsible for the maintenance and coordination of GB extensions to the CIM and to Common Grid Model Exchange Standard (CGMES) profiles, such that they effectively support the Grid Code and other relevant data exchanges.

GB Code User	A User in respect of:- (a) A Generator or OTSDUA whose Main Plant and Apparatus (excluding a DC Connected Power Park Module) is connected to the System before 27 April 2019, or who had concluded Purchase Contracts for its Main Plant and Apparatus before 17 May 2018, or whose Plant and Apparatus is not the subject of a Substantial Modification which is effective on or after 27 April 2019; or (b) A DC Converter Station owner whose Main Plant and Apparatus is connected to the System before 8 September 2019, or who had concluded Purchase Contracts for its Main Plant and Apparatus before 28 September 2018, or whose Plant and Apparatus is not the subject of a Substantial Modification which is effective on or after 8 September 2019; or (c) A Non-Embedded Customer whose Main Plant and Apparatus was connected to the National Electricity Transmission System at a GB Grid Supply Point before 18 August 2019 or who had placed Purchase Contracts for its Main Plant and Apparatus before 7 September 2018 or that Non-Embedded Customer is not the subject of a Substantial Modification which is effective on or after 18 August 2019; or (d) A Network Operator whose entire distribution System was connected to the National Electricity Transmission System at one or more GB Grid Supply Points before 18 August 2019 or who had placed Purchase Contracts for its Main Plant and Apparatus in respect of its entire distribution System before 7 September 2018 or its entire distribution System is not the subject of a Substantial Modification which is effective on or after 18 August 2019. For the avoidance of doubt, a Network Operator would still be classed as a GB Code User where its entire distribution System was connected to the National Electricity Transmission System at one or more GB Grid Supply Points, even where that entire distribution System may have one or more EU Grid Supply Points but still comprises of GB Grid Supply Points.
GB Generator	A Generator , or OTSDUA , who is also a GB Code User .
GB Generator Final-Balancing Compliance Notification	A notification from The Company to a GB Generator in respect of an Embedded Small Power Station with a Bilateral Embedded Generation Agreement with The Company, with a Completion Date on or after 5 September 2024, confirming that the GB Generator has demonstrated compliance with: (a) the relevant sections of the Grid Code as applicable, and (b) the Bilateral Embedded Generation Agreement, and that all the items in the schedule of Unresolved Issues have been completed to The Company's satisfaction.

GB Generator Interim-Balancing Compliance Notification	A notification from The Company to a GB Generator in respect of an Embedded Small Power Station with a Bilateral Embedded Generation Agreement with The Company, with a Completion Date on or after 5 September 2024, acknowledging that the GB Generator has demonstrated compliance, except for the Unresolved Issues, with: (a) the relevant sections of the Grid Code as applicable, and (b) the Bilateral Embedded Generation Agreement.
GBGF Fast Fault Current Injection	The ability of a Grid Forming Plant to supply reactive current, that starts to be delivered into the Total System in less than 5 ms when the voltage falls below 90% of its nominal value at the Grid Entry Point or User System Entry Point .
GB Grid Forming - Inverter or GBGF-I	Is any Power Park Module , HVDC System , DC Converter , OTSDUW Plant and Apparatus , Non-Synchronous Electricity Storage Module , Dynamic Reactive Compensation Equipment or any Plant and Apparatus (including a smart load) which is connected or partly connected to the Total System via an Electronic Power Converter which has a Grid Forming Capability (GBGF-I) .
GB Grid Forming – Synchronous or GBGF-S	Is a Synchronous Power Generating Module , Synchronous Electricity Storage Module or Synchronous Generating Unit with a Grid Forming Capability .
GB Grid Supply Point	A Grid Supply Point which is not an EU Grid Supply Point .
GB Synchronous Area	The AC power System in Great Britain which connects User's , Relevant Transmission Licensee's whose AC Plant and Apparatus is considered to operate in synchronism with each other at each Connection Point or User System Entry Point and at the same System Frequency .
GCDF	Means the Grid Code Development Forum.
General Conditions or GC	That portion of the Grid Code which is identified as the General Conditions .
Generating Plant Demand Margin	The difference between Output Usable and forecast Demand .
Generating Unit	An Onshore Generating Unit and/or an Offshore Generating Unit which could also be part of a Power Generating Module .

Generating Unit Data	The Physical Notification, Export and Import Limits and Other Relevant Data only in respect of each Generating Unit (which could be part of a Power Generating Module): (a) which forms part of the BM Unit which represents that Cascade Hydro Scheme; (b) at an Embedded Exemptable Large Power Station, where the relevant Bilateral Agreement specifies that compliance with BC1 and/or BC2 is required: (i) to each Generating Unit, or (ii) to each Power Park Module where the Power Station comprises Power Park Modules.
Generation Capacity	Has the meaning set out in the BSC .
Generation Planning Parameters	Those parameters listed in Appendix 1 of OC2 .
Generator	A person who generates electricity or undertakes Electricity Storage under licence or exemption under the Act , acting in its capacity as a generator in Great Britain or Offshore . The term Generator includes a EU Generator and a GB Generator .
Generator Performance Chart	A diagram which shows the MW and MVar capability limits within which a Generating Unit will be expected to operate under steady state conditions.
Genset	A Power Generating Module (including a DC Connected Power Park Module and/or Electricity Storage Module), Generating Unit , Power Park Module or CCGT Module at a Large Power Station or any Power Generating Module (including a DC Connected Power Park Module), Generating Unit , Power Park Module or CCGT Module which is directly connected to the National Electricity Transmission System .
Good Industry Practice	The exercise of that degree of skill, diligence, prudence and foresight which would reasonably and ordinarily be expected from a skilled and experienced operator engaged in the same type of undertaking under the same or similar circumstances.
Governance Rules or GR	That portion of the Grid Code which is identified as the Governance Rules .
Governor Deadband	An interval used intentionally to make the frequency control unresponsive.
Great Britain or GB	The landmass of England and Wales and Scotland, including internal waters.
Grid Code Fast Track Proposals	A proposal to modify the Grid Code which is raised pursuant to GR.26 and has not yet been approved or rejected by the Grid Code Review Panel .
Grid Code Modification Fast Track Report	A report prepared pursuant to GR.26

Grid Code Modification Register	Has the meaning given in GR.13.1.
Grid Code Modification Report	Has the meaning given in GR.22.1.
Grid Code Modification Procedures	The procedures for the modification of the Grid Code (including the implementation of Approved Modifications) as set out in the Governance Rules .
Grid Code Modification Proposal	A proposal to modify the Grid Code which is not yet rejected pursuant to GR.15.5 or GR.15.6 and has not yet been implemented.
Grid Code Modification Self- Governance Report	Has the meaning given in GR.24.5
Grid Code Objectives	Means the objectives referred to in condition E3.2(b) of the ESO Licence .
Grid Code Review Panel or Panel	The panel with the functions set out in GR.1.2.
Grid Code Review Panel Recommendation Vote	The vote of Panel Members undertaken by the Panel Chairperson in accordance with Paragraph GR.22.4 as to whether in their view they believe each proposed Grid Code Modification Proposal , or Workgroup Alternative Grid Code Modification would better facilitate achievement of the Grid Code Objective(s) and so should be made.
Grid Code Review Panel Self-Governance Vote	The vote of Panel Members undertaken by the Panel Chairperson in accordance with GR.24.9 as to whether they believe each proposed Grid Code Modification Proposal, as compared with the then existing provisions of the Grid Code and any Workgroup Alternative Grid Code Modification set out in the Grid Code Modification Self-Governance Report , would better facilitate achievement of the Grid Code Objective(s) .
Grid Code Self-Governance Proposals	Grid Code Modification Proposals which satisfy the Self Governance Criteria .
Grid Entry Point	An Onshore Grid Entry Point or an Offshore Grid Entry Point .
Grid Forming Active Power	Grid Forming Active Power is the inherent Active Power produced by Grid Forming Plant that includes Active Inertia Power plus Active Phase Jump Power plus Active Damping Power .

Grid Forming Capability	Is (but not limited to) the capability a Power Generating Module, HVDC Converter (which could form part of an HVDC System), Generating Unit, Power Park Module, DC Converter, OTSDUW Plant and Apparatus, Electricity Storage Module, Dynamic Reactive Compensation Equipment or any Plant and Apparatus (including a smart load) whose supplied Active Power is directly proportional to the difference between the magnitude and phase of its Internal Voltage Source and the magnitude and phase of the voltage at the Grid Entry Point or User System Entry Point and the sine of the Load Angle. As a consequence, Plant and Apparatus which has a Grid Forming Capability has a frequency of rotation of the Internal Voltage Source which is the same as the System Frequency for normal operation, with only the Load Angle defining the relative position between the two. In the case of a GBGF-I, a Grid Forming Unit forming part of a GBGF-I shall be capable of sustaining a voltage at its terminals irrespective of the voltage at the Grid Entry Point or User System Entry Point for normal operating conditions. For GBGF-I, the control system, which determines the amplitude and phase of the Internal Voltage Source, shall have a response to the voltage and System Frequency at the Grid Entry Point or User System Entry Point) with a bandwidth that is less than a defined value as shown by the control system's NFP Plot. Exceptions to this requirement are only allowed during transients caused by System faults, voltage dips/surges and/or step or ramp changes in the phase angle which are large enough to cause damage to the Grid Forming Plant via excessive currents.
Grid Forming Electronic Power Converter	A Grid Forming Plant whose output is derived from an Electronic Power Converter with a GBGF-I capability.
Grid Forming Plant	A site which contains Plant and Apparatus which is classified as either a GBGF-S or a GBGF-I
Grid Forming Plant Owner	The owner or operator of a Grid Forming Plant .
Grid Forming Unit	A Power Park Unit or Electricity Storage Unit or a Synchronous Power Generating Unit or individual Load with a Grid Forming Capability .
Grid Oscillation Value	An injected test frequency signal applied at nominal System Frequency with a superimposed oscillatory response overlayed onto the nominal System Frequency with an amplitude of 0.05 Hz peak to peak at a frequency of 1 Hz and is used for determining the rating of the Defined Active Damping Power .
Grid Supply Point	A point of supply from the National Electricity Transmission System to Network Operators or Non-Embedded Customers which could be a GB Grid Supply Point or an EU Grid Supply Point .
Gross Demand	The sum of the Group Demand and Embedded Power Station Import .
Group	Those National Electricity Transmission System sub-stations bounded solely by the faulted circuit(s) and the overloaded circuit(s) excluding any third party connections between the Group and the rest of the National Electricity Transmission System , the faulted circuit(s) being a Secured Event .

Group Demand	Aggregated Embedded Customer Import summated with the associated Latent Demand .
GSP Group	Has the meaning as set out in the BSC .
Headroom	The Power Available (in MW) less the actual Active Power exported from the Power Park Module (in MW).
High Frequency Response	An automatic reduction in Active Power output in response to an increase in System Frequency above the Target Frequency (or such other level of Frequency as may have been agreed in an Ancillary Services Agreement). This reduction in Active Power output must be in accordance with the provisions of the relevant Ancillary Services Agreement which will provide that it will be released increasingly with time over the period 0 to 10 seconds from the time of the Frequency increase on the basis set out in the Ancillary Services Agreement and fully achieved within 10 seconds of the time of the start of the Frequency increase and it must be sustained at no lesser reduction thereafter. The interpretation of the High Frequency Response to a + 0.5 Hz frequency change is shown diagrammatically in Figure CC.A.3.3 and Figure ECC.A.3.3.
High Voltage or HV	For E&W Transmission Systems , a voltage exceeding 650 V. For Scottish Transmission Systems , a voltage exceeding 1000 V.
Historic Frequency Data	System Frequency data at a maximum of 1 second intervals for the whole month, published by The Company as detailed in OC3.4.4.
Houseload Operation	Operation which ensures that a Power Station is able to continue to supply its in-house load in the event of System faults resulting in Power-Generating Modules being disconnected from the System and tripped onto their auxiliary supplies
HP Turbine Power Fraction	Ratio of steady state mechanical power delivered by the HP turbine to the total steady state mechanical power delivered by the total steam turbine at Registered Capacity or Maximum Capacity .
HV Connections	Apparatus connected at the same voltage as that of the National Electricity Transmission System , including Users' circuits, the higher voltage windings of Users' transformers and associated connection Apparatus .
HVDC Converter	Any EU Code User Apparatus used to convert alternating current electricity to direct current electricity, or vice versa. An HVDC Converter is a standalone operative configuration at a single site comprising one or more converter bridges, together with one or more converter transformers, reactors, converter control equipment, essential protective and switching devices and auxiliaries, if any, used for conversion. In a bipolar arrangement, an HVDC Converter represents the bipolar configuration.
HVDC Converter Station	Part of an HVDC System which consists of one or more HVDC Converters installed in a single location together with buildings, reactors, filters reactive power devices, control, monitoring, protective, measuring and auxiliary equipment.

HVDC Equipment	Collectively means an HVDC System and a DC Connected Power Park Module and a Remote End HVDC Converter Station .
HVDC Interface Point	A point at which HVDC Plant and Apparatus is connected to an AC System at which technical specifications affecting the performance of the Plant and Apparatus can be prescribed.
HVDC System	An electrical power system which transfers energy in the form of high voltage direct current between two or more alternating current (AC) buses and comprises at least two HVDC Converter Stations with DC Transmission lines or cables between the HVDC Converter Stations .
HVDC System Owner	A party who owns and is responsible for an HVDC System . For the avoidance of doubt a DC Connected Power Park Module owner would be treated as a Generator .
IEC	International Electrotechnical Commission.
IEC Standard	A standard approved by the International Electrotechnical Commission.
Implementation Date	Is the date and time for implementation of an Approved Modification as specified in accordance with Paragraph GR.25.3.
Implementing Safety Co-ordinator	The Safety Co-ordinator implementing Safety Precautions .
Import Usable	That portion of Registered Import Capacity which is expected to be available and which is not unavailable due to a Planned Outage .
Incident Centre	A centre established by The Company or a User as the focal point in The Company or in that User , as the case may be, for the communication and dissemination of information between the senior management representatives of The Company , or of that User , as the case may be, and the relevant other parties during a Joint System Incident in order to avoid overloading The Company's , or that User's , as the case may be, existing operational/control arrangements.
Independent Back-Up Protection	A Back-Up Protection system which utilises a discrete relay, different current transformers and an alternate operating principle to the Main Protection systems(s) such that it can operate autonomously in the event of a failure of the Main Protection .
Independent Main Protection	A Main Protection system which utilises a physically discrete relay and different current transformers to any other Main Protection .
Indicated Constraint Boundary Margin	The difference between a constraint boundary transfer limit and the difference between the sum of BM Unit Maximum Export Limits and the forecast of local Demand within the constraint boundary.
Indicated Imbalance	The difference between the sum of Physical Notifications for BM Units comprising Generating Units or CCGT Modules or Power Generating Modules and the forecast of Demand for the whole or any part of the System .
Indicated Margin	The difference between the sum of BM Unit Maximum Export Limits submitted and the forecast of Demand for the whole or any part of the System .

Inertia Constant H	For a GBGF-S the Inertia Constant H is measured in MWs/MVA.
Inertia Constant He	For a GBGF- I Electronic Power Converter the Inertia Constant He , is measured in MWs/MVA and produced by the Active ROCOF Response Power .
Information Request Notice	A notice that will be issued by The Company to a relevant party setting out The Company's reasonable requirements for relevant information in accordance with section 172 of the Energy Act 2023. This will be prepared in accordance with The Company's published Information Request Statement .
Information Request Statement	A statement prepared and published by The Company , in accordance with section 172 of the Energy Act 2023 and condition D2.5 of the ESO Licence and GSP Licence , setting out the process that The Company will follow when requesting information from relevant parties by the issue of an Information Request Notice .
Installation Document	A simple structured document containing information about a Type A Power Generating Module or a Demand Unit , with demand response connected below 1000 V, and confirming its compliance with the relevant requirements.
Instructor Facilities	A device or system which gives certain Transmission Control Centre instructions with an audible or visible alarm, and incorporates the means to return message acknowledgements to the Transmission Control Centre .
Integral Equipment Test or IET	A test on equipment, associated with Plant and/or Apparatus , which takes place when that Plant and/or Apparatus forms part of a Synchronised System and which, in the reasonable judgement of the person wishing to perform the test, may cause an Operational Effect .
Intellectual Property" or "IPRs	Patents, trade marks, service marks, rights in designs, trade names, copyrights and topography rights (whether or not any of the same are registered and including applications for registration of any of the same) and rights under licences and consents in relation to any of the same and all rights or forms of protection of a similar nature or having equivalent or similar effect to any of the same which may subsist anywhere in the world.
Interconnector	As defined in the BSC .
Interconnection Agreement	An agreement made between The Company and an Externally Interconnected System Operator and/or an Interconnector User and/or other relevant persons for the External Interconnection relating to an External Interconnection and/or an agreement under which an Interconnector User can use an External Interconnection .
Interconnector Export Capacity	In relation to an External Interconnection means the (daily or weekly) forecast value (in MW) at the time of the (daily or weekly) peak demand, of the maximum level at which the External Interconnection can export to the Grid Entry Point .

Interconnector Import Capacity	In relation to an External Interconnection means the (daily or weekly) forecast value (in MW) at the time of the (daily or weekly) peak demand of the maximum level at which the External Interconnection can import from the Grid Entry Point .
Interconnector Owner	Has the meaning given to the term in the Connection and Use of System Code .
Interconnector Reference Programme	Has the meaning given to that term in section BC1.A.3.
Interconnector User	Has the meaning set out in the BSC .
Interface Agreement	Has the meaning set out in the CUSC .
Interface Point	As the context admits or requires either; (a) the electrical point of connection between an Offshore Transmission System and an Onshore Transmission System , or (b) the electrical point of connection between an Offshore Transmission System and a Network Operator's User System .
Interface Point Capacity	The maximum amount of Active Power transferable at the Interface Point as declared by a User under the OTSDUW Arrangements expressed in whole MW.
Interface Point Target Voltage/Power factor	The nominal target voltage/power factor at an Interface Point which a Network Operator requires The Company to achieve by operation of the relevant Offshore Transmission System .
Interim-Balancing Compliance Notification	A notification from The Company to an EU Generator in respect of an Embedded Small Power Station with a Bilateral Embedded Generation Agreement with The Company , with a Completion Date on or after 5 September 2024, acknowledging that the Generator has demonstrated compliance, except for the Unresolved Issues , with: (a) Engineering Recommendation G99 as required by the relevant Network Operator , (b) The relevant sections of the Grid Code and Bilateral Embedded Generation Agreement .

Interim Operational Notification or ION	A notification from The Company to a Generator or DC Converter Station owner or HVDC System Owner or Network Operator or Non-Embedded Customer acknowledging that the User has demonstrated compliance, except for the Unresolved Issues; (a) with the Grid Code, and (b) where applicable, with Appendices F1 to F5 of the Bilateral Agreement, in each case in respect of the Plant and Apparatus (including OTSUA) specified in such notification and provided that in the case of the OTSDUW Arrangements such notification shall be provided to a Generator in two parts dealing with the OTSUA and Generator's Plant and Apparatus (called respectively "Interim Operational Notification Part A" or "ION A" and "Interim Operational Notification Part B" or "ION B") as provided for in the CP or ECP.
Intermittent Power Source	The primary source of power for a Generating Unit or Power Generating Module that cannot be considered as controllable, e.g. wind, wave or solar. For the avoidance of doubt, the output from an Electricity Storage Module would not be considered to be an Intermittent Power Source.
Internal Voltage Source or IVS	For a GBGF-S, a real magnetic field, that rotates synchronously with the System Frequency under normal operating conditions, which as a consequence induces an internal voltage (which is often referred to as the Electro Motive Force (EMF)) in the stationary generator winding that has a real impedance. In a GBGF-I, switched power electronic devices are used to produce a voltage waveform, with harmonics, that has a fundamental rotational component called the Internal Voltage Source (IVS) that rotates synchronously with the System Frequency under normal operating conditions. For a GBGF-I there must be an impedance between the Internal Voltage Source and the Grid Entry Point or User System Entry Point. For the avoidance of doubt, the impedance between the Internal Voltage Source and the Grid Entry Point or User System Entry Point could be virtual, real, or a combination of the two.
Intertripping	(a) The tripping of circuit-breaker(s) by commands initiated from Protection at a remote location independent of the state of the local Protection; or (b) Operational Intertripping.
Intertrip Apparatus	Apparatus which performs Intertripping .
IP Completion Day	31 December 2020 as defined in Section 39 of the European Union (Withdrawal Agreement) Act 2020.
IP Turbine Power Fraction	Ratio of steady state mechanical power delivered by the IP turbine to the total steady state mechanical power delivered by the total steam turbine at Registered Capacity or Maximum Capacity .
Isolating Device	A device for achieving Isolation .

Isolation	The disconnection of HV Apparatus (as defined in OC8A.1.6.2 and OC8B.1.7.2) from the remainder of the System in which that HV Apparatus is situated by either of the following: (a) an Isolating Device maintained in an isolating position. The isolating position must either be: (i) maintained by immobilising and Locking the Isolating Device in the isolating position and affixing a Caution Notice to it. Where the Isolating Device is Locked with a Safety Key, the Safety Key must be secured in a Key Safe and the Key Safe Key must be, where reasonably practicable, given to the authorised site representative of the Requesting Safety Co-Ordinator and is to be retained in safe custody. Where not reasonably practicable the Key Safe Key must be retained by the authorised site representative of the Implementing Safety Co-ordinator in safe custody; or (ii) maintained and/or secured by such other method which must be in accordance with the Local Safety Instructions or the Safety Rules of the Relevant Transmission Licensee or that User, as the case may be; or (b) an adequate physical separation which must be in accordance with and maintained by the method set out in the Local Safety Instructions or the Safety Rules of the Relevant Transmission Licensee or that User, as the case may be.
ISOP	Independent System Operator and Planner, means a person designated by the Secretary of State under section 162 of the Energy Act 2023 as the holder of the ESO Licence , and the GSP Licence . For the time being that person is the NESO .
Joint System Incident	An Event wherever occurring (other than on an Embedded Medium Power Station or an Embedded Small Power Station) which, in the opinion of The Company or a User , has or may have a serious and/or widespread effect, in the case of an Event on a User(s) System(s) (other than on an Embedded Medium Power Station or Embedded Small Power Station), on the National Electricity Transmission System , and in the case of an Event on the National Electricity Transmission System , on a User(s) System(s) (other than on an Embedded Medium Power Station or Embedded Small Power Station).
Key Safe	A device for the secure retention of keys.
Key Safe Key	A key unique at a Location capable of operating a lock, other than a control lock, on a Key Safe .

Large Power Station	A Power Station which is (a) directly connected to: (i) NGET's Transmission System where such Power Station has a Registered Capacity of 100 MW or more; or (ii) SPT's Transmission System where such Power Station has a Registered Capacity of 30 MW or more; or (iii) SHETL's Transmission System where such Power Station has a Registered Capacity of 10 MW or more; or (iv) an Offshore Transmission System where such Power Station has a Registered Capacity of 10 MW or more; or, (b) Embedded within a User System (or part thereof) where such User System (or part thereof) is connected under normal operating conditions to: (i) NGET's Transmission System and such Power Station has a Registered Capacity of 100 MW or more; or (ii) SPT's Transmission System and such Power Station has a Registered Capacity of 30 MW or more; or (iii) SHETL's Transmission System and such Power Station has a Registered Capacity of 10 MW or more; or, (c) Embedded within a User System (or part thereof) where the User System (or part thereof) is not connected to the National Electricity Transmission System, although such Power Station is in: (i) NGET's Transmission Area where such Power Station has a Registered Capacity of 100 MW or more; or (ii) SPT's Transmission Area where such Power Station has a Registered Capacity of 30 MW or more; or (iii) SHETL's Transmission Area where such Power Station has a Registered Capacity of 10 MW or more; For the avoidance of doubt, a Large Power Station could comprise of Type A, Type B, Type C or Type D Power Generating Modules.
Latent Demand	An increase in Embedded Customer Import that would appear: • If any demand side response was not operating; • If any Suppliers' time of use tariffs were not implemented; • If any Network Operator or The Company's price signals were not implemented; • If any other means of suppressing Embedded Customer Import were not operating; or In the event of cold load pickup.
Legally Binding Decisions of the European Commission and/or the Agency	Any relevant legally binding decision or decisions of the European Commission and/or the Agency, but a binding decision does not include a decision that is not, or so much of a decision as is not, Assimilated Law.

Legal Challenge	Where permitted by law, a judicial review in respect of the Authority's decision to approve or not to approve a Grid Code Modification Proposal .
Licence	Any licence granted to The Company or a Relevant Transmission Licensee or a User , under Section 6 of the Act .
Licence Standards	Those standards set out or referred to in condition E7 of The Company's ESO Licence and/or condition D3 and/or condition E16 of a Relevant Transmission Licensee's Transmission Licence .
Limited-Balancing Compliance Notification	A notification from The Company to an EU Generator in respect of an Embedded Small Power Station with a Bilateral Embedded Generation Agreement with The Company, with a Completion Date on or after 5 September 2024, stating that the Generator's Plant and/or Apparatus specified in such notification may be, or is, unable to comply: (a) with the relevant provisions of the Grid Code and the Bilateral Embedded Generation Agreement; and/or (b) in accordance with ECP.9.1 (ii) of the Grid Code, upon receipt of notification from the Network Operator concerning an EU Generator failing to meet the requirements of Engineering Recommendation G99 or any provisions of the Grid Code, or where applicable Bilateral Agreement.
Limited Frequency Sensitive Mode	A mode whereby the operation of the Genset or Power Generating Module (or DC Converter at a DC Converter Station or HVDC Systems exporting Active Power to the Total System) is Frequency insensitive except when the System Frequency exceeds 50.4 Hz, from which point Limited High Frequency Response must be provided. For Power Generating Modules (including DC Connected Power Park Modules) and HVDC Systems , operation in Limited Frequency Sensitive Mode would require Limited Frequency Sensitive Mode – Overfrequency (LFSM-O) capability and Limited Frequency Sensitive Mode – Underfrequency (LFSM-U) capability.
Limited Frequency Sensitive Mode – Overfrequency or LFSM-O	A Power Generating Module (including a DC Connected Power Park Module) or HVDC System operating mode which will result in Active Power output reduction in response to a change in System Frequency above a certain value.
Limited Frequency Sensitive Mode – Underfrequency or LFSM-U	A Power Generating Module (including a DC Connected Power Park Module) or HVDC System operating mode which will result in Active Power output increase in response to a change in System Frequency below a certain value.
Limited High Frequency Response	A response of a Genset (or DC Converter at a DC Converter Station exporting Active Power to the Total System) to an increase in System Frequency above 50.4 Hz leading to a reduction in Active Power in accordance with the provisions of BC3.7.2.1.

Limited Membership Workgroup	A Workgroup having less than five (5) but more than two (2) persons that have nominated themselves for membership in addition to the Code Administrator representative and the chairperson of the Workgroup. Members of a Limited Membership Workgroup where employed by companies that are considered to be an Affiliate of each other will be considered to be a single workgroup member for the purposes of fulfilling this minimum requirement.
Limited Operational Notification or LON	A notification from The Company to a Generator or DC Converter Station owner or HVDC System Owner or Network Operator or Non-Embedded Customer stating that the User's Plant and/or Apparatus specified in such notification may be, or is, unable to comply: (a) with the provisions of the Grid Code specified in the notice, and (b) where applicable, with Appendices F1 to F5 of the Bilateral Agreement , and specifying the Unresolved Issues.
Load	The Active, Reactive or Apparent Power , as the context requires, generated, transmitted or distributed.
Loaded	Supplying electrical power to the System .
Load Angle	The angle in radians between the voltage of the Internal Voltage Source and the voltage at the Grid Entry Point or User System Entry Point .
Load Factor	The ratio of the actual output of a Generating Unit or Power Generating Module to the possible maximum output of that Generating Unit or Power Generating Module .
Load Management Block	A block of Demand controlled by a Supplier or other party through the means of radio teleswitching or by some other means.
Local Joint Restoration Plan	A plan produced and agreed by The Company, Transmission Licensee, Restoration Contractors and a Network Operator under OC9.4.7.7, detailing the agreed method and procedure by which The Company or Transmission Licensee in Scotland will instruct a Restoration Contractor with an Anchor Plant to energise, part of the Total System within 2 hours of that instruction and subsequently meet complementary blocks of local Demand so as to form a Power Island. A Local Joint Restoration Plan may require the use of Top Up Restoration Plant. A Local Joint Restoration Plan is distinct from and falls outside the provisions of a Distribution Restoration Zone Plan.

Local Safety Instructions	For safety co-ordination in England and Wales, instructions on each User Site and Transmission Site , approved by NGET's , the relevant Competitively Appointed Transmission Licensee's or User's relevant manager as relevant for the User Site location, setting down the methods of achieving the objectives of NGET's or the relevant Competitively Appointed Transmission Licensee's or the User's Safety Rules , as the case may be, to ensure the safety of personnel carrying out work or testing on Plant and/or Apparatus on which their Safety Rules apply and, in the case of a User , any other document(s) on a User Site which contains rules with regard to maintaining or securing the isolating position of an Isolating Device , or maintaining a physical separation or maintaining or securing the position of an Earthing Device .
Local Switching Procedure	A procedure produced under OC7.6 detailing the agreed arrangements in respect of carrying out of Operational Switching at Connection Sites and parts of the National Electricity Transmission System adjacent to those Connection Sites .
Localised Negative Reserve Active Power Margin or Localised NRAM	That margin of Active Power sufficient to allow transfers to and from a System Constraint Group (as the case may be) to be contained within such reasonable limit as The Company may determine.
Location	Any place at which Safety Precautions are to be applied.
Locked	A condition of HV Apparatus that cannot be altered without the operation of a locking device.
Locking	The application of a locking device which enables HV Apparatus to be Locked .
London Court of International Arbitration	The leading London-based arbitral institution and not-for-profit company limited by guarantee of that name with a registered company number of 0204767 providing for the resolution of commercial disputes in accordance with its arbitration rules.
Low Frequency Relay	Has the same meaning as Under Frequency Relay .
Low Voltage or LV	For E&W Transmission Systems a voltage not exceeding 250 V. For Scottish Transmission Systems , a voltage exceeding 50 V but not exceeding 1000 V.
LV Side of the Offshore Platform	Unless otherwise specified in the Bilateral Agreement , the busbar on the Offshore Platform (typically 33 kV) at which the relevant Offshore Grid Entry Point is located.

Main Plant and Apparatus	In respect of a Power Station (including Power Stations comprising of DC Connected Power Park Modules and Electricity Storage Modules) is one or more of the principal items of Plant or Apparatus required to convert or re-convert the primary source of energy into electricity. In respect of HVDC Systems or DC Converters or Transmission DC Converters is one of the principal items of Plant or Apparatus used to convert high voltage direct current to high voltage alternating current or vice versa. In respect of a Network Operator's equipment or a Non-Embedded Customer's equipment, is one of the principal items of Plant or Apparatus required to facilitate the import or export of Active Power or Reactive Power to or from a Network Operator's or Non-Embedded Customer's System.
Main Protection	A Protection system which has priority above other Protection in initiating either a fault clearance or an action to terminate an abnormal condition in a power system.
Manufacturer's Data & Performance Report	A report submitted by a manufacturer to The Company relating to a specific version of a Power Park Unit demonstrating the performance characteristics of such Power Park Unit in respect of which The Company has evaluated its relevance for the purposes of the Compliance Processes .
Manufacturer's Test Certificates	A certificate prepared by a manufacturer which demonstrates that its Power Generating Module has undergone appropriate tests and conforms to the performance requirements expected by The Company in satisfying its compliance requirements and thereby satisfies the appropriate requirements of the Grid Code and Bilateral Agreement .
Market Operation Data Interface System (MODIS)	A computer system operated by The Company and made available for use by Customers connected to or using the National Electricity Transmission System for the purpose of submitting EU Transparency Availability Data to The Company .
Market Suspension Threshold	Has the meaning given to the term 'Market Suspension Threshold' in Section G of the BSC .
Material Effect	An effect causing The Company or a Relevant Transmission Licensee to effect any works or to alter the manner of operation of Transmission Plant and/or Transmission Apparatus at the Connection Site (which term shall, in this definition and in the definition of " Modification " only, have the meaning ascribed thereto in the CUSC) or the site of connection or a User to effect any works or to alter the manner of operation of its Plant and/or Apparatus at the Connection Site or the site of connection which in either case involves that party in expenditure of more than £10,000.
Materially Affected Party	Any person or class of persons designated by the Authority as such.
Maximum Delivery Offer (MDO)	As defined in BC1.A.1.5 Dynamic Parameters .
Maximum Delivery Bid (MDB)	As defined in BC1.A.1.5 Dynamic Parameters .

Maximum Export Capability	The maximum continuous Active Power that a Network Operator or Non-Embedded Customer can export to the Transmission System at the Grid Supply Point , as specified in the Bilateral Agreement .
Maximum Export Capacity	The maximum continuous Apparent Power expressed in MVA and maximum continuous Active Power expressed in MW which can flow from an Offshore Transmission System connected to a Network Operator's User System , to that User System .
Maximum Capacity or P_{max}	The maximum continuous Active Power which a Power Generating Module can supply to the Total System , less any demand associated solely with facilitating the operation of that Power Generating Module and not fed into the System . In the case of an Electricity Storage Module , the Maximum Capacity is the maximum continuous Active Power which an Electricity Storage Module can export to the Total System less any demand associated with facilitating the operation of that Electricity Storage Module when fully charged and operating in a mode analogous to Generation .
Maximum Generation Service or MGS	A service utilised by The Company in accordance with the CUSC and the Balancing Principles Statement in operating the Total System .
Maximum Generation Service Agreement	An agreement between a User and The Company for the payment by The Company to that User in respect of the provision by such User of a Maximum Generation Service .
Maximum HVDC Active Power Transmission Capacity (PHmax)	The maximum continuous Active Power which an HVDC System can exchange with the network at each Grid Entry Point or User System Entry Point as specified in the Bilateral Agreement or as agreed between The Company and the HVDC System Owner .
Maximum Import Capability	The maximum continuous Active Power that a Network Operator or Non-Embedded Customer can import from the Transmission System at the Grid Supply Point , as specified in the Bilateral Agreement .
Maximum Import Capacity	The maximum continuous Apparent Power expressed in MVA and maximum continuous Active Power expressed in MW which can flow to an Offshore Transmission System connected to a Network Operator's User System , from that User System .
Maximum Import Power	The maximum continuous Active Power which an Electricity Storage Module can import from the Total System , when fully discharged and operating in a mode analogous to Demand .
Measured Demand	Demand measured at the relevant Connection Point . Sometimes referred to as the net demand.

Medium Power Station	A Power Station which is (a) directly connected to NGET's Transmission System where such Power Station has a Registered Capacity of 50 MW or more but less than 100 MW; or, (b) Embedded within a User System (or part thereof) where such User System (or part thereof) is connected under normal operating conditions to NGET's Transmission System and such Power Station has a Registered Capacity of 50 MW or more but less than 100 MW; or, (c) Embedded within a User System (or part thereof) where the User System (or part thereof) is not connected to the National Electricity Transmission System, although such Power Station is in NGET's Transmission Area and such Power Station has a Registered Capacity of 50 MW or more but less than 100 MW. For the avoidance of doubt a Medium Power Station could comprise of Type A, Type B, Type C or Type D Power Generating Modules.
Medium Voltage or MV	For E&W Transmission Systems a voltage exceeding 250 V but not exceeding 650 V.
Mills	Milling plant which supplies pulverised fuel to the boiler of a coal fired Power Station .
Minimum Generation	The minimum output (in whole MW) which a Genset can generate or DC Converter at a DC Converter Station or Electricity Storage Module can import or export to the Total System under stable operating conditions, as registered with The Company under the PC (and amended pursuant to the PC). For the avoidance of doubt, the output may go below this level as a result of operation in accordance with BC3.7.
Minimum Active Power Transmission Capacity (PHmin)	The minimum continuous Active Power which an HVDC System can exchange with the System at each Grid Entry Point or User System Entry Point as specified in the Bilateral Agreement or as agreed between The Company and the HVDC System Owner .
Minimum Import Capacity	The minimum input (in whole MW) into a DC Converter at a DC Converter Station or HVDC System at an HVDC Converter (in any of its operating configurations) at the Onshore Grid Entry Point (or in the case of an Embedded DC Converter or an Embedded HVDC Converter at the User System Entry Point) at which a DC Converter or HVDC Converter can operate in a stable manner, as registered with The Company under the PC (and amended pursuant to the PC).
Minimum Regulating Level	The minimum Active Power , as specified in the Bilateral Agreement or as agreed between The Company and the Generator or HVDC System Owner , down to which the Power Generating Module (including a DC Connected Power Park Module) or HVDC System can control Active Power .

Minimum Stable Operating Level	The minimum Active Power , as specified in the Bilateral Agreement or as agreed between The Company and the Generator , at which the Power Generating Module can be operated stably for an unlimited time.
Minister of the Crown	As defined in the ESO Licence .
Modification	Any actual or proposed replacement, renovation, modification, alteration or construction by or on behalf of a User or The Company to either that User's Plant or Apparatus or Transmission Plant or Apparatus , as the case may be, or the manner of its operation which has or may have a Material Effect on The Company or a User , as the case may be, at a particular Connection Site .
Mothballed DC Connected Power Park Module	A DC Connected Power Park Module that has previously generated which the Generator plans not to use to generate for the remainder of the current Financial Year but which could be returned to service.
Mothballed DC Converter at a DC Converter Station	A DC Converter at a DC Converter Station that has previously imported or exported power which the DC Converter Station Owner plans not to use to import or export power for the remainder of the current Financial Year but which could be returned to service.
Mothballed HVDC System	An HVDC System that has previously imported or exported power which the HVDC System Owner plans not to use to import or export power for the remainder of the current Financial Year but which could be returned to service.
Mothballed HVDC Converter	An HVDC Converter which is part of an HVDC System that has previously imported or exported power which the HVDC System Owner plans not to use to import or export power for the remainder of the current Financial Year but which could be returned to service.
Mothballed Generating Unit	A Generating Unit that has previously generated which the Generator plans not to use to generate for the remainder of the current Financial Year but which could be returned to service. For the avoidance of doubt a Mothballed Generating Unit could be part of a Power Generating Module .
Mothballed Power Generating Module	A Power Generating Module that has previously generated which the Generator plans not to use to generate for the remainder of the current Financial Year but which could be returned to service.
Mothballed Power Park Module	A Power Park Module that has previously generated which the Generator plans not to use to generate for the remainder of the current Financial Year but which could be returned to service.
Multiple Point of Connection	A double (or more) Point of Connection , being two (or more) Points of Connection interconnected to each other through the User's System .
MSID	Has the meaning a set out in the BSC , covers Metering System Identifier.

National Demand	The amount of electricity supplied from the Grid Supply Points plus:- - that supplied by Embedded Large Power Stations, and National Electricity Transmission System Losses, minus:- - the Demand taken by Station Transformers and, Pumped Storage Units and Electricity Storage Modules’. and, for the purposes of this definition, does not include:- - any exports from the National Electricity Transmission System across External Interconnections.
National Electricity Transmission System (NETS)	The Onshore Transmission System and, where owned by Offshore Transmission Licensees , Offshore Transmission Systems .
National Electricity Transmission System Demand	The amount of electricity supplied from the Grid Supply Points plus:- - that supplied by Embedded Large Power Stations, and - exports from the National Electricity Transmission System across External Interconnections, and National Electricity Transmission System Losses, and, for the purposes of this definition, includes:- - the Demand taken by Station Transformers and, Pumped Storage Units and Electricity Storage Modules’.
National Electricity Transmission System Losses	The losses of electricity incurred on the National Electricity Transmission System .
National Electricity Transmission System Operator Area	Means the area by that name as set out in the terms of the ESO Licence .
National Electricity Transmission System Study Network Data File (NETS Study Network Data File)	A computer file produced by The Company which in The Company’s view provides an appropriate representation of the National Electricity Transmission System for a specific point in time. The computer file will contain information and data on Demand on the National Electricity Transmission System and on Large Power Stations including Genset power output consistent with Output Usable and The Company’s view of prevailing system conditions.
National Electricity Transmission System Warning	A warning issued by The Company to Users (or to certain Users only) in accordance with OC7.4.8.2, which provides information relating to System conditions or Events and is intended to: - alert Users to possible or actual Plant shortage, System problems and/or Demand reductions; - inform of the applicable period; - indicate intended consequences for Users; and - enable specified Users to be in a state of readiness to receive instructions from The Company.

National Electricity Transmission System Warning - Demand Control Imminent	A warning issued by The Company , in accordance with OC7.4.8.7, which is intended to provide short term notice, where possible, to those Users who are likely to receive Demand reduction instructions from The Company within 30 minutes.
National Electricity Transmission System Warning - Electricity Margin Notice	A warning issued by The Company , in accordance with OC7.4.8.5, which is intended to invite a response from and to alert recipients to a decreased System Margin .
National Electricity Transmission System Warning – Embedded Generation Control Imminent	A warning issued by The Company , in accordance with OC7.4.8.12, which is intended to provide short term notice, where possible, to those Network Operators who are likely to receive Embedded Generation Control instructions from The Company within 30 minutes.
National Electricity Transmission System Warning - High Risk of Demand Reduction	A warning issued by The Company , in accordance with OC7.4.8.6, which is intended to alert recipients that there is a high risk of Demand reduction being implemented and which may normally result from an Electricity Margin Notice .
National Electricity Transmission System Warning - High Risk of Embedded Generation Reduction	A warning issued by The Company , in accordance with OC7.4.8.11, which is intended to alert recipients that there is a high risk of Embedded Generation Control being implemented and which may result from a National Electricity Transmission System Warning – System NRAPM .
National Electricity Transmission System Warning – Localised NRAPM	A warning issued by The Company , in accordance with OC.7.4.8.10, which is intended to invite a response from and to alert recipients to a decreased Localised NRAPM .
National Electricity Transmission System Warning - Risk of System Disturbance	A warning issued by The Company , in accordance with OC7.4.8.8, which is intended to alert Users of the risk of widespread and serious System disturbance which may affect Users .
National Electricity Transmission System Warning – System NRAPM	A warning issued by The Company , in accordance with OC.7.4.8.9, which is intended to invite a response from and to alert recipients to a decreased System NRAPM .
NETS PSM	A PSM with the scope as set out in PC.10.4.
National Energy System Operator or NESO	The company with registered number 11014226, as the designated ISOP and holder of the ESO Licence and the GSP Licence .
Network Data	The data to be provided by The Company to Users in accordance with the PC , as listed in Part 3 of the Appendix A to the PC or PC.10 as appropriate.

Network Frequency Perturbation Plot	A form of Bode Plot which plots the amplitude (%) and phase (degrees) of the resulting output oscillation responding to an applied input oscillation across a frequency base. The plot will be used to assess the capability and performance of a Grid Forming Plant and to ensure that it does not pose a risk to other Plant and Apparatus connected to the Total System. For GBGF-I, these are used to provide data to The Company which together with the associated Nichols Chart (or equivalent) defines the effects on a GBGF-I for changes in the frequency of the applied input oscillation. The input is the applied as an input oscillation and the output is the resulting oscillations in the GBGF-I's Active Power. For the avoidance of doubt, Generators in respect of GBGF-S can provide their data using the existing formats and do not need to supply NFP plots.
Network Gas Supply Emergency	Has the meaning set out in the BSC .
Network Operator	A person with a User System directly connected to the National Electricity Transmission System to which Customers and/or Power Stations (not forming part of the User System) are connected, acting in its capacity as an operator of the User System , but shall not include a person acting in the capacity of an Externally Interconnected System Operator or a Generator in respect of OTSUA .
NGET	National Grid Electricity Transmission plc (NO: 2366977) whose registered office is at 1-3 Strand, London, WC2N 5EH.
Nichols Chart	For a GBGF-I , a chart derived from the open loop Bode Plots that are used to produce an NFP Plot . The Nichols Chart plots open loop gain versus open loop phase angle. This enables the open loop phase for an open loop gain of 1 to be identified for use in defining the GBGF-I's equivalent Damping Factor .
No-Load Field Voltage	Shall have the meaning ascribed to that term in IEC 34-16-1:1991 [equivalent to British Standard BS4999 Section 116.1 : 1992].
No System Connection	As defined in OC8A.1.6.2 and OC8B.1.7.2.
Non-CUSC Party	A Party who does not accede to the Connection and Use of System Code (CUSC) .
Non-Synchronous Electricity Storage Module	A Power Park Module comprising solely of one or more Non-Synchronous Electricity Storage Units .
Notification of User's Intention to Operate	A notification from a Network Operator or Non-Embedded Customer to The Company informing The Company of the date upon which any Network Operator's or Non-Embedded Customer's Plant and Apparatus at an EU Grid Supply Point will be ready to be connected to the Transmission System .

Notification of User's Intention to Synchronise	A notification from a Generator or DC Converter Station owner or HVDC System Owner to The Company informing The Company of the date upon which any OTSUA , a Generating Unit(s) , CCGT Module(s) , Power Park Module(s) , Power Generating Module(s) (including a DC Connected Power Park Module(s)), HVDC System or DC Converter(s) will be ready to be Synchronised to the Total System .
Non-Controllable Electricity Storage Equipment	An item of storage Plant , including but not limited to a Synchronous Flywheel or Synchronous Compensation Equipment or Regenerative Braking whose active output power cannot be independently controlled.
Non-Dynamic Frequency Response Service	A Demand Response Service in which the Demand is controlled through discrete switching rather than through continuous load changes in response to System Frequency changes.
Non-Embedded Customer	A Customer in Great Britain , except for a Network Operator acting in its capacity as such, receiving electricity direct from the Onshore Transmission System irrespective of from whom it is supplied.
Non-Synchronous Electricity Storage Module	A Power Park Module comprising solely of one or more Non-Synchronous Electricity Storage Units .
Non-Synchronous Electricity Storage Unit	A Power Park Unit which can produce electrical energy by converting or re-converting another source of energy such that the frequency of the generated voltage is not inherently in synchronism with the frequency of the System .
Non-Synchronous Generating Unit	An Onshore Non-Synchronous Generating Unit or Offshore Non-Synchronous Generating Unit which could form part of a Power Generating Module .
Normal CCGT Module	A CCGT Module other than a Range CCGT Module .
Novel Unit	A tidal, wave, wind, geothermal, or any similar, Generating Unit .
OC9 De-synchronised Island Procedure	Has the meaning set out in OC9.5.4.
Offer Acceptance	An acceptance by a BM Unit of a Bid-Offer Acceptance to increase its export onto, or decrease its import from, the National Electricity Transmission System , where in this context import and export are as defined in the BSC .
Offshore	Means wholly or partly in Offshore Waters , and when used in conjunction with another term and not defined means that the associated term is to be read accordingly.
Offshore DC Converter	Any User Apparatus located Offshore used to convert alternating current electricity to direct current electricity, or vice versa. An Offshore DC Converter is a standalone operative configuration at a single site comprising one or more converter bridges, together with one or more converter transformers, converter control equipment, essential protective and switching devices and auxiliaries, if any, used for conversion.

Offshore HVDC Converter	Any User Apparatus located Offshore used to convert alternating current electricity to direct current electricity, or vice versa. An Offshore HVDC Converter is a standalone operative configuration at a single site comprising one or more converter bridges, together with one or more converter transformers, converter control equipment, essential protective and switching devices and auxiliaries, if any, used for conversion.
Offshore Development Information Statement	A statement prepared by The Company .
Offshore Generating Unit	Unless otherwise provided in the Grid Code, any Apparatus located Offshore which produces electrical energy by converting or re-converting another source of energy, including, an Offshore Synchronous Generating Unit or Offshore Non-Synchronous Generating Unit which could also be part of a Power Generating Module or Electricity Storage Module
Offshore Grid Entry Point	In the case of:- (a) an Offshore Generating Unit or an Offshore Synchronous Power Generating Module or an Offshore DC Converter or an Offshore HVDC Converter , as the case may be, which is directly connected to an Offshore Transmission System , the point at which it connects to that Offshore Transmission System , or; (b) an Offshore Power Park Module which is directly connected to an Offshore Transmission System , the point where one Power Park String (registered by itself as a Power Park Module) or the collection of points where a number of Offshore Power Park Strings (registered as a single Power Park Module) connects to that Offshore Transmission System , or; (c) an External Interconnection which is directly connected to an Offshore Transmission System , the point at which it connects to that Offshore Transmission System .
Offshore Local Joint Restoration Plan	A plan produced and agreed by The Company , Offshore Transmission Licensees , Restoration Contractors , a Network Operator and in some cases an Onshore Transmission Licensee under OC9.4.7.7, detailing the agreed method and procedure by which The Company will instruct a Restoration Contractor with an Anchor Plant located Offshore to energise, part of the Total System (including but not limited to parts of the Offshore Transmission System) within 2 hours of that instruction and subsequently meet complementary blocks of local Demand so as to form a Power Island . An Offshore Local Joint Restoration Plan may require the use of Top Up Restoration Plant . An Offshore Local Joint Restoration Plan is distinct from and falls outside the provisions of a Distribution Restoration Zone Plan .
Offshore Non-Synchronous Generating Unit	An Offshore Generating Unit that is not an Offshore Synchronous Generating Unit including for the avoidance of doubt a Power Park Unit or Non-Synchronous Electricity Storage Unit located Offshore .
Offshore Platform	A single structure comprising of Plant and Apparatus located Offshore which includes one or more Offshore Grid Entry Points .

Offshore Power Park Module	A collection of one or more Offshore Power Park Strings (registered as a Power Park Module under the PC). There is no limit to the number of Power Park Strings within the Power Park Module, so long as they either: (a) connect to the same busbar which cannot be electrically split; or (b) connect to a collection of directly electrically connected busbars of the same nominal voltage and are configured in accordance with the operating arrangements set out in the relevant Bilateral Agreement.
Offshore Power Park String	A collection of Offshore Generating Units or Power Park Units or Non-Synchronous Electricity Storage Unit that are powered by an Intermittent Power Source, joined together by cables forming part of a User System with a single point of connection to an Offshore Transmission System. The connection to an Offshore Transmission System may include a DC Converter or HVDC Converter.
Offshore Synchronous Generating Unit	A Generating Unit or Synchronous Electricity Storage Unit located Offshore which could be part of an Offshore Synchronous Power Generating Module in which, under all steady state conditions, the rotor rotates at a mechanical speed equal to the electrical frequency of the National Electricity Transmission System divided by the number of pole pairs of the Generating Unit.
Offshore Synchronous Power Generating Module	A Synchronous Power Generating Module or Synchronous Electricity Storage Module located Offshore.
Offshore Tender Process	The process followed by the Authority to make, in prescribed cases, a determination on a competitive basis of the person to whom an offshore transmission licence is to be granted.
Offshore Transmission Distribution Connection Agreement	An agreement entered into by The Company and a Network Operator in respect of the connection to and use of a Network Operator's User System by an Offshore Transmission System.
Offshore Transmission Licensee	Such person in relation to whose Transmission Licence the standard conditions in Section E (offshore transmission owner standard conditions) of such Transmission Licence have been given effect, or any person in that prospective role who has acceded to the STC.
Offshore Transmission System	A system consisting (wholly or mainly) of high voltage electric lines and used for the transmission of electricity from one Power Station to a sub-station or to another Power Station or between sub-stations, and includes any Plant and Apparatus (including OTSUA) and meters in connection with the transmission of electricity but does not include any Remote Transmission Assets. An Offshore Transmission System extends from the Interface Point, or the Offshore Grid Entry Point(s) and may include Plant and Apparatus located Onshore and Offshore and, where the context permits, references to the Offshore Transmission System includes OTSUA.

Offshore Transmission System Development User Works or OTSDUW	In relation to a particular User where the OTSDUW Arrangements apply, means those activities and/or works for the design, planning, consenting and/or construction and installation of the Offshore Transmission System to be undertaken by the User as identified in Part 2 of Appendix I of the relevant Construction Agreement .
Offshore Transmission System User Assets or OTSUA	OTSDUW Plant and Apparatus constructed and/or installed by a User under the OTSDUW Arrangements which form an Offshore Transmission System that once transferred to a Relevant Transmission Licensee under an Offshore Tender Process will become part of the National Electricity Transmission System .
Offshore Waters	Has the meaning given to “offshore waters” in Section 90(9) of the Energy Act 2004.
Offshore Works Assumptions	In relation to a particular User , means those assumptions set out in Appendix P of the relevant Construction Agreement as amended from time to time.
Onshore	Means within Great Britain , and when used in conjunction with another term and not defined means that the associated term is to be read accordingly.
Onshore DC Converter	Any User Apparatus located Onshore with a Completion Date after 1 st April 2005 used to convert alternating current electricity to direct current electricity, or vice versa. An Onshore DC Converter is a standalone operative configuration at a single site comprising one or more converter bridges, together with one or more converter transformers, converter control equipment, essential protective and switching devices and auxiliaries, if any, used for conversion. In a bipolar arrangement, an Onshore DC Converter represents the bipolar configuration.
Onshore Generating Unit	Unless otherwise provided in the Grid Code, any Apparatus located Onshore which produces electrical energy by converting or re-converting another source of energy, including, an Onshore Synchronous Generating Unit or Onshore Non-Synchronous Generating Unit which could also be part of a Power Generating Module or an Electricity Storage Module .
Onshore Grid Entry Point	A point at which an Onshore Generating Unit or a CCGT Module or a CCGT Unit or an Onshore Power Generating Module or an Onshore DC Converter or an Onshore HVDC Converter or an Onshore Power Park Module or an Onshore Electricity Storage Module or an External Interconnection , as the case may be, which is directly connected to the Onshore Transmission System connects to the Onshore Transmission System .
Onshore HVDC Converter	Any User Apparatus located Onshore used to convert alternating current electricity to direct current electricity, or vice versa. An Onshore HVDC Converter is a standalone operative configuration at a single site comprising one or more converter bridges, together with one or more converter transformers, converter control equipment, essential protective and switching devices and auxiliaries, if any, used for conversion. In a bipolar arrangement, an Onshore HVDC Converter represents the bipolar configuration.

Onshore Non-Synchronous Generating Unit	A Generating Unit located Onshore that is not a Synchronous Generating Unit or Synchronous Electricity Storage Unit including for the avoidance of doubt a Power Park Unit or Non-Synchronous Electricity Storage Unit located Onshore .
Onshore Power Park Module	A collection of Non-Synchronous Generating Units that are powered by an Intermittent Power Source or connected through power electronic conversion technology or Non-Synchronous Electricity Storage Units , joined together by a System (registered as a Power Park Module under the PC) with a single electrical point of connection directly to the Onshore Transmission System (or User System if Embedded) with no intermediate Offshore Transmission System connections. The connection to the Onshore Transmission System (or User System if Embedded) may include a DC Converter or HVDC Converter .
Onshore Synchronous Generating Unit	An Onshore Generating Unit or Onshore Synchronous Electricity Storage Unit (which could also be part of an Onshore Power Generating Module) including, for the avoidance of doubt, a CCGT Unit or Synchronous Electricity Storage Unit in which, under all steady state conditions, the rotor rotates at a mechanical speed equal to the electrical frequency of the National Electricity Transmission System divided by the number of pole pairs of the Generating Unit .
Onshore Synchronous Power Generating Module	A Synchronous Power Generating Module or Synchronous Electricity Storage Module located Onshore .
Onshore Transmission Licensee	NGET , SPT , SHETL , or a Competitively Appointed Transmission Licensee .
Onshore Transmission System	The system consisting (wholly or mainly) of high voltage electric lines owned or operated by Onshore Transmission Licensees or operated by The Company and used for the transmission of electricity from one Power Station to a substation or to another Power Station or between substations or to or from Offshore Transmission Systems or to or from any External Interconnection , and includes any Plant and Apparatus and meters owned or operated by any Onshore Transmission Licensee in connection with the transmission of electricity but does not include any Remote Transmission Assets .
On-Site Generator Site	A site which is determined by the BSC Panel to be a Trading Unit under the BSC by reason of having fulfilled the Class 1 or Class 2 requirements as such terms are used in the BSC .
Operating Code or OC	That portion of the Grid Code which is identified as the Operating Code .
Operating Margin	Contingency Reserve plus Operating Reserve .
Operating Reserve	The additional output from Large Power Stations or the reduction in Demand , which must be realisable in real-time operation to respond in order to contribute to containing and correcting any System Frequency fall to an acceptable level in the event of a loss of generation or a loss of import from an External Interconnection or mismatch between generation and Demand .
Operation	A scheduled or planned action relating to the operation of a System (including an Embedded Power Station).

Operational Data	Data required under the Operating Codes and/or Balancing Codes .
Operational Day	The period from 05:00 hours on one day to 05:00 hours on the following day.
Operation Diagrams	Diagrams which are a schematic representation of the HV Apparatus and the connections to all external circuits at a Connection Site (and in the case of OTSDUW, Transmission Interface Site), incorporating its numbering, nomenclature and labelling.
Operational Effect	Any effect on the operation of the relevant other System which causes the National Electricity Transmission System or the System of the other User or Users , as the case may be, to operate (or be at a materially increased risk of operating) differently to the way in which they would or may have operated in the absence of that effect.
Operational Intertripping	The automatic tripping of circuit-breakers to prevent abnormal system conditions occurring, such as over voltage, overload, System instability, etc. after the tripping of other circuit-breakers following power System fault(s) which includes System to Generating Unit , System to CCGT Module , System to Power Park Module , System to Electricity Storage Module , System to DC Converter , System to Power Generating Module , System to HVDC Converter and System to Demand intertripping schemes.
Operational Notifications	Any Energisation Operational Notification , Interim Operational Notification , Final Operational Notification or Limited Operational Notification issued from The Company to a User .
Operational Planning	Planning through various timescales the matching of generation output with forecast National Electricity Transmission System Demand together with a reserve of generation to provide a margin, taking into account outages of certain Generating Units or Power Generating Modules , of parts of the National Electricity Transmission System and of parts of User Systems to which Power Stations and/or Customers are connected, carried out to achieve, so far as possible, the standards of security set out in the ESO Licence , each Relevant Transmission Licensee's Transmission Licence or Electricity Distribution Licence , as the case may be.
Operational Planning Margin	An operational planning margin set by The Company .
Operational Planning Phase	The period from 8 weeks to the end of the 5 th year ahead of real time operation.
Operational Procedures	Management instructions and procedures, both in support of the Safety Rules and for the local and remote operation of Plant and Apparatus , issued in connection with the actual operation of Plant and/or Apparatus at or from a Connection Site .
Operational Switching	Operation of Plant and/or Apparatus to the instruction of the relevant Control Engineer . For the avoidance of doubt, the operation of Transmission Plant and/or Apparatus forming part of the National Electricity Transmission System will be to the instruction of the Relevant Transmission Licensee .

Other Relevant Data	The data listed in BC1.4.2(f) under the heading Other Relevant Data .
OTSDUW Arrangements	The arrangements whereby certain aspects of the design, consenting, construction, installation and/or commissioning of transmission assets are capable of being undertaken by a User prior to the transfer of those assets to a Relevant Transmission Licensee under an Offshore Tender Process .
OTSDUW Data and Information	The data and information to be provided by Users undertaking OTSDUW , to The Company in accordance with Appendix F of the Planning Code .
OTSDUW DC Converter	A Transmission DC Converter designed and/or constructed and/or installed by a User under the OTSDUW Arrangements and/or operated by the User until the OTSUA Transfer Time .
OTSDUW Development and Data Timetable	The timetable for both the delivery of OTSDUW Data and Information and OTSDUW Network Data and Information as referred to in Appendix F of the Planning Code and the development of the scope of the OTSDUW .
OTSDUW Network Data and Information	The data and information to be provided by The Company to Users undertaking OTSDUW in accordance with Appendix F of the Planning Code .
OTSDUW Plant and Apparatus	Plant and Apparatus , including any OTSDUW DC Converter , designed by the User under the OTSDUW Arrangements .
OTSUA Transfer Time	The time and date at which the OTSUA are transferred to a Relevant Transmission Licensee .
Out of Synchronism	The condition where a System or Generating Unit or Power Generating Module cannot meet the requirements to enable it to be Synchronised .
Output Usable or OU	The forecast value (in MW), profiled across the time period affected by the unplanned or planned Event of the level at which the Genset can export to the Grid Entry Point, or in the case of Embedded Power Stations, to the User System Entry Point. In addition, for a Genset powered by an Intermittent Power Source the forecast value is based upon the Intermittent Power Source being at a level which would enable the Genset to generate at Registered Capacity. For the purpose of OC2 only, the term Output Usable shall include the terms Interconnector Export Capacity and Interconnector Import Capacity where the term Output Usable is being applied to an External Interconnection.
Over-excitation Limiter	Shall have the meaning ascribed to that term in IEC 34-16-1:1991 [equivalent to British Standard BS4999 Section 116.1: 1992].
Panel Chairperson	A person appointed as such in accordance with GR.4.1.
Panel Member	Any of the persons identified as such in GR.4.
Panel Members' Recommendation	The recommendation in accordance with the " Grid Code Review Panel Recommendation Vote ".

Panel Secretary	A person appointed as such in accordance with GR.3.1.2(d).
Part 1 System Ancillary Services	Ancillary Services which are required for System reasons and which must be provided by Users in accordance with the Connection Conditions or European Connection Conditions . An exhaustive list of Part 1 System Ancillary Services is included in that part of CC.8.1 or ECC.8.1 headed Part 1.
Part 2 System Ancillary Services	Ancillary Services which are required for System reasons and which must be provided by a User if the User has agreed to provide them under a Bilateral Agreement . A non-exhaustive list of Part 2 System Ancillary Services is included in that part of CC.8.1 or ECC.8.1 headed Part 2.
Part Load	The condition of a Genset , or Cascade Hydro Scheme which is Loaded but is not running at its Maximum Export Limit.
Peak Current Rating	For a GBGF-I this is the larger of either the: - • The registered maximum steady-state current plus the maximum additional current to supply the Active ROCOF Response Power plus the Defined Active Damping Power; or. • The registered maximum steady-state current plus the maximum additional current to supply the Phase Jump Angle limit power, or. This is the maximum short term total current as declared by the Grid Forming Plant Owner in accordance with PC.A.5.8.1.
Permit for Work for proximity work	In respect of E&W Transmission Systems, a document issued by the Relevant E&W Transmission Licensee or an E&W User in accordance with its respective Safety Rules to enable work to be carried out in accordance with OC8A.8 and which provides for Safety Precautions to be applied and maintained. An example format of a Relevant E&W Transmission Licensee's permit for work is attached as Appendix E to OC8A. In respect of Scottish Transmission Systems, a document issued by a Relevant Scottish Transmission Licensee or a Scottish User in accordance with its respective Safety Rules to enable work to be carried out in accordance with OC8B.8 and which provides for Safety Precautions to be applied and maintained. Example formats of Relevant Scottish Transmission Licensees' permits for work are attached as Appendix E to OC8B.
Partial Shutdown	The same as a Total Shutdown except that all generation has ceased in a separate part of the Total System and there is no electricity supply from External Interconnections or other parts of the Total System to that part of the Total System and, therefore, that part of the Total System is shutdown, with the result that it is not possible for that part of the Total System to begin to function again without The Company's directions relating to System Restoration .

Pending Grid Code Modification Proposal	A Grid Code Modification Proposal in respect of which, at the relevant time, the Authority has not yet made a decision as to whether to direct such Grid Code Modification Proposal to be made pursuant to the ESO Licence (whether or not a Grid Code Modification Report has been submitted in respect of such Grid Code Modification Proposal) or, in the case of a Grid Code Self Governance Proposals , in respect of which the Grid Code Review Panel has not yet voted whether or not to approve.
Phase Jump Angle	The difference in the measured phase angle of the voltage at the Grid Entry Point or User System Entry Point in a given mains half cycle compared with the measured phase angle of the voltage at the Grid Entry Point or User System Entry Point in the previous mains half cycle.
Phase Jump Angle Limit	The maximum Phase Jump Angle when applied to a GBGF-I which will result in a linear controlled response without activating current limiting functions. This is specified for a System angle near to zero which will be considered to be the normal operating angle under steady state conditions.
Phase Jump Angle Withstand	The maximum Phase Jump Angle change when applied to a GBGF-I which will result in the GBGF-I remaining in stable operation with current limiting functions activated. This is specified for a System angle near to zero which will be considered to be the normal operating angle under steady state conditions.
Phase (Voltage) Unbalance	The ratio (in percent) between the rms values of the negative sequence component and the positive sequence component of the voltage.
Physical Notification	Data that describes the BM Participant's best estimate of the expected input or output of Active Power of a BM Unit and/or (where relevant) Generating Unit , except in the instance of a Stage 2 or higher Network Gas Supply Emergency , with the accuracy of the Physical Notification being commensurate with Good Industry Practice .
Planning Code or PC	That portion of the Grid Code which is identified as the Planning Code .
Planned Maintenance Outage	An outage of The Company's electronic data communication facilities as provided for in CC.6.5.8 or ECC.6.5.8 and The Company's associated computer facilities of which normally at least 5 days notice is given, but in any event of which at least twelve hours notice has been given by The Company to the User and which is anticipated to last no longer than 2 hours. The length of such an outage may in exceptional circumstances be extended where at least 24 hours notice has been given by The Company to the User . It is anticipated that normally any planned outage would only last around one hour.
Planned Outage	An outage of a Large Power Station or of part of the National Electricity Transmission System , or of part of a User System , co-ordinated by The Company under OC2 .
Plant	Fixed and movable items used in the generation and/or supply and/or transmission of electricity, other than Apparatus .

Point of Common Coupling	That point on the National Electricity Transmission System electrically nearest to the User installation at which either Demands or Loads are, or may be, connected.
Point of Connection	An electrical point of connection between the National Electricity Transmission System and a User's System .
Point of Isolation	The point on Apparatus (as defined in OC8A.1.6.2 and OC8B.1.7.2) at which Isolation is achieved.
Post-Control Phase	The period following real time operation.
Power Available	A signal prepared in accordance with good industry practice, representing the instantaneous sum of the potential Active Power available from each individual Power Park Unit within the Power Park Module calculated using any applicable combination of electrical or mechanical or meteorological data (including wind speed) measured at each Power Park Unit at a specified time. Power Available shall be a value between 0 MW and Registered Capacity or Maximum Capacity which is the sum of the potential Active Power available of each Power Park Unit within the Power Park Module . A unit that is not generating or supplying power will be considered as not available. For the avoidance of doubt, the Power Available signal would be the Active Power output that a Power Park Module could reasonably be expected to export at the Grid Entry Point or User System Entry Point taking all the above criteria into account including Power Park Unit constraints such as optimisation modes but would exclude a reduction in the Active Power export of the Power Park Module instructed by The Company (for example) for the purposes selecting a Power Park Module to operate in Frequency Sensitive Mode or when an Emergency Instruction has been issued.
Power Factor	The ratio of Active Power to Apparent Power .
Power-Generating Module	Either a Synchronous Power Generating Module , a Synchronous Electricity Storage Module , a Power Park Module or a Non-Synchronous Electricity Storage Module owned or operated by an EU Generator .
Power-Generating Module Document (PGMD)	A document provided by the Generator to The Company for a Type B or Type C Power Generating Module which confirms that the Power Generating Module's compliance with the technical criteria set out in the Grid Code has been demonstrated and provides the necessary data and statements, including a statement of compliance.
Power Generating Module Performance Chart	A diagram showing the Active Power (MW) and Reactive Power (MVar) capability limits within which a Synchronous Power Generating Module or Power Park Module at its Grid Entry Point or User System Entry Point will be expected to operate under steady state conditions.
Power Island	Part of the Total System which is disconnected from, and out of Synchronism with, the rest of the Total System containing Generating Unit(s) at one or more Power Stations , and/or HVDC Systems and/or DC Converters , together with complementary local Demand .
Power Park Module	Any Onshore Power Park Module or Offshore Power Park Module .
Power Park Module Availability Matrix	The matrix described in Appendix 1 to BC1 under the heading Power Park Module Availability Matrix .

Power Park Module Planning Matrix	A matrix in the form set out in Appendix 3 of OC2 showing the combination of Power Park Units within a Power Park Module which would be expected to be running under normal conditions.
Power Park Unit	A Generating Unit within a Power Park Module .
Power Station	An installation comprising one or more Generating Units or Power Park Modules or Power Generating Modules or Electricity Storage Modules (even where sited separately) owned and/or controlled by the same Generator , which may reasonably be considered as being managed as one Power Station .
Power System Difference Model (PSDM)	A digital model that describes changes to the Structural Data of a PSM .
Power System Model (PSM)	A digital model of an electricity transmission and/or distribution system created for the purpose of performing studies. It organises the relevant data into: Structural Data , Situation Data , and Solution Data , and facilitates data exchange between relevant parties.
Power System Stabiliser or PSS	Equipment controlling the Exciter output via the voltage regulator in such a way that power oscillations of the synchronous machines are dampened. Input variables may be speed, frequency or power (or a combination of these).
Preface	The preface to the Grid Code (which does not form part of the Grid Code and therefore is not binding).
Preliminary Notice	A notice in writing, sent by The Company both to all Users identified by it under OC12.4.2.1 and to the Test Proposer , notifying them of a proposed System Test .
Preliminary Project Planning Data	Data relating to a proposed User Development at the time the User applies for a CUSC Contract but before an offer is made and accepted.
Primary Response	The automatic increase in Active Power output of a Genset or, as the case may be, the decrease in Active Power Demand in response to a System Frequency fall. This increase in Active Power output or, as the case may be, the decrease in Active Power Demand must be in accordance with the provisions of the relevant Ancillary Services Agreement which will provide that it will be released increasingly with time over the period 0 to 10 seconds from the time of the start of the Frequency fall on the basis set out in the Ancillary Services Agreement and fully available by the latter, and sustainable for at least a further 20 seconds. The interpretation of the Primary Response to a – 0.5 Hz frequency change is shown diagrammatically in Figure CC.A.3.2 and Figure ECC.A.3.2
Prioritisation Category	Prioritisation Category has the meaning given to that term by the Authority Guidance on Code Modification Prioritisation .
Prioritisation Criteria	Prioritisation Criteria has the meaning given to that term by the Authority Guidance on Code Modification Prioritisation .

Private Network	A network which connects to a Network Operator's System and that network belongs to a User who is not classified as a Generator , Network Operator or Non-Embedded Customer .
Programming Phase	The period between the Operational Planning Phase and the Control Phase . It starts at the 8 weeks ahead stage and finishes at 17:00 hours on the day ahead of real time.
Proposal Notice	A notice submitted to The Company by a User which would like to undertake a System Test .
Proposal Report	A report submitted by the Test Panel which contains: (a) proposals for carrying out a System Test (including the manner in which the System Test is to be monitored); (b) an allocation of costs (including un-anticipated costs) between the affected parties (the general principle being that the Test Proposer will bear the costs); and (c) such other matters as the Test Panel considers appropriate. The report may include requirements for indemnities to be given in respect of claims and losses arising from a System Test.
Proposed Implementation Date	The proposed date(s) for the implementation of a Grid Code Modification Proposal or Workgroup Alternative Grid Code Modification such date(s) to be either (i) described by reference to a specified period after a direction from the Authority approving the Grid Code Modification Proposal or Workgroup Alternative Grid Code Modification or (ii) a Fixed Proposed Implementation Date .
Proposer	In relation to a particular Grid Code Modification Proposal , the person who makes such Grid Code Modification Proposal .
Protection	The provisions for detecting abnormal conditions on a System and initiating fault clearance or actuating signals or indications.
Protection Apparatus	A group of one or more Protection relays and/or logic elements designated to perform a specified Protection function.
PSM Change Document	A document associated with a submission describing changes to the NETS or Network Operator's system or its operation and changes to the assumptions, as described in the PSM Scenario Document , used in the creation of a Solved PSM and/or the associated schedules forming part of the periodic information exchanges. Additional detail is provided in PC.G.6.
PSM Implementation Date	1 st January 2028 unless otherwise agreed in accordance with PC.3.1.1.2.
PSM Interface Node	A point in an interconnected electrical system model that defines the boundary either side of which different parties are responsible for data.
PSM Scenario Document	A document associated with a submission which provides information relating to the assumptions used in preparation of the Solved PSM and the associated schedules. Additional detail is provided in PC.G.5.

Pumped Storage	A hydro unit in which water can be raised by means of pumps and stored to be used for the generation of electrical energy.
Pumped Storage Generating Unit	A Generating Unit at a Pumped Storage Plant .
Pumped Storage Generator	A Generator which owns and/or operates any Pumped Storage Plant .
Pumped Storage Plant	A Power Station comprising Pumped Storage Generating Units .
Pumped Storage Unit	A Generating Unit within a Pumped Storage Plant . For the avoidance of doubt, a Pumped Storage Unit is not considered to form part of an Electricity Storage Unit unless specifically declared by the Generator .
Purchase Contracts	A final and binding contract for the purchase of the Main Plant and Apparatus .
Q/Pmax	The ratio of Reactive Power to the Maximum Capacity. The relationship between Power Factor and Q/Pmax is given by the formula:- $\text{Power Factor} = \cos \left[\arctan \left[\frac{Q}{P_{\max}} \right] \right]$ For example, a Power Park Module with a Q/P value of +0.33 would equate to a Power Factor of $\cos(\arctan 0.33) = 0.95$ Power Factor lag.
Quick Resynchronisation Capability	The capability of a Type C or Type D Power Generating Module as defined in ECC.6.3.5.6. For the avoidance of doubt this requirement is only mandatory for EU Code Generators who own or operate a Type C or Type D Power Generating Module but does not preclude owners of other generation electing to provide the capability.
Quick Resynchronisation Unit Test	A test undertaken on Generating Unit forming part of a Type C or Type D Power Generating Module as detailed in OC5.7.2.5 necessary to determine its ability to demonstrate a Quick Resynchronisation Capability .
Range CCGT Module	A CCGT Module where there is a physical connection by way of a steam or hot gas main between that CCGT Module and another CCGT Module or other CCGT Modules , which connection contributes (if open) to efficient modular operation, and which physical connection can be varied by the operator.
Rated Field Voltage	Shall have the meaning ascribed to that term in IEC 34-16-1:1991 [equivalent to British Standard BS4999 Section 116.1: 1992].

Rated MW	The “rating-plate” MW output of a Power Generating Module, Generating Unit, Power Park Module, Electricity Storage Module, HVDC Converter or DC Converter, being: (a) that output up to which the Generating Unit was designed to operate (Calculated as specified in British Standard BS EN 60034 – 1: 1995); or (b) the nominal rating for the MW output of a Power Park Module or Power Generating Module being the maximum continuous electric output power which the Power Park Module or Power Generating Module was designed to achieve under normal operating conditions; or (c) the nominal rating for the MW import capacity and export capacity (if at a DC Converter Station or HVDC Converter Station) of a DC Converter or HVDC Converter. (d) in an importing mode, is that input up to which an Electricity Storage Module was designed to operate being the maximum continuous electric input which the Electricity Storage Module was designed to achieve under normal operating conditions. In an exporting mode is:- (i) that output up to which the Synchronous Electricity Storage Unit was designed to operate (Calculated as specified in British Standard BS EN 60034 – 1: 1995); or (ii) the nominal rating for the MW output of a Non-Synchronous Electricity Storage Module being the maximum continuous electric output power which the Non-Synchronous Electricity Storage Module was designed to achieve under normal operating conditions.
Reactive Despatch Instruction	Has the meaning set out in the CUSC .
Reactive Despatch Network Restriction	A restriction placed upon an Embedded Power Generating Module, Embedded Generating Unit, Embedded Power Park Module or DC Converter at an Embedded DC Converter Station or HVDC Converter at an Embedded HVDC Converter Station by the Network Operator that prevents the Generator or DC Converter Station owner or HVDC System Owner in question (as applicable) from complying with any Reactive Despatch Instruction with respect to that Power Generating Module, Generating Unit, Power Park Module or DC Converter at a DC Converter Station or HVDC Converter at a HVDC Converter Station , whether to provide MVARs over the range referred to in CC 6.3.2, ECC.6.3.2 or otherwise.
Reactive Despatch to Zero MVAR Network Restriction	A Reactive Despatch Network Restriction which prevents an Embedded Power Generating Module, an Embedded Generating Unit, Embedded Power Park Module, Embedded HVDC System, HVDC Converter at an Embedded HVDC Converter Station or DC Converter at an Embedded DC Converter Station from supplying power at zero MVAR at all Active Power output levels up to and including Rated MW at the Grid Entry Point (or User System Entry Point if Embedded) .
Reactive Energy	The integral with respect to time of the Reactive Power .

Reactive Power	The product of voltage and current and the sine of the phase angle between them measured in units of voltamperes reactive and standard multiples thereof, ie: 1000 VAr = 1 kVAr 1000 kVAr = 1 MVar
Record of Inter-System Safety Precautions or RISSP	A written record of inter-system Safety Precautions to be compiled in accordance with the provisions of OC8 .
Regenerative Braking	A method of braking in which energy is extracted from the parts braked, which may be returned directly to the System and the purpose of the braking is motion control.

Registered Capacity	(a) In the case of a Generating Unit other than that forming part of a CCGT Module or Power Park Module or Power Generating Module, the normal full load capacity of a Generating Unit as declared by the Generator, less the MW consumed by the Generating Unit through the Generating Unit's Unit Transformer when producing the same (the resultant figure being expressed in whole MW, or in MW to one decimal place). (b) In the case of a CCGT Module or Power Park Module owned or operated by a GB Generator, the normal full load capacity of the CCGT Module or Power Park Module (as the case may be) as declared by the GB Generator, being the Active Power declared by the GB Generator as being deliverable by the CCGT Module or Power Park Module at the Grid Entry Point (or in the case of an Embedded CCGT Module or Power Park Module, at the User System Entry Point), expressed in whole MW, or in MW to one decimal place. For the avoidance of doubt Maximum Capacity would apply to Power Generating Modules which form part of a Large, Medium or Small Power Station. (c) In the case of a Power Station, the maximum amount of Active Power deliverable by the Power Station at the Grid Entry Point (or in the case of an Embedded Power Station at the User System Entry Point), as declared by the Generator, expressed in whole MW, or in MW to one decimal place. The maximum Active Power deliverable is the maximum amount deliverable simultaneously by the Power Generating Modules and/or Generating Units and/or CCGT Modules and/or Power Park Modules less the MW consumed by the Power Generating Modules and/or Generating Units and/or CCGT Modules in producing that Active Power and forming part of a Power Station. (d) In the case of a DC Converter at a DC Converter Station or HVDC Converter at an HVDC Converter Station, the normal full load amount of Active Power transferable from a DC Converter or HVDC Converter at the Onshore Grid Entry Point (or in the case of an Embedded DC Converter Station or an Embedded HVDC Converter Station at the User System Entry Point), as declared by the DC Converter Station owner or HVDC System Owner, expressed in whole MW, or in MW to one decimal place. (e) In the case of a DC Converter Station or HVDC Converter Station, the maximum amount of Active Power transferable from a DC Converter Station or HVDC Converter Station at the Onshore Grid Entry Point (or in the case of an Embedded DC Converter Station or Embedded HVDC Converter Station at the User System Entry Point), as declared by the DC Converter Station owner or HVDC System Owner, expressed in whole MW, or in MW to one decimal place. (f) In the case of an Electricity Storage Module, the normal full load amount of Active Power transferable from an Electricity Storage Module at the Grid Entry Point (or in the case of an Embedded Electricity Storage Module at the User System Entry Point), as declared by the Generator, expressed in whole MW, or in MW to one decimal place.

Registered Data	Those items of Standard Planning Data and Detailed Planning Data which upon connection become fixed (subject to any subsequent changes).
Registered Import Capability	In the case of a DC Converter Station or HVDC Converter Station containing DC Converters or HVDC Converters connected to an External System, the maximum amount of Active Power transferable into a DC Converter Station or HVDC Converter Station at the Onshore Grid Entry Point (or in the case of an Embedded DC Converter Station or Embedded HVDC Converter Station at the User System Entry Point), as declared by the DC Converter Station owner or HVDC System Owner, expressed in whole MW. In the case of a DC Converter or HVDC Converter connected to an External System and in a DC Converter Station or HVDC Converter Station, the normal full load amount of Active Power transferable into a DC Converter or HVDC Converter at the Onshore Grid Entry Point (or in the case of an Embedded DC Converter Station or Embedded HVDC Converter Station at the User System Entry Point), as declared by the DC Converter owner or HVDC System Owner, expressed in whole MW. In the case of an Electricity Storage Module, the maximum amount of Active Power transferable into an Electricity Storage Module at the Grid Entry Point (or in the case of an Embedded Electricity Storage Module at the User System Entry Point), as declared by the Generator, expressed in whole MW.
Regulations	The Utilities Contracts Regulations 1996, as amended from time to time.
Regulated Sections	Parts of the Grid Code that are referenced in Governance Rules Annex GR.B as amended from time to time with the approval of the Authority .
Reheater Time Constant	Determined at Registered Capacity , the reheater time constant will be construed in accordance with the principles of the IEEE Committee Report "Dynamic Models for Steam and Hydro Turbines in Power System Studies" published in 1973 which apply to such phrase.
Rejected Grid Code Modification Proposal	A Grid Code Modification Proposal in respect of which the Authority has decided not to direct The Company to modify the Grid Code pursuant to the ESO Licence in the manner set out herein or, in the case of a Grid Code Self Governance Proposals , in respect of which the Grid Code Review Panel has voted not to approve.
Related Person	Means, in relation to an individual, any member of their immediate family, their employer (and any former employer of theirs within the previous 12 months), any partner with whom they are in partnership, and any company or Affiliate of a company in which they or any member of their immediate family controls more than 20% of the voting rights in respect of the shares of the company;
Relevant E&W Transmission Licensee	As the context requires NGET , and/or a Competitively Appointed Transmission Licensee with Plant and Apparatus located in NGET's Transmission Area and/or an E&W Offshore Transmission Licensee .
Relevant Party	Has the meaning given in GR15.10(a).

Relevant Scottish Transmission Licensee	As the context requires SPT and/or SHETL , and/or a Competitively Appointed Transmission Licensee with Plant and Apparatus located in either SPT's or SHETL's Transmission Area and/or a Scottish Offshore Transmission Licensee .
Relevant Transmission Licensee	Means National Grid Electricity Transmission plc (NGET) in its Transmission Area or SP Transmission plc (SPT) in its Transmission Area or Scottish Hydro-Electric Transmission plc (SHETL) in its Transmission Area or any Offshore Transmission Licensee in its Transmission Area or any Competitively Appointed Transmission Licensee with Plant and Apparatus located in NGET's , SPT's or SHETL's Transmission Area as appropriate.
Relevant Unit	As defined in the STC , Schedule 3.
Remote End HVDC Converter Station	An HVDC Converter Station which forms part of an HVDC System and is not directly connected to the AC part of the GB Synchronous Area .
Remote Transmission Assets	Any Plant and Apparatus or meters owned by NGET which: (a) are Embedded in a User System and which are not directly connected by Plant and/or Apparatus owned by NGET to a sub-station owned by NGET ; and (b) are by agreement between NGET and such User operated under the direction and control of such User .
Replacement Reserves (RR)	Means, in the context of Balancing Services , the Active Power reserves available to restore or support the required level of FRR to be prepared for additional system imbalances, including generation reserves;
Requesting Safety Co-ordinator	The Safety Co-ordinator requesting Safety Precautions .
Responsible Engineer/Operator	A person nominated by a User to be responsible for System control.
Responsible Manager	A manager who has been duly authorised by a User or a Relevant Transmission Licensee to sign Site Responsibility Schedules on behalf of that User or Relevant Transmission Licensee as the case may be.
Restoration Contractor	An Anchor Restoration Contractor or a Top Up Restoration Contractor .
Restoration Plan	Either a Local Joint Restoration Plan , a Distribution Restoration Zone Plan or an Offshore Local Joint Restoration Plan as the context requires.
Restoration Service Provider	A User or a party with a legal or contractual obligation to provide a service contributing to one or several measures of the System Restoration Plan .
Restoration Service Test	A test carried out on a Plant to confirm it has an Anchor Plant Capability or Top Up Restoration Capability .

Re-synchronisation	The bringing of parts of the System which have become Out of Synchronism with any other System back into Synchronism , and like terms shall be construed accordingly.
RR Acceptance	The results of the TERRE auction for each BM Participant .
Restricted	Applies to a TERRE Bid which has been marked so that it will be passed to the TERRE Central Platform but will not be used in the auction.
ROCOF	Rate of Change of Frequency
RR Instruction	Replacement Reserve Instruction – used for instructing BM Participants after the results of the TERRE auction. An RR Instruction has the same format as a Bid-Offer Acceptance but has type field indicating it is for TERRE .
Safety Co-ordinator	A person or persons nominated by a Relevant E&W Transmission Licensee and each E&W User in relation to Connection Points (or in the case of OTSUA operational prior to the OTSUA Transfer Time, Transmission Interface Points) on an E&W Transmission System and/or by the Relevant Scottish Transmission Licensee and each Scottish User in relation to Connection Points (or in the case of OTSUA operational prior to the OTSUA Transfer Time, Transmission Interface Points) on a Scottish Transmission System to be responsible for the co-ordination of Safety Precautions at each Connection Point (or in the case of OTSUA operational prior to the OTSUA Transfer Time, Transmission Interface Points) when work (which includes testing) is to be carried out on a System which necessitates the provision of Safety Precautions on HV Apparatus (as defined in OC8A.1.6.2 and OC8B.1.7.2), pursuant to OC8 .
Safety From The System	That condition which safeguards persons when work is to be carried out on or near a System from the dangers which are inherent in the System .
Safety Key	A key unique at the Location capable of operating a lock which will cause an Isolating Device and/or Earthing Device to be Locked .
Safety Log	A chronological record of messages relating to safety co-ordination sent and received by each Safety Co-ordinator under OC8 .
Safety Precautions	Isolation and/or Earthing .
Safety Rules	The rules of the Relevant Transmission Licensee or a User that seek to ensure that persons working on Plant and/or Apparatus to which the rules apply are safeguarded from hazards arising from the System .
Scottish Offshore Transmission System	An Offshore Transmission System with an Interface Point in Scotland.
Scottish Offshore Transmission Licensee	A person who owns or operates a Scottish Offshore Transmission System pursuant to a Transmission Licence .

Scottish Transmission System	Collectively SPT's Transmission System and SHETL's Transmission System , any Competitively Appointed Transmission Licensee's Transmission System with Plant and Apparatus located in SPT's or SHETL's Transmission Area and any Scottish Offshore Transmission Systems .
Scottish User	A User in Scotland or any Offshore User who owns or operates Plant and/or Apparatus connected (or which will at the OTSUA Transfer Time be connected) to a Scottish Offshore Transmission System .
Secondary BM Unit	Has the same meaning set out in the BSC .
Secondary Response	The automatic increase in Active Power output of a Genset or, as the case may be, the decrease in Active Power Demand in response to a System Frequency fall. This increase in Active Power output or, as the case may be, the decrease in Active Power Demand must be in accordance with the provisions of the relevant Ancillary Services Agreement which will provide that it will be fully available by 30 seconds from the time of the start of the Frequency fall and be sustainable for at least a further 30 minutes. The interpretation of the Secondary Response to a -0.5 Hz frequency change is shown diagrammatically in Figure CC.A.3.2 or Figure ECC.A.3.2.
Secretary of State	Has the same meaning as in the Act .
Secured Event	Has the meaning set out in the Security and Quality of Supply Standard .
Security and Quality of Supply Standard (SQSS)	The version of the document entitled 'Security and Quality of Supply Standard' established pursuant to the Transmission Licence and the ESO Licence in force at the time of entering into the relevant Bilateral Agreement .
Self-Governance Criteria	A proposed Modification that, if implemented, (a) is unlikely to have a material effect on: (i) existing or future electricity consumers; and (ii) competition in the generation, storage, distribution, or supply of electricity or any commercial activities connected with the generation, storage, distribution or supply of electricity; and (iii) the operation of the National Electricity Transmission System; and (iv) matters relating to sustainable development, safety or security of supply, or the management of market or network emergencies; and (v) the Grid Code's governance procedures or the Grid Code's modification procedures, and (b) is unlikely to discriminate between different classes of Users. (c) other than where the modification meets the Fast Track Criteria, will not constitute an amendment to the Regulated Sections of the Grid Code.

Self-Governance Modifications	A Grid Code Modification Proposal that does not fall within the scope of a Significant Code Review and that meets the Self-Governance Criteria or which the Authority directs is to be treated as such any direction under GR.24.4.
Self-Governance Statement	The statement made by the Grid Code Review Panel and submitted to the Authority: (a) confirming that, in its opinion, the Self-Governance Criteria are met and the proposed Grid Code Modification Proposal is suitable for the Self-Governance route; and (b) providing a detailed explanation of the Grid Code Review Panel's reasons for that opinion.
Setpoint Voltage	The value of voltage at the Grid Entry Point , or User System Entry Point if Embedded , on the automatic control system steady state operating characteristic, as a percentage of the nominal voltage, at which the transfer of Reactive Power between a Power Park Module , DC Converter , HVDC Converter or Non-Synchronous Generating Unit and the Transmission System , or Network Operator's system if Embedded , is zero.
Settlement Period	A period of 30 minutes ending on the hour and half-hour in each hour during a day.
SF₆ Gas Zone	A segregated zone surrounding electrical conductors within a casing containing SF ₆ gas.
SHETL	Scottish Hydro-Electric Transmission plc.
Shutdown	In the case of a Generating Unit is the condition of a Generating Unit where the generator rotor is at rest or on barring or equivalent. In the case of an HVDC System or DC Converter Station, is the condition of an HVDC System or DC Converter Station where the HVDC System or DC Converter Station is de-energised and therefore not importing or exporting Apparent Power to or from the Total System. In the case of Auxiliaries, the state where they are de-energised and not capable of fulfilling their function until restarted or resupplied.
Significant Code Review	Means the period commencing on the start date of a Significant Code Review as stated in the notice issued by the Authority , and ending in the circumstances described in GR.16.6 or GR.16.7, as appropriate.
Significant Code Review Phase	Means the period commencing on the start date of a Significant Code Review as stated in the notice issued by the Authority , and ending in the circumstances described in GR.16.6 or GR.16.7, as appropriate.
Significant Event	An Event , as defined in OC3.4.1.

Significant Incident	An Event which either: (a) was notified by a User to The Company under OC7, and which The Company considers has had or may have had a significant effect on the National Electricity Transmission System, and The Company requires the User to report that Event in writing in accordance with OC10 and notifies the User accordingly; or (b) was notified by The Company to a User under OC7, and which that User considers has had or may have had a significant effect on that User's System, and that User requires The Company to report that Event in writing in accordance with the provisions of OC10 and notifies The Company accordingly.
Simultaneous Tap Change	A tap change implemented on the generator step-up transformers of Synchronised Gensets , effected by Generators in response to an instruction from The Company issued simultaneously to the relevant Power Stations . The instruction, preceded by advance notice, must be effected as soon as possible, and in any event within one minute of receipt from The Company of the instruction.
Single Intraday Coupling	The continuous process where collected orders are matched and cross-zonal capacity is allocated simultaneously for different bidding zones in the intraday market.
Single Line Diagram	A schematic representation of a three-phase network in which the three phases are represented by single lines. The diagram shall include (but not necessarily be limited to) busbars, overhead lines, underground cables, power transformers and reactive compensation equipment. It shall also show where Large Power Stations are connected, and the points at which Demand is supplied.
Single Point of Connection	A single Point of Connection , with no interconnection through the User's System to another Point of Connection .
Site Common Drawings	Drawings prepared for each Connection Site (and in the case of OTSDUW, Transmission Interface Site) which incorporate Connection Site (and in the case of OTSDUW, Transmission Interface Site) layout drawings, electrical layout drawings, common protection/ control drawings and common services drawings.
Site Responsibility Schedule	A schedule containing the information and prepared on the basis of the provisions set out in Appendix 1 of the CC and Appendix E1 of the ECC .
Situation Data	Data in a PSM representing an operational state of an electricity system, including demand and generation output and the operational position of relevant switching devices.
Slope	The ratio of the steady state change in voltage, as a percentage of the nominal voltage, to the steady state change in Reactive Power output, in per unit of Reactive Power capability. For the avoidance of doubt, the value indicates the percentage voltage reduction that will result in a 1 per unit increase in Reactive Power generation.
Small Participant	Has the meaning given in the CUSC .

Small Power Station	A Power Station which is (a) directly connected to: (i) NGET's Transmission System where such Power Station has a Registered Capacity of less than 50 MW; or (ii) SPT's Transmission System where such Power Station has a Registered Capacity of less than 30 MW; or (iii) SHETL's Transmission System where such a Power Station has a Registered Capacity of less than 10 MW; or (iv) an Offshore Transmission System where such Power Station has a Registered Capacity of less than 10 MW; or, (b) Embedded within a User System (or part thereof) where such User System (or part thereof) is connected under normal operating conditions to: (i) NGET's Transmission System and such Power Station has a Registered Capacity of less than 50 MW; or (ii) SPT's Transmission System and such Power Station has a Registered Capacity of less than 30 MW; or (iii) SHETL's Transmission System and such Power Station has a Registered Capacity of less than 10 MW; or, (c) Embedded within a User System (or part thereof) where the User System (or part thereof) is not connected to the National Electricity Transmission System, although such Power Station is in: (i) NGET's Transmission Area and such Power Station has a Registered Capacity of less than 50 MW; or (ii) SPT's Transmission Area and such Power Station has a Registered Capacity of less than 30 MW; or (iii) SHETL's Transmission Area and such Power Station has a Registered Capacity of less than 10 MW; For the avoidance of doubt, a Small Power Station could comprise of Type A, Type B, Type C or Type D Power Generating Modules.
Solved PSM	A PSM which includes Structural Data , Situation Data , and Solution Data .
Solution Data	Data in a PSM comprising the results of a steady-state power flow calculation and/or short circuit calculation, together with topology, voltage, and power flow data representing a steady-state solution using coordinated Structural Data and Situation Data .
Space Weather Advisory Statement	A statement issued by The Company to advise of a space weather related matter for information and further consideration.
Space Weather Cancellation Notification	A notification issued by The Company following Met Office guidance signalling that a space weather situation has concluded.

Space Weather Cessation Notification	A notification issued by The Company following Met Office guidance signalling a return to a Space Weather Prepare Notification level.
Space Weather Experienced Notification	A notification issued by The Company following Met Office guidance that impacts (consistent with a space weather event) have been seen or experienced in GB . This triggers the preparation and issuing of Space Weather Outcome Statements .
Space Weather Imminent Notification	A notification issued by The Company following Met Office guidance of imminent space weather of a nature and anticipated level of G5 (using the Met Office ranking). A Space Weather Imminent Notification is likely to be issued 20 to 60 minutes ahead of a space weather event being forecast to impact the NETS .
Space Weather Outcome Statement	A statement that is issued by a User to The Company where, following the issuing of a Space Weather Experienced Notification , their Plant or Apparatus has seen or experienced impacts that they believe, at the time, are or may be of a nature consistent with a space weather event.
Space Weather Output Usable Declaration	A declaration of the Output Usable that would apply to a Generator in respect of their Generating Unit and/or Power-Generating Module and/or Power Park Module , or Interconnector Owner in respect of their External Interconnection Circuits or Restoration Contractor in respect of their Plant and Apparatus following the issue of a Space Weather Imminent Notification until such time as specified by the Generator , Interconnector Owner or Restoration Contractor after either a Space Weather Cessation Notification or a Space Weather Cancellation Notification being issued by The Company .
Space Weather Prepare Notification	A notification issued by The Company following Met Office guidance of space weather related activity that is of a nature and anticipated level of G5 (using the Met Office ranking). A Space Weather Prepare Notification is likely to be issued 12 to 36 hours ahead of a space weather event being forecast to impact the NETS .
Speeder Motor Setting Range	The minimum and maximum no-load speeds (expressed as a percentage of rated speed) to which the turbine is capable of being controlled, by the speeder motor or equivalent, when the Generating Unit terminals are on open circuit.
SPT	SP Transmission plc.
Standard Contract Terms	The standard terms and conditions applicable to Ancillary Services provided by Demand Response Providers and published on the Website from time to time.
Standard Modifications	A Grid Code Modification Proposal that does not fall within the scope of a Significant Code Review subject to any direction by the Authority pursuant to GR.16.3 and GR.16.4, nor meets the Self-Governance Criteria subject to any direction by the Authority pursuant to GR.24.4 and in accordance with any direction under GR.24.2. A Grid Code Modification Proposal that constitutes an amendment to the Regulated Sections of the Grid Code shall be a Standard Modification except where it is an Urgent Modification or where it meets the Fast Track Criteria .

Standard Planning Data	The general data required by The Company under the PC . It is generally also the data which The Company requires from a User in an application for a CUSC Contract , as reflected in the PC .
Standard Product	Means a harmonised balancing product defined by all EU TSOs for the exchange of balance services.
Specific Product	Means in the context of Balancing Services a product that is not a standard product.
Structural Data	Data in a PSM representing the characteristics of electricity system assets, including their capabilities and connectivity.
Start Time	The time named as such in an instruction issued by The Company pursuant to the BC .
Start-Up	In the case of a Generating Unit is the action of bringing a Generating Unit from Shutdown to Synchronous Speed . In the case of an HVDC System or DC Converter Station , is the action of bringing the HVDC System or DC Converter Station from Shutdown to a state where it is energised.
Statement of Readiness	Has the meaning set out in the Bilateral Agreement and/or Construction Agreement .
Station Board	A switchboard through which electrical power is supplied to the Auxiliaries of a Power Station , and which is supplied by a Station Transformer . It may be interconnected with a Unit Board .
Station Transformer	A transformer supplying electrical power to the Auxiliaries of (a) a Power Station , which is not directly connected to the Generating Unit terminals (typical voltage ratios being 132/11 kV or 275/11 kV), or (b) a DC Converter Station or HVDC Converter Station .
STC Committee	The committee established under the STC .
Steam Unit	A Generating Unit whose prime mover converts the heat-energy in steam to mechanical energy.
Storage User	A Generator who owns or operates one or more Electricity Storage Modules . For the avoidance of doubt: (a) Assimilated Law (Commission Regulation (EU) 2016/631, Commission Regulation (EU) 2016/1388 and Commission Regulation (EU) 2016/1485) shall not apply to Storage Users ; and (b) the European Connection Conditions (ECC's) shall apply to Storage Users on the basis set out in Paragraph ECC1.1(d).
Subtransmission PSM	A PSM with the scope as set out in PC.9.4.1.

Subtransmission System	The part of a User's System which operates at a single transformation below the voltage of the relevant Transmission System .
Substantial Modification	A Modification in relation to modernisation or replacement of the User's Main Plant and Apparatus which impacts its technical capabilities, which, following notification by the relevant User to The Company , results in substantial amendment to the Bilateral Agreement .
Supergrid Voltage	Any voltage greater than 200 kV.
Supplier	(a) A person supplying electricity under an Electricity Supply Licence ; or (b) A person supplying electricity under exemption under the Act ; in each case acting in its capacity as a supplier of electricity to Customers in Great Britain .
Surplus	A MW figure equal to the total Output Usable : (a) minus the forecast of Active Power Demand , and (b) minus the Operational Planning Margin .
Switch-based Model	A PSM that includes all relevant switching devices. Such a model can be used to represent different system topologies, compared to a node and branch model which generally only represents a single system topology.
Synchronised	(a) The condition where an incoming Power Generating Module, Generating Unit or Power Park Module or DC Converter or HVDC Converter or System is connected to the busbars of another System so that the Frequencies and phase relationships of that Power Generating Module, Generating Unit, Power Park Module, DC Converter, HVDC Converter or System , as the case may be, and the System to which it is connected are identical, like terms shall be construed accordingly e.g. " Synchronism ". (b) The condition where an importing BM Unit is consuming electricity.
Synchronous Area	An area covered by synchronously interconnected Transmission Licensees , such as the Synchronous Areas of Continental Europe, Great Britain, Ireland-Northern Ireland and Nordic and the power systems of Lithuania, Latvia and Estonia, together referred to as 'Baltic' which are part of a wider Synchronous Area .
Synchronous Electricity Storage Module	A Synchronous Power Generating Module which can convert or re-convert electrical energy from another source of energy such that the frequency of the generated voltage, the rotor speed and the frequency of network voltage are in a constant ratio and thus in synchronism. For the avoidance of doubt a Synchronous Electricity Storage Module could comprise of one or more Synchronous Electricity Storage Units .
Synchronous Electricity Storage Unit	A Synchronous Generating Unit which can supply or absorb electrical energy such that the frequency of the generated voltage, the rotor speed and the frequency of the equipment are in constant ratio and thus in synchronism with the network.

Synchronising Generation	The amount of MW (in whole MW) produced at the moment of synchronising.
Synchronising Group	A group of two or more Gensets) which require a minimum time interval between their Synchronising or De-Synchronising times.
Synchronous Compensation	The operation of rotating synchronous Apparatus for the specific purpose of either the generation or absorption of Reactive Power .
Synchronous Compensation Equipment	Apparatus which has the function of providing Synchronous Compensation . For the avoidance of doubt, one or more Synchronous Compensation units would not constitute an Electricity Storage Module unless it could be operated in a controllable manner.
Synchronous Electricity Storage Module	A Synchronous Power Generating Module which can convert and reconvert electrical energy from another source of energy such that the frequency of the generated voltage, the rotor speed and the frequency of network voltage are in a constant ratio and thus in synchronism. For the avoidance of doubt a Synchronous Electricity Storage Module could comprise of one or more Synchronous Electricity Storage Units .
Synchronous Electricity Storage Unit	A Synchronous Generating Unit which can supply and absorb electrical energy such that the frequency of the generated voltage, the rotor speed and the frequency of the equipment are in constant ratio and thus in synchronism with the network.
Synchronous Flywheel	An item of synchronously rotating Plant for the specific purpose of contributing inertia to the System . One or more Synchronous Flywheels would not be considered to form an Electricity Storage Module unless it could be operated in a controllable manner for its AC input and output power.
Synchronous Generating Unit	Any Onshore Synchronous Generating Unit or Offshore Synchronous Generating Unit .
Synchronous Generating Unit Performance Chart	A diagram showing the Active Power (MW) and Reactive Power (MVar) capability limits within which a Synchronous Generating Unit at its stator terminals (which is part of a Synchronous Power Generating Module) will be expected to operate under steady state conditions.
Synchronous Power-Generating Module	An indivisible set of installations which can convert or re-convert electrical energy from another source of energy such that the frequency of the supplied voltage, the rotor speed and the frequency of network voltage are in a constant ratio and thus in synchronism. For the avoidance of doubt, a Synchronous Power Generating Module could comprise of one or more Synchronous Generating Units or one or more Synchronous Electricity Storage Units .
Synchronous Power Generating Module Matrix	The matrix described in Appendix 1 to BC1 under the heading Synchronous Power Generating Module Matrix .
Synchronous Power Generating Module Planning Matrix	A matrix in the form set out in Appendix 2 of OC2 showing the combination of Synchronous Generating Units within a Synchronous Power Generating Module which would be running in relation to any given MW output.

Synchronous Power Generating Unit	Has the same meaning as a Synchronous Generating Unit and would be considered to be part of a Power Generating Module .
Synchronous Speed	That speed required by a Generating Unit to enable it to be Synchronised to a System .
System	Any User System and/or the National Electricity Transmission System , as the case may be.
System Ancillary Services	Collectively Part 1 System Ancillary Services and Part 2 System Ancillary Services .
System Constraint	A limitation on the use of a System due to lack of transmission capacity or other System conditions.
System Constrained Capacity	That portion of Registered Capacity or Registered Import Capacity not available due to a System Constraint .
System Constraint Group	A part of the National Electricity Transmission System which, because of System Constraints , is subject to limits of Active Power which can flow into or out of (as the case may be) that part.
System Defence Plan	A document prepared by The Company , as published on its Website , outlining how the requirements of the “defence plan”, as provided for by Assimilated Law (Commission Regulation (EU) 2017/2196), has been implemented within the GB Synchronous Area .
System Fault Dependability Index or Dp	A measure of the ability of Protection to initiate successful tripping of circuit-breakers which are associated with a faulty item of Apparatus. It is calculated using the formula: $Dp = 1 - F_1/A$ Where: A = Total number of System faults F₁ = Number of System faults where there was a failure to trip a circuit-breaker.
System Incidents Report	A report submitted to the GCRP on a monthly basis, containing, but not limited to, a list of Significant Events , as detailed in OC3.4.1.
System Margin	The margin in any period between (a) the sum of Maximum Export Limits and (b) forecast Demand and the Operating Margin, for that period.
System Negative Reserve Active Power Margin or System NRAPM	That margin of Active Power sufficient to allow the largest loss of Load at any time.
System Operator - Transmission Owner Code or STC	Has the meaning set out in the ESO Licence .
System Restoration	The procedure necessary for a recovery from a Total Shutdown or Partial Shutdown .

System Restoration Region	Those regions of the Total System as defined in Appendix 1 of OC9.
System Restoration Plan	A document prepared by The Company , as published on its Website , outlining how the requirements of the “restoration plan”, as defined in Assimilated Law (Commission Regulation (EU) 2017/2196), has been implemented within the GB Synchronous Area .
System Telephony	An alternative method by which a User’s Responsible Engineer/Operator , the relevant Transmission Licensees’ Control Engineers and The Company’s Control Engineer(s) speak to one and another for the purposes of control of the Total System in both normal operating conditions and where practicable, emergency operating conditions.
System Tests	Tests which involve simulating conditions, or the controlled application of irregular, unusual or extreme conditions, on the Total System , or any part of the Total System , but which do not include commissioning or recommissioning tests or any other tests of a minor nature.
System to Demand Intertrip Scheme	An intertrip scheme which disconnects Demand when a System fault has arisen to prevent abnormal conditions occurring on the System .
System to Generator Operational Intertripping	A Balancing Service involving the initiation by a System to Generator Operational Intertripping Scheme of automatic tripping of the User’s circuit breaker(s), or Relevant Transmission Licensee’s circuit breaker(s) where agreed by The Company , the User and the Relevant Transmission Licensee , resulting in the tripping of BM Unit(s) or (where relevant) Generating Unit(s) comprised in a BM Unit to prevent abnormal system conditions occurring, such as over voltage, overload, System instability, etc, after the tripping of other circuit-breakers following power System fault(s).
System to Generator Operational Intertripping Scheme	A System to Generating Unit or System to CCGT Module or System to Power Park Module or System to Power Generating Module or System to Electricity Storage Module Intertripping Scheme forming a condition of connection and specified in Appendix F3 of the relevant Bilateral Agreement , being either a Category 1 Intertripping Scheme , Category 2 Intertripping Scheme , Category 3 Intertripping Scheme or Category 4 Intertripping Scheme .
Target Frequency	That Frequency determined by The Company , in its reasonable opinion, as the desired operating Frequency of the Total System or of a relevant Power Island . This will normally be 50.00 Hz plus or minus 0.05 Hz, except in exceptional circumstances as determined by The Company for example which may be operating the System during disputes affecting fuel supplies or following a Total Shutdown or Partial Shutdown where Power Islands are established, and each Power Island has its own unique Frequency .
Technical Specification	In relation to Plant and/or Apparatus , (a) the relevant European Specification ; or (b) if there is no relevant European Specification , other relevant standards which are in common use in the European Community.

TERRE	Trans European Replacement Reserves Exchange – a market covering the procurement of replacement reserves across Europe.
TERRE Activation Period	A period of time lasting 15 minutes and starting at either 0, 15, 30 or 45 minutes past the hour (e.g. 10:00 hours to 10:15 hours). There are 4 TERRE Activation Periods in one TERRE Auction Period .
TERRE Auction Period	A period of time lasting one hour and starting and ending on the hour (e.g. from 10:00 hours to 11:00 hours). Hence there are 24 TERRE Auction Periods in a day.
TERRE Bid	A submission by a BM Participant covering the price and MW deviation offered into the TERRE auction (please note – in the Balancing Mechanism the term bid has a different meaning – in this case a bid can be an upward or downward MW change).
TERRE Central Platform	An IT system which implements the TERRE auction.
TERRE Data Validation and Consistency Rules	A document produced by the central TERRE project detailing the correct format of submissions for TERRE .
TERRE Gate Closure	60 minutes before the start of the TERRE Auction Period (note still ongoing discussions if this may become 55 minutes).
TERRE Instruction Guide	Details specific rules for creating an RR Instruction from an RR Acceptance .
Test Co-ordinator	A person who co-ordinates System Tests .
Test Panel	A panel, whose composition is detailed in OC12 , which is responsible, inter alia, for considering a proposed System Test , and submitting a Proposal Report and a Test Programme .
Test Plan	A document prepared by The Company , as published on its Website , outlining how the requirements of the “ Test Plan ”, as provided for by Assimilated Law (Commission Regulation (EU) 2017/2196), has been implemented within the GB Synchronous Area .
Test Programme	A programme submitted by the Test Panel to The Company , the Test Proposer , and each User identified by The Company under OC12.4.2.1, which states the switching sequence and proposed timings of the switching sequence, a list of those staff involved in carrying out the System Test (including those responsible for the site safety) and such other matters as the Test Panel deems appropriate.
Test Proposer	The person who submits a Proposal Notice .
Test Signal	A signal in the form of a sine wave, applied to a GBGF-I to demonstrate its ability to contribute to Active Damping Power .
The Company	Has the meaning given to NESO or National Energy System Operator .
The Company Control Engineer	The nominated person employed by The Company to direct the operation of the National Electricity Transmission System or such person as nominated by The Company .

The Company Operational Strategy	The Company's operational procedures which form the guidelines for operation of the National Electricity Transmission System .
Top Up Restoration Capability	The ability of a Restoration Contractor's Plant to Start-Up from Shutdown and to be Synchronised and remain Synchronised to a part of the Total System upon instruction from The Company or Relevant Transmission Licensee (in Scotland) or relevant Network Operator , within a defined time period, pursuant to the terms of the Top Up Restoration Contract , once external electrical power supplies are restored to that Restoration Contractor's site. In the case of a Local Joint Restoration Plan , an instruction from The Company or Transmission Licensee in Scotland to a Restoration Contractor in respect of their Top Up Restoration Plant would generally be issued immediately after an instruction to an Anchor Restoration Contractor with the Top Up Capability expected to be delivered consecutively after external power supplies had been restored to the Top Up Restoration Contractor's site. In the case of a Distribution Restoration Zone Plan , an instruction from a Network Operator to a Restoration Contractor in respect of their Top Up Restoration Plant would generally be issued immediately after an instruction to an Anchor Restoration Contractor with the Top Up Capability expected to be delivered consecutively after external power supplies had been restored to the Top Up Restoration Contractor's site. For the avoidance of doubt a Restoration Contractor with a Top Up Restoration Capability shall have sufficient Auxiliary Energy Supplies to be capable of delivering the service they have agreed to provide as soon as their Connection Point or User System Entry Point is energised.
Top Up Restoration Contract	In the case of a Local Joint Restoration Plan or Offshore Local Joint Restoration Plan is a contract between The Company and Top Up Restoration Contractor for the provision of a Top Up Restoration Capability . In the case of a Distribution Restoration Zone Plan , an agreement between The Company and relevant Network Operator and Top Up Restoration Contractor for the provision of Top Up Restoration Capability .
Top Up Restoration Contractor	A Restoration Contractor with a Top Up Restoration Contract .
Top Up Restoration Plant	Plant owned and operated by a Top Up Restoration Contractor .
Top Up Restoration Plant Test	A test conducted on a Top Up Restoration Plant to confirm it is capable of meeting the requirements of a Top Up Restoration Contract .
Total Shutdown	The situation existing when all generation has ceased and there is no electricity supply from External Interconnections and, therefore, the Total System has shutdown with the result that it is not possible for the Total System to begin to function again without The Company's directions relating to System Restoration .
Total System	The National Electricity Transmission System and all User Systems in the National Electricity Transmission System Operator Area .
Trading Point	A commercial and, where so specified in the Grid Code, an operational interface between a User and The Company , which a User has notified to The Company .

Transfer Date	Such date as may be appointed by the Secretary of State by order under section 65 of the Act .
Transmission	Means, when used in conjunction with another term relating to equipment or a site, whether defined or not, that the associated term is to be read as being part of or directly associated with the National Electricity Transmission System , and not of or with the User System .
Transmission Area	Has the meaning set out in the Transmission Licence of a Transmission Licensee .
Transmission Connected Demand Facilities	A Demand Facility which has a Grid Supply Point to the National Electricity Transmission System .
Transmission DC Converter	Any Transmission Licensee Apparatus (or OTSUA that will become Transmission Licensee Apparatus at the OTSUA Transfer Time) used to convert alternating current electricity to direct current electricity, or vice versa. A Transmission Network DC Converter (which could include an HVDC System owned by an Offshore Transmission Licensee or Generator in respect of OTSUA) is a standalone operative configuration at a single site comprising one or more converter bridges, together with one or more converter transformers, converter control equipment, essential protective and switching devices and auxiliaries, if any, used for conversion.
Transmission Entry Capacity	Has the meaning set out in the CUSC .
Transmission Interface Circuit	In NGET's Transmission Area or a Competitively Appointed Transmission Licensee with Plant and Apparatus located in NGET's Transmission Area, a Transmission circuit which connects a System operating at a voltage above 132 kV to a System operating at a voltage of 132 kV or below. In SHETL's Transmission Area and SPT's Transmission Area, or a Competitively Appointed Transmission Licensee with Plant and Apparatus located in SHETL's Transmission Area and/or SPT's Transmission Area, a Transmission circuit which connects a System operating at a voltage of 132 kV or above to a System operating at a voltage below 132 kV.
Transmission Interface Point	Means the electrical point of connection between the Offshore Transmission System and an Onshore Transmission System .
Transmission Interface Site	The site at which the Transmission Interface Point is located.
Transmission Licence	A licence granted under Section 6(1)(b) of the Act .
Transmission Licensee	Any Onshore Transmission Licensee or Offshore Transmission Licensee .
Transmission Site	Means a site owned (or occupied pursuant to a lease, licence or other agreement) by a Relevant Transmission Licensee in which there is a Connection Point . For the avoidance of doubt, a site owned by a User but occupied by the Relevant Transmission Licensee as aforesaid, is a Transmission Site .

Transmission System	Has the same meaning as the term "licensee's transmission system" in the Transmission Licence of a Transmission Licensee. Where references are made in this document to NGET's, SPT's, or SHETL's Transmission System, such reference shall be deemed to include: • a Competitively Appointed Transmission Licensee's Transmission System where that Competitively Appointed Transmission Licensee's Transmission System has onshore interface point(s) with only one of NGET's, SPT's, or SHETL's Transmission Systems; or • elements of a Competitively Appointed Transmission Licensee's Transmission System located within NGET's, SPT's, or SHETL's Transmission Area where the Competitively Appointed Transmission Licensee's Transmission System has onshore interface point(s) with more than one of NGET's, SPT's and/or SHETL's Transmission Systems.
Turbine Time Constant	Determined at Registered Capacity , the turbine time constant will be construed in accordance with the principles of the IEEE Committee Report "Dynamic Models for Steam and Hydro Turbines in Power System Studies" published in 1973 which apply to such phrase.
Type A Power Generating Module	A Power Generating Module (including an Electricity Storage Module) with a Grid Entry Point or User System Entry Point below 110 kV and a Maximum Capacity of 0.8 kW or greater but less than 1 MW.
Type B Power Generating Module	A Power Generating Module (including an Electricity Storage Module) with a Grid Entry Point or User System Entry Point below 110 kV and a Maximum Capacity of 1 MW or greater but less than 10 MW.
Type C Power Generating Module	A Power Generating Module (including an Electricity Storage Module) with a Grid Entry Point or User System Entry Point below 110 kV and a Maximum Capacity of 10 MW or greater but less than 50 MW.
Type D Power Generating Module	A Power Generating Module: (including an Electricity Storage Module): with a Grid Entry Point or User System Entry Point at, or greater than, 110 kV; or with a Grid Entry Point or User System Entry Point below 110 kV and with Maximum Capacity of 50 MW or greater.
Unbalanced Load	The situation where the Load on each phase is not equal.
Under-excitation Limiter	Shall have the meaning ascribed to that term in IEC 34-16-1:1991 [equivalent to British Standard BS4999 Section 116.1: 1992].
Under Frequency Relay	An electrical measuring relay intended to operate when its characteristic quantity (Frequency) reaches the relay settings by a decrease in Frequency .
Unit Board	A switchboard through which electrical power is supplied to the Auxiliaries of a Generating Unit and which is supplied by a Unit Transformer . It may be interconnected with a Station Board .

Unit Transformer	A transformer directly connected to a Generating Unit's terminals, and which supplies power to the Auxiliaries of a Generating Unit . Typical voltage ratios are 23/11 kV and 15/6.6 kV.
Unit Load Controller Response Time Constant	The time constant, expressed in units of seconds, of the power output increase which occurs in the Secondary Response timescale in response to a step change in System Frequency .
Unresolved Issues	Any relevant Grid Code provisions or Bilateral Agreement requirements identified by The Company with which the relevant User has not demonstrated compliance to The Company's reasonable satisfaction at the date of issue of the Preliminary Operational Notification and/or Interim Operational Notification and/or Limited Operational Notification and which are detailed in such Preliminary Operational Notification and/or Interim Operational Notification and/or Limited Operational Notification .
Urgent Modification	A Grid Code Modification Proposal treated or to be treated as an Urgent Modification in accordance with GR.23.
User	A term utilised in various sections of the Grid Code to refer to the persons using the National Electricity Transmission System , as more particularly identified in each section of the Grid Code concerned. In the Preface and the General Conditions the term means any person to whom the Grid Code applies. The term User includes an EU Code User and a GB Code User .
User Data File Structure	The file structure given at DRC 18 which will be specified by The Company which a Generator or DC Converter Station owner or HVDC System Owner must use for the purposes of the CP or the ECP to submit DRC data Schedules and information demonstrating compliance with the Grid Code and, where applicable, with the CUSC Contract(s) , unless otherwise agreed by The Company .
User Development	In the PC means either User's Plant and/or Apparatus to be connected to the National Electricity Transmission System , or a Modification relating to a User's Plant and/or Apparatus already connected to the National Electricity Transmission System , or a proposed new connection or Modification to the connection within the User System .
User Self Certification of Compliance	A certificate, in the form attached at CP.A.2.(1) or ECP.A.2.(1) completed by a Generator or DC Converter Station owner or HVDC System Owner to which the Compliance Statement is attached which confirms that such Plant and Apparatus complies with the relevant Grid Code provisions and where appropriate, with the CUSC Contract(s) , as identified in the Compliance Statement and, if appropriate, identifies any Unresolved Issues and/or any exceptions to such compliance and details the derogation(s) granted in respect of such exceptions.
User Site	A site owned (or occupied pursuant to a lease, licence or other agreement) by a User in which there is a Connection Point . For the avoidance of doubt, a site owned by a Relevant Transmission Licensee but occupied by a User as aforesaid, is a User Site .

User System	Any system owned or operated by a User comprising:- (a) Power Generating Modules or Generating Units; and/or (b) Systems consisting (wholly or mainly) of electric lines used for the distribution of electricity from Grid Supply Points or Generating Units or Power Generating Modules or other entry points to the point of delivery to Customers, or other Users; and Plant and/or Apparatus (including prior to the OTSUA Transfer Time, any OTSUA) connecting:- (c) The system as described above; or (d) Non-Embedded Customers equipment; to the National Electricity Transmission System or to the relevant other User System, as the case may be. The User System includes any Remote Transmission Assets operated by such User or other person and any Plant and/or Apparatus and meters owned or operated by the User or other person in connection with the distribution of electricity but does not include any part of the National Electricity Transmission System.
User System Entry Point	A point at which an Embedded; Power Generating Module, Generating Unit, CCGT Module, CCGT Unit, Power Park Module, Electricity Storage Module, DC Converter; or HVDC Converter, connects to the User System.
Virtual Lead Party	As defined in the BSC .
Voltage Jump Reactive Power	The transient Reactive Power injected or absorbed from a Grid Forming Plant to the Total System as a result of either a step or ramp change in the difference between the voltage magnitude and/or phase of the voltage of the Internal Voltage Source of the Grid Forming Plant and Grid Entry Point or User System Entry Point. In the event of a voltage magnitude and phase change at the Grid Entry Point or User System Entry Point, a Grid Forming Plant will instantaneously (within 5 ms) supply Voltage Jump Reactive Power to the Total System as a result of the voltage magnitude change.
Water Time Constant	Bears the meaning ascribed to the term "Water inertia time" in IEC308 .

Weather Corrected	The normalised outturn Demand figures based on Annual ACS Conditions for dates and times that occur during calendar week 44 through to calendar week 12 (inclusive) or Average Conditions for dates and times that occur between calendar weeks 13 to calendar week 43 (inclusive) which shall be established by the relevant Network Operator on a best endeavours basis.
Website	The site established by The Company on the World-Wide Web for the exchange of information among Users and other interested persons in accordance with such restrictions on access as may be determined from time to time by The Company .
Weekly ACS Conditions	Means that particular combination of weather elements that gives rise to a level of peak Demand within a week, taken to commence on a Monday and end on a Sunday, which has a particular chance of being exceeded as a result of weather variation alone. This particular chance is determined such that the combined probabilities of Demand in all weeks of the year exceeding the annual peak Demand under Annual ACS Conditions is 50%, and in the week of maximum risk the weekly peak Demand under Weekly ACS Conditions is equal to the annual peak Demand under Annual ACS Conditions .
WG Consultation Alternative Request	Any request from an Authorised Electricity Operator ; the Citizens Advice or the Citizens Advice Scotland , The Company or a Materially Affected Party for a Workgroup Alternative Grid Code Modification to be developed by the Workgroup expressed as such and which contains the information referred to at GR.20.16. For the avoidance of doubt, any WG Consultation Alternative Request does not constitute either a Grid Code Modification Proposal or a Workgroup Alternative Grid Code Modification .
Workgroup	A Workgroup established by the Grid Code Review Panel pursuant to GR.20.1.
Workgroup Consultation	As defined in GR.20.13, and any further consultation which may be directed by the Grid Code Review Panel pursuant to GR.20.20.
Workgroup Alternative Grid Code Modification	An alternative modification to the Grid Code Modification Proposal developed by the Workgroup under the Workgroup terms of reference (either as a result of a Workgroup Consultation or otherwise) and which is believed by a majority of the members of the Workgroup or by the chairperson of the Workgroup to better facilitate the Grid Code Objectives than the Grid Code Modification Proposal or the current version of the Grid Code .
Zonal System Security Requirements	That generation required, within the boundary circuits defining the System Zone , which when added to the secured transfer capability of the boundary circuits exactly matches the Demand within the System Zone .

GD.2 Construction of References

GD.2.1 In the Grid Code:

- (i) a table of contents, a Preface, a Revision section, headings, and the Appendix to this **Glossary and Definitions** are inserted for convenience only and shall be ignored in construing the Grid Code;

- (ii) unless the context otherwise requires, all references to a particular paragraph, sub-paragraph, Appendix or Schedule shall be a reference to that paragraph, sub-paragraph Appendix or Schedule in or to that part of the Grid Code in which the reference is made;
- (iii) unless the context otherwise requires, the singular shall include the plural and vice versa, references to any gender shall include all other genders and references to persons shall include any individual, body corporate, corporation, joint venture, trust, unincorporated association, organisation, firm or partnership and any other entity, in each case whether or not having a separate legal personality;
- (iv) references to the words "include" or "including" are to be construed without limitation to the generality of the preceding words;
- (v) unless there is something in the subject matter or the context which is inconsistent therewith, any reference to an Act of Parliament or any Section of or Schedule to, or other provision of an Act of Parliament shall be construed at the particular time, as including a reference to any modification, extension or re-enactment thereof then in force and to all instruments, orders and regulations then in force and made under or deriving validity from the relevant Act of Parliament;
- (vi) where the **Glossary and Definitions** refers to any word or term which is more particularly defined in a part of the Grid Code, the definition in that part of the Grid Code will prevail (unless otherwise stated) over the definition in the **Glossary and Definitions** in the event of any inconsistency;
- (vii) a cross-reference to another document or part of the Grid Code shall not of itself impose any additional or further or co-existent obligation or confer any additional or further or co-existent right in the part of the text where such cross-reference is contained;
- (viii) nothing in the Grid Code is intended to or shall derogate from **The Company's** statutory or licence obligations;
- (ix) a "holding company" means, in relation to any person, a holding company of such person within the meaning of section 736, 736A and 736B of the Companies Act 1985 as substituted by section 144 of the Companies Act 1989 and, if that latter section is not in force at the **Transfer Date**, as if such latter section were in force at such date;
- (x) a "subsidiary" means, in relation to any person, a subsidiary of such person within the meaning of section 736, 736A and 736B of the Companies Act 1985 as substituted by section 144 of the Companies Act 1989 and, if that latter section is not in force at the **Transfer Date**, as if such latter section were in force at such date;
- (xi) references to time are to London time; and
- (xii) (a) Save where (b) below applies, where there is a reference to an item of data being expressed in a whole number of MW, fractions of a MW below 0.5 shall be rounded down to the nearest whole MW and fractions of a MW of 0.5 and above shall be rounded up to the nearest whole MW;
 (b) In the case of the definition of **Registered Capacity** or **Maximum Capacity**, fractions of a MW below 0.05 shall be rounded down to one decimal place and fractions of a MW of 0.05 and above shall be rounded up to one decimal place.
- (xiii) For the purposes of the Grid Code, physical quantities such as current or voltage are not defined terms as their meaning will vary depending upon the context of the obligation. For example, voltage could mean positive phase sequence root mean square voltage, instantaneous voltage, phase to phase voltage, phase to earth voltage. The same issue equally applies to current, and therefore the terms current and voltage should remain undefined with the meaning depending upon the context of the application. **Assimilated Law** (Commission Regulation (EU) 2016/631) defines requirements of current and voltage but they have not been adopted as part of EU implementation for the reasons outlined above.

- (xiv) Except where expressly stated to the contrary, reference to Commission Regulations means the Commission Regulation (EU) as it forms part of **Assimilated Law**, as such regulation may be amended.

< END OF GLOSSARY & DEFINITIONS>

PLANNING CODE

(PC)

CONTENTS

(This contents page does not form part of the Grid Code)

<u>Paragraph No/Title</u>	<u>Page Number</u>
PC.1 INTRODUCTION.....	2
PC.2 OBJECTIVE.....	3
PC.3 SCOPE	4
PC.4 PLANNING PROCEDURES	7
PC.5 PLANNING DATA	11
PC.6 PLANNING STANDARDS	14
PC.7 PLANNING LIAISON.....	14
PC.8 OTSDUW PLANNING LIAISON.....	16
PC.9 SUBMISSION OF SYSTEM MODELS AND INFORMATION BY NETWORK OPERATORS TO THE COMPANY	17
PC.7 PLANNING LIAISON	26
PC.10 SUBMISSION OF SYSTEM MODELS AND INFORMATION BY THE COMPANY TO NETWORK OPERATORS	27
APPENDIX A - PLANNING DATA REQUIREMENTS	34
PART 1 - STANDARD PLANNING DATA.....	38
PC.A.2 USER'S SYSTEM (AND OTSUA) DATA.....	38
PC.A.3 GENERATING UNIT AND DC CONVERTER DATA	46
PC.A.4 DEMAND AND ACTIVE ENERGY DATA.....	55
PART 2 - DETAILED PLANNING DATA.....	61
PC.A.5 GENERATING UNIT, POWER PARK MODULE, DC CONVERTER AND OTSDUW PLANT AND APPARATUS DATA.....	61
PC.A.6 USERS' SYSTEM DATA.....	84
PC.A.7 ADDITIONAL DATA FOR NEW TYPES OF POWER STATIONS, DC CONVERTER STATIONS, OTSUA AND CONFIGURATIONS.....	89
PART 3 – DETAILED PLANNING DATA.....	90
APPENDIX B - SINGLE LINE DIAGRAMS	99
APPENDIX C - TECHNICAL AND DESIGN CRITERIA	102
PART 1 – SHETL's TECHNICAL AND DESIGN CRITERIA.....	102
PART 2 - SPT's TECHNICAL AND DESIGN CRITERIA	104
APPENDIX D - DATA NOT DISCLOSED TO A RELEVANT TRANSMISSION LICENSEE	105
APPENDIX E - OFFSHORE TRANSMISSION SYSTEM AND OTSDUW PLANT AND APPARATUS TECHNICAL AND DESIGN CRITERIA.....	108
APPENDIX F - OTSDUW DATA AND INFORMATION AND OTSDUW NETWORK DATA AND INFORMATION.....	109
APPENDIX G – PERFORMANCE CHART EXAMPLES	111
APPENDIX G - NETWORK OPERATOR AND THE COMPANY PLANNING DATA EXCHANGE	113

PC.1 INTRODUCTION

- PC.1.1 The **Planning Code ("PC")** specifies the technical and design criteria and procedures to be applied by **The Company** in the planning and development of the **National Electricity Transmission System** and to be taken into account by **Users** in the planning and development of their own **Systems**. In the case of **OTSUA**, the **PC** also specifies the technical and design criteria and procedures to be applied by the **User** in the planning and development of the **OTSUA**. It details information to be supplied by **Users** to **The Company**, and certain information to be supplied by **The Company** to **Users**. **The Company** has obligations under the **STC** to inform **Relevant Transmission Licensees** of data required for the planning of the **National Electricity Transmission System**. In respect of **PC** data, **The Company** may pass on **User** data to a **Relevant Transmission Licensee**, as detailed in PC.3.4 and PC.3.5.
- PC.1.1A Provisions of the **PC** which apply in relation to **OTSDUW** and **OTSUA** shall apply up to the **OTSUA Transfer Time**, whereupon such provisions shall (without prejudice to any prior non-compliance) cease to apply, without prejudice to the continuing application of provisions of the **PC** applying in relation to the relevant **Offshore Transmission System** and/or **Connection Site**.
- PC.1.1B As used in the **PC**:
- (a) **National Electricity Transmission System** excludes **OTSDUW Plant and Apparatus** (prior to the **OTSUA Transfer Time**) unless the context otherwise requires; and
 - (b) User Development includes **OTSDUW** unless the context otherwise requires.
- PC.1.2 The **Users** referred to above are defined, for the purpose of the **PC**, in PC.3.1.
- PC.1.3 Development of the **National Electricity Transmission System**, involving its reinforcement or extension, will arise for a number of reasons including, but not limited to:
- (a) a development on a **User System** already connected to the **National Electricity Transmission System**;
 - (b) the introduction of a new **Connection Site** or the **Modification** of an existing **Connection Site** between a **User System** and the **National Electricity Transmission System**;
 - (c) the cumulative effect of a number of such developments referred to in (a) and (b) by one or more **Users**.
- PC.1.4 Accordingly, the reinforcement or extension of the **National Electricity Transmission System** may involve work:
- (a) at a substation at a **Connection Site** where **User's Plant** and/or **Apparatus** is connected to the **National Electricity Transmission System** (or in the case of **OTSDUW**, at a substation at an **Interface Point**);
 - (b) on transmission lines or other facilities which join that **Connection Site** (or in the case of **OTSDUW**, **Interface Point**) to the remainder of the **National Electricity Transmission System**;
 - (c) on transmission lines or other facilities at or between points remote from that **Connection Site** (or in the case of **OTSDUW**, **Interface Point**).
- PC.1.5 The time required for the planning and development of the **National Electricity Transmission System** will depend on the type and extent of the necessary reinforcement and/or extension work, the need or otherwise for statutory planning consent, the associated possibility of the need for a public inquiry and the degree of complexity in undertaking the new work while maintaining satisfactory security and quality of supply on the existing **National Electricity Transmission System**.

- PC1.6 For the avoidance of doubt and the purposes of the Grid Code, **DC Connected Power Park Modules** are treated as belonging to **Generators**. **Generators** who own **DC Connected Power Park Modules** would therefore be expected to supply the same data as required under this **PC** in respect of **Power Stations** comprising **Power Park Modules** other than where specific references to **DC Connected Power Park Modules** are made.
- PC1.7 As defined in the Glossary and Definitions, **Electricity Storage Modules** are treated as belonging to **Storage Users** who are a subset of **Generators** who own or operate **Electricity Storage Modules** and would therefore be expected to supply the same data as required under this **PC** in respect of **Power Stations**. In general, and notwithstanding the requirements in respect of the Glossary and Definitions and the wider requirements specified in the **Planning Code**, **Generators** in respect of **Synchronous Electricity Storage Modules** would be expected to supply the same data as required from **Generators** in respect of **Synchronous Power Generating Modules** and **Generators** in respect of **Non-Synchronous Electricity Storage Modules** would be expected to supply the same data as required from **Generators** in respect of **Power Park Modules**.

PC.2 **OBJECTIVE**

PC.2.1 The objectives of the **PC** are:

- (a) to promote **The Company/User** interaction in respect of any proposed development on the **User System** which may impact on the performance of the **National Electricity Transmission System** or the direct connection with the **National Electricity Transmission System**; and
- (b) to provide for the supply of information to **The Company** from **Users** in order that planning and development of the **National Electricity Transmission System** can be undertaken in accordance with the relevant **Licence Standards**, to facilitate existing and proposed connections, and also to provide for the supply of relevant information from **The Company** to **Users** in order that planning and development of the **User's System** can be undertaken in accordance with their relevant regulatory requirements; and
- (c) to specify the **Licence Standards** which will be used in the planning and development of the **National Electricity Transmission System**; and
- (d) to provide for the supply of information required by **The Company** from **Users** in respect of the following to enable **The Company** to carry out its duties under the **Act** and the **ESO Licence**:
 - (i) **Mothballed Generating Units, Mothballed Power Generating Modules**; and
 - (ii) capability of gas-fired **Synchronous Power Generating Modules** or **Generating Units** to run using alternative fuels.

The Company will use the information provided under PC.2.1(d) in providing reports to the **Authority** and the **Secretary of State** and, where directed by the **Authority** or the **Secretary of State** to do so, **The Company** may publish the information. Where it is known by **The Company** that such information is intended for wider publication the information provided under PC.2.1(d) shall be aggregated such that individual data items should not be identifiable; and

- (e) in the case of **OTSUA**:
 - (i) to specify the minimum technical and design criteria and procedures to be applied by **Users** in the planning and development of **OTSUA**; and thereby
 - (ii) to ensure that the **OTSUA** can from the **OTSUA Transfer Time** be operated as part of the **National Electricity Transmission System**; and
 - (iii) to provide for the arrangements and supply of information and data between **The Company** and a **User** to ensure that the **User** is able to undertake **OTSDUW**; and
 - (iv) to promote **The Company/User** interaction and co-ordination in respect of any proposed development on the **National Electricity Transmission System** or the

PC.3 **SCOPE**

PC.3.1 The **PC** applies to **The Company** and to **Users**, which in the **PC** means:

- (a) **Generators**;
- (b) **Generators** undertaking **OTSDUW**;
- (c) **Network Operators**;
- (d) **Non-Embedded Customers**;
- (e) **DC Converter Station** owners; and
- (f) **HVDC System Owners**.

The above categories of **User** will become bound by the **PC** prior to them generating, operating, or consuming or importing/exporting, as the case may be, and references to the various categories (or to the general category) of **User** should, therefore, be taken as referring to them in that prospective role as well as to **Users** actually connected.

PC.3.1.1 Exchanges between **The Company** and **Network Operators**

PC.3.1.1.1 From the **PSM Implementation Date** in relation to information exchanges between **The Company** and **Network Operators**, paragraphs PC.3.2.(c) and (d), PC.3.3, PC.3.4, PC.3.5, PC.3.6, PC.3.7, PC.4.3.1, PC.4.3.2, PC.4.5, PC.7, PC.A and PC.B shall no longer apply and paragraphs PC.9, PC.10 and PC.G shall instead apply.

PC.3.1.1.2 In the event that **The Company** and all **Network Operators** are not in a position to implement information exchange as described in PC.9, PC.10 and PC.G, by the **PSM Implementation Date**, **The Company** and **Network Operators** shall use their best endeavours to agree an alternative **PSM Implementation Date**.

PC.3.1.1.3 Subject to written consent between **The Company** and the relevant **Network Operator**, nothing shall prevent **The Company** and that **Network Operator** from applying the information exchange described in PC.9, PC.10, and PC.G before the **PSM Implementation Date**.

PC.3.1.1.4 The **PSM** data exchanges shall conform to the data exchange profile standards and satisfy the implementation requirements outlined in PC.G.4.1. Alternative exchange profile standards and/or appropriate extensions may be used as agreed between **The Company** and all the **Network Operators** or as directed by the **GB CIM Governance Group**, as described in PC.G.4.1.1, where agreed by **The Company** and all the **Network Operators**.

PC.3.1.1.5 The **Structural Data** in the exchanged **PSMs** shall utilise unique and persistent identifiers. A unique identifier shall be assigned to the role of each grid component within the **Structural Data** which shall persist throughout the life of that role.

PC.3.1.1.6 For the avoidance of doubt, **Network Operators** will not be in breach of the obligations imposed by PC.9, PC.10 and PC.G where data is omitted due to the data not yet being supported by the data exchange standard identified in PC.G.4.

PC.3.2 In the case of **Embedded Power Stations**, **Embedded DC Converter Stations** and **Embedded HVDC Systems**, unless provided otherwise, the following provisions apply with regard to the provision of data under this **PC**:

- (a) each **Generator** shall provide the data direct to **The Company** in respect of (i) **Embedded Large Power Stations**, (ii) **Embedded Medium Power Stations** subject to a **Bilateral Agreement** and (iii) **Embedded Small Power Stations** which form part of a **Cascade Hydro Scheme**;
- (b) each **DC Converter** owner or **HVDC System Owner** shall provide the data direct to **The Company** in respect of **Embedded DC Converter Stations** and **Embedded HVDC Systems** subject to a **Bilateral Agreement**;

- (c) each **Network Operator** shall provide the data to **The Company** in respect of each **Embedded Medium Power Station** not subject to a **Bilateral Agreement** or **Embedded DC Converter Station** not subject to a **Bilateral Agreement** or **Embedded HVDC System** not subject to a **Bilateral Agreement** connected, or proposed to be connected within such **Network Operator's System**;
- (d) although data is not normally required specifically on **Embedded Small Power Stations** or on **Embedded** installations of direct current converters which do not form a **DC Converter Station** or **HVDC System** under this **PC**, each **Network Operator** in whose **System** they are **Embedded** should provide the data (contained in the Appendix) to **The Company** in respect of **Embedded Small Power Stations** or **Embedded** installations of direct current converters which do not form a **DC Converter Station** or **Embedded** installations of **HVDC Systems** if:
 - (i) it falls to be supplied pursuant to the application for a **CUSC Contract** or in the **Statement of Readiness** to be supplied in connection with a **Bilateral Agreement** and/or **Construction Agreement**, by the **Network Operator**; or
 - (ii) it is specifically requested by **The Company** in the circumstances provided for under this **PC**.

PC.3.3

Certain data does not normally need to be provided in respect of certain **Embedded Power Stations**, **Embedded DC Converter Stations** or **Embedded HVDC Systems**, as provided in PC.A.1.12.

In summary, **Network Operators** are required to supply the data described in the below listed paragraphs of Appendix A of this **PC** in respect of **Embedded Medium Power Stations** not subject to a **Bilateral Agreement** or **Embedded DC Converter Stations** not subject to a **Bilateral Agreement** or **Embedded HVDC Systems** not subject to a **Bilateral Agreement** connected, or is proposed to be connected, within such **Network Operator's System**:

PC.A.2.1.1

PC.A.2.2.2

PC.A.2.5.5.2

PC.A.2.5.5.7

PC.A.2.5.6

PC.A.3.1.5

PC.A.3.2.2

PC.A.3.3.1

PC.A.3.4.1

PC.A.3.4.2

PC.A.5.2.2

PC.A.5.3.2

PC.A.5.4

PC.A.5.5.1

PC.A.5.6

For the avoidance of doubt **Network Operators** are required to supply the above data in respect of **Embedded Medium Power Stations** not subject to a **Bilateral Agreement** and **Embedded DC Converter Stations** not subject to a **Bilateral Agreement** and **Embedded HVDC Systems** not subject to a **Bilateral Agreement** which are located **Offshore** and which are connected or proposed to be connected within such **Network Operator's System**. This is because **Embedded Medium Power Stations** not subject to a **Bilateral Agreement** and **Embedded DC Converter Stations** not subject to a **Bilateral Agreement** and **Embedded HVDC Systems** not subject to a **Bilateral Agreement** are treated as **Onshore Generators** or **Onshore DC Converter Station** owners or **HVDC System Owners** connected to an **Onshore User System Entry Point**.

PC.3.4

The Company may provide to the **Relevant Transmission Licensees** any data which has been submitted to **The Company** by any **Users** pursuant to the following paragraphs of the **PC**. For the avoidance of doubt, **The Company** will not provide to the **Relevant Transmission Licensees**, the types of data specified in Appendix D. The **Relevant Transmission Licensees'** use of such data is detailed in the **STC**.

PC.A.2.2

PC.A.2.5

PC.A.3.1

PC.A.3.2.1

PC.A.3.2.2

PC.A.3.3

PC.A.3.4

PC.A.4

PC.A.5.1

PC.A.5.2

PC.A.5.3.1

PC.A.5.3.2

PC.A.5.4.1

PC.A.5.4.2

PC.A.5.4.3.1

PC.A.5.4.3.2

PC.A.5.4.3.3

PC.A.5.4.3.4

PC.A.7

(and in addition in respect of the data submitted in respect of the **OTSUA**)

PC.A.2.2

PC.A.2.3

PC.A.2.4

PC.A.2.5

PC.A.3.2.2

PC.A.3.3.1(d)

PC.A.4

PC.A.5.4.3.1

PC.A.5.4.3.2

- PC.A.6.2
- PC.A.6.3
- PC.A.6.4
- PC.A.6.5
- PC.A.6.6
- PC.A.7
- PC.3.5 In addition to the provisions of PC.3.4, **The Company** may provide to the **Relevant Transmission Licensees** any data which has been submitted to **The Company** by any **Users** in respect of **Relevant Units** pursuant to the following paragraphs of the **PC**.
 - PC.A.2.3
 - PC.A.2.4
 - PC.A.5.5
 - PC.A.5.7
 - PC.A.6.2
 - PC.A.6.3
 - PC.A.6.4
 - PC.A.6.5
 - PC.A.6.6
- PC.3.6 In the case of **Offshore Embedded Power Stations** connected to an **Offshore User System** which directly connects to an **Offshore Transmission System**, any additional data requirements in respect of such **Offshore Embedded Power Stations** may be specified in the relevant **Bilateral Agreement** with the **Network Operator** or in any **Bilateral Agreement** between **The Company** and such **Offshore Embedded Power Station**.
- PC.3.7 In the case of a **Generator** undertaking **OTSDUW** connecting to an **Onshore Network Operator's System**, any additional requirements in respect of such **OTSDUW Plant and Apparatus** will be specified in the relevant **Bilateral Agreement** with the **Generator**. For the avoidance of doubt, requirements applicable to **Generators** undertaking **OTSDUW** and connecting to a **Network Operator's User System**, shall be consistent with those applicable requirements of **Generators** undertaking **OTSDUW** and connecting to a **Transmission Interface Point**.
- PC.3.8 For the purpose of complying with the requirements of ECC.6.3.17.1.5 and ECC.6.3.17.2.3 **The Company** may share relevant modelling information with a **User** based on the following information submitted by a **User** to **The Company**:
 - PC.A.5.3.2(a), (b), (c), (d) and (g)
 - PC.A.5.4.2
 - PC.A.5.4.3
 - PC.A.9
- PC.3.9 A **User** who receives information from **The Company** under PC.3.8 may only use the information to complete the analysis required by ECC.6.3.17.1 and ECC.6.3.17.2 as applicable and the **Bilateral Agreement**. Further conditions on the sharing of models are detailed in PC.A.9
- PC.4 PLANNING PROCEDURES
- PC.4.1 Pursuant to condition C12 of the **ESO Licence**, the means by which **Users** and proposed **Users** of the **National Electricity Transmission System** are able to assess opportunities for connecting to, and using, the **National Electricity Transmission System** comprise two distinct parts, namely:

- (a) a statement, prepared by **The Company** in accordance with condition C12 of the **ESO Licence**, showing for the current **Financial Year** and each of the nine succeeding **Financial Years**, the opportunities available for connecting to and using the **National Electricity Transmission System** and indicating those parts of the **National Electricity Transmission System** most suited to new connections and transport of further quantities of electricity (the "**Electricity Ten Year Statement**" or **ETYS**); and
- (b) an offer, in accordance with its **ESO Licence**, by **The Company** to enter into a **CUSC Contract**. A **Bilateral Agreement** is to be entered into for every **Connection Site** (and for certain **Embedded Power Stations** and **Embedded DC Converter Stations** and **Embedded HVDC Systems**) within the first two of the following categories and the existing **Bilateral Agreement** may be required to be varied in the case of the third category:
 - (i) existing **Connection Sites** (and for certain **Embedded Power Stations**) as at the **Transfer Date**;
 - (ii) new **Connection Sites** (and for certain **Embedded Power Stations**, **Embedded DC Converter Stations** and **Embedded HVDC Systems**) with effect from the **Transfer Date**;
 - (iii) a **Modification** at a **Connection Site** (or in relation to the connection of certain **Embedded Power Stations**, **Embedded DC Converter Stations** and **Embedded HVDC Systems** whether or not the subject of a **Bilateral Agreement**) (whether such **Connection Site** or connection exists on the **Transfer Date** or is new thereafter) with effect from the **Transfer Date**.

In this **PC**, unless the context otherwise requires, "connection" means any of these 3 categories.

PC.4.2 Introduction to Data

User Data

PC.4.2.1 Under the **PC**, two types of data to be supplied by **Users** are called for:

- (a) **Standard Planning Data**; and
 - (b) **Detailed Planning Data**,
- as more particularly provided in PC.A.1.4.

PC.4.2.2 The **PC** recognises that these two types of data, namely **Standard Planning Data** and **Detailed Planning Data**, are considered at three different levels:

- (a) **Preliminary Project Planning Data**;
- (b) **Committed Project Planning Data**; and
- (c) **Connected Planning Data**,

as more particularly provided in PC.5

PC.4.2.3 **Connected Planning Data** is itself divided into:

- (a) **Forecast Data**;
- (b) **Registered Data**; and
- (c) **Estimated Registered Data**,

as more particularly provided in PC.5.5

PC.4.2.4 Clearly, an existing **User** proposing a new **Connection Site** (or **Embedded Power Station** or **Embedded DC Converter Station** or **Embedded HVDC System**) in the circumstances outlined in PC.4.1) will need to supply data both in an application for a **Bilateral Agreement** and under the **PC** in relation to that proposed new **Connection Site** (or **Embedded Power Station** or **Embedded DC Converter Station** or **Embedded HVDC System** in the circumstances outlined in PC.4.1) and that will be treated as **Preliminary Project Planning Data** or **Committed Project Planning Data** (as the case may be), but the data it supplies under the **PC** relating to its existing **Connection Sites** will be treated as **Connected Planning Data**.

Network Data

PC.4.2.5 In addition, there is **Network Data** supplied by **The Company** in relation to short circuit current contributions in relation to **OTSUA**.

Data Provision

Electricity Ten Year Statement

To enable the **Electricity Ten Year Statement** to be prepared, each **User** is required to submit to **The Company** (subject to the provisions relating to **Embedded Power Stations** and **Embedded DC Converter Stations** and **Embedded HVDC Systems** in PC.3.2) both the **Standard Planning Data** and the **Detailed Planning Data** as listed in parts 1 and 2 of Appendix A. This data should be submitted in calendar week 24 of each year (although **Network Operators** may delay the submission of data (other than that to be submitted pursuant to PC.3.2(c) and PC.3.2(d)) until calendar week 28) and should cover the current **Financial Year** and each of the nine succeeding **Financial Years**. Where, from the date of one submission to another, there is no change in the data (or in some of the data) to be submitted, instead of re-submitting the data, a **User** may submit a written statement that there has been no change from the data (or in some of the data) submitted the previous time. In addition, **The Company** will also use the **Transmission Entry Capacity** and **Connection Entry Capacity** data from the **CUSC Contract**, and any data submitted by **Network Operators** in relation to an **Embedded Medium Power Station** not subject to a **Bilateral Agreement** or **Embedded DC Converter Station** not subject to a **Bilateral Agreement**, or **Embedded HVDC System** not subject to a **Bilateral Agreement** in the preparation of the **Electricity Ten Year Statement** and to that extent the data will not be treated as confidential.

Network Data

To enable **Users** to model the **National Electricity Transmission System** in relation to short circuit current contributions, **The Company** is required to submit to **Users**, the **Network Data** as listed in Part 3 of Appendix A. The data will be submitted in week 42 of each year and will cover that **Financial Year**.

PC.4.3.3 To enable **Users** to model the **National Electricity Transmission System** in relation to **OTSUA**, **The Company** is required to submit to **Users** the **Network Data**, as listed in Part 3 of Appendix A and Appendix F. **The Company** shall provide the **Network Data** with the offer of a **CUSC Contract** in the case of the data in PC F2.1 and otherwise in accordance with the **OTSDUW Development and Data Timetable**.

Offer of Terms for Connection

CUSC Contract – Data Requirements/Offer Timing

The completed application form for a **CUSC Contract** to be submitted by a **User** when making an application for a **CUSC Contract** will include:

- (a) a description of the **Plant** and/or **Apparatus** (excluding **OTSDUW Plant and Apparatus**) to be connected to the **National Electricity Transmission System** or of the **Modification** relating to the **User's Plant** and/or **Apparatus** (and prior to the **OTSUA Transfer Time**, any **OTSUA**) already connected to the **National Electricity Transmission System** or, as the case may be, of the proposed new connection or **Modification** to the connection within the **User System** of the **User**, each of which shall be termed a "**User Development**" in the **PC**;

- (b) the relevant **Standard Planning Data** as listed in Part 1 of Appendix A (except in respect of any **OTSUA**);
- (c) the desired **Completion Date** of the proposed **User Development**; and
- (d) the desired **Connection Entry Capacity** and **Transmission Entry Capacity**.

The completed application form for a **CUSC Contract** will be sent to **The Company** as more particularly provided in the application form.

PC.4.4.2

Any offer of a **CUSC Contract** will provide that it must be accepted by the applicant **User** within the period stated in the offer, after which the offer automatically lapses. Except as provided in the **CUSC Contract**, acceptance of the offer renders the **National Electricity Transmission System** works relating to that **User Development**, reflected in the offer, committed and binds both parties to the terms of the offer. The User shall then provide the **Detailed Planning Data** as listed in Part 2 of Appendix A (and in the case of **OTSUA** the **Standard Planning Data** as listed in Part 1 of Appendix A within the timeline provided in PC.A.1.4). In respect of **DPD I** this shall generally be provided within 28 days (or such shorter period as **The Company** may determine, or such longer period as **The Company** may agree, in any particular case) of acceptance of the offer and in respect of **DPD II** this shall generally be provided at least two years (or such longer period as **The Company** may determine, or such shorter period as **The Company** may agree, in any particular case or in the case of **OTSUA** such shorter period as **The Company** shall require) prior to the **Completion Date** of the **User Development**.

PC.4.4.3

Embedded Development Agreement - Data Requirements

The **Network Operator** shall submit the following data in relation to an **Embedded Medium Power Station** not subject to, or proposed to be subject to, a **Bilateral Agreement** or **Embedded DC Converter Station** not subject to, or proposed to be subject to, a **Bilateral Agreement** as soon as reasonably practicable after receipt of an application from an **Embedded Person** to connect to its **System**:

- (a) details of the proposed new connection or variation (having a similar effect on the **Network Operator's System** as a **Modification** would have on the **National Electricity Transmission System**) to the connection within the **Network Operator's System**, each of which shall be termed an "**Embedded Development**" in the **PC** (where a **User Development** has an impact on the **Network Operator's System** details shall be supplied in accordance with PC.4.4 and PC.4.5);
- (b) the relevant **Standard Planning Data** as listed in Part 1 of Appendix A;
- (c) the proposed completion date (having a similar meaning in relation to the **Network Operator's System** as **Completion Date** would have in relation to the **National Electricity Transmission System**) of the **Embedded Development**; and
- (d) upon the request of **The Company**, the relevant **Detailed Planning Data** as listed in Part 2 of Appendix A.

PC.4.4.4

The **Network Operator** shall provide the **Detailed Planning Data** as listed in Part 1 of Appendix A. In respect of **DPD I**, this shall generally be provided within 28 days (or such shorter period as **The Company** may determine, or such longer period as **The Company** may agree, in any particular case) of entry into the **Embedded Development Agreement** and in respect to **DPD II** this shall generally be provided at least two years (or such longer period as **The Company** may determine, or such shorter period as **The Company** may agree, in any particular case) prior to the **Completion Date** of the **Embedded Development**.

PC.4.5

Complex Connections

- PC.4.5.1 The magnitude and complexity of any **National Electricity Transmission System** extension or reinforcement will vary according to the nature, location and timing of the proposed **User Development** which is the subject of the application and it may, in the event, be necessary for **The Company** to carry out additional more extensive system studies to evaluate more fully the impact of the proposed **User Development** on the **National Electricity Transmission System**. Where **The Company** judges that such additional more detailed studies are necessary the offer may indicate the areas that require more detailed analysis and before such additional studies are required, the **User** shall indicate whether it wishes **The Company** to undertake the work necessary to proceed to make a revised offer within the 3 month period normally allowed or, where relevant, the timescale consented to by the **Authority**.
- PC.4.5.2 To enable **The Company** to carry out any of the above mentioned necessary detailed system studies, the **User** may, at the request of **The Company**, be required to provide some or all of the **Detailed Planning Data** listed in part 2 of Appendix A in advance of the normal timescale referred in PC.4.4.2 provided that **The Company** can reasonably demonstrate that it is relevant and necessary.
- PC.4.5.3 To enable **The Company** to carry out any necessary detailed system studies, the relevant **Network Operator** may, at the request of **The Company**, be required to provide some or all of the **Detailed Planning Data** listed in Part 2 of Appendix A in advance of the normal timescale referred in PC.4.4.4 provided that **The Company** can reasonably demonstrate that it is relevant and necessary.

PC.5 PLANNING DATA

- PC.5.1 As far as the **PC** is concerned, there are three relevant levels of data in relation to **Users**. These levels, which relate to levels of confidentiality, commitment and validation, are described in the following paragraphs.

Preliminary Project Planning Data

- PC.5.2 At the time the **User** applies for a **CUSC Contract** but before an offer is made and accepted by the applicant **User**, the data relating to the proposed **User Development** will be considered as **Preliminary Project Planning Data**. Data relating to an **Embedded Development** provided by a **Network Operator** in accordance with PC.4.4.3, and PC.4.4.4 if requested, will be considered as **Preliminary Project Planning Data**. All such data will be treated as confidential within the scope of the provisions relating to confidentiality in the **CUSC**.
- PC.5.3 **Preliminary Project Planning Data** will normally only contain the **Standard Planning Data** unless the **Detailed Planning Data** is required in advance of the normal timescale to enable **The Company** to carry out additional detailed system studies as described in PC.4.5.

Committed Project Planning Data

- PC.5.4 Once the offer for a **CUSC Contract** is accepted, the data relating to the **User Development** already submitted as **Preliminary Project Planning Data**, and subsequent data required by **The Company** under this **PC**, will become **Committed Project Planning Data**. Once an **Embedded Person** has entered into an **Embedded Development Agreement**, as notified to **The Company** by the **Network Operator**, the data relating to the **Embedded Development** already submitted as **Preliminary Project Planning Data**, and subsequent data required by **The Company** under the **PC**, will become **Committed Project Planning Data**. Such data, together with **Connection Entry Capacity** and **Transmission Entry Capacity** data from the **CUSC Contract** and other data held by **The Company** relating to the **National Electricity Transmission System** will form the background against which new applications by any **User** will be considered and against which planning of the **National Electricity Transmission System** will be undertaken. Accordingly, **Committed Project Planning Data**, **Connection Entry Capacity** and **Transmission Entry Capacity** data will not be treated as confidential to the extent that **The Company**:
- (a) is obliged to use it in the preparation of the **Electricity Ten Year Statement** and in any further information given pursuant to the **Electricity Ten Year Statement**;

- (b) is obliged to use it when considering and/or advising on applications (or possible applications) of other **Users** (including making use of it by giving data from it, both orally and in writing, to other **Users** making an application (or considering or discussing a possible application) which is, in **The Company's** view, relevant to that other application or possible application);
- (c) is obliged to use it for operational planning purposes;
- (d) is obliged under the terms of an **Interconnection Agreement** to pass it on as part of system information on the **Total System**;
- (e) is obliged to disclose it under the **STC**;
- (f) is obliged to use and disclose it in the preparation of the **Offshore Development Information Statement**;
- (g) is obliged to use it in order to carry out its **EMR Functions** or is obliged to disclose it under an **EMR Document**.

To reflect different types of data, **Preliminary Project Planning Data** and **Committed Project Planning Data** are themselves divided into:

- (a) those items of **Standard Planning Data** and **Detailed Planning Data** which will always be forecast, known as **Forecast Data**; and
- (b) those items of **Standard Planning Data** and **Detailed Planning Data** which relate to **Plant** and/or **Apparatus** which upon connection will become **Registered Data**, but which prior to connection, for the current **Financial Year** and the nine succeeding **Financial Years**, will be an estimate of what is expected, known as **Estimated Registered Data**.

Connected Planning Data

PC.5.5

The **PC** requires that, at the time that a **Statement of Readiness** is submitted under the **Bilateral Agreement** and/or **Construction Agreement**, any estimated values assumed for planning purposes are confirmed or, where practical, replaced by validated actual values and by updated estimates for the future and by updated forecasts for forecast data items such as **Demand**. In the case of an **Embedded Development** the relevant **Network Operator** will update any estimated values assumed for planning purposes with validated actual values as soon as reasonably practicable after energisation. This data is then termed **Connected Planning Data**.

To reflect the three types of data referred to above, **Connected Planning Data** is itself divided into:

- (a) those items of **Standard Planning Data** and **Detailed Planning Data** which will always be forecast data, known as **Forecast Data**; and
- (b) those items of **Standard Planning Data** and **Detailed Planning Data** which upon connection become fixed (subject to any subsequent changes), known as **Registered Data**; and
- (c) those items of **Standard Planning Data** and **Detailed Planning Data** which for the purposes of the **Plant** and/or **Apparatus** concerned as at the date of submission are **Registered Data** but which for the current **Financial Year** and the nine succeeding **Financial Years** will be an estimate of what is expected, known as **Estimated Registered Data**,

as more particularly provided in Appendix A.

PC.5.6

Connected Planning Data, together with **Connection Entry Capacity** and **Transmission Entry Capacity** data from the **CUSC Contract**, and other data held by **The Company** relating to the **National Electricity Transmission System**, will form the background against which new applications by any **User** will be considered and against which planning of the **National Electricity Transmission System** will be undertaken. Accordingly, **Connected Planning Data**, **Connection Entry Capacity** and **Transmission Entry Capacity** data will not be treated as confidential to the extent that **The Company**:

- (a) is obliged to use it in the preparation of the **Electricity Ten Year Statement** and in any further information given pursuant to the **Electricity Ten Year Statement**;
- (b) is obliged to use it when considering and/or advising on applications (or possible applications) of other **Users** (including making use of it by giving data from it, both orally and in writing, to other **Users** making an application (or considering or discussing a possible application) which is, in **The Company's** view, relevant to that other application or possible application);
- (c) is obliged to use it for operational planning purposes;
- (d) is obliged under the terms of an **Interconnection Agreement** to pass it on as part of system information on the **Total System**.
- (e) is obliged to disclose it under the **STC**;
- (f) is obliged to use it in order to carry out its **EMR Functions** or is obliged to disclose it under an **EMR Document**.

PC.5.7 **Committed Project Planning Data** and **Connected Planning Data** will each contain both **Standard Planning Data** and **Detailed Planning Data**.

PC.6 PLANNING STANDARDS

PC.6.1 **The Company** shall apply the **Licence Standards** relevant to it in the planning and development of the **National Electricity Transmission System**. **The Company** shall procure that each **Relevant Transmission Licensee** shall apply the **Licence Standards** relevant to planning and development, in the planning and development of the **Transmission System** of each **Relevant Transmission Licensee** and that a **User** shall apply the **Licence Standards** relevant to planning and development, in the planning and development of the **OTSUA**.

PC.6.2 In relation to Scotland, Appendix C lists the technical and design criteria applied in the planning and development of each **Relevant Transmission Licensee's Transmission System**. The criteria are subject to review in accordance with each **Relevant Transmission Licensee's Transmission Licence** conditions. Copies of these documents are available from **The Company** on request. **The Company** will charge an amount sufficient to recover its reasonable costs incurred in providing this service.

PC.6.3 In relation to **Offshore**, Appendix E lists the technical and design criteria applied in the planning and development of each **Offshore Transmission System**. The criteria are subject to review in accordance with each **Offshore Transmission Licensee's Transmission Licence** conditions. Copies of these documents are available from **The Company** on request. **The Company** will charge an amount sufficient to recover its reasonable costs incurred in providing this service.

PC.6.4 In planning and developing the **OTSUA**, the **User** shall comply with (and shall ensure that (as at the **OTSUA Transfer Time**) the **OTSUA** comply with):

- (a) the **Licence Standards**; and
- (b) the technical and design criteria in Appendix E.

PC.6.5 In addition the **User** shall, in the planning and development of the **OTSUA**, to the extent it is reasonable and practicable to do so, take into account the reasonable requests of **The Company** (in the context of its obligation to develop an efficient, co-ordinated and economical system) relating to the planning and development of the **National Electricity Transmission System**.

PC.6.6 In planning and developing the **OTSUA** the **User** shall take into account the **Network Data** provided to it by **The Company** under Part 3 of Appendix A and Appendix F, and act on the basis that the **Plant** and **Apparatus** of other **Users** complies with:

- (a) the minimum technical design and operational criteria and performance requirements set out in either CC.6.1, CC.6.2, CC.6.3 and CC.6.4 or ECC.6.1, ECC.6.2, ECC.6.3 and ECC.6.4 ; or
- (b) such other criteria or requirements as **The Company** may from time to time notify the **User** are applicable to specified **Plant** and **Apparatus** pursuant to PC.6.7.

PC.6.7 Where the **OTSUA** are likely to be materially affected by the design or operation of another **User's Plant** and **Apparatus** and **The Company**:

- (a) becomes aware that such other **User** has or is likely to apply for a derogation under the Grid Code;
- (b) is itself applying for a derogation under the Grid Code in relation to the **Connection Site** on which such other **User's Plant** and **Apparatus** is located or to which it otherwise relates; or
- (c) is otherwise notified by such other **User** that specified **Plant** or **Apparatus** is normally capable of operating at levels better than those set out in CC.6.1, CC.6.2, CC.6.3 and CC.6.4 or ECC.6.1, ECC.6.2, ECC.6.3 and ECC.6.4,

The Company shall notify the **User**.

PC.7 PLANNING LIAISON

- PC.7.1 This PC.7 applies to **The Company** and **Users**, which in PC.7 means
- (a) **Network Operators**
 - (b) **Non-Embedded Customers**
- PC.7.2 As described in PC.2.1 (b) an objective of the **PC** is to provide for the supply of information to **The Company** by **Users** in order that planning and development of the **National Electricity Transmission System** can be undertaken in accordance with the relevant **Licence Standards**.
- PC.7.3 **Grid Code** amendment B/07 ("Amendment B/07") implemented changes to the **Grid Code** which included amendments to the datasets provided by both **The Company** and **Users** to inform the planning and development of the **National Electricity Transmission System**. The **Authority** has determined that these changes are to have a phased implementation. Consequently the provisions of Appendix A to the **PC** include specific years (ranging from 2009 to 2011) with effect from which certain of the specific additional obligations brought about by Amendment B/07 on **The Company** and **Users** are to take effect. Where specific provisions of paragraphs PC.A.4.1.4, PC.A.4.2.2 and PC.A.4.3.1 make reference to a year, then the obligation on **The Company** and the **Users** shall be required to be met by the relevant calendar week (as specified within such provision) in such year.
- In addition to the phased implementation of aspects of Amendment B/07, **Users** must discuss and agree with **The Company** by no later than 31 March 2009 a more detailed implementation programme to facilitate the implementation of **Grid Code** amendment B/07.
- It shall also be noted by **The Company** and **Users** that the dates set out in PC.A.4 are intended to be minimum requirements and are not intended to restrict a **User** and **The Company** from the earlier fulfilment of the new requirements prior to the specified years. Where **The Company** and a **User** wish to follow the new requirements from earlier dates than those specified, this will be set out in the more detailed implementation programme agreed between **The Company** and the **User**.
- The following provisions of PC.7 shall only apply with effect from 1 January 2011.
- PC.7.4 Following the submission of data by a **User** in or after week 24 of each year **The Company** will provide information to **Users** by calendar week 6 of the following year regarding the results of any relevant assessment that has been made by **The Company** based upon such data submissions to verify whether **Connection Points** are compliant with the relevant **Licence Standards**.
- PC.7.5 Where the result of any assessment identifies possible future non-compliance with the relevant **Licence Standards**, **The Company** shall notify the relevant **User(s)** of this fact as soon as reasonably practicable and shall agree with **Users** any opportunity to resubmit data to allow for a reassessment in accordance with PC.7.6.
- PC.7.6 Following any notification by **The Company** to a **User** pursuant to PC.7.5 and following any further discussions held between the **User** and **The Company**:
- (i) **The Company** and the **User** may agree revisions to the **Access Periods** for relevant **Transmission Interface Circuits**, such revisions shall not however permit an **Access Period** to be less than 4 continuous weeks in duration or to occur other than between calendar weeks 10 and 43 (inclusive); and/or,
 - (ii) The **User** shall as soon as reasonably practicable
 - (a) submit further relevant data to **The Company** that is to **The Company's** reasonable satisfaction; and/or,
 - (b) modify data previously submitted pursuant to this **PC**, such modified data to be to **The Company's** reasonable satisfaction; and/or
 - (c) notify **The Company** that it is the intention of the **User** to leave the data as originally submitted to **The Company** to stand as its submission.
- PC.7.7 Where an **Access Period** is amended pursuant to PC.7.6 (i) **The Company** shall notify **The Authority** that it has been necessary to do so.

- PC.7.8 When it is agreed that any resubmission of data is unlikely to confirm future compliance with the relevant **Licence Standards** the **Modification** process in the **CUSC** may apply.
- PC.7.9 A **User** may at any time, in writing, request further specified **National Electricity Transmission System** network data in order to provide **The Company** with viable **User** network data (as required under this **PC**). Upon receipt of such request, **The Company** shall consider, and where appropriate provide such **National Electricity Transmission System** network data to the **User** as soon as reasonably practicable following the request.
- PC.8 OTSDUW PLANNING LIAISON
- PC.8.1 This PC.8 applies to **The Company** and **Users**, which in PC.8 means **Users** undertaking **OTSDUW**.
- PC.8.2 As described in PC.2.1 (e) an objective of the **PC** is to provide for the supply of information between **The Company** and a **User** undertaking **OTSDUW** in order that planning and development of the **National Electricity Transmission System** can be co-ordinated.
- PC.8.3 Where the **OTSUA** also require works to be undertaken by any **Relevant Transmission Licensee** on its **Transmission System** **The Company** and the **User** shall throughout the construction and commissioning of such works:
- (a) co-operate and assist each other in the development of co-ordinated construction programmes or any other planning or, in the case of **The Company**, analysis it undertakes in respect of the works; and
 - (b) provide to each other all information relating to, in the case of the **User** its own works and, in the case of **The Company**, the works on the **Transmission Systems** reasonably necessary to assist each other in the performance of that other's part of the works, and shall use all reasonable endeavours to co-ordinate and integrate their respective part of the works; and
- the **User** shall plan and develop the **OTSUA**, taking into account to the extent that it is reasonable and practicable to do so the reasonable requests of **The Company** relating to the planning and development of the **National Electricity Transmission System**.
- PC.8.4 Where **The Company** becomes aware that changes made to the investment plans of any **Relevant Transmission Licensee** may have a material effect on the **OTSUA**, **The Company** shall notify the **User** and provide the **User** with the necessary information about the relevant **Transmission Systems** sufficient for the **User** to assess the impact on the **OTSUA**.

PC.9	SUBMISSION OF SYSTEM MODELS AND INFORMATION BY NETWORK OPERATORS TO THE COMPANY
PC.9.1	<u>General</u>
PC.9.1.1	PC.9 details the minimum planning data to be submitted by Network Operators to The Company .
PC.9.1.2	Compliance with the data submission requirements within PC.9 shall only apply after the PSM Implementation Date .
PC.9.1.3	The Network Operator shall use reasonable endeavours to obtain all applicable information required by PC.9 from any user connected to the Network Operator's System , such that the information provided is the best information available at the time of submission.
PC.9.2	<u>Purpose</u>
PC.9.2.1	The purpose of the data submission set out in PC.9 is to ensure that the Network Operators provide sufficient information to The Company so that it: (a) Can provide information to the Relevant Transmission Licensee so that they can establish the previous, current, and future year's compliance of the NETS with the NETS SQSS; (b) Can provide information to the Relevant Transmission Licensee so that they can establish that the NETS complies with relevant technical standards; (c) Can provide information to the Relevant Transmission Licensee so that they can establish that the NETS has sufficient capability to accommodate the connection of, and export from, Embedded Power Stations as considered in the CUSC Evaluation of Transmission Impact process; and (d) Can create operational models for use in operational timescales.
PC.9.2.2	The Data Freeze Date for the submission in calendar week 2 shall be 31 October of the previous year. The Data Freeze Date for the submission in calendar week 28 shall be 31 March of that year.
PC.9.2.3	PC.9 uses definitions of Group Demand , Latent Demand , Measured Demand , Embedded Power Station Export , Embedded Power Station Import and Gross Demand . The interpretation of these definitions is illustrated in the stylised figure PC.9.2.3.

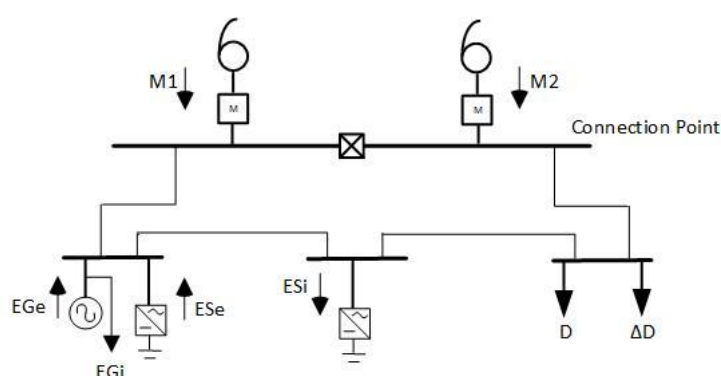


Figure PC.9.2.3

M1, M2	measurement at the Connection Point
EGi	import to Large Power Stations, Medium Power Stations and Small Power Stations other than to Electricity Storage Module(s)
EGe	export from Large Power Stations, Medium Power Stations and Small Power Stations other than from Electricity Storage Module(s)

ESi	import to Electricity Storage Module(s)
ESe	export from Electricity Storage Module(s)
D	aggregated Embedded Customer Import
ΔD	aggregated Latent Demand of Embedded Customers

Where:

$$\text{Group Demand} = D + \Delta D$$

$$\text{Group Demand} = (M1 + M2) + (EGe + ESe) - (EGi + ESi) + \Delta D$$

$$\text{Latent Demand} = \Delta D$$

$$\text{Gross Demand} = (D + \Delta D) + (EGi + ESi)$$

$$\text{Embedded Power Station Export} = EGe + ESe$$

$$\text{Embedded Power Station Import} = EGi + ESi$$

$$\text{Measured Demand (Net Demand)} = M1 + M2$$

PC.9.3 Submissions

PC.9.3.1 Submissions by the **Network Operator** to **The Company** include:

- a) Routine submissions each year in calendar week 2 and calendar week 28. These are described in PC.9.3.2 and PC.9.3.3 respectively. A diagram illustrating the coordination of submissions between the **Network Operators** and **The Company** is provided in PC.G.9; and
- b) Information provided as part of a **CUSC Evaluation of Transmission Impact** assessment application. This information is described in PC.9.3.4.

Nothing shall prevent the submission of data detailed in PC.9 at additional points during the year where agreed between **The Company** and the **Network Operator**.

At **The Company's** reasonable request and where agreed by the **Network Operator**, additional data on the **Network Operator's System** beyond that described in PC.9 shall be provided.

At **The Company's** reasonable request and where agreed by the **Network Operator** additional information on the **Network Operator's** forecasting methodologies relevant to PC.9 shall be provided.

PC.9.3.2 The data submitted in calendar week 2 shall comprise:

PC.9.3.2.1 A **Solved PSM** of the **Network Operator's System**, which conforms to the **Subtransmission PSM** requirements as described in PC.9.4.2 and which includes:

- a) **Structural Data** as at the **Data Freeze Date** for the submission in calendar week 2;
- b) **Situation Data** corresponding to the date and time of **NETS** minimum demand as specified by **The Company** in calendar week 43 of the previous year;
- c) **Solution Data** resulting from a power flow calculation executed on the **Structural Data** and **Situation Data**;
- d) **Solution Data** which includes results from a minimum fault level study executed on the **Structural Data** and **Situation Data**; and
- e) **Diagram Data** describing diagrams of **Structural Data** and a subset of **Situational Data**.

PC.9.3.2.2 A **PSM Scenario Document** and a **PSM Change Document**, conforming with the requirements described in PC.G.5 and PC.G.6, respectively.

- PC.9.3.2.3 A collection of individual **Power System Difference Models (PSDMs)** describing new or modified connections or proposed alterations to the **Network Operator's System** that the **Network Operator** is aware of at the **Data Freeze Date**. Individual **PSDMs** shall be supplied for all of the following not represented in the **Structural Data** of the submitted **Solved PSM**:
- a) each new or modified generation and/or load connection where the relevant customer has accepted a connection offer from the **Network Operator**; and
 - b) each authorised reinforcement, asset replacement scheme or similar related to the **Network Operator's System**.
- PC.9.3.2.4 A copy of **Data Registration Code** Schedule 21a, populated with demand and generation data corresponding to the date and time of the **NETS** minimum demand as specified by **The Company** in calendar week 43 of the previous year. Schedule 21a provides information including:
- a) **Group Demand** and the export from **Embedded Power Stations** for each **Connection Point** at:
 - i. the date and time of **NETS** minimum demand specified by **The Company**; and
 - ii. forecasts for future dates and times of **NETS** minimum demand specified by **The Company**.
- PC.9.3.2.5 A copy of **Data Registration Code** Schedule 21b, populated with demand and generation data relating to a date and time established by the **Network Operator** as being the date and time of the **Connection Point** summer minimum **Group Demand**. This summer minimum relates to a time between the hours 04:00 and 06:00 (BST) between April to October inclusive. Schedule 21b provides information including:
- a) **Group Demand** and the export from **Embedded Power Stations** for each **Connection Point** at:
 - i. the date and time of peak **Connection Point** summer minimum **Group Demand**.
- PC.9.3.2.6 A copy of **Data Registration Code** Schedule 21c, populated with demand and generation data relating to a date and time established by the **Network Operator** as being the time and date of the **Connection Point** summer daylight minimum **Group Demand**. Summer daylight relates to a time between the hours 10:00 and 16:00 (BST) between April to October inclusive. Schedule 21c provides information including:
- a) **Group Demand** and the export from **Embedded Power Stations** for each **Connection Point** at:
 - i. The date and time of peak **Connection Point** summer daylight minimum **Group Demand**.
- PC.9.3.2.7 A copy of **Data Registration Code** Schedule 22, populated with:
- a) The forecast half hourly **Measured Demand (Active Power)** profile for the **Network Operator's System** (summed over all **Connection Points**) for the dates of the forecast **NETS** minimum demand specified by **The Company**; and
 - b) The aggregate export from all **Embedded Power Stations** at the forecast half-hourly **NETS** minimum demand.
- PC.9.3.2.8 A copy of **Data Registration Code** Schedule 29a, populated with information about **Embedded Power Stations** with **Registered Capacities** greater than or equal to 1MW, that provides additional detail related to the generation modelling which is part of the **Structural Data** of the **Solved PSM** as described in PC.9.4.2.2.3.
- PC.9.3.2.9 A copy of **Data Registration Code** Schedule 29b, populated with information for each **Connection Point** about **Embedded Power Stations** with **Registered Capacities** less than 1MW, that provides additional detail related to the generation modelling which is part of the **Structural Data** of the **Solved PSM** as described in PC.9.4.2.2.3.
- PC.9.3.2.10 A copy of **Data Registration Code** Schedule 30, populated with information for each **Connection Point** detailing:

- a) Where a **Network Operator's System** imposes constraints on the import to or export from a **Generating Unit** at an **Embedded Large Power Station**, the following data:
 - i. outturn and forecast constrained capacity (MW)
 - ii. any **Reactive Dispatch Network Restriction** (MVA_r)

For the avoidance of doubt, a **Generating Unit** as referred to above includes:

- i. A **CCGT Unit** or **Synchronous Generating Unit** within a **Synchronous Power Generating Module**;
- ii. A **Power Park Module** (including **DC Connected Power Park Modules**);
- iii. An **Offshore Transmission System** at an **Interface Point**; or
- iv. An **Embedded HVDC System** or **DC Converter** at an **Embedded DC Converter Station**.

Constrained capacity is a limitation of the import to or export from a **Generating Unit** at an **Embedded Large Power Station**, due to the **Network Operator's System** in which the **Large Power Station** is **Embedded**, arising from intrinsic limitations of the **Network Operator's System** or an automated or manual control system designed to limit power flows in the **Network Operator's System** in certain scenarios.

Where **Generating Units** are connected to a **Network Operator's System** via a busbar arrangement which is or is expected to be operated in separate sections, details of busbar running arrangements and connected circuits at the substation to which the **Embedded Generating Unit** is connected, sufficient for **The Company** to determine where the MW generated by each **Generating Unit** would appear onto the **NETS**, shall be provided;

- b) Where a **Network Operator System** imposes constraints on the operation of an **Offshore Transmission System** at an **Interface Point** the following data:
 - i. outturn and forecast maximum import capacity (MW); and
 - ii. outturn and forecast maximum export capacity (MW).

PC.9.3.3 The data submitted in calendar week 28 shall comprise:

PC.9.3.3.1 A **Solved PSM** of the **Network Operator's System**, which conforms to the **Subtransmission PSM** requirements as described in PC.9.4.2 and which includes:

- a) **Structural Data** as at the **Data Freeze Date** for the submission in calendar week 28;
- b) **Situation Data** corresponding to the date and time of **NETS** peak demand as specified by **The Company** in calendar week 17;
- c) **Solution Data** resulting from a power flow calculation executed on the **Structural Data** and **Situation Data**;
- d) **Solution Data** which includes results from a maximum fault level study executed on the **Structural Data** and **Situation Data**; and
- e) **Diagram Data** describing diagrams of **Structural Data** and a subset of **Situation Data**.

PC.9.3.3.2 A **PSM Scenario Document** and a **PSM Change Document**, conforming with the requirements described in PC.G.5 and PC.G.6, respectively.

PC.9.3.3.3 A collection of individual **PSDMs** describing new or modified connections or proposed alterations to the **Network Operator's System** that the **Network Operator** is aware of at the **Data Freeze Date**. Individual **PSDMs** shall be supplied for all of the following not represented in the **Structural Data** of the submitted **Solved PSM**:

- a) each new or modified generation and/or demand connection where the relevant customer has accepted a connection offer from the **Network Operator**; and

- b) each authorised reinforcement, asset replacement scheme or similar related to the **Network Operators' System**.
- PC.9.3.3.4 A copy of **Data Registration Code** Schedule 23a, populated with demand and generation data corresponding to the date and time of **NETS** peak demand as specified by **The Company** in calendar week 17. Schedule 23a provides information including:
- a) **Group Demand** and the export from **Embedded Power Stations** for each **Connection Point** at:
 - i. the date and time of **NETS** peak demand specified by **The Company**; and
 - ii. forecasts for future dates and times of **NETS** peak demand specified by **The Company**.
- PC.9.3.3.5 A copy of **Data Registration Code** Schedule 23b, populated with demand and generation data relating to a date and time established by the **Network Operator** as being the time and date of the **Connection Point** peak **Group Demand**. Schedule 23b provides information including:
- a) **Group Demand** and the export from **Embedded Power Stations** for each **Connection Point** at:
 - i. the time and date of **Connection Point** peak **Group Demand**; and
 - ii. forecasts of the **Connection Point** peak **Group Demand** times and dates.
 - b) Associated **Connection Point** data at the dates and times of **Connection Point** peak **Group Demand**. Where an associated **Connection Point** is normally operated in parallel with the **Connection Point**, consideration shall be given to presenting data for the associated **Connection Point** and the **Connection Point** as if it was a single **Connection Point**.
 - c) A reference to any post fault actions, associated network reconfigurations and demand transfers which shall be described in more detail in the **PSM Scenario Document**.
- PC.9.3.3.6 A copy of **Data Registration Code** Schedule 23c, populated with demand and generation data relating to a date and time established by the **Network Operator** as being the time and date of the **Connection Point** peak **Group Demand** during the **Access Period**. Schedule 23c provides information including:
- a) **Group Demand** and the export from **Embedded Power Stations** for each **Connection Point** at:
 - i. the date and time of the **Connection Point** peak **Group Demand** during the **Access Period**; and
 - ii. forecasts for future dates and times of the **Connection Point** peak **Group Demand** during the **Access Period**.
 - b) Associated **Connection Point** data at the date and time of **Connection Point** peak **Group Demand** during the **Access Period**. Where an associated **Connection Point** is normally operated in parallel with the **Connection Point**, consideration shall be given to presenting data for the associated **Connection Point** and the **Connection Point** as if it was a single **Connection Point**.
 - c) A reference to any post fault actions, associated network reconfigurations and demand transfers which shall be described in more detail in the **PSM Scenario Document**.
- PC.9.3.3.7 A copy of **Data Registration Code** Schedules 24, populated with **Access Group(s)** and with the associated **Access Period** data demonstrating the maintainability of the **Transmission Interface Circuits**.
- PC.9.3.3.8 A copy of **Data Registration Code** Schedules 25a, 25b and 25c, populated in relation to **Demand Control** as described in OC.6.6.2, OC.6.5.3 and OC.6.7.2 respectively.
- PC.9.3.3.9 A copy of **Data Registration Code** Schedule 26a, populated with:

- a) The forecast half hourly **Measured Demand (Active Power)** profile, under **Annual ACS Conditions** for the **Network Operator's System** (summed over all **Connection Points**) for the dates of the forecast yearly peak **Measured Demand** on the **Network Operator's System** (as determined by the **Network Operator**); and
- b) The forecast half-hourly **Measured Demand (Active Power)** with generation netted out for the **Network Operator's System** (summed over all **Connection Points**) for the days of the forecast yearly peak **Measured Demand** on the **Network Operator's System** (as determined by the **Network Operator**).

PC.9.3.3.10 A copy of **Data Registration Code** Schedule 26b, populated with:

- a) The forecast half hourly **Measured Demand (Active Power)** profile for the **Network Operator's System** (summed over all **Connection Points**) for the dates of the forecast **NETS** peak demand specified by **The Company**;
- b) The actual and **Weather Corrected** outturn half-hourly **Measured Demand (Active Power)** for the **Network Operator's System** (summed over all **Connection Points**) for the half hour of the date and time of the **NETS** peak demand specified by **The Company**;
- c) The actual outturn **Measured Demand (Active Power)** with generation netted out on the **Network Operator's System** for the half-hour of the **NETS** peak demand specified by **The Company**; and
- d) The forecast half-hourly average **Measured Demand (Active Power)** with generation netted out for the **Network Operator's System** (summed over all **Connection Points**) for the dates of the forecast yearly **NETS** peak demand as specified by **The Company**.

PC.9.3.3.11 A copy of **Data Registration Code** Schedule 27, populated with the total **Active Energy** used on the **Network Operator's System** (summed over all **Connection Points**) in the preceding **Financial Year**, both outturn and **Weather Corrected**, together with a forecast for the current **Financial Year**. Each **Active Energy** submission shall be subdivided into the following categories of **Customer** tariff:

- (i) LV1
- (ii) LV2
- (iii) LV3
- (iv) HV
- (v) EHV
- (vi) Traction
- (vii) Public Lighting

In addition, the total **Network Operator System** losses and the **Active Energy** provided by **Embedded Power Stations** shall be supplied.

PC.9.3.3.12 A copy of **Data Registration Code** Schedule 28, populated with the **Network Operator's** forecast of **Power Station Registered Capacity** aggregated by **Aggregated Energy Source** (as set out in PC.G.8.1), per **Connection Point**.

PC.9.3.3.13 A copy of **Data Registration Code** Schedule 29a, as described in PC.9.3.2.8, Schedule 29b as described in PC.9.3.2.9, and Schedule 30, as described in PC.9.3.2.10.

PC.9.3.4 The information in support of a request to **The Company** by a **Network Operator** for an **Evaluation of Transmission Impact** assessment shall comprise:

- a) Technical information in compliance with PC.9.4.2.2.3, as appropriate, and the proposed connection dates in respect of the **Power Stations** associated with the **Evaluation of Transmission Impact** assessment and a description of any

proposed alteration to the **Network Operator System** required to accommodate the proposed connection(s); and

- b) A representation of the **Network Operator System** at the time of the proposed connection(s), either as a **PSM** or a combination of a **PSM** and **PSDMs**, as appropriate.

PC.9.4 Network Operator Subtransmission PSM

PC.9.4.1 Scope

PC.9.4.1.1 The **Subtransmission PSM** is intended to provide data sufficient for power system studies which support the activities outlined in PC.9.2.1, including:

- a) power flow calculations; and
- b) short circuit calculations in accordance with **Engineering Recommendation G74**.

Support for dynamic power system studies, including RMS dynamic stability type studies, is not required by the **Subtransmission PSM**.

PC.9.4.1.2 The scope of the **Network Operator's System** to be represented by a **Subtransmission PSM** shall include:

- a) all parts of the **Network Operator's System** operating at **Supergrid Voltage**;
- b) all parts of the **Network Operator's Subtransmission System** operating at a nominal voltage greater than 30kV;
- c) all parts of the **Network Operator's Subtransmission System** at any **Transmission Site** operating at a voltage of 30kV or less;
- d) **Network Operator's** assets (including transformers and switchgear) at substations connecting the **Network Operator's Subtransmission System** to a lower voltage;
- e) all parts of the **Network Operator's System** operating at the voltage level below the **Subtransmission System** which, under either intact network or **Planned Outage** conditions:
 - i. interconnects and operates in parallel between **Connection Points**; or
 - ii. interconnects busbars at a **Connection Point**, which are normally run as separate sections;
- f) the relevant assets in **Power Stations** connected to the **Network Operator's Subtransmission System**;
- g) aggregated representation of **Power Stations** connected to a voltage less than that of the **Subtransmission System**;
- h) any **OTSUA** connected to the **Network Operator's System**; and
- i) any parts of the **Offshore Transmission System** connected to the **Network Operator's System**.

For the avoidance of doubt, any assets owned or operated by a **Relevant Transmission Licensee** shall not be included in the **Subtransmission PSM**.

PC.9.4.1.3 The **Situation Data** of all **Subtransmission PSMs** shall reflect an intact system, with each switching device in its normal operational state.

PC.9.4.2 Components of the **Solved PSM**

PC.9.4.2.1 The **Solved PSM** has three main types of data:

- a) **Structural Data**, which represents the components of a **Network Operator's System**, including their capabilities and connectivity, at a specified date. The **Structural Data** of the **Solved PSM** describes the electrical characteristics of all relevant grid components within the scope set out in PC.9.4.1, including assets (for example overhead lines, underground cables, circuit breakers, switches, power transformers, reactive compensation equipment and similar equipment) including **Generators'** assets;

- b) **Situation Data**, which represents an operational state of the system, under specific conditions (i.e. **NETS** peak demand and **NETS** minimum demand as specified by **The Company**). The **Situation Data** of the **Solved PSM** describes the appropriate circuit breaker and/or switch positions, generation/load injections, and transformer tap positions etc; and
- c) **Solution Data**, which represents the results of calculations executed using a coordinated set of **Structural Data** and **Situation Data**. The **Solution Data** of the **Solved PSM** includes both steady-state power flow calculation results (which include topology, voltage, and power flow data) and short circuit calculation results (which include short circuit power and current data).

PC.9.4.2.2 Structural Data

PC.9.4.2.2.1 All equipment in scope as set out in PC.9.4.1 shall be described by the **Structural Data** of the **Solved PSM**, including **Network Operator** assets, **Generators'** assets and the load connection points. Where the **Network Operator** and **The Company** agree, a **Solved PSM** can also contain additional details of the **Network Operator's System**.

PC.9.4.2.2.2 The following assets, with their associated data, shall be modelled:

- a) Circuit breakers and/or switches to facilitate network reconfiguration required to ensure compliance with relevant technical standards. For all circuit breakers and/or switches modelled, the supplied data shall be the data specified in PC.G.1, which includes information relating to any substation infrastructure where it limits the capability of the circuit breaker and/or switch. Alternatively, supplied circuit breaker and/or switch data may relate to the most restrictive equipment at that site;
- b) All transformers with their associated tap changers within the scope of the model. Supplied data shall be the data specified in PC.G.1;
- c) All circuits within the scope of the model. Supplied data shall be the data specified in PC.G.1;
- d) All reactive compensation assets, for example series compensators, shunt compensators and static VAr compensators, within the scope of the model. Supplied data shall be the data as specified in PC.G.1;
- e) All assets comprising an **HVDC System** within the scope of the model. Supplied data shall be the data specified in PC.G.1; and
- f) Any assets not specified above, but considered necessary as part of the **Subtransmission PSM**. Where the currently utilised data exchange specification does not support data about such assets, the data shall be exchanged by agreement between **The Company** and the **Network Operator**.

PC.9.4.2.2.3 Each **Synchronous Power Generating Module** and **Power Park Module** in a **Power Station** shall be modelled as follows:

- a) Where connected to the **Subtransmission System**, individually, at its actual grid location, accompanied by information regarding the substation assets via which it is connected to the **Subtransmission System**. In the case of each **Power Park Module**, the representation shall be an equivalent; and
- b) Where connected at a voltage below that of the **Subtransmission System**, as an aggregated equivalent, connected to the relevant substation busbar in the **Subtransmission PSM**, grouped by **Aggregated Energy Source** (as described in PC.G.8.1).

Supplied data shall be the data as specified in PC.G.1.

The sum of the generation **Registered Capacities** described in a) and b) above should equal the sum of generation **Registered Capacities** provided in Data Registration Code Schedules 29a and 29b.

Where **The Company** reasonably requires it, the **Network Operator** shall supply individual modelling of specific generation connected at a voltage level below the **Subtransmission System**.

PC.9.4.2.2.4 Load shall be modelled as follows:

- a) Each load connected to the **Subtransmission System** shall be represented as an equivalent, together with any associated substation assets, at the relevant **Connection Point**, recognising the existence of the following:
 - i. Identifiable large motors;
 - ii. Any **Synchronous Power Generating Modules** or **Power Park Modules** in a **Non-Embedded Customer's** site; and
 - iii. Asynchronous motors that are not individually represented which form part of the general load, and which are modelled in accordance with **Engineering Recommendation G74** requirements as a suitable equivalent motor.
- b) All load connected at a voltage below that of the **Subtransmission System** shall be represented as aggregated load equivalents connected to the relevant substation busbar in the **Subtransmission PSM**. The load object shall be modelled as per **Engineering Recommendation G74** requirements.

Supplied data shall be the data specified in PC.G.1.

PC.9.4.2.2.5 Information including nominal voltage ratings and nominal current or **Apparent Power** ratings shall be provided for relevant equipment. Supplied data shall be the data specified in PC.G.1.

Normal capability/operational ratings, including seasonal and post-fault ratings, shall be stated according to the following guidelines:

- a) All busbars and connection nodes shall have operational voltage limits; and
- b) All circuits and transformers shall have current or **Apparent Power** operational ratings. Transformers shall have both normal direction flow ratings and reverse flow ratings.

The supplied normal capability/operational limits and ratings data shall be as specified in PC.G.1.

PC.9.4.2.2.6 At the **Network Operator's** discretion the geospatial location of substations and lines may be included in the **Structural Data**.

PC.9.4.2.2.7 The **Structural Data** of the **Subtransmission PSM** shall connect to the **Structural Data** of **PSMs** of adjacent **Systems** by means of **PSM Interface Nodes**, which are points that represent a modelling boundary either side of which different parties are responsible for data. The grid locations of **PSM Interface Nodes**, shall be agreed by the parties based on the ownership boundaries detailed in Appendix A of the relevant **Bilateral Agreements**. The grid locations of **PSM Interface Nodes**, between **Network Operators**, shall be agreed by the parties. Additional detail on the application of **PSM Interface Nodes** is specified in PC.G.3.

PC.9.4.2.3 Situation Data

PC.9.4.2.3.1 The **Solved PSMs** required by PC.9.3.2.1 and PC.9.3.3.1 have **Situation Data** that might need to be adjusted to represent a specific **NETS** condition, for example **NETS** minimum or **NETS** peak demand. This may arise for example if the **Structural Data** has changed between the date of the **NETS** condition and the **Data Freeze Date** or if there are permanent changes to the network topology.

PC.9.4.2.3.2 **Situation Data** correlating to the prescribed grid condition shall be provided for each relevant component present in the **Structural Data** of the **Solved PSM** as specified in PC.G.1.

PC.9.4.2.4 Solution Data

PC.9.4.2.4.1 Power flow **Solution Data** shall describe the results of a successful power flow calculation based on each specified set of **Situation Data**, and its related **Structural Data**.

- PC.9.4.2.4.2 Short circuit **Solution Data** shall describe the results of a specific short circuit calculation based on each specified set of **Situation Data**, and its related **Structural Data**.
- PC.9.4.2.5 Diagram Data
- The **Solved PSM** shall include diagrams as described in PC.G.1.6.
- PC.9.5 Assessment of Site Compliance
- PC.9.5.1 The process that ensures the compliance and operability at **Connection Points** during the maintenance of **Transmission Interface Circuits** and the obligations of **Network Operators** in that process are detailed in PC.G.7.
- PC.9.6 Confidentiality and Sharing
- PC.9.6.1 The models, supporting documentation and associated data submitted to **Network Operators** pursuant to PC.10 are provided in order that **Network Operators** may carry out their responsibilities to meet their **Electricity Distribution Licence** obligations to develop an efficient, coordinated and economical **Network Operator System**. A **Network Operator** may share such models, supporting documents and associated data with companies/contractors employed by the **Network Operator** to carry out those responsibilities.
- PC.9.6.2 A suitable, secure platform, to support the physical exchange of information submitted by **Network Operators** pursuant to PC.9 and **The Company** pursuant to PC.10, shall be established by **The Company**.
- PC.9.6.3 A system shall be agreed and implemented by **The Company** and **Network Operators** to support the creation, editing, storage and retrieval by appropriate parties, of data related to the **PSM Interface Nodes**.

PC.10 **SUBMISSION OF SYSTEM MODELS AND INFORMATION BY THE COMPANY TO NETWORK OPERATORS**

PC.10.1 General

PC.10.1.1 PC.10 details the planning data to be submitted by **The Company** to **Network Operators**.

PC.10.1.2 Compliance with the data submission requirements within PC.10 shall only apply after the **PSM Implementation Date**.

PC.10.1.3 **The Company** shall use reasonable endeavours to obtain all applicable information required by PC.10 from any **User** connected to the **NETS** and from **Relevant Transmission Licensees**, such that the information provided is the best information available at the time of submission.

PC.10.2 Purpose

PC.10.2.1 The purpose of the data submission set out in PC.10 is to ensure that **The Company** provides sufficient information to **Network Operators** so that they:

- a) Have models of the **NETS** which can be used in the creation of the **Network Operator's** own system model;
- b) Can establish that their distribution system complies with relevant technical standards; and
- c) Are aware of proposed changes to the **NETS** and connections to the **NETS** that may have an impact on the distribution system, hence facilitating a distribution impact assessment.

PC.10.3 Submissions

PC.10.3.1 Submissions by **The Company** to **Network Operators** include:

- a) Routine submissions each year in calendar week 12 and calendar week 38. These are described in PC.10.3.2 and PC.10.3.3 respectively. A diagram illustrating the coordination of submissions between the **Network Operators** and **The Company** is provided in PC.G.9; and
- b) Additional supplementary information when **The Company** reasonably believes that a new or modified **User** connection, or proposed alteration to the **NETS** may have an impact on a **Network Operator's System**, or on request by the **Network Operator**. This information, together with the routine submissions, shall provide sufficient data so that the **Network Operator** can assess the impact of such a change, modification or alteration. The supplementary information is described in PC.10.3.4.

Nothing shall prevent the submission of data detailed in PC.10 at additional points during the year where agreed between **The Company** and the **Network Operator(s)**.

At a **Network Operator's** reasonable request and where agreed by **The Company**, additional data on the **NETS** beyond that described in PC.10 shall be provided by **The Company**, for example dynamic model data or more detailed **HVDC System** models.

PC.10.3.1.1 **The Company** shall use the information in the submission from **Network Operators** in calendar week 2 and calendar week 28:

- a) When establishing the forecast dates of the summer and winter **Structural Data** to be used in the **Solved PSMs** referred to in PC.10.3.2 and PC.10.3.3 respectively. Those dates shall be provided in the **PSM Scenario Document**. The **Situation Data** of the demand scenarios reflecting those dates and times shall be estimated by **The Company** based on historical information and forecasts of future demand and generation; and
- b) To derive, in a reasonable manner, a cohesive forecast to be used in preparing forecast demand information in the **Electricity Ten Year Statement** and for use in **The Company's Operational Planning**. If a **Network Operator** believes that the cohesive forecast **Demand** information in the **Electricity Ten Year Statement** does not reflect its assumptions on **Demand**, it should contact **The Company** to explain

their concerns and may request that **The Company** explain the rationale underpinning these forecasts.

PC.10.3.1.2 **The Company** shall notify the **Network Operators**, in calendar week 43, of:

- a) The date and time of the most recent summer **NETS** minimum demand; and
- b) For the current **Financial Year** and for each of the following nine **Financial Years**, the forecast date and time of the **NETS** summer minimum demand.

PC.10.3.1.3 **The Company** shall notify the **Network Operators**, in calendar week 17, of:

- a) The date and time of the most recent winter **NETS** peak demand; and
- b) For the current **Financial Year** and for each of the following nine **Financial Years**, the forecast date and time of the **NETS** winter peak demand.

PC.10.3.2 The data submitted in calendar week 12 shall comprise:

PC.10.3.2.1 A set of **Solved PSMs** of the **NETS** which conform to the **NETS PSM** requirements as described in PC.10.4.2. Each **Solved PSM** shall be based on the same **Structural Data**, referred to as summer **Structural Data**, which reflects **The Company's** best view of the **System** as it is expected to be at the date and time of the forthcoming summer minimum **NETS** demand and which contains asset characteristics sufficient to support both power flow and short circuit calculations. The set of **Solved PSMs** include:

- a) A **NETS** minimum demand **Solved PSM** which includes:
 - i. Summer **Structural Data**;
 - ii. **Situation Data** corresponding to the date and time of the forecast **NETS** minimum demand between calendar weeks 13 and 43;
 - iii. **Solution Data** resulting from a power flow calculation executed on the **Structural Data** and **Situation Data**; and
 - iv. **Diagram Data** describing diagrams of **Structural Data** and a subset of **Situational Data**.
- b) A **NETS** minimum daylight demand **Solved PSM** which includes:
 - i. Summer **Structural Data**;
 - ii. **Situation Data** corresponding to the date and time of the forecast **NETS** minimum demand during the period 10:00 to 16:00 between calendar weeks 13 and 43;
 - iii. **Solution Data** resulting from a power flow calculation executed on the **Structural Data** and **Situation Data**; and
 - iv. **Diagram Data** describing diagrams of **Structural Data** and a subset of **Situational Data**.
- c) A **NETS** low power transfer **Solved PSM** which includes:
 - i. Summer **Structural Data**;
 - ii. **Situation Data** corresponding to the date and time of a forecast **NETS** low power transfer between calendar weeks 13 and 43;
 - iii. **Solution Data** resulting from a power flow calculation executed on the **Structural Data** and **Situation Data**; and
 - iv. **Diagram Data** describing diagrams of **Structural Data** and a subset of **Situation Data**.
- d) A **NETS** minimum fault level **Solved PSM** which includes:
 - i. Summer **Structural Data**;
 - ii. **Situation Data** based on **Situation Data** of the **NETS** minimum demand **Solved PSM**, defined under PC.10.3.2.1 a), and additionally includes:
 - a. Demand short circuit contributions; and

- b. All active generation connected and energised to the **System**;

Solution Data reflecting the theoretical minimum **NETS** bus fault levels which results from short circuit calculations executed on the **Structural Data** and **Situation Data**; and

- iii. **Solution Data** resulting from a short circuit calculation executed on the **Structural Data** and **Situation Data**; and
- iv. **Diagram Data** describing diagrams of **Structural Data** and a subset of **Situation Data**.

Where two or more of the **Solved PSMs** defined under PC.10.3.2.1 are identical, only a single **Solved PSM** need be provided for those conditions. The conditions represented by such a single **Solved PSM** shall be described in the **PSM Scenario Document**.

PC.10.3.2.2 A **PSM Scenario Document** and a **PSM Change Document**, conformant to the requirements described in PC.G.5 and PC.G.6, respectively.

PC.10.3.2.3 A collection of individual **PSDMs** describing new or modified **User** connections or proposed alterations to the **NETS** that **The Company** reasonably believes may have a material impact on this submission's set of **Solved PSMs**. Individual **PSDMs** shall be supplied for:

- a) each new or modified generation and/or load connection not represented in the summer **Structural Data** where the relevant customer has accepted a connection offer from **The Company** to connect to the **NETS**; and
- b) each authorised **NETS** reinforcement, asset replacement scheme or similar not included in the summer **Structural Data**.

PC.10.3.3 The data submitted in calendar week 38 shall comprise:

PC.10.3.3.1 A set of **Solved PSMs** of the **NETS** which conform to the **NETS PSM** requirements as described in PC.10.4.2. Each **Solved PSM** shall be based on the same **Structural Data**, referred to as winter **Structural Data**, which reflects **The Company's** best view of the **System** as it is expected to be at the date and time of the forthcoming winter peak **NETS** demand and which contains asset characteristics sufficient to support both power flow and short circuit calculations. The set of **Solved PSMs** include:

- a) A **NETS** peak demand **Solved PSM** which includes:
 - i. Winter **Structural Data**;
 - ii. **Situation Data** corresponding to the date and time of the forecast **NETS** peak demand between calendar weeks 43 and 13;
 - iii. **Solution Data** resulting from a power flow calculation executed on the **Structural Data** and **Situation Data**; and
 - iv. **Diagram Data** describing diagrams of **Structural Data** and a subset of **Situation Data**.
- b) For the current **Financial Year** and for each of the following nine **Financial Years**, the forecast date and time of the **NETS** winter peak demand high power transfer **Solved PSM** which includes:
 - i. Winter **Structural Data**;
 - ii. **Situation Data** corresponding to the date and time of a forecast **NETS** high power transfer between calendar weeks 43 and 13;
 - iii. **Solution Data** resulting from a power flow calculation executed on the **Structural Data** and **Situation Data**; and
 - iv. **Diagram Data** describing diagrams of **Structural Data** and a subset of **Situation Data**.
- c) A **NETS** maximum fault level **Solved PSM** which includes:
 - i. Winter **Structural Data**;

- ii. **Situation Data** based on **Situation Data** of the maximum demand **Solved PSM**, defined under PC.10.3.3.1 a), and additionally includes:
 - a. Demand short circuit contributions; and
 - b. All generation connected and energised to the **System**;

Solution Data reflecting the theoretical maximum **NETS** bus fault levels which results from short circuit calculations executed on the **Structural Data** and **Situation Data**; and

- iii. **Diagram Data** describing diagrams of **Structural Data** and a subset of **Situation Data**.

Where two or more of the **Solved PSMs** defined under PC.10.3.3.1 are identical, only a single **Solved PSM** need be provided for these conditions. The conditions represented by such a single **Solved PSM** shall be described in the **PSM Scenario Document**.

PC.10.3.3.2 A **PSM Scenario Document** and a **PSM Change Document**, conformant to the requirements described in PC.G.5 and PC.G.6, respectively.

PC.10.3.3.3 A collection of individual **PSDMs** describing new or modified **User** connections or proposed alterations to the **NETS** that **The Company** reasonably believes may have a material impact on this submission's set of **Solved PSMs**. Individual **PSDMs** shall be supplied for:

- a) Each new or modified generation and/or load connection not represented in the winter **Structural Data** where the relevant customer has accepted a connection offer from **The Company** to connect to the **NETS**; and
- b) Each authorised **NETS** reinforcement, asset replacement scheme or similar not included in the winter **Structural Data**.

PC.10.3.4 The supplementary information required under the conditions outlined in PC.10.3.1 b) shall comprise:

- a) A **PSDM** describing the new or modified **User** connection or proposed alteration to the **NETS**; and
- b) A representation of the **NETS** and its **User** connections at the time the new or modified **User** connection, or proposed **NETS** alteration is planned to be commissioned, supplied in the form of an updated **Structural Data** file or **Solved PSM** and **PSDMs** as required, where:
 - i. The **PSM** reflects the time of commissioning; or
 - ii. The **PSM** reflects any earlier time supplemented by **PSDMs** sufficient to enable updating of the **PSM** to reflect the time of commissioning.

PC.10.4 The Company's NETS PSM

PC.10.4.1 Scope

PC.10.4.1.1 The **NETS PSM(s)** is intended to provide data sufficient for power system studies which support the activities outlined in PC.10.2.1, including:

- a) power flow calculations; and
- b) short circuit calculations in accordance with **Engineering Recommendation G74**.

Support for dynamic power system studies, including RMS dynamic stability type studies, is not required in the **NETS PSM**.

PC.10.4.1.2 The scope of the **NETS PSM** includes the entirety of the **NETS**, including any **HVDC Systems**, together with equivalent representation of **Users' Systems**, connected to the **NETS**.

PC.10.4.1.3 The **Structural Data** of the **NETS PSM** shall include:

- a) all assets forming the **NETS** including transformers and switchgear at substations connecting **Users** to the **NETS**;
- b) the relevant assets in **Power Stations** directly connected to the **NETS**;
- c) the relevant assets of **Non-Embedded Customers**, aggregated;

- d) a representation of **Power Stations** and the load, which shall be modelled as per **Engineering Recommendation G74** requirements; and
- e) any **OTSUA** connected to the **NETS**.

For the avoidance of doubt, any assets owned or operated by a **Network Operator** shall not be included in the **NETS PSM**.

PC.10.4.1.4 The **Situation Data** of all **NETS PSMs** shall reflect an intact system, with each switching device in its normal operational state.

PC.10.4.2 Components of the **Solved PSM**

PC.10.4.2.1 The **Solved PSM** has three main types of data:

- a) **Structural Data**, which represents the equipment forming the **NETS**, including their capabilities and connectivity, at a specified date. The **Structural Data** of the **Solved PSM** describes the electrical characteristics of all relevant **NETS** equipment within the scope set out in PC.10.4.1, including assets (for example overhead lines, underground cables, circuit breakers, switches, power transformers, reactive compensation equipment, quadrature boosters, and similar equipment) as well as **Generators'** assets and the load connection points;
- b) **Situation Data**, which represents an operational state of the **System**, under specific conditions (i.e. **NETS** peak and **NETS** minimum as specified by **The Company**). The **Situation Data** of the **Solved PSM** describes the appropriate circuit breaker and/or switch positions, generation/load injections, and transformer tap positions etc.; and
- c) **Solution Data**, which represents the results of calculations executed using a coordinated set of **Structural Data** and **Situation Data**. The **Solution Data** of the **Solved PSM** can represent either steady-state power flow calculation results (which include topology, voltage, and power flow data) or short circuit calculation results (which include short circuit power and current data).

PC.10.4.2.2 Structural Data

PC.10.4.2.2.1 All equipment in scope as set out in PC.10.4.1 shall be described by the **Structural Data** of the **Solved PSM**.

PC.10.4.2.2.2 The following assets, with their associated data, shall be modelled:

- a) All circuit breakers within the scope of the model and switches that are required to facilitate system reconfiguration. For all circuit breakers and/or switches modelled, the supplied data shall be the data specified in PC.G.1, which includes information relating to any substation infrastructure where it limits the capability of the circuit breaker and/or switch. Alternatively, supplied circuit breaker and/or switch data may relate to the most restrictive equipment at that site;
- b) All transformers (including quadrature boosters) with their associated tap changers within the scope of the model. Supplied data shall be the data specified in PC.G.1;
- c) All circuits within the scope of the model. Supplied data shall be the data specified in PC.G.1;
- d) All reactive compensation assets, for example series compensators, shunt compensators and static VAr compensators, within the scope of the model. Supplied data shall be the data specified in PC.G.1;
- e) All assets comprising an **HVDC System** within the scope of the model. Supplied data shall be the data specified in PC.G.1.

In relation to **HVDC Systems** where not all the **HVDC Interface Points** connect to the **NETS**, the model may include an equivalent representation of the **HVDC System**. Reference to the operation of these equivalents shall be made in the **PSM Scenario Document**; and

- f) Any assets not specified above, but considered necessary as part of the **NETS PSM**. Where the currently utilised data exchange specification does not support data about such assets, the data shall be exchanged by agreement.

PC.10.4.2.2.3 **Synchronous Power Generating Modules** in **Power Stations** shall be individually represented, and accompanied by information regarding the substation assets, at the relevant **Connection Point**. **Power Park Modules** in **Power Stations** shall be represented as an equivalent, together with any associated substation assets, at the relevant **Connection Point**. Supplied data shall be the data specified in PC.G.1.

PC.10.4.2.2.4 **Non-Embedded Customer's** assets shall be represented as an equivalent, together with any associated substation assets, at the relevant **Connection Point**, recognising the existence of the following:

- a) Identifiable large motors;
- b) Any **Synchronous Power Generating Modules** or **Power Park Modules** in a **Non-Embedded Customer's** site; and
- c) Asynchronous motors that are not individually represented which form part of the general load and which are modelled, in accordance with **Engineering Recommendation G74** requirements as a suitable equivalent motor.

Supplied data shall be the data specified in PC.G.1.

PC.10.4.2.2.5 Information including nominal voltage ratings and nominal current or **Apparent Power** ratings shall be provided for relevant equipment. Supplied data shall be the data specified in PC.G.1. Normal capability/operational ratings, including seasonal and post-fault ratings, shall be stated according to the following guidelines:

- a) All busbars and connection nodes shall have operational voltage limits; and
- b) All circuits and transformers shall have current or **Apparent Power** operational ratings. Transformers shall have both normal direction flow ratings and reverse flow ratings.

The supplied normal capability/operational limits and ratings data shall be as specified in PC.G.1.

PC.10.4.2.2.6 At **The Company's** discretion the geospatial location of substations and lines may be modelled.

PC.10.4.2.2.7 The **Structural Data** of the **NETS PSM** shall connect to the **Structural Data** of **Subtransmission PSMs** by means of **PSM Interface Nodes**, which are points that represent a modelling boundary either side of which different parties are responsible for data. The grid locations of **PSM Interface Nodes** shall be agreed by the relevant parties based on the ownership boundaries detailed in Appendix A of the relevant **Bilateral Agreements**. Additional detail on the application of **PSM Interface Nodes** is specified in PC.G.3.

PC.10.4.2.3 Situation Data

PC.10.4.2.3.1 Both the summer and winter **Structural Data** sets shall have one or more sets of related **Situation Data** reflecting each of the forecast operational conditions set out in PC.10.3.2.1 and PC.10.3.3.1.

PC.10.4.2.3.2 **Situation Data** correlating to the prescribed grid condition shall be provided for each relevant component present in the **Structural Data** of the **Solved PSM** as specified in PC.G.1.

PC.10.4.2.4 Solution Data

PC.10.4.2.4.1 Power flow **Solution Data** shall describe the results of a successful power flow calculation based on each specified set of **Situation Data**, and its related **Structural Data**.

PC.10.4.2.4.2 Short circuit **Solution Data** shall describe the results of a specific short circuit calculation based on each specified set of **Situation Data**, and its related **Structural Data**.

PC.10.4.2.5 Diagram Data

The **Solved PSM** shall include diagrams as described in PC.G.1.6.

- PC.10.5 Assessment of Site Compliance
- PC.10.5.1 The process to ensure the compliance and operability at **Connection Points** during the maintenance of **Transmission Interface Circuit** and the obligations of **The Company** in that process are detailed in PC.G.7.
- PC.10.5.2 **The Company** shall, no later than calendar week 7 of each year, in accordance with the requirements of PC.G.7.5, provide each **Network Operator** with a proposed **Transmission Interface Circuit** outage plan in the form of a draft version of Schedule 24.
- PC.10.5.3 **The Company** shall notify **The Authority**, where an **Access Period** is amended pursuant to PC.G.7.11 (b).
- PC.10.5.4 Following the submission of data by a **Network Operator** by calendar week 28 of each year, **The Company** shall, by calendar week 6 of the following year, submit in writing to the **Network Operator**, the assessment results detailed in PC.G.7.13.
- PC.10.6 Confidentiality and Sharing
- PC.10.6.1 The models, supporting documentation and associated data submitted to **The Company** pursuant to PC.9 are provided in order that **The Company** and **Transmission Licensees** may carry out their responsibilities to meet their electricity transmission **Licence** obligations to develop efficient, coordinated and economical **NETS** and **Transmission Systems**. **The Company** and **Transmission Licensees** may share such models, supporting document and associated data with companies/contractors employed by **The Company** and **Transmission Licensees** to carry out those responsibilities.
- PC.10.6.2 A suitable, secure platform shall be agreed and implemented by **The Company** and **Network Operators** to support the physical exchange of information submitted by **Network Operators** and **The Company**.
- PC.10.6.3 A system shall be agreed and implemented by **The Company** and **Network Operators** to support the creation, editing, storage and retrieval by appropriate parties, of data related to the **PSM Interface Nodes**.

APPENDIX A - PLANNING DATA REQUIREMENTS

PC.A.1 INTRODUCTION

PC.A.1.1 Appendix A specifies data requirements to be submitted to **The Company** by **Users**, and in certain circumstances to **Users** by **The Company**.

PC.A.1.2 Submissions by Users

- (a) Planning data submissions by **Users** shall be:
- (i) with respect to the current **Financial Year** and each of the nine succeeding **Financial Years** (other than in the case of **Registered Data** which will reflect the current position and data relating to **Demand** forecasts which relates also to the current year);
 - (ii) provided by **Users** in connection with a **CUSC Contract** (PC.4.1, PC.4.4 and PC.4.5 refer);
 - (iii) provided by **Users** on a routine annual basis in calendar week 24 of each year to maintain an up-to-date data bank (although **Network Operators** may delay the submission of data (other than that to be submitted pursuant to PC.3.2(c) and PC.3.2(d)) until calendar week 28). In addition the structural data in DRC Schedule 5 Tables 5(a), 5(b), 5(d), 5(e), 5(f) and DRC Schedule 13 (Lumped system susceptance (PC.A.2.3) only) provided by **Network Operators** by calendar week 28 shall be updated by calendar week 50 of each year (again which may be delayed as above until week 2 of the following calendar year). Where from the date of one annual (or in the case of Schedule 5 or Schedule 13 the calendar week 50) submission to another there is no change in the data (or in some of the data) to be submitted, instead of re-submitting the data, a **User** may submit a written statement that there has been no change from the data (or some of the data) submitted the previous time; and
 - (iv) provided by **Network Operators** in connection with **Embedded Development** (PC.4.4 refers).
- (b) Where there is any change (or anticipated change) in **Committed Project Planning Data** or a significant change in **Connected Planning Data** in the category of **Forecast Data** or any change (or anticipated change) in **Connected Planning Data** in the categories of **Registered Data** or **Estimated Registered Data** supplied to **The Company** under the **PC**, notwithstanding that the change may subsequently be notified to **The Company** under the **PC** as part of the routine annual update of data (or that the change may be a **Modification** under the **CUSC**), the **User** shall, subject to PC.A.3.2.3 and PC.A.3.2.4, notify **The Company** in writing without delay.
- (c) The notification of the change will be in the form required under this **PC** in relation to the supply of that data and will also contain the following information:
- (i) the time and date at which the change became, or is expected to become, effective;
 - (ii) if the change is only temporary, an estimate of the time and date at which the data will revert to the previous registered form.
- (d) The routine annual update of data, referred to in (a)(iii) above, need not be submitted in respect of **Small Power Stations** or **Embedded** installations of direct current converters which do not form a **DC Converter Station** or **HVDC System** (except as provided in PC.3.2.(c)), or unless specifically requested by **The Company**, or unless otherwise specifically provided.

PC.A.1.3 Submissions by The Company

Network Data release by **The Company** shall be:

- (a) with respect to the current **Financial Year**;

- (b) provided by **The Company** on a routine annual basis in calendar week 42 of each year. Where from the date of one annual submission to another there is no change in the data (or in some of the data) to be released, instead of repeating the data, **The Company** may release a written statement that there has been no change from the data (or some of the data) released the previous time.

The three parts of Appendix A

PC.A.1.4 The data requirements listed in this Appendix are subdivided into the following four parts:

(a) Standard Planning Data

This data (as listed in Part 1 of Appendix A) is first to be provided by a **User** at the time of an application for a **CUSC Contract** or in accordance with PC.4.4.3. It comprises data which is expected normally to be sufficient for **The Company** to investigate the impact on the **National Electricity Transmission System** of any **User Development** or **Embedded Development** associated with an application by the **User** for a **CUSC Contract**. **Users** should note that the term **Standard Planning Data** also includes the information referred to in PC.4.4.1.(a) and PC.4.4.3.(a). In the case of **OTSUA**, this data is first to be provided by a **User** in accordance with the time line in Appendix F.

(b) Detailed Planning Data

This data (as listed in Part 2 of Appendix A) includes both **DPD I** and **DPD II** and is to be provided in accordance with PC.4.4.2 and PC.4.4.4. It comprises additional, more detailed, data not normally expected to be required by **The Company** to investigate the impact on the **National Electricity Transmission System** of any **User Development** associated with an application by the **User** for a **CUSC Contract** or **Embedded Development Agreement**. **Users** and **Network Operators** in respect of **Embedded Developments** should note that the term **Detailed Planning Data** also includes **Operation Diagrams** and **Site Common Drawings** produced in accordance with the **CC** and **ECC**.

The **User** may, however, be required by **The Company** to provide the **Detailed Planning Data** in advance of the normal timescale before **The Company** can make an offer for a **CUSC Contract**, as explained in PC.4.5.

(c) Network Data

The data requirements for **The Company** in this Appendix are in Part 3.

(d) Offshore Transmission System (OTSDUW) Data

Generators who are undertaking **OTSDUW** are required to submit data in accordance with Appendix A as summarised in Schedule 18 of the **Data Registration Code**.

Forecast Data, Registered Data and Estimated Registered Data

PC.A.1.5 As explained in PC.5.4 and PC.5.5, **Planning Data** is divided into:

- (i) those items of **Standard Planning Data** and **Detailed Planning Data** known as **Forecast Data**; and
- (ii) those items of **Standard Planning Data** and **Detailed Planning Data** known as **Registered Data**; and
- (iii) those items of **Standard Planning Data** and **Detailed Planning Data** known as **Estimated Registered Data**.

PC.A.1.6 The following paragraphs in this Appendix relate to **Forecast Data**:

3.2.2(b), (h), (i) and (j)

4.2.1

4.3.1

4.3.2

4.3.3

4.3.4

4.3.5

4.5

4.7.1

5.2.1

5.2.2

5.6.1

PC.A.1.7 The following paragraphs in this Appendix relate to **Registered Data** and **Estimated Registered Data**:

2.2.1

2.2.4

2.2.5

2.2.6

2.3.1

2.4.1

2.4.2

3.2.2(a), (c), (d), (e), (f), (g), (i)(part) and (j)

3.4.1

3.4.2

4.2.3

4.5(a)(i), (a)(iii), (b)(i) and (b)(iii)

4.6

5.3.2

5.4

5.4.2

5.4.3

5.5

5.6.3

6.2

6.3

PC.A.1.8 The data supplied under PC.A.3.3.1, although in the nature of **Registered Data**, is only supplied either upon application for a **CUSC Contract**, or in accordance with PC.4.4.3, and therefore does not fall to be **Registered Data**, but is **Estimated Registered Data**.

PC.A.1.9 **Forecast Data** must contain the **User's** best forecast of the data being forecast, acting as a reasonable and prudent **User** in all the circumstances.

- PC.A.1.10 **Registered Data** must contain validated actual values, parameters or other information (as the case may be) which replace the estimated values, parameters or other information (as the case may be) which were given in relation to those data items when they were **Preliminary Project Planning Data** and **Committed Project Planning Data**, or in the case of changes, which replace earlier actual values, parameters or other information (as the case may be). Until amended pursuant to the Grid Code, these actual values, parameters or other information (as the case may be) will be the basis upon which the **National Electricity Transmission System** is planned, designed, built and operated in accordance with, amongst other things, the **Transmission Licence** and the **ESO Licence**, the **STC** and the Grid Code, and on which **The Company** therefore relies. In following the processes set out in the **BC**, **The Company** will use the data which has been supplied to it under the **BC** and the data supplied under **OC2** in relation to **Gensets**, but the provision of such data will not alter the data supplied by **Users** under the **PC**, which may only be amended as provided in the **PC**.
- PC.A.1.11 **Estimated Registered Data** must contain the **User's** best estimate of the values, parameters or other information (as the case may be), acting as a reasonable and prudent **User** in all the circumstances.
- PC.A.1.12 Certain data does not need to be supplied in relation to **Embedded Power Stations** or **Embedded DC Converter Stations** or **Embedded HVDC Systems** where these are connected at a voltage level below the voltage level directly connected to the **National Electricity Transmission System** except in connection with a **CUSC Contract**, or unless specifically requested by **The Company**.
- PC.A.1.13 In the case of **OTSUA**, Schedule 18 of the **Data Registration Code** shall be construed in such a manner as to achieve the intent of such provisions by reference to the **OTSUA** and the **Interface Point** and all **Connection Points**.

PART 1 - STANDARD PLANNING DATA

PC.A.2 USER'S SYSTEM (AND OTSUA) DATA

PC.A.2.1 Introduction

PC.A.2.1.1 Each **User**, whether connected directly via an existing **Connection Point** to the **National Electricity Transmission System**, or seeking such a direct connection, or providing terms for connection of an **Offshore Transmission System** to its **User System** to **The Company**, shall provide **The Company** with data on its **User System** (and any **OTSUA**) which relates to the **Connection Site** (and in the case of **OTSUA**, the **Interface Point**) and/or which may have a system effect on the performance of the **National Electricity Transmission System**. Such data, current and forecast, is specified in PC.A.2.2 to PC.A.2.5. In addition each **Generator** in respect of its **Embedded Large Power Stations** and its **Embedded Medium Power Stations** subject to a **Bilateral Agreement** and each **Network Operator** in respect of **Embedded Medium Power Stations** within its **System** not subject to a **Bilateral Agreement** connected to the **Subtransmission System**, shall provide **The Company** with fault infeed data as specified in PC.A.2.5.5 and each **DC Converter** owner with **Embedded DC Converter Stations** subject to a **Bilateral Agreement** and **Embedded HVDC System Owner** subject to a **Bilateral Agreement**, or **Network Operator** in the case of **Embedded DC Converter Stations** not subject to a **Bilateral Agreement** or **Embedded HVDC Systems** not subject to a **Bilateral Agreement**, connected to the **Subtransmission System** shall provide **The Company** with fault infeed data as specified in PC.A.2.5.6.

PC.A.2.1.2 Each **User** must reflect the system effect at the **Connection Site(s)** of any third party **Embedded** within its **User System** whether existing or proposed.

PC.A.2.1.3 Although not itemised here, each **User** with an existing or proposed **Embedded Small Power Station**, **Embedded Medium Power Station**, **Embedded DC Converter Station** or **HVDC System** with a **Registered Capacity** of less than 100MW or an **Embedded** installation of direct current converters which does not form a **DC Converter Station** or **HVDC System** in its **User System** may, at **The Company's** reasonable discretion, be required to provide additional details relating to the **User's System** between the **Connection Site** and the existing or proposed **Embedded Small Power Station**, **Embedded Medium Power Station**, **Embedded DC Converter Station**, **Embedded HVDC System** or **Embedded** installation of direct current converters which does not form a **DC Converter Station** or **Embedded** installation which does not form an **HVDC System**.

PC.A.2.1.4 At **The Company's** reasonable request, additional data on the **User's System** (or **OTSUA**) will need to be supplied. Some of the possible reasons for such a request, and the data required, are given in PC.A.6.2, PC.A.6.4, PC.A.6.5 and PC.A.6.6.

PC.A.2.2 User's System (and OTSUA) Layout

PC.A.2.2.1 Each **User** shall provide a **Single Line Diagram**, depicting both its existing and proposed arrangement(s) of load current carrying **Apparatus** relating to both existing and proposed **Connection Points** (including in the case of **OTSUA**, **Interface Points**).

PC.A.2.2.2 The **Single Line Diagram** (three examples are shown in Appendix B) must include all parts of the **User System** operating at **Supergrid Voltage** throughout **Great Britain** and, in Scotland and **Offshore**, also all parts of the **User System** operating at 132kV or greater, and those parts of its **Subtransmission System** at any **Transmission Site**. In the case of **OTSDUW**, the **Single Line Diagram** must also include the **OTSUA**. In addition, the **Single Line Diagram** must include all parts of the **User's Subtransmission System** (and any **OTSUA**) throughout **Great Britain** operating at a voltage greater than 50kV, and, in Scotland and **Offshore**, also all parts of the **User's Subtransmission System** (and any **OTSUA**) operating at a voltage greater than 30kV, which, under either intact network or **Planned Outage** conditions:

- (a) normally interconnects separate **Connection Points**, or busbars at a **Connection Point** which are normally run in separate sections; or

- (b) connects **Embedded Large Power Stations**, or **Embedded Medium Power Stations**, or **Embedded DC Converter Stations**, or **Embedded HVDC Systems** or **Offshore Transmission Systems** connected to the **User's Subtransmission System**, to a **Connection Point** or **Interface Point**.

At the **User's** discretion, the **Single Line Diagram** can also contain additional details of the **User's Subtransmission System** (and any **OTSUA**) not already included above, and also details of the transformers connecting the **User's Subtransmission System** to a lower voltage. With **The Company's** agreement, the **Single Line Diagram** can also contain information about the **User's System** (and any **OTSUA**) at a voltage below the voltage of the **Subtransmission System**.

The **Single Line Diagram** for a **Power Park Module** (including **DC Connected Power Park Modules**) must include all parts of the System connecting generating equipment to the **Grid Entry Point** (or **User System Entry Point** if **Embedded**). As an alternative, the **User** may choose to submit a **Single Line Diagram** with the equipment between the equivalent **Power Park Unit** and the **Common Collection Busbar** reduced to an electrically equivalent network. The format for a **Single Line Diagram** for a **Power Park Module** (including **DC Connected Power Park Modules**) electrically equivalent system is shown in Appendix B.

The **Single Line Diagram** must include the points at which **Demand** data (provided under PC.A.4.3.4 and PC.A.4.3.5, or in the case of **Generators**, PC.A.5.) and fault infeed data (provided under PC.A.2.5) are supplied.

PC.A.2.2.3 The above-mentioned **Single Line Diagram** shall include:

- (a) electrical circuitry (i.e. overhead lines, identifying which circuits are on the same towers, underground cables, power transformers, reactive compensation equipment and similar equipment); and
- (b) substation names (in full or abbreviated form) with operating voltages.

In addition, for all load current carrying **Apparatus** operating at **Supergrid Voltage** throughout **Great Britain** and, in Scotland and **Offshore**, also at 132kV or greater, (and any **OTSUA**) the **Single Line Diagram** shall include:

- (a) circuit breakers
- (b) phasing arrangements.

PC.A.2.2.3.1 For the avoidance of doubt, the **Single Line Diagram** to be supplied is in addition to the **Operation Diagram** supplied pursuant to CC.7.4 or ECC.7.4.

PC.A.2.2.4 For each circuit shown on the **Single Line Diagram** provided under PC.A.2.2.1, each **User** shall provide the following details relating to that part of its **User System** and **OTSUA**:

Circuit Parameters:

Rated voltage (kV)

Operating voltage (kV)

Positive phase sequence reactance

Positive phase sequence resistance

Positive phase sequence susceptance

Zero phase sequence reactance (both self and mutual)

Zero phase sequence resistance (both self and mutual)

Zero phase sequence susceptance (both self and mutual)

In the case of a **Single Line Diagram** for a **Power Park Module** (including **DC Connected Power Park Modules**) electrically equivalent system the data should be on a 100MVA base. Depending on the equivalent system supplied an equivalent tap changer range may need to be supplied. Similarly mutual values, rated voltage and operating voltage may be inappropriate. Additionally in the case of **OTSUA**, seasonal maximum continuous ratings and circuit lengths are to be provided in addition to the data required under PC.A.2.2.4.

PC.A.2.2.5 For each transformer shown on the **Single Line Diagram** provided under PC.A.2.2.1, each **User** (including those undertaking **OTSDUW**) shall provide the following details:

Rated MVA

Voltage Ratio

Winding arrangement

Positive sequence reactance (max, min and nominal tap)

Positive sequence resistance (max, min and nominal tap)

Zero sequence reactance

PC.A.2.2.5.1. In addition, for all interconnecting transformers between the **User's Supergrid Voltage System** and the **User's Subtransmission System** throughout **Great Britain** and, in Scotland and **Offshore**, also for all interconnecting transformers operating at 132kV or greater between the **User's System** and the **User's Subtransmission System** (and any **OTSUA**) the **User** shall supply the following information:-

Tap changer range

Tap change step size

Tap changer type: on load or off circuit

Earthing method: Direct, resistance or reactance

Impedance (if not directly earthed)

PC.A.2.2.6 Each **User** shall supply the following information about the **User's** equipment installed at a **Transmission Site** (or in the case of **OTSUA**, all **OTSDUW Plant and Apparatus**):-

(a) Switchgear. For all circuit breakers:-

Rated voltage (kV)

Operating voltage (kV)

Rated 3-phase rms short-circuit breaking current, (kA)

Rated 1-phase rms short-circuit breaking current, (kA)

Rated 3-phase peak short-circuit making current, (kA)

Rated 1-phase peak short-circuit making current, (kA)

Rated rms continuous current (A)

DC time constant applied at testing of asymmetrical breaking abilities (secs)

In the case of **OTSDUW Plant and Apparatus** operating times for circuit breaker, **Protection**, trip relay and total operating time should be provided.

(b) Substation Infrastructure. For the substation infrastructure (including, but not limited to, switch disconnectors, disconnectors, current transformers, line traps, busbars, through bushings, etc):-

Rated 3-phase rms short-circuit withstand current (kA)

Rated 1-phase rms short-circuit withstand current (kA).

Rated 3-phase short-circuit peak withstand current (kA)

Rated 1- phase short-circuit peak withstand current (kA)

Rated duration of short circuit withstand (secs)

Rated rms continuous current (A)

A single value for the entire substation may be supplied, provided it represents the most restrictive item of current carrying apparatus.

PC.A.2.2.7 In the case of **OTSUA** the following should also be provided

- (a) Automatic switching scheme schedules including diagrams and an explanation of how the **System** will operate and what plant will be affected by the schemes **Operation**.
- (b) **Intertripping** schemes both generation and **Demand**. In each case a diagram of the scheme and an explanation of how the **System** will operate and what **Plant** will be affected by the schemes **Operation**.

PC.A.2.3 Lumped System Susceptance

PC.A.2.3.1 For all parts of the **User's Subtransmission System** (and any **OTSUA**) which are not included in the **Single Line Diagram** provided under PC.A.2.2.1, each **User** shall provide the equivalent lumped shunt susceptance at nominal **Frequency**.

PC.A.2.3.1.1 This should include shunt reactors connected to cables which are not normally in or out of service independent of the cable (ie. they are regarded as part of the cable).

PC.A.2.3.1.2 This should not include:

- (a) independently switched reactive compensation equipment connected to the **User's System** specified under PC.A.2.4, or;
- (b) any susceptance of the **User's System** inherent in the **Demand (Reactive Power)** data specified under PC.A.4.3.1.

PC.A.2.4 Reactive Compensation Equipment

PC.A.2.4.1 For all independently switched reactive compensation equipment (including any **OTSUA**), including that shown on the **Single Line Diagram**, not operated by **The Company** and connected to the **User's System** at 132kV and above in England and Wales and 33kV and above in Scotland and **Offshore** (including any **OTSDUW Plant and Apparatus** operating at **High Voltage**), other than **Power Factor** correction equipment associated directly with **Customers' Plant and Apparatus**, the following information is required:

- (a) type of equipment (eg. fixed or variable);
- (b) capacitive and/or inductive rating or its operating range in MVar;
- (c) details of any automatic control logic to enable operating characteristics to be determined;
- (d) the point of connection to the **User's System** (including **OTSUA**) in terms of electrical location and **System** voltage.
- (e) In the case of **OTSDUW Plant and Apparatus** the **User** should also provide:-
 - (i) Connection node, voltage, rating, power loss, tap range and connection arrangement.
 - (ii) A mathematical representation in block diagram format to model the control of any dynamic compensation plant. The model should be suitable for RMS dynamic stability type studies where each time constant should be no less than 10ms.
 - (iii) For Static Var Compensation equipment the **User** should provide:

HV Node

LV Node

Control Node

Nominal Voltage (kV)

Target Voltage (kV)

Maximum MVA_r at HV
 Minimum MVA_r at HV
 Slope %
 Voltage dependant Q Limit
 Normal Running Mode
 Positive and zero phase sequence resistance and reactance
 Transformer winding type
 Connection arrangements

PC.A.2.4.2 **DC Converter Station** owners, **HVDC System Owners** (and a **User** where the **OTSUA** includes an **OTSDUW DC Converter**) are also required to provide information about the reactive compensation and harmonic filtering equipment required to ensure that their **Plant** and **Apparatus** (and the **OTSUA**) complies with the criteria set out in CC.6.1.5 or ECC.6.1.5 (as applicable).

PC.A.2.5 Short Circuit Contribution to National Electricity Transmission System

PC.A.2.5.1 General

- (a) To allow **The Company** to calculate fault currents, each **User** is required to provide data, calculated in accordance with **Good Industry Practice**, as set out in the following paragraphs of PC.A.2.5.
- (b) The data should be provided for the **User's System** with all **Generating Units** (including **Synchronous Generating Units**), **Power Park Units**, **HVDC Systems** and **DC Converters Synchronised** to that **User's System** (and any **OTSUA** where appropriate). The **User** must ensure that the pre-fault network conditions reflect a credible **System** operating arrangement.
- (c) The list of data items required, in whole or part, under the following provisions, is set out in PC.A.2.5.6. Each of the relevant following provisions identifies which data items in the list are required for the situation with which that provision deals.

The fault currents in sub-paragraphs (a) and (b) of the data list in PC.A.2.5.6 should be based on an a.c. load flow that takes into account any pre-fault current flow across the **Point of Connection** (and in the case of **OTSUA**, **Interface Points** and **Connection Points**) being considered.

Measurements made under appropriate **System** conditions may be used by the **User** to obtain the relevant data.

- (d) **The Company** may at any time, in writing, specifically request for data to be provided for an alternative **System** condition, for example minimum plant, and the **User** will, insofar as such request is reasonable, provide the information as soon as reasonably practicable following the request.

PC.A.2.5.2 **Network Operators** and **Non-Embedded Customers** are required to submit data in accordance with PC.A.2.5.4. **Generators**, **DC Converter Station** owners, **HVDC System Owners** and **Network Operators**, in respect of **Embedded Medium Power Stations** not subject to a **Bilateral Agreement** and **Embedded DC Converter Stations** not subject to a **Bilateral Agreement** and **Embedded HVDC Systems** within such **Network Operator's Systems** are required to submit data in accordance with PC.A.2.5.5.

PC.A.2.5.3 Where prospective short-circuit currents on **Transmission** equipment are close to the equipment rating, and in **The Company's** reasonable opinion more accurate calculations of the prospective short circuit currents are required, then **The Company** will request additional data as outlined in PC.A.6.6 below.

- PC.A.2.5.4 Data from Network Operators and Non-Embedded Customers
- PC.A.2.5.4.1 Data is required to be provided at each node on the **Single Line Diagram** provided under PC.A.2.2.1 at which motor loads and/or **Embedded Small Power Stations** and/or **Embedded Medium Power Stations** and/or **Embedded** installations of direct current converters which do not form a **DC Converter Station** or **HVDC System** are connected, assuming a fault at that location, as follows:-
- The data items listed under the following parts of PC.A.2.5.6:-
- (a) (i), (ii), (iii), (iv), (v) and (vi);
- and the data items shall be provided in accordance with the detailed provisions of PC.A.2.5.6(c) - (f).
- PC.A.2.5.4.2 **Network Operators** shall provide the following data items in respect of each **Interface Point** within their **User System**:
- (a) **Maximum Export Capacity**;
- (b) **Maximum Import Capacity**; and,
- (c) **Interface Point Target Voltage/Power Factor**
- Network Operators** shall alongside these parameters include details of any manual or automatic post fault actions to be taken by the owner / operator of the **Offshore Transmission System** connected to such **Interface Point** that are required by the **Network Operator**.
- PC.A.2.5.5 Data from **Generators** (including **Generators** undertaking **OTSDUW** and those responsible for **DC Connected Power Park Modules**), **DC Converter Station** owners, **HVDC System Owners** and from **Network Operators** in respect of **Embedded Medium Power Stations** not subject to a **Bilateral Agreement** and **Embedded DC Converter Stations** not subject to a **Bilateral Agreement** and **Embedded HVDC Systems** within such **Network Operator's Systems**.
- PC.A.2.5.5.1 For each **Generating Unit** (including **Synchronous Generating Units** forming part of a **Synchronous Power Generating Module**) with one or more associated **Unit Transformers**, the **Generator**, or the **Network Operator** in respect of **Embedded Medium Power Stations** not subject to a **Bilateral Agreement** and **Embedded DC Converter Stations** not subject to a **Bilateral Agreement** and **Embedded HVDC Systems** within such **Network Operator's System** is required to provide values for the contribution of the **Power Station Auxiliaries** (including **Auxiliary Energy Supplies**) to the fault current flowing through the **Unit Transformer(s)**.
- The data items listed under the following parts of PC.A.2.5.6(a) should be provided:-
- (i), (ii) and (v);
- (iii) if the associated **Generating Unit** (including **Synchronous Generating Units** forming part of a **Synchronous Power Generating Module**) step-up transformer can supply zero phase sequence current from the **Generating Unit** side to the **National Electricity Transmission System**;
- (iv) if the value is not 1.0 p.u;
- and the data items shall be provided in accordance with the detailed provisions of PC.A.2.5.6(c) - (f), and with the following parts of this PC.A.2.5.5.
- PC.A.2.5.5.2 Auxiliary motor short circuit current contribution and any **Auxiliary Gas Turbine Unit** contribution through the **Unit Transformers** must be represented as a combined short circuit current contribution at the **Generating Unit's** (including **Synchronous Generating Units** forming part of a **Synchronous Power Generating Module**) terminals, assuming a fault at that location.

PC.A.2.5.5.3 If the **Power Station** or **HVDC System** or **DC Converter Station** (or **OTSDUW Plant and Apparatus** which provides a fault infeed) has separate **Station Transformers**, data should be provided for the fault current contribution from each transformer at its high voltage terminals, assuming a fault at that location, as follows:-

The data items listed under the following parts of PC.A.2.5.6

(a) (i), (ii), (iii), (iv), (v) and (vi);

and the data items shall be provided in accordance with the detailed provisions of PC.A.2.5.6(b) - (f).

PC.A.2.5.5.4 Data for the fault infeeds through both **Unit Transformers** and **Station Transformers** shall be provided for the normal running arrangement when the maximum number of **Generating Units** (including **Synchronous Generating Units** forming part of a **Synchronous Power Generating Module**) are **Synchronised** to the **System** or when all the **DC Converters** at a **DC Converter Station** or **HVDC Converters** within an **HVDC System** are transferring **Rated MW** in either direction. Where there is an alternative running arrangement (or transfer in the case of a **DC Converter Station** or **HVDC System**) which can give a higher fault infeed through the **Station Transformers**, then a separate data submission representing this condition shall be made.

PC.A.2.5.5.5 Unless the normal operating arrangement within the **Power Station** is to have the **Station** and **Unit Boards** interconnected within the **Power Station**, no account should be taken of the interconnection between the **Station Board** and the **Unit Board**.

PC.A.2.5.5.6 Auxiliary motor short circuit current contribution and any auxiliary **DC Converter Station** contribution or **HVDC System** contribution through the **Station Transformers** must be represented as a combined short circuit current contribution through the **Station Transformers**.

PC.A.2.5.5.7 Where a **Manufacturer's Data & Performance Report** exists in respect of the model of the **Power Park Unit**, the **User** may opt to reference the **Manufacturer's Data & Performance Report** as an alternative to the provision of data in accordance with this PC.A.2.5.5.7. For the avoidance of doubt, all other data provision pursuant to the Grid Code shall still be provided including a Single Line Diagram and those data pertaining thereto.

For each **Power Park Module** (including **DC Connected Power Park Modules**) and each type of **Power Park Unit** (eg. a Doubly Fed Induction Generator) (and any **OTSDUW Plant and Apparatus** which provides a fault infeed), including any **Auxiliaries**, positive, negative and zero sequence root mean square current values are to be provided of the contribution to the short circuit current flowing at:

- (i) the **Power Park Unit** terminals, or the **Common Collection Busbar** if an equivalent **Single Line Diagram** and associated data as described in PC.A.2.2.2 is provided, and
- (ii) the **Grid Entry Point** (and in case of **OTSUA, Transmission Interface Point**), or **User System Entry Point** if **Embedded**

for the following solid faults at the **Grid Entry Point** (and in case of **OTSUA, Interface Point**), or **User System Entry Point** if **Embedded**:

- (i) a symmetrical three phase short circuit
- (ii) a single phase to earth short circuit
- (iii) a phase to phase short circuit
- (iv) a two phase to earth short circuit

For a **Power Park Module** (including **DC Connected Power Park Modules**) in which one or more of the **Power Park Units** utilise a protective control such as a crowbar circuit, the data should indicate whether the protective control will act in each of the above cases and the effects of its action shall be included in the data. For any case in which the protective control will act, the data for the fault shall also be submitted for the limiting case in which the protective circuit will not act, which may involve the application of a non-solid fault, and the positive, negative and zero sequence retained voltages at;

- (i) the **Power Park Unit** terminals, or the **Common Collection Busbar** if an equivalent **Single Line Diagram** and associated data is provided and
- (ii) the **Grid Entry Point**, or **User System Entry Point** if **Embedded**

in this limiting case shall be provided.

For each fault for which data is submitted, the data items listed under the following parts of PC.A.2.5.6(a) shall be provided:-

(iv), (vii), (viii), (ix), (x);

In addition, if an equivalent **Single Line Diagram** has been provided the data items listed under the following parts of PC.A.2.5.6(a) shall be provided:-

(xi), (xii), (xiii);

In addition, for a **Power Park Module** (including **DC Connected Power Park Modules**) in which one or more of the **Power Park Units** utilise a protective control such as a crowbar circuit:-

the data items listed under the following parts of PC.A.2.5.6(a) shall be provided:-

(xiv), (xv);

All of the above data items shall be provided in accordance with the detailed provisions of PC.A.2.5.6(c), (d), (f).

Should actual data in respect of fault infeeds be unavailable at the time of the application for a **CUSC Contract** or **Embedded Development Agreement**, a limited subset of the data, representing the maximum fault infeed that may result from all of the plant types being considered, shall be submitted. This data will, as a minimum, represent the root mean square of the positive, negative and zero sequence components of the fault current for both single phase and three phase solid faults at the **Grid Entry Point** (or **User System Entry Point** if **Embedded**) at the time of fault application and 50ms following fault application. Actual data in respect of fault infeeds shall be submitted to **The Company** as soon as it is available, in line with PC.A.1.2

PC.A.2.5.6

Data Items

- (a) The following is the list of data utilised in this part of the **PC**. It also contains rules on the data which generally apply:-
 - (i) Root mean square of the symmetrical three-phase short circuit current infeed at the instant of fault, (I_1'');
 - (ii) Root mean square of the symmetrical three-phase short circuit current after the subtransient fault current contribution has substantially decayed, (I_1');
 - (iii) the zero sequence source resistance and reactance values of the **User's System** as seen from the node on the **Single Line Diagram** provided under PC.A.2.2.1 (or **Power Generating Module** or **Station Transformer** high voltage terminals or **Generating Unit** terminals or **DC Converter** terminals or **HVDC System** terminals, as appropriate) consistent with the infeed described in PC.A.2.5.1.(b);
 - (iv) root mean square of the pre-fault voltage at which the maximum fault currents were calculated;
 - (v) the positive sequence X/R ratio at the instant of fault;
 - (vi) the negative sequence resistance and reactance values of the **User's System** seen from the node on the **Single Line Diagram** provided under PC.A.2.2.1 (or **Power Generating Module** or **Station Transformer** high voltage terminals, or **Generating Unit** terminals or **DC Converter** terminals or **HVDC System** terminals as appropriate) if substantially different from the values of positive sequence resistance and reactance which would be derived from the data provided above;

- (vii) A continuous trace and a table showing the root mean square of the positive, negative and zero sequence components of the short circuit current between zero and 140ms at 10ms intervals;
 - (viii) The **Active Power** (or **Interface Point Capacity** being exported pre-fault by the **OTSDUW Plant and Apparatus**) being generated pre-fault by the **Power Park Module** (including **DC Connected Power Park Modules**) and by each type of **Power Park Unit**;
 - (ix) The reactive compensation shown explicitly on the **Single Line Diagram** that is switched in;
 - (x) The **Power Factor** of the **Power Park Module** (including **DC Connected Power Park Modules**) and of each **Power Park Unit** type;
 - (xi) The positive sequence X/R ratio of the equivalent at the **Common Collection Busbar** or **Interface Point** in the case of **OTSUA**;
 - (xii) The minimum zero sequence impedance of the equivalent seen from the **Common Collection Busbar** or **Interface Point** in the case of **OTSUA**;
 - (xiii) The number of **Power Park Units** represented in the equivalent **Power Park Unit**;
 - (xiv) The additional rotor resistance and reactance (if any) that is applied to the **Power Park Unit** under a fault condition;
 - (xv) A continuous trace and a table showing the root mean square of the positive, negative and zero sequence components of the retained voltage at the fault point and **Power Park Unit** terminals, or the **Common Collection Busbar** if an equivalent **Single Line Diagram** and associated data as described in PC.A.2.2.2 is provided or **Interface Point** in the case of **OTSUA**, representing the limiting case, which may involve the application of a non-solid fault, required to not cause operation of the protective control;
- (b) In considering this data, unless the **User** notifies **The Company** accordingly at the time of data submission, **The Company** will assume that the time constant of decay of the subtransient fault current corresponding to the change from I_1'' to I_1' , (T'') is not significantly different from 40ms. If that assumption is not correct in relation to an item of data, the **User** must inform **The Company** at the time of submission of the data.
 - (c) The value for the X/R ratio must reflect the rate of decay of the d.c. component that may be present in the fault current and hence that of the sources of the initial fault current. All shunt elements and loads must therefore be deleted from any system model before the X/R ratio is calculated.
 - (d) In producing the data, the **User** may use "time step analysis" or "fixed-point-in-time analysis" with different impedances.
 - (e) If a fixed-point-in-time analysis with different impedances method is used, then in relation to the data submitted under (a) (i) above, the data will be required for "time zero" to give I_1'' . The figure of 120ms is consistent with a decay time constant T'' of 40ms, and if that figure is different, then the figure of 120ms must be changed accordingly.
 - (f) Where a "time step analysis" is carried out, the X/R ratio may be calculated directly from the rate of decay of the d.c. component. The X/R ratio is not that given by the phase angle of the fault current if this is based on a system calculation with shunt loads, but from the Thévenin equivalent of the system impedance at the instant of fault with all non-source shunts removed.

PC.A.3

POWER GENERATING MODULE, GENERATING UNIT, HVDC SYSTEM AND DC CONVERTER DATA

PC.A.3.1

Introduction

Directly Connected

- PC.A.3.1.1 Each **Generator**, **HVDC System Owner** and **DC Converter Station** owner (and a **User** where the **OTSUA** includes an **OTSDUW DC Converter**) with an existing, or proposed, **Power Station** or **DC Converter Station** or **HVDC System** directly connected, or to be directly connected, to the **National Electricity Transmission System** (or in the case of **OTSUA**, the **Interface Point**), shall provide **The Company** with data relating to that **Power Station** or **DC Converter Station** or **HVDC System**, both current and forecast, as specified in PC.A.3.2 to PC.A.3.4.
- Embedded
- PC.A.3.1.2 (a) Each **Generator**, **HVDC System Owner** and **DC Converter Station** owner in respect of its existing, and/or proposed, **Embedded Large Power Stations** and/or **Embedded HVDC Systems** and/or **Embedded DC Converter Stations** and/or its **Embedded Medium Power Stations** subject to a **Bilateral Agreement** and each **Network Operator** in respect of its **Embedded Medium Power Stations** not subject to a **Bilateral Agreement** and/or **Embedded DC Converter Stations** not subject to a **Bilateral Agreement** and/or **Embedded HVDC Systems** not subject to a **Bilateral Agreement** within such **Network Operator's System** in each case connected to the **Subtransmission System**, shall provide **The Company** with data relating to that **Power Station** or **DC Converter Station** or **HVC System**, both current and forecast, as specified in PC.A.3.2 to PC.A.3.4.
- (b) No data need be supplied in relation to any **Small Power Station** or any **Medium Power Station** or installations of direct current converters which do not form a **DC Converter Station** or **HVDC System**, connected at a voltage level below the voltage level of the **Subtransmission System** except:-
- (i) in connection with an application for, or under, a **CUSC Contract**, or
- (ii) unless specifically requested by **The Company** under PC.A.3.1.4.
- PC.A.3.1.3 (a) Each **Network Operator** shall provide **The Company** with the data specified in PC.A.3.2.2(c)(i) and (ii) and PC.A.3.2.2(i).
- (b) **Network Operators** need not submit planning data in respect of an **Embedded Small Power Station** unless required to do so under PC.A.1.2(b) or unless specifically requested under PC.A.3.1.4 below, in which case they will supply such data.
- PC.A.3.1.4 (a) PC.A.4.2.4(b) and PC.A.4.3.2(a) explain that the forecast **Demand** submitted by each **Network Operator** must be net of the export of all **Small Power Stations** and **Medium Power Stations** and **Customer Generating Plant** and all installations of direct current converters which do not form a **DC Converter Station** or **HVDC System**, **Embedded** within that **Network Operator's System**. The **Network Operator** must inform **The Company** of:
- (i) the number of such **Embedded Power Stations** and such **Embedded** installations of direct current converters (including the number of **Generating Units** or **Power Park Modules** (including **DC Connected Power Park Modules**) or **DC Converters** or **HVDC Systems**) together with their summated capacity; and
- (ii) beginning from the 2015 Week 24 data submission, for each **Embedded Small Power Station** of registered capacity (as defined in the **Distribution Code**) of 1MW or more:
1. A reference which is unique to each **Network Operator**;
 2. The production type as follows:
 - a) In the case of an **Embedded Small Power Station** first connected on or after 1 January 2015, the production type must be selected from Table PC.A.3.1.4(a) below together with a statement as to whether the generation forms part of a CHP scheme;
 - b) In the case of an **Embedded Small Power Station** first connected to the **Users' System** before 1 January 2015, as an alternative to the production type, the technology type(s) used, selected from the list set

out at paragraph 2.23 in Version 2 of the Regulatory Instructions and Guidance relating to the distributed generation incentive, innovation funding incentive and registered power zones, reference 83/07, published by Ofgem in April 2007;

3. The registered capacity (as defined in the **Distribution Code**) in MW;
 4. The lowest voltage level node that is specified on the most up-to-date **Single Line Diagram** to which it connects or where it will export most of its power;
 5. Where it generates electricity from wind or PV, the geographical location using either latitude or longitude or grid reference coordinates of the primary or higher voltage substation to which it connects;
 6. The **Reactive Power** and voltage control mode, including the voltage set-point and reactive range, where it operates in voltage control mode, or the target **Power Factor**, where it operates in **Power Factor** mode;
 7. Details of the types of loss of mains **Protection** in place and their relay settings which in the case of **Embedded Small Power Stations** first connected to the **Users' System** before 1 January 2015 shall be provided on a reasonable endeavours basis; and
- (iii) beginning from the 2019 Week 24 data submission, for **Embedded Power Stations** with **Registered Capacity** of less than 1MW, their best estimate of the aggregated capacity of all such **Embedded Power Stations** per production type as defined in Table PC.A.3.1.4(a); and
- (iv) In the case of an **Embedded Small Power Station** comprising **Electricity Storage Modules** or **Electricity Storage Units** first connected the **User's System** on or after 20 May 2020, the storage type selected from Table PC.A.3.1.4(b) and a statement as to whether the storage forms part of a CHP scheme. Where this information is not held by the **Network Operator** it should provide its best view of the type of storage technology.
- (b) On receipt of this data, the **Network Operator** or **Generator** (if the data relates to **Power Stations** referred to in PC.A.3.1.2) may be further required, at **The Company's** reasonable discretion, to provide details of **Embedded Small Power Stations** and **Embedded Medium Power Stations** and **Customer Generating Plant** and **Embedded** installations of direct current converters which do not form a **DC Converter Station** or **HVDC System**, both current and forecast, as specified in PC.A.3.2 to PC.A.3.4. Such requirement would arise where **The Company** reasonably considers that the collective effect of a number of such **Embedded Power Stations** and **Customer Generating Plants** and **Embedded** installations of direct current converters may have a significant system effect on the **National Electricity Transmission System**.

Biomass	Hydro run-of-river and poundage
Fossil brown coal/lignite	Hydro water reservoir
Fossil coal-derived gas	Marine
Fossil gas	Nuclear
Fossil hard coal	Other renewable
Fossil oil	Solar
Fossil oil shale	Waste
Fossil peat	Wind offshore
Geothermal	Wind onshore or
Hydro pumped storage	Other

Table PC.A.3.1.4(a)

Chemical	Ammonia	
	Hydrogen	
	Synthetic Fuels	
	Drop-in Fuels	
	Methanol	
	Synthetic Natural Gas	
Electrical	Supercapacitors	
	Superconducting Magnetic ES (SMES)	
Mechanical	Adiabatic Compressed Air	
	Diabatic Compressed Air	
	Liquid Air Energy Storage	
	Pumped Hydro	
	Flywheels	
Electrochemical	Classical batteries	Lead Acid
		Lithium Polymer (Li-Polymer)
		Metal Air
		Nickle Cadmium (Ni-Cd)
		Sodium Nickle Chloride (Na-NiCl ₂)
		Lithium Ion (Li-ion)
		Sodium Ion (Na-ion)
		Lithium Sulphur (Li-S)
		Sodium Sulphur(Na-S)
		Nickle –Metal Hydride (Ni-MH)
	Flow batteries	Vanadium Red-Oxide
		Zinc – Iron (Zn –Fe)
		Zinc – Bromine (Zn –Br)
Other		

Table PC.A.3.1.4(b)

Busbar Arrangements

PC.A.3.1.5 Where **Generating Units**, which term includes **CCGT Units** and **Synchronous Generating Units** within a **Synchronous Power Generating Module** and **Power Park Modules** (including **DC Connected Power Park Modules**), and **DC Converters**, and **HVDC Systems** are connected to the **National Electricity Transmission System** via a busbar arrangement which is or is expected to be operated in separate sections, the section of busbar to which each **Generating Unit** (including **Synchronous Generating Units** within a **Synchronous Power Generating Module**), **DC Converter**, **HVDC System** or **Power Park Module** (including **DC Connected Power Park Modules**) is connected is to be identified in the submission.

PC.A.3.2 Output Data

(a) **Large Power Stations and Gensets**

Data items PC.A.3.2.2 (a), (b), (c), (d), (e), (f) and (h) are required with respect to each **Large Power Station** and each **Generating Unit** (including **Synchronous Generating Units** within a **Synchronous Power Generating Module**) and **Power Park Module** (including **DC Connected Power Park Modules**) of each **Large Power Station** and for each **Genset** (although (a) is not required for **CCGT Units** and (b), (d) and (e) are not normally required for **CCGT Units** and (a), (b), (c), (d), (e), (f) and (h) are not normally required for **Power Park Units**).

(b) **Embedded Small Power Stations and Embedded Medium Power Stations**

Data item PC.A.3.2.2 (a) is required with respect to each **Embedded Small Power Station** and **Embedded Medium Power Station** and each **Generating Unit** (including **Synchronous Generating Units** within a **Synchronous Power Generating Module**) and **Power Park Module** (including **DC Connected Power Park Modules**) of each **Embedded Small Power Station** and **Embedded Medium Power Station** (although (a) is not required for **CCGT Units** or **Power Park Units**). In addition, data item PC.A.3.2.2(c)(ii) is required with respect to each **Embedded Medium Power Station**.

(c) **CCGT Units/Modules**

- (i) Data item PC.A.3.2.2 (g) is required with respect to each **CCGT Unit**;
- (ii) data item PC.A.3.2.2 (a) is required with respect to each **CCGT Module**; and
- (iii) data items PC.A.3.2.2 (b), (c), (d) and (e) are required with respect to each **CCGT Module** unless **The Company** informs the relevant **User** in advance of the submission that it needs the data items with respect to each **CCGT Unit** for particular studies, in which case it must be supplied on a **CCGT Unit** basis.

Where any definition utilised or referred to in relation to any of the data items does not reflect **CCGT Units**, such definition shall be deemed to relate to **CCGT Units** for the purposes of these data items. Any **Schedule** in the **DRC** which refers to these data items shall be interpreted to incorporate the **CCGT Unit** basis where appropriate;

(d) **Cascade Hydro Schemes**

Data item PC.A.3.2.2(i) is required with respect to each **Cascade Hydro Scheme**.

(e) **Power Park Units/Modules**

Data items PC.A.3.2.2 (k) is required with respect to each **Power Park Module** (including **DC Connected Power Park Modules**).

(f) **DC Converters and HVDC Systems**

Data items PC.A.3.2.2 (a), (b), (c), (d) (e) (f) (h) and (i) are required with respect of each **HVDC System**, each **DC Converter Station** and each **DC Converter** in each **DC Converter Station**. For installations of direct current converters which do not form a **DC Converter Station** only data item PC.A.3.2.2.(a) is required.

Items (a), (b), (d), (e), (f), (g), (h), (i), (j) and (k) are to be supplied by each **Generator**, **DC Converter Station** owner, **HVDC System Owner** or **Network Operator** (as the case may be) in accordance with PC.A.3.1.1, PC.A.3.1.2, PC.A.3.1.3 and PC.A.3.1.4. Items (a), and (f)(iv) are to be supplied (as applicable) by a **User** in the case of **OTSUA** which includes an **OTSDUW DC Converter**. Item (c) is to be supplied by each **Network Operator** in all cases:-

- (a) **Registered Capacity (MW), Maximum Capacity** (in the case of **Power Generating Modules** in addition to **Registered Capacity** on a **Power Station** basis) or **Interface Point Capacity** in the case of **OTSDUW**;
- (b) **Output Usable (MW)** on a monthly basis;
- (c) (i) **System Constrained Capacity (MW)** ie. any constraint placed on the capacity of the **Embedded Generating Unit** (including a **Synchronous Generating Unit** within a **Synchronous Power Generating Module**), **Embedded Power Park Module** (including **DC Connected Power Park Modules**) an **Offshore Transmission**

System at an **Interface Point**, **Embedded HVDC System** or **DC Converter** at an **Embedded DC Converter Station** due to the **Network Operator's System** in which it is **Embedded**. Where **Generating Units** (which term includes **CCGT Units** and **Synchronous Generating Units** within a **Synchronous Power Generating Module**), **Power Park Modules** (including **DC Connected Power Park Modules**), **Offshore Transmission Systems** at an **Interface Point**, **HVDC Systems** or **DC Converters** are connected to a **Network Operator's User System** via a busbar arrangement which is or is expected to be operated in separate sections, details of busbar running arrangements and connected circuits at the substation to which the **Embedded Generating Unit** (including **Synchronous Generating Units** within an **Embedded Synchronous Power Generating Module**), **Embedded Power Park Module** (including **DC Connected Power Park Modules**), **Offshore Transmission System** at an **Interface Point**, or **Embedded HVDC System** or **Embedded DC Converter** is connected sufficient for **The Company** to determine where the MW generated by each **Generating Unit** (including **Synchronous Generating Units** within a **Synchronous Power Generating Module**), **Power Park Module** (including **DC Connected Power Park Modules**), **HVDC System** or **DC Converter** at that **Power Station** or **DC Converter Station** or **Offshore Transmission System** at an **Interface Point** would appear onto the **National Electricity Transmission System**;

- (ii) any **Reactive Despatch Network Restrictions**;
- (d) **Minimum Generation** (MW), and in the case of **Power Generating Modules** only **Minimum Stable Operating Level** (MW) and **Minimum Regulating Level**;
- (e) MW obtainable from **Generating Units** (including **Synchronous Generating Units** within a **Synchronous Power Generating Module**), **Power Park Modules** (including **DC Connected Power Park Modules**), **HVDC Systems** or **DC Converters** at a **DC Converter Station** in excess of **Registered Capacity** or **Maximum Capacity**;
- (f) **Generator Performance Chart**:
 - (i) **GB Code User(s)** in respect of **Generating Units** shall provide a **Generator Performance Chart** and **EU Code Users** in respect of **Power Generating Modules** shall provide a **Power Generating Module Performance Chart** and a **Synchronous Generating Unit Performance Chart**.
 - (ii) at the electrical point of connection to the **Offshore Transmission System** for an **Offshore Synchronous Generating Unit** and **Offshore Synchronous Power Generating Module**.
 - (iii) at the electrical point of connection to the **National Electricity Transmission System** (or **User System** if **Embedded**) for a **Non Synchronous Generating Unit** (excluding a **Power Park Unit**), **Power Park Module** (including **DC Connected Power Park Modules**), **HVDC System** and **DC Converter** at a **DC Converter Station**;
 - (iv) at the **Interface Point** for **OTSDUW Plant and Apparatus**
 - (v) the charts referenced in PC.A.3.2.2 (f) (i) shall be in the format indicated in Appendix G of the **Planning Code**.

Where a **Reactive Despatch Network Restriction** applies, its existence and details should be highlighted on the **Generator Performance Chart**, in sufficient detail for **The Company** to determine the nature of the restriction.

- (g) a list of the **CCGT Units** within a **CCGT Module**, identifying each **CCGT Unit**, and the **CCGT Module** of which it forms part, unambiguously. In the case of a **Range CCGT Module**, details of the possible configurations should also be submitted, together:-
 - (i) (in the case of a **Range CCGT Module** connected to the **National Electricity Transmission System**) with details of the single **Grid Entry Point** (there can only be one) at which power is provided from the **Range CCGT Module**;
 - (ii) (in the case of an **Embedded Range CCGT Module**) with details of the single **User System Entry Point** (there can only be one) at which power is provided from the

Range CCGT Module;

Provided that, nothing in this sub-paragraph (g) shall prevent the busbar at the relevant point being operated in separate sections;

- (h) expected running regime(s) at each **Power Station, HVDC System or DC Converter Station** and type of **Power Generating Module or Generating Unit** (as applicable), eg. **Steam Unit, Gas Turbine Unit, Combined Cycle Gas Turbine Unit, Power Park Module** (including **DC Connected Power Park Modules**), **Novel Units** (specify by type), etc;
- (i) a list of **Power Stations** and **Generating Units** within a **Cascade Hydro Scheme**, identifying each **Generating Unit** (including **Synchronous Generating Units** within a **Synchronous Power Generating Module**) and **Power Station** and the **Cascade Hydro Scheme** of which each form part unambiguously. In addition:
 - (i) details of the **Grid Entry Point** at which **Active Power** is provided, or if **Embedded** the **Grid Supply Point(s)** within which the **Generating Unit** (including **Synchronous Generating Units** within a **Synchronous Power Generating Module**) is connected;
 - (ii) where the **Active Power** output of a **Generating Unit** is split between more than one **Grid Supply Points** the percentage that would appear under normal and outage conditions at each **Grid Supply Point**.
- (j) The following additional items are only applicable to **DC Converters at DC Converter Stations and HVDC Systems**.

Registered Import Capacity (MW);

Import Usable (MW) on a monthly basis;

Minimum Import Capacity (MW);

MW that may be absorbed by a **DC Converter or HVDC System** in excess of **Registered Import Capacity** and **Maximum HVDC Active Power Transmission Capacity** under importing conditions and the duration for which this is available;

- (k) the number and types of the **Power Park Units** within a **Power Park Module** (including **DC Connected Power Park Modules**), identifying each **Power Park Unit**, the **Power Park Module** of which it forms part and identifying the **BM Unit** of which each **Power Park Module** forms part, unambiguously. In the case of a **Power Station** directly connected to the **National Electricity Transmission System** with multiple **Power Park Modules** (including **DC Connected Power Park Modules**) where **Power Park Units** can be selected to run in different **Power Park Modules** and/or **Power Park Modules** can be selected to run in different **BM Units**, details of the possible configurations should also be submitted. In addition, for **Offshore Power Park Modules** (including **DC Connected Power Park Modules**), the number of **Offshore Power Park Strings** that are aggregated into one **Offshore Power Park Module** should also be submitted.
- (l) the number and types of the **Synchronous Generating Units** within a **Synchronous Power Generating Module**, identifying each **Synchronous Generating Unit**, the **Synchronous Power Generating Module** of which it forms part and identifying the **BM Unit** of which each **Synchronous Power Generating Module** forms part, unambiguously. In the case of a **Power Station** directly connected to the **National Electricity Transmission System** with multiple **Synchronous Power Generating Modules** where **Synchronous Generating Units** can be selected to run in different **Synchronous Power Generating Modules** and/or **Synchronous Power Generating Modules** can be selected to run in different **BM Units**, details of the possible configurations should also be submitted.

PC.A.3.2.3 Notwithstanding any other provision of this PC, the **CCGT Units** within a **CCGT Module**, details of which are required under paragraph (g) of PC.A.3.2.2, can only be amended in accordance with the following provisions:-

- (a) if the **CCGT Module** is a **Normal CCGT Module**, the **CCGT Units** within that **CCGT Module** can only be amended such that the **CCGT Module** comprises different **CCGT Units** if **The Company** gives its prior consent in writing. Notice of the wish to amend the **CCGT Units** within such a **CCGT Module** must be given at least 6 months before it is wished for the amendment to take effect;
- (b) if the **CCGT Module** is a **Range CCGT Module**, the **CCGT Units** within that **CCGT Module** and the **Grid Entry Point** at which the power is provided can only be amended as described in BC1.A1.6.4.

PC.A.3.2.4 Notwithstanding any other provision of this **PC**, the **Power Park Units** within a **Power Park Module** (including **DC Connected Power Park Modules**), and the **Power Park Modules** (including **DC Connected Power Park Modules**) within a **BM Unit**, details of which are required under paragraph (k) of PC.A.3.2.2, can only be amended in accordance with the following provisions:-

- (a) if the **Power Park Units** within that **Power Park Module** can only be amended such that the **Power Park Module** comprises different **Power Park Units** due to repair/replacement of individual **Power Park Units** if **The Company** gives its prior consent in writing. Notice of the wish to amend a **Power Park Unit** within such a **Power Park Module** (including **DC Connected Power Park Modules**) must be given at least 4 weeks before it is wished for the amendment to take effect;
- (b) if the **Power Park Units** within that **Power Park Module** (including **DC Connected Power Park Modules**) and/or the **Power Park Modules** (including **DC Connected Power Park Modules**) within that **BM Unit** can be selected to run in different **Power Park Modules** and/or **BM Units** as an alternative operational running arrangement the **Power Park Units** within the **Power Park Module**, the **BM Unit** of which each **Power Park Module** forms part, and the **Grid Entry Point** at which the power is provided can only be amended as described in BC1.A.1.8.4.

PC.A.3.2.5 Notwithstanding any other provision of this **PC**, the **Synchronous Generating Units** within a **Synchronous Power Generating Module**, and the **Synchronous Power Generating Modules** within a **BM Unit**, details of which are required under paragraph (l) of PC.A.3.2.2, can only be amended in accordance with the following provisions:-

- (a) if the **Synchronous Generating Units** within that **Synchronous Power Generating Module** can only be amended such that the **Synchronous Power Generating Module** comprises different **Synchronous Generating Units** due to repair/replacement of individual **Synchronous Generating Units** if **The Company** gives its prior consent in writing. Notice of the wish to amend a **Synchronous Generating Unit** within such a **Synchronous Power Generating Module** must be given at least 4 weeks before it is wished for the amendment to take effect;
- (b) if the **Synchronous Generating Units** within that **Synchronous Power Generating Module** and/or the **Synchronous Power Generating Modules** within that **BM Unit** can be selected to run in different **Synchronous Power Generating Modules** and/or **BM Units** as an alternative operational running arrangement the **Synchronous Generating Units** within the **Synchronous Power Generating Module**, the **BM Unit** of which each **Synchronous Power Generating Module** forms part, and the **Grid Entry Point** at which the power is provided can only be amended as described in BC1.A.1.9.4(c). The requirements of PC.A.3.2.5 need not be satisfied if **Generators** have already submitted data in respect of PC.A.3.2.3, PC.A.3.2.4 and PC.A.3.2.5 for the same **Power Generating Module**.

PC.A.3.3. Rated Parameters Data

PC.A.3.3.1 The following information is required to facilitate an early assessment, by **The Company**, of the need for more detailed studies;

- (a) for all **Generating Units** (excluding **Power Park Units**) and **Power Park Modules** (including **DC Connected Power Park Modules**):

Rated MVA

Rated MW;

- (b) for each **Synchronous Generating Unit** (including **Synchronous Generating Units** within a **Synchronous Power Generating Module**):

Short circuit ratio

Direct axis transient reactance;

Inertia constant (for whole machine), MWsecs/MVA;

- (c) for each **Synchronous Generating Unit** step-up transformer (including the step up transformer of a **Synchronous Generating Unit** within a **Synchronous Power Generating Module**):

Rated MVA

Positive sequence reactance (at max, min and nominal tap);

- (d) for each **DC Converter** at a **DC Converter Station**, **HVDC System**, **DC Converter** connecting a **Power Park Module** (including a **DC Connected Power Park Module**) and **Transmission DC Converter** (forming part of an **OTSUA**).

DC Converter or **HVDC Converter** type (e.g. current/voltage sourced)

Rated MW per pole for import and export

Number of poles and pole arrangement

Rated DC voltage/pole (kV)

Return path arrangement

Remote AC connection arrangement (excluding **OTSDUW DC Converters**)

Maximum HVDC Active Power Transmission Capacity

Minimum Active Power Transmission Capacity

- (e) for each type of **Power Park Unit** in a **Power Park Module** not connected to the **Total System** by a **DC Converter** or **HVDC System**:

Rated MVA

Rated MW

Rated terminal voltage

Inertia constant, (MWsec/MVA)

Additionally, for **Power Park Units** that are squirrel-cage or doubly-fed induction generators driven by wind turbines:

Stator reactance.

Magnetising reactance.

Rotor resistance (at rated running)

Rotor reactance (at rated running)

The generator rotor speed range (minimum and maximum speeds in RPM) (for doubly-fed induction generators only)

Converter MVA rating (for doubly-fed induction generators only)

For a **Power Park Unit** consisting of a synchronous machine in combination with a back-to-back **DC Converter** or **HVDC Converter**, or for a **Power Park Unit** not driven by a wind turbine, the data to be supplied shall be agreed with **The Company** in accordance with PC.A.7.

This information should only be given in the data supplied in accordance with PC.4.4 and PC.4.5.

- PC.A.3.4 General Generating Unit, Power Park Module (including **DC Connected Power Park Modules**), Power Generating Module, HVDC System and DC Converter Data
- PC.A.3.4.1 The point of connection to the **National Electricity Transmission System** or the **Total System**, if other than to the **National Electricity Transmission System**, in terms of geographical and electrical location and system voltage is also required.
- PC.A.3.4.2 (a) Type of **Generating Unit** (ie **Synchronous Power Generating Unit** within a **Power Generating Module, Synchronous Generating Unit, Non-Synchronous Generating Unit, DC Converter, Power Park Module** (including **DC Connected Power Park Modules**) or **HVDC System**).
- (b) In the case of a **Synchronous Generating Unit** (including **Synchronous Generating Units** within a **Synchronous Power Generating Module**) details of the **Exciter** category, for example whether it is a rotating **Exciter** or a static **Exciter** or in the case of a **Non-Synchronous Generating Unit** the voltage control system.
- (c) Whether a **Power System Stabiliser** is fitted.
- PC.A.3.4.3 Each **Generator** shall supply **The Company** with the production type(s) used as the primary source of power in respect of each **Generating Unit** (including **Synchronous Generating Units** within a **Synchronous Power Generating Module**), selected from the list set out in Table PC.A.3.1.4(a).
- PC.A.3.4.4 In the case of an **Electricity Storage Module** or **Electricity Storage Unit**, each **Generator** shall supply **The Company** with the production type(s) used as the primary **Electricity Storage** source (including **Synchronous Electricity Storage Units** within a **Synchronous Electricity Storage Module**), selected from the list set out in Table PC.A.3.1.4(b).
- PC.A.4 DEMAND AND ACTIVE ENERGY DATA
- PC.A.4.1 Introduction
- PC.A.4.1.1 Each **User** directly connected to the **National Electricity Transmission System** with **Demand** shall provide **The Company** with the **Demand** data, historic, current and forecast, as specified in PC.A.4.2 and PC.A.4.3. Paragraphs PC.A.4.1.2 and PC.A.4.1.3 apply equally to **Active Energy** requirements as to **Demand** unless the context otherwise requires.
- PC.A.4.1.2 Data will need to be supplied by:
- (a) each **Network Operator**, in relation to **Demand** and **Active Energy** requirements on its **User System**;
- (b) each **Non-Embedded Customer, Pumped Storage Generators** (with respect to Pumping **Demand**) and **Generators** in relation to **Electricity Storage Modules** in relation to their **Demand** and **Active Energy** requirements.
- (c) each **DC Converter Station** owner or **HVDC System Owner** in relation to **Demand** and **Active Energy** transferred (imported) to its **DC Converter Station** or **HVDC System**.
- (d) each **OTSDUW DC Converter** in relation to the **Demand** at each **Interface Point** and **Connection Point**.
- Demand** of **Power Stations** directly connected to the **National Electricity Transmission System** is to be supplied by the **Generator** under PC.A.5.2.
- PC.A.4.1.3 References in this **PC** to data being supplied on a half hourly basis refer to it being supplied for each period of 30 minutes ending on the hour or half-hour in each hour.
- PC.A.4.1.4 **Access Periods and Access Groups**
- PC.A.4.1.4.1 Each **Connection Point** must belong to one, and only one, **Access Group**.
- PC.A.4.1.4.2 Each **Transmission Interface Circuit** must have an **Access Period**.
- PC.A.4.1.4.3 The **Access Period** shall

- (a) normally be a minimum of 8 continuous weeks and can occur in any one of three maintenance years during the period from calendar week 13 to calendar week 43 (inclusive) in each year; or,
- (b) exceptionally and provided that agreement is reached between **The Company** and the relevant **User(s)**, such agreement to be sought in accordance with PC.7, the **Access Period** may be of a period not less than 4 continuous weeks and can occur in any one of three maintenance years during the period from calendar week 10 to calendar week 43 (inclusive) in each year.

PC.A.4.1.4.4 **The Company** shall submit in writing no later than calendar week 6 in each year:

- (a) the calendar weeks defining the proposed start and finish of each **Access Period** for each **Transmission Interface Circuit**; and
- (b) the **Connection Points** in each **Access Group**.

The submission by **The Company** under PC.A.4.1.4.4 (a) above shall commence in 2010 and shall then continue each year thereafter. The submission by **The Company** under PC.A.4.1.4.4 (b) shall commence in 2009 and then continue each year thereafter.

PC.A.4.1.4.5 It is permitted for **Access Periods** to overlap in the same **Access Group** and in the same maintenance year. However, where possible **Access Periods** will be sought by **The Company** that do not overlap with any other **Access Period** within that **Access Group** for each maintenance year. Where it is not possible to avoid overlapping **Access Periods**, **The Company** will indicate to **Users** by calendar week 6 its initial view of which **Transmission Interface Circuits** will need to be considered out of service concurrently for the purpose of assessing compliance to **Licence Standards**. The obligation on **The Company** to indicate which **Transmission Interface Circuits** will need to be considered out of service concurrently for the purpose of assessing compliance to **Licence Standards** shall commence in 2010 and shall continue each year thereafter.

PC.A.4.1.4.6 Following the submission(s) by **The Company** by week 6 in each year and where required by either party, both **The Company** and the relevant **User(s)** shall use their reasonable endeavours to agree the appropriate **Access Group(s)** and **Access Period** for each **Transmission Interface Circuit** prior to week 17 in each year. The requirement on **The Company** and the relevant **User(s)** to agree, shall commence in respect of **Access Groups** only in 2010. This paragraph PC.A.4.1.4.6 shall apply in its entirety in 2011 and shall then continue each year thereafter.

PC.A.4.1.4.7 In exceptional circumstances, and with the agreement of all parties concerned, where a **Connection Point** is specified for the purpose of the **Planning Code** as electrically independent **Subtransmission Systems**, then data submissions can be on the basis of two (or more) individual **Connection Points**.

PC.A.4.2 User's User System Demand (Active Power) and Active Energy Data

PC.A.4.2.1 Forecast daily **Demand (Active Power)** profiles, as specified in (a), (b) and (c) below, in respect of each of the **User's User Systems** (each summated over all **Grid Supply Points** in each **User System**) are required for:

- (a) peak day on each of the **User's User Systems** (as determined by the **User**) giving the numerical value of the maximum **Demand (Active Power)** that in the **Users'** opinion could reasonably be imposed on the **National Electricity Transmission System**;
- (b) day of peak **National Electricity Transmission System Demand (Active Power)** as notified by **The Company** pursuant to PC.A.4.2.2;
- (c) day of minimum **National Electricity Transmission System Demand (Active Power)** as notified by **The Company** pursuant to PC.A.4.2.2.

In addition, the total **Demand (Active Power)** in respect of the time of peak **National Electricity Transmission System Demand** in the preceding **Financial Year** in respect of each of the **User's User Systems** (each summated over all **Grid Supply Points** in each **User System**) both outturn and weather corrected shall be supplied.

- PC.A.4.2.2 No later than calendar week 17 each year, **The Company** shall notify each **Network Operator** and **Non-Embedded Customer** in writing of the following, for the current **Financial Year** and for each of the following nine **Financial Years**, which will, until replaced by the following year's notification, be regarded as the relevant specified days and times under PC.A.4.2.1:
- the date and time of the annual peak of the **National Electricity Transmission System Demand**;
 - the date and time of the annual minimum of the **National Electricity Transmission System Demand**;
 - the relevant **Access Period** for each **Transmission Interface Circuit**; and,
 - concurrent **Access Periods** of two or more **Transmission Interface Circuits** (if any) that are situated in the same **Access Group**.
- The submissions by **The Company** made under PC.A.4.2.1 (c) and PC.A.4.2.1 (d) above shall commence in 2010 and shall then continue in respect of each year thereafter.
- PC.A.4.2.3 The total **Active Energy** used on each of the **Network Operators'** or **Non-Embedded Customers' User Systems** (each summated over all **Grid Supply Points** in each **User System**) in the preceding **Financial Year**, both outturn and weather corrected, together with a prediction for the current financial year, is required. Each **Active Energy** submission shall be subdivided into the following categories of **Customer** tariff:
- LV1
 - LV2
 - LV3
 - HV
 - EHV
 - Traction
 - Lighting
- In addition, the total **User System** losses and the **Active Energy** provided by **Embedded Small Power Stations** and **Embedded Medium Power Stations** shall be supplied.
- PC.A.4.2.4 All forecast **Demand (Active Power)** and **Active Energy** specified in PC.A.4.2.1 and PC.A.4.2.3 shall:
- in the case of PC.A.4.2.1(a), (b) and (c), be such that the profiles comprise average **Active Power** levels in 'MW' for each time marked half hour throughout the day;
 - in the case of PC.A.4.2.1(a), (b) and (c), be that remaining after any deductions reasonably considered appropriate by the **User** to take account of the output profile of all **Embedded Small Power Stations** and **Embedded Medium Power Stations** and **Customer Generating Plant** and imports across **Embedded External Interconnections** including imports across **Embedded** installations of direct current converters which do not form a **DC Converter Station** or **HVDC System** and **Embedded DC Converter Stations** and **Embedded HVDC Systems** with a **Registered Capacity** or **HVDC Active Power Transmission Capacity** of less than 100MW;
 - be based upon **Annual ACS Conditions** for times that occur during week 44 through to week 12 (inclusive) and based on **Average Conditions** for weeks 13 to 43 (inclusive).
- PC.A.4.3 Connection Point Demand (Active and Reactive Power)
- PC.A.4.3.1 Forecast **Demand (Active Power)** and **Power Factor** (values of the **Power Factor** at maximum and minimum continuous excitation may be given instead where more than 95% of the total **Demand** at a **Connection Point** is taken by synchronous motors) to be met at each **Connection Point** within each **Access Group** is required for:
- the time of the maximum **Demand (Active Power)** at the **Connection Point** (as determined by the **User**) that in the **User's** opinion could reasonably be imposed on the **National Electricity Transmission System**;

- (b) the time of peak **National Electricity Transmission System Demand** as provided by **The Company** under PC.A.4.2.2;
- (c) the time of minimum **National Electricity Transmission System Demand** as provided by **The Company** under PC.A.4.2.2;
- (d) the time of the maximum **Demand (Apparent Power)** at the **Connection Point** (as determined by the **User**) during the **Access Period** of each **Transmission Interface Circuit**;
- (e) at a time specified by either **The Company** or a **User** insofar as such a request is reasonable.

Instead of such forecast **Demand** to be met at each **Connection Point** within each **Access Group** the **User** may (subject to PC.A.4.3.4) submit such **Demand** at each node on the **Single Line Diagram**.

In addition, the **Demand** in respect of each of the time periods referred to in PC.A.4.3.1 (a) to (e) in the preceding **Financial Year** in respect of each **Connection Point** within each **Access Group** both outturn and weather corrected shall be supplied. The "weather correction" shall normalise outturn figures to **Annual ACS Conditions** for times that occur during calendar week 44 through to calendar week 12 (inclusive) or **Average Conditions** for the period calendar weeks 13 to calendar week 43 (inclusive) and shall be performed by the relevant **User** on a best endeavours basis.

The submission by a **User** pursuant to PC.A.4.3.1 (d) shall commence in 2011 and shall then continue each year thereafter.

PC.A.4.3.2 All forecast **Demand** specified in PC.A.4.3.1 shall:

- (a) be that remaining after any deductions reasonably considered appropriate by the **User** to take account of the output of all **Embedded Small Power Stations** and **Embedded Medium Power Stations** and **Customer Generating Plant** and imports across **Embedded External Interconnections**, including **Embedded** installations of direct current converters which do not form a **DC Converter Station**, **HVDC System** and **Embedded DC Converter Stations** and **Embedded HVDC Systems** and such deductions should be separately stated;
- (b) include any **User's System** series reactive losses but exclude any reactive compensation equipment specified in PC.A.2.4 and exclude any network susceptance specified in PC.A.2.3;
- (c) be based upon **Annual ACS Conditions** for times that occur during calendar week 44 through to calendar week 12 (inclusive) and based on **Average Conditions** for calendar weeks 13 to calendar week 43 (inclusive), both corrections being made on a best endeavours basis;
- (d) reflect the **User's** opinion of what could reasonably be imposed on the **National Electricity Transmission System**.

PC.A.4.3.3 The date and time of the forecast maximum **Demand (Apparent Power)** at the **Connection Point** as specified in PC.A.4.3.1 (a) and (d) is required.

PC.A.4.3.4 Each **Single Line Diagram** provided under PC.A.2.2.2 shall include the **Demand (Active Power)** and **Power Factor** (values of the **Power Factor** at maximum and minimum continuous excitation may be given instead where more than 95% of the **Demand** is taken by synchronous motors) at the time of the peak **National Electricity Transmission System Demand** (as provided under PC.A.4.2.2) at each node on the **Single Line Diagram**. These **Demands** shall be consistent with those provided under PC.A.4.3.1(b) above for the relevant year.

PC.A.4.3.5 The **Single Line Diagram** must represent the **User's User System** layout under the period specified in PC.A.4.3.1(b) (at the time of peak **National Electricity Transmission System Demand**). Should the **User's User System** layout during the other times specified in PC.A.4.3.1 be planned to be materially different from the **Single Line Diagram** submitted to **The Company** pursuant to PC.A.2.2.1 the **User** shall in respect of such other times submit:

- (i) an alternative **Single Line Diagram** that accurately reflects the revised layout and in such case shall also include appropriate associated data representing the relevant changes, or;
- (ii) submit an accurate and unambiguous description of the changes to the **Single Line Diagram** previously submitted for the time of peak **National Electricity Transmission System Demand**.

Where a **User** does not submit any changes, **The Company** will assume that the **Single Line Diagram** (and associated circuit and node data) provided at the time of peak **National Electricity Transmission System Demand** will be valid for all other times. In respect of such other times, where the **User** does not submit such nodal demands at the times defined in PC.A.4.3.1(a), (c), (d) and (e), the nodal demands will be pro-rata, to be consistent with the submitted **Connection Point Demands**.

PC.A.4.4 **The Company** will assemble and derive in a reasonable manner, the forecast information supplied to it under PC.A.4.2.1, PC.A.4.3.1, PC.A.4.3.4 and PC.A.4.3.5 above into a cohesive forecast and will use this in preparing **Forecast Demand** information in the **Electricity Ten Year Statement** and for use in **The Company's Operational Planning**. If any **User** believes that the cohesive forecast **Demand** information in the **Electricity Ten Year Statement** does not reflect its assumptions on **Demand**, it should contact **The Company** to explain its concerns and may require **The Company**, on reasonable request, to discuss these forecasts. In the absence of such expressions, **The Company** will assume that **Users** concur with **The Company's** cohesive forecast.

PC.A.4.5 Post Fault User System Layout

PC.A.4.5.1 Where for the purposes of **The Company** assessing against the Licence Standards an **Access Group**, the **User** reasonably considers it appropriate that revised post fault **User System** layouts should be taken into account by **The Company**, the following information is required to be submitted by the **User**:

- (i) the specified **Connection Point** assessment period (PC.A.4.3.1,(a)-(e)) that is being evaluated;
- (ii) an accurate and unambiguous description of the **Transmission Interface Circuits** considered to be switched out due to a fault;
- (iii) appropriate revised **Single Line Diagrams** and/or associated revised nodal **Demand** and circuit data detailing the revised **User System(s)** conditions;
- (iv) where the **User's** planned post fault action consists of more than one component, each component must be explicitly identified using the **Single Line Diagram** and associated nodal **Demand** and circuit data;
- (v) the arrangements for undertaking actions (eg the time taken, automatic or manual and any other appropriate information);.

The **User** must not submit any action that it does not have the capability or the intention to implement during the assessment period specified (subject to there being no further unplanned outages on the **User's User System**).

PC.A.4.6 Control of Demand or Reduction of Pumping Load Offered as Reserve

Magnitude of Demand or pumping load or Electricity Storage Module charging load which is tripped	MW
System Frequency at which tripping is initiated	Hz
Time duration of System Frequency below trip setting for tripping to be initiated	S
Time delay from trip initiation to tripping	S

PC.A.4.7 General Demand Data

PC.A.4.7.1 The following information is infrequently required and should be supplied (wherever possible) when requested by **The Company**:

- (a) details of any individual loads (including (as applicable) the load behaviour of an **Electricity Storage Module** when operating in a mode analogous to demand) which have characteristics significantly different from the typical range of Domestic, Commercial, **Electricity Storage** or Industrial loads supplied;
- (b) the sensitivity of the **Demand (Active and Reactive Power)** to variations in voltage and **Frequency** on the **National Electricity Transmission System** at the time of the peak **Demand (Active Power)**. The sensitivity factors quoted for the **Demand (Reactive Power)** should relate to that given under PC.A.4.3.1 and, therefore, include any **User's System** series reactive losses but exclude any reactive compensation equipment specified in PC.A.2.4 and exclude any network susceptance specified in PC.A.2.3;
- (c) details of any traction loads, e.g. connection phase pairs and continuous load variation with time;
- (d) the average and maximum phase unbalance, in magnitude and phase angle, which the **User** would expect its **Demand** to impose on the **National Electricity Transmission System**;
- (e) the maximum harmonic content which the **User** would expect its **Demand** to impose on the **National Electricity Transmission System**;
- (f) details of all loads which may cause **Demand** fluctuations greater than those permitted under **Engineering Recommendation P28 Issue 2, Stage 1** at a **Point of Common Coupling** including the **Flicker Severity Short Term** and the **Flicker Severity Long Term**.
- (g) In the case of **Electricity Storage Modules**, details of the **Maximum Capacity, Maximum Import Power, Registered Import Capability**, charge time, discharge time and operating periods.

PART 2 - DETAILED PLANNING DATA

PC.A.5 POWER GENERATING MODULE, GENERATING UNIT, POWER PARK MODULE (INCLUDING DC CONNECTED POWER PARK MODULES), DC CONVERTER, HVDC EQUIPMENT AND OTSDUW PLANT AND APPARATUS DATA

PC.A.5.1 Introduction

Directly Connected

PC.A.5.1.1 Each **Generator** (including those undertaking **OTSDUW**), with existing or proposed **Power Stations** directly connected, or to be directly connected, to the **National Electricity Transmission System**, shall provide **The Company** with data relating to that **Plant** and **Apparatus**, both current and forecast, as specified in PC.A.5.2, PC.A.5.3, PC.A.5.4 and PC.A.5.7 as applicable.

Each **DC Converter Station** owner or **HVDC System Owner**, with existing or proposed **DC Converter Stations** or **HVDC Systems** (including **Generators** undertaking **OTSDUW** which includes an **OTSDUW DC Converter**) directly connected, or to be directly connected, to the **National Electricity Transmission System**, shall provide **The Company** with data relating to that **Plant** and **Apparatus**, both current and forecast, as specified in PC.A.5.2 and PC.A.5.4.

GB Generators, DC Converter Station owners, **EU Generators** and **HVDC System Owners** shall ensure that the models supplied in respect of their **Plant** and **Apparatus** provide a true and accurate behaviour of the plant as built as required under PC.A.5.3.2(c), PC.A.5.4.2(a) and PC.A.5.4.3 and verified through the **Compliance Processes (CP)** or **European Compliance Processes (ECP)** as applicable.

Embedded

PC.A.5.1.2 Each **Generator**, in respect of its existing, or proposed, **Embedded Large Power Stations** and its **Embedded Medium Power Stations** subject to a **Bilateral Agreement** and each **Network Operator** in respect of **Embedded Medium Power Stations** not subject to a **Bilateral Agreement** within its **System** shall provide **The Company** with data relating to each of those **Large Power Stations** and **Medium Power Stations**, both current and forecast, as specified in PC.A.5.2, PC.A.5.3, PC.A.5.4 and PC.A.5.7 as applicable.

Each **DC Converter Station** owner or **HVDC System Owner**, or **Network Operator** in the case of an **Embedded DC Converter Station** or **Embedded HVDC System** not subject to a **Bilateral Agreement** within its **System** with existing or proposed **HVDC Systems** or **DC Converter Stations** shall provide **The Company** with data relating to each of those **HVDC Systems** or **DC Converter Stations**, both current and forecast, as specified in PC.A.5.2 and PC.A.5.4.

However, no data need be supplied in relation to those **Embedded Medium Power Stations** or **Embedded DC Converter Stations** or **Embedded HVDC Systems** if they are connected at a voltage level below the voltage level of the **Subtransmission System** except in connection with an application for, or under a, **CUSC Contract** or unless specifically requested by **The Company** under PC.A.5.1.4.

GB Generators, DC Converter Station owners, **EU Generators** and **HVDC System Owners** shall ensure that the models supplied in respect of their **Plant** and **Apparatus** provide a true and accurate behaviour of the plant as built as required under PC.A.5.3.2(c), PC.A.5.4.2(a) and PC.A.5.4.3 and verified through the **Compliance Processes (CP)** or **European Compliance Processes (ECP)** as applicable

PC.A.5.1.3 Each **Network Operator** need not submit **Planning Data** in respect of **Embedded Small Power Stations** unless required to do so under PC.A.1.2(b), PC.A.3.1.4 or unless specifically requested under PC.A.5.1.4 below, in which case they will supply such data.

PC.A.5.1.4 PC.A.4.2.4(b) and PC.A.4.3.2(a) explained that the forecast **Demand** submitted by each **Network Operator** must be net of the output of all **Medium Power Stations** and **Small Power Stations** and **Customer Generating Plant Embedded** within that **User's System**. In such cases, the **Network Operator** must provide **The Company** with the relevant information specified under PC.A.3.1.4 . On receipt of this data further details may be required at **The Company's** discretion as follows:

- (i) in the case of details required from the **Network Operator** for **Embedded Medium Power Stations** not subject to a **Bilateral Agreement** and **Embedded DC Converter Stations** not subject to a **Bilateral Agreement** and **Embedded HVDC Systems** not subject to a **Bilateral Agreement** and **Embedded Small Power Stations** and **Embedded DC Converters** and **Embedded HVDC Systems** in each case within such **Network Operator's System** and **Customer Generating Plant**; and
- (ii) in the case of details required from the **Generator** of **Embedded Large Power Stations** and **Embedded Medium Power Stations** subject to a **Bilateral Agreement**; and
- (iii) in the case of details required from the **DC Converter Station** owner of an **Embedded DC Converter** or **DC Converter Station** or **HVDC System Owner** of an **Embedded HVDC System Owner** subject to a **Bilateral Agreement**.

both current and forecast, as specified in PC.A.5.2 and PC.A.5.3. Such requirement would arise when **The Company** reasonably considers that the collective effect of a number of such **Embedded Small Power Stations**, **Embedded Medium Power Stations**, **Embedded DC Converter Stations**, **Embedded HVDC Systems**, **DC Converters** and **Customer Generating Plants** may have a significant system effect on the **National Electricity Transmission System**.

PC.A.5.1.5 DPD I and DPD II

The **Detailed Planning Data** described in this Part 2 of Appendix A comprises both **DPD I** and **DPD II**. The required data is listed and collated in the **Data Registration Code**. The **Users** need to refer to the **DRC** to establish whether data referred to here is **DPD I** or **DPD II**.

PC.A.5.2 Demand

PC.A.5.2.1 For each **Generating Unit** (including **Synchronous Generating Units** within a **Synchronous Power Generating Module**) which has an associated **Unit Transformer**, the value of the **Demand** supplied through this **Unit Transformer** when the **Generating Unit** is at **Rated MW** output is to be provided.

PC.A.5.2.2 Where the **Power Station** or **DC Converter Station** or **HVDC System** has associated **Demand** additional to the unit-supplied **Demand** of PC.A.5.2.1 which is supplied from either the **National Electricity Transmission System** or the **Generator's User System** the **Generator**, **DC Converter Station** owner, **HVDC System Owner** or the **Network Operator** (in the case of **Embedded Medium Power Stations** not subject to a **Bilateral Agreement** within its **System**), as the case may be, shall supply forecasts for each **Power Station** or **DC Converter Station** or **HVDC System** of:

- (a) the maximum **Demand** that, in the **User's** opinion, could reasonably be imposed on the **National Electricity Transmission System** or the **Generator's User System** as appropriate;
- (b) the **Demand** at the time of the peak **National Electricity Transmission System Demand**
- (c) the **Demand** at the time of minimum **National Electricity Transmission System Demand**.

PC.A.5.2.3 No later than calendar week 17 each year **The Company** shall notify each **Generator** in respect of its **Large Power Stations** and its **Medium Power Stations** and each **DC Converter** owner in respect of its **DC Converter Station** and each **HVDC System Owner** in respect of its **HVDC System** subject to a **Bilateral Agreement** and each **Network Operator** in respect of each **Embedded Medium Power Station** not subject to a **Bilateral Agreement** and each **Embedded DC Converter Station** or **Embedded HVDC System** not subject to a **Bilateral Agreement** within such **Network Operator's System** in writing of the following, for the current **Financial Year** and for each of the following nine **Financial Years**, which will be regarded as the relevant specified days and times under PC.A.5.2.2:

- (a) the date and time of the annual peak of the **National Electricity Transmission System Demand** at **Annual ACS Conditions**;
- (b) the date and time of the annual minimum of the **National Electricity Transmission System Demand** at **Average Conditions**.

PC.A.5.2.4 At its discretion, **The Company** may also request further details of the **Demand** as specified in PC.A.4.6

PC.A.5.2.5 In the case of **OTSDUW Plant and Apparatus** the following data shall be supplied:

- (a) The maximum **Demand** that could occur at the **Interface Point** and each **Connection Point** (in MW and MVar);
- (b) **Demand** at specified time of annual peak half hour of **National Electricity Transmission System Demand** at **Annual ACS Conditions** (in MW and MVar); and
- (c) **Demand** at specified time of annual minimum half-hour of **National Electricity Transmission System Demand** (in MW and MVar).

For the avoidance of doubt, **Demand** data associated with **Generators** undertaking **OTSDUW** which utilise an **OTSDUW DC Converter** should supply data under PC.A.4.

PC.A.5.3 Synchronous Power Generating Modules, Synchronous Generating Unit and Associated Control System Data

PC.A.5.3.1 The data submitted below are not intended to constrain any **Ancillary Services Agreement**

PC.A.5.3.2 The following **Synchronous Generating Unit** (including **Synchronous Generating Units** within a **Synchronous Power Generating Module**) and **Power Station** data should be supplied:

- (a) **Synchronous Generating Unit Parameters**

Rated terminal volts (kV)

Maximum terminal voltage set point (kV)

Terminal voltage set point step resolution – if not continuous (kV)

* Rated MVA

* **Rated MW**

* Minimum Generation MW

* Short circuit ratio

Direct axis synchronous reactance

* Direct axis transient reactance

Direct axis sub-transient reactance

Direct axis short-circuit transient time constant

Direct axis short-circuit sub-transient time constant

Quadrature axis synchronous reactance

Quadrature axis sub-transient reactance

Quadrature axis short-circuit sub-transient time constant.

Stator time constant

Stator leakage reactance

Armature winding direct-current resistance.

Note: The above data item relating to armature winding direct-current resistance need only be supplied with respect to **Generating Units** commissioned after 1st March 1996 and in cases where, for whatever reason, the **Generator** or the **Network Operator**, as the case may be is aware of the value of the relevant parameter.

- * Turbogenerator inertia constant (MWsec/MVA)

Rated field current (amps) at **Rated MW** and MVA_r output and at rated terminal voltage.

Field current (amps) open circuit saturation curve for **Generating Unit** terminal voltages ranging from 50% to 120% of rated value in 10% steps as derived from appropriate manufacturers test certificates.

(b) Parameters for **Generating Unit** Step-up Transformers

- * Rated MVA

Voltage ratio

- * Positive sequence reactance (at max, min, & nominal tap)

Positive sequence resistance (at max, min, & nominal tap)

Zero phase sequence reactance

Tap changer range

Tap changer step size

Tap changer type: on load or off circuit

(c) Excitation Control System parameters

Note: The data items requested under Option 1 below may continue to be provided in relation to **Generating Units** connected to the **System** at 09 January 1995 (in this paragraph, the "relevant date") or the new data items set out under Option 2 may be provided. **Generators** or **Network Operators**, as the case may be, must supply the data as set out under Option 2 (and not those under Option 1) for **Generating Unit** excitation control systems commissioned after the relevant date, those **Generating Unit** excitation control systems recommissioned for any reason such as refurbishment after the relevant date and **Generating Unit** excitation control systems where, as a result of testing or other process, the **Generator** or **Network Operator**, as the case may be, is aware of the data items listed under Option 2 in relation to that **Generating Unit**.

For any excitation control systems associated with a **Generating Unit** or **Synchronous Power Generating Module** with a **Completion Date** after 1 September 2022 and any **Generating Unit** or **Synchronous Power Generating Module** excitation control systems subject to a control system change or **Modification** after 1 September 2022, the **Generator** should supply the control system model in accordance with PC.A.9. For the avoidance of doubt, excitation control system models as detailed in PC.A.9 may be submitted for any **Generating Unit** regardless of **Completion Date** as an alternative to block diagrams detailed below. The control system model of the **Excitation System** shall include but not limited to, the **PSS** if fitted, **Over-excitation Limiter**, **Under-excitation Limiter** and should have been verified as far as reasonably practicable by simulation studies as representing the expected behaviour of the control system. Additionally the data items listed under Option 2 below are also required.

Option 1

DC gain of Excitation Loop

Rated field voltage

Maximum field voltage

Minimum field voltage

Maximum rate of change of field voltage (rising)

Maximum rate of change of field voltage (falling)

Details of Excitation Loop described in block diagram form showing transfer functions of individual elements.

Dynamic characteristics of **Over-excitation Limiter**

Dynamic characteristics of **Under-excitation Limiter**

Option 2

Excitation System Nominal Response

Rated Field Voltage

No-Load Field Voltage

Excitation System On-Load Positive Ceiling Voltage

Excitation System No-Load Positive Ceiling Voltage

Excitation System No-Load Negative Ceiling Voltage

Stator Current Limiter (applicable only to **Synchronous Power Generating Modules**)

Details of **Excitation System** (including **PSS** if fitted) described in block diagram form showing transfer functions of individual elements.

Details of **Over-excitation Limiter** described in block diagram form showing transfer functions of individual elements.

Details of **Under-excitation Limiter** described in block diagram form showing transfer functions of individual elements.

The block diagrams submitted after 1 January 2009 in respect of the **Excitation System** (including the **Over-excitation Limiter** and the **Under-excitation Limiter**) for **Generating Units** with a **Completion date** after 1 January 2009 or subject to a **Modification** to the **Excitation System** after 1 January 2009, should have been verified as far as reasonably practicable by simulation studies as representing the expected behaviour of the system.

(d) Governor Parameters

Incremental **Droop** values (in %) are required for each **Generating Unit** at six MW loading points (MLP1 to MLP6) as detailed in PC.A.5.5.1 (this data item needs only be provided for **Large Power Stations**).

Note: The data items requested under Option 1 below may continue to be provided by **Generators** in relation to **Generating Units** on the **System** at 09 January 1995 (in this paragraph, the "relevant date") or they may provide the new data items set out under Option 2. **Generators** must supply the data as set out under Option 2 (and not those under Option 1) for **Generating Unit** governor control systems commissioned after the relevant date, those **Generating Unit** governor control systems recommissioned for any reason such as refurbishment after the relevant date and **Generating Unit** governor control systems where, as a result of testing or other process, the **Generator** is aware of the data items listed under Option 2 in relation to that **Generating Unit**. **EU Generators** are also required to submit the data as set out in option 2. Additional data required from **EU Generators** which own or operate **Type C** or **Type D Power Generating Modules** are marked in brackets with an asterisk (eg (*)). For the avoidance of doubt, items marked as (*) need not be supplied by **GB Generators**.

For any governor control systems associated with a **Generating Unit** or **Synchronous Power Generating Module** with a **Completion Date** after 1 September 2022 and any **Generating Unit** or **Synchronous Power Generating Module** governor control systems subject to a control system change or **Modification** after 1 September 2022, the **Generator** should supply the control system model in accordance with PC.A.9. For the avoidance of doubt, governor control system models as detailed in PC.A.9 maybe submitted for any **Generating Unit** regardless of **Completion Date** as an alternative to governor block diagrams. The control system model shall include but not limited to, the governor and prime mover dynamics such as steam flow, boiler, water flow which could impact on representation of the requirements required by the Grid Code. Additional the data items listed under Option 2 are also required.

Option 1

(i) Governor Parameters (for Reheat **Steam Units**)

HP governor average gain MW/Hz
 Speeder motor setting range
 HP governor valve time constant
 HP governor valve opening limits
 HP governor valve rate limits
 Reheater time constant (**Active Energy** stored in reheater)

IP governor average gain MW/Hz
 IP governor setting range
 IP governor valve time constant
 IP governor valve opening limits
 IP governor valve rate limits

Details of acceleration sensitive elements in HP & IP governor loop.
 A governor block diagram showing transfer functions of individual elements.

(ii) Governor Parameters (for Non-Reheat **Steam Units** and **Gas Turbine Units**)

Governor average gain
 Speeder motor setting range
 Time constant of steam or fuel governor valve
 Governor valve opening limits
 Governor valve rate limits

Time constant of turbine

Governor block diagram

The following data items need only be supplied for **Large Power Stations**:

(iii) Boiler & Steam Turbine Data

Boiler Time Constant (Stored **Active Energy**) s

HP turbine response ratio:

proportion of **Primary Response** arising from HP turbine %

HP turbine response ratio:

proportion of High Frequency Response arising from HP turbine %

[End of Option 1]

Option 2

(i) Governor and associated prime mover Parameters - All **Generating Units** (including **Synchronous Generating Units** within a **Synchronous Power Generating Module**)

Governor Block Diagram showing transfer function of individual elements including acceleration sensitive elements.

Governor Time Constant (in seconds)

Speeder Motor Setting Range (%)

Average Gain (MW/Hz)

Governor Deadband need only be provided for **Large Power Stations** owned and operated by **GB Generators** (and both **Frequency Response Deadband** and **Frequency Response Insensitivity** should be supplied in respect of **Type C** and **D Power Generating Modules** within **Large Power Stations** and **Medium Power Stations** excluding **Embedded Medium Power Stations** not subject to a **Bilateral Agreement***) owned and operated by **EU Code Generators**.

- Maximum Setting $\pm$ Hz

- Normal Setting $\pm$ Hz

- Minimum Setting $\pm$ Hz

Where the **Generating Unit** governor does not have a selectable **Governor Deadband** (or **Frequency Response Deadband** and **Frequency Response Insensitivity**)* facility as specified above, then the actual value of the **Governor Deadband** or (**Frequency Response Deadband** and **Frequency Response Insensitivity**)* need only be provided.

The block diagrams submitted after 1 January 2009 in respect of the governor system for **Generating Units** with a **Completion date** after 1 January 2009 or subject to a **Modification** to the governor system after 1 January 2009, should have been verified as far as reasonably practicable by simulation studies as representing the expected behaviour of the system.

(ii) Governor and associated prime mover Parameters - **Steam Units**

HP Valve Time Constant (in seconds)

HP Valve Opening Limits (%)

HP Valve Opening Rate Limits (%/second)

HP Valve Closing Rate Limits (%/second)

HP Turbine Time Constant (in seconds)

IP Valve Time Constant (in seconds)

IP Valve Opening Limits (%)

IP Valve Opening Rate Limits (%/second)

IP Valve Closing Rate Limits (%/second)

IP Turbine Time Constant (in seconds)

LP Valve Time Constant (in seconds)

LP Valve Opening Limits (%)

LP Valve Opening Rate Limits (%/second)

LP Valve Closing Rate Limits (%/second)

LP Turbine Time Constant (in seconds)

Reheater Time Constant (in seconds)

Boiler Time Constant (in seconds)

HP Power Fraction (%)

IP Power Fraction (%)

(iii) Governor and associated prime mover Parameters - **Gas Turbine Units**

Inlet Guide Vane Time Constant (in seconds)

Inlet Guide Vane Opening Limits (%)

Inlet Guide Vane Opening Rate Limits (%/second)

Inlet Guide Vane Closing Rate Limits (%/second)

Fuel Valve Constant (in seconds)

Fuel Valve Opening Limits (%)

Fuel Valve Opening Rate Limits (%/second)

Fuel Valve Closing Rate Limits (%/second)

Waste Heat Recovery Boiler Time Constant (in seconds)

(iv) Governor and associated prime mover Parameters - Hydro Generating Units

Guide Vane Actuator Time Constant (in seconds)

Guide Vane Opening Limits (%)

Guide Vane Opening Rate Limits (%/second)

Guide Vane Closing Rate Limits (%/second)

Water Time Constant (in seconds)

(v) Governor Parameters – Synchronous Electricity Storage Units

For **Synchronous Electricity Storage Modules** which are derived from compressed air energy storage systems, the following data should be provided. For other **Synchronous Electricity Storage Modules**, data should be supplied as required by **The Company** in accordance with PC.A.7

Valve Actuator Time Constant (in seconds)

Valve Opening Limits (%)
 Valve Opening Rate Limits (%/second)
 Valve Closing Rate Limits (%/second)

[End of Option 2]

(e) Unit Control Options

The following data items need only be supplied with respect to **Large Power Stations**:

Maximum Droop	%
Normal Droop	%
Minimum Droop	%
Maximum Governor Deadband or (maximum Frequency Response Deadband and maximum Frequency Response Insensitivity*)	±Hz
Normal Governor Deadband or (normal Frequency Response Deadband and normal Frequency Response Insensitivity*)	±Hz
Minimum Governor Deadband or (minimum Frequency Response Deadband and minimum Frequency Response Insensitivity*)	±Hz
Maximum output Governor Deadband (or maximum output Frequency Response Deadband and maximum Frequency Response Insensitivity*)	±MW
Normal output Governor Deadband (or normal output Frequency Response Deadband and normal output Frequency Response Insensitivity*)	±MW
Minimum output Governor Deadband or (minimum output Frequency Response Deadband and minimum output Frequency Response Insensitivity*)	±MW

Frequency settings between which Unit Load Controller **Droop** applies:

- Maximum	Hz
- Normal	Hz
- Minimum	Hz

State if sustained response is normally selected.

(* **GB Generators** which are not required to satisfy the requirements of the **European Connection Conditions** are not required to supply **Frequency Response Insensitivity** or **Frequency Response Deadband** data but should instead supply **Governor Deadband** data). For the avoidance of doubt, **EU Code Generators** in respect of **Type C** and **Type D Power Generating Modules** are required to supply **Frequency Response Deadband** and **Frequency Response Insensitivity** data).

(f) Plant Flexibility Performance

The following data items need only be supplied with respect to **Large Power Stations**, and should be provided with respect to each **Genset**:

Run-up rate to **Registered Capacity**,
 # Run-down rate from **Registered Capacity**,
 # **Synchronising Generation**,
 Regulating range
 Load rejection capability while still **Synchronised** and able to supply **Load**.

Data items marked with a hash (#) should be applicable to a **Genset** which has been **Shutdown** for 48 hours.

- * Data items marked with an asterisk are already requested under partx1, PC.A.3.3.1, to facilitate an early assessment by **The Company** as to whether detailed stability studies will be required before an offer of terms for a **CUSC Contract** can be made. Such data items have been repeated here merely for completeness and need not, of course, be resubmitted unless their values, known or estimated, have changed.

(g) **Generating Unit Mechanical Parameters**

It is occasionally necessary for **The Company** to assess the interaction between the **Total System** and the mechanical components of **Generating Units**. For **Generating Units** (including **Synchronous Generating Units** within a **Synchronous Power Generating Module**) with a **Completion Date** on or after 01 April 2015,

or:

with a **Completion Date** before 01 April 2015 when requested by **The Company** in accordance with good industry practice and without undue delay.

the following data items should be supplied:

The number of turbine generator masses.

Diagram showing the Inertia and parameters for each turbine generator mass (kgm²) and Stiffness constants and parameters between each turbine generator mass for the complete drive train (Nm/rad).

Number of poles.

Relative power applied to different parts of the turbine (%).

Torsional mode frequencies (Hz).

Modal damping decrement factors for the different mechanical modes.

PC.A.5.4 **Power Park Module, Non-Synchronous Generating Unit and Associated Control System Data**

PC.A.5.4.1 The data submitted below are not intended to constrain any **Ancillary Services Agreement**

PC.A.5.4.2 The following **Power Park Unit**, **Power Park Module** and **Power Station** data should be supplied in the case of a **Power Park Module** not connected to the **Total System** by a **DC Converter** or **HVDC System** (and in the case of PC.A.5.4.2(f) any **OTSUA**):

Where a **Manufacturer's Data & Performance Report** exists in respect of the model of the **Power Park Unit**, the **User** may subject to **The Company's** agreement, opt to reference the **Manufacturer's Data & Performance Report** as an alternative to the provision of data in accordance with PC.A.5.4.2 except for:

- (1) the section marked thus # at sub paragraph (b); and
- (2) all of the harmonic and flicker parameters required under sub paragraph (h); and
- (3) all of the site specific model parameters relating to the voltage or frequency control systems required under sub paragraphs (d) and (e),

which must be provided by the **User** in addition to the **Manufacturer's Data & Performance Report** reference.

(a) **Power Park Unit** model

A mathematical model of each type of **Power Park Unit** (including **Electricity Storage Units**) capable of representing its transient and dynamic behaviour under both small and large disturbance conditions. The model shall include non-linear effects and represent all equipment relevant to the dynamic performance of the **Power Park Unit** as agreed with **The Company**. The model shall be suitable for the study of balanced, root mean square, positive phase sequence time-domain behaviour, excluding the effects of electromagnetic transients, harmonic and sub-harmonic frequencies.

The model shall accurately represent the overall performance of the **Power Park Unit** over its entire operating range including that which is inherent to the **Power Park Unit** and that which is achieved by use of supplementary control systems providing either continuous or stepwise control. Model resolution should be sufficient to accurately represent **Power Park Unit** behaviour both in response to operation of **Transmission System** protection and in the context of longer-term simulations.

The overall structure of the model shall include:

- (i) any supplementary control signal modules not covered by (c), (d) and (e) below.
- (ii) any blocking, deblocking and protective trip features that are part of the **Power Park Unit** (e.g. "crowbar").
- (iii) any other information required to model the **Power Park Unit** behaviour to meet the model functional requirement described above.

The model shall be submitted in the form of a transfer function block diagram and may be accompanied by dynamic and algebraic equations.

This model shall display all the transfer functions and their parameter values, any non wind-up logic, signal limits and non-linearities.

The submitted **Power Park Unit** model and the supplementary control signal module models covered by (c), (d) and (e) below shall have been validated and this shall be confirmed by the **Generator**. The validation shall be based on comparing the submitted model simulation results against measured test results. Validation evidence shall also be submitted and this shall include the simulation and measured test results. The latter shall include appropriate short-circuit tests. In the case of an **Embedded Medium Power Station** not subject to a **Bilateral Agreement** the **Network Operator** will provide **The Company** with the validation evidence if requested by **The Company**. The validation of the supplementary control signal module models covered by (c), (d) and (e) below applies only to a **Power Park Module** with a **Completion Date** after 1 January 2009 or **Power Park Modules** within a **Power Generating Module**.

(b) **Power Park Unit** parameters

- * Rated MVA
- * **Rated MW**
- * Rated terminal voltage
- * Average site air density (kg/m^3), maximum site air density (kg/m^3) and minimum site air density (kg/m^3) for the year (as applicable)

Year for which the air density is submitted (as applicable)

Number of pole pairs (as applicable)

Blade swept area (m^2) (as applicable)

Gear box ratio (as applicable)

Mechanical drive train (as applicable)

For each **Power Park Unit**, details of the parameters of the drive train (as applicable) represented as an equivalent two mass model should be provided. This model should accurately represent the behaviour of the complete drive train for the purposes of power system analysis studies and should include the following data items:-

Equivalent inertia constant (MWsec/MVA) of the first mass (e.g. wind turbine rotor and blades) at minimum, synchronous and rated speeds

Equivalent inertia constant (MWsec/MVA) of the second mass (e.g. generator rotor) at minimum, synchronous and rated speeds

Equivalent shaft stiffness between the two masses (Nm/electrical radian)

Additionally, for **Power Park Units** that are induction generators (e.g. squirrel cage, doubly-fed) driven by wind turbines:

- * Stator resistance
- * Stator reactance
- * Magnetising reactance.
- * Rotor resistance.(at starting)
- * Rotor resistance.(at rated running)
- * Rotor reactance (at starting)
- * Rotor reactance (at rated running)

Additionally for doubly-fed induction generators only:

The generator rotor speed range (minimum and maximum speeds in RPM)

The optimum generator rotor speed versus wind speed submitted in tabular format

Power converter rating (MVA)

The rotor power coefficient (C_p) versus tip speed ratio (λ) curves for a range of blade angles (where applicable) together with the corresponding values submitted in tabular format. The tip speed ratio (λ) is defined as $\Omega R/U$ where Ω is the angular velocity of the rotor, R is the radius of the wind turbine rotor and U is the wind speed.

The electrical power output versus generator rotor speed for a range of wind speeds over the entire operating range of the **Power Park Unit**, together with the corresponding values submitted in tabular format.

The blade angle versus wind speed curve together with the corresponding values submitted in tabular format.

The electrical power output versus wind speed over the entire operating range of the **Power Park Unit**, together with the corresponding values submitted in tabular format.

Transfer function block diagram, including parameters and description of the operation of the power electronic converter and fault ride through capability (where applicable). For any **Power Park Units** in a **Power Park Module** with a **Completion Date** after 1 September 2022 and any **Power Park Units** subject to a control system change or **Modification** after 1 September 2022 control system models in accordance with PC.A.9 should be supplied. For the avoidance of doubt, a **User** may submit control system models as detailed in PC.A.9 for any **Power Park Unit** regardless of **Power Park Module Completion Date** as an alternative to this paragraph.

For a **Power Park Unit** consisting of a synchronous machine in combination with a back to back **DC Converter** or **HVDC System**, or for a **Power Park Unit** not driven by a wind turbine, the data to be supplied shall be agreed with **The Company** in accordance with PC.A.7.

(c) Torque / speed and blade angle control systems and parameters

For the type of **Power Park Unit** (as applicable), details of the torque / speed controller and blade angle controller in the case of a wind turbine and power limitation functions (where applicable) described in block diagram form showing transfer functions and parameters of individual elements.

(d) Voltage/**Reactive Power/Power Factor** control system parameters

For the **Power Park Unit** and **Power Park Module** details of voltage/**Reactive Power/Power Factor** controller (and **PSS** if fitted) described in block diagram form showing transfer functions and parameters of individual elements.

(e) **Frequency** control system parameters

For the **Power Park Unit** and **Power Park Module** details of the **Frequency** controller described in block diagram form showing transfer functions and parameters of individual elements.

(f) **Protection**

Details of settings for the following **Protection** relays (to include): Under **Frequency**, over **Frequency**, under voltage, over voltage, rotor over current, stator over current, high wind speed shut down level.

(g) Complete **Power Park Unit** model, parameters and controls

(i) For any **Power Park Units** in a **Power Park Module** with a **Completion Date** after 1 September 2022 and any **Power Park Units** and/or **Power Park Module(s)** subject to a control system change or **Modification** after 1 September 2022, control system models in accordance with PC.A.9 should be supplied covering the full information required under PC.A.5.4.2 (a), (b), (c), (d), (e) and (f).

(ii) For any **Power Park Units** in a **Power Park Module** with a **Completion Date** before 1 September 2022 as an alternative to PC.A.5.4.2 (a), (b), (c), (d), (e) and (f), is the submission of a single complete model that consists of the full information required under PC.A.5.4.2 (a), (b), (c), (d), (e) and (f) provided that all the information required under PC.A.5.4.2 (a), (b), (c), (d), (e) and (f) individually is clearly identifiable. For the avoidance of doubt, a **User** may submit control system models as detailed in PC.A.9 for any **Power Park Unit** or **Power Park Module** regardless of **Completion Date** as an alternative to this clause.

(h) Harmonic and flicker parameters

When connecting a **Power Park Module**, it is necessary for **The Company** to evaluate the production of flicker and harmonics on the **National Electricity Transmission System** and **User's Systems**. At **The Company's** reasonable request, the **User** (a **Network Operator** in the case of an **Embedded Power Park Module** not subject to a **Bilateral Agreement**) is required to submit the following data (as defined in IEC 61400-21 (2001)) for each **Power Park Unit**:-

Flicker coefficient for continuous operation.

Flicker step factor.

Number of switching operations in a 10 minute window.

Number of switching operations in a 2 hour window.

Voltage change factor.

Current Injection at each harmonic for each **Power Park Unit** and for each **Power Park Module**.

* Data items marked with an asterisk are already requested under part 1, PC.A.3.3.1, to facilitate an early assessment by **The Company** as to whether detailed stability studies will be required before an offer of terms for a **CUSC Contract** can be made. Such data items have been repeated here merely for completeness and need not, of course, be resubmitted unless their values, known or estimated, have changed.

PC.A.5.4.3 DC Converter and HVDC Systems

PC.A.5.4.3.1 For a **DC Converter** at a **DC Converter Station** or an **HVDC System** connected to the **Total System** by a **DC Converter** or **HVDC System** (or in the case of **OTSUA** which includes an **OTSDUW DC Converter**) the following information for each **DC Converter**, **HVDC System** and **DC Network** should be supplied:

(a) **DC Converter** and **HVDC System** parameters

- * **Rated MW** per pole for transfer in each direction;
- * **DC Converter** type (i.e. current or voltage source (including a **HVDC Converter** in an **HVDC System**));
- * Number of poles and pole arrangement;
- * Rated DC voltage/pole (kV);
- * Return path arrangement;

(b) **DC Converter** and **HVDC System** transformer parameters

Rated MVA

Nominal primary voltage (kV);

Nominal secondary (converter-side) voltage(s) (kV);

Winding and earthing arrangement;

Positive phase sequence reactance at minimum, maximum and nominal tap;

Positive phase sequence resistance at minimum, maximum and nominal tap;

Zero phase sequence reactance;

Tap-changer range in %;

number of tap-changer steps;

(c) **DC Network** parameters

Rated DC voltage per pole;

Rated DC current per pole;

Single line diagram of the complete **DC Network** and **HVDC System**;

Details of the complete **DC Network**, including resistance, inductance and capacitance of all DC cables and/or DC lines and **HVDC System**;

Details of any DC reactors (including DC reactor resistance), DC capacitors and/or DC-side filters that form part of the **DC Network** and/or **HVDC System**;

(d) AC filter reactive compensation equipment parameters

Note: The data provided pursuant to this paragraph must not include any contribution from reactive compensation plant.

Total number of AC filter banks.

Type of equipment (e.g. fixed or variable)

Single line diagram of filter arrangement and connections;

Reactive Power rating for each AC filter bank, capacitor bank or operating range of each item of reactive compensation equipment, at rated voltage;

Performance chart showing **Reactive Power** capability of the **DC Converter** and **HVDC System**, as a function of MW transfer, with all filters and reactive compensation plant, belonging to the **DC Converter Station** or **HVDC System** working correctly.

Note: Details in PC.A.5.4.3.1 are required for each **DC Converter** connected to the **DC Network** and **HVDC System**, unless each is identical or where the data has already been submitted for an identical **DC Converter** or **HVDC System** at another **Connection Point**.

Note: For a **Power Park Module** and **DC Connected Power Park Module** connected to the **Grid Entry Point** or (**User System Entry Point** if **Embedded**) by a **DC Converter** or **HVDC System** the equivalent inertia and fault infeed at the **Power Park Unit** should be given.

DC Converter and HVDC System Control System Models

PC.A.5.4.3.2 The following data is required by **The Company** to represent **DC Converters** and associated **DC Networks** and **HVDC Systems** (and including **OTSUA** which includes an **OTSDUW DC Converter**) in dynamic power system simulations,

- (a) For **DC Converters** and **HVDC Systems** with a **Completion Date** before 1 September 2022 in which the AC power system is typically represented by a positive sequence equivalent, it is acceptable to represent **DC Converters** and **HVDC Systems** by simplified equations rather than to the switching device level.
 - (i) Static $V_{DC}-I_{DC}$ (DC voltage - DC current) characteristics, for both the rectifier and inverter modes for a current source converter. Static $V_{DC}-P_{DC}$ (DC voltage - DC power) characteristics, for both the rectifier and inverter modes for a voltage source converter. Transfer function block diagram including parameters representation of the control systems of each **DC Converter** and of the **DC Converter Station** and the **HVDC System**, for both the rectifier and inverter modes. A suitable model would feature the **DC Converter** or **HVDC Converter** firing angle as the output variable.
 - (ii) Transfer function block diagram representation including parameters of the **DC Converter** or **HVDC Converter** transformer tap changer control systems, including time delays
 - (iii) Transfer function block diagram representation including parameters of AC filter and reactive compensation equipment control systems, including any time delays.
 - (iv) Transfer function block diagram representation including parameters of any **Frequency** and/or load control systems.
 - (v) Transfer function block diagram representation including parameters of any small signal modulation controls such as power oscillation damping controls or sub-synchronous oscillation damping controls, that have not been submitted as part of the above control system data.
 - (vi) Transfer block diagram representation of the **Reactive Power** control at converter ends for a voltage source converter.

In addition and where not provided for above, **HVDC System Owners** and **Generators** in respect of **OTSDUW DC Converters** who are also **EU Code Users** shall also provide the following dynamic simulation sub-models

- (i) **HVDC Converter** unit models
- (ii) AC component models
- (iii) DC Grid models
- (iv) Voltage and power controller
- (v) Special control features if applicable (eg power oscillation damping (POD) function, subsynchronous torsional interaction (SSTI) control;
- (vi) Multi terminal control, if applicable
- (vii) **HVDC System** protection models as agreed between **The Company** and the **HVDC System Owner**

HVDC System Owners are also required to supply an equivalent model of the control system when adverse control interactions may result with **HVDC Converter Stations** and other connections in close proximity if requested by **The Company**. The equivalent model shall contain all necessary data for the realistic simulation of the adverse control interactions.

- (b) For any **DC Converters** and **HVDC Systems** with a **Completion Date** after 1 September 2022 and any **DC Converters** and **HVDC Systems** subject to a control system change or **Modification** after 1 September 2022, control system models in accordance with PC.A.9 should be supplied covering the full functionality required under PC.A.5.4.3.2 (a).

For the avoidance of doubt a **User** may submit control system models as detailed in PC.A.9 for any **DC Converters** and **HVDC Systems** regardless of **Completion Date** as an alternative to PC.A.5.4.3.2(a).

Plant Flexibility Performance

PC.A.5.4.3.3 The following information on plant flexibility and performance should be supplied (and also in respect of **OTSUA** which includes an **OTSDUW DC Converter**):

- (i) Nominal and maximum (emergency) loading rate with the **DC Converter** or **HVDC Converter** in rectifier mode.
- (ii) Nominal and maximum (emergency) loading rate with the **DC Converter** or **HVDC Converter** in inverter mode.
- (iii) Maximum recovery time, to 90% of pre-fault loading, following an AC system fault or severe voltage depression.
- (iv) Maximum recovery time, to 90% of pre-fault loading, following a transient **DC Network** fault.

Harmonic Assessment Information

PC.A.5.4.3.4 **DC Converter** owners and **HVDC System Owners** shall provide such additional further information as required by **The Company** in order that compliance with CC.6.1.5 or ECC.6.1.5 can be demonstrated.

* Data items marked with an asterisk are already requested under part 1, PC.A.3.3.1, to facilitate an early assessment by **The Company** as to whether detailed stability studies will be required before an offer of terms for a **CUSC Contract** can be made. Such data items have been repeated here merely for completeness and need not, of course, be resubmitted unless their values, known or estimated, have changed.

PC.A.5.5 Response Data For Frequency Changes

The information detailed below is required to describe the actual frequency response capability profile as illustrated in Figure CC.A.3.1 of the **Connection Conditions** or Figure ECC.A.3.1 of the **European Connection Conditions**, and need only be provided for each:

- (i) **Genset at Large Power Stations**; and
- (ii) **Generating Unit** (including **Synchronous Generating Units** within a **Synchronous Power Generating Module**), **Power Park Module** (including a **DC Connected Power Park Module**) or **CCGT Module** at a **Medium Power Station** or **DC Converter Station** or **HVDC System** that has agreed to provide **Frequency** response in accordance with a **CUSC Contract**.

In the case of (ii) above for the rest of this PC.A.5.5 where reference is made to **Gensets**, it shall include such **Generating Units** (including **Synchronous Generating Units** within a **Synchronous Power Generating Module**), **CCGT Modules**, **Power Park Modules** (including **DC Connected Power Park Modules**), **HVDC Systems** and **DC Converters** as appropriate, but excludes **OTSDUW Plant and Apparatus** utilising **OTSDUW DC Converters**.

In this PC.A.5.5, for a **CCGT Module** with more than one **Generating Unit**, the phrase **Minimum Generation** or **Minimum Regulating Level** applies to the entire **CCGT Module** operating with all **Generating Units** (including **Synchronous Generating Units** within a **Synchronous Power Generating Module**) **Synchronised** to the **System**. Similarly for a **Power Park Module** (including a **DC Connected Power Park Module**) with more than one **Power Park Unit**, the phrase **Minimum Generation** or **Minimum Regulating Level** applies to the entire **Power Park Module** operating with all **Power Park Units Synchronised** to the **System**.

PC.A.5.5.1 MW Loading Points At Which Data Is Required

Response values are required at six MW loading points (MLP1 to MLP6) for each **Genset**. **Primary** and **Secondary Response** values need not be provided for MW loading points which are below **Minimum Generation** or **Minimum Stable Operating Level**. MLP1 to MLP6 must be provided to the nearest MW.

Prior to the **Genset** being first **Synchronised**, the MW loading points must take the following values :

MLP1	Designed Minimum Operating Level or Minimum Regulating Level
MLP2	Minimum Generation or Minimum Stable Operating Level
MLP3	70% of Registered Capacity or Maximum Capacity
MLP4	80% of Registered Capacity or Maximum Capacity
MLP5	95% of Registered Capacity or Maximum Capacity
MLP6	Registered Capacity or Maximum Capacity

When data is provided after the **Genset** is first **Synchronised**, the MW loading points may take any value between the **Designed Minimum Operating Level** or **Minimum Regulating Level** and **Registered Capacity** or **Maximum Capacity** but the value of the **Designed Minimum Operating Level** or **Minimum Regulating Level** must still be provided if it does not form one of the MW loading points.

PC.A.5.5.2 Primary And Secondary Response To Frequency Fall

Primary and **Secondary Response** values for a -0.5Hz ramp are required at six MW loading points (MLP1 to MLP6) as detailed above

PC.A.5.5.3 High Frequency Response To Frequency Rise

High Frequency Response values for a +0.5Hz ramp are required at six MW loading points (MLP1 to MLP6) as detailed above.

PC.A.5.5.4 Each **Generator** or **Defence Service Provider** or **Restoration Contractor** or **Non-Embedded Customer** in respect of an **Electricity Storage Module**, shall provide **Frequency** response curves that demonstrate the ability of their **Electricity Storage Modules** to transition from a mode analogous to **Demand** to a mode analogous to generation (excluding **Auxiliary Supplies**) within a period of 20 seconds or less in accordance with the requirements of ECC.6.3.7.2.3, unless the provisions of ECC.6.3.7.2.3.1 apply where the requirements of OC6.6.6. relate.

PC.A.5.6 Mothballed Power Generating Module, Mothballed Generating Unit, Mothballed Power Park Module (including DC Connected Power Park Modules), Mothballed HVDC Systems or Mothballed DC Converter at a DC Converter Station And Alternative Fuel Information

Data identified under this section PC.A.5.6 must be submitted as required under PC.A.1.2 and at **The Company's** reasonable request.

In the case of **Embedded Medium Power Stations** not subject to a **Bilateral Agreement**, **Embedded HVDC Systems** not subject to a **Bilateral Agreement** and **Embedded DC Converter Stations** not subject to a **Bilateral Agreement**, upon request from **The Company** each **Network Operator** shall provide the information required in PC.A.5.6.1, PC.A.5.6.2, PC.A.5.6.3 and PC.A.5.6.4 on respect of such **Embedded Medium Power Stations** and **Embedded DC Converters Stations** and **Embedded HVDC Systems** with their **System**.

PC.A.5.6.1 Mothballed Generating Unit Information

Generators, HVDC System Owners and DC Converter Station owners must supply with respect to each **Mothballed Power Generating Module, Mothballed Generating Unit, Mothballed Power Park Module** (including a **DC Connected Power Park Module**), **Mothballed HVDC System** or **Mothballed DC Converter** at a **DC Converter Station** the estimated **MW** output which could be returned to service within the following time periods from the time that a decision to return was made:

- < 1 month;
- 1-2 months;
- 2-3 months;
- 3-6 months;
- 6-12 months; and
- >12 months.

The return to service time should be determined in accordance with **Good Industry Practice** assuming normal working arrangements and normal plant procurement lead times. The MW output values should be the incremental values made available in each time period as further described in the **DRC**.

PC.A.5.6.2 **Generators, HVDC System Owners and DC Converter Station** owners must also notify **The Company** of any significant factors which may prevent the **Mothballed Power Generating Module, Mothballed Generating Unit, Mothballed Power Park Module** (including **DC Connected Power Park Modules**), **Mothballed HVDC Systems** or **Mothballed DC Converter** at a **DC Converter Station** achieving the estimated values provided under PC.A.5.6.1 above, excluding factors relating to **Transmission Entry Capacity**.

PC.A.5.6.3 Alternative Fuel Information

The following data items must be supplied with respect to each **Generating Unit** (including **Synchronous Generating Units** within a **Synchronous Power Generating Module**) whose main fuel is gas.

For each alternative fuel type (if facility installed):

- (a) Alternative fuel type e.g. oil distillate, alternative gas supply
- (b) For the changeover from main to alternative fuel:
 - Time to carry out off-line and on-line fuel changeover (minutes).
 - Maximum output following off-line and on-line changeover (MW).
 - Maximum output during on-line fuel changeover (MW).
 - Maximum operating time at full load assuming typical and maximum possible stock levels (hours).
 - Maximum rate of replacement of depleted stocks (MWh electrical/day) on the basis of **Good Industry Practice**.
 - Is changeover to alternative fuel used in normal operating arrangements?
 - Number of successful changeovers carried out in the last of **The Company's Financial Year** (choice of 0, 1-5, 6-10, 11-20, >20).

(c) For the changeover back to main fuel:

- Time to carry out off-line and on-line fuel changeover (minutes).
- Maximum output during on-line fuel changeover (MW).

PC.A.5.6.4 **Generators** must also notify **The Company** of any significant factors and their effects which may prevent the use of alternative fuels achieving the estimated values provided under PC.A.5.6.3 above (e.g. emissions limits, distilled water stocks etc.)

PC.A.5.7 System Restoration Related Information

PC.A.5.7.1 Data identified under this section PC.A.5.7.1 must be submitted as required under PC.A.1.2. This information may also be requested by **The Company** during **System Restoration** and should be provided by **Generators**, **HVDC System Owners** and **DC Converter Station Owners** where reasonably possible. For the avoidance of doubt, **Generators** in this section PC.A.5.7.1 means each **Generator** in respect of their **BM Unit** at any directly connected **Power Station** or **Large Power Station** (excluding **Generators** in respect of **Embedded Medium Power Stations** and **Embedded Small Power Stations**).

The data items/text in (a) and (b) below must be supplied, by each **Generator** and **HVDC System Owner** and **DC Converter Station** owner to **The Company**. In the case of **Generators**, the data supplied should be with respect to each **BM Unit** at any directly connected **Power Station** or **Large Power Station**. For the avoidance of doubt, the data required under PC.A.5.7.1(a) and (b) below, i) does not need to be supplied in respect of **Restoration Contractors Plant** and ii), only needs to be supplied in respect of each **BM Unit** at a **Large Power Station** or any directly connected **Power Station** and does not need to include **Generating Unit** data;

- (a) The expected time for each **BM Unit** to be **Synchronised** following a **Total Shutdown** or **Partial Shutdown**. The assessment should include the **Power Stations** or **HVDC Systems** or **DC Converter Stations** ability to re-synchronise all **BM Units**, if all were running immediately prior to the **Total Shutdown** or **Partial Shutdown** once auxiliary supplies have been restored, or supplies have been restored to the **User's Site** where the **Plant** was running immediately prior to the **Shutdown**) and at time intervals of 12 hours, 24 hours, 36 hours, 48 hours and 72 hours before the **BM Unit** had been **Shutdown**. Additionally this should highlight any specific issues (i.e. those that would have an impact on the **BM Unit's** time to be **Synchronised**) that may arise, as time progresses without external supplies being restored or the availability of primary fuel supplies. In submitting this data, **Generators**, **HVDC System Owners** and **DC Converter Station** owners should be aware of the requirements in CC.7.11 or ECC.7.11.
- (b) **Block Loading Capability**. This should be provided in either graphical or tabular format showing the estimated block loading capability from 0MW to **Registered Capacity** and the time between each incremental step. Any particular **Active Power** loading points at which the **BM Unit** should be operated until further changes in output can be accommodated should also be identified. The data of each **BM Unit** should be provided for the condition of a **Generating Unit** (which was running immediately prior to the **Shutdown**) and at time intervals of 12 hours, 24 hours, 36 hours, 48 hours and 72 hours before the **BM Unit** had been **Shutdown**. In the case of an **HVDC System** or **DC Converter Station**, data should be provided when the **HVDC System** or **DC Converter Station** (which was running immediately prior to the **Shutdown**) and at time intervals of 12 hours, 24 hours, 36 hours, 48 hours and 72 hours prior to the **HVDC System** or **DC Converter Station** had been **Shutdown**. The block loading assessment should be done against a frequency variation of 47.5Hz – 52Hz.

PC.A.5.7.2 Where a **Network Operator** has a **Distribution Restoration Zone Plan** in place, the data specified in this section shall be submitted as required under PC.A.1.2 by **Network Operators** to **The Company** annually by calendar week 28. This information may also be requested by **The Company** from the relevant **Network Operator** during **System Restoration** and should be provided by **Network Operators** where reasonably practicable. **Restoration Contractors** party to a **Distribution Restoration Zone Plan** shall, where reasonably practicable, submit the relevant information to the **Network Operator** who shall then supply the relevant information to **The Company**. The following data shall be provided;

- (a) The expected time for each **Restoration Contractor's Plant** to **Re-Synchronise** to the **Network Operator's System** following a **Total Shutdown** or **Partial Shutdown**. The assessment should include the **Restoration Contractor's** ability to **Re-Synchronise** all their **Plant**, if all were running immediately prior to the **Total Shutdown** or **Partial Shutdown**. Additionally, the data and supporting text should highlight any specific issues (eg those that would affect the time before which the **Restoration Contractor's Plant** could be energised) that may arise as time progresses from **Shutdown** without external supplies being restored or the availability of primary fuel supplies..
- (b) The **Restoration Contractor's Plants Block Loading Capability** as required in PC.A.5.7.1(b).

PC.A.5.7.3 From 31st December 2026 onwards, all **Users** and **Restoration Contractors** are required to confirm annually they comply with the applicable requirements of OC5.7. In the case of **Generators, HVDC System Owners, DC Converter owners, Non-Embedded Customers, and Network Operators** this confirmation shall be provided in their Week 24 submission. From 1st January 2024 until 31st December 2026, evidence to support the work **Generators, HVDC System Owners, DC Converter owners, Non-Embedded Customers, and Network Operators** are carrying out to achieve these requirements on or after 31st December 2026 shall be provided in their Week 24 submission.

PC.A.5.7.4 From 1st January 2025 onwards, **Restoration Contractors, Generators, HVDC System Owners** and **DC Converter** owners, shall supply the governor setting information in accordance with the applicable requirements of CC.6.3.7(g), (h) and (i) or ECC.6.3.7.3.8.

PC.A.5.8 Grid Forming Related Information

PC.A.5.8.1 The following data need only be supplied by **Users** (be they a **GB Code User** or **EU Code User**) or **Non-CUSC Parties** who wish to offer a **Grid Forming Capability** as provided for ECC.6.3.19.3. Where such a **Grid Forming Capability** is provided then the following data items and models are to be supplied.

- (i) Each **GBGF-I** shall be designed so as not to interact and affect the operation, performance, safety or capability of other **User's Plant** and **Apparatus** connected to the **Total System**. To achieve this requirement, each **User** shall be required to submit a **Network Frequency Perturbation Plot** and **Nichols Chart** (or equivalent as agreed with **The Company**) which shall be assessed in accordance with the requirements of ECP.A.3.9.3.

Each **User** or **Non-CUSC Party** is required to supply a high level equivalent architecture diagram of their **Grid Forming Plant** as shown in Figure PC.A.5.8.1 together with the equivalent linear classical block diagram model (using the Laplace Operator) of their **Grid Forming Plant** which should preferably be in the general form shown in Figure PC.A.5.8.1 (a) or Figure PC.A.5.8.1 (b). When submitting either Figure PC.A.5.8.1 (a) or Figure PC.A.5.8.1 (b), each **User** or **Non-CUSC Party** can use their own design, that may be very different to Figures PC.A.5.8.1 (a) or PC.A.5.8.1 (b), but should contain all relevant functions that can include simulation models and other equivalent data and documentation.

Each **User** or **Non-CUSC Party** shall provide a model of their **Grid Forming Plant** which provides a true and accurate reflection of its **Grid Forming Capability**.

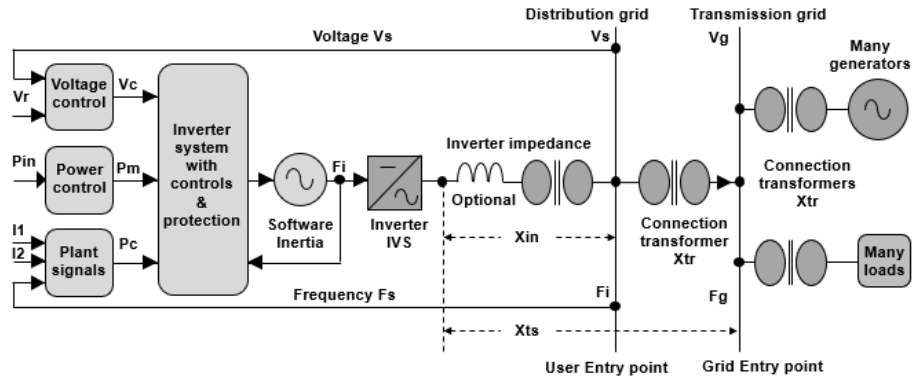


Figure PC.A.5.8.1

Typical simulation model 1

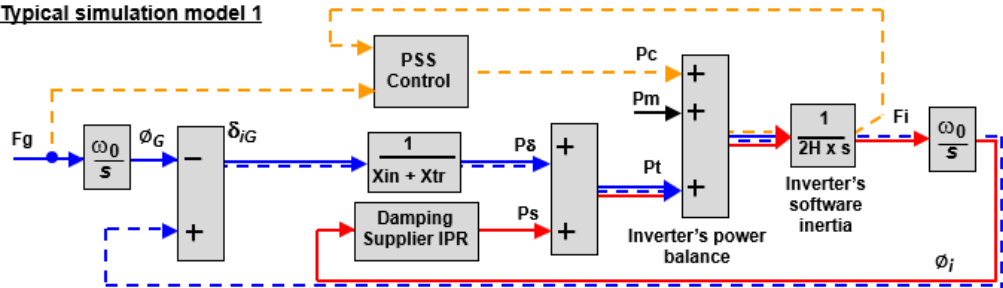


Figure PC.A.5.8.1 (a) Preferred simplified diagram of a **GBGF-I** with a **Power System Stabiliser "PSS"** that can add damping to the **GBGF-I's** closed loop function shown by the solid red line and the dotted blue line.

Typical simulation model 2

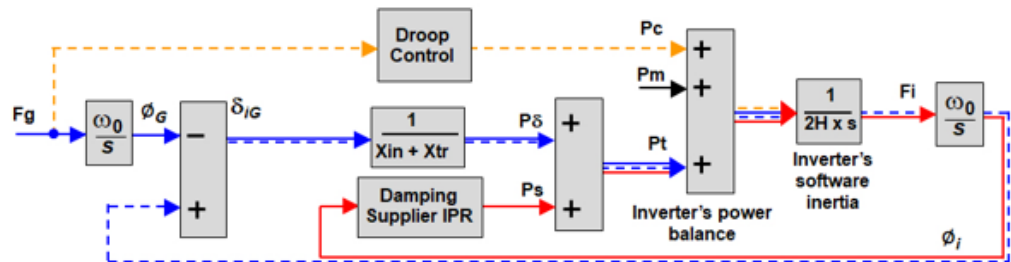


Figure PC.A.5.8.1 (b) – Preferred simplified diagram of a system with a droop control ability that can add **Control-Based Active Droop Power**. This diagram does not add extra closed loop damping to the **GBGF-I's** closed loop function shown by the solid red line and the dotted blue line.

- (ii) In order to participate in the **Grid Forming Capability** market, **User's** and **Non-CUSC Parties** are required to provide data of their **GBGF-I** in accordance with Figures PC.A.5.8.1(a) and PC.A.5.8.1(b). **Users** and **Non-CUSC Parties** in respect of **Grid Forming Plants** should indicate if the data is submitted on a unit or aggregated basis. Table PC.A.5.8.1(a) defines the notation used in Figure PC.5.8.1

Parameter	Symbol	Units
The primary reactance of the Grid Forming Unit , in pu.	X_{in} or X_{ts}	pu on MVA Rating of Grid Forming Unit
The additional reactance, in pu, between the terminals of the Grid Forming Unit and the Grid Entry Point or User System Entry Point (if Embedded).	X_{tr}	pu on MVA Rating of Grid Forming Unit
The rated angle between the Internal Voltage Source and the input terminals of the Grid Forming Unit .		radians
The rated angle between the Internal Voltage Source and Grid Entry Point or User System Entry Point (if Embedded).		radians
The rated voltage and phase of the Internal Voltage Source of the Grid Forming Unit .		Voltage - pu Phase - radians
The rated electrical angle between current and voltage at the input to the Grid transformer.		radians

Table PC.A.5.8.1

- (iii) In order to participate in a **Grid Forming Capability** market, **User's** and **Non-CUSC Parties** are also required to provide the data of their **GBGF-I** in accordance with Table PC.A.5.8.1.2 to **The Company**. The details and arrangements for **Users** and **Non-CUSC Parties** participating in this market shall be published on **The Company's Website**.

Quantity	Units	Range (where Applicable)	User Defined Parameter
Type of Grid Forming Plant (eg Generating Unit , Electricity Storage Module , Dynamic Reactive Compensation Equipment etc)	N/A		
Maximum Continuous Rating at Registered Capacity or Maximum Capacity	MVA		
Primary reactance X_{in} or X_{ts} (see Table PC.A.5.8.1)	pu on MVA		
Additional reactance X_{tr} (See Table PC.A.5.8.1)	pu on MVA		

Maximum Capacity	MW		
Active ROCOF Response Power (MW) injected or absorbed at 1Hz/s System Frequency change (which is the maximum frequency change for linear operation of the Grid Forming Plant)	MW		
Phase Jump Angle Withstand	degrees		60 degrees specified
Phase Jump Angle limit	degrees		5 degrees recommended
Phase Jump Power (MW) at the rated angle	MW		
Defined Active Damping Power for a Grid Oscillation Value of 0.05 Hz peak to peak at 1 Hz	MW		
The cumulative energy delivered for a 1Hz/s System Frequency fall from 52 Hz to 47 Hz. This is the total Active Power transient output of the Grid Forming Plant	MWs or MJ		
Inertia Constant (H) using equation 1 or declared in accordance with the simulation results of ECP.A.3.9.4	MWs/MVA		
Inertia Constant (He) using equation 2 or declared in accordance with the simulation results of ECP.A.3.9.4	MWs/MVA		
Continuous Overload Capability	% on MVA		
Short Term duration Overload capability			
Duration of Short Term Overload Capability	s		
Peak Current Rating	Pu		
Nominal Grid Entry Point or User System Entry Point voltage	kV		
Grid Entry Point or User System Entry Point	- Location		
Continuous or defined time duration MVA Rating	MVA		
Continuous or defined time duration MW Rating	MW		

For a GBGF-I the inverters maximum Internal Voltage Source (IVS) for the worst case condition – for example operation at maximum exporting Reactive Power at the maximum AC System voltage	pu		
Maximum Three Phase Short Circuit Infeed at Grid Entry Point or User System Entry Point	kA		
Maximum Single Phase Short Circuit Infeed at Grid Entry Point or User System Entry Point	kA		
Will the Grid Forming Plant contribute to any other form of commercial service – for example Dynamic Containment, Firm Frequency Response,	Details to be provided		
Equivalent Damping Factor.	Z		0.2 to 5.0 allowed

Table PC.A.5.8.2

H = Installed MWs / Rated installed MVA

(equation 1)

$H_e = (\text{Active ROCOF Response Power at 1 Hz / s} \times \text{System Frequency}) / (\text{Installed MVA} \times 2)$

(equation 2)

PC.A.6 USERS' SYSTEM DATA

PC.A.6.1 Introduction

PC.A.6.1.1 Each **User**, whether connected directly via an existing **Connection Point** to the **National Electricity Transmission System** or seeking such a direct connection, or providing terms for connection of an **Offshore Transmission System** to its **User System** to **The Company** or undertaking **OTSDUW**, shall provide **The Company** with data on its **User System** or **OTSDUW Plant and Apparatus** which relates to the **Connection Site** containing the **Connection Point** (or **Interface Points** or **Connection Points** in the case of **OTSUA**) both current and forecast, as specified in PC.A.6.2 to PC.A.6.6.

PC.A.6.1.2 Each **User** must reflect the system effect at the **Connection Site(s)** of any third party **Embedded** within its **User System** whether existing or proposed.

PC.A.6.1.3 PC.A.6.2, and PC.A.6.4 to PC.A.6.7 consist of data which is only to be supplied to **The Company** at **The Company's** reasonable request. In the event that **The Company** identifies a reason for requiring this data, **The Company** shall write to the relevant **User(s)**, requesting the data, and explaining the reasons for the request. If the **User(s)** wishes, **The Company** shall also arrange a meeting at which the request for data can be discussed, with the objective of identifying the best way in which **The Company's** requirements can be met. In respect of **EU Code User(s)** only, **The Company** may request the need for electromagnetic transient simulations at **The Company's** reasonable request. **Users** with **EU Grid Supply Points** may be required to provide electromagnetic transient simulations in relation to those **EU Grid Supply Points** at **The Company's** reasonable request.

Where **The Company** makes a request to a **User** for dynamic models under PC.A.6.7, each relevant **User** shall ensure that the models supplied in respect of their **Plant** and **Apparatus** reflect the true and accurate behaviour of the **Plant** and **Apparatus** as built and verified through the **Compliance Processes (CP's)** or **European Compliance Processes (ECP)**.

PC.A.6.2 Transient Overvoltage Assessment Data

PC.A.6.2.1 It is occasionally necessary for **The Company** to undertake transient overvoltage assessments (e.g. capacitor switching transients, switchgear transient recovery voltages, etc). At **The Company's** reasonable request, each **User** is required to provide the following data with respect to the **Connection Site** (and in the case of **OTSUA**, **Interface Points** and **Connection Points**), current and forecast, together with a **Single Line Diagram** where not already supplied under PC.A.2.2.1, as follows:

- (a) busbar layout plan(s), including dimensions and geometry showing positioning of any current and voltage transformers, through bushings, support insulators, disconnectors, circuit breakers, surge arresters, etc. Electrical parameters of any associated current and voltage transformers, stray capacitances of wall bushings and support insulators, and grading capacitances of circuit breakers;
- (b) Electrical parameters and physical construction details of lines and cables connected at that busbar. Electrical parameters of all plant e.g., transformers (including neutral earthing impedance or zig-zag transformers, if any), series reactors and shunt compensation equipment connected at that busbar (or to the tertiary of a transformer) or by lines or cables to that busbar;
- (c) Basic insulation levels (BIL) of all **Apparatus** connected directly, by lines or by cables to the busbar;
- (d) characteristics of overvoltage **Protection** devices at the busbar and at the termination points of all lines, and all cables connected to the busbar;
- (e) fault levels at the lower voltage terminals of each transformer connected directly or indirectly to the **National Electricity Transmission System** (including **OTSUA** at each **Interface Point** and **Connection Point**) without intermediate transformation;
- (f) the following data is required on all transformers operating at **Supergrid Voltage** throughout **Great Britain** and, in Scotland and **Offshore**, also at 132kV or greater (including **OTSUA**): three or five limb cores or single phase units to be specified, and operating peak flux density at nominal voltage;
- (g) an indication of which items of equipment may be out of service simultaneously during **Planned Outage** conditions.

PC.A.6.3 User's Protection Data

PC.A.6.3.1 Protection

The following information is required which relates only to **Protection** equipment which can trip or inter-trip or close any **Connection Point** circuit-breaker or any **Transmission** circuit-breaker (or in the case of **OTSUA**, any **Interface Point** or **Connection Point** circuit breaker). This information need only be supplied once, in accordance with the timing requirements set out in PC.A.1.4(b), and need not be supplied on a routine annual basis thereafter, although **The Company** should be notified if any of the information changes;

- (a) a full description, including estimated settings, for all relays and **Protection** systems installed or to be installed on the **User's System**;
- (b) a full description of any auto-reclose facilities installed or to be installed on the **User's System**, including type and time delays;
- (c) a full description, including estimated settings, for all relays and **Protection** systems or to be installed on the generator, generator transformer, **Station Transformer** and their associated connections;
- (d) for **Generating Units** (including **Synchronous Generating Units** forming part of a **Synchronous Power Generating Module** but excluding **Power Park Units**) or **Power Park Modules** (including **DC Connected Power Park Modules**) or **HVDC Systems** or **DC Converters** at a **DC Converter Station** or **OTSDUW Plant and Apparatus** having (or intended to have) a circuit breaker at the generator terminal voltage, clearance times for electrical faults within the **Generating Unit** (including **Synchronous Generating Units** forming part of a **Synchronous Power Generating Module** but excluding a **Power Park Unit**) or **Power Park Module** (including **DC Connected Power Park Modules**) zone, or within the **OTSDUW Plant and Apparatus**;
- (e) the most probable fault clearance time for electrical faults on any part of the **User's System** directly connected to the **National Electricity Transmission System** including **OTSDUW Plant and Apparatus**; and
- (f) in the case of **OTSDUW Plant and Apparatus**, synchronisation facilities and delayed auto reclose sequence schedules (where applicable).
- (g) **Restoration Contractors** and **Network Operators** shall provide the above **Protection** data where different settings are used in respect of their **Plant** and **Apparatus** which are associated with a **Restoration Plan**.

PC.A.6.4 Harmonic Studies

PC.A.6.4.1 It is occasionally necessary for **The Company** to evaluate the production/magnification of harmonic distortion on the **National Electricity Transmission System** and **User's Systems** (and **OTSUA**), especially when **The Company** is connecting equipment such as capacitor banks. At **The Company's** reasonable request, each **User** is required to submit data with respect to the **Connection Site** (and in the case of **OTSUA**, each **Interface Point** and **Connection Point**), current and forecast, and where not already supplied under PC.A.2.2.4 and PC.A.2.2.5, as follows:

PC.A.6.4.2 Overhead lines and underground cable circuits of the **User's Subtransmission System** must be differentiated and the following data provided separately for each type:

Positive phase sequence resistance;

Positive phase sequence reactance;

Positive phase sequence susceptance;

and for all transformers connecting the **User's Subtransmission System** and **OTSDUW Plant and Apparatus** to a lower voltage:

Rated MVA;

Voltage Ratio;

Positive phase sequence resistance;

Positive phase sequence reactance;

and at the lower voltage points of those connecting transformers:

Equivalent positive phase sequence susceptance;

Connection voltage and MVar rating of any capacitor bank and component design parameters if configured as a filter;

Equivalent positive phase sequence interconnection impedance with other lower voltage points;

The minimum and maximum **Demand** (both MW and MVar) that could occur;

Harmonic current injection sources in Amps at the Connection voltage points. Where the harmonic injection current comes from a diverse group of sources, the equivalent contribution may be established from appropriate measurements;

Details of traction loads, eg connection phase pairs, continuous variation with time, etc;

An indication of which items of equipment may be out of service simultaneously during **Planned Outage** conditions.

PC.A.6.5 Voltage Assessment Studies

It is occasionally necessary for **The Company** to undertake detailed voltage assessment studies (e.g., to examine potential voltage instability, voltage control co-ordination or to calculate voltage step changes). At **The Company's** reasonable request, each **User** is required to submit the following data where not already supplied under PC.A.2.2.4 and PC.A.2.2.5:

For all circuits of the User's Subtransmission System (and any OTSUA):-

Positive Phase Sequence Reactance;

Positive Phase Sequence Resistance;

Positive Phase Sequence Susceptance;

MVar rating of any reactive compensation equipment;

and for all transformers connecting the **User's Subtransmission System** to a lower voltage (and any **OTSUA**):

Rated MVA;

Voltage Ratio;

Positive phase sequence resistance;

Positive Phase sequence reactance;

Tap-changer range;

Number of tap steps;

Tap-changer type: on-load or off-circuit;

AVC/tap-changer time delay to first tap movement;

AVC/tap-changer inter-tap time delay;

and at the lower voltage points of those connecting transformers (and any **OTSUA**):-

Equivalent positive phase sequence susceptance;

MVar rating of any reactive compensation equipment;

Equivalent positive phase sequence interconnection impedance with other lower voltage points;

The maximum **Demand** (both MW and MVar) that could occur;

Estimate of voltage insensitive (constant power) load content in % of total load at both winter peak and 75% off-peak load conditions.

PC.A.6.6 Short Circuit Analysis

PC.A.6.6.1 Where prospective short-circuit currents on **Transmission** equipment are greater than 90% of the equipment rating, and in **The Company's** reasonable opinion more accurate calculations of short-circuit currents are required, then at **The Company's** request each **User** is required to submit data with respect to the **Connection Site** (and in the case of **OTSUA**, each **Interface Point** and **Connection Point**), current and forecast, and where not already supplied under PC.A.2.2.4 and PC.A.2.2.5, as follows:

PC.A.6.6.2 For all circuits of the **User's Subtransmission System** (and any **OTSUA**):

- Positive phase sequence resistance;
- Positive phase sequence reactance;
- Positive phase sequence susceptance;
- Zero phase sequence resistance (both self and mutuals);
- Zero phase sequence reactance (both self and mutuals);
- Zero phase sequence susceptance (both self and mutuals);

and for all transformers connecting the **User's Subtransmission System** to a lower voltage (and any **OTSUA**):

- Rated MVA;
- Voltage Ratio;
- Positive phase sequence resistance (at max, min and nominal tap);
- Positive Phase sequence reactance (at max, min and nominal tap);
- Zero phase sequence reactance (at nominal tap);
- Tap changer range;
- Earthing method: direct, resistance or reactance;
- Impedance if not directly earthed;

and at the lower voltage points of those connecting transformers (and any **OTSUA**):

- The maximum **Demand** (in MW and MVA_r) that could occur;
- Short-circuit infeed data in accordance with PC.A.2.5.6 unless the **User's** lower voltage network runs in parallel with the **User's Subtransmission System**, when to prevent double counting in each node infeed data, a π equivalent comprising the data items of PC.A.2.5.6 for each node together with the positive phase sequence interconnection impedance between the nodes shall be submitted.

PC.A.6.7 Dynamic Models

PC.A.6.7.1 It is occasionally necessary for **The Company** to evaluate the dynamic performance of **User's Plant** and **Apparatus** at each **EU Grid Supply Point** or in the case of **EU Code Users**, their **System**. At **The Company's** reasonable request and as agreed between **The Company** and the relevant **Network Operator** or **Non-Embedded Customer**, each **User** is required to provide the following data. Where such data is required, **The Company** will work with the **Network Operator** or **Non-Embedded Customer** to establish the scope of the dynamic modelling work and share the required information where it is available:-

- (a) Dynamic model structure and block diagrams including parameters, transfer functions and individual elements (as applicable);
- (b) Power control functions and block diagrams including parameters, transfer functions and individual elements (as applicable);
- (c) Voltage control functions and block diagrams including parameters, transfer functions and individual elements (as applicable);

- (d) Converter control models and block diagrams including parameters, transfer functions and individual elements (as applicable).

PC.A.7 ADDITIONAL DATA FOR NEW TYPES OF POWER STATIONS, DC CONVERTER STATIONS, OTSUA AND CONFIGURATIONS

Notwithstanding the **Standard Planning Data** and **Detailed Planning Data** set out in this Appendix, as new types of configurations and operating arrangements of **Power Stations**, **HVDC Systems**, **DC Converter Stations** and **OTSUA** emerge in future, **The Company** may reasonably require additional data to represent correctly the performance of such **Plant** and **Apparatus** on the **System**, where the present data submissions would prove insufficient for the purpose of producing meaningful **System** studies for the relevant parties.

PART 3 - DETAILED PLANNING DATA

PC.A.8 To allow a **User** to model the **National Electricity Transmission System**, **The Company** will provide, upon request, the following **Network Data** to **Users**, calculated in accordance with **Good Industry Practice**:

To allow a **User** to assess undertaking **OTSDUW** and except where provided for in Appendix F, **The Company** will provide upon request the following **Network Data** to **Users**, calculated in accordance with **Good Industry Practice**:

PC.A.8.1 Single Point of Connection

For a **Single Point of Connection** to a **User's System** (and **OTSUA**), as a Transmission System voltage source, the data (as at the HV side of the **Point of Connection** (and in the case of **OTSUA**, each **Interface Point** and **Connection Point**) reflecting data given to **The Company** by **Users**) will be given to a **User** as follows:

The data items listed under the following parts of PC.A.8.3:

(a) (i), (ii), (iii), (iv), (v) and (vi) and the data items shall be provided in accordance with the detailed provisions of PC.A.8.3 (b) - (e).

PC.A.8.2 Multiple Point of Connection

For a **Multiple Point of Connection** to a **User's System** equivalents suitable for use in loadflow and fault level analysis shall be provided. These equivalents will normally be in the form of a π model or extension with a source (or demand for a loadflow equivalent) at each node and a linking impedance. The boundary nodes for the equivalent shall be either at the **Connection Point** (and in the case of **OTSDUW**, each **Interface Point** and **Connection Point**) or (where **The Company** agrees) at suitable nodes (the nodes to be agreed with the **User**) within the **National Electricity Transmission System**. The data at the **Connection Point** (and in the case of **OTSDUW**, each **Interface Point** and **Connection Point**) will be given to a **User** as follows:

The data items listed under the following parts of PC.A.8.3:-

(a) (i), (ii), (iv), (v), (vi), (vii), (viii), (ix), (x) and (xi)

and the data items shall be provided in accordance with the detailed provisions of PC.A.8.3 (b) - (e).

When an equivalent of this form is not required **The Company** will not provide the data items listed under the following parts of PC.A.8.3:-

(a) (vii), (viii), (ix), (x) and (xi)

PC.A.8.3 Data Items

(a) The following is a list of data utilised in this part of the **PC**. It also contains rules on the data which generally apply.

- (i) symmetrical three-phase short circuit current infeed at the instant of fault from the **National Electricity Transmission System**, (I_1'');
- (ii) symmetrical three-phase short circuit current from the **National Electricity Transmission System** after the subtransient fault current contribution has substantially decayed, (I_1');
- (iii) the zero sequence source resistance and reactance values at the **Point of Connection** (and in case of **OTSUA**, each **Interface Point** and **Connection Point**), consistent with the maximum infeed below;
- (iv) the pre-fault voltage magnitude at which the maximum fault currents were calculated;
- (v) the positive sequence X/R ratio at the instant of fault;
- (vi) the negative sequence resistance and reactance values of the **National Electricity Transmission System** seen from the **Point of Connection** (and in case of **OTSUA**, each **Interface Point** and **Connection Point**), if substantially different from the

- values of positive sequence resistance and reactance which would be derived from the data provided above;
- (vii) the initial positive sequence resistance and reactance values of the two (or more) sources and the linking impedance(s) derived from a fault study constituting the (π) equivalent and evaluated without the **User** network and load and where appropriate without elements of the **National Electricity Transmission System** between the **User** network and agreed boundary nodes (and in case of **OTSUA**, each **Interface Point** and **Connection Point**);
 - (viii) the positive sequence resistance and reactance values of the two (or more) sources and the linking impedance(s) derived from a fault study, considering the short circuit current contributions after the subtransient fault current contribution has substantially decayed, constituting the (π) equivalent and evaluated without the **User** network and load, and where appropriate without elements of the **National Electricity Transmission System** between the **User** network and agreed boundary nodes (and in case of **OTSUA**, each **Interface Point** and **Connection Point**);
 - (ix) the corresponding zero sequence impedance values of the (π) equivalent produced for use in fault level analysis;
 - (x) the **Demand** and voltage at the boundary nodes and the positive sequence resistance and reactance values of the linking impedance(s) derived from a loadflow study considering **National Electricity Transmission System** peak **Demand** constituting the (π) loadflow equivalent; and,
 - (xi) where the agreed boundary nodes are not at a **Connection Point** (and in case of **OTSUA**, **Interface Point** or **Connection Point**), the positive sequence and zero sequence impedances of all elements of the **National Electricity Transmission System** between the **User** network and agreed boundary nodes that are not included in the equivalent (and in case of **OTSUA**, each **Interface Point** and **Connection Point**).
- (b) To enable the model to be constructed, **The Company** will provide data based on the following conditions.
 - (c) The initial symmetrical three phase short circuit current and the transient period three phase short circuit current will normally be derived from the fixed impedance studies. The latter value should be taken as applying at times of 120ms and longer. Shorter values may be interpolated using a value for the subtransient time constant of 40ms. These fault currents will be obtained from a full **System** study based on load flow analysis that takes into account any existing flow across the point of connection being considered.
 - (d) **The Company** will provide the appropriate supergrid transformer data for the **National Electricity Transmission System** associated with equivalent voltage source data.
 - (e) The positive sequence X/R ratio and the zero sequence impedance value will correspond to **The Company's** source network only, that is with the section of network if any with which the equivalent is to be used excluded. These impedance values will be derived from the condition when all **Generating Units** (including **Synchronous Generating Units** forming part of a **Synchronous Power Generating Module**) are **Synchronised** to the **National Electricity Transmission System** or a **User's System** and will take account of active sources only including any contribution from the load to the fault current. The passive component of the load itself or other system shunt impedances should not be included.
 - (f) A **User** may at any time, in writing, specifically request for an equivalent to be prepared for an alternative **System** condition, for example where the **User's System** peak does not correspond to the **National Electricity Transmission System** peak, and **The Company** will, insofar as such request is reasonable, provide the information as soon as reasonably practicable following the request.

PC.A.9	<u>CONTROL SYSTEM MODEL REQUIREMENTS FOR USERS</u>
PC.A.9.1	<u>OBJECTIVE</u>
PC.A.9.1.1	Control and protection system models, along with other Plant and Apparatus information are required by this PC , with supporting documentation provided to The Company in order for The Company and Transmission Licensees to assess the impact of the User's Plant and Apparatus on the transient performance, security and stability of the Transmission System .
PC.A.9.1.2	The control and protection system models submitted by the User shall be representative of the User's Plant and Apparatus at the Connection Point appropriate to the type of model eg. RMS or EMT. All control and protection system models must take into account all communication, controller and processing delays relevant to modelling the performance of the User's Plant and Apparatus . If all Power Park Units or DC Convertors or HVDC Converters contained within the Users Plant and Apparatus are not identical, the control system model shall account for this by accurately representing the overall performance of the Users Plant and Apparatus at the Connection Point .
PC.A.9.1.3	The control and protection system models shall include representation of all relevant functionality required by the Grid Code including services provided to The Company . For example, this includes voltage control, LFSM-O, LFSM-U, frequency response, fault ride through, fast fault current injection, protection and automatic switching of shunt devices. Where modes of operation are selectable, the ability to select the mode of operation shall be included within the control system model. Additional guidance on relevant functionality will be published on The Company website.
PC.A.9.2.	<u>SCOPE</u>
PC.A.9.2.1	All Users shall provide root mean-square (RMS) models which represent the Users Plant and Apparatus and controllers in balanced, RMS, positive phase-sequence, time domain studies.
PC.A.9.2.2	All Generators , HVDC Converter Station Owners , or HVDC System Owners directly connected to the Transmission System or Generators with Large Power Stations and HVDC Converter Station Owners or HVDC System Owners with DC Converter Stations or HVDC Systems embedded within a User system which employ convertors/invertors to import or export power to or from the System shall provide Electro-Magnetic Transient (EMT) models which represent the Users Plant and Apparatus in electromagnetic transient studies on the transmission and distribution system. For the avoidance of doubt this includes Generators who own and operate a Power Park Module comprising doubly fed induction generators and may include the excitation and governor control systems associated with Synchronous Generating Units if these impact on the types of study described on The Company website.
PC.A.9.2.3	The Company may specify requirements for other models in the Bilateral Agreement if required for specific connections in accordance with good industry practice. For example Real Time Dynamic Simulator (RTDS) Models may be required for protection co-ordination.
PC.A.9.3	<u>Balanced Root Mean Squared (RMS) Control System Model</u>
PC.A.9.3.1	The balanced, root mean-square positive sequence time-domain models shall be able to calculate how aspects, (including but not limited to; Active Power and Reactive Power) of the User's Plant and Apparatus vary due to changes in System Frequency and voltage at the Connection Point .
PC.A.9.3.2	The RMS models shall include all electrical and mechanical phenomena that impact on the Active Power and/or Reactive Power of the User's Plant and Apparatus for sub-transient, transient and synchronous dynamics within the context of an RMS study assumptions up to and including Primary and Secondary Response timeframes or when post-event steady state conditions have been achieved.
PC.A.9.3.3	The User shall provide RMS models in the software package specified in PC.A.9.8.1.

- PC.A.9.3.4 The RMS models maybe either a User specific model or a standard open-source models, such as a standard WECC, IEEE or IEC control system model available in the software format as specified by **The Company** provided this model represents the **User's Plant and Apparatus** at the **Connection Point**. Where the **User** is referencing a standard model, the **User** will submit an unambiguous reference to the model and a full set of parameters for the control system model representing the control system performance of the real **Plant and Apparatus**.
- PC.A.9.3.4.1 Where a **User** specific model is provided sufficient information shall be provided by the **User** to allow for **The Company** to redevelop RMS models in the event of future software environment changes or version updates. All models shall be accompanied with appropriate documentation with sufficient detail as specified and deemed complete by **The Company** (such agreement not to be unreasonably withheld).
- PC.A.9.3.4.2 Where a **User** specific model is provided the **User** shall provide information:
- (i) a full description of the models structure, functionality and the **User's Plant and Apparatus** represented.
 - (ii) inputs/outputs and functionality,
 - (iii) the information described in PC.A.5 relevant to the technology modelled.
- PC.A.9.3.5 **The Company** may, when necessary, require the **User** to provide details of the proper operation of its complete RMS system representation or to facilitate its understanding of the results of a RMS dynamic simulation or request additional information concerning the RMS control system model. This should take place no later than the issuance of the FON.
- PC.A.9.3.5 The performance requirements for the RMS models are included in Appendix PC.A.9.8
- PC.A.9.4 **Electromagnetic Transient (EMT) Model**
- PC.A.9.4.1 The three-phase electromagnetic transient control and supporting informtion shall include all material aspects of the **User's Plant and Apparatus** that affect the voltage and current outputs, including those of the control and protection response from the **User's Plant and Apparatus**. The models shall represent phenomena that materially affect the voltage and **Frequency** on the **Total System** over timeframes of sub-cycle up to 50 cycles including, but not limited to, switching electronic devices, transformer saturation and equipment energisation.
- PC.A.9.4.2 The **User** shall provide EMT models in the software package specified in PC.A.9.9.1.
- PC.A.9.4.3 The performance requirements for the EMT control system model are included in Appendix PC.A.9.9
- PC.A.9.5 **Replica Control Systems, RTDS, RSCAd**
- PC.A.9.5.1 Where required by the Bilateral Agreement, the **User** shall provide replica and/or suitable Real Time Dynamic Simulator models. The details of any such models will be included in the Bilateral Agreement.
- PC.A.9.6 **CONFIDENTIALITY AND SHARING**
- PC.A.9.6.1 **CONFIDENTIALITY AND SHARING RMS TYPE MODELS**
- PC.A.9.6.1.1 The models, supporting documentation and associated data are provided to **The Company** in order to carry out its duties to meet its **ESO Licence** and Grid Code obligations. In that regard, **the Company** is entitled to share the models, supporting documentation and associated data with the **Transmission Licensees**. **The Company** and/or **Transmission Licensees** may share the models with companies/contractors employed by **the Company** or **Transmission Licensees** to carry out licensed activities. Where such data is shared with third parties working with **The Company** or **Transmission Licensees**, this data will be shared as provided in GC.12.

- PC.A.9.6.1.2 It is the responsibility of the **User** to provide the RMS models, supporting documentation and associated data to **The Company**. **The Company** will accept the models, supporting documentation and associated data from a manufacturer as a **Manufacturers Data and Performance Report** (See ECP.10). **The Company** will only accept this information from a third party manufacturer provided the third party manufacturer agrees to enter into **The Company's** standard confidentiality agreement for **Users** for sharing of the model as outlined in PC.A.9.6.1. In the event the third party manufacturer is unable to enter into **The Company's** standard confidentiality agreement, the **User** shall be responsible for the provision of the RMS models, supporting documentation and associated data to **The Company**.
- PC.A.9.6.1.3 It may also be necessary for **The Company** to share a representative RMS model with another **User** to comply with applicable Grid Code requirements (e.g. ECC.6.3.17.1.5 and ECC.6.3.17.2.3) and Bilateral Agreement. For these purposes the **User** must recorded in the **Compliance Statements** either:
- (i) A declaration that the models submitted for compliance purposes may be shared; or,
 - (ii) provide an equivalent encrypted version of the model that may be shared. In this event the **User** shall demonstrate that the performance of the models and the encrypted model are comparable.
- PC.A.9.6.1.4 The **User** shall notify **The Company** of any changes to RMS models in accordance with PC.A.1.2. Unless specified otherwise in the **Bilateral Agreement**, RMS models must be submitted:
- (i) at least 3 months prior to date requested for issue of the **Interim Operational Notification**
 - (ii) at least 1 month prior to date of issue of a **Limited Operational Notification** for the **Users Plant and Apparatus**.
- PC.A.9.6.2 CONFIDENTIALITY AND SHARING EMT TYPE MODELS
- PC.A.9.6.2.1 The EMT model, supporting documentation and associated data are provided to **The Company** in order to carry out its duties to meet its **ESO Licence** and Grid Code obligations. In that regard, **the Company** is entitled to share the EMT models, supporting documentation and associated data with the **Transmission Licensees**. **The Company** and/or **Transmission Licensees** may share the EMT model with companies/contractors employed by **the Company** or **Transmission Licensees** to carry out licensed activities. Where such data is shared with third parties working with **The Company** or **Transmission Licensees**, this data will be shared and protected as provided in GC.12.
- PC.A.9.6.2.2 It is the responsibility of the **User** to provide the EMT models, supporting documentation and associated data to **The Company**. **The Company** will accept the EMT models, supporting documentation and associated data from a manufacturer as a **Manufacturers Data and Performance Report** (See ECP.10). **The Company** will only accept this information from a third party manufacturer provided the third party manufacturer agrees to enter into **The Company's** standard confidentiality agreement for **Users** for sharing of the model as outlined in PC.A.9.6.2. In the event the third party manufacturer is unable to enter into **The Company's** standard confidentiality agreement, the **User** shall be responsible for the provision of the EMT models, supporting documentation and associated data to **The Company**.
- PC.A.9.6.2.3 It may be necessary for **The Company** to share a representative EMT model with another **User** to comply with applicable Grid Code requirements (e.g. ECC.6.3.17.1.5 and ECC.6.3.17.2.3) and Bilateral Agreement. For these purposes the **User** must record in the **Compliance Statements** either:
- (i) a declaration that the EMT model submitted for compliance purposes (PC.A.9.6.2.1) may be shared with another **User** for the purpose of fulfilling relevant Grid Code requirements; or,

- (ii) provide an equivalent EMT model that maybe shared with another **User** for the purpose of fulfilling relevant Grid Code requirements. In this event the **User** shall declare that the performance of the equivalent EMT model is adequate for the purposes of fulfilling relevant Grid Requirements as published on **The Company** website.

PC.A.9.6.2.4 Where it is necessary for **The Company** to share a representative EMT model with another **User**, the **User** in receipt of the model shall:

- (i) limit of the use of the EMT model to a specific purpose agreed with **The Company** (e.g. simulation requirements to demonstrate compliance with Grid Code including ECC.6.3.17.1 and ECC.6.3.17.2 and Bilateral Agreement)
- (ii) control access to the EMT model to only those individuals who are strictly necessary for the execution of the specific purpose.
- (iii) establish and maintain security measures to restrict access to and prevent distribution of the EMT model (e.g. single computer terminal containing the EMT model and restricting access to file areas where the model resides)
- (iv) ensure any publication is only for demonstrating compliance with the specific purpose agreed with **The Company** and shall not include any data directly derived from the EMT model
- (v) not disclose the EMT model
- (vi) destroy all copies of the EMT model and supporting material in a confidentially secure manner after the execution of the specific purpose is complete. Destruction of the EMT model and supporting material shall be confirmed to **The Company** in writing.

PC.A.9.6.2.5 The **User** shall notify **The Company** of any changes to EMT models in accordance with PC.A.1.2. Unless specified otherwise in the **Bilateral Agreement**, EMT models must be submitted:

- (i) at least 3 months prior to date requested for issue of the **Interim Operational Notification**
- (ii) at least 1 month prior to date of issue of a **Limited Operational Notification** for the **Users Plant and Apparatus**.

PC.A.9.7 VALIDATION

PC.A.9.7.1 The **User** shall submit evidence that the models have been validated demonstrating that the models under simulation conditions is representative of the **User's Plant and Apparatus** under equivalent conditions. Validation of models before commissioning may be against test results at other comparable sites, Factory Acceptance Tests of comparable equipment, or type test results to show that the responses shown by the models are representative of the **Users Plant and Apparatus**. Results from model validation in accordance internationally recommended standards (for example IEC) where applicable are also acceptable.

PC.A.9.7.2 A User may request agreement from **The Company** on the process for validating the models. In particular, for **Users Plant and Apparatus** where Factory Acceptance Testing is to be carried out details of any additional model validation at this stage should be agreed in a timely manner prior to the testing being carried out. Tests should generally include steady state **Reactive Power** capability, voltage control, **Fault Ride Through** and **Frequency** response.

PC.A.9.7.3 After final compliance testing as required under the **CP** or **ECP**, the **User** shall carry out validation of the model simulation results against measurements from final compliance testing in accordance with CP.A.3 or ECP.A.3, to ensure the model responses are representative of the **Users Plant and Apparatus**.

PC.A.9.7.4 If these tests show the models are not representative of the **User's Plant and Apparatus**, the **User** shall provide updated models, supporting documentation and associated data to ensure the responses shown by the model is representative of the responses shown by **User's Plant and Apparatus** during testing.

- PC.A.9.7.5 In the event **The Company** identifies through lifetime monitoring (OC5) that the response of the models are not representative of the **User's Plant and Apparatus**, **The Company** shall notify the **User**. The **User** shall provide the revised models, supporting documentation and associated data whose response is representative of the **Users Plant and Apparatus** as soon as reasonably practicable, but in any case no longer than 54 days after notification by **The Company**. In the event of revised models not being made available a **Limited Operational Notification** (as detailed in CP.9 or ECP.9 as applicable) may be issued with appropriate restrictions.
- PC.A.9.7.6 The **User** is responsible for ensuring the models remain representative of the **User's Plant and Apparatus** throughout the operational lifetime of the **User's Plant and Apparatus**. In the event of the **User** modifying hardware/software which affects the control and/or operation of the **Users Plant and Apparatus**, the **User** shall provide **The Company** with updated models, supporting documentation and associated data to enable **The Company** to assess the impact of the modification of the **Users Plant and Apparatus** on the **Total System**. Such changes may require other compliance activity as described in the **CP** or **ECP** as applicable.
- PC.A.9.7.7 The **User** shall demonstrate that the representation of a **User's Plant and Apparatus** and models perform correctly in a sample network model published by **The Company** before being accepted. The **User** should represent the **User's Plant and Apparatus** modelled in accordance with the **Single Line Diagram** and parameters submitted under the **Planning Code** and **DRC** in Schedules 1, 5 or 18 aggregating multiple **Power Park Units** and the collector grid to a single **Power Park Unit** representing a **Power Park Module**.
- PC.A.9.8 RMS MODEL PERFORMANCE SPECIFICATION
- PC.A.9.8.1 The RMS models shall be provided in the format required by **The Company**. **The Company** shall publish on **The Company** website acceptable software versions. **The Company** will act reasonable in determining acceptable software versions or compatible formats. In accordance with good industry practice **The Company** will consult with the industry prior to changing the format required. Prior to the start of model development the **User** may request formal agreement from **The Company** of the software version. The RMS models shall be compatible with Objectives as outlined in Grid Code PC.A.9.1 Additional guidance on RMS model is published on **The Company** website.
- PC.A.9.8.2 GENERAL
- PC.A.9.8.2.1 User RMS models shall interface with the software in a manner that is consistent with the behaviour of standard library models.
- PC.A.9.8.2.1 The models shall use standard library functional blocks representing using standard Laplace block diagram format to the extent practicable.. Where user defined functional blocks have been submitted the **User** must provide **The Company** with the relevant documentation for the model including transfer block diagrams and an explanation of any coding to the satisfaction of **The Company**.
- PC.A.9.8.2.2 The use of any "black boxes" encrypted code or external DLLs is not acceptable. An additional RMS model with these features maybe provided for comparison but for the avoidance of doubt does not meet the requirements of PC.A.9.
- PC.A.9.8.2.3 The **User** shall specify the operating ranges for the model and shall be consistent with the real physical values and the actual performance of the **Plant and Apparatus**. This may include **Reactive Power** limits and allowable voltage ranges with control mode and **Droop** settings configured according to the usual operation. This information shall be provided either on the appropriate per unit base or in physical units.
- PC.A.9.8.2.4 The RMS model must compile without errors. Warnings must be kept to a minimum.
- PC.A.9.8.3 INITIALISATION
- PC.A.9.8.3.1 The RMS model shall be self contained. The combined load-flow and dynamic model shall solve with minimal warnings without the need for manual adjustment or to run external software routines that adjust parameters in either the load-flow case or the dynamic case or both. External software or automation routines to integrate the model are not acceptable.

- PC.A.9.8.3.2 The RMS model shall automatically initialise its parameters from load flow simulations without errors and with minimal warnings , must not result in run time errors and run with minimal warnings , and there must not be any interactions or conflicts with other models. The RMS models initialisation shall be invariant to simulation start time (i.e. not require the simulation to be initialised at a particular time). External software or automation routines to initialise the model are not acceptable.
- PC.A.9.8.3.3 The RMS model is expected to be numerically stable and must adequately represent the expected equipment behaviour over the operational range of the **Plant and Apparatus** at the **Connection Point**. This includes the full load and **Reactive Power** range of the **Plant and Apparatus**, the range of system voltage and **frequency** operating range (described in Grid Code CC.6.1/ECC.6.1), short circuit levels and X/R ratio at the **Connection Point** where it would be in operation. These values maybe requested from **The Company** or the **Distribution Network Owner** during the compliance process. If necessary, the **User** shall provide a supplementary model for specific conditions. All information on the model capabilities shall be addressed in the model documentation provided to **The Company**.
- PC.A.9.8.4 OUTPUT MESSAGES
- PC.A.9.8.4.1 It is not acceptable for the models to crash catastrophically and provide no documentary evidence as to why the simulation failed.
- PC.A.9.8.4.2 RMS models shall allow all appropriate internal variables to be requested for output for the duration of the simulation.
- PC.A.9.8.4.3 In the case where the **User's Plant** trips during simulation, the relevant RMS models shall set the flag that indicates that the **User's Plant** has tripped.
- PC.A.9.8.4.4 For protection events (e.g. crow bar controller operation) the simulation events, including initial detection, operation, and time-out, should be reported to the PowerFactory output window during the simulation.
- PC.A.9.8.5 Integration Time Step
- PC.A.9.8.5.1 The dynamic model must support time domain simulations with a minimum integration step size of 0.01 s.
- PC.A.9.8.5.2 The models must not include algorithms that require use of a particular integration step size (for example the control system model should not fail to solve, or the response be materially different for an integration step size of 0.005 s).
- PC.A.9.8.5.3 Time constants below 0.01 s should only be included if their inclusion is critical to the performance of the dynamic model and should be agreed with **The Company**. In this case, an alternative model may be requested according to PC.A.9.8.3.3, if required.
- PC.A.9.8.5.4 Internal integration algorithms should only be included if their inclusion is critical to meeting the accuracy requirements, and should not materially detract from model simulation speed performance.
- PC.A.9.9 EMT MODEL PERFORMANCE SPECIFICATION
- PC.A.9.9.1 The **User** shall provide EMT models in the format required by **The Company**. **The Company** shall maintain a list of acceptable software versions, and compiler version which shall be published on **The Company** website. **The Company** will act reasonable in determining acceptable software versions or compatible formats. In accordance with good industry practice **The Company** will consult with the industry prior to changing the format required. The EMT models shall be compatible with Objectives as outlined in Grid Code PC.A.9.1 and **The Company** shall also publish on **The Company** website a description of the types of study that **The Company** and **Transmission Licensees** will use the EMT control system models in. Additional guidance on EMT model is also published on **The Company** website.

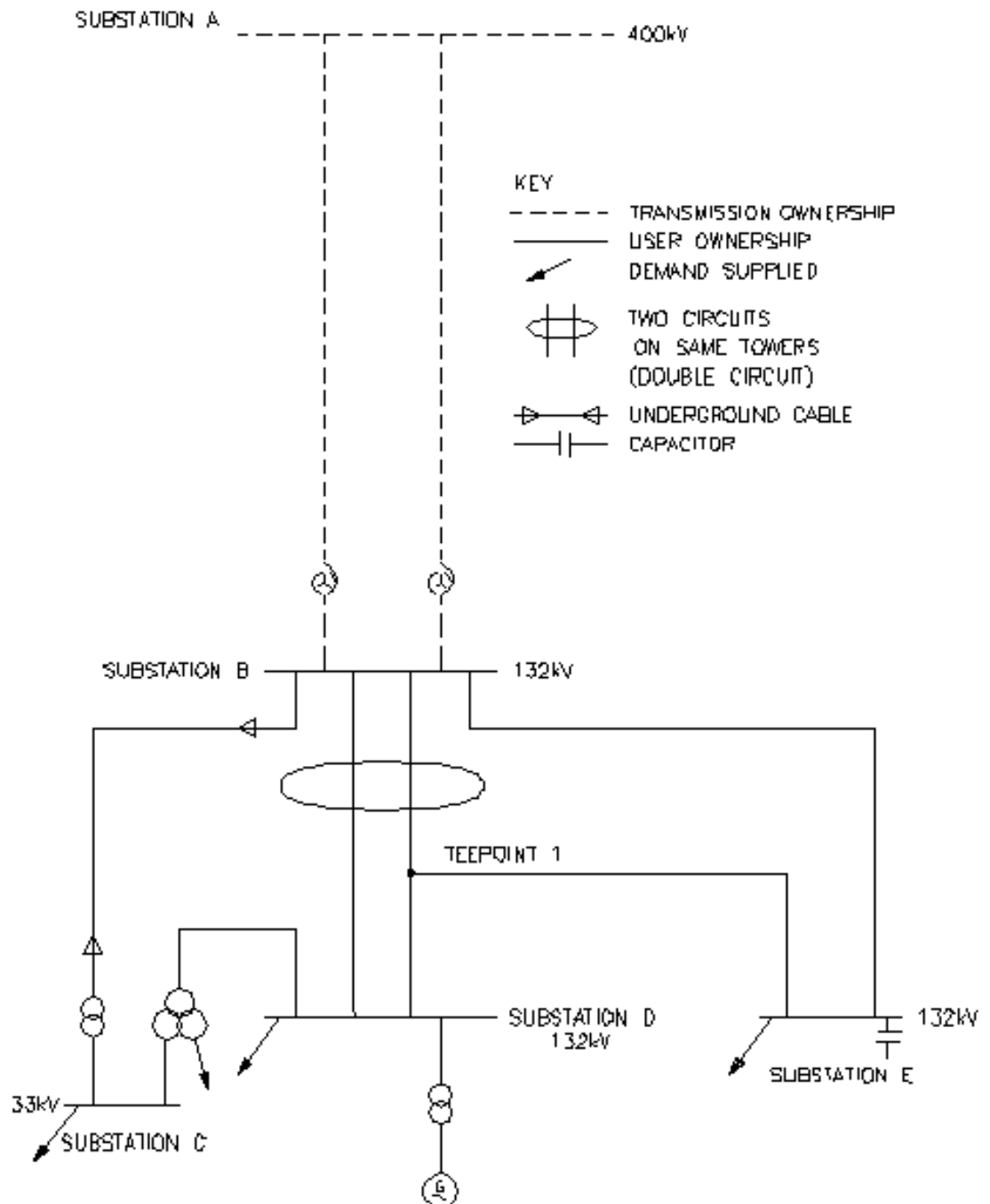
- PC.A.9.9.2 The EMT models maybe encrypted. The scope, behaviour and performance of all encrypted elements must be documented. Documentation should include behaviour and performance of all encrypted inner and outer loop control functionality such as voltage control, frequency control, protection systems, convertor controls and phase locked loop controllers (PLL). Aspects of the control system may be omitted provided the study objectives published by **The Company** in accordance with PC.A.9.4.2 are met in which case the documentation should explain any functionality not included in the EMT control system model.
- PC.A.9.9.3 The EMT model shall:
- i) have adjustable operational control parameters. For example this would be expected to include setpoints, control drops, operational limits, relay thresholds. The **User** may seek agreement from **The Company** on the list of adjustable parameters prior to submission of the model.
 - ii) be based on plant design and validated against testing of the **Plant and Apparatus** (See Model Validation)
 - iii) include all control systems from outer loop control down to inner and switching functions
 - iv) represent all electrical, mechanical and control features appropriate for the **Plant and Apparatus** including switching algorithms of power convertors applicable to studies described by **The Company**.
 - v) Have all appropriate protection systems modelled for power system transient stability analysis including balanced and unbalanced fault conditions, **Frequency** and voltage disturbances configured to match the site specific installation of the **Plant and Apparatus**. Any protections which relate to multiple disturbances should have an option to be disabled.
 - vi) Allow **Plant and Apparatus** to be scaled where appropriate in accordance with good industry practice. For example representation of multiple **Power Park Units** by a single equivalent unit.
 - vii) Have time steps which must be appropriate for the accurate representation of the switching algorithms used in the **Plant and Apparatus** and compatible with study time steps down to 10us.
 - viii) Be portable between network models which may be any size between a single machine infinite bus power system representation and a full multi node power system network depending on the studies that need to be undertaken.
 - ix) Allow multiple instances within a network and be compatible with other control system models within a network.
 - x) Be capable of self initiation to **User** defined terminal conditions within 4 seconds of the simulation time when connected to an equivalent Thevenin source. In the case of complex models **The Company** may agree a self initiation simulation time within 6 seconds.
 - xi) Warn the **User** by way of an output message when **System** conditions exceed the operational limits of the **Plant and Apparatus** or are not valid for continued operation.
 - xii) Be able to be initialised from a snapshot of network conditions

APPENDIX B - SINGLE LINE DIAGRAMS

PC.B.1

The diagrams below show three examples of single line diagrams, showing the detail that should be incorporated in the diagram. The first example is for an **Network Operator** connection, the second for a **Generator** connection, the third for a **Power Park Module** electrically equivalent system.

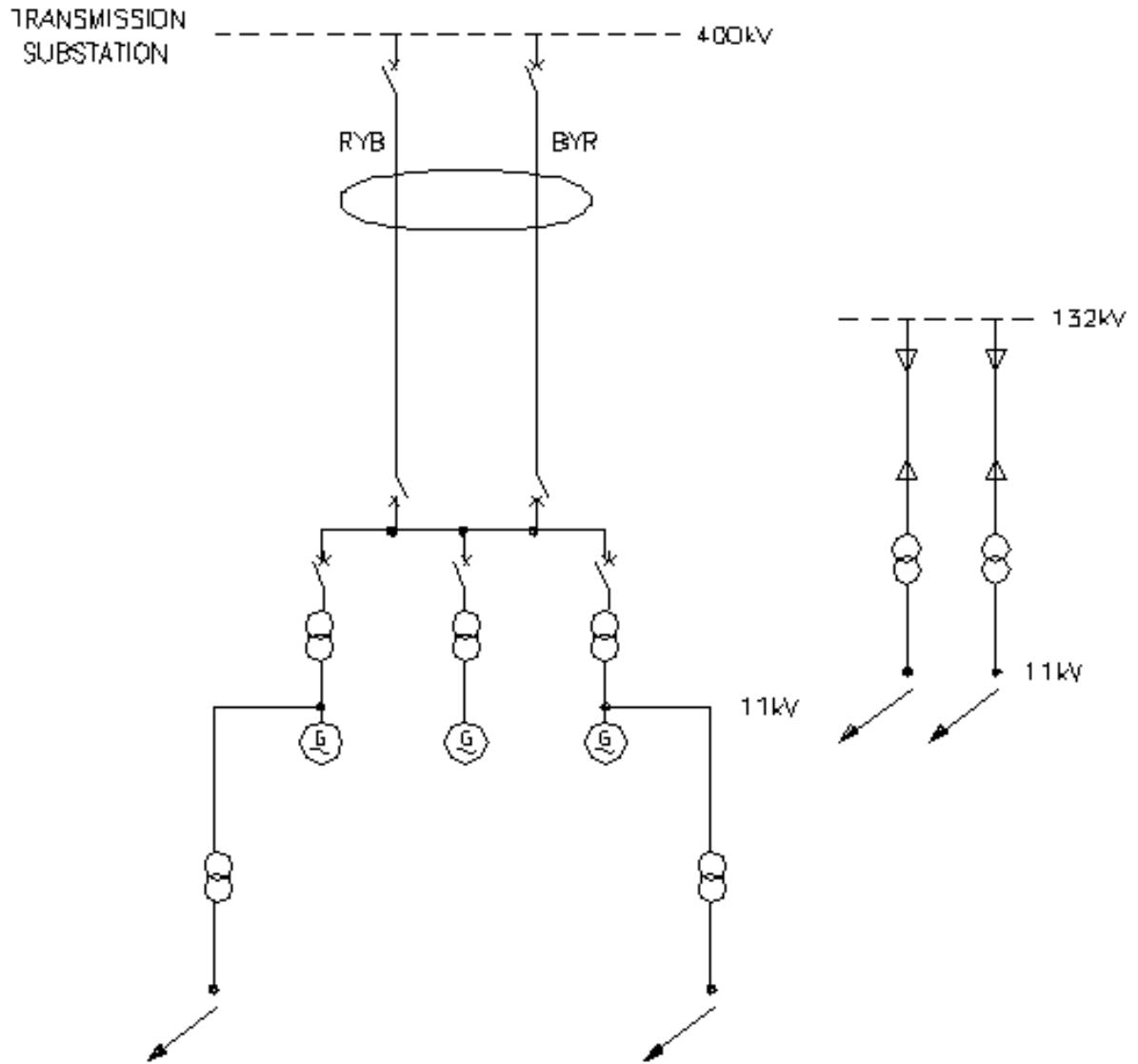
Network Operator Single Line Diagram



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Generator Single Line Diagram

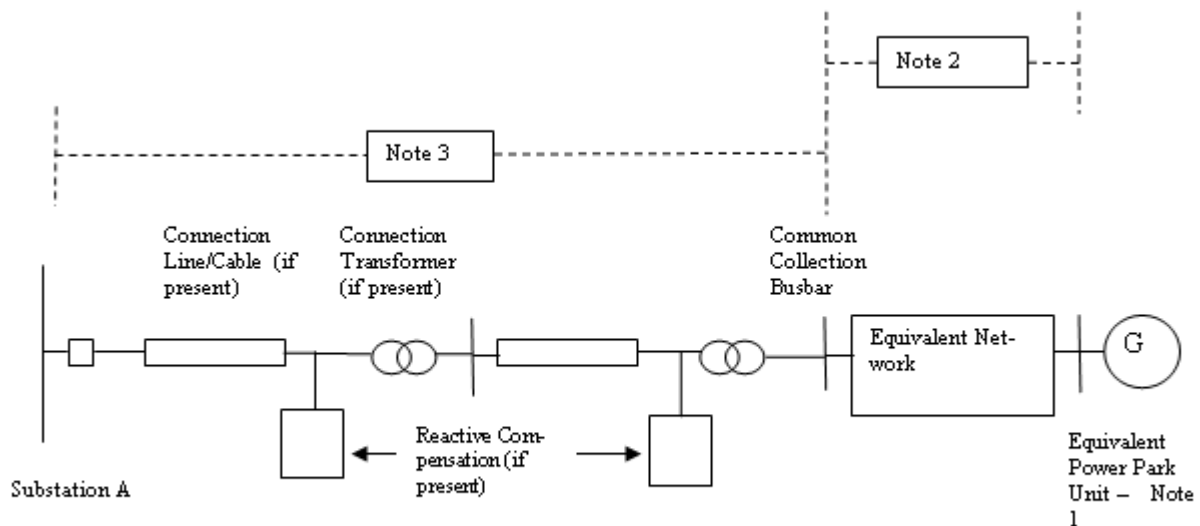


- KEY
- TRANSMISSION OWNERSHIP
 - USER OWNERSHIP
 - ↘ DEMAND SUPPLIED
 - ⌞ TWO CIRCUITS ON SAME TOWERS (DOUBLE CIRCUIT)
 - ⌞ UNDERGROUND CABLE

THIS DRAWING IS NOT VALID FOR DESIGN PURPOSES

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Power Park Module Single Line Diagram



Notes:

- (1) The electrically equivalent **Power Park Unit** consists of a number of actual **Power Park Units** of the same type ie. any equipment external to the **Power Park Unit** terminals is considered as part of the equivalent network. **Power Park Units** of different types shall be included in separate electrically equivalent **Power Park Units**. The total number of equivalent **Power Park Units** shall represent all of the actual **Power Park Units** in the **Power Park Module** (which could be a **DC Connected Power Park Module**).
- (2) Separate electrically equivalent networks are required for each different type of electrically equivalent **Power Park Unit**. The electrically equivalent network shall include all equipment between the **Power Park Unit** terminals and the **Common Collection Busbar**.
- (3) All **Plant** and **Apparatus** including the circuit breakers, transformers, lines, cables and reactive compensation plant between the **Common Collection Busbar** and Substation A shall be shown.

APPENDIX C - TECHNICAL AND DESIGN CRITERIA

- PC.C.1 Planning and design of the **SPT** and **SHETL Transmission Systems** is based generally, but not totally, on criteria which evolved from joint consultation among various **Transmission Licensees** responsible for design of the **National Electricity Transmission System**.
- PC.C.2 The above criteria are set down within the standards, memoranda, recommendations and reports and are provided as a guide to system planning. It should be noted that each scheme for reinforcement or modification of the **Transmission System** is individually designed in the light of economic and technical factors associated with the particular system limitations under consideration.
- PC.C.3 The tables below identify the literature referred to above, together with the main topics considered within each document.

PART 1 – SHETL's TECHNICAL AND DESIGN CRITERIA

ITEM No.	DOCUMENT	REFERENCE No.
1	National Electricity Transmission System Security and Quality of Supply Standard	Version []
2	System Phasing	TPS 13/4
3	Not used	
4	Voltage fluctuations and the connection of disturbing equipment to transmission systems and distribution networks in the United Kingdom	EREC P28 Issue 2
5	EHV or HV Supplies to Induction Furnaces Voltage unbalance limits. Harmonic current limits.	ER P16 (Supported by ACE Report No.48)
6	Planning Levels for Harmonic Voltage Distortion and the Connection of Non-Linear Loads to Transmission Systems and Public Electricity Supply Systems in the United Kingdom Harmonic distortion (waveform). Harmonic voltage distortion. Harmonic current distortion. Stage 1 limits. Stage 2 limits. Stage 3 Limits Addition of Harmonics Short Duration Harmonics Site Measurements	ER G5 (Supported by ACE Report No.73)
7	AC Traction Supplies to British Rail Type of supply point to railway system. Estimation of traction loads. Nature of traction current. System disturbance estimation. Earthing arrangements.	ER P24

ITEM No.	DOCUMENT	REFERENCE No.
8	Operational Memoranda	(SOM)
	Main System operating procedure.	SOM 1
	Operational standards of security.	SOM 3
	Voltage and reactive control on main system.	SOM 4
	System warnings and procedures for instructed load reduction.	SOM 7
	Continuous tape recording of system control telephone messages and instructions.	SOM 10
9	Emergency action in the event of an exceptionally serious breakdown of the main system.	SOM 15
	Planning Limits for Voltage Unbalance in the United Kingdom.	ER P29

The applicable **SHETL's** technical and design criteria shall also be used in the design and development of a **Competitively Appointed Transmission Licensee's System** having a **Competitively Appointed Transmission Licensee's Interface Point** to **SHETL's Transmission System**.

PART 2 - SPT's TECHNICAL AND DESIGN CRITERIA

ITEM No.	DOCUMENT	REFERENCE No.
1	National Electricity Transmission System Security and Quality of Supply Standard	Version []
2	System Phasing	TDM 13/10,002 Issue 4
3	Not used	
4	Voltage fluctuations and the connection of disturbing equipment to transmission systems and distribution networks in the United Kingdom	EREC P28 Issue 2
5	EHV or HV Supplies to Induction Furnaces Voltage Unbalance limits. Harmonic current limits.	ER P16 (Supported by ACE Report No.48)
6	Planning Levels for Harmonic Voltage Distortion and the Connection of Non-Linear Loads to Transmission Systems and Public Electricity Supply Systems in the United Kingdom Harmonic distortion (waveform). Harmonic voltage distortion. Harmonic current distortion. Stage 1 limits. Stage 2 limits. Stage 3 Limits Addition of Harmonics Short Duration Harmonics Site Measurements	ER G5 (Supported by ACE Report No.73)
7	AC Traction Supplies to British Rail Type of supply point to railway system. Estimation of traction loads. Nature of traction current. System disturbance estimation. Earthing arrangements.	ER P24

The applicable **SPT's** technical and design criteria shall also be used in the design and development of a **Competitively Appointed Transmission System** having a **Competitively Appointed Transmission Licensee Interface Point** to **SPT's Transmission System**.

APPENDIX D - DATA NOT DISCLOSED TO A RELEVANT TRANSMISSION LICENSEE

PC.D.1 Pursuant to PC.3.4, **The Company** will not disclose to a **Relevant Transmission Licensee** data items specified in the below extract:

PC REFERENCE	DATA DESCRIPTION	UNITS	DATA CATEGORY
PC.A.3.2.2 (f) (i)	(i) For GB Code Users The Generator Performance Chart at the Generating Unit stator terminals (ii) For EU Code Users:- The Power Generating Module Performance Chart, and Synchronous Generating Unit Performance Chart;		SPD
PC.A.3.2.2 (b)	Output Usable (on a monthly basis)	MW	SPD
PC.A.5.3.2 (d) Option 1 (iii)	GOVERNOR AND ASSOCIATED PRIME MOVER PARAMETERS Option 1 BOILER & STEAM TURBINE DATA Boiler time constant (Stored Active Energy) HP turbine response ratio: (Proportion of Primary Response arising from HP turbine) HP turbine response ratio: (Proportion of High Frequency Response arising from HP turbine)	S % %	DPD II DPD II DPD II
Part of PC.A.5.3.2 (d) Option 2 (i)	Option 2 All Generating Units (including Synchronous Generating Units forming part of a Synchronous Power Generating Module) Governor Deadband or (Frequency Response Deadband and Frequency Response Insensitivity)* - Maximum Setting - Normal Setting - Minimum Setting *(Note GB Generators who are not required to satisfy the requirements of the European Connection Conditions do not need to supply Frequency Response Deadband or Frequency Response Insensitivity data).	±Hz ±Hz ±Hz	DPD II DPD II DPD II
Part of PC.A.5.3.2 (d) Option 2 (ii)	Steam Units		

PC REFERENCE	DATA DESCRIPTION	UNITS	DATA CATEGORY
	Reheater Time Constant	sec	DPD II
	Boiler Time Constant	sec	DPD II
	HP Power Fraction	%	DPD II
	IP Power Fraction	%	DPD II
Part of PC.A.5.3.2 (d) Option 2 (iii)	Gas Turbine Units Waste Heat Recovery Boiler Time Constant		
Part of PC.A.5.3.2 (e)	UNIT CONTROL OPTIONS Maximum droop Minimum droop Maximum Governor Deadband or (Maximum Frequency Response Deadband and Maximum Frequency Response Insensitivity)* Normal Governor Deadband or (normal Frequency Response Deadband and normal Frequency Response Insensitivity)* Minimum Governor Deadband or (minimum Frequency Response Deadband and minimum Frequency Response Insensitivity)* Maximum Output Governor Deadband or (Maximum Output Frequency Response Deadband and Maximum Output Frequency Response Insensitivity)* Normal Output Governor Deadband or (Normal Output Frequency Response Deadband and Normal Output Frequency Response Insensitivity)* Minimum Output Governor Deadband or (Minimum Output Frequency Response Deadband and Minimum Output Frequency Response Insensitivity)* (Note Generators who are not required to satisfy the requirements of the European Connection Conditions do not need to supply Frequency Response Deadband and Frequency Response Insensitivity data). Frequency settings between which Unit Load Controller droop applies: Maximum Normal Minimum Sustained response normally selected	% % ±Hz ±Hz ±Hz ±MW ±MW ±MW Hz Hz Hz Yes/No	DPD II DPD II DPD II DPD II DPD II DPD II DPD II DPD II DPD II DPD II DPD II
PC.A.3.2.2 (f) (ii)	Performance Chart of a Power Park Modules (including DC Connected Power Park Modules) at the connection point		SPD

PC REFERENCE	DATA DESCRIPTION	UNITS	DATA CATEGORY
PC.A.3.2.2 (b)	Output Usable (on a monthly basis)	MW	SPD
PC.A.3.2.2 (e) and (j)	DC CONVERTER STATION AND HVDC SYSTEM DATA ACTIVE POWER TRANSFER CAPABILITY (PC.A.3.2.2) Import MW available in excess of Registered Import Capacity . Time duration for which MW in excess of Registered Import Capacity is available Export MW available in excess of Registered Capacity . Time duration for which MW in excess of Registered Capacity is available	 MW Min MW Min	 SPD SPD SPD SPD
Part of PC.A.5.4.3.3	LOADING PARAMETERS MW Export Nominal loading rate Maximum (emergency) loading rate MW Import Nominal loading rate Maximum (emergency) loading rate	 MW MW/s MW/s MW/s MW/s	 SPD DPD I DPD I DPD I DPD I

APPENDIX E - OFFSHORE TRANSMISSION SYSTEM AND OTSDUW PLANT AND APPARATUS TECHNICAL AND DESIGN CRITERIA

PC.E.1 In the absence of any relevant **Electrical Standards**, **Offshore Transmission Licensees** and **Generators** undertaking **OTSDUW** are required to ensure that all equipment used in the construction of their network is:

- (i) Fully compliant and suitably designed to any relevant **Technical Specification**;
- (ii) Suitable for use and operation in an **Offshore** environment, where such parts of the **Offshore Transmission System** and **OTSDUW Plant and Apparatus** are located in **Offshore Waters** and are not installed in an area that is protected from that **Offshore** environment, and
- (iii) Compatible with any relevant **Electrical Standards** or **Technical Specifications** at the **Offshore Grid Entry Point** and **Interface Point**.

PC.E.2 The table below identifies the technical and design criteria that will be used in the design and development of an **Offshore Transmission System** and **OTSDUW Plant and Apparatus**.

ITEM No.	DOCUMENT	REFERENCE No.
1	National Electricity Transmission System Security and Quality of Supply Standard	Version []
2*	Voltage fluctuations and the connection of disturbing equipment to transmission systems and distribution networks in the United Kingdom	EREC P28 Issue 2
3*	Planning Levels for Harmonic Voltage Distortion and the Connection of Non-Linear Loads to Transmission Systems and Public Electricity Supply Systems in the United Kingdom	ER G5
4*	Planning Limits for Voltage Unbalance in the United Kingdom	ER P29

* Note:- Items 2, 3 and 4 above shall only apply at the **Interface Point**.

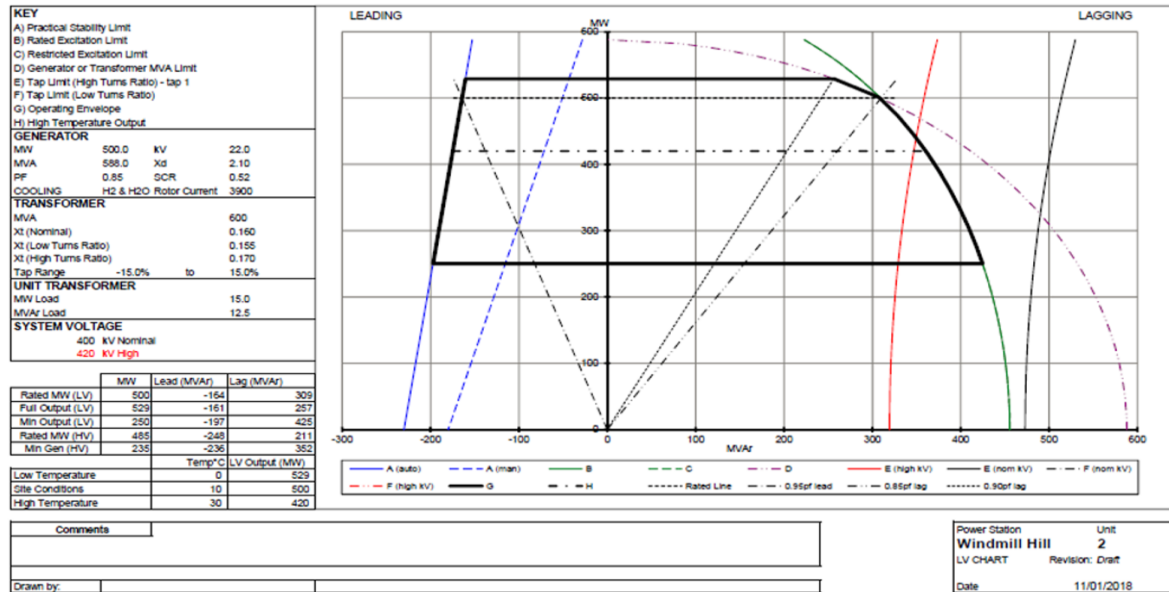
APPENDIX F - OTSDUW DATA AND INFORMATION AND OTSDUW NETWORK DATA AND INFORMATION

- PC.F.1 Introduction
- PC.F.1.1 Appendix F specifies data requirements to be submitted to **The Company** by **Users** and **Users** by **The Company** in respect of **OTSDUW**.
- PC.F.1.2 Such **User** submissions shall be in accordance with the **OTSDUW Development and Data Timetable** in a **Construction Agreement**.
- PC.F.1.3 Such submissions shall be issued to **The Company** with the offer of a **CUSC Contract** in the case of the data in Part 1 and otherwise in accordance with the **OTSDUW Development and Data Timetable** in a **Construction Agreement**.
- PC.F.2. OTSDUW Network Data and Information
- PC.F.2.1 With the offer of a **CUSC Contract** under the **OTSDUW Arrangements** **The Company** shall provide:
- (a) the site specific technical design and operational criteria for the **Connection Site**;
 - (b) the site specific technical design and operational criteria for the **Interface Point**, and
 - (c) details of **The Company's** preliminary identification and consideration of the options available for the **Interface Point** in the context of the **User's** application for connection or modification, the preliminary costs used by **The Company** in assessing such options and the **Offshore Works Assumptions** including the assumed **Interface Point** identified during these preliminary considerations.
- PC.F.2.2 In accordance with the **OTSDUW Development and Data Timetable** in a **Construction Agreement** **The Company** shall provide the following information and data to a **User**:
- (a) equivalent of the fault infeed or fault level ratings at the Interface Point (as identified in the **Offshore Works Assumptions**)
 - (b) notification of numbering and nomenclature of the **HV Apparatus** comprised in the **OTSDUW**;
 - (i) past or present physical properties, including both actual and designed physical properties, of **Plant** and **Apparatus** forming part of the **National Electricity Transmission System** at the Interface Point at which the **OTSUA** will be connected to the extent it is required for the design and construction of the **OTSDUW**, including but not limited to:
 - (ii) the voltage of any part of such **Plant** and **Apparatus**;
 - (iii) the electrical current flowing in or over such **Plant** and **Apparatus**;
 - (iv) the configuration of any part of such **Plant** and **Apparatus**
 - (v) the temperature of any part of such **Plant** and **Apparatus**;
 - (vi) the pressure of any fluid forming part of such **Plant** and **Apparatus**
 - (vii) the electromagnetic properties of such **Plant** and **Apparatus**; and
 - (viii) the technical specifications, settings or operation of any **Protection Systems** forming part of such **Plant** and **Apparatus**.
 - (c) information necessary to enable the **User** to harmonise the **OTSDUW** with construction works elsewhere on the **National Electricity Transmission System** that could affect the **OTSDUW**;
 - (d) information related to the current or future configuration of any circuits of the **Onshore Transmission System** with which the **OTSUA** are to connect;
 - (e) any changes which are planned on the **National Electricity Transmission System** in the current or following six **Financial Years** and which will materially affect the planning or development of the **OTSDUW**.

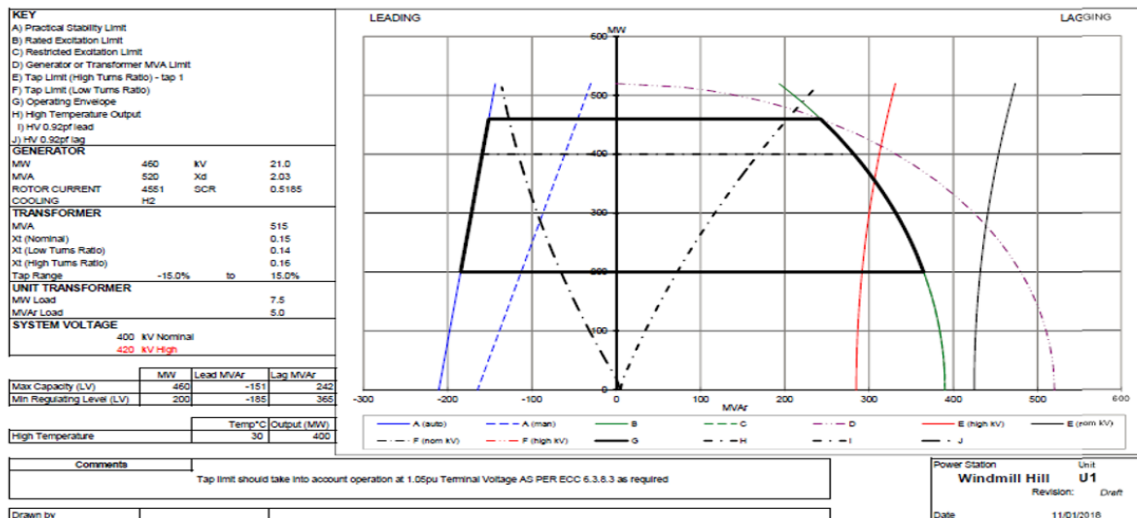
- PC.F.2.3 At the **Users** reasonable request, additional information and data in respect of the **National Electricity Transmission System** shall be provided.
- PC.F.2.4 OTSDUW Data And Information
- PC.F.2.4.1 In accordance with the **OTSDUW Development and Data Timetable** in a **Construction Agreement**, the **User** shall provide to **The Company**, the following information and data relating to the **OTSDUW Plant and Apparatus** in accordance with Appendix A of the **Planning Code**.

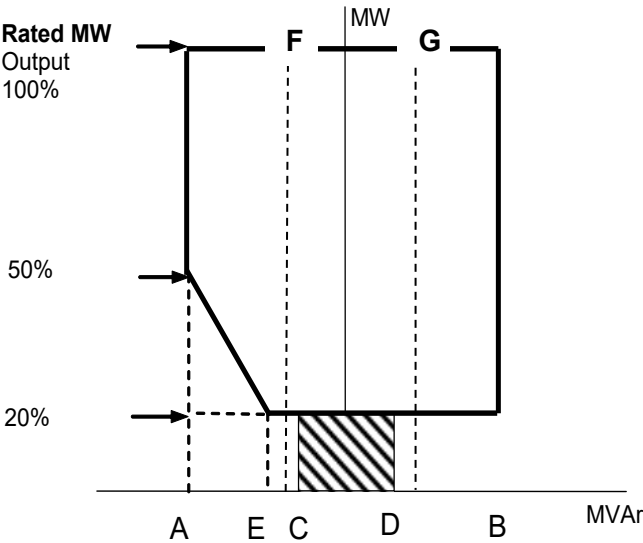
APPENDIX G – PERFORMANCE CHART EXAMPLES

PC.G.1.1 Generator Performance Chart within a Power Station or CCGT Module (GB Code User)



PC.G.1.2 Synchronous Generating Unit Performance Chart within a Synchronous Power Generating Module (EU Code User)





LEADING

LAGGING

- Point A is equivalent (in MVar) to: 0.95 leading **Power Factor** at **Rated MW** output
- Point B is equivalent (in MVar) to: 0.95 lagging **Power Factor** at **Rated MW** output
- Point C is equivalent (in MVar) to: -5% of **Rated MW** output
- Point D is equivalent (in MVar) to: +5% of **Rated MW** output
- Point E is equivalent (in MVar) to: -12% of **Rated MW** output
- Line F is equivalent (in MVar) to: Leading **Power Factor Reactive Despatch Network Restriction**
- Line G is equivalent (in MVar) to: Lagging **Power Factor Reactive Despatch Network Restriction**

☐

Where a **Reactive Despatch Network Restriction** is in place which requires following of local voltage conditions, alternatively to Line F and G, please check this box.

APPENDIX G – NETWORK OPERATOR AND THE COMPANY PLANNING DATA EXCHANGE

- PC.G.1 Data to be Included in the Solved PSM
- PC.G.1.1 The **Solved PSM**:
- (a) Shall include **Structural Data**, **Situation Data**, and **Solution Data** relating to all relevant equipment within the scope of the **Network Operator Subtransmission PSM** or **The Company NETS PSM** as set out in PC.9.4 and PC.10.4, respectively.
 - (b) Shall conform to the data exchange definitions and implementation requirements described in PC.G.4.
 - (c) May include additional data if supported by the data exchange definitions.
- PC.G.1.2 **PSM** data shall meet the following general requirements regarding **Structural Data**:
- i. Define the connectivity of all relevant equipment;
 - ii. Have identifiers which are unique and remain consistent throughout the life of the data as required in PC.3.1.1.5; and
 - iii. Have a name and description sufficient to provide human readability.
- PC.G.1.3 Equipment
- PC.G.1.3.1 For all equipment the following data shall be included in the **PSM**:
- (a) **Structural Data**:
 - i. The line, substation or substation voltage level, as applicable, of which it is a part.
 - (b) **Situation Data**:
 - i. In-service status, which indicates whether or not the equipment is to be included in the development of **Solution Data**. Status “false” means that the equipment is considered as being disconnected from the **System**.
- PC.G.1.3.2 For each busbar the following data shall be included in the **PSM**:
- (a) **Structural Data**:
 - i. Node by which it is represented;
 - ii. Nominal voltage; and
 - iii. Maximum and minimum operational voltage limits.
 - (b) **Situation Data**:
 - i. Operational voltage limits to be used as power flow solution violation limits.
 - (c) **Solution Data**:
 - i. Voltage magnitude and angle if energised.
- PC.G.1.3.2.1 For each busbar designated as a **PSM Interface Node**, or by exception at alternative points agreed by the relevant parties, the following data shall additionally be included in the **PSM**:
- (a) **Solution Data** (short circuit) (as defined in **Engineering Recommendation G74**):
 - i. Fault kind (single- or 3-phase);
 - ii. Steady state current;
 - iii. Maximum steady state current;
 - iv. Minimum steady state current;
 - v. Peak current;
 - vi. Decaying component current ;
 - vii. Initial symmetrical current; and
 - viii. Symmetrical breaking current.

PC.G.1.3.3 For each switching device required to facilitate **System** reconfiguration, the following data shall be included in the **PSM**:

(a) **Structural Data:**

- i. For all devices:
 - (a) Normal operating status (open/closed).
- ii. For all circuit breakers or circuit switchers inclusive of their relevant substation infrastructure:
 - (a) Rated RMS continuous current;
 - (b) Rated 3-phase RMS short-circuit withstand current and duration;
 - (c) Rated 1-phase RMS short-circuit withstand current and duration;
 - (d) Rated 3-phase short-circuit peak withstand current; and
 - (e) Rated 1-phase short-circuit peak withstand current.
- iii. Additionally, for all circuit breakers or circuit switchers:
 - (a) DC time constant applied at testing of asymmetrical breaking abilities;
 - (b) Break time;
 - (c) Rated 3-phase RMS short-circuit breaking current; and
 - (d) Rated 1-phase RMS short-circuit breaking current.
- iv. Additionally, for all circuit breakers or circuit switchers with current making capability:
 - (a) Rated 3-phase peak short-circuit making current; and
 - (b) Rated 1-phase peak short-circuit making current.

(b) **Situation Data:**

- i. Operational position.

(c) **Solution Data:**

- i. Operational position.

PC.G.1.3.4 For each transformer (including step-up transformers, auto transformers, and phase shifting transformers) the following data shall be included in the **PSM**:

(a) **Structural Data:**

- i. For each transformer winding:
 - (a) Rated **Apparent Power**;
 - (b) Rated voltage;
 - (c) Positive sequence reactance and resistance;
 - (d) Zero sequence reactance and resistance;
 - (e) Positive sequence susceptance and conductance;
 - (f) Zero sequence susceptance and conductance;
 - (g) Connection type, for instance type D, Y, Yn, including any tertiary winding;
 - (h) Vector group;
 - (i) Grounding reactance and resistance;
 - (j) Earthing method (direct, resistance, reactance, through earthing transformer or none);
 - (k) Positive sequence reactance and resistance at minimum and maximum tap;
 - (l) Normal seasonal operational **Apparent Power** limits (Winter, Spring, Summer and Autumn):

- i. For two-winding transformer, of the HV winding;
- ii. For multi-winding transformers, of all windings; and
- iii. Date of commencement of each season.

(m) Reverse power-flow operational limits (applied to the HV winding).

- ii. For the tap changer:
 - (a) Tap changer steps information (high step, low step, neutral step);
 - (b) Tap changer on-load change capability;
 - (c) Type of phase tap changer: symmetrical, asymmetrical described in a linear, non-linear, or tabular way;
 - (d) Tap changer control mode;
 - (e) Impedance information per tap step, if applicable;
 - (f) Operational limit per tap step, if applicable; and
 - (g) Transformer winding on which tap-changer operates.

(b) Situation Data:

- i. For each winding:
 - (a) Operational apparent power limits to be used as power flow solution violation limits:
 - i. For two-winding transformer, of the HV winding; and
 - ii. For multi-winding transformers, of all windings.
- ii. For the tap changer:
 - (a) Tap changer regulating status;
 - (b) Tap changer regulating quantity target value;
 - (c) Tap changer regulating deadband; and
 - (d) Tap changer step.

(c) Solution Data:

- i. For the tap changer:
 - (a) Tap changer step.

PC.G.1.3.5 For each circuit the following data shall be included in the **PSM**:

(a) Structural Data:

- i. For all circuits, to support power flow and short circuit calculations:
 - (a) Nominal voltage;
 - (b) Length of circuit;
 - (c) Max permitted temperature at the end of the short circuit ;
 - (d) Circuit composition: Overhead/underground/mixed;
 - (e) Normal seasonal operational current limits (Winter, Spring, Summer and Autumn):
 - i. Date of commencement of each season.
 - (f) Positive sequence resistance, reactance and susceptance;
 - (g) Negative sequence resistance, reactance and susceptance; and
 - (h) Zero sequence resistance, reactance and susceptance.
- ii. In addition to the information presented in PC.G.1.3.5.a).i, for overhead lines where applicable:

- a) Relevant zero sequence mutual coupling resistance, reactance and susceptance.

(b) **Situation Data:**

- i. Operating limits to be used in the analysis of the power flow solution.

(c) **Solution Data:**

- i. Calculated **Active Power** and **Reactive Power** flows for the circuit.

PC.G.1.3.6 For each compensating equipment (including linear and non-linear shunts, series compensators, and static var compensators), the following data shall be included in the **PSM**:

(a) **Structural Data:**

- i. Operating type of compensation equipment (switched equipment with automated module activation or fixed equipment that can only be operated manually);
- ii. For shunt compensators, the compensation type (for instance, R-L, R-L-C, C, R-L-C);
- iii. Nominal voltage;
- iv. For controllable compensating equipment, the regulating mode and regulating range;
- v. For discrete shunt compensating equipment:
 - i. Positive sequence conductance and susceptance per section;
 - ii. Zero sequence conductance and susceptance per section; and
 - iii. Number of maximum sections.
- vi. For series compensating equipment:
 - i. Positive sequence reactance and resistance;
 - ii. Zero sequence reactance and resistance; and
 - iii. Rated current and voltage threshold, if a variable resistor is present.
- vii. For continuous compensating equipment, for instance static Var compensators:
 - i. Nominal compensation range;
 - ii. Capacitive and inductive rating;
 - iii. Slope characteristics is the slope that defines how the **Reactive Power** output changes in proportion to the difference between the regulated bus voltage and the voltage setpoint;
 - iv. Positive and zero sequence reactance; and
 - v. Positive and zero sequence resistance.

(b) **Situation Data:**

- i. Section or initial compensation setting according to the type of compensating equipment;
- ii. Regulating status; and
- iii. Regulating quantity target value.

(c) **Solution Data:**

- i. Section or final compensation setting according to the type of compensating equipment

PC.G.1.3.7 For each **HVDC System**, the following data shall be included in the **PSM**:

(a) **Structural Data:**

- i. A reduced representation of the **HVDC System** comprised of:

- i. information on the power output including active and reactive regulation range; and
- ii. voltage regulation capabilities, if applicable.

(b) **Situation Data:**

- i. **Active Power;**
- ii. **Reactive Power;**
- iii. Regulating status, if applicable; and
- iv. Regulating quantity target value, if applicable.

(c) **Solution Data:**

- i. **Reactive Power.**

(d) Specific requirements to related to representation in **The Company NETS PSM:**

- i. For **HVDC Systems** internal to the **NETS** losses need to be accounted for and defined in the **PSM Scenario Document**.

PC.G.1.4 Generation and Storage

PC.G.1.4.1 For each **Synchronous Power Generating Module**, which is not an **Electricity Storage Module**, the following data shall be included in the **PSM**:

(a) **Structural Data:**

- i. Nominal **Apparent Power**;
- ii. Nominal **Active Power**;
- iii. Nominal terminal voltage;
- iv. Nominal **Power Factor**;
- v. Rotor type by construction;
- vi. Rotor type for the purpose of short circuit calculation in accordance with **Engineering Recommendation G74**;
- vii. Relevant points from the **Generator Performance Chart** defining a reactive capability curve, including **Active Power** and **Reactive Power** limits at nominal voltage;
- viii. Direct axis reactances (saturated and unsaturated):
 - (a) Subtransient reactance (X_d'');
 - (b) Transient reactance (X_d'); and
 - (c) Synchronous reactance (X_d).
- ix. Direct axis time constants (saturated and unsaturated):
 - (a) Subtransient time constants (T_d''); and
 - (b) Transient time constant (T_d).
- x. Quadrature axis reactances (saturated and unsaturated):
 - (a) Subtransient reactance (X_q'');
 - (b) Transient reactance (X_q'); and
 - (c) Synchronous reactance (X_q).
- xi. Quadrature time constants (saturated and unsaturated):
 - (a) Subtransient time constants (T_q''); and
 - (b) Transient time constant (T_q').
- xii. Zero sequence reactance and resistance;

- xiii. Negative sequence reactance and resistance;
- xiv. Stator resistance;
- xv. Inertia constant (H);
- xvi. Primary **Energy Source** (from the list given in PC.G.8.1);
- xvii. Control mode; and
- xviii. Earthing star point reactance and resistance, if applicable.

(b) **Situation Data:**

- i. Active and reactive power;
- ii. Regulating status (enabled/disabled); and
- iii. Regulating quantity target value.

(c) **Solution Data:**

- i. Calculated **Active Power** and **Reactive Power** output.

PC.G.1.4.2

For each **Power Park Module**, which is not an **Electricity Storage Module**, comprising **Non-Synchronous Generating Units** or **Offshore Power Park Strings** none of which are connected through power electronic conversion technology, the following data shall be included in the **PSM**:

(a) **Structural Data:**

- i. Nominal **Apparent Power**;
- ii. Nominal **Active Power**;
- iii. Nominal mechanical power;
- iv. Nominal terminal voltage;
- v. Nominal speed;
- vi. Nominal frequency ;
- vii. Nominal **Power Factor**;
- viii. Pole pair number;
- ix. Locked r/x rotor ratio;
- x. Nominal efficiency;
- xi. Ratio of locked-rotor current to the rated current of the motor;
- xii. Information if it is converter fed drive and reversable capability;
- xiii. Primary **Energy Source** (from the list given in PC.G.8.1);
- xiv. Energy conversion technology (from the list given in PC.G.8.2); and
- xv. Regulating mode and regulating range.

(b) **Situation Data:**

- i. **Active Power** and **Reactive Power**;
- ii. Regulating status; and
- iii. Regulating quantity target value.

(c) **Solution Data:**

- i. Calculated **Active Power** and **Reactive Power** output.

PC.G.1.4.3

For each **Power Park Module**, which is not an **Electricity Storage Module**, comprising **Non-Synchronous Generating Units** or **Offshore Power Park Strings** which are all connected through power electronic conversion technology, the following data shall be included in the **PSM**:

(a) **Structural Data:**

- i. Nominal **Apparent Power**;
- ii. Nominal **Active Power**;
- iii. Nominal terminal voltage;
- iv. Primary **Energy Source** (from the list given in PC.G.8.1);
- v. Energy conversion technology (from the list given in PC.G.8.2); and
- vi. Regulating mode and regulating range.

(b) **Situation Data:**

- i. **Active Power** and **Reactive Power**;
- ii. Regulating status; and
- iii. Regulating quantity target value.

(c) **Solution Data:**

- i. Calculated **Active Power** and **Reactive Power** output.

PC.G.1.4.4 For each **Synchronous Electricity Storage Module** the following data shall be included in the **PSM**:

(a) **Structural Data:**

- i. Nominal energy capability;
- ii. Nominal **Apparent Power** when supplying;
- iii. Nominal **Apparent Power** when consuming;
- iv. Nominal terminal voltage;
- v. Primary **Energy Source** (from the list given in PC.G.8.1);
- vi. Energy conversion technology (from the list given in PC.G.8.2);
- vii. Regulating mode and regulating range; and
- viii. Minimum and maximum **Active Power** and **Reactive Power**.

(b) **Situation Data:**

- i. Stored energy, where available;
- ii. Storage status, where available;
- iii. **Active Power** and **Reactive Power**;
- iv. Regulating status; and
- v. Regulating quantity target value.

(c) **Solution Data:**

- i. Calculated **Active Power** and **Reactive Power** output.

PC.G.1.4.5 For each **Non-Synchronous Electricity Storage Module** the following data shall be included in the **PSM**:

(a) **Structural Data:**

- i. Nominal energy capability;
- ii. Nominal **Apparent Power** when supplying;
- iii. Nominal apparent power when consuming;
- iv. Nominal terminal voltage;
- v. Primary **Energy Source** (from the list given in PC.G.8.1);
- vi. Energy conversion technology (from the list given in PC.G.8.2);

- vii. Regulating mode and regulating range; and
- viii. Minimum and maximum **Active Power** and **Reactive Power**.

(b) **Situation Data:**

- i. Stored energy, where available;
- ii. Storage status, where available;
- iii. **Active Power** and **Reactive Power**;
- iv. Regulating status; and
- v. Regulating quantity target value.

(c) **Solution Data:**

- i. Calculated **Active Power** and **Reactive Power** output.

PC.G.1.4.6 For each connection between a **Power-Generating Module** and either the **NETS** or the **Subtransmission System**, the equipment providing that connection, including the **Station Transformer** data and the auxiliary load it serves, shall be included in the **PSM**. The following data shall be included for the auxiliary load:

(a) **Structural Data:**

- i. Subtransient short-circuit current maximum and minimum;
- ii. Transient short-circuit current maximum and minimum;
- iii. X/R maximum and minimum ratios;
- iv. Indication of whether the auxiliary load is scalable (conform type) or not (non-conform type); and
- v. Load response components i.e. constant power, constant impedance, constant current components.

(b) **Situation Data:**

- i. **Active Power** and **Reactive Power**.

(c) **Solution Data:**

- i. Calculated **Active Power** and **Reactive Power** output.

PC.G.1.4.7 The detail specified in PC.G.1.4.1 through PC.G.1.4.5 is required only for **Power Generating Modules** connected to the **NETS** or the **Subtransmission System**. **Power Generating Modules** connected at a voltage level below that of the **Subtransmission System** shall be represented as aggregated equivalents, grouped by **Aggregated Energy Source**. The following data shall be included in the **PSM** for such equivalents:

(a) **Structural Data:**

- i. **Aggregated Energy Source**, reflecting the dominant generation type of the aggregation (synchronous, asynchronous, inverter-based) (from the list given in PC.G.8.1);
- ii. Aggregate short circuit current;
- iii. X/R ratio of the equivalent;
- iv. Control capability and mode; and
- v. Relevant points from an assumed **Generator Performance Chart** relating to the aggregated equivalent defining a reactive capability curve, including active and reactive power limits at nominal voltage.

(b) **Situation Data:**

- i. **Active Power** and **Reactive Power**; and
- ii. Control (enabled or disabled).

(c) **Solution Data:**

- i. Calculated **Active Power** and **Reactive Power** output.

PC.G.1.5 Load

PC.G.1.5.1 For each **Demand Facility** connected to the **Subtransmission System** or the **NETS**, the following data shall be included in the **PSM**:

(a) **Structural Data:**

- i. Indication of whether the load is scalable (conform type) or not (non-conform type);
- ii. Load response components i.e. constant power, constant impedance, constant current components;
- iii. Transient short-circuit current maximum and minimum;
- iv. Subtransient short-circuit current maximum and minimum; and
- v. X/R maximum and minimum ratios.

(b) **Situation Data:**

- i. **Active Power** and **Reactive Power**.

(c) **Solution Data:**

- i. Calculated **Active Power** and **Reactive Power** output; and
- ii. Short circuit current results.

PC.G.1.5.2 The detail specified in PC.G.1.5.1 is required only for **Demand Facilities** connected to the **Subtransmission System** or the **NETS**. Any demand connected at a voltage below that of the **Subtransmission System** shall be represented as an aggregated demand equivalent connected to the lower voltage busbar at substations connecting the **Subtransmission System** to a lower voltage. The following data shall be included in the **PSM** for such equivalents:

(a) **Structural Data:**

- i. Indication of whether the load is scalable (conform type) or not (non-conform type);
- ii. Transient short-circuit current maximum and minimum level;
- iii. Subtransient short-circuit current maximum and minimum level; and
- iv. X/R maximum and minimum ratios.

(b) **Situation Data:**

- i. **Active Power** and **Reactive Power**.

(c) **Solution Data:**

- i. Calculated **Active Power** and **Reactive Power** output; and
- ii. Short circuit current results.

PC.G.1.6 Diagram Data

PC.G.1.6.1 For each of the following types of diagrams, **Diagram Data** shall be included in the **PSM**. The diagram data shall define the arrangement of the listed **Structural Data** on the diagram:

(a) A **PSM** overview diagram containing references to **Structural Data** representing:

- i. All major substations in the **PSM**;
- ii. Lines connecting the above substations;
- iii. Names of the substations and lines; and

iv. Voltage levels of lines.

(b) A schematic diagram for each substation in the **PSM** containing references to **Structural Data** representing:

- i. All equipment (e.g., lines, transformers, switches, busbars, compensation equipment), load, and generation/storage, both AC and DC, in the substation;
- ii. Connectivity of equipment, load and generation/storage;
- iii. Normal operating status (open/closed) of switches; and
- iv. Voltage levels of busses.

PC.G.2 Additional Data Not Included in the **Solved PSM**

PC.G.2.1 Several sections of the **Planning Code**, including PC.9.3.1 and PC.10.3.1, anticipate the need for the exchange of **PSM**-related data which is not yet supported by the data exchange standard specified in PC.G.4. Several types of such data are described below.

PC.G.2.2 Full Technical **HVDC System** Models

PC.G.2.2.1 Due to the complexity of modelling **HVDC Systems**, **The Company** will model **HVDC System Connection Points** using a simplistic method. This will comprise of either:

- (a) A single generator connection for **HVDC Systems** that connect the **NETS** to an **EU Grid Supply Point**;
- (b) A single generator connection for **HVDC Systems** that connect the **NETS** to an **Offshore Transmission System** which provides the connection to one or more **Offshore Power Park Modules**;
- (c) For **HVDC Systems** which form part of the **NETS** and have only two **Onshore Grid Entry Points**, both these points will be represented by a simple generation but with additional information around system loss allowance listed in the **PSM Scenario Document**;
- (d) For **HVDC Systems** which form part of the **NETS** and have more than two **Onshore Grid Entry Points**:
 - (i) Those **Onshore Grid Entry Points** which are located on the GB mainland shall be represented by a simple generator with additional information detailing relevant system loss allowances listed in the **PSM Scenario Document**; or
 - (ii) Those **Onshore Grid Entry Points** which are located outside the GB mainland shall be represented by a simple generator, relevant **NETS** data and additional information detailing relevant system loss allowances listed in the **PSM Scenario Document**.

PC.G.2.2.2 **The Company** will consider any request from a **Network Operator** for a full **HVDC System** model connected to the **NETS**. **The Company** will, where possible, use the data exchange profile standard specified in PC.G.4.1.1 to make this **HVDC System** model available. A **PSM Scenario Document** will be provided with this model to assist the **Network Operator** to use this data.

PC.G.2.2.3 Should **The Company** be unable to facilitate a **Network Operator's** request, an alternative method to provide data will be agreed.

PC.G.2.2.4 The provision of models representing **HVDC System(s)**, with more than two **Onshore Grid Entry Points**, by **The Company** shall be agreed with the relevant **Network Operator(s)**. These models may be outside of the **NETS Solved PSM**. At such time as the **GB CIM Governance Group** update the **GB CIM** profile, these models may be exchanged as part of the **NETS Solved PSM**.

PC.G.2.3 General Demand Data

PC.G.2.3.1 The following information is infrequently required and should be supplied (wherever possible) when requested by **The Company**:

- (a) Details of any individual loads (including (as applicable) the load behaviour of an **Electricity Storage Module** when operating in a mode analogous to demand) which have characteristics significantly different from the typical range of domestic, commercial, **Electricity Storage** or industrial loads;
- (b) The sensitivity of the **Demand** to variations in voltage and **Frequency** on the **NETS** at the time of the **NETS** peak demand. The sensitivity factors quoted for the **Reactive Power** should relate to that given under PC.G.2.5;
- (c) Details of any traction loads, e.g. connection phase pairs and continuous load variation with time;
- (d) The average and maximum phase unbalance, in magnitude and phase angle, which the **User** would expect its **Demand** to impose on the **NETS**;
- (e) The maximum harmonic content which the **User** would expect its **Demand** to impose on the **NETS**;
- (f) Details of all loads which may cause **Demand** fluctuations greater than those permitted under **Engineering Recommendation P28 Issue 2, Stage 1** at a **Point of Common Coupling** including the **Flicker Severity (Short Term)** and the **Flicker Severity (Long Term)**.
- (g) In the case of **Electricity Storage Modules**, details of the **Maximum Capacity**, **Maximum Import Power**, **Registered Import Capability**, charge time, discharge time and operating periods.

PC.G.2.4 Import to Embedded Power Stations

PC.G.2.4.1 Introduction

PC.G.2.4.1.1 The import to **Embedded Power Stations** (excluding the import to **Electricity Storage Module(s)**) shall be treated, for the purpose of providing **Demand** related data to **The Company**, in the same manner as import to other types of **Demand Facility**.

PC.G.2.4.1.2 In relation to **Embedded Large Power Stations** and **Embedded Medium Power Stations** (excluding the import to **Electricity Storage Module(s)**), **The Company** may request the **Network Operator** to provide the following:

- (a) the maximum **Demand** that, in the **Network Operator's** opinion, could reasonably be imposed on the **NETS**;
- (b) the **Demand** at the time of the **NETS** peak demand; and
- (c) the **Demand** at the time of the **NETS** minimum demand.

PC.G.2.4.1.3 At its discretion **The Company** may also request the following details of the control of demand or reduction of pumping load offered as reserve:

- (a) Magnitude of **Demand** or pumping load or **Electricity Storage Module** charging load which is tripped
- (b) **System Frequency** at which tripping is initiated
- (c) Time duration of **System Frequency** below trip setting for tripping to be initiated
- (d) Time delay from trip initiation to tripping

PC.G.2.5 Network Operators' System Data

PC.G.2.5.1 Introduction

PC.G.2.5.2, PC.G.2.5.4 to PC.G.2.5.5 consist of data which is only to be supplied to **The Company** at **The Company's** reasonable request. In the event that **The Company** identifies a reason for requiring this data, **The Company** shall write to the relevant **Network Operator(s)**, requesting the data, and explaining the reasons for the request. If the **Network Operator(s)** wishes, **The Company** shall also arrange a meeting at which the request for data can be discussed, with the objective of identifying the best way in which **The Company's** requirements can be met.

Where **The Company** makes a request to a **Network Operator** for dynamic models under PC.G.2.5.5, each relevant **Network Operator** shall ensure that the models supplied in respect of their **Plant** and **Apparatus** reflect the true and accurate behaviour of the **Plant** and **Apparatus** as built and verified through the **Compliance Processes**.

PC.G.2.5.2 Network Operator's Protection Data

The following information is required which relates only to **Protection** equipment which can trip or inter-trip or close any **Connection Point** circuit-breaker or any **Transmission** circuit-breaker. This information need only be supplied once, in accordance with the timing requirements set out in PC.A.1.4(b), and need not be supplied on a routine annual basis thereafter, although **The Company** should be notified if any of the information changes;

- (a) a full description, including actual or estimated settings as appropriate, for all relays and **Protection** systems installed or to be installed on the **Network Operator's System**;
- (b) a full description of any auto-reclose facilities installed or to be installed on the **Network Operator's System**, including type and time delays; and
- (c) the most probable fault clearance time for electrical faults on any part of the **Network Operator's System** directly connected to the **NETS** including **OTSDUW Plant** and **Apparatus**.

PC.G.2.5.3 Harmonic Studies

PC.G.2.5.3.1 It is occasionally necessary for **The Company** to evaluate the production/magnification of harmonic distortion on the **NETS**, **OTSUA** and **Network Operator's Systems**, especially when equipment such as capacitor banks are being connected to the **NETS**. At **The Company's** reasonable request, each **Network Operator** shall submit data with respect to the **Connection Site**, relating to the existing and forecast harmonic distortion levels, and:

- (a) At the lower voltage busbar at substations connecting the **Subtransmission System** to a lower voltage:
 - (i) Connection voltage and MVar rating of any capacitor bank and component design parameters if configured as a filter;
 - (ii) The minimum and maximum **Demand** (both MW and MVar) that could occur;
 - (iii) Harmonic current injection sources in Amps at locations agreed between **Network Operators** and **The Company**. Where the harmonic injection current comes from a diverse group of sources, the equivalent contribution may be established from appropriate measurements; and
 - (iv) Details of traction loads, eg connection phase pairs, continuous variation with time, etc;
- (b) An indication of which items of equipment may be out of service simultaneously during **Planned Outage** conditions.

PC.G.2.5.4 Dynamic Models

It is occasionally necessary for **The Company** to evaluate the dynamic performance of **Network Operator's Plant** and **Apparatus** at each **EU Grid Supply Point** or in the case of **EU Code Users**, their **System**. At **The Company's** reasonable request and as agreed between **The Company** and the relevant **Network Operator**, each **Network Operator** is required to provide the following data. Where such data is required, **The Company** will work with the **Network Operator** to establish the scope of the dynamic modelling work and share the required information where it is available:

- (a) Dynamic model structure and block diagrams including parameters, transfer functions and individual elements (as applicable);
- (b) Power control functions and block diagrams including parameters, transfer functions and individual elements (as applicable);
- (c) Voltage control functions and block diagrams including parameters, transfer functions and individual elements (as applicable); and
- (d) Converter control models and block diagrams including parameters, transfer functions and individual elements (as applicable).

Where **The Company** makes a request to a **Network Operator** for dynamic models, the **Network Operator**, to the best of its ability, shall ensure that the models supplied in respect of the **Plant** and **Apparatus** reflect the true and accurate behaviour of the **Plant** and **Apparatus** as built and verified through the **Compliance Processes**.

PC.G.2.5.5 Transient Overvoltage Assessment Data

It is occasionally necessary for **The Company** to undertake transient overvoltage assessments (e.g. capacitor switching transients, switchgear transient recovery voltages, etc). At **The Company's** reasonable request, each **Network Operator** is required to provide the following data with respect to the **Connection Site**, as follows:

- (a) busbar layout plan(s), including dimensions and geometry showing positioning of any current and voltage transformers, through bushings, support insulators, disconnectors, circuit breakers, surge arresters, etc. Electrical parameters of any associated current and voltage transformers, stray capacitances of wall bushings and support insulators, and grading capacitances of circuit breakers;
- (b) Electrical parameters and physical construction details of lines and cables connected at that busbar. Electrical parameters of all plant not previously supplied as part of the **Structural Data** e.g., transformers (including neutral earthing impedance or zig-zag transformers, if any), series reactors and shunt compensation equipment connected at that busbar (or to the tertiary of a transformer) or by lines or cables to that busbar;
- (c) Basic insulation levels (BIL) of all **Apparatus** connected directly, by lines or by cables to the busbar;
- (d) characteristics of overvoltage protection devices at the busbar and at the termination points of all lines, and all cables connected to the busbar;
- (e) the following data is required on all transformers operating at **Supergrid Voltage** throughout Great Britain and, in Scotland, also at 132kV or greater: three or five limb cores or single phase units to be specified, and operating peak flux density at nominal voltage; and
- (f) an indication of which items of equipment may be out of service simultaneously during **Planned Outage** conditions.

PC.G.2.6 System Restoration Related Information

PC.G.2.6.1 Data identified under this section PC.G.2.6.1 must be submitted as required under OC9.5.

PC.G.2.6.2 Where a **Network Operator** has a **Distribution Restoration Zone Plan** in place, the data specified in this section shall be submitted as required by **Network Operator(s)** to **The Company** annually by calendar week 28. This information may also be requested by **The Company** from the relevant **Network Operator(s)** during **System Restoration** and should be provided by **Network Operator(s)** where reasonably practicable. **Restoration Contractors** party to a **Distribution Restoration Zone Plan** shall, where reasonably practicable, submit the relevant information to the **Network Operator** who shall then supply the relevant information to **The Company**. The following data shall be provided;

- (a) The expected time for each **Restoration Contractor's Plant** to **Re-Synchronise** to the **Network Operator's System** following a **Total Shutdown** or **Partial Shutdown**. The assessment should include the **Restoration Contractor's** ability to **Re-Synchronise** all their **Plant** if all were running immediately prior to the **Total Shutdown** or **Partial Shutdown**. Additionally, the data and supporting text should highlight any specific issues (e.g., those that would affect the time before which the **Restoration Contractor's Plant** could be energised) that may arise as time progresses from **Shutdown** without external supplies being restored or the availability of primary fuel supplies; and
- (b) The **Restoration Contractor's Plants Block Loading Capability** as required in PC.G.2.6.1(b).

PC.G.2.6.3 From 31st December 2026 onwards, all **Network Operators** are required to confirm annually they comply with the applicable requirements of OC5.7. In the case of **Network Operators** this confirmation shall be provided in their Week 28 submission. From 1st January 2024 until 31st December 2026, evidence to support the work **Network Operators** are carrying out to achieve these requirements on or after 31st December 2026 shall be provided in their week 24 submission.

PC.G.3 Organisation of **PSM** data

PC.G.3.1 Sections 9 and 10 of the **Planning Code** require **The Company** and **Network Operators** to use **Solved PSMs** to describe the equipment, connectivity and operating condition of their portion of the **System**. This section describes how the data of a **Solved PSM** is organised and is included for information purposes.

Four main organizational concepts work together to allow the description of grid model data in building block 'modules'. These organizational constructs are:

- Profiles – Profiles divide data by type (Structural, Situation or Solution).
- Frames and Boundaries – Frames and Boundaries represent grid extents (sometimes call territories). A Frame is typically used to define a grid extent under the data mastership of one modelling party. A Boundary exists between Frames whose systems are connected.
- Models – Models are snapshots of grid objects representing a specific system or system operating condition.
- Assembly – Assemblies are collections of Models, typically for a specific purpose.

Planning Code Section 9, Section 10, and Appendix G.1 reference the concept of **CIM** profiles in their definition of data requirements. This Appendix will explore the other organisational concepts.

PC.G.3.2 Frame, Boundary, Model and Assembly concepts

Frames and Boundaries define grid extents which enable the maintenance of power system models in 'modules' which can be easily combined to create cohesive input data for various network analysis studies. Every Boundary is associated with two or more Frames. (Two is the most common number of Frames per Boundary, however, three or more Frames can be associated with a Boundary if necessary to accurately express the relationships among the systems of the various modelling-responsible parties.) There is an electrical connection between one or more pieces of equipment in the grid extent defined by each Frame and the equipment in the Boundary. All connections between the equipment of one Frame and that of another Frame (or set of Frames) are defined using a single Boundary.

Models contain grid objects which represent some facet of the portion of the power system contained in a Frame or Boundary. The grid objects in a Model all conform to a Profile describing a type of data. The Structural Profile describes information about the characteristics of electricity system equipment, including their capabilities and connectivity. The Situation Profile describes information about the operational state of an electricity system, including demand and generation output and switch positions. The Solution Profile describes information regarding the results of a steady-state power flow calculation and/or short circuit calculation performed by a power system modelling application.

Assemblies are collections of Models grouped to support a purpose. An Assembly can contain multiple Models whose data conforms to the same Profile or Models conforming to multiple different Profiles.

PC.G.3.3 Organising grid model data using the four concepts

Figure illustrates how an electrical power system composed of a transmission system and seven distribution systems could be divided into the Frames and Boundaries which delineate modelling responsibility.

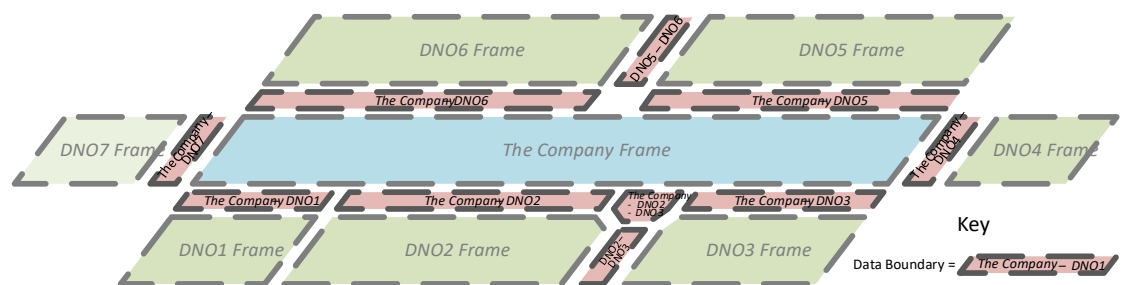


Figure 1 - Frames and Boundaries of a typical transmission and distribution power system

In this diagram, seven **Network Operators** each have modelling responsibility for their own system – their Frames are labelled DNO1 Frame through DNO7 Frame. **The Company** has modelling responsibility for the transmission system - its Frame is called The Company Frame. There is a Boundary defined wherever the system of one Frame connects to the system of another Frame. In Figure , the system of every DNO Frame connects to the system of The Company Frame. These connections are reflected by the presence of The Company-DNO1, The Company-DNO2, The Company-DNO3, The Company-DNO4, The Company-DNO5, The Company-DNO6, and The Company-DNO7 Boundaries. The systems of the DNO2 and the DNO3 Frames connect to each other and the systems of the DNO6 and DNO7 Frames connect to each other - the DNO2-DNO3 Boundary and DNO6-DNO7 Boundary, respectively, reflect these connections. Additionally, the systems of the DNO2 and DNO3 Frames happen to have shared connection points with the system of The Company Frame, thus there is one tri-lateral Boundary, The Company-DNO2-DNO3.

In the straightforward situation where a detailed master Structural Model of the entire system is being constructed, each modelling-responsible party would create a Structural Model (a model of the equipment and connectivity of its system) describing the power system in its Frame. Each set of modelling-responsible parties whose Frames adjoin a given Boundary would agree on the modelling of their connections and would create a Structural Model for that Boundary. Each Structural Model would essentially 'fit into' or 'fill' its Frame or Boundary. This is illustrated in Figure .

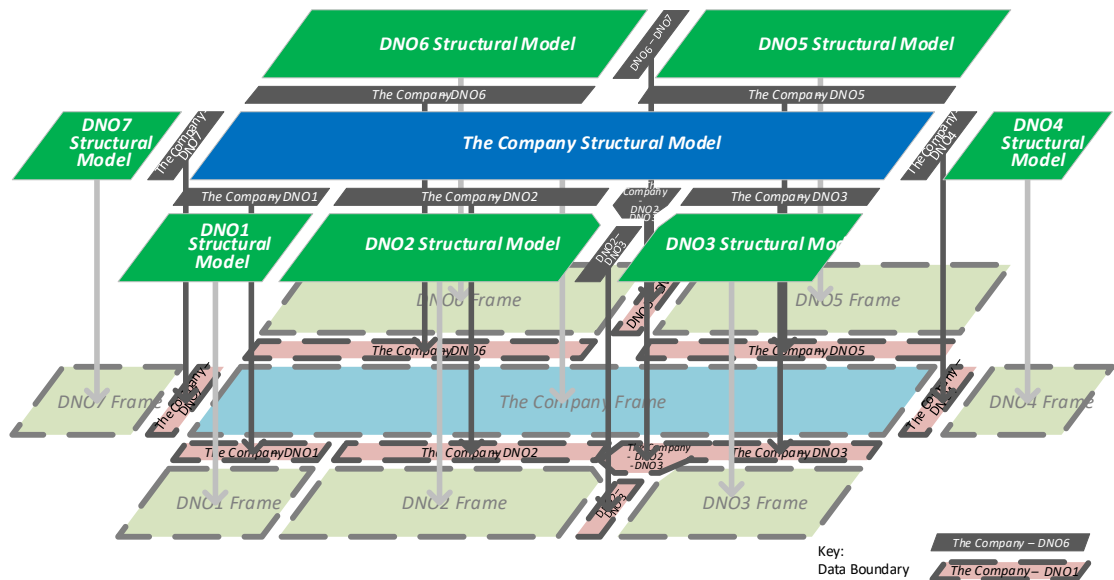


Figure 2 - Models ‘fit into’ Frames and Boundaries

The Structural grid model data that results from combining all the Models is complete model of the system, which is modular, and reflective of each parties modelling responsibility.

This collection of Models – the Structural Models which together describe the complete, master Structural data of the power system – could be shared as an Assembly (a collection of Models for a purpose), as shown in **Error! Reference source not found..**

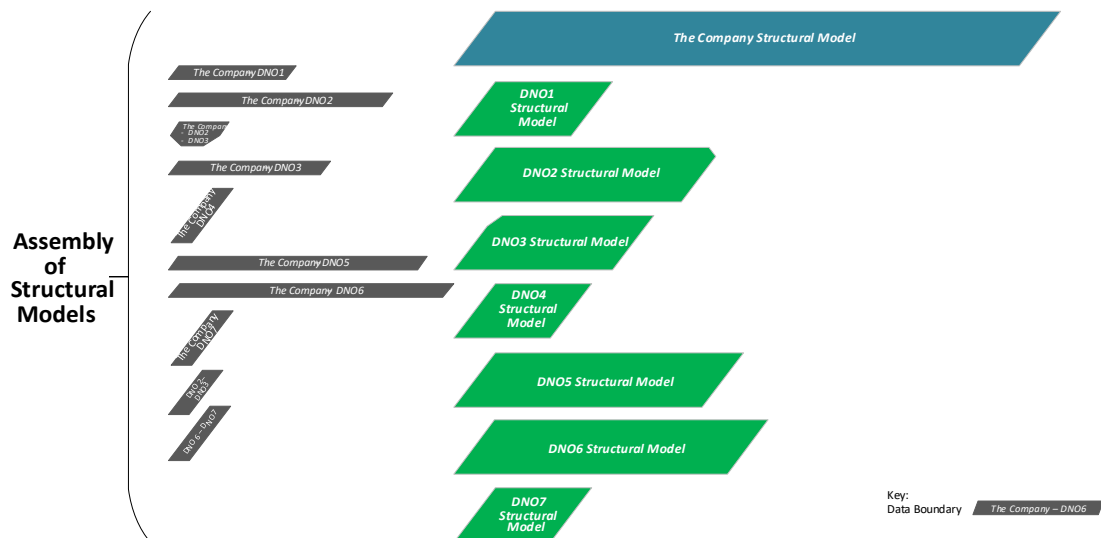


Figure 3 - An Assembly of Structural Models describing the equipment and connectivity of the complete power system

To describe the operating condition for a given study, the set of Structural Models could be augmented with Situation Models for each of the Frames. The Situation Models are shown in the upper portion of Figure .

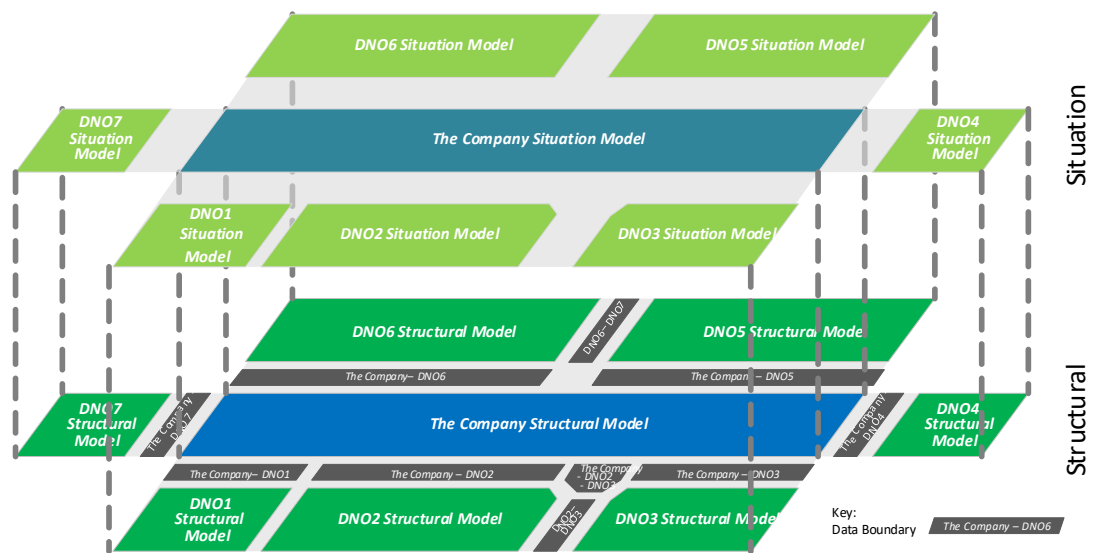


Figure 4 - A set of Situation Models augmenting their relevant Structural Models

Situation Models are typically needed only for Frames because Boundaries should not include equipment that needs to have Situation (system operating condition) data defined for it. An Assembly, made up of the Structural and Situation Models shown in Figure , could be created to facilitate the sharing of the inputs necessary to run a given type of network analysis.

If the appropriate type of network analysis were run using the set of Structural and Situation Models shown in Figure as input, a single Solution Model for the entire power system would be created. It is shown at the top of Figure , which, for context, also shows the Structural and Situation Models.

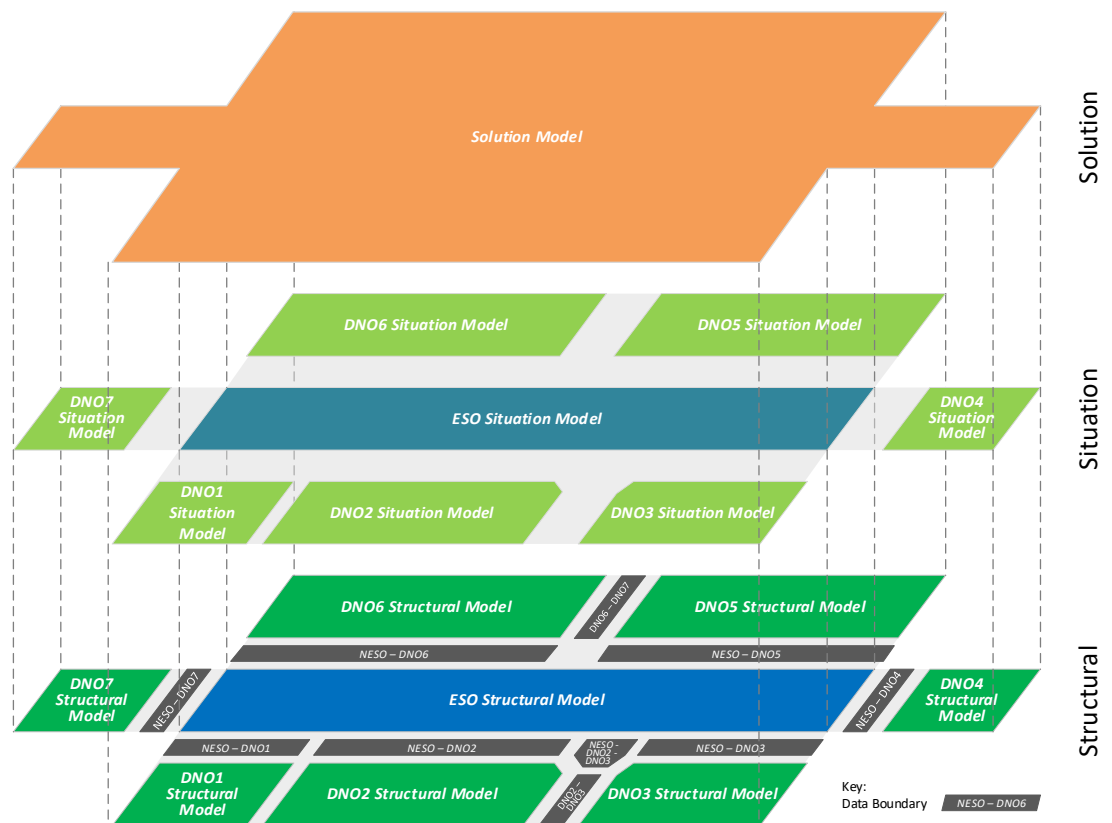


Figure 5 – A Solution Model created by network analysis using the relevant Structural and Situation Models as input

This complete case, composed of Models describing both the inputs and outputs of a specific network analysis execution, could also be shared as an Assembly.

PC.G.3.4 A Great Britain example

PC.G.3.4.1. Structural Models and their Frames and Boundaries

This section explores how grid objects in Models can connect across Frames and Boundaries using a very small, hypothetical portion of a system as an example. The red outline in Figure indicates the portion of the power system presented in PC.G.3.3 which the small system example encompasses.

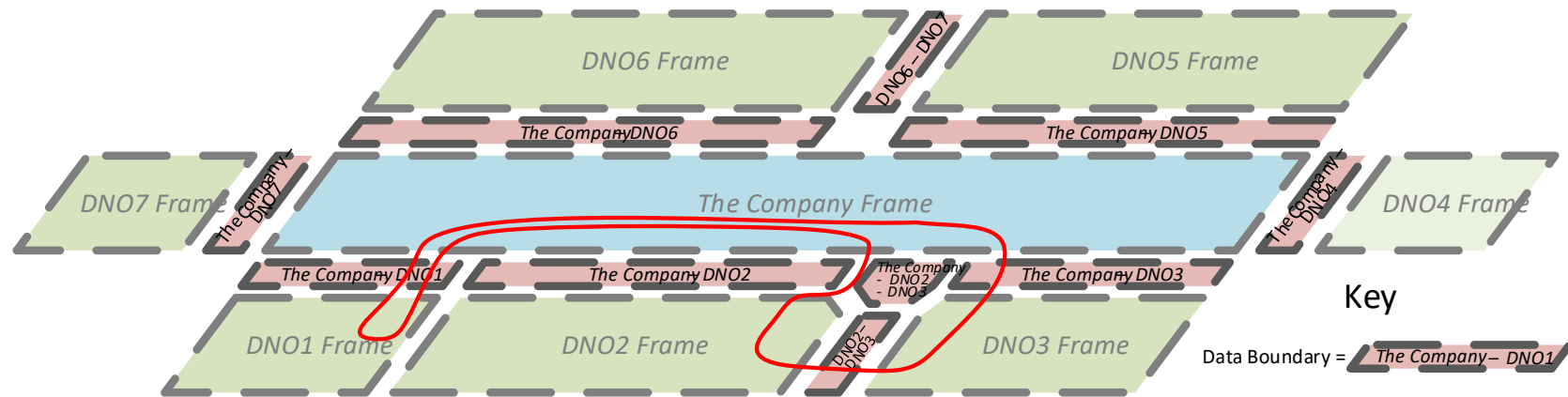


Figure 6 – Portion of the power system represented by the small system example

The small system example, whose schematic is shown in Figure , reflects a variety of system configuration characteristics found in the GB **System**. It focuses on points of connection among three **Network Operator Systems** and the **NETS**. The example has three substations:

- Substation A – A **GSP** substation where the DNO1 **Network Operator System** connects to the **NETS**. It is connected at a voltage level lower than that of Substation B and C and could be viewed as representing a **GSP** in Scotland.
- Substation B – A **GSP** substation where the **Systems** of the DNO2 and DNO3 **Network Operators** both connect to the **NETS**. It reflects an uncommon connection configuration, but one that is present in England
- Substation C – A **GSP** substation where the DNO3 **Network Operator System** connects to the **NETS**. It reflects a connection configuration commonly present in England.

The example also includes three types of connection configurations between the **Systems** of the DNO2 and DNO3 **Network Operators**. Additionally it contains a subtransmission line operated by **The Company**, which is connected to the low-voltage bus of Substation B and the high-voltage bus of Substation A.

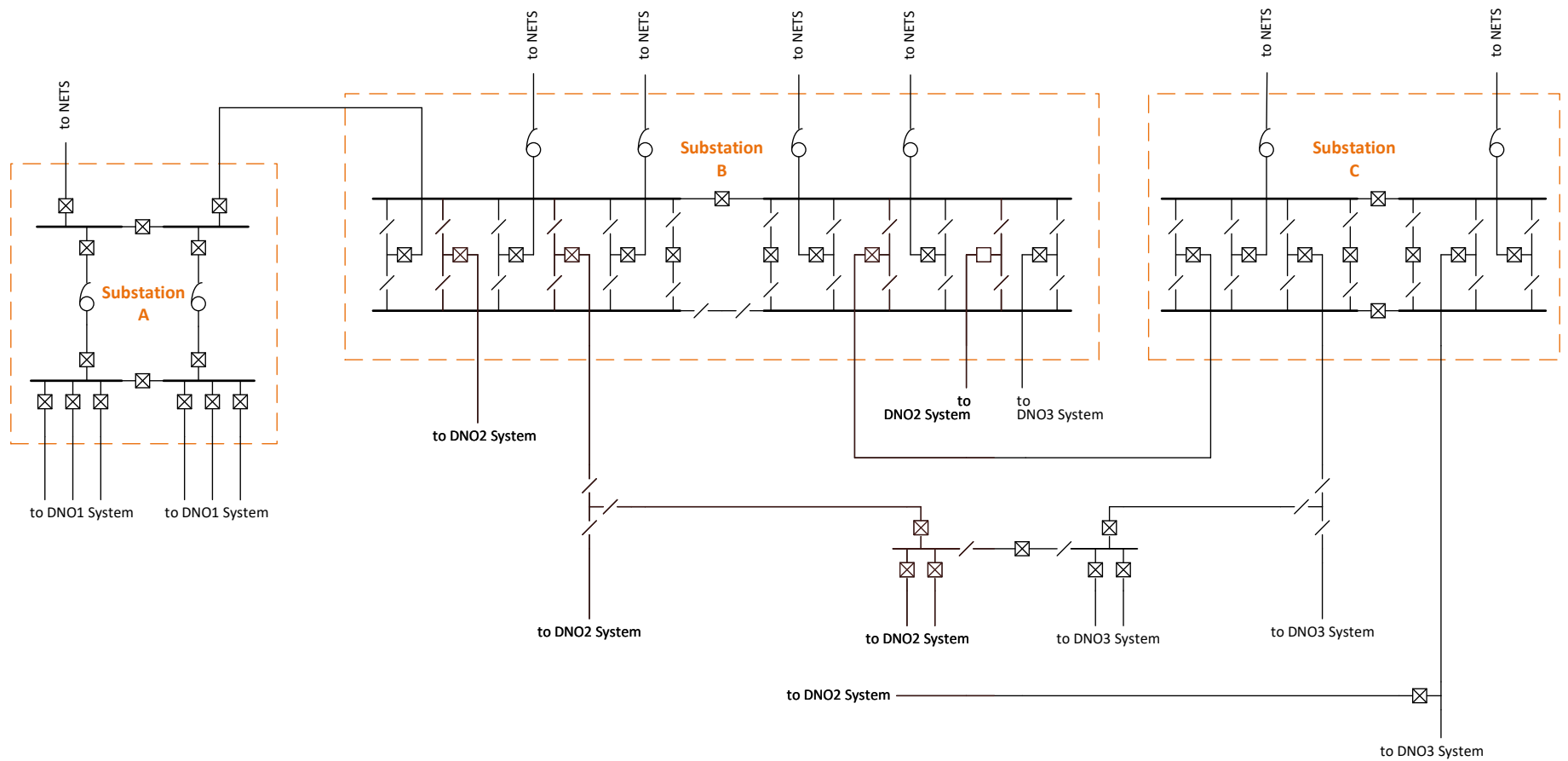


Figure 7 - Schematic of the small system example

The major grid objects used in a **PSM** representation of the small system example are superimposed on the schematic in Figure .

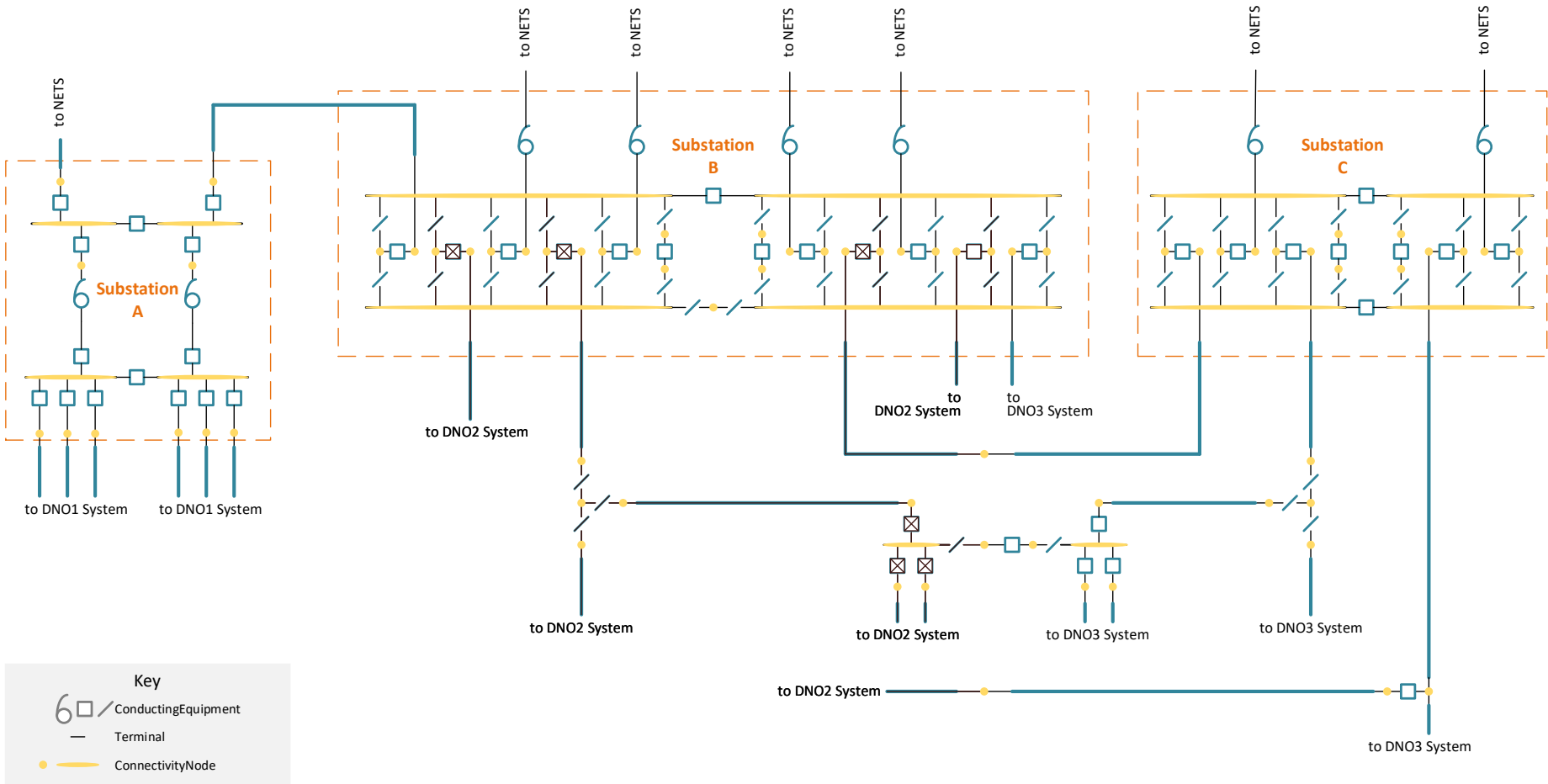


Figure 8 – Foundational grid objects used to represent the equipment and connectivity of small system example

Figure illustrates, using the small system example, the philosophy typically followed in allocating grid operating responsibility among **The Company** and **Network Operators**. The circuit breakers and switches which couple busbars and those which connect the main and reserve busbars are the operating responsibility of the relevant **Network Operator System** for Substations A and C because only one **Network Operator System** connects to the **NETS** at those substations. At Substation B, however, **The Company** has operating responsibility for the busbar circuit breakers and switches because two **Network Operators' Systems** connect to the **NETS** there.

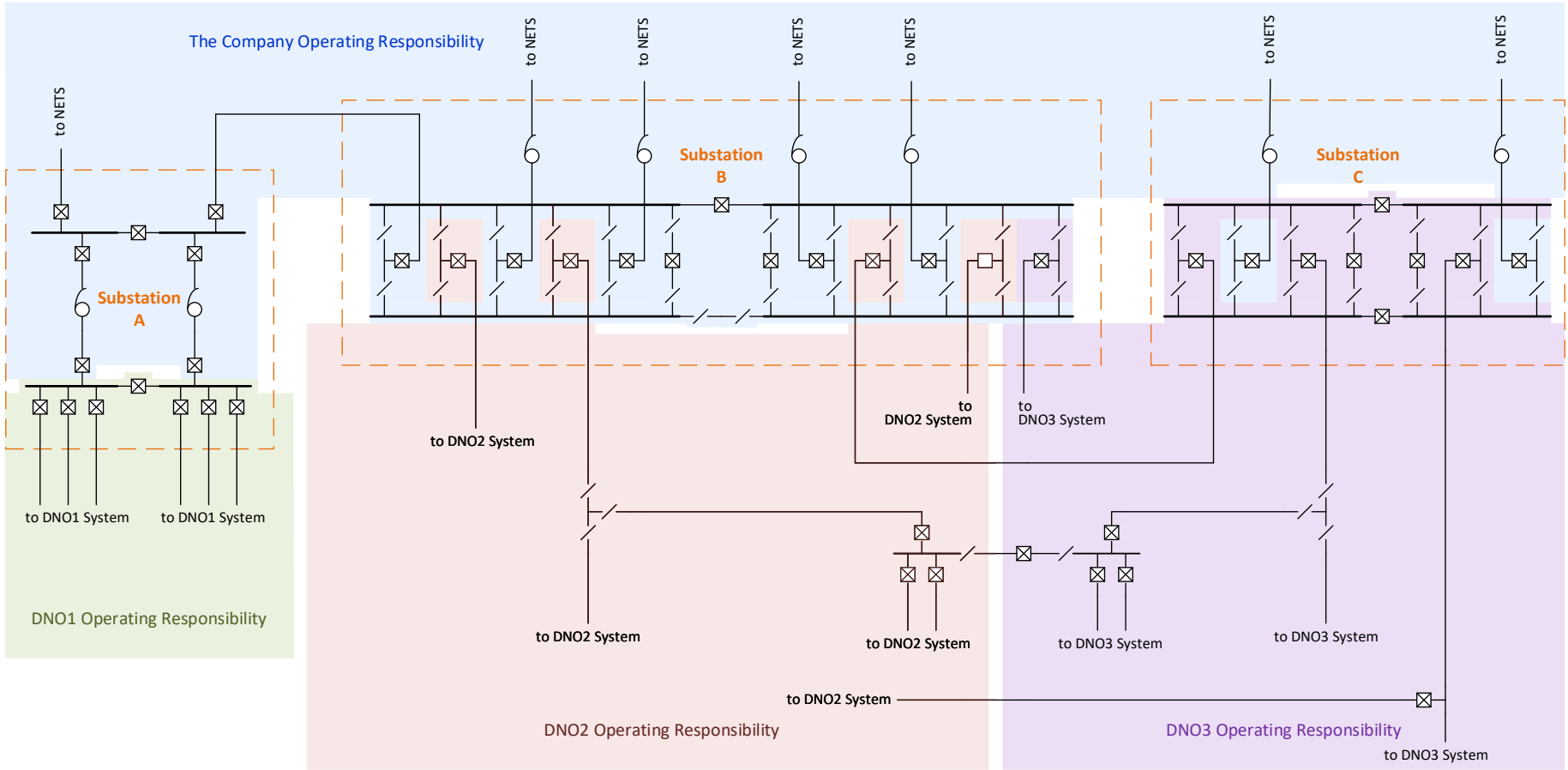


Figure 9 – Allocation of operating responsibility for the small system example

The decision has been taken to align modelling responsibility with operating responsibility in Planning Code data exchanges. The four Frames (The Company Frame, DNO1 Frame, DNO2 Frame and DNO3 Frame) and four Boundaries (The Company-DNO1, The Company-DNO2-DNO3, The Company-DNO3, and DNO2-DNO3) outlined in Figure reflect that decision.

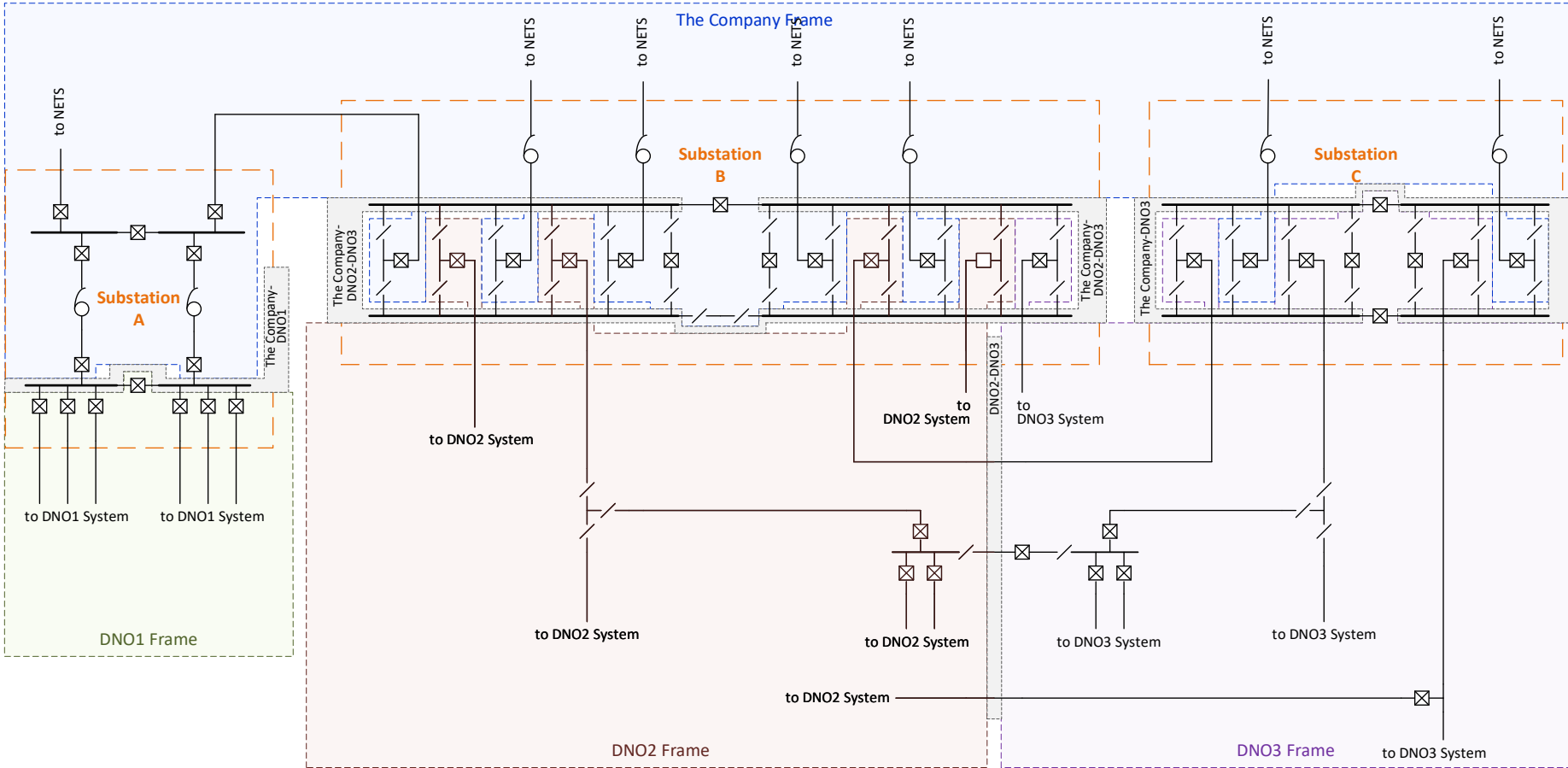


Figure 10 - The Frames and Boundaries of the small system example

Figure shows the major grid objects contained in the various master Structural Models which 'fit into' each of the Frames and Boundaries of the small system example.

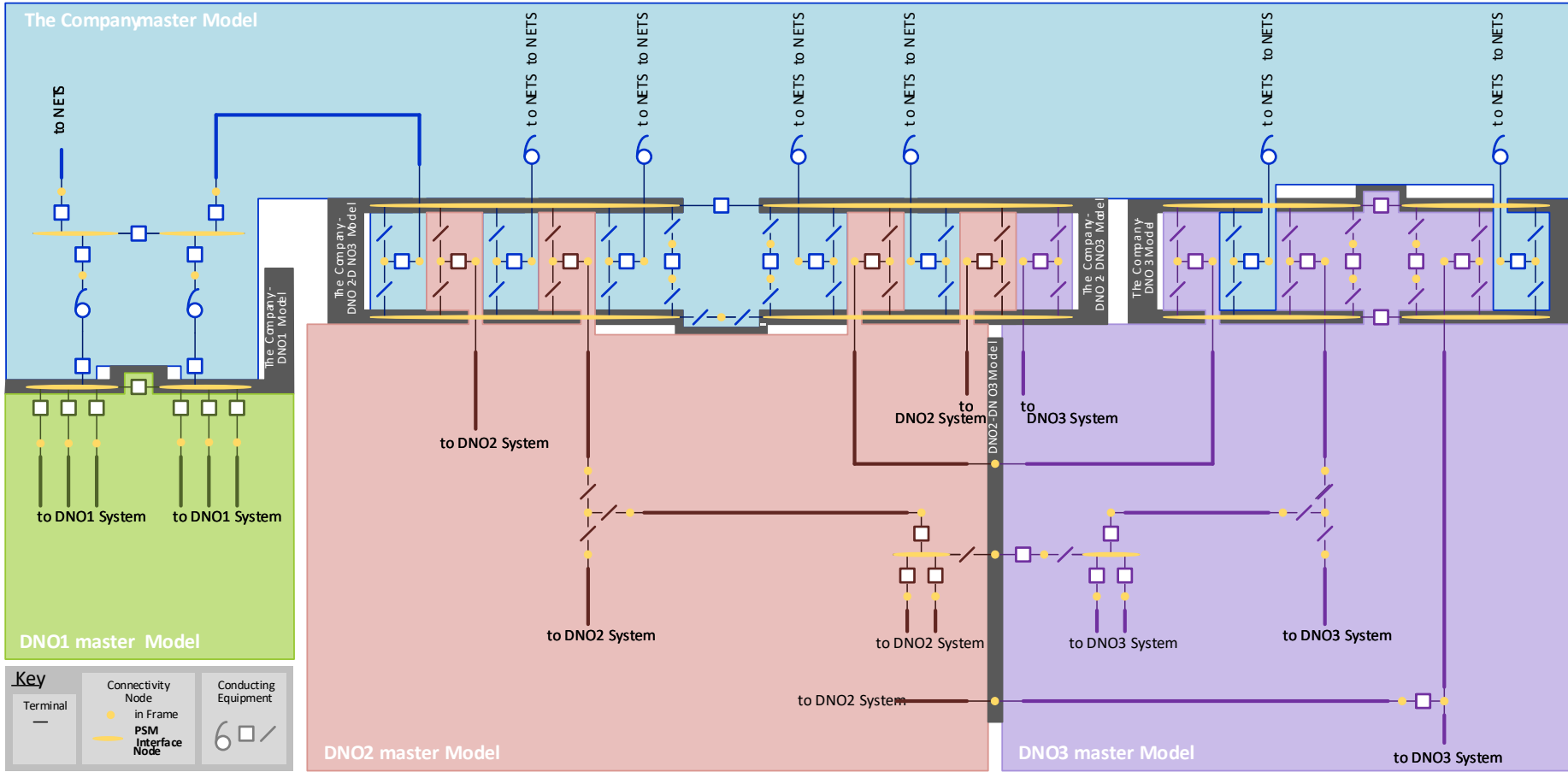


Figure 11 – Major grid objects comprising the master Structural Models which 'fit into' each Frame and Boundary

Note that the only grid objects in the Structural Boundary Models in Figure are the Connectivity Nodes representing **PSM Interface Nodes** which are shown as gold oblongs with green glow.

PC.G.3.4.2 Assemblies for the exchange of **Solved PSMs**

The **Solved PSMs** required by PC.9 and PC.10 are exchanged using Assemblies of Models. In creating their **Solved PSMs**, it is anticipated that both **The Company** and the **Network Operators** will execute a process similar to the following:

The **Solved PSM** creator performs studies in its own power systems analysis software tool using appropriately detailed models representing both its portion of the **System** and adjacent portions. When a study solution of suitable quality is achieved, the **Solved PSM** is created by trimming off the adjacent portions, leaving only the Structural, Situation and Solution Models which 'fit into' the creator's Frame along with the Structural Models which 'fit into' all Boundaries adjacent to their Frame.

The resulting **Solved PSMs** are then submitted to the receiving party as an Assembly. Within the Assembly, there are references by grid objects in one Model to grid objects in other Models:

- Situation and Solution Frame Model grid objects point to grid objects in the Structural Frame Model.
- Structural Frame Model grid objects point to grid objects representing **PSM Interface Nodes** in Structural Boundary Models.

However, for the Assembly as a whole, there are no dangling references.

The receiving party typically uses the Assembly in the following manner:

- The Structural Frame Model is incorporated into the model of the receiving party's study tool, replacing the previous modelling for that Frame and connecting to the **PSM Interface Nodes** contained in the study tool model.
- The Situation and Solution Models are used as reference inputs into various studies set up and run by the receiver as part of its own business processes.

For the small system example outlined in PC.G.3.4.1, the Models shown in Figure would comprise the **Solved PSMs** submitted by **The Company** and by the DNO1, DNO2 and DNO3 **Network Operators**.

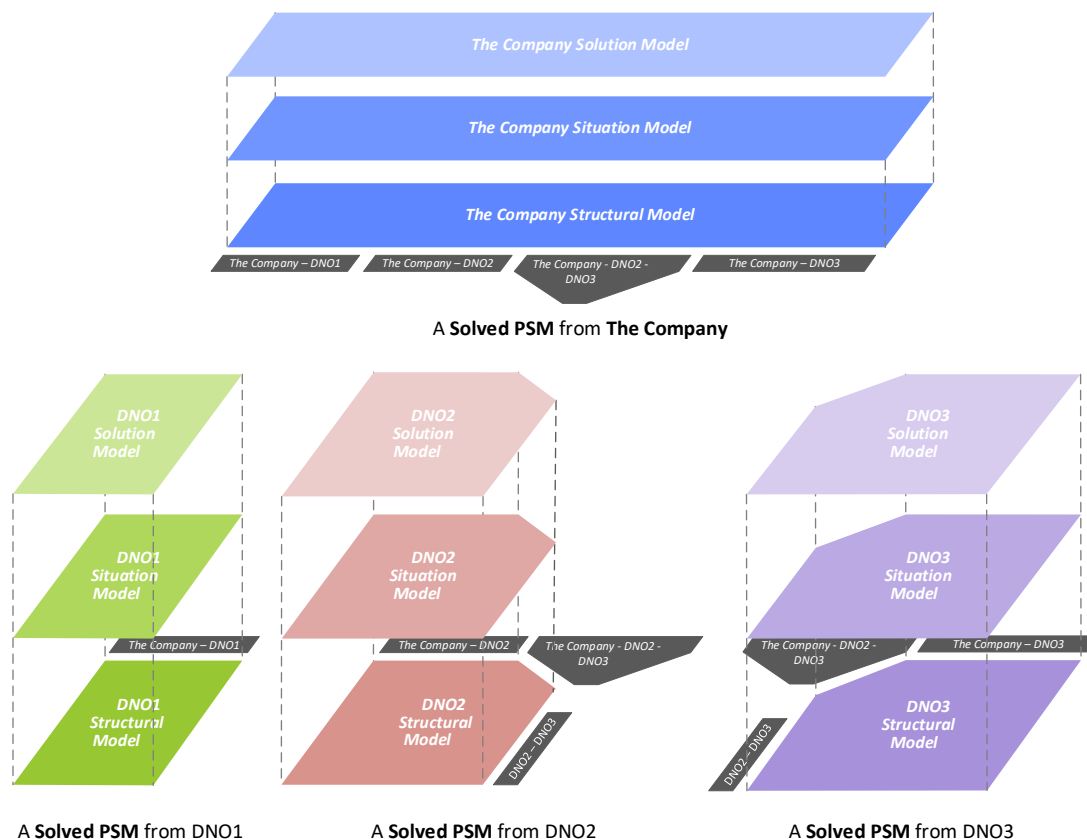


Figure 12 – Models appearing the Solved PSMs from The Company and Network Operators

- PC.G.4 PSM/PSDM data exchange standards
- PC.G.4.1 The data of the **Solved PSMs** or **PSDMs** required under PC.9, PC.10, PC.G.1 and whose organisation is described in PC.G.3 shall conform to the schema and constraints defined by the designated data exchange profile standards listed in PC.G.4.1.1.
- PC.G.4.1.1 The currently designated data exchange profile standard is defined by a combination of:
- IEC 61970-600-2:2021 Common Grid Model Exchange Specification (CGMES) - Exchange profiles specification, commonly known as CGMES v3.0; plus
 - **Planning Code**-specific extensions to CGMES v3.0 as identified and managed by the **GB CIM Governance Group**.
- PC.G.5 PSM Scenario Document
- PC.G.5.1 A **PSM Scenario Document** shall be submitted to **The Company** as part of each **Network Operator's** submission in calendar weeks 2 and 28. A **PSM Scenario Document**, tailored to the individual **Network Operator**, shall be submitted to each **Network Operator** by **The Company** as part of its submission in calendar weeks 12 and 38. The aim of the **PSM Scenario Document** is to provide contextual information to help the receiving party better understand the submission and the assumptions made in developing it. The **PSM Scenario Document** shall contain:
- PC.G.5.1.1 Information related to the content and creation of **Solved PSMs**, including:
- PC.G.5.1.1.1 For the **Structural Data** underlying the **Solved PSMs** of a submission, the following:
- (a) To be supplied by **Network Operators**:
 - i. Descriptions of the simple representation of **HVDC Systems**.
 - (b) To be supplied by **The Company**:
 - i. Descriptions of the simple representation of **HVDC Systems**; and
 - ii. The identification of all schemes which are nearing completion as of the time of submission which are included in the **Structural Data** of the **Solved PSM**. Such schemes include **NETS** reinforcement, asset replacement, or similar schemes and new generation or load schemes where the relevant customer has accepted a connection offer from **The Company** to connect to the **NETS** but is not yet connected at the time of submission.
- PC.G.5.1.1.2 For each **Solved PSM** in a submission, the following:
- (a) To be supplied by **Network Operators**:
 - i. A summary of the **Network Operator's System** conditions reflected by the **Solved PSM** and any general information regarding the **Solved PSM** that would aid in its use;
 - ii. Description of running arrangements where they are different to that described by the **Situation Data** of the **Solved PSM** (e.g. where there is a different post outage running arrangement, or modifications to the **Network Operator's System** due to the commissioning of a system reinforcement project);
 - iii. Demand and generation assumptions used in developing the **Situation Data** (e.g., generation dispatch assumptions like PV generation export being zero at the time of the **NETS** peak demand on the basis that the **NETS** peak demand occurs when it's dark). Describing these assumptions should address any differences in **Demand** and generation values between the **Solved PSM** and Schedule 21;
 - iv. Where the information is known by the **Network Operator**, the extent to which any customer demand has been influenced by a flexible demand contract with any party; and

- v. For fault level **Solved PSMs**, a description of the assumptions made in the process of developing the **Situation Data** used in the fault level **Solved PSM** e.g. generation energisation / export and running arrangement assumption.

(b) To be supplied by **The Company**

- i. A summary of the condition(s) specified in PC.10.3.2.1 a) or PC.10.3.3.1 a), as applicable, which are represented by each **Solved PSM** and any general information regarding the **Solved PSM** that would aid in its use. In the case of the low power transfer and high power transfer **Solved PSMs**, this would include an indication of the direction of flow (e.g., north to south);
- ii. Description of changes to current running arrangements as a result of planned modifications to the **NETS** which are included in the summer or winter **Structural Data**, and which reflect future not-yet-commissioned reinforcement or asset replacement schemes or generator or load connections;
- iii. Demand and generation assumptions used in developing the **Situation Data** (e.g., generation dispatch assumptions, or how generation injections were adjusted to accommodate new, not-yet-connected generation included in the summer/winter **Structural Data**, or how demand and/or generation injections supplied by **Network Operators** were modified to facilitate power flow convergence or specific **Real Power (P)** and **Reactive Power (Q)** results at the **PSM Interface Nodes**);
- iv. Dispatch assumptions for external **HVDC Systems**, including both export and import;
- v. For fault level **Solved PSMs**, a description of the assumptions made in the process of developing the **Situation Data** used in the fault level **Solved PSM** e.g. generation energisation / dispatch and running arrangement assumptions; and
- vi. An identification of known discrepancies in the **Structural Data**, **Situation Data** or **Solution Data** due to changes occurring during the timeframe the **Solved PSM** was being built. Such discrepancies are assumed to be minor as any change occurring during the construction process with significant impact should have been incorporated into the **Solved PSM**.

PC.G.5.1.2 Information helpful in utilising the **Solved PSMs**, including:

PC.G.5.1.2.1 Descriptions of network constraints:

(a) To be supplied by **Network Operators**:

- i. Any constraints which could impact the capability of the **Network Operator's Subtransmission System** to accommodate import to demand customers or export from generation under normal operational conditions. For example, this could include a limit of the import from and/or the export to a **Connection Point** implemented by an **Active Network Management** scheme. The **Network Operator** may provide further information about other constraints on their **System** operating at voltages below the **Subtransmission System**.

(b) To be supplied by **The Company**:

- i. Any **NETS** operational schemes that could have an impact on the **Network Operator's System**.

PC.G.5.1.2.2 Modelling guidance:

(a) To be supplied by **The Company**:

- i. Guidance that would assist recipients using the model, e.g. guidance on the generation connected to the **NETS** whose modelled output may be modified by a **Network Operator** to facilitate studies outside the standard exchanged scenarios; and
- ii. Guidance that would assist recipients using the model, e.g. guidance on the **HVDC** plant connected to the **NETS** whose modelled output may be modified by a **Network Operator** to facilitate studies outside the standard exchanged scenarios.

PC.G.5.1.2.3 Descriptions of contingency actions:

(a) To be supplied by **The Company**:

- i. A description of changes to the **NETS** so that the **Network Operator** may undertake analysis of the impact of additional operational arrangements other than that included in the **Situational Data** of the **Solved PSM**.

PC.G.5.1.2.4 Descriptions of additional network constraint actions:

(a) To be supplied by **Network Operators**:

- i. Where agreed with **The Company** a description of additional actions that would be taken with respect to their **System** when analysing a scenario outside the ones included in the information exchanges defined in PC.9

(b) To be supplied by **The Company**:

- i. Where agreed with the **Network Operator** a description of additional actions that would be taken with respect to the **NETS** when analysing a scenario outside the ones included in the information exchanges defined in PC.10.

PC.G.5.1.3 Information related to Schedules 23b and 23c:

PC.G.5.1.3.1 For Schedules 23b and 23c, the following post fault **Network Operator System** information, relating to the **Connection Point Access Period**, shall be provided by the **Network Operators**:

- (a) An accurate and unambiguous description of the **Transmission Interface Circuits** considered to be switched out due to a planned outage being assessed; and
- (b) The reconfiguration plan to transfer demand from one **Connection Point** to another **Connection Point**. Details of the switching operation or reconfiguration which implements any demand transfer, including arrangements for undertaking actions (e.g. the time taken, automatic or manual and any other appropriate information), shall be provided for:
 - i. Those actions which would be implemented for a first planned outage; and
 - ii. Those actions that would be implemented following a subsequent fault outage during a planned outage.

The **Network Operator** must not submit any action that it does not have the capability or the intention to implement during the assessment period specified (subject to there being no further unplanned outages on the **Network Operator's System**).

PC.G.6 PSM Change Document

PC.G.6.1 A **PSM Change Document** shall be submitted as part of each **Network Operator** submission in calendar weeks 2 and 28 and each submission made by **The Company** in calendar weeks 12 and 38. The aim of the **PSM Change Document** is to provide contextual information to help the receiving party understand what has changed in the **Solved PSMs** of this submission relative to the preceding submitted **Solved PSMs**. The **PSM Change Document** shall contain:

PC.G.6.1.1 Information related to the content of **Solved PSMs**, including:

PC.G.6.1.1.1 An overview of the major changes to **Structural Data**.

(a) To be supplied by **Network Operators**:

- i. A description, including the purpose and in-service date, of any new or modified connections or alterations to the **Network Operator's System** whose changes are included in the **Structural Data** of this submission; and
- ii. A description of any other changes to the **Structural Data** of this submission, for example, the inclusion of new network data, or changes to operating parameters like ratings or normal positions of transformer taps or switches.

(b) To be supplied by **The Company**:

- i. A description, including the purpose and in-service date, of any new or modified connections or alterations to the **NETS** whose changes are included in the **Structural Data** of this submission;
- ii. A description including the purpose and reason for non-implementation of each delayed or cancelled connection or alteration to the **NETS** whose changes were included in the **Structural Data** of the preceding submitted **Solved PSM(s)** but which are not included in the **Structural Data** of this submission's **Solved PSM(s)**; and
- iii. A description of any other changes to the **Structural Data** of this submission, for example, the renaming of an asset, the inclusion of a new type of data, or changes to operating parameters like ratings or normal positions of taps or switches.

PC.G.6.1.1.2 An overview of any significant changes in the assumptions, approach, or inputs used in the creation of **Situation Data**.

(a) To be supplied by **Network Operators**:

- i. A description of significant differences of demand or generation patterns, constraints, or running arrangements (e.g., commissioning of a new Active Network Management scheme in **Network Operator's System** to manage power flow at a **Connection Point**, or a newly implemented curtailment agreement, or unusual growth of EV-related demand at a given substation);
- ii. For the **Situation Data** of **Solved PSM(s)** providing steady state power flow information, a description of any changes made to the process by which the **Situation Data** is created (e.g., changes have been made in the treatment of the import to **Electricity Storage**, or a new technique is being used for calculating historic demand or generation values from field monitoring data, or improved mechanics are being used to 'fit' **Situation Data** reflective of a particular grid condition to the **Structural Data** reflective of the **Data Freeze Date**); and
- iii. For the **Situation Data** of **Solved PSM(s)** providing fault level information, a description of any changes made to the process by which fault level data is created (e.g., new software or a new process is being used to perform fault level calculations, or an improved mechanism is being used to determine demand short circuit contributions).

(b) To be supplied by **The Company**:

- i. A description of significant differences of demand or generation patterns, constraints, or running arrangements (e.g., a change to the permitted export from parts of the **NETS** due to dispatch related constraints on the **NETS** becoming permanent, or a changed summer operating arrangement due to a new demand customer);
- ii. For the **Situation Data** of **Solved PSM(s)** providing steady state power flow information, a description of any changes made to the process by which the **Situation Data** is created (e.g., changes have been made to demand or generation prediction techniques, or a new philosophy for designing off-normal running arrangements has been implemented); and

- iii. For the **Situation Data** of **Solved PSM(s)** providing fault level information, a description of any changes made to the process by which fault level data is created (e.g., new software or a new process is being used to perform fault level calculations, or an improved mechanism is being used to determine demand short circuit contributions).

PC.G.7 Assessment of Connection Point Compliance process

Overview of the assessment of Access Group

PC.G.7.1 An **Access Group** is a group of **Connection Points**, which are either permanently interconnected or are interconnected following a pre or post outage action, and hence there is transfer of demand from one **Connection Point** to another.

PC.G.7.2 All **Connection Points** are considered as either an **Access Group** on their own (if they are not interconnected through the **Network Operator's System** to another **Connection Point**), or as a group of interconnected **Connection Points** to be considered as an **Access Group**. Each **Connection Point** is only in one **Access Group**.

PC.G.7.3 Once **Access Groups** have been identified, **The Company** carries out assessments on each **Access Group** to identify those **Connection Points** (and the associated **Transmission Interface Circuits**) which need to be assessed simultaneously and whether each **Transmission Interface Circuit** is theoretically maintainable in accordance with the **SQSS**.

PC.G.7.4 For planning purposes, **The Company** assumes that the maintenance season is during British Summer Time i.e., calendar weeks 13 to 43.

PC.G.7.5 **The Company** shall submit to the **Network Operator** no later than calendar week 7 in each year, a proposed **Transmission Interface Circuit** outage plan, including:

- (a) the calendar weeks defining the proposed start and finish of each **Access Period** for each **Transmission Interface Circuit**; and

- (b) the **Connection Points** in each **Access Group**.

This information shall be provided by populating the appropriate cells in Schedule 24. Where it is not possible to avoid overlapping **Access Periods**, **The Company** will indicate to **Network Operators** its initial view of which **Transmission Interface Circuits** shall be considered as being out of service concurrently for the purpose of assessing compliance to **Licence Standards**.

PC.G.7.6 Each **Connection Point** must belong to one, and only one, **Access Group**.

PC.G.7.6.1 Each **Transmission Interface Circuit** must have an **Access Period**.

PC.G.7.6.2 The **Access Period** shall:

- (a) normally be a minimum of 8 continuous weeks and can occur in any one of three maintenance years during the period from calendar week 13 to calendar week 43 (inclusive) in each year; or

- (b) exceptionally and provided that agreement is reached between **The Company** and the relevant **User(s)**, such agreement to be sought in accordance with PC.7, the **Access Period** may be of a period not less than 4 continuous weeks and can occur in any one of three maintenance years during the period from calendar week 10 to calendar week 43 (inclusive) in each year.

PC.G.7.7 **The Company** and the relevant **Network Operator(s)** shall use their reasonable endeavours to agree the appropriate **Access Group(s)** and **Access Period** for each **Transmission Interface Circuit** prior to calendar week 17 in each year.

PC.G.7.8 **Network Operators**, in calendar week 28, shall submit the data detailed in PC.9.3.3.6 and PC.9.3.3.7.

PC.G.7.9 Following the submission of data by a **Network Operator**, **The Company** shall perform assessments to verify whether **Connection Points** are compliant with the relevant **Licence Standards**. This shall include identifying which **Transmission Interface Circuits** will need to be considered out of service concurrently for the purpose of assessing compliance.

- PC.G.7.10 Where the result of any assessment identifies possible future non-compliance with the relevant **Licence Standards**, **The Company** shall notify the relevant **Network Operator(s)** of this fact as soon as reasonably practicable and shall agree with **Network Operator(s)** any requirement to resubmit data to allow for a reassessment.
- PC.G.7.11 Following any notification by **The Company** to a **Network Operator** pursuant to PC.G.7.7, and following any further discussions between the **Network Operator** and **The Company**;
- (a) **The Company** and the **Network Operator** may agree revisions to the **Access Periods**, provided they are not less than 4 continuous weeks in duration and occur between calendar weeks 10 and 43 (inclusive), for relevant **Transmission Interface Circuits**.
 - (b) **The Company** and the **Network Operator** may agree revisions to the **Access Periods** less than 4 continuous weeks in duration and which occur other than between calendar weeks 10 and 43 (inclusive), for relevant **Transmission Interface Circuits**. In such cases **The Company** shall notify **The Authority** where this has been necessary.
 - (c) The **Network Operator** shall as soon as reasonably practicable:
 - i. submit further relevant data to **The Company** that is to **The Company's** reasonable satisfaction; and/or
 - ii. modify data previously submitted pursuant to this PC, such modified data to be to **The Company's** reasonable satisfaction; and/or
 - iii. notify **The Company** that it is the intention of the **Network Operator** to leave the data as originally submitted to **The Company** to stand as its submission.
- PC.G.7.12 When it is agreed that any resubmission of data is unlikely to confirm future compliance with the relevant **Licence Standards** the **Modification** process in the **CUSC** may apply.
- PC.G.7.13 By calendar week 6 of the following year, as specified in PC.10.5.4, **The Company** shall notify the **Network Operator** of the results of any relevant assessment.
- PC.G.7.14 Where **The Company** or **Network Operator(s)** agree that any resubmission of data is unlikely to confirm future compliance with the relevant **Licence Standards**, **The Company** and the **Network Operator(s)** shall agree the best way of addressing non-compliance.

PC.G.8 Generation

PC.G.8.1 Table of **Aggregated Energy Source** types to be used for developing aggregated equivalent model as required by PC.G.1.4.7:

Energy Source	Aggregated Energy Source (for aggregated equivalent modelling required by PC.G.1.4.7)	Aggregate equivalent modelled as:		
		Synchronous	Asynchronous	Inverter-Based
Advanced Fuel (produced via gasification or pyrolysis of biofuel or waste)	Advanced Fuel	Default		
Biofuel - Biogas from anaerobic digestion (excluding landfill & sewage)	Biofuel	Default		
Biofuel - Landfill gas				
Biofuel - Sewage gas				
Biofuel - Other				
Biomass	Biomass	Default		
Fossil - Brown coal/lignite	Fossil	Default		
Fossil - Coal gas				
Fossil - Gas				
Fossil - Hard coal				
Fossil - Oil				
Fossil - Oil shale				
Fossil - Peat				
Fossil - Other				
Geothermal	Geothermal	Default		
Hydrogen	Hydrogen	Optional		Default
Nuclear	Nuclear	Default		
Solar	Solar			Default
Stored Energy (all stored energy irrespective of the original energy source)	Stored Energy	Optional		Default
Waste	Waste	Default		
Water (flowing water or head of water)	Water	Default		
Wind	Wind		Optional	Default
Other	Other	Default		

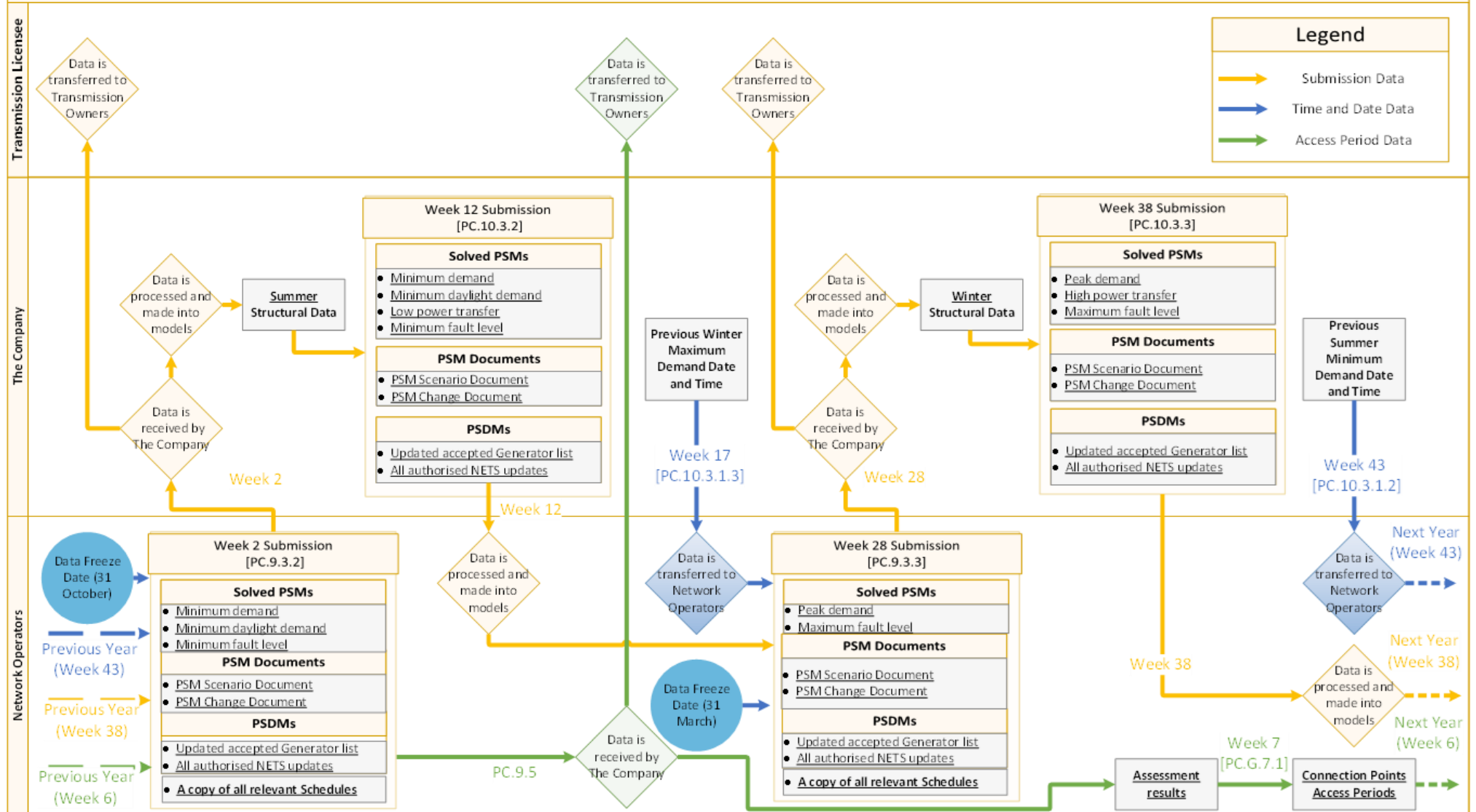
PC.G.8.2 Table of **Energy Source** types and energy conversion technology to be used for **Power Generation Modules** as required in PC.G.1.4.1 to PC.G.1.4.5:

Energy Source	Energy Conversion Technology
Advanced Fuel (produced via gasification or pyrolysis of biofuel or waste)	Engine (Combustion/reciprocating) Gas Turbine Steam Turbine (Thermal Power Plant) Steam-gas Turbine (CCGT) Other
Biofuel - Biogas from anaerobic digestion (excluding landfill & sewage)	
Biofuel - Landfill gas	
Biofuel - Sewage gas	
Biofuel - Other	
Fossil - Coal gas	
Fossil - Gas	
Fossil - Oil	
Fossil - Oil shale	
Fossil - Other	
Biomass	Steam Turbine (Thermal Power Plant) Other
Fossil - Brown coal/lignite	
Fossil - Hard coal	
Fossil - Peat	
Nuclear	
Waste	Geothermal Power Plant Other
Geothermal	
Hydrogen	Engine (Combustion/reciprocating) Gas Turbine Steam Turbine (Thermal Power Plant) Steam-gas Turbine (CCGT) Fuel Cell Other
Solar	Photovoltaic Other
Stored Energy (all stored energy irrespective of the original energy source)	Storage – Chemical Storage – Electrical Storage – Mechanical - Compressed Air (Adiabatic & Diabatic) Storage – Mechanical – Liquid Air Storage – Mechanical – Pumped Hydro Storage – Mechanical – Flywheels Storage – Thermal Storage – Electrochemical (Batteries) Storage - Other
Water (flowing water or head of water)	Hydro – Reservoir (not pumped) Hydro – Run of River Hydro – Other Tidal Lagoons Tidal Steam Devices Wave Devices Other
Wind	Offshore Wind Turbines Onshore Wind Turbines Other
Other	Interconnector Engine (Combustion/reciprocating) Gas Turbine Steam Turbine (Thermal Power Plant) Steam-gas Turbine (CCGT) Other

PC.G.9 Submission Cycle

PC.G.9.1 The diagram below illustrates the annual, coordinated process of submissions between **Network Operators** and **The Company**.

Planning Code Data Exchange Timeline



< END OF PLANNING CODE >

OPERATING CODE NO. 5

(OC5)

TESTING AND MONITORING

CONTENTS

(This contents page does not form part of the Grid Code)

<u>Paragraph No/Title</u>	<u>Page Number</u>
OC5.1 INTRODUCTION	2
OC5.2 OBJECTIVE.....	2
OC5.3 SCOPE.....	3
OC5.4 MONITORING	3
OC5.4.1 Parameters To Be Monitored	3
OC5.4.2 Procedure for Monitoring.....	3
OC5.5 PROCEDURE FOR TESTING.....	4
OC5.5.1 The Company's Instruction for Testing	4
OC5.5.2 User Request for Testing	5
OC5.5.3 Conduct of Test	6
OC5.5.4 Test and Monitoring Assessment	6
OC5.5.5 Test Failure / Re-test	10
OC5.5.6 Dispute Following Re-test	10
OC5.6 DISPUTE RESOLUTION	10
OC5.7 SYSTEM RESTORATION TESTING.....	11
OC5.7.1 General	11
OC5.7.2 Procedures for Restoration Service Tests	12
OC5.7.2.1 Anchor Generating Unit Tests.....	12
OC5.7.2.2 Anchor Power Station Test	13
OC5.7.2.3 Anchor HVDC Test or Anchor DC Converter Test	14
OC5.7.2.4 Top up Restoration Plant Tests.....	15
OC5.7.2.5 Quick Re-synchronisation Unit Test.....	16
OC5.7.2.6 Distribution Restoration Zone Control System Tests	16
OC5.7.3 Failure of Restoration Service Tests.....	16
OC5.8 PROCEDURES APPLYING TO EMBEDDED MEDIUM POWER STATION NOT SUBJECT TO A BILATERAL AGREEMENT AND EMBEDDED DC CONVERTER STATIONS NOT SUBJECT TO A BILATERAL AGREEMENT	18
APPENDIX 1 - ONSITE SIGNAL PROVISION FOR WITNESSING TESTS	21
APPENDIX 2 - COMPLIANCE TESTING OF SYNCHRONOUS PLANT	27
APPENDIX 3 - COMPLIANCE TESTING OF POWER PARK MODULES (AND OTSUA).....	38
APPENDIX 4 - COMPLIANCE TESTING FOR DC CONVERTERS AT A DC CONVERTER STATION	49

INTRODUCTION

Operating Code No. 5 ("OC5") specifies the procedures to be followed by **The Company** in carrying out:

- (a) monitoring
 - (i) of **BM Units** against their expected input or output;
 - (ii) of compliance by **Users** with the **CC** or **ECC** as applicable and in the case of response to **Frequency, BC3**; and
 - (iii) of the provision by **Users** of **Ancillary Services** which they are required or have agreed to provide; and
- (b) the following tests (which are subject to **System** conditions prevailing on the day):
 - (i) tests on **Gensets, CCGT Modules, Power Generating Modules, Power Park Modules, DC Converters, HVDC Equipment, OTSUA** (prior to the **OTSUA Transfer Time**) and **Generating Units** (excluding **Power Park Units**) to test that they have the capability to comply with the **CC** and **ECC**, and in the case of response to **Frequency, BC3** and to provide the **Ancillary Services** that they are either required or have agreed to provide;
 - (ii) tests on **BM Units**, to ensure that the **BM Units** are available in accordance with their submitted **Export and Import Limits** and **Dynamic Parameters**.

The tests specified in OC5.7 include the procedures relating to **System Restoration Tests**.

OC5 also specifies in OC5.8 the procedures which apply to the monitoring and testing of **Embedded Medium Power Stations** not subject to a **Bilateral Agreement** and **Embedded DC Converter Stations** (or **Embedded HVDC Equipment**) not subject to a **Bilateral Agreement**.

In respect of a **Cascade Hydro Scheme** the provisions of **OC5** shall be applied as follows:

- (a) in respect of the **BM Unit** for the **Cascade Hydro Scheme** the parameters referred to at OC5.4.1 (a) and (c) in respect of **Commercial Ancillary Services** will be monitored and tested;
- (b) in respect of each **Genset** forming part of the **Cascade Hydro Scheme** the parameters referred to at OC5.4.1 (a), (b) and (c) will be tested and monitored. In respect of OC5.4.1 (a) the performance of the **Gensets** will be tested and monitored against their expected input or output derived from the data submitted under BC1.4.2(a)(2). Where necessary to give effect to the requirements for **Cascade Hydro Schemes** in the following provisions of **OC5**, the term **Genset** will be read and construed in the place of **BM Unit**.

In respect of **Embedded Exemptable Large Power Stations** the provisions of **OC5** shall be applied as follows:

- (a) where there is a **BM Unit** registered in the **BSC** in respect of **Generating Units** the provisions of **OC5** shall apply as written;
- (b) in all other cases, in respect of each **Power Generating Module**, and/or **Generating Unit** and **HVDC Equipment** the parameters referred to at OC5.4.1(a), (b) and (c) will be tested and monitored. In respect of OC5.4.1(a) the performance of the **Power Generating Module** and/or **Generating Unit** and **HVDC Equipment** will be tested and monitored against their expected input or output derived from the data submitted under BC1.4.2(a)(2). Where necessary to give effect to the requirements for such **Embedded Exemptable Large Power Stations** in the provisions of **OC5**, the term **Generating Unit** will be read and construed in place of **BM Unit**.

OBJECTIVE

The objectives of **OC5** are to establish:

- (a) that **Users** comply with the **CC** or **ECC** as applicable (including in the case of **OTSUA** prior to the **OTSUA Transfer Time**);

- (b) whether **BM Units** operate in accordance with their expected input or output derived from their **Final Physical Notification Data** and agreed **Bid-Offer Acceptances** issued under **BC2**;
- (c) whether each **BM Unit** is available as declared in accordance with its submitted **Export and Import Limits** and **Dynamic Parameters**; and
- (d) whether **Generators**, **DC Converter Station** owners, **HVDC Equipment Owners** and **Suppliers** can provide those **Ancillary Services** which they are either required or have agreed to provide.

In certain limited circumstances as specified in this **OC5**, the output of **CCGT Units** may be verified, namely the monitoring of the provision of **Ancillary Services** and the testing of **Reactive Power** and automatic **Frequency Sensitive Operation**.

OC5.3 SCOPE

OC5 applies to **The Company** and to **Users**, which in **OC5** means:

- (a) **Generators** (including those undertaking **OTSDUW**);
- (b) **Network Operators**;
- (c) **Non-Embedded Customers**;
- (d) **Suppliers**; and
- (e) **DC Converter Station** owners or **HVDC Equipment Owners**.

OC5.4 MONITORING

OC5.4.1 Parameters to be monitored

The Company will monitor the performance of:

- (a) **BM Units** against their expected input or output derived from their **Final Physical Notification Data** and agreed **Bid-Offer Acceptances** issued under **BC2**;
- (b) compliance by **Users** with the **CC** or **ECC** as applicable; and
- (c) the provision by **Users** of **Ancillary Services** which they are required or have agreed to provide.

OC5.4.2 Procedure for Monitoring

OC5.4.2.1 In the event that a **BM Unit** fails persistently, in **The Company's** reasonable view, to follow, in any material respect, its expected input or output or a **User** fails persistently to comply with the **CC** or **ECC** as applicable, or fails to comply in the case of CC.6.3.15 or ECC 6.3.15 as applicable, and in the case of response to **Frequency**, **BC3** or to provide the **Ancillary Services** it is required, or has agreed, to provide, **The Company** shall notify the relevant **User** giving details of the failure and of the monitoring that **The Company** has carried out.

OC5.4.2.2 The relevant **User** will, as soon as possible, and in the case of a failure to comply with the requirements of CC.6.3.15 or ECC.6.3.15 as applicable, within 2 hours in respect of a notification to this effect under OC10 or a longer time period only where agreed by **The Company**, provide **The Company** with an explanation of the reasons for the failure and details of the action that it proposes to take to:

- (a) enable the **BM Unit** to meet its expected input or output or to provide the **Ancillary Services** it is required or has agreed to provide, within a reasonable period, or
- (b) in the case of a **Power Generating Module**, **Generating Unit** (excluding a **Power Park Unit**), **CCGT Module**, **Power Park Module**, **OTSUA** (prior to the **OTSUA Transfer Time**), **HVDC Equipment** or **DC Converter** to comply with the **CC** or **ECC** as applicable and in the case of response to **Frequency**, **BC3** or to provide the **Ancillary Services** it is required or has agreed to provide, within a reasonable period.

(c) in the case of a **Power Generating Module, Generating Unit** (excluding a **Power Park Unit**), **CCGT Module, Power Park Module, OTSUA** (prior to the **OTSUA Transfer Time**), **HVDC Equipment** or **DC Converter** which has tripped off or de-loaded coincident with a fault as described in CC.6.3.15 or ECC.6.3.15, resolve any non-compliance, within a reasonable period.

For the avoidance of doubt in the case of CC.6.3.15 or ECC.6.3.15 as applicable, the explanation may indicate that the **User** has complied with CC.6.3.15 or ECC.6.3.15 on the basis that:

- (i) the **User** had complied with CC.6.3.15 or ECC.6.3.15 as applicable on the basis that the **User** has provided recordings to show the voltage waveform during the fault was beyond the conditions specified in CC.6.3.15 or ECC.6.3.15 as applicable; or
- (ii) the **User's Connection Point** had been de-energised by receipt of an intertrip signal from the **National Electricity Transmission System**; or
- (iii) that other information has been shared between the **User** and **The Company** enabling agreement between them that compliance with CC.6.3.15 or ECC.6.3.15 as applicable has been confirmed.

Data relating to a fault on the **Transmission System** that **The Company** believes has led to **Users** to co-incidentally trip or de-load is to be provided by **The Company**, where available, in a file structure as agreed with the **User**. Where waveform data is available, this will be obtained from the recorder electrically closest to the **User's Connection Point**.

OC5.4.2.3 In the event of a **User** being notified under OC5.4.2.1 by **The Company** of a potential failure to comply with CC6.3.15 or ECC6.3.15 as applicable and where the **User** is required to provide an explanation as described in OC5.4.2.2(c), the **User** shall take action to restrict the output of their **Power Generating Module, Generating Unit** (excluding a **Power Park Unit**), **CCGT Module, Power Park Module, OTSUA** (prior to the **OTSUA Transfer Time**), **HVDC Equipment** or **DC Converter** to a level and for a period as agreed with **The Company** or until an explanation has been provided by the **User** and agreed between the **User** and **The Company** as set out under OC5.4.2.2(c).

OC5.4.2.4 **The Company** and the **User** will discuss any action the **User** proposes to take and will endeavour to reach agreement as to:

- (a) any short term operational measures necessary to protect other **Users**; and
- (b) the parameters which are to be submitted for the **BM Unit** and the effective time(s) and date(s) for the application of the agreed parameters. For the avoidance of doubt in the case of a failure to comply with CC.6.3.15 or ECC.6.3.15 as applicable which requires the **User** to provide an explanation as described in OC5.4.2.2(c), this may be to zero MW or another value if agreed between the **User** and **The Company**.

OC5.4.2.5 In the event that agreement cannot be reached within 10 days of notification of the failure by **The Company** to the **User**, **The Company** or the **User** shall be entitled to require a test, as set out in OC5.5 and OC5.6, to be carried out, except in respect of CC.6.3.15 or ECC.6.3.15, as applicable, where testing is impractical and OC5.4.2.6 shall apply instead.

OC5.4.2.6 In the case of a **Power Generating Module, Generating Unit** (excluding a **Power Park Unit**), **CCGT Module, Power Park Module, OTSUA** (prior to the **OTSUA Transfer Time**), **HVDC Equipment** or **DC Converter** identifying their non-compliance with CC.6.3.15 or ECC.6.3.15 as applicable by completion of their report into this as set out in **OC10**, **The Company** will as soon as reasonably practicable, issue a **Limited Operational Notification** or amend any **Interim Operational Notification**.

OC5.4.2.7 The requirements of OC5.4.2.1 – OC5.4.2.6 shall not apply during **System Restoration**, unless **The Company** expressly notifies the **User**.

OC5.5 PROCEDURE FOR TESTING

OC5.5.1 The Company's Instruction for Testing

- OC5.5.1.1 **The Company** may at any time (although not normally more than twice in any calendar year in respect of any particular **BM Unit**) issue an instruction requiring a **User** to carry out a test, provided **The Company** has reasonable grounds of justification based upon:
- (a) a failure to agree arising from the process in CP.8.1 or ECP.8.1; or
 - (b) monitoring carried out in accordance with OC5.4.2.
- OC5.5.1.2 The test, referred to in OC5.5.1.1 and carried out at a time no sooner than 48 hours from the time that the instruction was issued, on any one or more of the **User's BM Units** should only be to demonstrate that the relevant **BM Unit**:
- (a) if active in the **Balancing Mechanism**, meets the ability to operate in accordance with its submitted **Export and Import Limits** and **Dynamic Parameters** and achieve its expected input or output which has been monitored under OC5.4; and
 - (b) meets the requirements of the paragraphs in the **CC** and **ECC** which are applicable to such **BM Units**; and
- in the case of a **BM Unit** comprising a **Generating Unit**, a **CCGT Module**, a **Power Park Module**, a **Power Generating Module**, **HVDC System** or a **DC Converter** meets,
- (c) the requirements for operation in **Frequency Sensitive Mode** and compliance with the requirements for operation in **Limited Frequency Sensitive Mode** in accordance with CC.6.3.3, ECC.6.3.3, CC.6.3.7, ECC.6.3.7, BC3.5.2, BC.3.7.1 and BC3.7.2; or
 - (d) the terms of the applicable **Bilateral Agreement** agreed with the **Generator** to have a **Fast Start Capability**; or
 - (e) the **Reactive Power** capability registered with **The Company** under **OC2** which shall meet the requirements set out in CC.6.3.2 or ECC.6.3.2 as applicable. In the case of a test on a **Generating Unit** within a **CCGT Module** the instruction need not identify the particular **CCGT Unit** within the **CCGT Module** which is to be tested, but instead may specify that a test is to be carried out on one of the **CCGT Units** within the **CCGT Module**.
- OC5.5.1.3
- (a) The instruction referred to in OC5.5.1.1 may only be issued if the relevant **User** has submitted **Export and Import Limits** which notify that the relevant **BM Unit** is available in respect of the **Operational Day** current at the time at which the instruction is issued. The relevant **User** shall then be obliged to submit **Export and Import Limits** with a magnitude greater than zero for that **BM Unit** in respect of the time and the duration that the test is instructed to be carried out, unless that **BM Unit** would not then be available by reason of forced outage or **Planned Outage** expected prior to this instruction.
 - (b) In the case of a **CCGT Module** the **Export and Import Limits** data must relate to the same **CCGT Units** which were included in respect of the **Operational Day** current at the time at which the instruction referred to in OC5.5.1.1 is issued and must include, in relation to each of the **CCGT Units** within the **CCGT Module**, details of the various data set out in BC1.A.1.3 and BC1.A.1.5, which parameters **The Company** will utilise in instructing in accordance with this **OC5** in issuing **Bid-Offer Acceptances**. The parameters shall reasonably reflect the true operating characteristics of each **CCGT Unit**.
 - (c) The test referred to in OC5.5.1.1 will be initiated by the issue of instructions, which may be accompanied by a **Bid-Offer Acceptance**, under **BC2** (in accordance with the **Export and Import Limits** and **Dynamic Parameters** which have been submitted for the day on which the test was called, or in the case of a **CCGT Unit**, in accordance with the parameters submitted under OC5.5.1.3(b)). The instructions in respect of a **CCGT Unit** within a **CCGT Module** will be in respect of the **CCGT Unit**, as provided in BC2.
- OC5.5.2 User Request for Testing
- OC5.5.2.1 Where a **GB Code User** undertakes a test to demonstrate compliance with the **Grid Code** and **Bilateral Agreement** in accordance with CP.6 or CP.7 or CP.8 (other than a failure between **The Company** and a **GB Code User** to agree in CP.8.1 where OC5.5.1.1 applies) the **GB Code User** shall request permission to test using the process laid out in OC7.5.

- OC5.5.2.2 Where an **EU Code User** undertakes a test to demonstrate compliance with the **Grid Code** and **Bilateral Agreement** in accordance with ECP.6.1, ECP.6.2, ECP.6.3 or ECP.7 or ECP.8 (other than a failure between **The Company** and a **EU Code User** to agree in ECP.8.1 where OC5.5.1.1 applies) the **EU Code User** shall request permission to test using the process laid out in OC7.5.
- OC5.5.3 Conduct of Test
- OC5.5.3.1 The performance of the **BM Unit** will be recorded at **Transmission Control Centres** notified by **The Company** with monitoring at site when necessary, from voltage and current signals provided by the **User** for each **BM Unit** under CC.6.6.1 or ECC.6.6.1 as applicable.
- OC5.5.3.2 If monitoring at site is undertaken, the performance of the **BM Unit** will be recorded on a suitable recorder (with measurements, in the case of a **Synchronous Generating Unit** (which could be part of a **Synchronous Power Generating Module**), taken on the **Generating Unit** stator terminals / on the **LV** side of the generator transformer) or in the case of a **Non-Synchronous Generating Unit** (excluding **Power Park Units**), **Power Generating Module**, **Power Park Module** or **HVDC Equipment** or **DC Converter** at the point of connection (including where the **OTSUA** is operational prior to the **OTSUA Transfer Time**, the **Transmission Interface Point**) in the relevant **User's Control Room**, in the presence of a reasonable number of representatives appointed and authorised by **The Company**. If **The Company** or the **User** requests, monitoring at site will include measurement of the parameters set out in OC5.A.1.2 or OC5.A.1.3 or ECP.A4.2 or ECP.A.4.3 as appropriate.
- OC5.5.3.3 The **User** is responsible for carrying out the test on their **Plant** and retains the responsibility for the safety of personnel and their **Plant** during the test.
- OC5.5.4 Test and Monitoring Assessment
- The criteria must be read in conjunction with the full text under the Grid Code reference. The **BM Unit**, **Power Generating Module**, **CCGT Module**, **Power Park Module** or **Generating Unit** (excluding **Power Park Units**), **HVDC Equipment** and **DC Converters** and **OTSUA** will pass the test the criteria below are met:

<u>Capability to be Tested</u>		<u>Criteria against which the test results will be assessed by The Company.</u>
Voltage Quality	Harmonic Content	CC.6.1.5(a) or ECC.6.1.5(a) Measured harmonic emissions do not exceed the limits specified in the Bilateral Agreement or where no such limits are specified, the relevant planning level specified in Engineering Recommendation G5 .
	Phase Unbalance	CC.6.1.5(b) or ECC.6.1.5(b), The measured maximum Phase (Voltage) Unbalance on the National Electricity Transmission System should remain, in England and Wales, below 1% and, in Scotland, below 2% and Offshore will be defined in relevant Bilateral Agreement . CC.6.1.6 or ECC.6.1.6 In England and Wales, measured infrequent short duration peaks in Phase (Voltage) Unbalance should not exceed the maximum value stated in the Bilateral Agreement .
	Rapid Voltage Change	CC.6.1.7(a) or ECC.6.1.7(a) The measured Rapid Voltage Change at the Point of Common Coupling shall not exceed the Planning Levels specified in CC.6.1.7(a) or ECC 6.1.7.(i)
	Flicker Severity	CC.6.1.7(j) or ECC.6.1.7(j) The measured Flicker Severity at the Point of Common Coupling shall not exceed the limits specified in the table of CC.6.1.7(j) or ECC 6.1.7(j).
	Voltage Fluctuation	CC.6.1.8 or ECC.6.1.8 Offshore , measured voltage fluctuations at the Point of Common Coupling shall not exceed the limits set out in the Bilateral Agreement .
Fault Clearance	Fault Clearance Times	CC.6.2.2.2.2(a), CC.6.2.3.1.1(a), ECC.6.2.2.2.2(a), ECC.6.2.3.1.1(a), Bilateral Agreement
	Back Up Protection	CC.6.2.2.2.2(b), CC.6.2.3.1.1(b), ECC.6.2.2.2.2(a), ECC.6.2.3.1.1(a), Bilateral Agreement
	Circuit Breaker Fail Protection	CC.6.2.2.2.2(c), CC.6.2.3.1.1(c), ECC.6.2.2.2.2(c), ECC.6.2.3.1.1(c)

<u>Capability to be Tested</u>		<u>Criteria against which the test results will be assessed by The Company.</u>
	Reactive Capability	CC.6.3.2 or ECC.6.3.2 (and in the case of CC.6.3.2(e)(iii) and ECC.6.3.2.5 and ECC.6.3.2.6, the Bilateral Agreement), CC.6.3.4, Ancillary Services Agreement. For a test initiated under OC.5.5.1.1 the Power Generating Module, Generating Unit, HVDC Equipment, DC Converter or Power Park Module or (prior to the OTSUA Transfer Time) OTSUA will pass the test if it is within $\pm 5\%$ of the reactive capability registered with The Company under OC2. The duration of the test will be for a period of up to 60 minutes during which period the System voltage at the Grid Entry Point for the relevant Power Generating Module, Generating Unit, HVDC Equipment, DC Converter or Power Park Module or Interface Point in the case of OTSUA will be maintained by the Generator or HVDC System Owner, DC Converter Station owner at the voltage specified pursuant to BC2.8 by adjustment of Reactive Power on the remaining Power Generating Module, Generating Unit, HVDC Equipment, DC Converter or Power Park Modules or OTSUA, if necessary. Any test performed in respect of an Embedded Medium Power Station not subject to a Bilateral Agreement or, an Embedded DC Converter Station or Embedded HVDC System not subject to a Bilateral Agreement shall be as confirmed pursuant to OC5.8.3. Measurements of the Reactive Power output under steady state conditions should be consistent with Grid Code requirements i.e. fully available within the voltage range $\pm 5\%$ at all voltages.
Governor / Frequency Control	Primary Secondary and High Frequency Response	Ancillary Services Agreement, CC.6.3.7 and where applicable CC.A.3 or ECC.6.3.7 and where applicable ECC.A.3. For a test initiated under OC.5.5.1.1 the measured response in MW/Hz is within $\pm 5\%$ of the level of response specified in the Ancillary Services Agreement for that Genset.
	Stability with Voltage	CC.6.3.4 or ECC.6.3.4
	Governor / Load / Frequency Controller System Compliance	CC.6.3.6(a), CC.6.3.7, CC.6.3.9, CC8.1, where applicable CC.A.3, BC3.5, BC3.6, BC3.7 or ECC.6.3.6, ECC.6.3.7, ECC.6.3.9, ECC8.1, where applicable ECC.A.3, BC3.5, BC3.6, BC3.7
	Output at Reduced System Frequency	CC.6.3.3 or ECC.6.3.3 - For variations in System Frequency exceeding 0.1Hz within a period of less than 10 seconds, the Active Power output is within $\pm 0.2\%$ of the requirements of CC.6.3.3 or ECC.6.3.3 when monitored at prevailing external air temperatures of up to 25°C., BC3.5.1

<u>Capability to be Tested</u>		<u>Criteria against which the test results will be assessed by The Company.</u>
	Fast Start	Ancillary Services Agreement requirements
	System Restoration	OC5.7
	Excitation/Voltage Control System	CC.6.3.6(b), CC.6.3.8, CC.A.6 or CC.A.7 as applicable, BC2.11.2, and the Bilateral Agreement or ECC.6.3.6, ECC.6.3.8, ECC.A.6 or ECC.A.7 or ECC.A.8 and the Bilateral Agreement as applicable
	Fault Ride Through and Fast Fault Current Injection	CC.6.3.15, CC.A.4.A or CC.A.4.B as applicable or ECC.6.3.15, ECC.6.3.16, ECC.A.4 as applicable
Dynamic Parameters	Export and Import Limits and Dynamic Parameters	BC2 The Export and Import Limits and Dynamic Parameters under test are within 2½% of the declared value being tested.
	Synchronisation time	BC2.5.2.3 Synchronisation takes place within ±5 minutes of the time it should have achieved Synchronisation .
	Run-up rates	BC2 Achieves the instructed output and, where applicable, the first and/or second intermediate breakpoints, each within ±3 minutes of the time it should have reached such output and breakpoints from Synchronisation (or break point, as the case may be), calculated from the run-up rates in its Dynamic Parameters .
	Run-down rates	BC2 Achieves the instructed output and, where applicable, the first and/or second intermediate breakpoints, each within ±5 minutes of the time it should have reached such output and breakpoints from Synchronisation (or break point, as the case may be), calculated from the run-up rates in its Dynamic Parameters .
	Demand Response	DRSC.11.7 Non-Embedded Customers and BM Participants who are also Demand Response Providers shall execute a demand modification test when requested as per DRSC.11.7 to ensure the requirements of the Ancillary Services agreement and Demand Response Services Code are satisfied.

- OC5.5.4.1 The duration of the **Dynamic Parameter** tests in the above table will be consistent with and sufficient to measure the relevant expected input or output derived from the **Final Physical Notification Data** and **Bid-Offer Acceptances** issued under **BC2** which are still in dispute following the procedure in OC5.4.2.
- OC5.5.4.2 Due account will be taken of any conditions on the **System** which may affect the results of the test. The relevant **User** must, if requested, demonstrate, to **The Company's** reasonable satisfaction, the reliability of the suitable recorders, disclosing calibration records to the extent appropriate.
- OC5.5.5 Test Failure / Re-test
- OC5.5.5.1 If the **BM Unit, Power Generating Module, CCGT Module, Power Park Module, OTSUA, or Generating Unit** (excluding **Power Park Units**), **HVDC Equipment** or **DC Converter Station** concerned fails to pass the test instructed by **The Company** under OC5.5.1.1, the **User** must provide **The Company** with a written report specifying in reasonable detail the reasons for any failure of the test so far as they are then known to the **User** after due and careful enquiry. This must be provided within five **Business Days** of the test.
- OC5.5.5.2 If in **The Company's** reasonable opinion, the failure to pass the test relates to compliance with the **CC** or **ECC** as applicable, then **The Company** may invoke the process detailed in CP.8.2 to CP.9, or ECP.8.2 to ECP.9
- OC5.5.5.3 If a dispute arises relating to the failure, **The Company** and the relevant **User** shall seek to resolve the dispute by discussion, and, if they fail to reach agreement, the **User** may by notice require **The Company** to carry out a re-test on 48 hours' notice which shall be carried out following the procedure set out in OC5.5.3 and OC5.5.4 and subject as provided in OC5.5.1.3, as if **The Company** had issued an instruction at the time of notice from the **User**.
- OC5.5.6 Dispute Following Re-Test
- If the **BM Unit, Power Generating Module, CCGT Module, Power Park Module, OTSUA, or Generating Unit** (excluding **Power Park Units**), **HVDC Equipment** or **DC Converter** in **The Company's** view fails to pass the re-test and a dispute arises on that re-test, either party may use the **Disputes Resolution Procedure** for a ruling in relation to the dispute, which ruling shall be binding.
- OC5.6 DISPUTE RESOLUTION
- OC5.6.1 If following the procedure set out in OC5.5 it is accepted that the **BM Unit, Power Generating Module, CCGT Module, Power Park Module, OTSUA** (prior to the **OTSUA Transfer Time**) or **Generating Unit** (excluding **Power Park Units**), **HVDC Equipment** or **DC Converter** has failed the test or re-test (as applicable), the **User** shall within 14 days, or such longer period as **The Company** may reasonably agree, following such failure, submit in writing to **The Company** for approval the date and time by which the **User** shall have brought the **BM Unit** concerned to a condition where it complies with the relevant requirement. **The Company** will not unreasonably withhold or delay its approval of the **User's** proposed date and time submitted. Should **The Company** not approve the **User's** proposed date or time (or any revised proposal), the **User** should amend such proposal having regard to any comments **The Company** may have made and re-submit it for approval.
- OC5.6.2 If a **BM Unit** fails the test, the **User** shall submit revised **Export and Import Limits** and/or **Dynamic Parameters**, or in the case of a **BM Unit** comprising a **Generating Unit, Power Generating Module, CCGT Module, HVDC Equipment, DC Converter, OTSUA** (prior to the **OTSUA Transfer Time**) or **Power Park Module**, the **User** may amend, with **The Company's** approval, the relevant registered parameters of that **Generating Unit, Power Generating Module, CCGT Module, HVDC Equipment, DC Converter, OTSUA** (prior to the **OTSUA Transfer Time**) or **Power Park Module**, as the case may be, relating to the criteria, for the period of time until the **BM Unit** can achieve the parameters previously registered, as demonstrated in a re-test.

OC5.6.3 Once the **User** has indicated to **The Company** the date and time that the **BM Unit, Power Generating Module, CCGT Module, Power Park Module, Generating Unit** (excluding **Power Park Units**) or **OTSUA** (prior to the **OTSUA Transfer Time**), **HVDC Equipment** or **DC Converter Station** can achieve the parameters previously registered or submitted, **The Company** shall either accept this information or require the **User** to demonstrate the restoration of the capability by means of a repetition of the test referred to in OC5.5.3 by an instruction requiring the **User** on 48 hours notice to carry out such a test. The provisions of this OC5.6 will apply to such further test.

OC5.7 SYSTEM RESTORATION TESTING

OC5.7.1 General

As provided for in OC9.1.1 there are two ways in which the **Total System** (or disconnected part of the **Total System** in the case of a **Partial Shutdown**) can be re-established. These being a top-down approach using **Local Joint Restoration Plans** or a bottom-up approach using **Distribution Restoration Zone Plans** which are necessary in order to satisfy the requirements of the **Electricity System Restoration Standard**.

To help achieve this objective, it is essential that **Restoration Contractors** test their **Plant** and **Apparatus** at regular intervals to demonstrate that there is a high level of confidence that they will be able to satisfy the requirements of the Grid Code and their **Anchor Restoration Contracts** or **Top Up Restoration Contracts**.

- (a) **The Company** and/or relevant **Network Operator** shall require a **Restoration Contractor** to carry out testing in order to demonstrate that its **Plant** and **Apparatus** has the appropriate capability.
 - (i) In the case of an **Anchor Generating Unit, The Company** and/or relevant **Network Operator** shall require the **Restoration Contractor** to carry out a test (either a **Anchor Generating Unit Test** or a **Anchor Power Station Test**) in order to demonstrate that an **Anchor Plant** has **Anchor Plant Capability**.
 - (ii) In the case of either an **Anchor HVDC System** or **Anchor DC Converter, The Company** or relevant **Network Operator** shall require the **Restoration Contractor** to carry out a test (an **Anchor HVDC System Test** or **Anchor DC Converter Test**), in order to demonstrate that an **Anchor HVDC System** or **Anchor DC Converter** has **Anchor Plant Capability**.
 - (iii) In the case of an **EU Generator** with an **Anchor Plant Capability** who is also a **Restoration Contractor, The Company** and/or relevant **Network Operator** may also require the **Restoration Contractor** to carry out a test (a **Quick Resynchronisation Unit Test**) in order to demonstrate that its **Anchor Power Station** has **Quick Re-Synchronisation Capability**.
 - (iv) In the case of a **Top Up Restoration Plant, The Company** and/or relevant **Network Operator** shall require the **Top Up Restoration Contractor** to demonstrate that the requirements of their **Top Up Restoration Contract** can be fulfilled.
- (b) Where **The Company** and/or relevant **Network Operator** requires a **Restoration Contractor** to undertake testing, the following requirements shall apply:-
 - (i) Each **Anchor Generating Unit** within an **Anchor Power Station** shall be required to undertake an **Anchor Generating Unit Test** at least once every three years. **The Company** and/or relevant **Network Operator** shall not require the **Anchor Generating Unit Test** to be carried out on more than one **Generating Unit** at that **Anchor Power Station** at the same time, and would not, in the absence of exceptional circumstances, expect any of the other **Generating Units** at the **Anchor Power Station** to be directly affected by the **Anchor Generating Unit Test**.

- (ii) **The Company** and/or relevant **Network Operator** may occasionally require the **Anchor Generator** to carry out an **Anchor Power Station Test** at any time (but will not require a **Anchor Power Station Test** to be carried out more than once in every three calendar years in respect of any particular **Generating Unit** unless it can justify on reasonable grounds the necessity for further tests or unless the further test is a re-test). If successful, this **Anchor Power Station Test** shall count as a successful **Anchor Generating Unit Test** for the **Generating Unit** used in the test.
- (iii) **The Company** and/or relevant **Network Operator** shall require the **Anchor HVDC System Owner** or **Anchor DC Converter Owner** to carry out an **Anchor HVDC System Test** at least once every three years which could be at any time (but such a test will not be required to be carried out more than once in every three calendar years unless it can justify on reasonable grounds the necessity for further tests or unless the further test is a re-test).
- (iv) **The Company** and/or relevant **Network Operator** may require the **EU Generator** to carry out a **Quick Re-Synchronisation Test** at any time, but this will generally only be required where the **EU Generator** has made a change to its **Plant** and **Apparatus** which has an impact on its **Houseload Operation** or after two unsuccessful tripping **Events** in the operational environment. The timing of the test shall be agreed by the relevant parties.
- (v) **The Company** and/or relevant **Network Operator** shall require the **Restoration Contractor** to carry out testing on its **Top Up Restoration Plant** at least once every three years which could be at any time (but such a test will not be required to be carried out more than once in every three calendar years unless it can justify on reasonable grounds the necessity for further tests or unless the further test is a retest).

The above tests will be deemed a success where starting from **Shutdown** is achieved within a time frame specified by **The Company** and/or relevant **Network Operator** and which will be agreed in the **Restoration Contract**.

- (c) When **The Company** and/or relevant **Network Operator** wishes a **Restoration Contractor** to carry out either an **Anchor Generating Unit Test**, an **Anchor Power Station Test**, an **Anchor System HVDC Test**, **Quick Re-Synchronisation Test** or **Top Up Restoration Test**, it shall notify the relevant **Restoration Contractor** at least 7 days prior to the time of the test with details of the proposed test.

OC5.7.2 Procedures for Restoration Service Tests

OC5.7.2.1 Anchor Generating Unit Tests

- (a) The relevant **Generating Unit** shall be **Synchronised** and **Loaded**.
- (b) All the **Auxiliary Energy Supplies** in the **Anchor Power Station** in which that **Generating Unit** is situated, shall be **Shutdown**.
- (c) The **Generating Unit** shall be **De-Loaded** and **De-Synchronised** and all alternating current electrical supplies to its **Auxiliaries** shall be disconnected.
- (d) The **Auxiliary Energy Supplies** to the relevant **Generating Unit** shall be started, and shall re-energise the **Unit Board** of the relevant **Generating Unit**.
- (e) The **Auxiliaries** of the relevant **Generating Unit** shall be fed by the **Auxiliary Energy Supplies**, via the **Unit Board**, to enable the relevant **Generating Unit** to return to **Synchronous Speed**.
- (f) The relevant **Generating Unit** shall be **Synchronised** to the **System** but not **Loaded**, unless a subsequent instruction is issued by **The Company** or relevant **Network Operator** under **BC2**.

- (g) Where required by **The Company** and/or relevant **Network Operator** and technically feasible, the test may be arranged such that the relevant **Generating Unit** shall energise the dead sections of the **System** as required in the relevant **Restoration Plan**. As part of these tests, **The Company** (in the case of an **Local Joint Restoration Plan**) or **Network Operator** (in the case of a **Distribution Restoration Zone Plan**) may require the **Anchor Generator** to undertake a:

- a) A dead line charge test only; or
- b) A dead line charge and a remote synchronisation test.

A dead line charge test would require the steps detailed in (i) and (ii) below to be undertaken. A remote synchronisation test would require the steps detailed in (i) – (iii) below to be undertaken.

- i) **Start-Up** of one or more of the **Generating Units** at the **Anchor Power Station** under normal operational conditions;
- ii) Re-energisation of a dead test section of the **Total System** as defined in the **Local Joint Restoration Plan** or **Distribution Restoration Zone Plan** as appropriate; and
- iii) Demonstration of the ability to synchronise to a section of the **Total System** at a location remote from the **Anchor Power Station's Grid Entry Point** or **User System Entry Point** (as the case may be).

A dead line charge test is to demonstrate the **Anchor Generating Unit's** ability to charge a pre-defined dead part of the **Total System** and its ability to control the voltage on that part of the **Total System**.

A remote synchronisation test is used to demonstrate the successful operation of a **Transmission Licensee's** or **Network Operator's** system synchronising facilities across individual circuit breakers which are either i) a necessary part of a **Local Joint Restoration Plan** or ii) defined in a **Distribution Restoration Zone Plan**.

When planning a dead line charge test, consideration shall be given to the effect the test will have on **Customers** supplied from the part of the **Total System** that needs to be de-energised, including whether their supplies would need to be interrupted to undertake the test. Where possible, tests should be conducted to avoid interruption to **Customer** supplies however where this is not possible, alternative tests or computer simulation exercises can be agreed between **The Company**, **Relevant Transmission Licensee** (as applicable), the **Network Operator** (as applicable) and the **Restoration Contractor**. Where it is identified that routine testing cannot be undertaken which is critical to restoration of the **Total System**, from a strategic perspective, as a result of interruption to **Customer** supplies, consideration should be given to **System** reconfiguration where such a change is technically and economically viable which would be agreed between **The Company**, **Relevant Transmission Licensee** and **Network Operator** (as appropriate).

- (h) In respect of **EU Generators**, the above tests defined in OC5.7.2.1(a) – (g) shall be assessed against the requirements of ECC.6.3.5.3.
- (i) **The Company** and/or **Network Operator** shall agree with **Anchor Restoration Contractor** when the above tests have been completed.

OC5.7.2.2 Anchor Power Station Test

- (a) All **Generating Units** at the **Anchor Power Station**, other than the **Generating Unit** on which the **Anchor Plant Test** is to be carried out, and all the **Auxiliary Energy Supplies** at the **Anchor Power Station**, shall be **Shutdown**.
- (b) The relevant **Generating Unit** shall be **Synchronised** and **Loaded**.
- (c) The relevant **Generating Unit** shall be **De-Loaded** and **De-Synchronised**.

- (d) All external alternating current electrical supplies to the **Unit Board** of the relevant **Generating Unit**, and to the **Station Board** of the relevant **Anchor Power Station**, shall be disconnected.
- (e) **Auxiliary Energy Supplies** at the **Anchor Power Station** shall be started, and shall re-energise either directly, or via the **Station Board** or the **Unit Board** of the relevant **Generating Unit**.
- (f) The provisions of OC5.7.2.1 (e) to (i) in respect of the **Generating Units** in the **Anchor Power Station** shall thereafter be followed.
- (g) In respect of **EU Generators**, the above tests defined in OC5.7.2.2(a) – (f) shall be assessed against the requirements of ECC.6.3.5.3.

OC5.7.2.3 Anchor HVDC Test or Anchor DC Converter Test

- a) The **HVDC System** or **DC Converter** shall demonstrate its technical capability to energise the busbar of the disconnected AC substation to which it is connected, within the **GB Synchronous Area** within a timeframe specified by **The Company** and/or relevant **Network Operator** in the **Anchor Restoration Contract** or **Top Up Restoration Contract**. In the case of **HVDC Systems** this shall be in accordance with the requirements of ECC.6.3.5.4. As part of this test, all **Auxiliaries** are required to be derived from within the **HVDC System** or **DC Converter Station**;
- b) The test shall be carried out while the **HVDC System** or **DC Converter Station** starts from **Shutdown**;
- c) The test shall be deemed to have been successfully completed when the following conditions are cumulatively fulfilled:
 - i) The **HVDC System Owner** has demonstrated its **HVDC System** or **DC Converter Station** is able to energise the busbar of the isolated AC-substation to which it is connected within the **GB Synchronous Area**.
 - ii) The **HVDC System** or **DC Converter Station** can achieve a stable operating point at an agreed capacity as agreed with **The Company** and/or relevant **Network Operator**. The relevant **HVDC System** or **DC Converter Station** can be connected to the **Total System** but not **Loaded**, unless appropriate instructions are given by **The Company** under **BC2** which would also be in accordance with the requirements of the **Anchor Restoration Contract**.
 - iii) In respect of **HVDC Systems** and **Remote End HVDC Converter Stations**, the above tests defined in OC5.7.2.3(a) – (c) shall be assessed against the requirements of ECC.6.1.2, ECC.6.1.4, ECC.6.2.2.9.4 and ECC.6.3.5.4.
 - iv) In respect of **DC Converter Stations**, the above tests defined in OC5.7.2.3(a) – (c) shall be assessed against the requirements of, CC.6.1.2, CC.6.1.3 and CC.6.1.4.
- (d) As part of these tests, **The Company** (in the case of an **Local Joint Restoration Plan**) or **Network Operator** (in the case of a **Distribution Restoration Zone Plan**) may require the **Anchor HVDC System Owner** or **Anchor DC Converter Owner** to undertake a:
 - a) A dead line charge test only; or
 - b) A dead line charge and a remote synchronisation test.

A dead line charge test would require the steps detailed in OC5.7.2.3(d) (i) and (ii) to be undertaken. A remote synchronisation test would require the steps detailed in OC5.7.2.3(d) (i) – (iii) to be undertaken.

- i) **Start-Up** of the **HVDC System** or **DC Converter Station** under normal operational conditions.

- ii) Re-energisation of a dead test section of the **Total System** as defined in the **Local Joint Restoration Plan** or **Distribution Restoration Zone Plan** as appropriate.
- iii) Demonstration of the ability to synchronise to a section of the **Total System** at a location remote from the **HVDC System** or **DC Converter Station Grid Entry Point** or **User System Entry Point** (as the case may be).

A dead line charge test is to demonstrate the **HVDC System** or **DC Converter Stations** ability to charge a pre-defined dead part of the **Total System** and its ability to control the voltage on that part.

A remote synchronisation test is used to demonstrate the successful operation of a **Transmission Licensee's** or **Network Operator's** system synchronising facilities across individual circuit breakers which are either necessary part of a **Local Joint Restoration Plan** or defined in a **Distribution Restoration Zone Plan**.

When planning a dead line charge test, consideration shall be given to the effect the test will have on **Customers** supplied from the part of the **Total System** that needs to be de-energised, including whether their supplies would need to be interrupted to undertake the test. Where possible, tests should be conducted to avoid interruption to **Customer** supplies however where this is not possible, alternative tests or computer simulation exercises can be agreed between **The Company**, **Relevant Transmission Licensee** (as applicable), **Network Operator** (as applicable) and **Restoration Contractor**. Where it is identified that routine testing cannot be undertaken which is critical to restoration of the **Total System**, from a strategic perspective, as a result of interruption to **Customer** supplies, consideration should be given to **System** reconfiguration where such a change is technically and economically viable which would be agreed between the **The Company**, **Relevant Transmission Licensee** and **Network Operator** (as appropriate).

OC5.7.2.4 Top Up Restoration Plant Tests

Top Up Restoration Contractors have contracts with **The Company** and where appropriate **Network Operators**, to provide a service in respect of their **Top Up Plant** to contribute to a **Local Joint Restoration Plan** or **Distribution Restoration Zone Plan**. As provided for in OC9.4.7.7.4 and OC9.4.7.8.4, **Top Up Restoration Contractors** will generally be instructed to prepare their **Top Up Restoration Plant** immediately after instructions are issued to **Restoration Contractors** in respect of their **Anchor Plant** such that a **Top Up Restoration Contractor** can deliver the service they have agreed to provide, without delay, upon restoration of external site supplies. The purpose of these tests is to demonstrate that **Top Up Restoration Plant** has the capability in accordance with the requirements of the **Top Up Restoration Contract**.

- (a) Prior to the test, the relevant **Transmission Licensee** and/or **Network Operator** shall reconfigure its **System** as necessary to enable the test of the relevant **Plant** and **Apparatus** to be completed whilst having due regard for the safety of **Plant** and **Apparatus** and personnel on or adjacent to its **System**, and for the public.
- (b) The relevant **Plant** and/or **Apparatus** shall be operating normally, i.e. in the operational state it is anticipated to be in if a **Shutdown** were to occur.
- (c) All the **Auxiliary Energy Supplies** which relate to the relevant **Plant** and/or **Apparatus** shall be **Shutdown**.
- (d) The **Plant** and/or **Apparatus** shall be de-loaded, **De-Synchronised** and **Shutdown** as appropriate and all alternating current electrical supplies to its **Auxiliaries** shall be disconnected.
- (e) **Auxiliary Energy Supplies** at the **Top Up Plant** shall be started, and shall re-energise either directly, or via the **Station Board** or the **Unit Board** of the relevant **Plant**.
- (f) With the **Auxiliaries** available the relevant **Plant** and/or **Apparatus** should be in a position to return to a condition when it is ready to be reconnected and/or **Synchronised** to the **System**.

- (g) Relevant **Top Up Restoration Plant** shall be **Synchronised** to the **System** and shall be **Loaded** with **Active Power** and/or **Reactive Power** as agreed with **The Company** and/or the **Network Operator**, unless an overriding instruction has been given directly by **The Company** or from **The Company** to the **Network Operator** under **BC2**.
- (h) **The Company** and/or **Network Operator** shall agree with the **Top Up Restoration Contractor** when the test has been completed.

OC5.7.2.5 Quick Re-synchronisation Unit Test

- (a) The relevant **Generating Unit** shall be **Synchronised** and **Loaded**;
- (b) All the **Auxiliary Energy Supplies** in the **Anchor Power Station** in which that **Generating Unit** is situated, shall be **Shutdown**;
- (c) The **Generating Unit** shall tripped to house load;
- (d) The relevant **Generating Unit** shall be **Synchronised** to the **System** but not **Loaded**, unless the appropriate instruction has been given by **The Company** and/or **relevant Network Operator** under **BC2** which would also be in accordance with the requirements of the **Anchor Restoration Contract**;

In respect of **EU Generators**, the above tests defined in OC5.7.2.5(a) – (c) shall be assessed against the requirements of ECC.6.3.5.6.

OC5.7.2.6 Distribution Restoration Zone Control System Tests

Where a **Network Operator** uses a **Distribution Restoration Zone Control System** as part of the implementation of a **Distribution Restoration Zone Plan**, the **Network Operator** shall undertake tests or otherwise demonstrate the correct functioning of the **Distribution Restoration Zone Control System**. The tests shall be in accordance with the applicable electrical standard as listed in the annex to the **General Conditions**.

OC5.7.2.7 General Testing Arrangements

All the above tests listed in OC5.7.2.1 to OC5.7.2.6, shall be carried out at the time agreed by **The Company** and/or **relevant Network Operator** in the notice given under OC5.7.1 and shall be undertaken in the presence of a reasonable number of representatives appointed and authorised by **The Company** and/or **relevant Network Operator**, who shall be given access to all information relevant to the **Test**. In the case of a **Restoration Contractor** who wishes to undertake their own tests independently of a test requested by **The Company** and/or **Relevant Network Operator**, then they shall be undertaken in accordance with OC7.5.

OC5.7.3. Failure of Restoration Service Tests

- OC5.7.3.1 An **Anchor Restoration Contractor** shall fail an **Anchor Plant Test** if it fails to energise parts of the **System** and to provide the **Active Power** or **Reactive Power** output in accordance with that specified in the **Anchor Restoration Contract**.
- OC5.7.3.2 A **Top Up Restoration Contractor** shall fail a **Top Up Restoration Plant Test** if it fails to be **Synchronised** to the **System** and to provide the **Active Power** or **Reactive Power** output in accordance with that specified in the **Top Up Restoration Contract**.
- OC5.7.3.4 If a **Restoration Contractor's Plant** fails to pass a **Restoration Service Test** the **Restoration Contractor** must provide **The Company** and/or **relevant Network Operator** with a written report specifying in reasonable detail the reasons for any failure of the test so far as they are then known to the **Restoration Contractor** after due and careful enquiry. This must be provided within five **Business Days** of the test. If a dispute arises relating to the failure, **The Company** and/or **relevant Network Operator** and the **relevant Restoration Contractor** shall seek to resolve the dispute by discussion. To aid resolution of the dispute the **Restoration Contractor** may request **The Company** and/or **relevant Network Operator** to help facilitate a further **Restoration Service Test** with 48 hours notice which shall be carried out following the applicable procedure set out in OC5.7.2.1 to OC5.7.2.7 as the case may be.

- OC5.7.3.5 If the **Restoration Contractor's Plant and Apparatus** concerned fails to pass the re-test and a dispute arises on that re-test, the parties may use the **Disputes Resolution Procedure** for a ruling in relation to the dispute, which shall be binding.
- OC5.7.3.6 If, following the procedure in OC5.7.3.4 and OC5.7.3.5, it is accepted that the **Restoration Contractor** has failed the **Restoration Service Test** (or a re-test carried out under OC5.7.2.7), within 14 days, or such longer period as **The Company** and/or relevant **Network Operator** may reasonably agree, following such failure, the relevant **Restoration Contractor** shall submit to **The Company** and/or relevant **Network Operator** in writing for approval, the date and time by which that **Restoration Contractor** shall have brought the relevant **Plant** and/or **Apparatus** back to a suitable state that it would pass a **Restoration Service Test**, and **The Company** and/or relevant **Network Operator** will not unreasonably withhold or delay its approval of the **Restoration Contractor's** proposed date and time submitted. Should **The Company** and/or relevant **Network Operator** not approve the **Restoration Contractor's** proposed date and time (or any revised proposal) the **Restoration Contractor** shall revise such proposal, having regard to any comments **The Company** and/or relevant **Network Operators** may have made, and resubmit it for approval.
- OC5.7.3.7 Once the **Restoration Contractor** has indicated to **The Company** and/or relevant **Network Operator** that the **Restoration Contractor's Plant** and/or **Apparatus** has been restored to a suitable state, **The Company** and/or relevant **Network Operator** shall either accept this information or require the **Restoration Contractor** to demonstrate that the relevant **Plant** and/or **Apparatus** has its capability restored, by means of a repetition of the **Restoration Service Test** referred to in OC5.7.1 following the same procedure as for the initial **Restoration Service Test**. The provisions of this OC5.7.2 will apply to such test.
- OC5.7.4 System Restoration Assurance, Awareness and Training
- OC5.7.4.1 **The Company** will coordinate with **Users** and **Restoration Contractors** for undertaking regular exercises with **Users** and **Restoration Contractors** to ensure **System Restoration** plans are capable of meeting the **Electricity System Restoration Standard**.
- OC5.7.4.2 **The Company** in coordination with **Users** and **Restoration Contractors**, from 31st December 2026, will undertake desk top and computer exercises and tests at the specified frequencies defined in Part III of **DRC** Schedule 16 to confirm:-
- i) That **The Company's** plans for **System Restoration** are robust and sufficiently able to satisfy the requirements of the **Electricity System Restoration Standard**.
 - ii) There is a high level of confidence that **Restoration Contractors** will be able to deliver the service they have contracted to provide.
 - iii) There is a high level of confidence that **User's Critical Tools and Facilities** will be able to satisfy the requirements of CC7.10 and/or ECC.7.10 in addition to the requirements of CC7.11 and/or ECC.7.11.
 - iv) There is a high level of assurance that **Local Joint Restoration Plans** and **Distribution Restoration Zone Plans** will be capable of contributing to the restoration of those sections of the **System** they have been designed to re-establish.
 - v) That **Restoration Contractors** and **Users** have arrangements in place in order for them to receive and act upon instructions issued by **The Company** or relevant **Transmission Licensee** in Scotland or relevant **Network Operator** for a period of upto 72 hours following the loss of site supplies.
 - vi) All communications systems used satisfy the minimum requirements of CC6.5.1 – CC.6.5.5 and/or ECC.6.5.1 – ECC.6.5.5.
 - vii) **Network Operators** can satisfy the requirements of CC.6.4.5 and/or ECC.6.4.6.
 - viii) **The Company** in coordination with **Network Operators** involved in planning the wider **System Restoration** process shall work collaboratively to ensure the balance of generation and demand, and minimise the risk of actions which could have a destabilising effect on the **Total System**.

- ix) Demonstrate their control systems will remain functional and can handle incidents when the **Total System** is in a de-energised state including client applications and server architecture.
- x) Demonstrate the cyber-security of their voice and control systems in accordance with CC.7.10.6 or ECC.7.10.6.
- xi) Report the service level agreement compliance of their telephony systems including infrastructure and service provision as provided for CC.6.5.4 or ECC.6.5.4.
- xii) The resilience of voice systems including power supplies by its ability to withstand a minimum of 72 hours during **System Restoration**.

As part of these exercises, **Restoration Contractors** and **Users** are required to inform **The Company** of any assumptions they make and any reasons why they would be unable to fulfil their obligations.

In addition, from 1st January 2024 until 31st December 2026 desk top and computer exercises and tests in relation to items i) to xii) may be carried out by agreement with **The Company**, **Users** and **Restoration Contractors**.

OC5.7.4.3 In addition to the above requirements, from 31 December 2026 onwards, **Restoration Contractors** and **Users**, other than **Network Operators**, are also required to provide an annual statement confirming that their **Plant** and **Apparatus** has the capability to satisfy the requirements of OC5.7 through their Week 24 data submission. In the case of **Network Operators** prior to the **PSM Implementation Date**, this confirmation shall be provided in their Week 24 data submission; after the **PSM Implementation Date** this confirmation shall be provided in their Week 28 data submission.

OC5.7.5 In addition to the requirements of OC5.7.4.2 the following assurance tests shall be undertaken at least once every three years.

- i) **Users, BM Participants** and **Restoration Contractors** shall undertake tests or otherwise demonstrate their **Critical Tools and Facilities** satisfy the requirements of CC.6.5.4.4, CC.6.5.5.1, CC.7.10 and CC.7.11 or ECC.6.5.4.4, ECC.6.5.5.1, ECC.7.10 and ECC.7.11 as applicable.
- ii) **User's, BM Participants** and **Restoration Contractors** shall undertake tests or otherwise demonstrate that their **Critical Tools and Facilities** are sufficiently robust and reliable enough to manage the high volumes of data and alarms that are expected to be generated during **System Restoration** in accordance with the requirements of CC.7.10.7 and/or ECC.7.10.7.

OC5.7.6 **The Company**, as part of its regular **System Restoration** assurance activities, will ensure **Users** and **Restoration Contractors** are capable of satisfying the applicable requirements of OC5.7.

OC5.8 PROCEDURES APPLYING TO EMBEDDED MEDIUM POWER STATIONS NOT SUBJECT TO A BILATERAL AGREEMENT AND EMBEDDED DC CONVERTER STATIONS NOT SUBJECT TO A BILATERAL AGREEMENT

OC5.8.1 Compliance Statement

Each **Network Operator** shall ensure that each **Embedded Person** provides to the **Network Operator** upon **The Company's** request:

- (a) written confirmation that each such **Power Generating Module, Generating Unit, Power Park Module, HVDC Equipment**, or **DC Converter** complies with the requirements of the **CC** and **ECC**; and

- (b) evidence, where requested, reasonably satisfactory to **The Company**, of such compliance. Such a request shall not normally be made by **The Company** more than twice in any calendar year in respect of any **Generator's Power Generating Module, Generating Unit or Power Park Module or HVDC System Owner's HVDC System, or DC Converter owner's DC Converter**.

The **Network Operator** shall provide the evidence or written confirmation required under OC5.8.1 (a) and (b) forthwith upon receipt to **The Company**.

OC5.8.2 Network Operator's Obligations To Facilitate Tests

If:

- (a) the **Network Operator** fails to procure the confirmation referred to at OC5.8.1(a); or
(b) the evidence of compliance is not to **The Company's** reasonable satisfaction,

then, **The Company** shall be entitled to require the **Network Operator** to procure access upon terms reasonably satisfactory to **The Company** to enable **The Company** to witness the **Embedded Person** carrying out the tests referred to in OC5.8.3 in respect of the relevant **Embedded Medium Power Station or Embedded DC Converter Station or Embedded HVDC System**.

OC5.8.3 Testing Of Embedded Medium Power Stations Not Subject To A Bilateral Agreement Or Embedded DC Converter Stations Not Subject To A Bilateral Agreement or Embedded HVDC Equipment Not Subject To A Bilateral Agreement

The Company may, in accordance with the provisions of OC5.8.2, at any time (although not normally more than twice in any calendar year in respect of any particular **Embedded Medium Power Station** not subject to a **Bilateral Agreement** or **Embedded DC Converter Station** or **Embedded HVDC Equipment** not subject to a **Bilateral Agreement**) issue an instruction requiring the **Network Operator** within whose **System** the relevant **Medium Power Station** not subject to a **Bilateral Agreement** or **DC Converter Station** or **HVDC Equipment** not subject to a **Bilateral Agreement** is **Embedded**, to require the **Embedded Person** to carry out a test.

Such test shall be carried out at a time no sooner than 48 hours from the time that the instruction was issued, on any one or more of the **Generating Units, Power Generating Modules, Power Park Modules or DC Converters or HVDC Equipment** comprising part of the relevant **Embedded Medium Power Station or Embedded DC Converter Station or HVDC System** and should only be to demonstrate that:

- (a) the relevant **Generating Unit, Power Generating Module, Power Park Module or DC Converter or HVDC Equipment** meets the requirements of the paragraphs in the **CC** or **ECC** which are applicable to such **Generating Units, Power Generating Modules, Power Park Module or DC Converter or HVDC Equipment**;
(b) the **Reactive Power** capability registered with **The Company** under **OC2** meets the requirements set out in CC.6.3.2 or ECC.6.3.2 as applicable.

The instruction may only be issued where, following consultation with the relevant **Network Operator**, **The Company** has:

- (c) confirmed to the relevant **Network Operator** the manner in which the test will be conducted, which shall be consistent with the principles established in OC5.5.3; and
(d) received confirmation from the relevant **Network Operator** that the relevant **Generating Unit, Power Generating Module, Power Park Module or DC Converter or HVDC Equipment** would not then be unavailable by reason of forced outage or **Planned Outage** expected prior to the instruction.

The relevant **Network Operator** is responsible for ensuring the performance of any test so required by **The Company** and the **Network Operator** shall ensure that the **Embedded Person** retains the responsibility for ensuring the safety of personnel and plant during the test.

OC5.8.4 Test Failures/Re-Tests and Disputes

The relevant **Network Operator** shall:

- (a) ensure that provisions equivalent to OC5.5.5, OC5.5.6 and OC5.6 apply to **Embedded Medium Power Stations** not the subject of a **Bilateral Agreement**, **Embedded DC Converter Stations** not the subject of a **Bilateral Agreement** or **Embedded HVDC Equipment** not the subject of a **Bilateral Agreement** within its **System** in respect of test failures, re-tests and disputes as to test failures and re-tests;
- (b) ensure that the provisions equivalent to OC5.5.5, OC5.5.6 and OC5.6 referred to in OC5.8.4(a) are effective so that **The Company** may require, if it so wishes, the provision to it of any reports or other information equivalent to those or that to which **The Company** would be entitled in relation to test failures, re-tests and disputes as to test failures and re-tests under the provisions of OC5.5.5, OC5.5.6 and OC5.6; and
- (c) the provisions equivalent to OC5.5.5, OC5.5.6 and OC5.6 referred to in OC5.8.4(a) are effective to permit **The Company** to conduct itself and take decisions in such a manner in relation to test failures, re-tests and disputes as to test failures and re-tests in respect of **Embedded Medium Power Stations** not the subject of a **Bilateral Agreement**, **Embedded DC Converter Stations** not the subject of a **Bilateral Agreement** or **Embedded HVDC Equipment** not the subject of a **Bilateral Agreement** as it is able to conduct itself and take decisions in relation to test failures, re-tests and disputes as to test failures and re-tests under OC5.5.5, OC5.5.6 and OC5.6.

APPENDIX 1 - ONSITE SIGNAL PROVISION FOR WITNESSING TESTS

OC5.A.1.1 During tests witnessed on-site by **The Company**, the following signals shall be provided to **The Company** by the **GB Generator**, **GB Generator** undertaking **OTSDUW** or **DC Converter Station** owner in accordance with CC.6.6.2:

OC5.A.1.2 Synchronous Generating Units

(a) All Tests

- MW - **Active Power** at **Generating Unit** terminals

(b) Reactive & Excitation System

- MVA_r - **Reactive Power** at **Generating Unit** terminals
- V_t - **Generating Unit** terminal voltage
- E_{fd} - **Generating Unit** field voltage and/or main exciter field voltage
- I_{fd} – **Generating Unit** field current (where possible)
- **Power System Stabiliser** output, where applicable.
- Noise – Injected noise signal (where applicable and possible)

(c) Governor System & Frequency Response

- F_{sys} - **System Frequency**
- F_{inj} - Injected Speed Reference
- Logic - Stop / Start Logic Signal

For Gas Turbines:

- GT Fuel Demand
- GT Fuel Valve Position
- GT Inlet Guide Vane Position
- GT Exhaust Gas Temperature

For Steam Turbines at >= 1Hz:

- Pressure before Turbine Governor Valves
- Turbine Governor Valve Positions
- Governor Oil Pressure*
- Boiler Pressure Set Point *
- Superheater Outlet Pressure *
- Pressure after Turbine Governor Valves*
- Boiler Firing Demand*

*Where applicable (typically not in **CCGT Module**)

For Hydro Plant:

- Speed Governor Demand Signal
- Actuator Output Signal
- Guide Vane / Needle Valve Position

(d) Compliance with CC.6.3.3

- Fsys - **System Frequency**
- Finj - Injected Speed Reference
- Appropriate control system parameters as agreed with **The Company** (See OC5.A.2.9)

OC5.A.1.3 Power Park Modules, OTSUA and DC Converters

Each **Power Park Module** and **DC Converter** at a **Grid Entry Point** or **User System Entry Point**

(a) Real Time on site.

- Total **Active Power** (MW)
- Total **Reactive Power** (MVar)
- Line-line Voltage (kV)
- **System Frequency** (Hz)

(b) Real Time on site or Downloadable

- Injected frequency signal (Hz) or test logic signal (Boolean) when appropriate
- Injected voltage signal (per unit voltage) or test logic signal (Boolean) when appropriate
- In the case of an **Onshore Power Park Module** the **Onshore Power Park Module** site voltage (MV) (kV)
- **Power System Stabiliser** output, where appropriate
- In the case of a **Power Park Module** or **DC Converter** where the **Reactive Power** is provided from more than one **Reactive Power** source, the individual **Reactive Power** contributions from each source, as agreed with **The Company**.
- In the case of **DC Converters** appropriate control system parameters as agreed with **The Company** (See OC5.A.4)
- In the case of an **Offshore Power Park Module** the total **Active Power** (MW) and the total **Reactive Power** (MVar) at the **Offshore Grid Entry Point**

(c) Real Time on site or Downloadable

- Available power for **Power Park Module** (MW)
- Power source speed for **Power Park Module** (e.g. wind speed) (m/s) when appropriate
- Power source direction for **Power Park Module** (degrees) when appropriate

See OC5.A.1.3.1

OC5.A.1.3.1 **The Company** accept that the signals specified in OC5.A.1.3(c) may have lower effective sample rates than those required in CC.6.6.2 although any signals supplied for connection to **The Company's** recording equipment which do not meet at least the sample rates detailed in CC.6.6.2 should have the actual sample rates indicated to **The Company** before testing commences.

OC5.A.1.3.2 For all **The Company** witnessed testing either;

- (i) the **Generator** or **DC Converter Station** owner shall provide to **The Company** all signals outlined in OC5.A.1.3 direct from the **Power Park Module** control system without any attenuation, delay or filtering which would result in the inability to fully demonstrate the objectives of the test, or identify any potential safety or plant instability issues, and with a signal update rate corresponding to CC.6.6.2.1; or

- (ii) in the case of **Onshore Power Park Modules**, the **Generator** or **DC Converter Station** owner shall provide signals OC5.A.1.3(a) direct from one or more transducer(s) connected to current and voltage transformers for monitoring in real time on site; or,
- (iii) In the case of **Offshore Power Park Modules** and **OTSUA** signals OC5.A.1.3(a) will be provided at the **Interface Point** by the **Offshore Transmission Licensee** pursuant to the **STC** or by the **Generator** when **OTSDUW Arrangements** apply.

OC5.A.1.3.3 Options OC5.A.1.3.2 (ii) and (iii) will only be available on condition that;

- (a) all signals outlined in OC5.A.1.3 are recorded and made available to **The Company** by the **Generator** or **DC Converter Station** owner from the **Power Park Module** or **OTSUA** or **DC Converter** control systems as a download once the testing has been completed; and
- (b) the full test results are provided by the **Generator** or **DC Converter Station** owner within 2 working days of the test date to **The Company** unless **The Company** agrees otherwise; and
- (c) all data is provided with a sample rate in accordance with CC.6.6.2.2 or ECC.6.6.3.3 unless **The Company** agrees otherwise; and
- (d) in **The Company's** reasonable opinion the solution does not unreasonably add a significant delay between tests or impede the volume of testing which can take place on the day.

OC5.A.1.3.4 In the case of where transducers connected to current and voltage transformers are installed (OC5.A.1.3.3 (ii) and (iii)), the transducers shall meet the following specification

- (a) The transducer(s) shall be permanently installed to easily allow safe testing at any point in the future, and to avoid a requirement for recalibration of the current transformers and voltage transformers.
- (b) The transducer(s) should be directly connected to the metering quality current transformers and voltage transformers or similar.
- (c) The transducers shall either have a response time no greater than 50ms to reach 90% of output, or no greater than 300ms to reach 99.5%.

OC5.A.1.4 Testing not witnessed by **The Company** on-site

OC5.A.1.4.1.1 Where **The Company** has decided not to witness testing on-site, the results shall be submitted to **The Company** in spreadsheet format with the signal data in columns arranged as follows. Signal data denoted by “#” is not essential but if not provided the column should remain in place but without values entered. Where two signal names are given in a column these are alternatives related to the type of plant under test.

OC5.A.1.4.1.2. Where **The Company** has requested addition signals to be recorded prior to the testing these signals shall be placed in columns to the right of the spreadsheet.

OC5.A.1.4.2.1 Onshore Synchronous Generating Unit Excitation System and Reactive Capability

	Col 1	Col 2	Col 3	Col 4	Col 5	Col 6	Col 7	Col 8
1	Time	Active Power	Reactive Power	Terminal Voltage	Speed /Frequency #	Freq Injection #	Logic / Test Start #	Field Voltage
	Col 9	Col 10	Col 11	Col 12	Col 13	Col 14	Col 15	Col 16
1	Field Current	PSS Output #	Noise Injection #					
# Columns may be left blank but the column must still be included in the files								

OC5.A.1.4.2.2 Onshore Synchronous Generating Unit Frequency Response and CC.6.3.3

	Col 1	Col 2	Col 3	Col 4	Col 5	Col 6	Col 7	Col 8
1	Time	Active Power	Reactive Power #	Terminal Voltage #	Speed /Frequency	Freq Injection	Logic / Test Start	Fuel Demand
2								Guide Vane Setpoint
	Col 9	Col 10	Col 11	Col 12	Col 13	Col 14	Col 15	Col 16
1	Inlet Guide Vane	Exhaust Gas Temp	ST Valve Pos	Fuel Valve Pos	HP Steam Valve Pos	IP Steam Valve Pos	LP Steam Valve Pos	
2	Guide Vane Position	Head						
# Columns may be left blank but must still be included in the files								

OC5.A.1.4.3.1 Onshore Power Park Modules Voltage Control & Reactive Capability

	Col 1	Col 2	Col 3	Col 4	Col 5	Col 6	Col 7	Col 8
1	Time	Active Power	Reactive Power	Connection Point Voltage	Speed /Frequency #	Freq Injection #	Logic / Test Start #	Statcom or Windfarm Reactive Power #
	Col 9	Col 10	Col 11	Col 12	Col 13	Col 14	Col 15	Col 16
1	Power Available	Wind Speed	Wind Direction	Voltage Setpoint				
2	State of Charge							
# Columns may be left blank but the column must still be included in the files								

OC5.A.1.4.3.2 Offshore Power Park Modules Voltage Control & Reactive Capability

	Col 1	Col 2	Col 3	Col 4	Col 5	Col 6	Col 7	Col 8
1	Time	Onshore Interface Point Active Power	Onshore Interface Point Reactive Power	Onshore Interface Point Voltage	Speed /Frequency #	Freq Injection #	Logic / Test Start #	Statcom or Windfarm Reactive Power #
	Col 9	Col 10	Col 11	Col 12	Col 13	Col 14	Col 15	Col 16
1	Power Available	Wind Speed m/s	Wind Direction	Voltage Setpoint				
2	State of Charge							
# Columns may be left blank but the column must still be included in the files								

OC5.A.1.4.3.3 Power Park Modules Frequency Control

	Col 1	Col 2	Col 3	Col 4	Col 5	Col 6	Col 7	Col 8
1	Time	GEP Active Power	GEP Reactive Power #	GEP Connection Voltage #	Speed /Frequency	Freq Injection	Logic / Test Start	Statcom or Windfarm Output

								#
	Col 9	Col 10	Col 11	Col 12	Col 13	Col 14	Col 15	Col 16
1	Power Available	Wind Speed m/s	Wind Direction					
2	State of Charge							
# Columns may be left blank but must still be included in the files								

OC5.A.1.5.1 Where test results are completed without any prescence of **The Company** but are relied upon as evidence of the compliance they should be accompanied by a logsheet. This sheet should be legible, in English and detail the items as indicated below:

- Time and date of test;
- Name of **Power Station** and module if applicable;
- Name of test engineer(s) and company name;
- Name of **User** representative(s) and company name;
- Type of testing being undertake eg voltage control;
- Ambient conditions eg. temperature, pressure, wind speed, wind direction; and
- Controller settings, eg voltage slope, frequency droop, voltage setpoint, UEL & OEL settings.

OC5.A.1.5.2 For each test the following items should be recorded as relevant to the type of test being undertaken. Where there is uncertainty on the information to be recorded this should be discussed with **The Company** in advance of the test.

OC5.A.1.5.2 .1 Voltage Control Tests

- Start time of each test step;
- **Active Power**;
- **Reactive Power**;
- Connection voltage;
- Voltage vontrol setpoint, if applicable or changed;
- Voltage control slope, if applicable or changed;
- Terminal voltage if applicable;
- **Generating Unit** transformer tap position or grid transformer tap position, as applicable;
- Number of **Power Park Units** in service in each **Power Park Module**, if applicable; and
- For Offshore Connections, **Offshore Grid Entry Point** voltage.

OC5.A.1.5.2.2 Reactive Power Capability Tests

- Start time of test;
- **Active Power**;
- **Reactive Power**;
- Connection voltage;
- Terminal voltage if applicable;

- **Generating Unit** transformer tap position or grid transformer tap position as applicable;
 - Number of **Power Park Units** in service in each **Power Park Module**, if applicable and
 - For Offshore Connections, **Offshore Grid Entry Point** voltage.

OC5.A.1.5.2.3 Frequency Response Capability Tests

- Start time of test;
- **Active Power**;
- **System Frequency**;
- For **CCGT Modules**, **Active Power** for the individual units (GT &ST);
- For boiler plant, HP steam pressure;
- Droop setting of controller if applicable;
- Number of **Power Park Units** in service in each **Power Park Module**, if applicable.; and
- For Offshore Connections, **Offshore Grid Entry Point Active Power** for each Power Park Module.

OC5.A.1.5.3 Material changes during the test period should be recorded e.g. **Generating Units** tripping / starting, changes to tapchange positions.

APPENDIX 2 - COMPLIANCE TESTING OF SYNCHRONOUS PLANT

OC5.A.2.1 Scope

OC5.A.2.1.1 This Appendix sets out the tests contained therein to demonstrate compliance with the relevant clauses of the **Connection Conditions** of the Grid Code and apply only to **GB Generators**. This Appendix shall be read in conjunction with the **CP** with regard to the submission of the reports to **The Company**. The testing requirements applicable to **EU Generators** are specified in ECP.A.5.

OC5.A.2.1.2 The tests specified in this Appendix will normally be sufficient to demonstrate compliance however **The Company** may:

- (i) agree an alternative set of tests provided **The Company** deem the alternative set of tests sufficient to demonstrate compliance with the **Grid Code** and **Bilateral Agreement**; and/or
- (ii) require additional or alternative tests if information supplied to **The Company** during the compliance process suggests that the tests in this Appendix will not fully demonstrate compliance with the relevant section of the **Grid Code** or **Bilateral Agreement**.
- (iii) Agree a reduced set of tests for subsequent **Generating Units** following successful completion of the first **Generating Unit** tests in the case of a **Power Station** comprised of two or more **Generating Units** which **The Company** reasonably considers to be identical.

If:

- (a) the tests performed pursuant to OC5.A.2.1.2(iii) in respect of subsequent **Generating Units** do not replicate the full tests for the first **Generating Unit**, or
- (b) any of the tests performed pursuant to OC5.A.2.1.2(iii) do not fully demonstrate compliance with the relevant aspects of the **Grid Code**, **Ancillary Services Agreement** and / or **Bilateral Agreement**,

then notwithstanding the provisions above, the full testing requirements set out in this Appendix will be applied.

OC5.A.2.1.3 The **Generator** is responsible for carrying out the tests set out in and in accordance with this Appendix and the **Generator** retains the responsibility for the safety of personnel and plant during the test. **The Company** will witness all of the tests outlined or agreed in relation to this Appendix unless **The Company** decides and notifies the **Generator** otherwise. Reactive Capability tests may be witnessed by **The Company** remotely from the **The Company** control centre. During **The Company** witnessed tests, the **Generator** should ensure suitable representatives from the **Generator** and manufacturer (if appropriate) are available on site for the entire testing period. In all cases the **Generator** shall provide suitable monitoring equipment to record all relevant test signals as outlined below in OC5.A.3.1.5.

OC5.A.2.1.4 The **Generator** shall submit a schedule of tests to **The Company** in accordance with CP.4.3.1

OC5.A.2.1.5 Prior to the testing of a **Generating Unit**, the **Generator** shall complete the **Integral Equipment Test** procedure in accordance with OC.7.5

OC5.A.2.1.6 Full **Generating Unit** testing as required by CP.7.2 is to be completed as defined in OC5.A.2.2 through to OC5.A.2.9

OC5.A.2.2 Excitation System Open Circuit Step Response Tests

OC5.A.2.2.1 The open circuit step response of the **Excitation System** will be tested by applying a voltage step change from 90% to 100% of the nominal **Generating Unit** terminal voltage, with the **Generating Unit** on open circuit and at rated speed.

- OC5.A.2.2.2 The test shall be carried out prior to synchronisation in accordance with CP.6.4. This is not witnessed by **The Company** unless specifically requested by **The Company**. Where **The Company** is not witnessing the tests, the **Generator** shall supply the recordings of the following signals to **The Company** in an electronic spreadsheet format:
- Vt - **Generating Unit** terminal voltage
 - Efd - **Generating Unit** field voltage or main exciter field voltage
 - Ifd- **Generating Unit** field current (where possible)
 - Step injection signal
- OC5.A.2.2.3 Results shall be legible, identifiable by labelling, and shall have appropriate scaling.
- OC5.A.2.3 Open & Short Circuit Saturation Characteristics
- OC5.A.2.3.1 The test shall normally be carried out prior to synchronisation in accordance with CP.6.4. Manufacturer factory test results may be used where appropriate or manufacturers factory type test results may be used if agreed by **The Company**.
- OC5.A.2.3.2 This is not witnessed by **The Company**. Graphical and tabular representations of the results in an electronic spreadsheet format showing per unit open circuit terminal voltage and short circuit current versus per unit field current shall be submitted to **The Company**.
- OC5.A.2.3.3 Results shall be legible, identifiable by labelling, and shall have appropriate scaling.
- OC5.A.2.4 Excitation System On-Load Tests
- OC5.A.2.4.1 The time domain performance of the **Excitation System** shall be tested by application of voltage step changes corresponding to 1% and 2% of the nominal terminal voltage.
- OC5.A.2.4.2 Where a **Power System Stabiliser** is present:
- (i) The **PSS** must only be commissioned in accordance with BC2.11.2. When a **PSS** is switched on for the first time as part of on-load commissioning or if parameters have been adjusted, the **Generator** should consider reducing the **PSS** output gain by at least 50% and should consider reducing the limits on the **PSS** output by at least a factor of 5 to prevent unexpected PSS action affecting the stability of the **Generating Unit** or the **National Electricity Transmission System**.
 - (ii) The time domain performance of the **Excitation System** shall be tested by application of voltage step changes corresponding to 1% and 2% of the nominal terminal voltage, repeating with and without the **PSS** in service.
 - (iii) The frequency domain tuning of the **PSS** shall also be demonstrated by injecting a 0.2Hz-3Hz band limited random noise signal into the **Automatic Voltage Regulator** reference with the **Generating Unit** operating at points specified by **The Company** (up to rated MVA output).
 - (iv) The **PSS** gain margin shall be tested by increasing the **PSS** gain gradually to threefold and observing the **Generating Unit** steady state **Active Power** output.
 - (v) The interaction of the **PSS** with changes in **Active Power** shall be tested by application of a +0.5Hz frequency injection to the governor while the **Generating Unit** is selected to **Frequency Sensitive Mode**.
 - (vi) If the **Generating Unit** is of the pump storage type, then the step tests shall be carried out, with and without the **PSS**, in the pumping mode in addition to the generating mode.
 - (vii) Where the **Bilateral Agreement** requires that the **PSS** is in service at a specified loading level, additional testing witnessed by **The Company** will be required during the commissioning process before the **Generating Unit** or **CCGT Module** may exceed this output level.
 - (viii) Where the **Excitation System** includes a **PSS**, the **Generator** shall provide a suitable noise source to facilitate noise injection testing.

OC5.A.2.4.3 The following typical procedure is provided to assist **Generators** in drawing up their own site specific procedures for the **The Company** witnessed **PSS** Tests.

Test	Injection	Notes
	Synchronous Generator running rated MW, unity pf, PSS Switched Off	
1	- Record steady state for 10 seconds - Inject +1% step to AVR Voltage Reference and hold for at least 10 seconds until stabilised - Remove step returning AVR Voltage Reference to nominal and hold for at least 10 seconds	
2	- Record steady state for 10 seconds - Inject +2% step to AVR Voltage Reference and hold for at least 10 seconds until stabilised - Remove step returning AVR Voltage Reference to nominal and hold for at least 10 seconds	
3	- Inject band limited (0.2-3Hz) random noise signal into voltage reference and measure frequency spectrum of Real Power. - Remove noise injection.	
	Switch On Power System Stabiliser	
4	- Record steady state for 10 seconds - Inject +1% step to AVR Voltage Reference and hold for at least 10 seconds until stabilised - Remove step returning AVR Voltage Reference to nominal and hold for at least 10 seconds	
5	- Record steady state for 10 seconds - Inject +2% step to AVR Voltage Reference and hold for at least 10 seconds until stabilised - Remove step returning AVR Voltage Reference to nominal and hold for at least 10 seconds	
6	- Increase PSS gain at 30 second intervals. i.e. x1 – x1.5 – x2 – x2.5 – x3 - Return PSS gain to initial setting	
7	- Inject band limited (0.2-3Hz) random noise signal into voltage reference and measure frequency spectrum of Real Power. - Remove noise injection.	

8	- Select the governor to Frequency Sensitive Mode (FSM) - Inject +0.5 Hz step into governor. - Hold until generator MW output is stabilised - Remove step	

OC5.A.2.5 Under-excitation Limiter Performance Test

- OC5.A.2.5.1 Initially the performance of the **Under-excitation Limiter** should be checked by moving the limit line close to the operating point of the **Generating Unit** when operating close to unity power factor. The operating point of the **Generating Unit** is then stepped into the limit by applying a 2% decrease in **Automatic Voltage Regulator** reference voltage.
- OC5.A.2.5.2 The final performance of the **Under-excitation Limiter** shall be demonstrated by testing its response to a step change corresponding to a 2% decrease in **Automatic Voltage Regulator** reference voltage when the **Generating Unit** is operating just off the limit line, at the designed setting as indicated on the **Performance Chart** submitted to **The Company** under OC2.
- OC5.A.2.5.3 Where possible, the **Under-excitation Limiter** should also be tested by operating the tap-changer when the **Generating Unit** is operating just off the limit line, as set up.
- OC5.A.2.5.4 The **Under-excitation Limiter** will normally be tested at low **Active Power** output and at maximum **Active Power** output (**Registered Capacity**).
- OC5.A.2.5.5 The following typical procedure is provided to assist **Generators** in drawing up their own site specific procedures for the **The Company** witnessed **Under-excitation Limiter** Tests.

Test	Injection	Notes
	Synchronous generator running rated MW at unity Power Factor . Under-excitation limit temporarily moved close to the operating point of the generator.	
1	PSS on. - Inject -2% voltage step into AVR voltage reference and hold at least for 10 seconds until stabilised - Remove step returning AVR Voltage Reference to nominal and hold for at least 10 seconds	
	Under-excitation limit moved to normal position. Synchronous generator running at rated MW and at leading MVARs close to Under-excitation limit.	
2	PSS on. - Inject -2% voltage step into AVR voltage reference and hold at least for 10 seconds until stabilised - Remove step returning AVR Voltage Reference to nominal and hold for at least 10 seconds	

OC5.A.2.6 Over-excitation Limiter Performance Test

Description & Purpose of Test

- OC5.A.2.6.1 The performance of the **Over-excitation Limiter**, where it exists, shall be demonstrated by testing its response to a step increase in the **Automatic Voltage Regulator** reference voltage that results in operation of the **Over-excitation Limiter**. Prior to application of the step the **Generating Unit** shall be generating **Rated Active Power** and operating within its continuous **Reactive Power** capability. The size of the step will be determined by the minimum value necessary to operate the **Over-excitation Limiter** and will be agreed by **The Company** and the **Generator**. The resulting operation beyond the **Over-excitation Limit** shall be controlled by the **Over-excitation Limiter** without the operation of any protection that could trip the **Generating Unit**. The step shall be removed immediately on completion of the test.
- OC5.A.2.6.2 If the **Over-excitation Limiter** has multiple levels to account for heating effects, an explanation of this functionality will be necessary and if appropriate, a description of how this can be tested.
- OC5.A.2.6.3 The following typical procedure is provided to assist **Generators** in drawing up their own site specific procedures for the **The Company** witnessed **Under-excitation Limiter** Tests.

Test	Injection	Notes
	Synchronous Generator running Rated MW and maximum lagging MVar.	
	Over-excitation Limit temporarily set close to this operating point. PSS on.	
1	- Inject positive voltage step into AVR voltage reference and hold - Wait till Over-excitation Limiter operates after sufficient time delay to bring back the excitation back to the limit. - Remove step returning AVR Voltage Reference to nominal.	
	Over-excitation Limit restored to its normal operating value. PSS on.	

OC5.A.2.7 Reactive Capability

- OC5.A.2.7.1 The leading and lagging **Reactive Power** capability on each **Generating Unit** will normally be demonstrated by operation of the **Generating Unit** at 0.85 power factor lagging for 1 hour and 0.95 power factor leading for 1 hour.
- OC5.A.2.7.2 In the case of an **Embedded Generating Unit** where distribution network considerations restrict the **Generating Unit Reactive Power** output then the maximum leading and lagging capability will be demonstrated without breaching the host network operators limits.
- OC5.A.2.7.3 The test procedure, time and date will be agreed with **The Company** and will be to the instruction of **The Company** control centre and shall be monitored and recorded at both the **The Company** control centre and by the **Generator**.
- OC5.A.2.7.4 Where the **Generator** is recording the voltage and **Reactive Power** at the **Generating Unit** terminals, the results shall be supplied in an electronic spreadsheet format.
- OC5.A.2.7.5 The ability of the **Generating Unit** to comply with the operational requirements specified in BC2.A.2.6 and CC.6.1.7 will normally be demonstrated by changing the tap position and, where agreed in the **Bilateral Agreement**, the **Generating Unit** terminal voltage.

OC5.A.2.8 Governor and Load Controller Response Performance

- OC5.A.2.8.1 The governor and load controller response performance will be tested by injecting simulated frequency deviations into the governor and load controller systems. Such simulated frequency deviation signals must be injected simultaneously at both speed governor and load controller references. For **CCGT modules**, simultaneous injection into all gas turbines, steam turbine governors and module controllers is required.
- OC5.A.2.8.2 Prior to witnessing the governor tests set out in OC5.A.2.8.6, **The Company** requires the **Generator** to conduct the preliminary tests detailed in OC5.A.2.8.4 and send the results to **The Company** for assessment unless agreed otherwise by **The Company**. The results should be supplied in an electronic spreadsheet format. These tests shall be completed at least two weeks prior to the witnessed governor response tests.
- OC5.A.2.8.3 Where a **CCGT Module** or **Generating Unit** is capable of operating on alternative fuels, tests will be required to demonstrate performance when operating on each fuel. **The Company** may agree a reduction from the tests listed in OC5.A.2.8.6 for demonstrating performance on the alternative fuel. This includes the case where a main fuel is supplemented by bio-fuel.

Preliminary Governor Frequency Response Testing

- OC5.A.2.8.4 Prior to conducting the full set of tests as per OC5.A.2.8.6, **Generators** are required to conduct a preliminary set of tests below to confirm the frequency injection method is correct and the plant control performance is within expectation. The test numbers refer to Figure 1 below. With the plant running at 80% of full load, the following frequency injections shall be applied.

Test No (Figure 1)	Frequency Injection	Notes
8	- Inject - 0.5Hz frequency fall over 10 sec - Hold until conditions stabilise - Remove the injected signal	
14	- Inject +0.5Hz frequency rise over 10 sec - Hold until conditions stabilise - Remove the injected signal	
13	- Inject -0.5Hz frequency fall over 10 sec - Hold for a further 20 sec - At 30 sec from the start of the test, Inject a +0.3Hz frequency rise over 30 sec. - Hold until conditions stabilise - Remove the injected signal	

- OC5.A.2.8.5 The recorded results (e.g. Finj, MW and control signals) should be sampled at a minimum rate of 1 Hz to allow **The Company** to assess the plant performance from the initial transients (seconds) to the final steady state conditions (5-15 minutes depending on the plant design). This is not witnessed by **The Company**. The **Generator** shall supply the recordings including data to **The Company** in an electronic spreadsheet format. Results shall be legible, identifiable by labelling, and shall have appropriate scaling.

Full Frequency Response Testing Schedule Witnessed by The Company

OC5.A.2.8.6 The tests are to be conducted at a number of different Module Load Points (MLP). The load points are conducted as shown below unless agreed otherwise by **The Company**.

Module Load Point 6 (Maximum Export Limit)	100% MEL
Module Load Point 5	95% MEL
Module Load Point 4 (Mid point of Operating Range)	80% MEL
Module Load Point 3	70% MEL
Module Load Point 2 (Minimum Generation)	MG
Module Load Point 1 (Design Minimum Operating Level)	DMOL

OC5.A.2.8.7 The tests are divided into the following two types;

- (i) **Frequency** response volume tests as per OC5.A.2.8. Figure 1. These tests consist of **Frequency** profile and ramp tests.
- (ii) **System** islanding and step response tests as shown by OC5.A.2.8. Figure 2.

OC5.A.2.8.8 There should be sufficient time allowed between tests for control systems to reach steady state. Where the diagram states 'HOLD' the current injection should be maintained until the **Active Power** (MW) output of the **Generating Unit** or **CCGT Module** has stabilised or 90 seconds, whichever is the longer. The frequency response capability test (see Figure 1) injection signal shall be returned to zero at the same rate at which it was applied. **The Company** may require repeat tests should the tests give unexpected results. When witnessed by **The Company** each test should be carried out as a separate injection; when not witnessed by **The Company** there must be sufficient time allowed between tests for the **Plant** to have reached a stable steady state operating condition or 90 seconds, whichever is the longer.

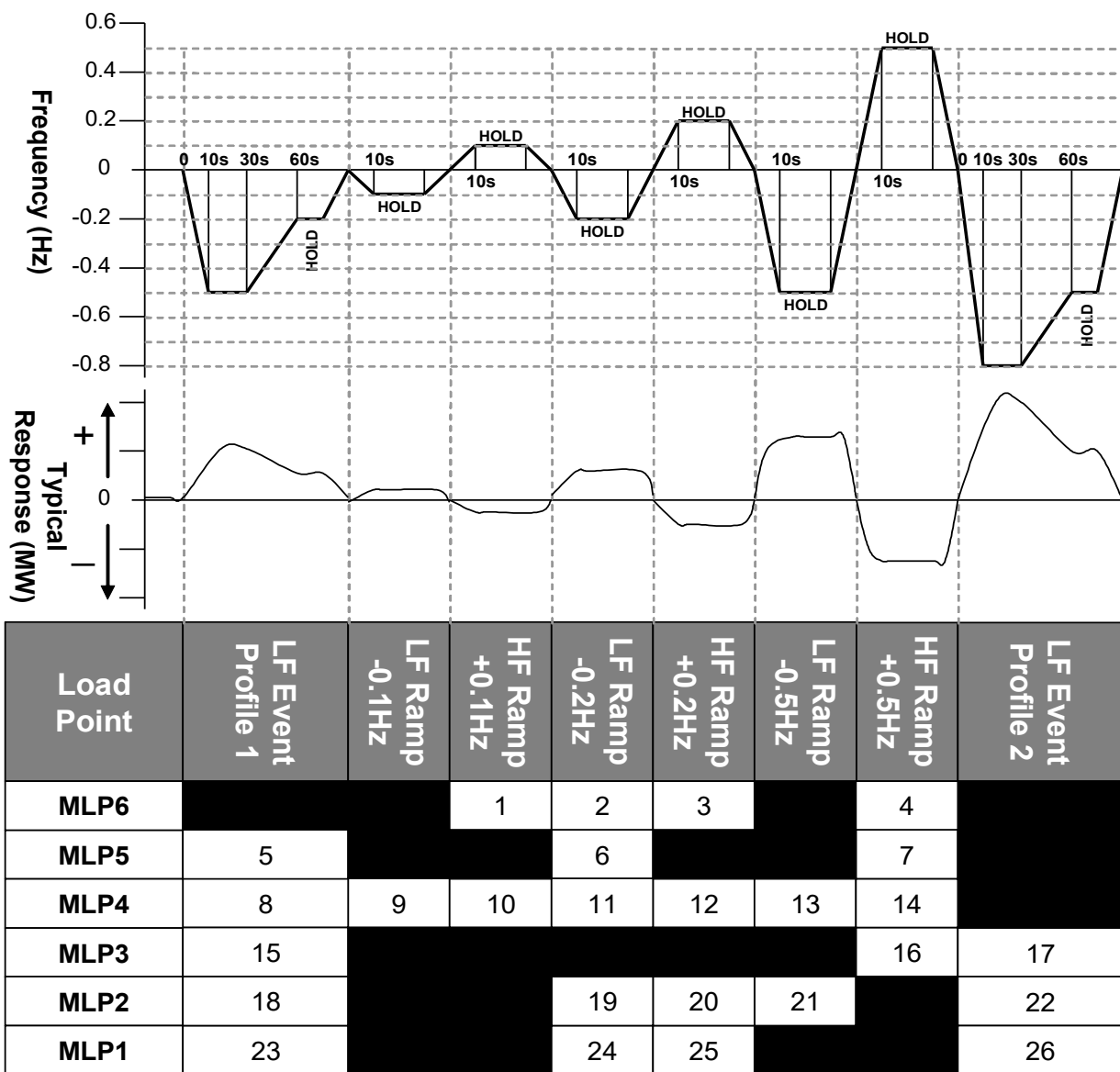


Figure 1: Frequency Response Capability Tests

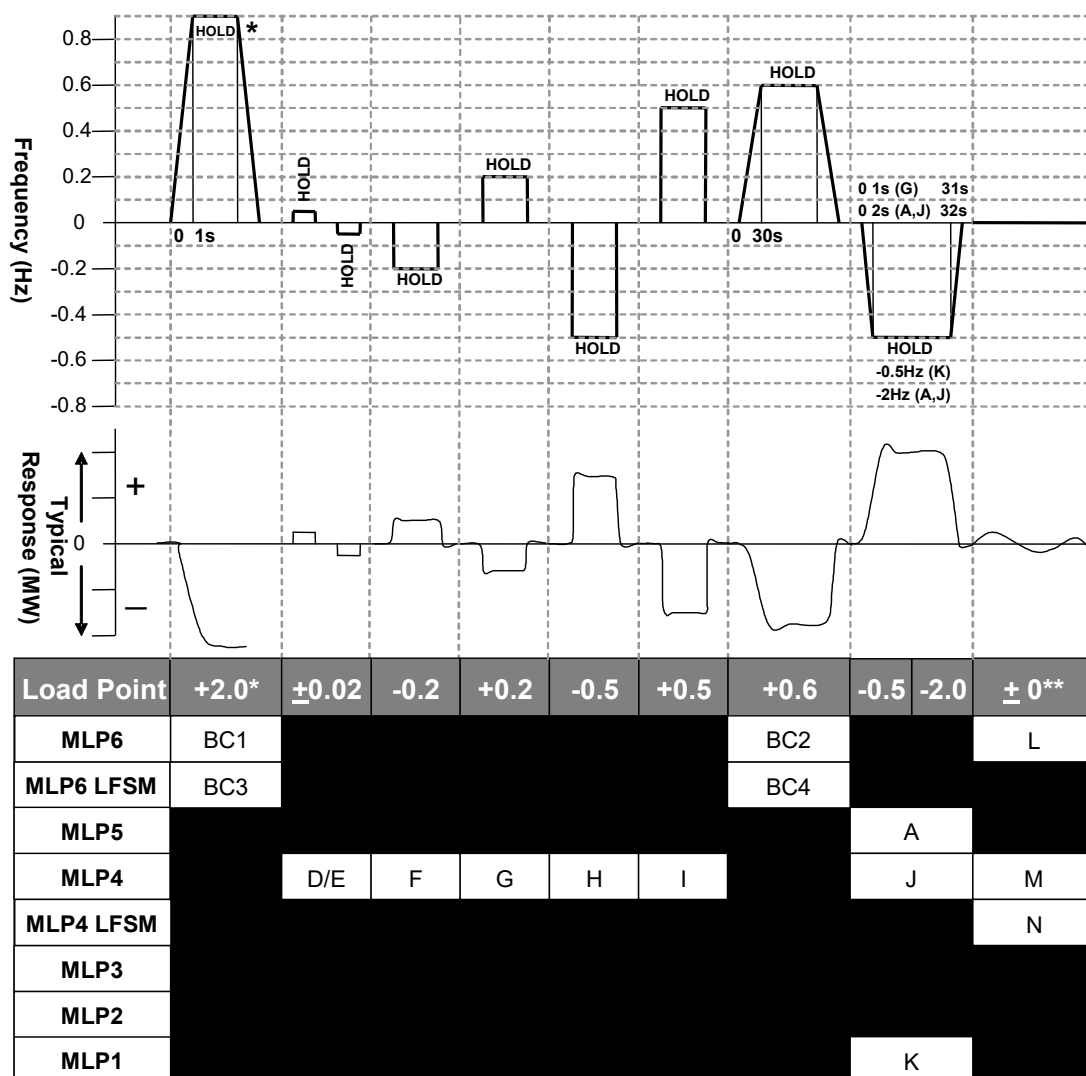


Figure 2: System islanding and step response tests

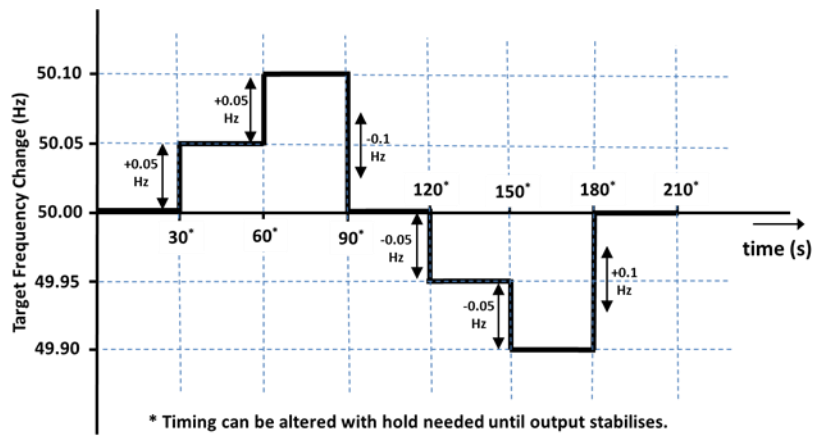
* This will generally be +2.0Hz unless an injection of this size causes a reduction in plant output that takes the operating point below **Designed Minimum Operating Level** in which case an appropriate injection should be calculated in accordance with the following:

For example, 0.9Hz is needed to take an initial output 65% to a final output of 20%. If the initial output was not 65% and the **Designed Minimum Operating Level** is not 20% then the injected step should be adjusted accordingly as shown in the example given below

Initial Output	65%
Designed Minimum Operating Level	20%
Frequency Controller Droop	4%
Frequency to be injected =	$(0.65 - 0.20) \times 0.04 \times 50 = 0.9\text{Hz}$

** Tests L and M in Figure 2 shall be conducted if in this range of tests the **System Frequency** feedback signal is replaced by the injection signal rather than the injection signal being added to the **System Frequency** signal. The tests will consist of monitoring the **Generating Unit** and **CCGT Module** in **Frequency Sensitive Mode** during normal **System Frequency** variations without applying any injection. Test N in figure 2 shall be conducted in all cases. All three tests should be conducted for a period of at least 10 minutes.

OC5.A.2.8.9 The target frequency adjustment facility should be demonstrated from the normal **Control Point** within the range of 49.9Hz to 50.1Hz by step changes to the target frequency setpoint as indicated in OC5.A.2.8 Figure 3.



OC5.A.2.8.10 Figure 3 – Target Frequency setting changes

OC5.A.2.9 Compliance with CC.6.3.3 Functionality Test

- OC5.A.2.9.1 Where the plant design includes active control function or functions to deliver CC.6.3.3 compliance, the **Generator** will propose and agree a test procedure with **The Company**, which will demonstrate how the **Generating Unit Active Power** output responds to changes in **System Frequency** and ambient conditions (e.g. by **Frequency** and temperature injection methods).
- OC5.A.2.9.2 The **Generator** shall inform **The Company** if any load limiter control is additionally employed.
- OC5.A.2.9.3 With reference to the signals specified in OC5.A.1, **The Company** will agree with the **Generator** which additional control system parameters shall be monitored to demonstrate the functionality of CC.6.3.3 compliance systems. Where **The Company** recording equipment is not used, results shall be supplied to **The Company** in an electronic spreadsheet format.

APPENDIX 3 - COMPLIANCE TESTING OF POWER PARK MODULES (AND OTSUA)

OC5.A.3.1 Scope

OC5.A.3.1.1 This Appendix outlines the general testing requirements for **Power Park Modules** and **OTSUA** to demonstrate compliance with the relevant aspects of the **Grid Code**, **Ancillary Services Agreement** and **Bilateral Agreement** and apply only to **GB Generators**. The testing requirements applicable to **EU Generators** are specified in ECP.A.6. The tests specified in this Appendix will normally be sufficient to demonstrate compliance however **The Company** may:

- (i) agree an alternative set of tests provided **The Company** deem the alternative set of tests sufficient to demonstrate compliance with the **Grid Code**, **Ancillary Services Agreement** and **Bilateral Agreement**; and/or
- (ii) require additional or alternative tests if information supplied to **The Company** during the compliance process suggests that the tests in this Appendix will not fully demonstrate compliance with the relevant section of the **Grid Code**, **Ancillary Services Agreement** or **Bilateral Agreement**; and/or
- (ii) require additional tests if a **Power System Stabiliser** is fitted; and/or
- (iv) agree a reduced set of tests if a relevant **Manufacturer's Data & Performance Report** has been submitted to and deemed to be appropriate by **The Company**; and/or
- (v) agree a reduced set of tests for subsequent **Power Park Modules** or **OTSUA** following successful completion of the first **Power Park Module** or **OTSUA** tests in the case of a **Power Station** comprised of two or more **Power Park Modules** or **OTSUA** which **The Company** reasonably considers to be identical.

If:

- (a) the tests performed pursuant to OC5.A.3.1.1(iv) do not replicate the results contained in the **Manufacturer's Data & Performance Report** or
- (b) the tests performed pursuant to OC5.A.3.1.1(v) in respect of subsequent **Power Park Modules** or **OTSUA** do not replicate the full tests for the first **Power Park Module** or **OTSUA**, or
- (c) any of the tests performed pursuant to OC5.A.3.1.1(iv) or OC5.A.3.1.1(v) do not fully demonstrate compliance with the relevant aspects of the **Grid Code**, **Ancillary Services Agreement** and / or **Bilateral Agreement**,

then notwithstanding the provisions above, the full testing requirements set out in this Appendix will be applied.

OC5.A.3.1.2 The **Generator** is responsible for carrying out the tests set out in and in accordance with this Appendix and the **Generator** retains the responsibility for the safety of personnel and plant during the test. **The Company** will witness all of the tests outlined or agreed in relation to this Appendix unless **The Company** decides and notifies the **Generator** owner otherwise. Reactive Capability tests may be witnessed by **The Company** remotely from the **The Company** control centre. For all on site during **The Company** witnessed tests, the **Generator** must ensure suitable representatives from the **Generator** and / or **Power Park Module** manufacturer (if appropriate) and/or **OTSUA** manufacturer (if appropriate) are available on site for the entire testing period. In all cases and in addition to any recording of signals conducted by **The Company**, the **Generator** shall record all relevant test signals as outlined in OC5.A.1.

OC5.A.3.1.3 In addition to the dynamic signals supplied in OC5.A.1, the **Generator** shall inform **The Company** of the following information prior to the commencement of the tests and any changes to the following, if any values change during the tests:

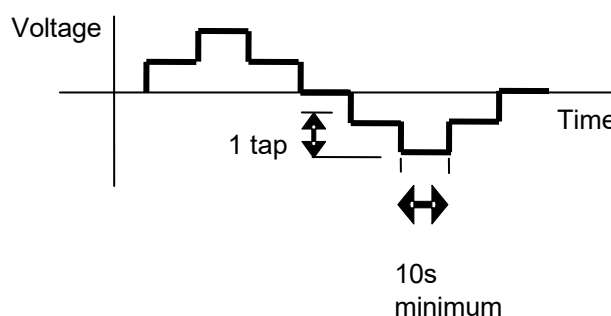
- (i) All relevant transformer tap numbers; and
- (ii) Number of **Power Park Units** in operation

- OC5.A.3.1.4 The **Generator** shall submit a detailed schedule of tests to **The Company** in accordance with CP.6.3.1, and this Appendix.
- OC5.A.3.1.5 Prior to the testing of a **Power Park Module** or **OTSUA**, the **Generator** shall complete the **Integral Equipment Tests** procedure in accordance with OC.7.5.
- OC5.A.3.1.6 Partial **Power Park Module** or **OTSUA** testing as defined in OC5.A.3.2 and OC5.A.3.3 is to be completed at the appropriate stage in accordance with CP.6.
- OC5.A.3.1.7 Full **Power Park Module** or **OTSUA** testing as required by CP.7.2 is to be completed as defined in OC5.A.3.4 through to OC5.A.3.7.
- OC5.A.3.1.8 Where **OTSDUW Arrangements** apply and prior to the **OTSUA Transfer Time**, any relevant **OTSDUW Plant and Apparatus** shall be considered within the scope of testing described in this Appendix. Performance shall be assessed against the relevant Grid Code requirements for **OTSDUW Plant and Apparatus** at the **Interface Point** and other **Generator Plant and Apparatus** at the **Offshore Grid Entry Point**. This Appendix should be read accordingly.
- OC5.A.3.2 Pre 20% (or <50MW) **Synchronised Power Park Module** basic Voltage Control Tests
- OC5.A.3.2.1 Before 20% of the **Power Park Module** (or 50MW if less) has commissioned, either voltage control test OC5.A.3.5.6(i) or (ii) must be completed in accordance with CP.6.
- OC5.A.3.2.2 In the case of an **Offshore Power Park Module** which provides all or a portion of the **Reactive Power** capability as described in CC.6.3.2(e)(iii) and / or voltage control requirements as described in CC.6.3.8(b)(ii) to enable an **Offshore Transmission Licensee** to meet the requirements of **STC** Section K, the **Generator** is required to cooperate with the **Offshore Transmission Licensee** to conduct the 20% voltage control test. The results in relation to the **Offshore Power Park Module** will be assessed against the requirements in the **Bilateral Agreement**. In the case of **OTSUA** prior to the **OTSUA Transfer Time**, the **Generator** shall conduct the testing by reference to the entire control system responding to changes at the **Interface Point**.
- OC5.A.3.3 Pre 70% **Power Park Module** Tests
- OC5.A.3.3.1 For **Power Park Modules** with **Registered Capacity** ≥100MW only. Before 70% but with at least 50% of the **Power Park Module** commissioned, the following **Limited Frequency Sensitive** tests as detailed in OC5.A.3.6.2 must be completed.
- (a) BC3
- (b) BC4
- OC5.A.3.4 Reactive Capability Test
- OC5.A.3.4.1 This section details the procedure for demonstrating the reactive capability of an **Onshore Power Park Module** or an **Offshore Power Park Module** or **OTSUA** which provides all or a portion of the **Reactive Power** capability as described in CC.6.3.2(e)(iii) (for the avoidance of doubt, an **Offshore Power Park Module** which does not provide part of the **Offshore Transmission Licensee Reactive Power** capability as described in CC6.3.2(e)(i) and CC6.3.2(e)(ii) should complete the reactive power transfer / voltage control tests as per section OC5.A.3.8). These tests should be scheduled at a time where there are at least 95% of the **Power Park Units** within the **Power Park Module** in service. There should be sufficient MW resource forecasted in order to generate at least 85% of **Registered Capacity** of the **Power Park Module**.
- OC5.A.3.4.2 The tests shall be performed by modifying the voltage set-point of the voltage control scheme of the **Power Park Module** or **OTSUA** by the amount necessary to demonstrate the required reactive range. This is to be conducted for the operating points and durations specified in OC5.A.3.4.5.

- OC5.A.3.4.3 **Embedded Generators** should liaise with the relevant **Network Operator** to ensure the following tests will not have an adverse impact upon the **Network Operator's System** as per OC.7.5. In situations where the tests have an adverse impact upon the **Network Operator's System**, **The Company** will only require demonstration within the acceptable limits of the **Network Operator**. For the avoidance of doubt, these tests do not negate the requirement to produce a complete **Power Park Module** performance chart as specified in OC2.3.2.1
- OC5.A.3.4.4 In the case where the **Reactive Power** metering point is not at the same location as the **Reactive Power** capability requirement, then an equivalent **Reactive Power** capability for the metering point shall be agreed between the **Generator** and **The Company**.
- OC5.A.3.4.5 The following tests shall be completed:
- (i) Operation in excess of 50% **Rated MW** and maximum continuous lagging **Reactive Power** for 60 minutes. For the avoidance of doubt this test must start with **Active Power** output in excess of 85% of **Registered Capacity** of the **Power Park Module** as OC5.A.3.4.1 and must not fall below 50% of **Registered Capacity** of the **Power Park Module** during the 60 minutes.
 - (ii) Operation in excess of 50% **Rated MW** and maximum continuous leading **Reactive Power** for 60 minutes. For the avoidance of doubt this test must start with **Active Power** output in excess of 85% of **Registered Capacity** of the **Power Park Module** as OC5.A.3.4.1 and must not fall below 50% of **Registered Capacity** of the **Power Park Module** during the 60 minutes.
 - (iii) Operation at 50% **Rated MW** and maximum continuous leading **Reactive Power** for 5 minutes.
 - (iv) Operation at 20% **Rated MW** and maximum continuous leading **Reactive Power** for 5 minutes.
 - (v) Operation at 20% **Rated MW** and maximum continuous lagging **Reactive Power** for 5 minutes.
 - (vi) Operation at less than 20% **Rated MW** and unity **Power Factor** for 5 minutes. This test only applies to systems which do not offer voltage control below 20% of **Rated MW**.
 - (vii) Operation at 0% **Rated MW** and maximum continuous leading **Reactive Power** for 5 minutes. This test only applies to systems which offer voltage control below 20% and hence establishes actual capability rather than required capability.
 - (viii) Operation at 0% **Rated MW** and maximum continuous lagging **Reactive Power** for 5 minutes. This test only applies to systems which offer voltage control below 20% and hence establishes actual capability rather than required capability.
- OC5.A.3.4.6 Within this **OC5** lagging **Reactive Power** is the export of **Reactive Power** from the **Power Park Module** to the **Total System** and leading **Reactive Power** is the import of **Reactive Power** from the **Total System** to the **Power Park Module** or **OTSUA**.
- OC5.A.3.5 Voltage Control Tests
- OC5.A.3.5.1 This section details the procedure for conducting voltage control tests on **Onshore Power Park Modules** or **OTSUA** or an **Offshore Power Park Module** which provides all or a portion of the voltage control capability as described in CC.6.3.8(b)(ii) (for the avoidance of doubt, **Offshore Power Park Modules** which do not provide part of the **Offshore Transmission Licensee** voltage control capability as described in CC6.3.8(b)(i) should complete the reactive power transfer / voltage control tests as per section OC5.A.3.8). These tests should be scheduled at a time when there are at least 95% of the **Power Park Units** within the **Power Park Module** in service. There should be sufficient MW resource forecasted in order to generate at least 65% of **Registered Capacity** of the **Onshore Power Park Module**. An **Embedded Generator** should also liaise with the relevant **Network Operator** to ensure all requirements covered in this section will not have a detrimental effect on the **Network Operator's System**.

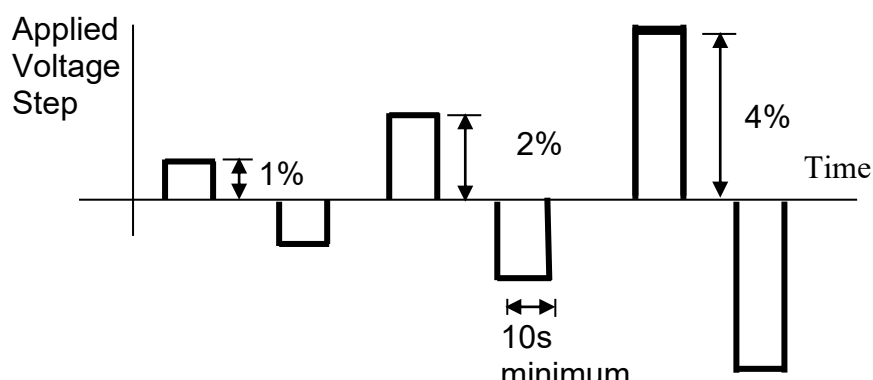
- OC5.A.3.5.2 The voltage control system shall be perturbed with a series of step injections to the **Power Park Module** voltage reference, and where possible, multiple up-stream transformer taps. In the case of an **Offshore Power Park Module** providing part of the **Offshore Transmission Licensee** voltage control capability, this may require a series of step injections to the voltage reference of the **Offshore Transmission Licensee** control system.
- OC5.A.3.5.3 For steps initiated using network tap changers, the **Generator** will need to coordinate with **The Company** or the relevant **Network Operator** as appropriate. The time between transformer taps shall be at least 10 seconds as per OC5.A.3.5 Figure 1.
- OC5.A.3.5.4 For step injections into the **Power Park Module** or **OTSUA** voltage reference, steps of $\pm 1\%$, $\pm 2\%$ and $\pm 4\%$ shall be applied to the voltage control system reference summing junction. The injection shall be maintained for a minimum of 10 seconds as per OC5.A.3.5 Figure 2.
- OC5.A.3.5.5 Where the voltage control system comprises of discretely switched **Plant** and **Apparatus** (eg. mechanically switched shunt reactors or capacitors) additional tests will be required to demonstrate that the overall performance of the voltage control system when switching these devices as part of the response is in accordance with Grid Code and **Bilateral Agreement** requirements.
- OC5.A.3.5.6 Tests to be completed:

(i)



OC5.A.3.5 Figure 1 – Transformer tap sequence for voltage control tests

(ii)



OC5.A.3.5 Figure 2 – Step injection sequence for voltage control tests

- OC5.A.3.5.7 In the case of **OTSUA** where the **Bilateral Agreement** specifies additional damping facilities, additional testing to demonstrate these damping facilities may be required.
- OC.A.3.5.8 In the case of **Power Park Modules** that do not provide voltage control down to zero **Active Power** a test to demonstrate the smooth transition from voltage control mode to unity **Power Factor** shall be carried out. The **Power Park Module** voltage setpoint should be altered to produce lagging **Reactive Power** or absorbing leading **Reactive Power** at a low **Active Power** level where voltage control is provided. The **Power Park Module Active Power** should

then be reduced to zero **Active Power** as a ramp over a short period (60 seconds is suggested).

OC5.A.3.6 Frequency Response Tests

- OC5.A.3.6.1 This section describes the procedure for performing frequency response testing on a **Power Park Module**. These tests should be scheduled at a time where there are at least 95% of the **Power Park Units** within the **Power Park Module** in service. There should be sufficient MW resource forecasted in order to generate at least 65% of **Registered Capacity** of the **Power Park Module**.
- OC5.A.3.6.2 The frequency controller shall be in **Frequency Sensitive Mode** or **Limited Frequency Sensitive Mode** as appropriate for each test. Simulated frequency deviation signals shall be injected into the frequency controller reference/feedback summing junction. If the injected frequency signal replaces rather than sums with the real **System Frequency** signal then the additional tests outlined in OC5.A.3.6.6 shall be performed with the **Power Park Module** or **Power Park Unit** in normal **Frequency Sensitive Mode** monitoring actual **System Frequency**, over a period of at least 10 minutes. The aim of this additional test is to verify that the control system correctly measures the real **System Frequency** for normal variations over a period of time.
- OC5.A.3.6.3 In addition to the frequency response requirements, it is necessary to demonstrate the **Power Park Module** ability to deliver a requested steady state power output which is not impacted by power source variation as per CC.6.3.9 or ECC.6.3.9. This test shall be conducted in **Limited Frequency Sensitive Mode** at a part-loaded output for a period of 10 minutes as per OC5.A.3.6.6.

Preliminary Frequency Response Testing

- OC5.A.3.6.4 Prior to conducting the full set of tests as per OC5.A.3.6.6, **Generators** are required to conduct the preliminary set of tests below to confirm the frequency injection method is correct and the plant control performance is within expectation. The test numbers refer to Figure 1 below. The test should be conducted when sufficient MW resource is forecasted in order to generate at least 65% of **Registered Capacity** of the **Power Park Module**. The following frequency injections shall be applied when operating at module load point 4.

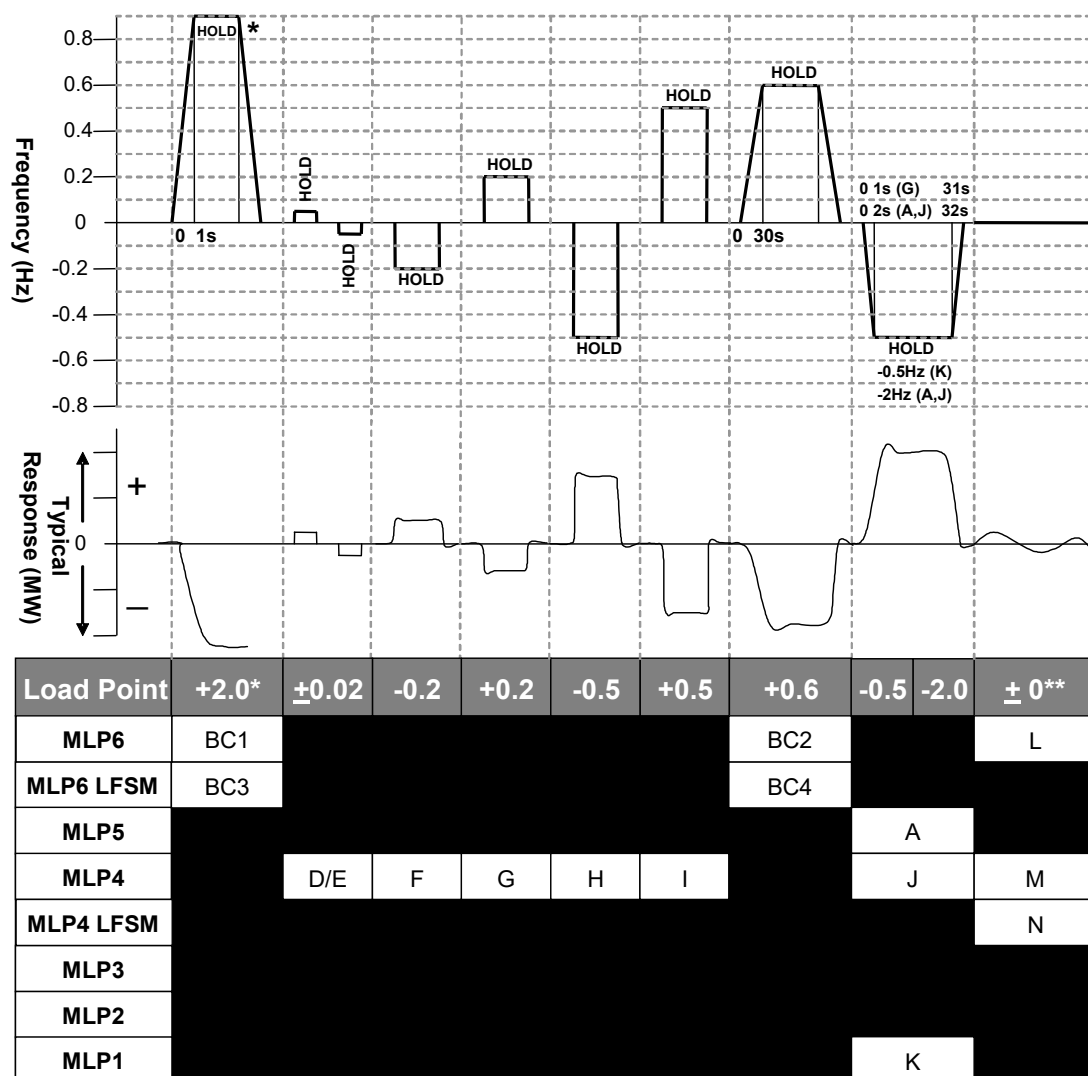
Test No (Figure 1)	Frequency Injection	Notes
8	- Inject - 0.5Hz frequency fall over 10 sec - Hold until conditions stabilise - Remove the injected signal	
14	- Inject +0.5Hz frequency rise over 10 sec - Hold until conditions stabilise - Remove the injected signal	
13	- Inject -0.5Hz frequency fall over 10 sec - Hold for a further 20 sec - At 30 sec from the start of the test, Inject a +0.3Hz frequency rise over 30 sec. - Hold until conditions stabilise - Remove the injected signal	

- OC5.A.3.6.5 The recorded results (e.g. Finj, MW and control signals) should be sampled at a minimum rate of 1 Hz to allow **The Company** to assess the plant performance from the initial transients (seconds) to the final steady state conditions (5-15 minutes depending on the plant design). This is not witnessed by **The Company**. The **Generator** shall supply the recordings including data to **The Company** in an electronic spreadsheet format. Results shall be legible, identifiable by labelling, and shall have appropriate scaling.

Full Frequency Response Testing Schedule Witnessed by The Company

- OC5.A.3.6.6 The tests are to be conducted at a number of different Module Load Points (MLP). In the case of a **Power Park Module** the module load points are conducted as shown below unless agreed otherwise by **The Company**.

Module Load Point 6 (Maximum Export Limit)	100% MEL
Module Load Point 5	90% MEL
Module Load Point 4 (Mid point of Operating Range)	80% MEL
Module Load Point 3	DMOL + 0.6 x (80% MEL – DMOL)
Module Load Point 2 (Minimum Generation)	DMOL + 0.3 x (80% MEL – DMOL)
Module Load Point 1 (Designed Minimum Operating	DMOL



OC5.A.3.6. Figure 2 – System islanding and step response tests

* This will generally be +2.0Hz unless an injection of this size causes a reduction in plant output that takes the operating point below **Designed Minimum Operating Level** in which case an appropriate injection should be calculated in accordance with the following:

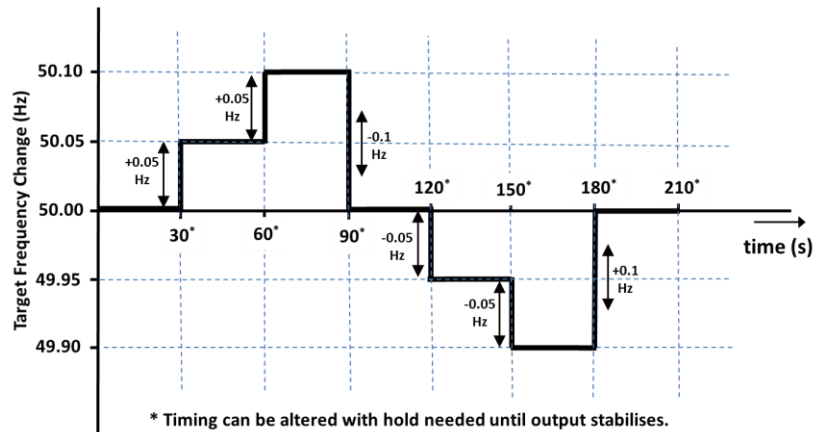
For example 0.9Hz is needed to take an initial output 65% to a final output of 20%. If the initial output was not 65% and the **Designed Minimum Operating Level** is not 20% then the injected step should be adjusted accordingly as shown in the example given below

Initial Output	65%
Designed Minimum Operating Level	20%
Frequency Controller Droop	4%
Frequency to be injected =	$(0.65 - 0.20) \times 0.04 \times 50 = 0.9\text{Hz}$

** Tests L and M in Figure 2 shall be conducted if in this range of tests the **System Frequency** feedback signal is replaced by the injection signal rather than the injection signal being added to the **System Frequency** signal. The tests will consist of monitoring the **Power Park Module** in **Frequency Sensitive Mode** during normal **System Frequency** variations without applying any injection. Test N in Figure 2 shall be conducted in all cases. All three tests should be conducted for a period of at least 10 minutes.

OC5.A.3.6.9 The **Target Frequency** adjustment facility should be demonstrated from the normal control point within the range of 49.9Hz to 50.1Hz by step changes to the **Target Frequency** setpoint

as indicated in OC5.A.3.6 Figure 3.



OC5.A.3.6. Figure 3 – Target Frequency setting changes

OC5.A.3.7 Fault Ride Through Testing

OC5.A.3.7.1 This section describes the procedure for conducting fault ride through tests on a single **Power Park Unit**.

OC5.A.3.7.2 The test circuit will utilise the full **Power Park Unit** (e.g. in the case of a wind turbine it would include the full wind turbine nacelle structure, all inverters and converters along with step up transformer to medium voltage, all control systems including pitch control emulation) and shall be conducted with sufficient power input resource available to produce at least 95% of the **Registered Capacity** of the **Power Park Unit**. The test will comprise of a number of controlled short circuits applied to a test network to which the **Power Park Unit** is connected, typically comprising of the **Power Park Unit** transformer and a test impedance or other decoupling equipment to shield the connected network from voltage dips at the **Power Park Unit** terminals.

OC5.A.3.7.3 In each case, the tests should demonstrate the minimum voltage at the **Power Park Unit** terminals or **High Voltage** side of the **Power Park Unit** transformer which the **Power Park Unit** can withstand for the length of time specified in OC5.A.3.7.5. Any test results provided to **The Company** should contain sufficient data pre and post fault in order to determine steady state values of all signals, and the power recovery timescales.

OC5.A.3.7.4 In addition to the signals outlined in OC5.A.1.2. the following signals from either the **Power Park Unit** terminals or **High Voltage** side of the **Power Park Unit** transformer should be provided for this test only:

- (i) Phase voltages
- (ii) Positive phase sequence and negative phase sequence voltages
- (iii) Phase currents
- (iv) Positive phase sequence and negative phase sequence currents
- (v) Estimate of **Power Park Unit** negative phase sequence impedance
- (vi) MW – **Active Power** at the generating unit.
- (vii) MVar – **Reactive Power** at the generating unit.
- (viii) Mechanical Rotor Speed
- (ix) Real / reactive, current / power reference as appropriate
- (x) Fault ride through protection operation (e.g. a crowbar in the case of a doubly fed induction generator)
- (xi) Any other signals relevant to the control action of the fault ride through control deemed applicable for model validation.

At a suitable frequency rate for fault ride through tests as agreed with **The Company**.

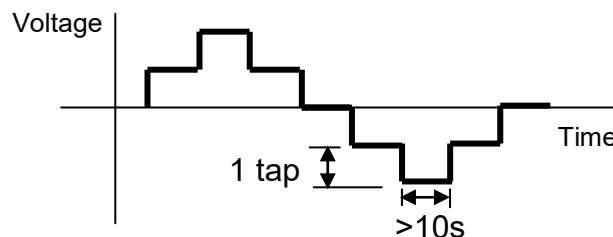
OC5.A.3.7.5 The tests should be conducted for the times and fault types indicated in OC5.A.3.7 Table 1.

3 Phase	Phase to Phase	2 Phase to Earth	1 Phase to Earth	Grid Code Ref
0.14s	0.14s	0.14s	0.14s	CC.6.3.15a
0.384s				CC.6.3.15b
0.710s				
2.5s				
180.0s				

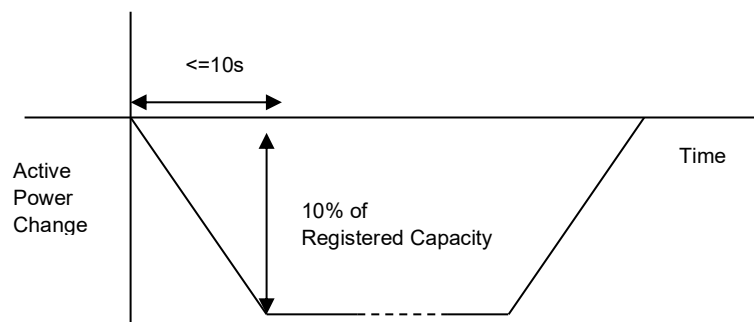
OC5.A.3.7 Table 1 – Types of fault for fault ride through **testing**

OC5.A.3.8 Reactive Power Transfer / Voltage Control Tests for Offshore Power Park Modules

- OC5.A.3.8.1 In the case of an **Offshore Power Park Module** which provides all or a portion of the **Reactive Power** capability as described in CC.6.3.2(e)(iii) and / or voltage control requirements as described in CC.6.3.8(b)(ii) to enable an **Offshore Transmission Licensee** to meet the requirements of **STC** Section K, the testing, will comprise of the entire control system responding to changes at the onshore **Interface Point**. Therefore the tests in this section OC5.A.3.8 will not apply. The **Generator** shall cooperate with the relevant **Offshore Transmission Licensee** to facilitate these tests as required by **The Company**. The testing may be combined with testing of the corresponding **Offshore Transmission Licensee** requirements under the **STC**. The results in relation to the **Offshore Power Park Module** will be assessed against the requirements in the **Bilateral Agreement**.
- OC5.A.3.8.2 In the case of an **Offshore Power Park Module** which does not provide part of the **Offshore Transmission Licensee Reactive Power** capability the following procedure for conducting reactive power transfer control tests on **Offshore Power Park Modules** and / or voltage control system as per CC6.3.2(e)(i) and CC6.3.2(e)(ii) apply. These tests should be carried out prior to 20% of the **Power Park Units** within the **Offshore Power Park Module** being synchronised, and again when at least 95% of the **Power Park Units** within the **Offshore Power Park Module** in service. There should be sufficient power resource forecast to generate at least 85% of the **Registered Capacity** of the **Offshore Power Park Module**.
- OC5.A.3.8.3 The **Reactive Power** control system shall be perturbed by a series of system voltage changes and changes to the **Active Power** output of the **Offshore Power Park Module**.
- OC5.A.3.8.4 **System** voltage changes should be created by a series of multiple upstream transformer taps. The **Generator** should coordinate with **The Company** or the relevant **Network Operator** in order to conduct the required tests. The time between transformer taps should be at least 10 seconds as per OC5.A.3.8 Figure 1.
- OC5.A.3.8.5 The **Active Power** output of the **Offshore Power Park Module** should be varied by applying a sufficiently large step to the frequency controller reference/feedback summing junction to cause a 10% change in output of the **Registered Capacity** of the **Offshore Power Park Module** in a time not exceeding 10 seconds. This test does not need to be conducted provided that the frequency response tests as outlined in OC5.A.3.6 are completed.
- OC5.A.3.8.6 The following diagrams illustrate the tests to be completed:



OC5.A.3.8 Figure 1 – Transformer tap sequence for reactive transfer tests



OC5.A.3.8 Figure 2 – Active Power ramp for reactive transfer tests

APPENDIX 4 - COMPLIANCE TESTING FOR DC CONVERTERS AT A DC CONVERTER STATION

OC5.A.4.1 Scope

OC5.A.4.1.1 This Appendix outlines the general testing requirements for **DC Converter Station** owners to demonstrate compliance with the relevant aspects of the **Grid Code**, **Ancillary Services Agreement** and **Bilateral Agreement** and apply only to **DC Converter Station** owners. The testing requirements applicable to **HVDC System Owners** are specified in ECP.A.7. The tests specified in this Appendix will normally be sufficient to demonstrate compliance however **The Company** may:

- (i) agree an alternative set of tests provided **The Company** deem the alternative set of tests sufficient to demonstrate compliance with the **Grid Code**, **Ancillary Services Agreement** and **Bilateral Agreement**; and/or
- (ii) require additional or alternative tests if information supplied to **The Company** during the compliance process suggests that the tests in this Appendix will not fully demonstrate compliance with the relevant section of the **Grid Code**, **Ancillary Services Agreement** or **Bilateral Agreement**; and/or
- (iii) require additional tests if control functions to improve damping of power system oscillations and/or subsynchronous resonance torsional oscillations required by the **Bilateral Agreement** or included in the control scheme and active; and/or
- (iv) agree a reduced set of tests for subsequent **DC Converters** following successful completion of the first **DC Converter** tests in the case of a **Power Station** comprised of two or more **DC Converters** which **The Company** reasonably considers to be identical.

If:

- (a) the tests performed pursuant to OC5.A.4.1.1(iv) in respect of subsequent **DC Converters** do not replicate the full tests for the first **DC Converter**, or
- (b) any of the tests performed pursuant to OC5.A.4.1.1(iv) do not fully demonstrate compliance with the relevant aspects of the **Grid Code**, **Ancillary Services Agreement** and / or **Bilateral Agreement**,

then notwithstanding the provisions above, the full testing requirements set out in this Appendix will be applied.

OC5.A.4.1.2 The **DC Converter Station** owner is responsible for carrying out the tests set out in and in accordance with this Appendix and the **DC Converter Station** owner retains the responsibility for the safety of personnel and plant during the test. The **DC Converter Station** owner is responsible for ensuring that suitable arrangements are in place with the **Externally Interconnected System Operator** to facilitate testing. **The Company** will witness all of the tests outlined or agreed in relation to this Appendix unless **The Company** decides and notifies the **DC Converter Station** owner otherwise. Reactive Capability tests if required, may be witnessed by **The Company** remotely from the **The Company** control centre. For all on site **The Company** witnessed tests the **DC Converter Station** owner must ensure suitable representatives from the **DC Converter Station** owner and / or **DC Converter** manufacturer (if appropriate) are available on site for the entire testing period. In all cases and in addition to any recording of signals conducted by **The Company** the **DC Converter Station** owner shall record all relevant test signals as outlined in OC5.A.1.

OC5.A.4.1.3 In addition to the dynamic signals supplied in OC5.A.1 the **DC Converter Station** owner shall inform **The Company** of the following information prior to the commencement of the tests and any changes to the following, if any values change during the tests:

- (i) All relevant transformer tap numbers.

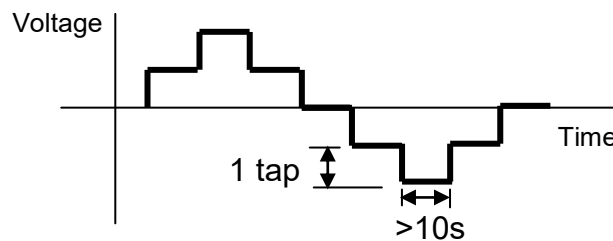
- OC5.A.4.1.4 The **DC Converter Station** owner shall submit a detailed schedule of tests to **The Company** in accordance with CP.6.3.1, and this Appendix.
- OC5.A.4.1.5 Prior to the testing of a **DC Converter** the **DC Converter Station** owner shall complete the **Integral Equipment Tests** procedure in accordance with OC.7.5
- OC5.A.4.1.6 Full **DC Converter** testing as required by CP.7.2 is to be completed as defined in OC5.A.4.2 through to OC5.A.4.5
- OC5.A.4.1.7 **The Company** may agree a reduction from the requirements set out in CP.A.7.2 to CP.A.7.5 for on-site testing where suitable factory acceptance testing on a representative installation with the same equipment and settings of the **HVDC Equipment** that can, in **The Company's** opinion, reasonably represent the performance of the installed **HVDC Equipment** at that site. This is also conditional on **The Company** and the **DC Converter Station** owner agreeing sufficient on site testing of the fully commissioned **DC Converter Station** to demonstrate that the factory acceptance tests are valid. If in the reasonable opinion of **The Company**, the on-site testing does not demonstrate the factory acceptance tests are valid then the full set of on-site tests should be carried out.
- OC5.A.4.2 Reactive Capability Test
- OC5.A.4.2.1 This section details the procedure for demonstrating the reactive capability of an **Onshore DC Converter**. These tests should be scheduled at a time where there are sufficient MW resource forecasted in order to import and export full **Registered Capacity** of the **DC Converter**.
- OC5.A.4.2.2 The tests shall be performed by modifying the voltage set-point of the voltage control scheme of the **DC Converter** by the amount necessary to demonstrate the required reactive range. This is to be conducted for the operating points and durations specified in OC5.A.4.2.5.
- OC5.A.4.2.3 **Embedded DC Converter Station** owner should liaise with the relevant **Network Operator** to ensure the following tests will not have an adverse impact upon the **Network Operator's System** as per OC.7.5. In situations where the tests have an adverse impact upon the **Network Operator's System**, **The Company** will only require demonstration within the acceptable limits of the **Network Operator**. For the avoidance of doubt, these tests do not negate the requirement to produce a complete **DC Converter** performance chart as specified in OC2.4.2.1.
- OC5.A.4.2.4 In the case where the **Reactive Power** metering point is not at the same location as the **Reactive Power** capability requirement, then an equivalent **Reactive Power** capability for the metering point shall be agreed between the **DC Converter Station** owner and **The Company**.
- OC5.A.4.2.5 The following tests shall be completed for both importing and exporting of **Active Power** for a **DC Converter** (excluding current source technology):
- (i) Operation at **Rated MW** and maximum continuous lagging **Reactive Power** for 60 minutes.
 - (ii) Operation at **Rated MW** and maximum continuous leading **Reactive Power** for 60 minutes.
 - (iii) Operation at 50% **Rated MW** and maximum continuous leading **Reactive Power** for 5 minutes.
 - (iv) Operation at 20% **Rated MW** and maximum continuous leading **Reactive Power** for 5 minutes.
 - (v) Operation at 20% **Rated MW** and maximum continuous lagging **Reactive Power** for 5 minutes.
 - (vi) Operation at less than 20% **Rated MW** and unity **Power Factor** for 5 minutes. This test only applies to systems which do not offer voltage control below 20% of **Rated MW**.
 - (vii) Operation at 0% **Rated MW** and maximum continuous leading **Reactive Power** for 5 minutes. This test only applies to systems which offer voltage control below 20% and hence establishes actual capability rather than required capability.

(viii) Operation at 0% **Rated MW** and maximum continuous lagging **Reactive Power** for 5 minutes. This test only applies to systems which offer voltage control below 20% and hence establishes actual capability rather than required capability.

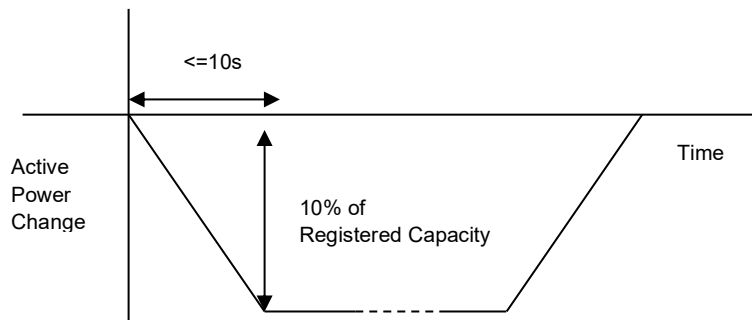
OC5.A.4.2.6 For the avoidance of doubt, lagging **Reactive Power** is the export of **Reactive Power** from the **DC Converter** to the **Total System** and leading **Reactive Power** is the import of **Reactive Power** from the **Total System** to the **DC Converter**.

OC5.A.4.3 Reactive Control Testing For DC Converters (Current Source Technology)

- OC5.A.4.3.1 The Reactive control testing for **DC Converters** employing current source technology shall be for both importing and exporting of **Active Power** and shall demonstrate that the **Reactive Power** transfer limits specified in the **Bilateral Agreement** are not exceeded. The **Reactive Power** control system shall be perturbed by a series of system voltage changes to the **Active Power** output of the **DC Converter** and changes of system voltage where possible. The **DC Converter Station** owner is responsible for ensuring that suitable arrangements are in place with the **Externally Interconnected System Operator** to facilitate the **Active Power** changes required by these tests
- OC5.A.4.3.2 The **Active Power** output of the **DC Converter** should be varied by applying a sufficiently large step to the frequency controller reference/feedback summing junction to cause at least a 10% change in output of the **Registered Capacity** of the **DC Converter** in a time not exceeding 10 seconds. This test does not need to be conducted provided that the frequency response tests as outlined in OC5.A.4.3 are completed.
- OC5.A.4.3.3 Where possible, **System** voltage changes should be created by a series of multiple upstream transformer taps. The **DC Converter station** owner should coordinate with **The Company** or the relevant **Network Operator** in order to conduct the required tests. The time between transformer taps should be at least 10 seconds as per OC5.A.4.3 Figure 1.
- OC5.A.4.3.4 The following diagrams illustrate the tests to be completed:



OC5.A.4.3 Figure 1 – Transformer tap sequence for reactive transfer tests

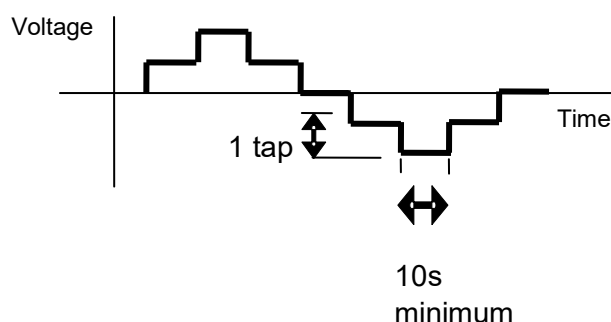


OC5.A.4.3 Figure 2 – Active Power ramp for reactive transfer tests

OC5.A.4.4 Voltage Control Tests

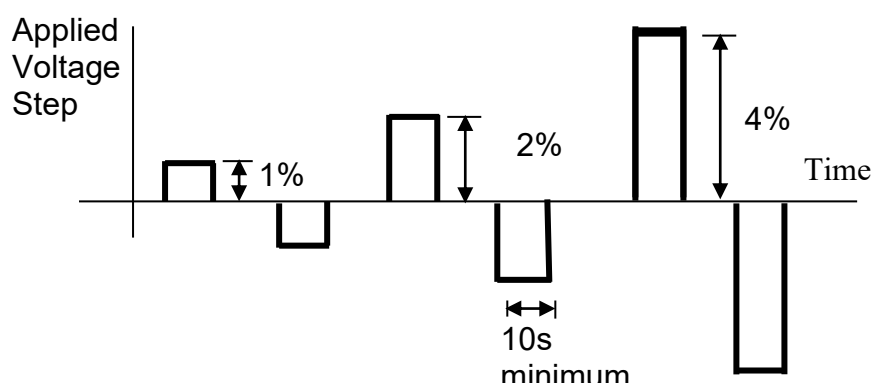
- OC5.A.4.4.1 This section details the procedure for conducting voltage control tests on **DC Converters** (excluding current source technology). These tests should be scheduled at a time where there is sufficient MW resource in order to import and export full **Registered Capacity** of the **DC Converter**. An **Embedded DC Converter Station** owner should also liaise with the relevant **Network Operator** to ensure all requirements covered in this section will not have a detrimental effect on the **Network Operator's System**.
- OC5.A.4.4.2 The voltage control system shall be perturbed with a series of step injections to the **DC Converter** voltage reference, and where possible, multiple up-stream transformer taps.

- OC5.A.4.4.3 For steps initiated using network tap changers, the **DC Converter Station** owner will need to coordinate with **The Company** or the relevant **Network Operator** as appropriate. The time between transformer taps shall be at least 10 seconds as per OC5.A.4.4 Figure 1.
- OC5.A.4.4.4 For step injections into the **DC Converter** voltage reference, steps of $\pm 1\%$, $\pm 2\%$ and $\pm 4\%$ shall be applied to the voltage control system reference summing junction. The injection shall be maintained for 10 seconds as per OC5.A.4.4 Figure 2.
- OC5.A.4.4.5 Where the voltage control system comprises of discretely switched **Plant** and **Apparatus**, additional tests will be required to demonstrate that its performance is in accordance with **Grid Code** and **Bilateral Agreement** requirements.
- OC5.A.4.4.6 Tests to be completed:
- (i)



OC5.A.4.4 Figure 1 – Transformer tap sequence for voltage control tests

(ii)



OC5.A.4.4 Figure 2 – Step injection sequence for voltage control tests

OC5.A.4.5 Frequency Response Tests

- OC5.A.4.5.1 This section describes the procedure for performing frequency response testing on a **DC Converter**. These tests should be scheduled at a time where there is sufficient MW resource in order to import and export full **Registered Capacity** of the **DC Converter**. The **DC Converter Station** owner is responsible for ensuring that suitable arrangements are in place with the **Externally Interconnected System Operator** to facilitate the **Active Power** changes required by these tests

- OC5.A.4.5.2 The frequency controller shall be in **Frequency Sensitive Mode** or **Limited Frequency Sensitive Mode** as appropriate for each test. Simulated frequency deviation signals shall be injected into the frequency controller reference/feedback summing junction. If the injected frequency signal replaces rather than sums with the real **System Frequency** signal then the additional tests outlined in OC5.A.4.5.6 shall be performed with the **DC Converter** in normal **Frequency Sensitive Mode** monitoring actual system frequency, over a period of at least 10 minutes. The aim of this additional test is to verify that the control system correctly measures the real **System Frequency** for normal variations over a period of time.
- OC5.A.4.5.3 In addition to the frequency response requirements it is necessary to demonstrate the **DC Converter** ability to deliver a requested steady state power output which is not impacted by power source variation as per CC.6.3.9. This test shall be conducted in **Limited Frequency Sensitive Mode** at a part-loaded output for a period of 10 minutes as per OC5.A.4.5.6.

Preliminary Frequency Response Testing

- OC5.A.4.5.4 Prior to conducting the full set of tests as per OC5.A.4.5.6, **DC Converter Station** owners are required to conduct a preliminary set of tests below to confirm the frequency injection method is correct and the plant control performance is within expectation. The test numbers refer to Figure 1 below. These tests should be scheduled at a time where there is sufficient MW resource in order to export full **Registered Capacity** from the **DC Converter**. The following frequency injections shall be applied when operating at module load point 4.

Test No (Figure 1)	Frequency Injection	Notes
8	- Inject - 0.5Hz frequency fall over 10 sec - Hold until conditions stabilise - Remove the injected signal	
14	- Inject +0.5Hz frequency rise over 10 sec - Hold until conditions stabilise - Remove the injected signal	
13	- Inject -0.5Hz frequency fall over 10 sec - Hold for a further 20 sec - At 30 sec from the start of the test, Inject a +0.3Hz frequency rise over 30 sec. - Hold until conditions stabilise - Remove the injected signal	

- OC5.A.4.5.5 The recorded results (e.g. Finj, MW and control signals) should be sampled at a minimum rate of 1 Hz to allow **The Company** to assess the plant performance from the initial transients (seconds) to the final steady state conditions (5-15 minutes depending on the plant design). This is not witnessed by **The Company**. The **DC Converter Station** owner shall supply the recordings including data to **The Company** in an electronic spreadsheet format. Results shall be legible, identifiable by labelling, and shall have appropriate scaling.

Full Frequency Response Testing Schedule Witnessed by **The Company**

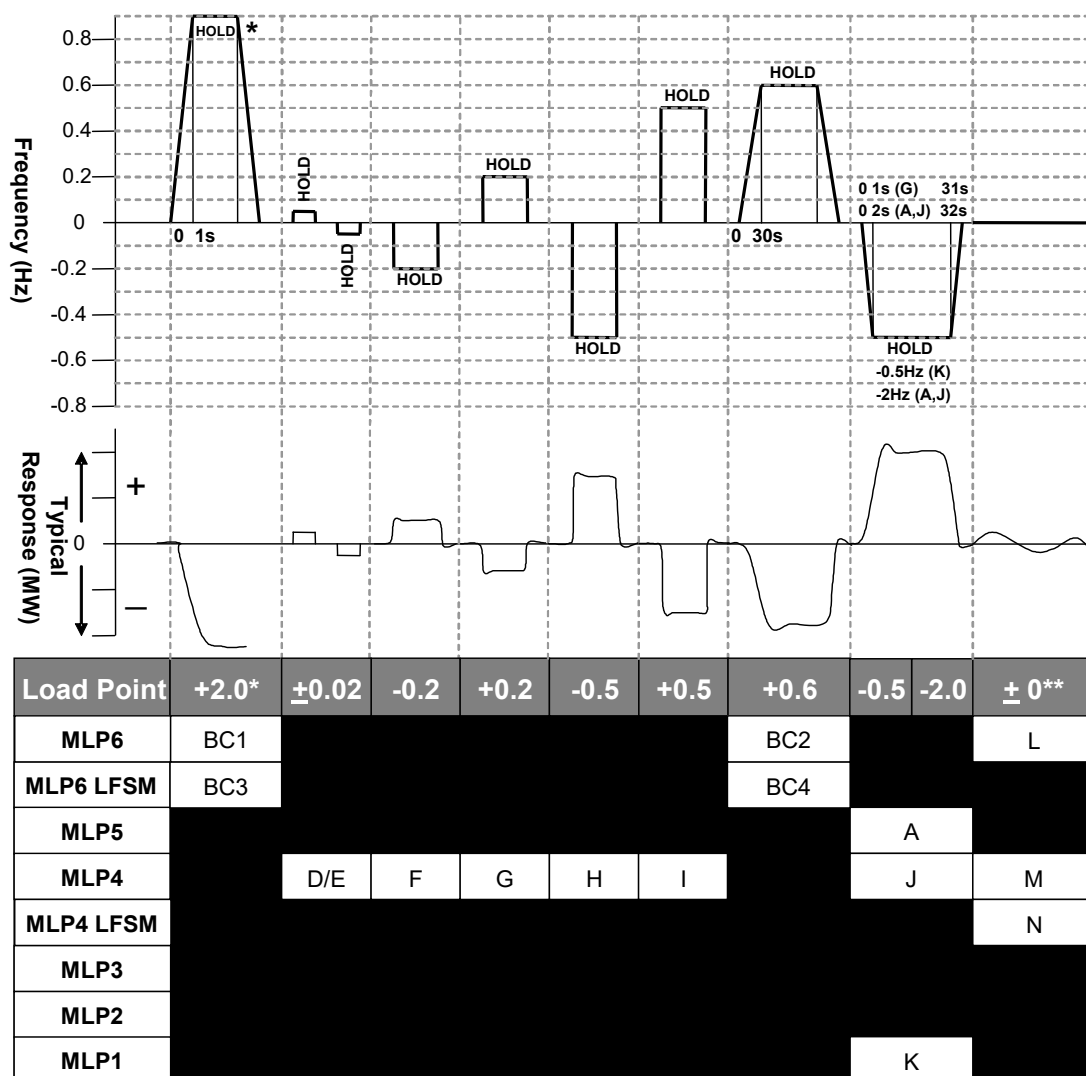
- OC5.A.4.5.6 The tests are to be conducted at a number of different Module Load Points (MLP). In the case of a **DC Converter** the module load points are conducted as shown below unless agreed otherwise by **The Company**.

Module Load Point 6 (Maximum Export Limit)	100% MEL
Module Load Point 5	90% MEL
Module Load Point 4	80% MEL
Module Load Point 3	DMOL + 0.6 x (80% MEL – DMOL)
Module Load Point 2 (Minimum Generation)	DMOL + 0.3 x (80% MEL – DMOL)
Module Load Point 1 (Designed Minimum Operating Level)	DMOL

(i) **Frequency** response volume tests as per OC5.A.4.5. Figure 1. These tests consist of frequency profile and ramp tests.

OC5.A.4.5.8 There should be sufficient time allowed between tests for control systems to reach steady state (depending on available power resource). Where the diagram states 'HOLD' the current injection should be maintained until the **Active Power** (MW) output of the **DC Converter** has stabilised or 90 seconds whichever is the longer. All frequency response tests should be removed over the same timescale for which they were applied. **The Company** may require repeat tests should the response volume be affected by the available power, or if tests give unexpected results. When witnessed by **The Company** each test should be carried out as a separate injection, when not witnessed by **The Company** there must be sufficient time allowed between tests for the **Active Power** (MW) output of the **HVDC Equipment** to have stabilised or 90 seconds, whichever is the longer.





OC5.A.4.5. Figure 2 – System islanding and step response tests

* This will generally be +2.0Hz unless an injection of this size causes a reduction in plant output that takes the operating point below the **Designed Minimum Operating Level** in which case an appropriate injection should be calculated in accordance with the following:

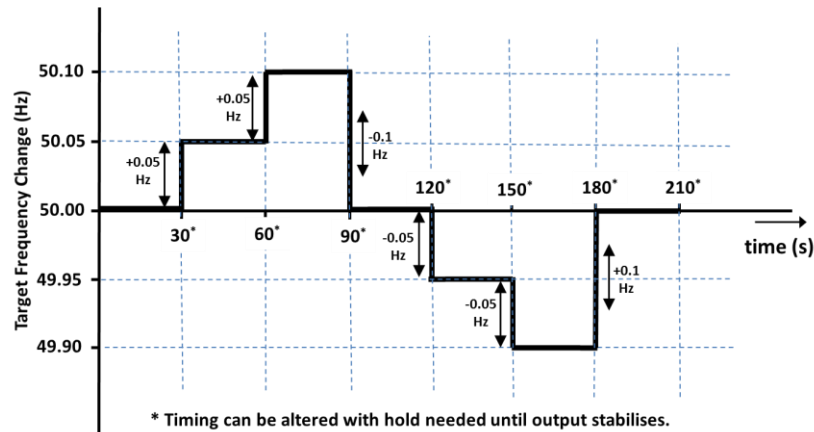
For example 0.9Hz is needed to take an initial output of 65% to a final output of 20%. If the initial output was not 65% and the **Designed Minimum Operating Level** is not 20% then the injected step should be adjusted accordingly as shown in the example given below

Initial Output	65%
Designed Minimum Operating Level	20%
Frequency Controller Droop	4%
Frequency to be injected =	$(0.65 - 0.20) \times 0.04 \times 50 = 0.9\text{Hz}$

** Tests L and M in Figure 2 shall be conducted if in this range of tests the **System Frequency** feedback signal is replaced by the injection signal rather than the injection signal being added to the **System Frequency** signal. The tests will consist of monitoring the **DC Converter** in **Frequency Sensitive Mode** during normal **System Frequency** variations without applying any injection. Test N in Figure 2 shall be conducted in all cases. All three tests should be conducted for a period of at least 10 minutes.

OC5.A.4.6.9 The **Target Frequency** adjustment facility should be demonstrated from the normal **Control Point** within the range of 49.9Hz to 50.1Hz by step changes to the **Target Frequency** setpoint

as indicated in OC5.A.4.6 Figure 3.



OC5.A.4.6. Figure 3 – Target Frequency setting changes

< END OF OPERATING CODE NO. 5 >

OPERATING CODE NO. 6
(OC6)

DEMAND CONTROL

CONTENTS

(This contents page does not form part of the Grid Code)

<u>Paragraph No/Title</u>	<u>Page Number</u>
OC6.1 INTRODUCTION.....	2
OC6.2 OBJECTIVE	3
OC6.3 SCOPE.....	3
OC6.4 PROCEDURE FOR THE NOTIFICATION OF DEMAND CONTROL INITIATED BY NETWORK OPERATORS	4
OC6.5 PROCEDURE FOR THE IMPLEMENTATION OF DEMAND CONTROL ON THE INSTRUCTIONS OF THE COMPANY	5
OC6.6 AUTOMATIC LOW FREQUENCY DEMAND DISCONNECTION.....	7
OC6.7 EMERGENCY MANUAL DISCONNECTION	9
OC6.8 OPERATION OF THE BALANCING MECHANISM DURING DEMAND CONTROL.....	10
APPENDIX 1 - EMERGENCY MANUAL DEMAND REDUCTION/DISCONNECTION SUMMARY SHEET.....	11

OC6.1 INTRODUCTION

OC6.1.1 **Operating Code No.6 ("OC6")** is concerned with the provisions to be made by **Network Operators**, and in relation to **Non-Embedded Customers** by **The Company**, to permit the reduction of **Demand** in the event of insufficient **Active Power** generation being available to meet **Demand**, or in the event of breakdown or operating problems (such as in respect of **System Frequency**, **System** voltage levels or **System** thermal overloads) on any part of the **National Electricity Transmission System**.

OC6.1.2 **OC6** deals with the following:

- (a) **Customer** voltage reduction initiated by **Network Operators** (other than following the instruction of **The Company**);
- (b) **Customer Demand** reduction by **Disconnection** initiated by **Network Operators** (other than following the instruction of **The Company**);
- (c) **Demand** reduction instructed by **The Company**;
- (d) automatic low frequency **Demand Disconnection**; and
- (e) emergency manual **Demand Disconnection**.

The term "**Demand Control**" is used to describe any or all of these methods of achieving a **Demand** reduction.

OC6.1.3 The procedure set out in **OC6** includes a system of warnings to give advance notice of **Demand Control** that may be required by **The Company** under this **OC6**.

OC6.1.4 Data relating to **Demand Control** should include details relating to MW

OC6.1.5 The Electricity Supply Emergency Code as reviewed and published from time to time by the appropriate government department for energy emergencies provides that in certain circumstances consumers are given a certain degree of "protection" when rota disconnections are implemented pursuant to a direction under the Energy Act 1976. No such protection can be given in relation to **Demand Control** instructed by **The Company** under the **Grid Code**, except in relation to those **Demand Disconnection** stages referred to in OC6.5 and where it is technically feasible to provide such protection to pre-designated protected sites, although, even in these situations, protection cannot be guaranteed.

To invoke the Electricity Supply Emergency Code the Secretary of State will issue direction(s) to all **Network Operators** affected, exercising emergency powers under the Electricity Act 1989 or by virtue of an Order in Council under the Energy Act 1976. Following the issuance of such direction, **The Company** will act to coordinate the implementation of an agreed schedule of rota disconnections across all affected **Network Operators'** licence area(s) and to disseminate any information as necessary throughout the period of the emergency in accordance with the instructions **The Company** receives from the Secretary of State or those authorised on their behalf for this purpose.

The list of pre-designated protected sites is compiled and kept up to date by **Network Operators** in accordance with the terms set out in the Electricity Supply Emergency Code.

OC6.1.6 Connections between **Large Power Stations** and the **National Electricity Transmission System** and between such **Power Stations** and a **User System** will not, as far as possible, be disconnected by **The Company** pursuant to the provisions of **OC6** insofar as that would interrupt supplies

- (a) for the purposes of operation of the **Power Station** (including **Start-Up** and shutting down);
- (b) for the purposes of keeping the **Power Station** in a state such that it could be Started-up when it is off-**Load** for ordinary operational reasons; or
- (c) for the purposes of compliance with the requirements of a Nuclear Site Licence.

Demand Control pursuant to this **OC6** therefore applies subject to this exception.

OC6.2 OBJECTIVE

OC6.2.1 The overall objective of **OC6** is to require the provision of facilities to enable **The Company** to achieve reduction in **Demand** that will either avoid or relieve operating problems on the **National Electricity Transmission System**, in whole or in part, and thereby to enable **The Company** to instruct **Demand Control** in a manner that does not unduly discriminate against, or unduly prefer, any one or any group of **Suppliers** or **Network Operators** or **Non-Embedded Customers**. It is also to ensure that **The Company** is notified of any **Demand Control** utilised by **Users** other than following an instruction from **The Company**.

OC6.2.2 For certain **Grid Supply Points** in Scotland it is recognised that it may not be possible to meet the requirements in OC6.4.5(b), OC6.5.3(b) (in respect of **Demand Disconnection** only), OC6.5.6 (ii), OC6.6.2 (c) and OC6.7.2 (b). In these circumstances **The Company** and the relevant **Network Operator(s)** will agree equivalent requirements covering a number of **Grid Supply Points**. If **The Company** and the relevant **Network Operator** fail to agree equivalent requirements covering a number of **Grid Supply Points**, then the relevant **Network Operator** will apply the provisions of OC6.4.5(b), OC6.5.3(b) (in respect of **Demand Disconnection** only), OC6.5.6(ii), OC6.6.2(c) and OC6.7.2(b) as evenly as reasonably practicable over the relevant **Network Operator's** entire **System**.

OC6.3 SCOPE

OC6.3.1 **OC6** applies to **The Company** and to **Users** which in **OC6** means:

- (a) **Generators**; and
- (b) **Network Operators**.

It also applies to **The Company** in relation to **Non-Embedded Customers**.

OC6.3.2 Explanation

- OC6.3.2.1
- (a) Although OC6 does not apply to **Suppliers**, the implementation of **Demand Control** may affect their **Customers**.
 - (b) In all situations envisaged in **OC6**, **Demand Control** is exercisable:
 - (i) by reference to a **Network Operator's System**; or
 - (ii) by **The Company** in relation to **Non-Embedded Customers**.
 - (c) **Demand Control** in all situations relates to the physical organisation of the **Total System**, and not to any contractual arrangements that may exist.
- OC6.3.2.2
- (a) Accordingly, **Demand Control** will be exercisable with reference to, for example, five per cent (or such other figure as may be utilised under OC6.5) tranches of **Demand** by a **Network Operator**.
 - (b) For a **Supplier**, whose **Customers** may be spread throughout a number of **User Systems** (and the **National Electricity Transmission System**), to split its **Customers** into five per cent (or such other figure as may be utilised under OC6.5) tranches of **Demand** would not result in **Demand Control** being implemented effectively on the **Total System**.
 - (c) Where **Demand Control** is needed in a particular area, **The Company** would not know which **Supplier** to contact and (even if it were to) the resulting **Demand Control** implemented, because of the diversity of contracts, may well not produce the required result.
- OC6.3.2.3
- (a) **Suppliers** should note, however, that, although implementation of **Demand Control** in respect of their **Customers** is not exercisable by them, their **Customers** may be affected by **Demand Control**.

- (b) This will be implemented by **Network Operators** where the **Customers** are within **User Systems** directly connected to the **National Electricity Transmission System** and by **The Company** where they are **Non-Embedded Customers**.
- (c) The contractual arrangements relating to **Customers** being supplied by **Suppliers** will, accordingly, need to reflect this.
- (d) The existence of a commercial arrangement for the provision of **Customer Demand Management** or **Commercial Ancillary Services** does not relieve a **Network Operator** from the **Demand Control** provisions of OC6.5, OC6.6 and OC6.7, which may be exercised from time to time.

OC6.4 PROCEDURE FOR THE NOTIFICATION OF DEMAND CONTROL INITIATED BY NETWORK OPERATORS (OTHER THAN FOLLOWING THE INSTRUCTION OF THE COMPANY)

- OC6.4.1 Pursuant to the provisions of **OC1**, in respect of the time periods prior to 1100 hours each day, each **Network Operator** will notify **The Company** of all **Customer** voltage reductions and/or restorations and **Demand Disconnection** or reconnection, on a **Grid Supply Point** and half-hourly basis, which will or may, either alone or when aggregated with any other **Demand Control** planned by that **Network Operator**, result in a **Demand** change equal to or greater than the **Demand Control Notification Level** averaged over any half hour on any **Grid Supply Point**, which is planned to be instructed by the **Network Operator** other than following an instruction from **The Company** relating to **Demand** reduction.
- OC6.4.2 Under **OC6**, each **Network Operator** will notify **The Company** in writing by 1100 hours each day (or such other time specified by **The Company** from time to time) for the next day (except that it will be for the next 3 days on Fridays and 2 days on Saturdays and may be longer (as specified by **The Company** at least one week in advance) to cover holiday periods) of **Customer** voltage reduction or **Demand Disconnection** which will or may result in a **Demand** change equal to or greater than the **Demand Control Notification Level** averaged over any half hour on any **Grid Supply Point**, (or which when aggregated with any other **Demand Control** planned by that **Network Operator** is equal to or greater than the **Demand Control Notification Level**), planned to take place during the next **Operational Day**.
- OC6.4.3 When the **Customer** voltage reduction or **Demand Disconnection** which may result in a **Demand** change equal to or greater than the **Demand Control Notification Level** averaged over any half hour on any **Grid Supply Point** (or which when aggregated with any other **Demand Control** planned or implemented by that **Network Operator** is equal to or greater than the **Demand Control Notification Level**) is planned after 1100 hours, each **Network Operator** must notify **The Company** as soon as possible after the decision to implement has been made. If the **Customer** voltage reduction or **Demand Disconnection** is implemented immediately after the decision to implement is made, each **Network Operator** must notify **The Company** within five minutes of implementation.
- OC6.4.4 Where, after **The Company** has been notified, whether pursuant to **OC1**, OC6.4.2 or OC6.4.3, the planned **Customer** voltage reduction or **Demand Disconnection** is changed, the **Network Operator** will notify **The Company** as soon as possible of the new plans, or if the **Customer** voltage reduction or **Demand Disconnection** implemented is different to that notified, the **Network Operator** will notify **The Company** of what took place within five minutes of implementation.
- OC6.4.5 Any notification under OC6.4.2, OC6.4.3 or OC6.4.4 will contain the following information on a **Grid Supply Point** and half hourly basis:
- (a) the proposed (in the case of prior notification) and actual (in the case of subsequent notification) date, time and duration of implementation of the **Customer** voltage reduction or **Demand Disconnection**; and
 - (b) the proposed reduction in **Demand** by use of the **Customer** voltage reduction or **Demand Disconnection**.

- OC6.4.6 Pursuant to the provisions of OC1.5.6, each **Network Operator** will supply to **The Company** details of the amount of **Demand** reduction actually achieved by use of the **Customer** voltage reduction or **Demand Disconnection**.
- OC6.5 PROCEDURE FOR THE IMPLEMENTATION OF DEMAND CONTROL ON THE INSTRUCTIONS OF THE COMPANY
- OC6.5.1 A **National Electricity Transmission System Warning - High Risk of Demand Reduction** will, where possible, be issued by **The Company**, as more particularly set out in OC6.5.4, OC7.4.8 and BC1.5.4 when **The Company** anticipates that it will or may instruct a **Network Operator** to implement **Demand** reduction. It will, as provided in OC6.5.10 and OC7.4.8.2, also be issued to **Non-Embedded Customers**.
- OC6.5.2 Where **The Company** expects to instruct **Demand** reduction within the following 30 minutes, **The Company** will where possible, issue a **National Electricity Transmission System Warning - Demand Control Imminent** in accordance with OC7.4.8.2(c) and OC7.4.8.6.
- OC6.5.3 (a) Whether a **National Electricity Transmission System Warning - High Risk of Demand Reduction** or **National Electricity Transmission System Warning - Demand Control Imminent** has been issued or not:
- (i) provided the instruction relates to not more than 20 per cent of its total **Demand**; and
 - (ii) if the instruction relates to less than 20 per cent of its total **Demand**, is in
 - two voltage reduction stages of between 2 and 4 percent, each of which can reasonably be expected to deliver around 1.5 percent **Demand** reduction; and
 - up to three **Demand Disconnection** stages, each of which can reasonably be expected to deliver between four and six percent **Demand** reduction,

each **Network Operator** will abide by the instructions of **The Company**, which should specify whether a voltage reduction or **Demand Disconnection** stage is required; or
 - (iii) if the instruction relates to less than 20 per cent of its total **Demand**, is in four **Demand Disconnection** stages each of which can reasonably be expected to deliver between four and six per cent **Demand** reduction,
- each **Network Operator** will abide by the instructions of **The Company** with regard to **Demand** reduction under OC6.5 without delay.
- (b) The **Demand** reduction must be achieved within the **Network Operator's System** as far as possible uniformly across all **Grid Supply Points** (unless otherwise specified in the **National Electricity Transmission System Warning - High Risk of Demand Reduction**) either by **Customer** voltage reduction or by **Demand Disconnection**.
 - (c) **Demand Control** initiated by voltage reduction shall be initiated as soon as possible but in any event no longer than two minutes from the instruction being received from **The Company**, and completed within 10 minutes of the instruction being received from **The Company**.
 - (d) **Demand Control** initiated by **Demand Disconnection** shall be initiated as soon as possible but in any event no longer than two minutes from the instruction being received from **The Company**, and completed within five minutes of the instruction being received from **The Company**.
 - (e) Each **Network Operator** must notify **The Company** in writing by calendar week 28 each year, for the succeeding **Financial Year** onwards, whether **Demand Control** is to be implemented either:
 - i) by a combination of voltage reduction and **Demand Disconnection**; or

ii) **Demand Disconnection** alone;

together with the magnitude of the voltage reduction stages (where applicable) and for **Demand Disconnection** stages, the demand reduction anticipated. Thereafter, any changes must be notified in writing to **The Company** at least 10 **Business Days** prior to the change coming into effect.

OC6.5.4

- (a) Where **The Company** wishes to instruct a **Demand** reduction of more than 20 per cent of a **Network Operator's Demand**, it shall, if it is able, issue a **National Electricity Transmission System Warning - High Risk of Demand Reduction** to the **Network Operator** by 1600 hours on the previous day. The warning will state the percentage level of **Demand** reduction that **The Company** may want to instruct.
- (b) The **National Electricity Transmission System Warning - High Risk of Demand Reduction** will specify the percentage of **Demand** reduction that **The Company** may require in integral multiples of the percentage levels notified by **Users** under OC6.5.3(e) up to (and including) 20 per cent and integral multiples of between 4 and 6 per cent above 20 per cent and will not relate to more than 40 per cent of **Demand** on the **User System** of a **Network Operator**.
- (c) If **The Company** has issued the **National Electricity Transmission System Warning - High Risk of Demand Reduction** by 1600 hours on the previous day, on receipt of it, the relevant **Network Operator** shall make available the percentage reduction in **Demand** specified for use within the period of the **National Electricity Transmission System Warning**.
- (d) If **The Company** has not issued the **National Electricity Transmission System Warning - High Risk of Demand Reduction** by 1600 hours the previous day, but after that time, the **Network Operator** shall make available as much of the required **Demand** reduction as it is able, for use within the period of the **National Electricity Transmission System Warning**.

OC6.5.5

- (a) If **The Company** has given a **National Electricity Transmission System Warning - High Risk of Demand Reduction** to a **Network Operator**, and has issued it by 1600 hours on the previous day, it can instruct the **Network Operator** to reduce its **Demand** by the percentage specified in the **National Electricity Transmission System Warning**.
- (b) **The Company** accepts that if it has not issued the **National Electricity Transmission System Warning - High Risk of Demand Reduction** by 1600 hours on the previous day or if it has issued it by 1600 hours on the previous day, but it requires a further percentage of **Demand** reduction (which may be in excess of 40 per cent of the total **Demand** on the **User System** of the **Network Operator** from that set out in the **National Electricity Transmission System Warning**), it can only receive an amount that can be made available at that time by the **Network Operator**.
- (c) Where the instruction relates to not more than 20 per cent of its total **Demand** each **Network Operator** will implement the instruction, in accordance with OC6.5.3.
- (d) Where a single instruction relates to more than 20 per cent of its total **Demand** each **Network Operator** will:
 - (i) implement that part of the instruction relating to up to and including 20 per cent of **Demand Reduction** in accordance with OC6.5.3.
 - (ii) once these instructions have been implemented by the **Network Operator**, any further **Demand Disconnection** above those implemented in OC6.5.5(d)(i) shall take up to 5 additional minutes from the instruction being received from **The Company** for each extra 4 to 6 per cent of **Demand** being disconnected.

- (e) Where **The Company** issues a **Network Operator** with consecutive instructions to reduce **Demand**, the **Network Operator** will complete instructions in the order they were issued by **The Company** and will not start to execute any instruction until any preceding instruction has been completed, unless agreed with **The Company**.

OC6.5.6 Once a **Demand** reduction has been applied by a **Network Operator** at the instruction of **The Company**, the **Network Operator** may interchange the **Customers** to whom the **Demand** reduction has been applied provided that,

- (i) the percentage of **Demand** reduction at all times within the **Network Operator's System** does not change; and
- (ii) at all times it is achieved within the **Network Operator's System** as far as possible uniformly across all **Grid Supply Points** (unless otherwise specified in the **National Electricity Transmission System Warning - High Risk of Demand Reduction** if one has been issued),

until **The Company** instructs that **Network Operator** in accordance with **OC6**.

OC6.5.7 Each **Network Operator** will abide by the instructions of **The Company** with regard to the restoration of **Demand** under OC6.5 without delay. It shall not restore **Demand** until it has received such instruction. The restoration of **Demand** must be achieved as soon as possible and the process of restoration must begin within 2 minutes of the instruction being given by **The Company**.

OC6.5.8 In circumstances of protracted shortage of generation or where a statutory instruction has been given (eg. a fuel security period) and when a reduction in **Demand** is envisaged by **The Company** to be prolonged, **The Company** will notify the **Network Operator** of the expected duration.

OC6.5.9 The **Network Operator** will notify **The Company** in writing that it has complied with **The Company's** instruction under OC6.5, within five minutes of so doing, together with an estimation of the **Demand** reduction or restoration achieved, as the case may be.

OC6.5.10 **The Company** may itself implement **Demand** reduction and subsequent restoration on **Non-Embedded Customers** as part of a **Demand Control** requirement and it will organise the **National Electricity Transmission System** so that it will be able to reduce **Demand** by **Disconnection** of, or **Customer** voltage reduction to, all or any **Non-Embedded Customers**. Equivalent provisions to those in OC6.5.4 shall apply to issuing a **National Electricity Transmission System Warning - High Risk of Demand Reduction** to **Non-Embedded Customers**, as envisaged in OC7.4.8.

OC6.5.11 Pursuant to the provisions of OC1.5.6, the **Network Operator** will supply to **The Company** details of the amount of **Demand** reduction or restoration actually achieved.

OC6.6 AUTOMATIC LOW FREQUENCY DEMAND DISCONNECTION

OC6.6.1 Each **Network Operator** will make arrangements that will enable automatic low **Frequency Disconnection** of at least:

- (i) 60 per cent of its total **Demand** (based on **Annual ACS Conditions**) at the time of forecast **National Electricity Transmission System** peak **Demand** where such **Network Operator's System** is connected to the **National Electricity Transmission System** in **NGET's Transmission Area**
- (ii) 40 per cent of its total **Demand** (based on **Annual ACS Conditions**) at the time of forecast **National Electricity Transmission System** peak where such **Network Operator's System** is connected to the **National Electricity Transmission System** in either **SPT's** or **SHETL's Transmission Area**

in order to seek to limit the consequences of a major loss of generation or an **Event** on the **Total System** which leaves part of the **Total System** with a generation deficit. Where a **Network Operator's System** is connected to the **National Electricity Transmission System** in more than one **Transmission Area**, the figure above for the **Transmission Area** in which the majority of the **Network Operator's Demand** is connected shall apply.

- OC6.6.2 (a) The **Demand** of each **Network Operator** which is subject to automatic low **Frequency Disconnection** will be split into discrete MW blocks.
- (b) The number, size (% **Demand**) and the associated low **Frequency** settings of these blocks, will be as specified in Table CC.A.5.5.1a and Table ECC.A.5.5.1a. **The Company** will keep the settings under review.
- (c) The distribution of the blocks will be such as to give a reasonably uniform **Disconnection** within the **Network Operator's System**, as the case may be, across all **Grid Supply Points**.
- (d) Each **Network Operator** will notify **The Company** in writing by calendar week 28 each year of the details of the automatic low **Frequency Demand Disconnection** on its **User System**. The information provided should identify, for each **Grid Supply Point** at the date and time of the annual peak of the **National Electricity Transmission System Demand** at **Annual ACS Conditions** (as notified pursuant to OC1.4.2), the frequency settings at which **Demand Disconnection** will be initiated and the amount of **Demand** disconnected at each such setting.
- OC6.6.3 Where conditions are such that, following automatic low **Frequency Demand Disconnection**, and the subsequent **Frequency** recovery, it is not possible to restore a large proportion of the total **Demand** so disconnected within a reasonable period of time, **The Company** may instruct a **Network Operator** to implement additional **Demand Disconnection** manually, and restore an equivalent amount of the **Demand** that had been disconnected automatically. The purpose of such action is to ensure that a subsequent fall in **Frequency** will again be contained by the operation of automatic low **Frequency Demand Disconnection**.
- OC6.6.4 Once an automatic low **Frequency Demand Disconnection** has taken place, the **Network Operator** on whose **User System** it has occurred, will not reconnect until **The Company** instructs that **Network Operator** to do so in accordance with **OC6**.
- OC6.6.5 Once the **Frequency** has recovered, each **Network Operator** will abide by the instructions of **The Company** with regard to reconnection under OC6.6 without delay. Reconnection must be achieved as soon as possible and the process of reconnection must begin within 2 minutes of the instruction being given by **The Company**.
- OC6.6.6 (a) **Non-Embedded Customers** and **Pumped Storage Generators**, must provide automatic low **Frequency** disconnection, which shall be split into discrete blocks.
- (b) The number and size of blocks and the associated low **Frequency** settings shall be as specified by **The Company** by week 24 each calendar year following discussion with the **Non-Embedded Customer** and **Pumped Storage Generator** in accordance with the relevant **Bilateral Agreement**.
- (c) **Generators, Defence Service Providers, Restoration Service Providers** or **Non-Embedded Customers** in respect of **Electricity Storage Modules** who have agreed with **The Company** to satisfy the requirements of OC6.6.6 as provided for in ECC.6.3.7.2.3.1 must provide automatic low **Frequency** disconnection, which shall be split into discrete blocks. The number and size of blocks and the associated low **Frequency** settings will be specified by **The Company** by week 24 each calendar year following discussion with the relevant parties in accordance with the relevant **Bilateral Agreement** or other relevant **Ancillary Services** agreement.

- OC6.6.7 (a) In addition, **Generators** may wish to disconnect **Power Generating Modules** and/or **Generating Units** from the **System**, either manually or automatically, should they be subject to **Frequency** levels which could result in **Power Generating Module** and/or **Generating Unit** damage.
- (b) This **Disconnection** facility on such a **Power Generating Module** and/or **Generating Unit** directly connected to the **National Electricity Transmission System**, will be agreed with **The Company** in accordance with the **Bilateral Agreement**.
- (c) Any **Embedded Power Stations** will need to agree this **Disconnection** facility with the relevant **User** to whose **System** that **Power Station** is connected, which will then need to notify **The Company** of this.
- OC6.6.8 The **Network Operator** or **Non-Embedded Customer**, as the case may be, will notify **The Company** with an estimation of the **Demand** reduction which has occurred under automatic low **Frequency Demand Disconnection** and similarly notify the restoration, as the case may be, in each case within five minutes of the **Disconnection** or restoration.
- OC6.6.9 Pursuant to the provisions of OC1.5.6 the **Network Operator** and **Non-Embedded Customer** will supply to **The Company** details of the amount of **Demand** reduction or restoration actually achieved.
- OC6.6.10 (a) In the case of a **User**, it is not necessary for it to provide automatic low **Frequency** disconnection under OC6.6 only to the extent that it is providing, at the time it would be so needed, low **Frequency** disconnection at a higher level of **Frequency** as an **Ancillary Service**, namely if the amount provided as an **Ancillary Service** is less than that required under OC6.6 then the **User** must provide the balance required under OC6.6 at the time it is so needed.
- (b) The provisions of OC7.4.8 relating to the use of **Demand Control** should be borne in mind by **Users**.
- OC6.7 EMERGENCY MANUAL DISCONNECTION
- OC6.7.1 Each **Network Operator** will make arrangements that will enable it, following an instruction from **The Company**, to disconnect **Customers** on its **User System** under emergency conditions irrespective of **Frequency** within 30 minutes. It must be possible to apply the **Demand Disconnections** to individual or specific groups of **Grid Supply Points**, as determined by **The Company**.
- OC6.7.2 (a) Each **Network Operator** shall provide **The Company** in writing by week 28 in each calendar year, in respect of the next following year beginning week 28, on a **Grid Supply Point** basis, with the following information (which is set out in a tabular format in the Appendix):
- (i) its total peak **Demand** (based on **Annual ACS Conditions**); and
- (ii) the percentage value of the total peak **Demand** that can be disconnected (and must include that which can also be reduced by voltage reduction, where applicable) within timescales of 5/10/15/20/25/30 minutes.
- (b) The information should include, in relation to the first 5 minutes, as a minimum, the 20% of **Demand** that must be reduced on instruction under OC6.5.
- OC6.7.3 Each **Network Operator** will abide by the instructions of **The Company** with regard to **Disconnection** under OC6.7 without delay, and the **Disconnection** must be achieved as soon as possible after the instruction being given by **The Company**, and in any case, within the timescale registered in OC6.7. The instruction may relate to an individual **Grid Supply Point** and/or groups of **Grid Supply Points**.
- OC6.7.4 **The Company** will notify a **Network Operator** who has been instructed under OC6.7, of what has happened on the **National Electricity Transmission System** to necessitate the instruction, in accordance with the provisions of **OC7** and, if relevant, **OC10**.

- OC6.7.5 Once a **Disconnection** has been applied by a **Network Operator** at the instruction of **The Company**, that **Network Operator** will not reconnect until **The Company** instructs it to do so in accordance with **OC6**.
- OC6.7.6 Each **Network Operator** will abide by the instructions of **The Company** with regard to reconnection under OC6.7 without delay, and shall not reconnect until it has received such instruction and reconnection must be achieved as soon as possible and the process of reconnection must begin within 2 minutes of the instruction being given by **The Company**.
- OC6.7.7 **The Company** may itself disconnect manually and reconnect **Non-Embedded Customers** as part of a **Demand Control** requirement under emergency conditions.
- OC6.7.8 If **The Company** determines that emergency manual **Disconnection** referred to in OC6.7 is inadequate, **The Company** may disconnect **Network Operators** and/or **Non-Embedded Customers** at **Grid Supply Points**, to preserve the security of the **National Electricity Transmission System**.
- OC6.7.9 Pursuant to the provisions of OC1.5.6 the **Network Operator** will supply to **The Company** details of the amount of **Demand** reduction or restoration actually achieved.
- OC6.8 OPERATION OF THE BALANCING MECHANISM DURING DEMAND CONTROL
- Demand Control** will constitute an **Emergency Instruction** in accordance with BC2.9 and it may be necessary to depart from normal **Balancing Mechanism** operation in accordance with BC2 in issuing **Bid-Offer Acceptances**. **The Company** will inform affected **BM Participants** in accordance with the provisions of **OC7**.

APPENDIX 1 - EMERGENCY MANUAL DEMAND
REDUCTION/DISCONNECTION SUMMARY SHEET

(As set out in OC6.7)

NETWORK OPERATOR: _____ [YEAR] PEAK: _____

GRID SUPPLY POINT (Name)	PEAK MW	% OF GROUP DEMAND DISCONNECTION (AND/OR REDUCTION IN THE CASE OF THE FIRST 5 MINUTES) (CUMULATIVE)						REMARKS
		TIME (MINS)						
		5	10	15	20	25	30	

Notes:
1. Data to be provided annually by week 28 to cover the following year.

< END OF OPERATING CODE NO. 6 >

DATA REGISTRATION CODE (DRC)

CONTENTS

(This contents page does not form part of the Grid Code)

<u>Paragraph No/Title</u>	<u>Page Number</u>
DRC.1 INTRODUCTION	3
DRC.2 OBJECTIVE	3
DRC.3 SCOPE	3
DRC.4 DATA CATEGORIES AND STAGES IN REGISTRATION	4
DRC.4.2 Standard Planning Data	4
DRC.4.3 Detailed Planning Data	4
DRC.4.4 Operational Data	4
DRC.5 PROCEDURES AND RESPONSIBILITIES	4
DRC.5.1 Responsibility For Submission And Updating Of Data	4
DRC.5.2 Methods Of Submitting Data	4
DRC.5.3 Changes To Users Data	5
DRC.5.4 Data Not Supplied	5
DRC.5.5 Substituted Data	5
DRC.6 DATA TO BE REGISTERED	5
SCHEDULE 1 - POWER GENERATING MODULE, GENERATING UNIT (OR CCGT MODULE), POWER PARK MODULE, DC CONNECTED POWER PARK MODULE, HVDC SYSTEM AND DC CONVERTER TECHNICAL DATA	11
SCHEDULE 2 - GENERATION PLANNING PARAMETERS	37
SCHEDULE 3 - LARGE POWER STATION OUTAGE PROGRAMMES, OUTPUT USABLE AND INFLEXIBILITY INFORMATION	41
SCHEDULE 4 - LARGE POWER STATION DROOP AND RESPONSE DATA	42
SCHEDULE 5 - USERS SYSTEM DATA	43
SCHEDULE 6 - USERS OUTAGE INFORMATION	55
SCHEDULE 7 - LOAD CHARACTERISTICS AT GRID SUPPLY POINTS	60
SCHEDULE 8 - DATA SUPPLIED BY BM PARTICIPANTS	61
SCHEDULE 9 - DATA SUPPLIED BY THE COMPANY TO USERS	62
SCHEDULE 10 - DEMAND PROFILES AND ACTIVE ENERGY DATA	64
SCHEDULE 11 - CONNECTION POINT DATA	66
SCHEDULE 12 - DEMAND CONTROL	73
SCHEDULE 13 - FAULT INFEED DATA	77
SCHEDULE 14 - FAULT INFEED DATA (GENERATORS INCLUDING UNIT TRANSFORMERS AND STATION TRANSFORMERS)	79
SCHEDULE 15 - MOTHBALLED POWER GENERATING MODULE, MOTHBALLED GENERATING UNIT, MOTHBALLED POWER PARK MODULE (INCLUDING MOTHBALLED DC CONNECTED POWER PARK MODULES), MOTHBALLED HVDC SYSTEMS, MOTHBALLED HVDC CONVERTERS,	

MOTHBALLED DC CONVERTERS AT A DC CONVERTER STATION AND ALTERNATIVE FUEL DATA..... 85

SCHEDULE 16 - SYSTEM RESTORATION INFORMATION 88

SCHEDULE 17 - ACCESS PERIOD DATA 94

SCHEDULE 18 - OFFSHORE TRANSMISSION SYSTEM DATA..... 95

SCHEDULE 19 - USER DATA FILE STRUCTURE 122

SCHEDULE 20 - GRID FORMING PLANT CAPABILITY DATA..... 124

SCHEDULE 21 - GENERATION AND DEMAND OUTTURN AND FORECASTS 128

SCHEDULE 22 - DEMAND DATA..... 131

SCHEDULE 23 - NETWORK OPERATOR DEMAND PROFILES AND ACTIVE ENERGY DATA 132

SCHEDULE 24 - GENERATION LARGER THAN 1 MW 137

SCHEDULE 25 - NETWORK OPERATOR DEMAND CONTROL DATA..... 138

SCHEDULE 26 - DEMAND DATA..... 141

SCHEDULE 27 - NETWORK OPERATOR ACTIVE ENERGY DATA 143

SCHEDULE 28 - EMBEDDED POWER STATION FORECAST CAPACITY SCHEDULE 144

SCHEDULE 29 - EMBEDDED GENERATION SCHEDULE..... 145

SCHEDULE 30 - EMBEDDED GENERATION CONSTRAINTS SCHEDULE..... 147

DRC.1 INTRODUCTION

DRC.1.1 The **Data Registration Code ("DRC")** presents a unified listing of all data required by **The Company** from **Users** (including **Restoration Contractors** where they are not a **User**) and by **Users** (including **Restoration Contractors** where they are not a **User**) from **The Company**, from time to time under the **Grid Code**. The data which is specified in each section of the **Grid Code** is collated here in the **DRC**. Where there is any inconsistency in the data requirements under any particular section of the **Grid Code** and the **Data Registration Code** the provisions of the particular section of the **Grid Code** shall prevail.

DRC.1.2 The **DRC** identifies the section of the **Grid Code** under which each item of data is required.

DRC.1.3 The Code under which any item of data is required specifies procedures and timings for the supply of that data, for routine updating and for recording temporary or permanent changes to that data. All timetables for the provision of data are repeated in the **DRC**.

DRC.1.4 Various sections of the **Grid Code** also specify information which **Users** will receive from **The Company**. This information is summarised in a single schedule in the **DRC** (Schedule 9).

DRC.1.5 The categorisation of data into **DPD I** and **DPD II** is indicated in the **DRC** below.

DRC.1.6 For the purposes of this **DRC**, if a **User** is also a **Restoration Contractor**, they shall only need to submit the data once stating on their data submission they are also a **Restoration Contractor**. If a **Restoration Contractor** does not have a **CUSC Contract** then the data required to be submitted shall be pursuant to the terms of the **Anchor Plant Contract** or **Top Up Restoration Contract**.

DRC.2 OBJECTIVE

The objective of the **DRC** is to:

DRC.2.1 List and collate all the data to be provided by each category of **User** to **The Company** under the **Grid Code**.

DRC.2.2 List all the data to be provided by **The Company** to each category of **User** under the **Grid Code**.

DRC.3 SCOPE

DRC.3.1 The **DRC** applies to **The Company**, **Users** and **Restoration Contractors**, which in this **DRC** means:-

- (a) **Generators** (including those undertaking **OTSDUW** and/or those who own and/or operate **DC Connected Power Park Modules**);
- (b) **Network Operators**;
- (c) **DC Converter Station** owners and **HVDC System Owners**;
- (d) **Suppliers**;
- (e) **Non-Embedded Customers**;
- (f) **Externally Interconnected System Operators**;
- (g) **Interconnector Users**;
- (h) **BM Participants**; and
- (i) **Pumped Storage Generators** and **Generators** in respect of Electricity **Storage Modules**.
- (j) **Restoration Contractors** (which would be pursuant to the requirements of their **Anchor Restoration Contract** or **Top Up Restoration Contract**).

- DRC.3.2 For the avoidance of doubt, the **DRC** applies to both **GB Code Users** and **EU Code Users**.
- DRC.4 DATA CATEGORIES AND STAGES IN REGISTRATION
- DRC.4.1.1 Within the **DRC** each data item is allocated to one of the following three categories:
- (a) **Standard Planning Data (SPD)**
 - (b) **Detailed Planning Data (DPD)**
 - (c) **Operational Data**
- DRC.4.2 Standard Planning Data (SPD)
- DRC.4.2.1 The **Standard Planning Data** listed and collated in this **DRC** is that data listed in Part 1 of the Appendix to the **PC**.
- DRC.4.2.2 **Standard Planning Data** will be provided to **The Company** in accordance with PC.4.4 and PC.A.1.2.
- DRC.4.3 Detailed Planning Data (DPD)
- DRC.4.3.1 The **Detailed Planning Data** listed and collated in this **DRC** is categorised as **DPD I** and **DPD II** and is that data listed in Part 2 of the Appendix to the **PC**.
- DRC.4.3.2 **Detailed Planning Data** will be provided to **The Company** in accordance with PC.4.4, PC.4.5 and PC.A.1.2.
- DRC.4.4 Operational Data
- DRC.4.4.1 **Operational Data** is data which is required by the **Operating Codes** and the **Balancing Codes**. Within the **DRC**, **Operational Data** is sub-categorised according to the Code under which it is required, namely **OC1**, **OC2**, **BC1** or **BC2**.
- DRC.4.4.2 **Operational Data** is to be supplied in accordance with timetables set down in the relevant **Operating Codes** and **Balancing Codes** and repeated in tabular form in the schedules to the **DRC**.
- DRC.5 PROCEDURES AND RESPONSIBILITIES
- DRC.5.1 Responsibility For Submission And Updating Of Data
- In accordance with the provisions of the various sections of the **Grid Code**, each **User** must submit data as summarised in DRC.6 and listed and collated in the attached schedules.
- DRC.5.2 Methods Of Submitting Data
- DRC.5.2.1 Wherever possible, the data schedules to the **DRC** are structured to serve as standard formats for data submission and such format must be used for the written submission of data to **The Company**.
- DRC.5.2.2 Data must be submitted to the **Transmission Control Centre** notified by **The Company**, or to such other department or address as **The Company** may from time to time advise. The name of the person at the **User Site** who is submitting each schedule of data must be included.
- DRC.5.2.3 Where a computer data link exists between a **User** and **The Company**, data may be submitted via this link. **The Company** will, in this situation, provide computer files for completion by the **User** containing all the data in the corresponding **DRC** schedule.
- Data submitted can be in an electronic format using a proforma to be supplied by **The Company** or other format to be agreed annually in advance with **The Company**. In all cases the data must be complete and relate to, and relate only to, what is required by the relevant section of the **Grid Code**.

- DRC.5.2.4 Other modes of data transfer, such as magnetic tape, may be utilised if **The Company** gives its prior written consent.
- DRC.5.2.5 **Generators, HVDC System Owners and DC Converter Station** owners submitting data for a **Power Generating Module, Generating Unit, DC Converter, HVDC System, Power Park Module** (including **DC Connected Power Park Modules**) or **CCGT Module** before the issue of a **Final Operational Notification** should submit the **DRC** data schedules and compliance information required under the **CP** electronically using the **User Data File Structure** unless otherwise agreed with **The Company**. Data required from **Restoration Contractors** where not provided would be pursuant to the the terms of their **Anchor Restoration Contract** or **Top Up Restoration Contract**.
- DRC.5.3 Changes To User's Data
- DRC.5.3.1 Whenever a **User** becomes aware of a change to an item of data which is registered with **The Company**, the **User** must notify **The Company** in accordance with each section of the Grid Code. The method and timing of the notification to **The Company** is set out in each section of the Grid Code. Data required from **Restoration Contractors** where not provided would be pursuant to the the terms of their **Anchor Restoration Contract** or **Top Up Restoration Contract**.
- DRC.5.4 Data Not Supplied
- DRC.5.4.1 **Users** and **The Company** are obliged to supply data as set out in the individual sections of the **Grid Code** and repeated in the **DRC**. If a **User** fails to supply data when required by any section of the **Grid Code**, **The Company** will estimate such data if and when, in **The Company's** view, it is necessary to do so. If **The Company** fails to supply data when required by any section of the **Grid Code**, the **User** to whom that data ought to have been supplied, will estimate such data if and when, in that **User's** view, it is necessary to do so. Such estimates will, in each case, be based upon data supplied previously for the same **Plant** or **Apparatus** or upon corresponding data for similar **Plant** or **Apparatus** or upon such other information as **The Company** or that **User**, as the case may be, deems appropriate.
- DRC.5.4.2 **The Company** will advise a **User** in writing of any estimated data it intends to use pursuant to DRC.5.4.1 relating directly to that **User's Plant** or **Apparatus** in the event of data not being supplied.
- DRC.5.4.3 A **User** will advise **The Company** in writing of any estimated data it intends to use pursuant to DRC.5.4.1 in the event of data not being supplied.
- DRC.5.4.4 Data requirements defined in DRC5.4.1 – DRC5.4.3 as applicable to a **Restoration Contractor** where that **Restoration Contractor** is a not a **User**, would be pursuantto the the terms of the **Anchor Restoration Contract** or **Top Up Restoration Contract**.
- DRC.5.5 Substituted Data
- DRC.5.5.1 In the case of PC.A.4 only, if the data supplied by a **User** does not in **The Company's** reasonable opinion reflect the equivalent data recorded by **The Company**, **The Company** may estimate such data if and when, in the view of **The Company**, it is necessary to do so. Such estimates will, in each case, be based upon data supplied previously for the same **Plant** or **Apparatus** or upon corresponding data for similar **Plant** or **Apparatus** or upon such other information as **The Company** deems appropriate.
- DRC.5.5.2 **The Company** will advise a **User** in writing of any estimated data it intends to use pursuant to DRC.5.5.1 relating directly to that **User's Plant** or **Apparatus** where it does not in **The Company's** reasonable opinion reflect the equivalent data recorded by **The Company**. Such estimated data will be used by **The Company** in place of the appropriate data submitted by the **User** pursuant to PC.A.4 and as such shall be deemed to accurately represent the **User's** submission until such time as the **User** provides data to **The Company's** reasonable satisfaction.
- DRC.6 DATA TO BE REGISTERED

- DRC.6.1 Schedules 1 to 20 attached cover the following data areas.
- DRC.6.1.1 Schedule 1 – Power Generating Module, Generating Unit (or CCGT Module), Power Park Module (including DC Connected Power Park Module and Power Park Unit), HVDC System and DC Converter Technical Data.
- Comprising **Power Generating Module, Generating Unit (and CCGT Module), Power Park Module (including DC Connected Power Park Module and Power Park Unit) and DC Converter** fixed electrical parameters. Any data required under **DRC** Schedule 1 from **Restoration Contractors** where not provided, would be pursuant to the terms of their **Anchor Restoration Contract** or **Top Up Restoration Contract**.
- DRC.6.1.2 Schedule 2 - Generation Planning Parameters
- Comprising **Genset** parameters and **Restoration Contractors** parameters required for **Operational Planning** studies.
- DRC.6.1.3 Schedule 3 - Power Station Outage Programmes, Output Usable and Inflexibility Information.
- Comprising generation and storage outage planning in respect of **Large Power Stations, Output Usable** and inflexibility information at timescales down to the daily **BM Unit Data** submission. In the case of **Restoration Contractors**, this data needs to only to be provided where such a **Restoration Contractor** has an **Anchor Restoration Contract** or **Top Up Restoration Contract** other than in respect of **Large Power Stations** where the data will already be required.
- DRC.6.1.4 Schedule 4 - Large Power Station Droop and Response Data.
- Comprising data on governor **Droop** settings and **Primary, Secondary and High Frequency Response** data for **Large Power Stations**.
- DRC.6.1.5 Schedule 5 – User's System Data.
- Comprising electrical parameters relating to **Plant** and **Apparatus** connected to the **National Electricity Transmission System**.
- DRC.6.1.6 Schedule 6 – Users Outage and Restoration Service Provider Outage Information.
- Comprising the information required by **The Company** for outages on the **User's System**, including outages at **Power Stations** other than outages of **Gensets**. Outages of **Plant** and **Apparatus** of **Restoration Contractors** and key **Plant** and **Apparatus** of a **Network Operator's System** associated with a **Distribution Restoration Zone Plan** also need to be co-ordinated with outages on the **National Electricity Transmission System**. The data submitted should therefore also include outages on **Restoration Contractors Plant** and **Apparatus** and **Network Operator's Plant** and **Apparatus** which would prevent the operation of a **Local Joint Restoration Plan** or **Distribution Restoration Zone Plan**.
- DRC.6.1.7 Schedule 7 - Load Characteristics.
- Comprising the estimated parameters of load groups in respect of, for example, harmonic content and response to frequency.
- DRC.6.1.8 Schedule 8 - BM Unit Data.
- DRC.6.1.9 Schedule 9 - Data Supplied by The Company to Users.
- DRC.6.1.10 Schedule 10 - Demand Profiles and Active Energy Data
- Comprising information relating to the **Network Operators' and Non-Embedded Customers' total Demand and Active Energy** taken from the **National Electricity Transmission System**
- DRC.6.1.11 Schedule 11 - Connection Point Data
- Comprising information relating to **Demand**, demand transfer capability and the **Small Power Station, Medium Power Station** and **Customer** generation connected to the **Connection Point**

DRC.6.1.12	<u>Schedule 12 - Demand Control Data</u> Comprising information related to Demand Control
DRC.6.1.13	<u>Schedule 13 - Fault Infeed Data</u> Comprising information relating to the short circuit contribution to the National Electricity Transmission System from Users other than Generators, HVDC System Owners and DC Converter Station owners.
DRC.6.1.14	<u>Schedule 14 - Fault Infeed Data (Generators Including Unit and Station Transformers)</u> Comprising information relating to the Short Circuit contribution to the National Electricity Transmission System from Generators, HVDC System Owners and DC Converter Station owners.
DRC.6.1.15	<u>Schedule 15 – Mothballed Power Generating Module, Mothballed Generating Unit, Mothballed Power Park Module (including Mothballed DC Connected Power Park Modules), Mothballed HVDC Systems, Mothballed HVDC Converters, Mothballed DC Converters at a DC Converter Station and Alternative Fuel Data</u> Comprising information relating to estimated return to service times for Mothballed Power Generating Modules, Mothballed Generating Units, Mothballed Power Park Modules (including Mothballed DC Connected Power Park Modules), Mothballed HVDC Systems, Mothballed HVDC Converters and Mothballed DC Converters at a DC Converter Station and the capability of gas-fired Generating Units to operate using alternative fuels.
DRC.6.1.16	<u>Schedule 16 – System Restoration Information</u> Comprising information relating to System Restoration .
DRC.6.1.17	<u>Schedule 17 – Access Period Schedule</u> Comprising Access Period information for Transmission Interface Circuits within an Access Group .
DRC.6.1.18	<u>Schedule 18 – Generators Undertaking OTSDUW Arrangements</u> Comprising electrical parameters relating to OTSDUW Plant and Apparatus between the Offshore Grid Entry Point and Transmission Interface Point .
DRC.6.1.19	<u>Schedule 19 – User Data File Structure</u> Comprising information relating to the User Data File Structure .
DRC.6.1.20	<u>Schedule 20 – Grid Forming Plant Data</u> Comprising information relating to Grid Forming Plant .
DRC.6.1.21	<u>Schedule 21 – Generation and Demand Data (21A-C)</u> Comprising information relating to generation and demand at historic defined date/times plus forecast data.
DRC.6.1.22	<u>Schedule 22 – Demand Data</u> Comprising information relating to Measured Demand at historic defined date/times plus forecast data.
DRC.6.1.23	<u>Schedule 23 – Network Operator Demand Data (23A-C)</u> Comprising information relating to the Network Operators’ demand and Access Period data.
DRC.6.1.24	<u>Schedule 24 – Access Group Schedule</u> Comprising Access Period information for Transmission Interface Circuits within an Access Group .
DRC.6.1.25	<u>Schedule 25 – Network Operator Demand Control Data (25A-C)</u> Comprising information related to Demand Control on a Network Operator’s System .

- DRC.6.1.26 Schedule 26 – Demand Data (26A-B)
Comprising information relating to **Measured Demand** at historic defined date/times plus forecast data.
- DRC.6.1.27 Schedule 27 – Network Operator Active Energy Data
Comprising information relating to the **Network Operators’ Active Energy**.
- DRC.6.1.28 Schedule 28 – Embedded Power Station Forecast Capacity Schedule
Comprising information relating to embedded generation a **Network Operator** forecasts to connect to their system.
- DRC.6.1.29 Schedule 29 – Embedded Generation Schedule (29A-B)
Comprising information relating to embedded generation connected to a **Network Operator’s** system, split between those rated at greater than or equal to 1MW, and those rated below 1MW.
- DRC.6.1.30 Schedule 30 – Embedded Generation Constraints Schedule
Comprising information relating to embedded generation connected to a **Network Operator’s** system where a constraint is applied to the output of either a **Large Power Station** or an **Offshore Transmission System**.
- DRC.6.2 The **Schedules** applicable to each class of **User** before the **PSM Implementation Date** are as follows:

<u>User</u>	<u>Schedule</u>
Generators with Large Power Stations	1, 2, 3, 4, 9, 14, 15, 16, 19
Generators with Medium Power Stations (see notes 2, 3, 4)	1, 2 (part), 9, 14, 15, 19
Generators with Small Power Stations directly connected to the National Electricity Transmission System	1, 6, 14, 15, 19
Generators undertaking OTSDUW (see note 5)	18, 19
All Users connected directly to the National Electricity Transmission System	5, 6, 9
All Users connected directly to the National Electricity Transmission System other than Generators	10,11,13,17
All Users connected directly to the National Electricity Transmission System with Demand	7, 9
A Pumped Storage Generator , a Generator in respect of one or more Electricity Storage Modules and an Externally Interconnected System Operator and Interconnector Users	12 (as marked)
All Suppliers	12
All Network Operators	12, 16
All BM Participants	8
All DC Converter Station owners	1, 4, 9, 14, 15, 19
Restoration Contractors	2, 3, 6, 16

DRC.6.2.1

The **Schedules** applicable to each class of **User** after the **PSM Implementation Date** are as follows:

<u>User</u>	<u>Schedule</u>
Generators with Large Power Stations	1, 2, 3, 4, 9, 14, 15, 16, 19
Generators with Medium Power Stations (see notes 2, 3, 4)	1, 2 (part), 9, 14, 15, 19
Generators with Small Power Stations directly connected to the National Electricity Transmission System	1, 6, 14, 15, 19
Generators undertaking OTSDUW (see note 5)	18, 19
All Users connected directly to the National Electricity Transmission System	6, 9
All Users connected directly to the National Electricity Transmission System other than Generators or Network Operators	10,11,13,17
All Users connected directly to the National Electricity Transmission System with Demand	7, 9
A Pumped Storage Generator , a Generator in respect of one or more Electricity Storage Modules and an Externally Interconnected System Operator and Interconnector Users	12 (as marked)
All Suppliers	12
All Network Operators after the PSM Implementation Date (see note 8, 9)	12,16, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30
All BM Participants	8
All DC Converter Station owners	1, 4, 9, 14, 15, 19
Restoration Contractors	2, 3, 6, 16

Notes:

- (1) **Network Operators** must provide data relating to **Small Power Stations** and/or **Customer Generating Plant Embedded** in their **Systems** when such data is requested by **The Company** pursuant to PC.A.3.1.4 or PC.A.5.1.4. After the **PSM Implementation Date** this information shall be provided pursuant to PC.9.
- (2) The data in schedules 1, 14 and 15 need not be supplied in relation to **Medium Power Stations** connected at a voltage level below the voltage level of the **Subtransmission System** except in connection with a **CUSC Contract** or unless specifically requested by **The Company**.
- (3) Each **Network Operator** within whose **System** an **Embedded Medium Power Station** not subject to a **Bilateral Agreement** or **Embedded DC Converter Station** not subject to a **Bilateral Agreement** is situated shall provide the data to **The Company** in respect of each such **Embedded Medium Power Station** or **Embedded DC Converter Station** or **HVDC System**. After the **PSM Implementation Date** this information shall be provided pursuant to PC.9.

- (4) In the case of Schedule 2, **Generators**, **HVDC System Owners**, **DC Converter Station** owners or **Network Operators** in the case of **Embedded Medium Power Stations** not subject to a **Bilateral Agreement** or **Embedded DC Converter Stations** not subject to a **Bilateral Agreement**, would only be expected to submit data in relation to **Standard Planning Data** as required by the **Planning Code**.
- (5) In the case of **Generators** undertaking **OTSDUW**, the **Generator** will need to supply **User** data in accordance with the requirements of **Large** or **Small Power Stations** (as defined in DRC.6.2) up to the **Offshore Grid Entry Point**. In addition, the **User** will also need to submit **Offshore Transmission System** data in between the **Interface Point** and its **Connection Points** in accordance with the requirements of Schedule 18.
- (6) In the case of **Restoration Contractors**, data only needs to be provided by a **Restoration Contractor** where such a **Restoration Contractor** is not a **CUSC Party** and the data has not been submitted. In this case the data to be submitted would be pursuant to the terms of the **Anchor Restoration Contract** or **Top Up Restoration Contract**.
- (7) The changes to the PC driving the enhanced data exchange between **Network Operators** and **The Company** described in PC.9, PC.10 and PC.G together with the relevant schedules will take effect after the **PSM Implementation Date**.
- (8) Schedule 12 does not form part of the Excel template found on **The Company's Website** and is not part of the **Network Operator's** week 2/28 data submissions.
- (9) In the case of Schedules 16, 21-30, **The Company** shall publish these Schedules as an Excel template on their Website. Where there are discrepancies between the DRC legal text and the **Website** version, the DRC legal text shall be followed. **Network Operators** should use the **Website** version of Schedules 16, 21-30 where possible.

SCHEDULE 1 – POWER GENERATING MODULE, GENERATING UNIT (OR CCGT MODULE), POWER PARK MODULE, DC CONNECTED POWER PARK MODULE, HVDC SYSTEM AND DC CONVERTER TECHNICAL DATA

PAGE 1 OF 19

ABBREVIATIONS:

SPD = Standard Planning Data

% on MVA = % on Rated MVA

% on 100 = % on 100 MVA

DPD = Detailed Planning Data

RC = Registered Capacity

MC = Maximum Capacity

OC1, BC1, etc = Grid Code
for which data is required

CUSC Contract = User data which may be submitted to the **Relevant Transmission Licensees** by **The Company**, following the acceptance by a **User** of a **CUSC Contract**.

CUSC App. Form = User data which may be submitted to the **Relevant Transmission Licensees** by **The Company**, following an application by a **User** for a **CUSC Contract**.

Note:

All parameters, where applicable, are to be measured at nominal **System Frequency**

- + these **SPD** items should only be given in the data supplied with the application for a **CUSC Contract**.
- * Asterisk items are not required for **Small Power Stations** and **Medium Power Stations**
Information is to be given on a **Unit** basis, unless otherwise stated. Where references to **CCGT Modules** are made, the columns "G1" etc should be amended to read "M1" etc, as appropriate
- These data items may be submitted to the **Relevant Transmission Licensees** from **The Company** in respect of the **National Electricity Transmission System**. The data may be submitted to the **Relevant Transmission Licensees** in a summarised form e.g. network model; the data transferred will have been originally derived from data submitted by **Users** to **The Company**.
- these data items may be submitted to the **Relevant Transmission Licensee** from **The Company** in respect to **Relevant Units** only. The data may be submitted to the **Relevant Transmission Licensee** in a summarised form e.g. network model; the data transferred will have been originally derived from data submitted by **Users** to **The Company**.

SCHEDULE 1 – POWER GENERATING MODULE, GENERATING UNIT (OR CCGT MODULE), POWER PARK MODULE, DC CONNECTED POWER PARK MODULE, HVDC SYSTEM AND DC CONVERTER TECHNICAL DATA

PAGE 2 OF 19

POWER STATION NAME: _____

DATE: _____

DATA DESCRIPTION	UNITS	DATA to RTL		DATA CAT.	GENERATING UNIT OR STATION DATA						
		CUSC Cont ract	CUSC App. Form		F.Yr. 0	F.Yr. 1	F.Yr. 2	F.Yr. 3	F.Yr. 4	F.Yr. 5	F.Yr. 6
GENERATING STATION DEMANDS: Demand associated with the Power Station supplied through the National Electricity Transmission System or the Generator's User System (PC.A.5.2)											
- The maximum Demand that could occur. - Demand at specified time of annual peak half hour of National Electricity Transmission System Demand at Annual ACS Conditions.	MW MVA MW MVA	☐ ☐ ☐ ☐		DPD I DPD I DPD II DPD II							
- Demand at specified time of annual minimum half-hour of National Electricity Transmission System Demand.	MW MVA	☐ ☐		DPD II DPD II							
(Additional Demand supplied through the unit transformers to be provided below)											
INDIVIDUAL GENERATING UNIT (OR AS THE CASE MAY BE, SYNCHRONOUS POWER GENERATING MODULE OR CCGT MODULE) DATA					G1	G2	G3	G4	G5	G6	STN
Point of connection to the National Electricity Transmission System (or the Total System if embedded) of the Generating Unit or Synchronous Power Generating Module (other than a CCGT Unit) or the CCGT Module , as the case may be in terms of geographical and electrical location and system voltage (PC.A.3.4.1)	Text	☐	■	SPD							
If the busbars at the Connection Point are normally run in separate sections identify the section to which the Generating Unit (other than a CCGT Unit) or Synchronous Power Generating Module or CCGT Module , as the case may be is connected (PC.A.3.1.5)	Section Number	☐	■	SPD							

Type of Unit (steam, Gas Turbine Combined Cycle Gas Turbine Unit, tidal, wind, storage type etc.) (PC.A.3.2.2 (h), PC.A.3.4.4)		□											

SCHEDULE 1 – POWER GENERATING MODULE, GENERATING UNIT (OR CCGT MODULE), POWER PARK MODULE, DC CONNECTED POWER PARK MODULE, HVDC SYSTEM AND DC CONVERTER TECHNICAL DATA
PAGE 3 OF 19

<u>INDIVIDUAL SYNCHRONOUS POWER GENERATING MODULE</u> <u>GENERATING UNIT (OR AS THE CASE MAY BE, CCGT MODULE) DATA</u>					G1	G2	G3	G4	G5	G6	STN
A list of the Generating Units and CCGT Units within a Synchronous Power Generating Module or CCGT Module , identifying each CCGT Unit , and the Power Generating Module or CCGT Module of which it forms part, unambiguously. In the case of a Range CCGT Module , details of the possible configurations should also be submitted. (PC.A.3.2.2 (g))		□	■	SPD							

SCHEDULE 1 – POWER GENERATING MODULE, GENERATING UNIT (OR CCGT MODULE), POWER PARK MODULE, DC CONNECTED POWER PARK MODULE, HVDC SYSTEM AND DC CONVERTER TECHNICAL DATA

PAGE 4 OF 19

DATA DESCRIPTION	UNITS	DATA to RTL		DATA CAT.	GENERATING UNIT (OR CCGT MODULE, AS THE CASE MAY BE)						
		CUSC Cont ract	CUSC App. Form		G1	G2	G3	G4	G5	G6	STN
Rated MVA (PC.A.3.3.1)	MVA	☐	☒	SPD+							
Rated MW (PC.A.3.3.1)	MW	☐	☒	SPD+							
Rated terminal voltage (PC.A.5.3.2.(a) & PC.A.5.4.2 (b))	kV	☐		DPD I							
*Performance Chart at Onshore Synchronous Generating Unit stator terminals (PC.A.3.2.2(f)(i))				SPD	(see OC2 for specification)						
* Performance Chart of the Offshore Synchronous Generating Unit at the Offshore Grid Entry Point (PC.A.3.2.2(f)(iii))											
* Synchronous Generating Unit Performance Chart (PC.A.3.2.2(f))											
* Power Generating Module Performance Chart of the Synchronous Power Generating Module (PC.A.3.2.2(f))											
* Maximum terminal voltage set point (PC.A.5.3.2.(a) & PC.A.5.4.2 (b))	kV	☐		DPD I							
* Terminal voltage set point step resolution – if not continuous (PC.A.5.3.2.(a) & PC.A.5.4.2 (b))	kV	☐		DPD I							
* Output Usable (on a monthly basis) (PC.A.3.2.2(b))	MW			SPD	(except in relation to CCGT Modules when required on a unit basis under the Grid Code , this data item may be supplied under Schedule 3)						
Turbo-Generator inertia constant (for synchronous machines) (PC.A.5.3.2(a))	MW secs /MVA	☐	☒	SPD+							
Short circuit ratio (synchronous machines) (PC.A.5.3.2(a))		☐	☒	SPD+							
Normal auxiliary load supplied by the Generating Unit at rated MW output (PC.A.5.2.1)	MW	☐		DPD II							
	MVA _r	☐		DPD II							
Rated field current at rated MW and MVA _r output and at rated terminal voltage (PC.A.5.3.2 (a))	A	☐		DPD II							
Field current open circuit saturation curve (as derived from appropriate manufacturers' test certificates): (PC.A.5.3.2 (a))											
120% rated terminal volts	A	☐		DPD II							
110% rated terminal volts	A	☐		DPD II							
100% rated terminal volts	A	☐		DPD II							
90% rated terminal volts	A	☐		DPD II							
80% rated terminal volts	A	☐		DPD II							
70% rated terminal volts	A	☐		DPD II							
60% rated terminal volts	A	☐		DPD II							
50% rated terminal volts	A	☐		DPD II							
IMPEDANCES:											
(Unsaturated)											
Direct axis synchronous reactance (PC.A.5.3.2(a))	% on MVA	☐		DPD I							
Direct axis transient reactance (PC.A.3.3.1(a)& PC.A.5.3.2(a))	% on MVA	☐	☒	SPD+							
Direct axis sub-transient reactance (PC.A.5.3.2(a))	% on MVA	☐		DPD I							
Quad axis synch reactance (PC.A.5.3.2(a))	% on MVA	☐		DPD I							
Quad axis sub-transient reactance (PC.A.5.3.2(a))	% on MVA	☐		DPD I							
Stator leakage reactance (PC.A.5.3.2(a))	% on MVA	☐		DPD I							

Armature winding direct current resistance. (PC.A.5.3.2(a))	% on MVA	☐		DPD I								
In Scotland, negative sequence resistance (PC.A.2.5.6 (a) (iv))	% on MVA	☐		DPD I								
Note:- the above data item relating to armature winding direct-current resistance need only be provided by Generators in relation to Generating Units or Synchronous Generating Units within Power Generating Modules commissioned after 1st March 1996 and in cases where, for whatever reason, the Generator is aware of the value of the data item.												

SCHEDULE 1 – POWER GENERATING MODULE, GENERATING UNIT (OR CCGT MODULE), POWER PARK MODULE DC CONNECTED POWER PARK MODULE, HVDC SYSTEM AND DC CONVERTER TECHNICAL DATA

PAGE 5 OF 19

DATA DESCRIPTION	UNITS	DATA to RTL		DATA CAT.	GENERATING UNIT OR STATION DATA						
		CUSC Contract	CUSC App. Form		G1	G2	G3	G4	G5	G6	STN
TIME CONSTANTS (Short-circuit and Unsaturated)											
Direct axis transient time constant (PC.A.5.3.2(a))	S	☐		DPD I							
Direct axis sub-transient time constant (PC.A.5.3.2(a))	S	☐		DPD I							
Quadrature axis sub-transient time constant (PC.A.5.3.2(a))	S	☐		DPD I							
Stator time constant (PC.A.5.3.2(a))	S	☐		DPD I							
MECHANICAL PARAMETERS (PC.A.5.3.2(a))											
The number of turbine generator masses		☐		DPD II							
Diagram showing the Inertia and parameters for each turbine generator mass for the complete drive train	Kgm ²	☐		DPD II							
Diagram showing Stiffness constants and parameters between each turbine generator mass for the complete drive train	Nm/rad	☐		DPD II							
Number of poles		☐		DPD II							
Relative power applied to different parts of the turbine	%	☐		DPD II							
Torsional mode frequencies	Hz	☐		DPD II							
Modal damping decrement factors for the different mechanical modes		☐		DPD II							
GENERATING UNIT STEP-UP TRANSFORMER											
Rated MVA (PC.A.3.3.1 & PC.A.5.3.2)	MVA	☐	■	SPD+							
Voltage Ratio (PC.A.5.3.2)	-	☐		DPD I							
Positive sequence reactance: (PC.A.5.3.2)											
Max tap	% on MVA	☐	■	SPD+							
Min tap	% on MVA	☐	■	SPD+							
Nominal tap	% on MVA	☐	■	SPD+							
Positive sequence resistance: (PC.A.5.3.2)											
Max tap	% on MVA	☐		DPD II							
Min tap	% on MVA	☐		DPD II							
Nominal tap	% on MVA	☐		DPD II							
Zero phase sequence reactance (PC.A.5.3.2)	% on MVA	☐		DPD II							
Tap change range (PC.A.5.3.2)	+% / -%	☐		DPD II							
Tap change step size (PC.A.5.3.2)	%	☐		DPD II							
Tap changer type: on-load or off-circuit (PC.A.5.3.2)	On/Off	☐		DPD II							

SCHEDULE 1 – POWER GENERATING MODULE, GENERATING UNIT (OR CCGT MODULE), POWER PARK MODULE, DC CONNECTED POWER PARK MODULE, HVDC SYSTEM AND DC CONVERTER TECHNICAL DATA

PAGE 6 OF 19

DATA DESCRIPTION	UNITS	DATA to RTL		DATA CAT.	GENERATING UNIT OR STATION DATA						
		CUSC Contract	CUSC App. Form		G1	G2	G3	G4	G5	G6	STN
<u>EXCITATION:</u>											
<u>Note:</u> The data items requested under Option 1 below may continue to be provided by Generators in relation to Generating Units on the System at 9 January 1995 (in this paragraph, the "relevant date") or they may provide the new data items set out under Option 2. Generators must supply the data as set out under Option 2 (and not those under Option 1) for Generating Unit and Synchronous Power Generating Unit excitation control systems commissioned after the relevant date, those Generating Unit or Synchronous Power Generating Unit excitation control systems recommissioned for any reason such as refurbishment after the relevant date and Generating Unit or Synchronous Power Generating Unit excitation control systems where, as a result of testing or other process, the Generator is aware of the data items listed under Option 2 in relation to that Generating Unit or Synchronous Power Generating Unit .											
Option 1											
DC gain of Excitation Loop (PC.A.5.3.2(c))			☐	DPD II							
Max field voltage (PC.A.5.3.2(c))	V		☐	DPD II							
Min field voltage (PC.A.5.3.2(c))	V		☐	DPD II							
Rated field voltage (PC.A.5.3.2(c))	V		☐	DPD II							
Max rate of change of field volts: (PC.A.5.3.2(c))											
Rising	V/Sec		☐	DPD II							
Falling	V/Sec		☐	DPD II							
Details of Excitation Loop (PC.A.5.3.2(c)) Described in block diagram form showing transfer functions of individual elements	Diagram		☐	DPD II	(please attach)						
Dynamic characteristics of over- excitation limiter (PC.A.5.3.2(c))			☐	DPD II							
Dynamic characteristics of under-excitation limiter (PC.A.5.3.2(c))			☐	DPD II							
Option 2											
Exciter category, e.g. Rotating Exciter , or Static Exciter etc (PC.A.5.3.2(c))	Text		☐	■	SPD						
Excitation System Nominal Response V_E	Sec ⁻¹		☐		DPD II						
Rated Field Voltage (PC.A.5.3.2(c)) U_{fN}	V		☐		DPD II						
No-load Field Voltage (PC.A.5.3.2(c)) U_{f0}	V		☐		DPD II						
Excitation System On-Load Positive Ceiling Voltage U_{pL+}	V		☐		DPD II						
Excitation System No-Load Positive Ceiling Voltage U_{p0+}	V		☐		DPD II						
Excitation System No-Load Negative Ceiling Voltage U_{p0-}	V		☐		DPD II						
Power System Stabiliser (PSS) <u>fitted</u> (PC.A.3.4.2)	Yes/No		☐	■	SPD						
Stator Current Limit (PC.A.5.3.2(c))	A		☐		DPD II						
Details of Excitation System (PC.A.5.3.2(c)) (including PSS if fitted) described in block diagram form showing transfer functions of individual elements.	Diagram		☐		DPD II						
Details of Over-excitation Limiter (PC.A.5.3.2(c)) described in block diagram form showing transfer functions of individual elements.	Diagram		☐		DPD II						
Details of Under-excitation Limiter			☐								

(PC.A.5.3.2(c)) described in block diagram form showing transfer functions of individual elements.	Diagram			DPD II							

SCHEDULE 1 – POWER GENERATING MODULE, GENERATING UNIT (OR CCGT MODULE), POWER PARK MODULE, DC CONNECTED POWER PARK MODULE, HVDC SYSTEM AND DC CONVERTER TECHNICAL DATA

PAGE 7 OF 19

DATA DESCRIPTION	UNITS	DATA to RTL		DATA CAT.	GENERATING UNIT OR STATION DATA						
		CUSC Contract	CUSC App. Form		G1	G2	G3	G4	G5	G6	STN
<u>GOVERNOR AND ASSOCIATED PRIME MOVER PARAMETERS</u>											
<u>Note:</u> The data items requested under Option 1 below may continue to be provided by Generators in relation to Generating Units on the System at 9 January 1995 (in this paragraph, the "relevant date") or they may provide the new data items set out under Option 2. Generators must supply the data as set out under Option 2 (and not those under Option 1) for Generating Unit and Synchronous Power Generating Unit governor control systems commissioned after the relevant date, those Generating Unit and Synchronous Power Generating Unit governor control systems recommissioned for any reason such as refurbishment after the relevant date and Generating Unit and Synchronous Power Generating Unit governor control systems where, as a result of testing or other process, the Generator is aware of the data items listed under Option 2 in relation to that Generating Unit and Synchronous Power Generating Unit .											
Option 1											
<u>GOVERNOR PARAMETERS (REHEAT UNITS) (PC.A.5.3.2(d) – Option 1(i))</u>											
HP Governor average gain	MW/Hz	☐		DPD II							
Speeder motor setting range	Hz	☐		DPD II							
HP governor valve time constant	S	☐		DPD II							
HP governor valve opening limits		☐		DPD II							
HP governor valve rate limits		☐		DPD II							
Re-heat time constant (stored Active Energy in reheater)	S	☐		DPD II							
IP governor average gain	MW/Hz	☐		DPD II							
IP governor setting range	Hz	☐		DPD II							
IP governor time constant	S	☐		DPD II							
IP governor valve opening limits		☐		DPD II							
IP governor valve rate limits		☐		DPD II							
Details of acceleration sensitive elements HP & IP in governor loop		☐		DPD II	(please attach)						
Governor block diagram showing transfer functions of individual elements		☐		DPD II	(please attach)						
<u>GOVERNOR (Non-reheat steam and Gas Turbines) (PC.A.5.3.2(d) – Option 1(ii))</u>											
Governor average gain	MW/Hz	☐		DPD II							
Speeder motor setting range		☐		DPD II							
Time constant of steam or fuel governor valve	S	☐		DPD II							
Governor valve opening limits		☐		DPD II							
Governor valve rate limits		☐		DPD II							
Time constant of turbine	S	☐		DPD II							
Governor block diagram		☐		DPD II	(please attach)						

SCHEDULE 1 – POWER GENERATING MODULE, GENERATING UNIT (OR CCGT MODULE), POWER PARK MODULE DC CONNECTED POWER PARK MODULE, HVDC SYSTEM AND DC CONVERTER TECHNICAL DATA
PAGE 8 OF 19

DATA DESCRIPTION	UNITS	DATA to RTL		DATA CAT.	GENERATING UNIT OR STATION DATA						
		CUSC Contract	CUSC App. Form		G1	G2	G3	G4	G5	G6	STN
(PC.A.5.3.2(d) – Option 1(iii)) BOILER & STEAM TURBINE DATA*											
Boiler time constant (Stored Active Energy)	S			DPD II							
HP turbine response ratio: (Proportion of Primary Response arising from HP turbine)	%			DPD II							
HP turbine response ratio: (Proportion of High Frequency Response arising from HP turbine)	%			DPD II							
End of Option 1											
Option 2											
<u>All Generating Units and Synchronous Power Generating Units</u>											
Governor Block Diagram showing transfer function of individual elements including acceleration sensitive elements		□		DPD II							
Governor Time Constant (PC.A.5.3.2(d) – Option 2(i))	Sec	□		DPD II							
#Governor Deadband (PC.A.5.3.2(d) – Option 2(i))											
- Maximum Setting	±Hz			DPD II							
- Normal Setting	±Hz			DPD II							
- Minimum Setting	±Hz			DPD II							
Speeder Motor Setting Range (PC.A.5.3.2(d) – Option 2(i))	%	□		DPD II							
Average Gain (PC.A.5.3.2(d) – Option 2(i))	MW/Hz	□		DPD II							
Steam Units (PC.A.5.3.2(d) – Option 2(ii))											
HP Valve Time Constant	sec	□		DPD II							
HP Valve Opening Limits	%	□		DPD II							
HP Valve Opening Rate Limits	%/sec	□		DPD II							
HP Valve Closing Rate Limits	%/sec	□		DPD II							
HP Turbine Time Constant (PC.A.5.3.2(d) – Option 2(ii))	sec	□		DPD II							
IP Valve Time Constant	sec	□		DPD II							
IP Valve Opening Limits	%	□		DPD II							
IP Valve Opening Rate Limits	%/sec	□		DPD II							
IP Valve Closing Rate Limits	%/sec	□		DPD II							
IP Turbine Time Constant (PC.A.5.3.2(d) – Option 2(ii))	sec	□		DPD II							
LP Valve Time Constant	sec	□		DPD II							
LP Valve Opening Limits	%	□		DPD II							
LP Valve Opening Rate Limits	%/sec	□		DPD II							
LP Valve Closing Rate Limits	%/sec	□		DPD II							
LP Turbine Time Constant (PC.A.5.3.2(d) – Option 2(ii))	sec	□		DPD II							
Reheater Time Constant	sec			DPD II							
Boiler Time Constant	sec			DPD II							
HP Power Fraction	%			DPD II							
IP Power Fraction	%			DPD II							

Where the generating unit or synchronous power generating unit governor does not have a selectable deadband facility, then the actual value of the deadband need only be provided.

SCHEDULE 1 – POWER GENERATING MODULE, GENERATING UNIT (OR CCGT MODULE), POWER PARK MODULE, DC CONNECTED POWER PARK MODULE, HVDC SYSTEM AND DC CONVERTER TECHNICAL DATA

PAGE 9 OF 19

DATA DESCRIPTION	UNITS	DATA to RTL		DATA CAT.	GENERATING UNIT OR STATION DATA						
		CUSC Contract	CUSC App. Form		G1	G2	G3	G4	G5	G6	STN
Gas Turbine Units (PC.A.5.3.2(d) – Option 2(iii))											
Inlet Guide Vane Time Constant	sec	☐		DPD II							
Inlet Guide Vane Opening Limits	%	☐		DPD II							
Inlet Guide Vane Opening Rate Limits	%/sec	☐		DPD II							
Inlet Guide Vane Closing Rate Limits	%/sec	☐		DPD II							
(PC.A.5.3.2(d) – Option 2(iii))											
Fuel Valve Time Constant	sec	☐		DPD II							
Fuel Valve Opening Limits	%	☐		DPD II							
Fuel Valve Opening Rate Limits	%/sec	☐		DPD II							
Fuel Valve Closing Rate Limits	%/sec	☐		DPD II							
(PC.A.5.3.2(d) – Option 2(iii))											
Waste Heat Recovery Boiler Time Constant											
Hydro Generating Units (PC.A.5.3.2(d) – Option 2(iv))											
Guide Vane Actuator Time Constant	sec	☐		DPD II							
Guide Vane Opening Limits	%	☐		DPD II							
Guide Vane Opening Rate Limits	%/sec	☐		DPD II							
Guide Vane Closing Rate Limits	%/sec	☐		DPD II							
Water Time Constant	sec	☐		DPD II							
Synchronous Electricity Storage Units and Modules (PC.A.5.3.2(d) – Option 2(v))											
Valve Actuator Time Constant	sec	☐		DPD II							
Valve Opening Limits	%	☐		DPD II							
Valve Opening Rate Limits	%/sec	☐		DPD II							
Valve Closing Rate Limits	%/sec	☐		DPD II							
For Synchronous Electricity Storage Modules which are derived from compressed air energy storage systems the above data should be provided. For other Synchronous Electricity Storage Modules data should be supplied as required by The Company in accordance with PC.A.7.											
End of Option 2											
UNIT CONTROL OPTIONS* (PC.A.5.3.2(e))											
Maximum droop	%	☐		DPD II							
Normal droop	%	☐		DPD II							
Minimum droop	%	☐		DPD II							
Maximum Governor Deadband				DPD II							
Normal Governor Deadband				DPD II							
Minimum Governor Deadband				DPD II							
Maximum Frequency Response Deadband ¹	±Hz			DPD II							
Normal Frequency Response Deadband ¹	±Hz			DPD II							
Minimum Frequency Response Deadband ¹	±Hz			DPD II							
Maximum Frequency Response Insensitivity ¹	±Hz			DPDII							
Normal Frequency Response Insensitivity ¹	±Hz			DPDII							
Minimum Frequency Response Insensitivity ¹	±Hz			DPDII							

	±Hz ±Hz ±Hz											
Frequency settings between which Unit Load Controller droop applies:												
Maximum	Hz				DPD II							
Normal	Hz				DPD II							
Minimum	Hz				DPD II							
Sustained response normally selected	Yes/No				DPD II							
¹ Data required only in respect of Large Power Stations comprising Type C and Type D Power Generating Modules owned and operated by EU Code Generators .												

SCHEDULE 1 – POWER GENERATING MODULE, GENERATING UNIT (OR CCGT MODULE), POWER PARK MODULE, DC CONNECTED POWER PARK MODULE, HVDC SYSTEM AND DC CONVERTER TECHNICAL DATA

PAGE 10 OF 19

DATA DESCRIPTION	UNITS	DATA to RTL		DATA CAT.	POWER PARK UNIT (OR POWER PARK MODULE, AS THE CASE MAY BE)						
		CUSC Contract	CUSC App. Form		G1	G2	G3	G4	G5	G6	STN
Power Park Module Rated MVA (PC.A.3.3.1(a))	MVA	☐	☒	SPD+							
Power Park Module Rated MW (PC.A.3.3.1(a))	MW	☐	☒	SPD+							
*Performance Chart of a Power Park Module at the connection point (PC.A.3.2.2(f)(ii))				SPD	(see OC2 for specification)						
* Output Usable (on a monthly basis) (PC.A.3.2.2(b))	MW			SPD	(except in relation to CCGT Modules when required on a unit basis under the Grid Code , this data item may be supplied under Schedule 3)						
Number & Type of Power Park Units within each Power Park Module (PC.A.3.2.2(k))		☐		SPD							
Number & Type of Offshore Power Park Units within each Offshore Power Park String and the number of Offshore Power Park Strings and connection point within each Offshore Power Park Module (PC.A.3.2.2.(k))				SPD							
In the case where an appropriate Manufacturer's Data & Performance Report is registered with The Company then subject to The Company's agreement, the report reference may be given as an alternative to completion of the following sections of this Schedule 1 to the end of page 11 with the exception of the sections marked thus # below.	Reference the Manufacturer's Data & Performance Report			SPD							
Power Park Unit Model (including Non Synchronous Electricity Storage Units) - A validated mathematical model in accordance with PC.5.4.2 (a)	Transfer function block diagram and algebraic equations, simulation and measured test results	☐		DPD II							

SCHEDULE 1 – POWER GENERATING MODULE, GENERATING UNIT (OR CCGT MODULE), POWER PARK MODULE DC CONNECTED POWER PARK MODULE, HVDC SYSTEM AND DC CONVERTER TECHNICAL DATA

PAGE 11 OF 19

DATA DESCRIPTION	UNITS	DATA to		DATA CAT.	POWER PARK UNIT (OR POWER PARK MODULE, AS THE CASE MAY BE)						
		CUSC Contract	RTL CUSC App. Form		G1	G2	G3	G4	G5	G6	STN
Power Park Unit Data (where applicable)											
Rated MVA (PC.A.3.3.1(e))	MVA	☐	☒	SPD+							
Rated MW (PC.A.3.3.1(e))	MW	☐	☒	SPD+							
Rated terminal voltage (PC.A.3.3.1(e))	V	☐	☒	SPD+							
Site minimum air density (PC.A.5.4.2(b))	kg/m ³	☐	☒	DPD II							
Site maximum air density	kg/m ³	☐	☒	DPD II							
Site average air density	kg/m ³	☐	☒	DPD II							
Year for which air density data is submitted		☐	☒	DPD II							
Number of pole pairs		☐	☒	DPD II							
Blade swept area	m ²	☐	☒	DPD II							
Gear Box Ratio		☐	☒	DPD II							
Stator Resistance (PC.A.5.4.2(b))	% on MVA	☐	☒	SPD+							
Stator Reactance (PC.A.3.3.1(e))	% on MVA	☐	☒	SPD+							
Magnetising Reactance (PC.A.3.3.1(e))	% on MVA	☐	☒	SPD+							
Rotor Resistance (at starting). (PC.A.5.4.2(b))	% on MVA	☐	☒	DPD II							
Rotor Resistance (at rated running) (PC.A.3.3.1(e))	% on MVA	☐	☒	SPD+							
Rotor Reactance (at starting). (PC.A.5.4.2(b))	% on MVA	☐	☒	DPD II							
Rotor Reactance (at rated running) (PC.A.3.3.1(e))	% on MVA	☐	☒	SPD							
Equivalent inertia constant of the first mass (e.g. wind turbine rotor and blades) at minimum speed (PC.A.5.4.2(b))	MW secs /MVA	☐	☒	SPD+							
Equivalent inertia constant of the first mass (e.g. wind turbine rotor and blades) at synchronous speed (PC.A.5.4.2(b))	MW secs /MVA	☐	☒	SPD+							
Equivalent inertia constant of the first mass (e.g. wind turbine rotor and blades) at rated speed (PC.A.5.4.2(b))	MW secs /MVA	☐	☒	SPD+							
Equivalent inertia constant of the second mass (e.g. generator rotor) at minimum speed (PC.A.5.4.2(b))	MW secs /MVA	☐	☒	SPD+							
Equivalent inertia constant of the second mass (e.g. generator rotor) at synchronous speed (PC.A.5.4.2(b))	MW secs /MVA	☐	☒	SPD+							
Equivalent inertia constant of the second mass (e.g. generator rotor) at rated speed (PC.A.5.4.2(b))	MW secs /MVA	☐	☒	SPD+							
Equivalent shaft stiffness between the two masses (PC.A.5.4.2(b))	Nm / electrical radian	☐	☒	SPD+							

SCHEDULE 1 – POWER GENERATING MODULE, GENERATING UNIT (OR CCGT MODULE), POWER PARK MODULE, DC CONNECTED POWER PARK MODULE, HVDC SYSTEM AND DC CONVERTER TECHNICAL DATA

PAGE 12 OF 19

DATA DESCRIPTION	UNITS	DATA to RTL		DATA CAT.	POWER PARK UNIT (OR POWER PARK MODULE, AS THE CASE MAY BE)						
		CUSC Contract	CUSC App. Form		G1	G2	G3	G4	G5	G6	STN
Minimum generator rotor speed (Doubly Fed Induction Generators) (PC.A.3.3.1(e))	RPM	☐	☒	SPD+							
Maximum generator rotor speed (Doubly Fed Induction Generators) (PC.A.3.3.1(e))	RPM	☐	☒	SPD+							
The optimum generator rotor speed versus wind speed (PC.A.5.4.2(b))	tabular format	☐		DPD II							
Power Converter Rating (Doubly Fed Induction Generators) (PC.A.5.4.2(b))	MVA	☐	☒	DPD II							
The rotor power coefficient (C_p) versus tip speed ratio (λ) curves for a range of blade angles (where applicable) (PC.A.5.4.2(b))	Diagram + tabular format	☐		DPD II							
# The electrical power output versus generator rotor speed for a range of wind speeds over the entire operating range of the Power Park Unit . (PC.A.5.4.2(b))	Diagram + tabular format	☐		DPD II							
The blade angle versus wind speed curve (PC.A.5.4.2(b))	Diagram + tabular format	☐		DPD II							
The electrical power output versus wind speed over the entire operating range of the Power Park Unit . (PC.A.5.4.2(b))	Diagram + tabular format	☐		DPD II							
Transfer function block diagram, parameters and description of the operation of the power electronic converter including fault ride through capability (where applicable). (PC.A.5.4.2(b))	Diagram	☐		DPD II							
For a Power Park Unit consisting of a synchronous machine in combination with a back to back DC Converter or HVDC Converter , or for a Power Park Unit not driven by a wind turbine, the data to be supplied shall be agreed with The Company in accordance with PC.A.7. (PC.A.5.4.2(b))		☐									

SCHEDULE 1 – POWER GENERATING MODULE, GENERATING UNIT (OR CCGT MODULE), POWER PARK MODULE, DC CONNECTED POWER PARK MODULE, HVDC SYSTEM AND DC CONVERTER TECHNICAL DATA

PAGE 13 OF 19

DATA DESCRIPTION	UNITS	DATA to RTL		DATA CAT.	POWER PARK UNIT (OR POWER PARK MODULE, AS THE CASE MAY BE)						
		CUSC Contract	CUSC App. Form		G1	G2	G3	G4	G5	G6	STN
Torque / Speed and blade angle control systems and parameters (PC.A.5.4.2(c)) For the Power Park Unit , details of the torque / speed controller and blade angle controller in the case of a wind turbine and power limitation functions (where applicable) described in block diagram form showing transfer functions and parameters of individual elements	Diagram	□		DPD II							
# Voltage/Reactive Power/Power Factor control system parameters (PC.A.5.4.2(d)) # For the Power Park Unit and Power Park Module details of Voltage/Reactive Power/Power Factor controller (and PSS if fitted) described in block diagram form including parameters showing transfer functions of individual elements.	Diagram	□		DPD II							
# Frequency control system parameters (PC.A.5.4.2(e)) # For the Power Park Unit and Power Park Module details of the Frequency controller described in block diagram form showing transfer functions and parameters of individual elements.	Diagram	□		DPD II							
As an alternative to PC.A.5.4.2 (a), (b), (c), (d), (e) and (f), is the submission of a single complete model that consists of the full information required under PC.A.5.4.2 (a), (b), (c), (d) (e) and (f) provided that all the information required under PC.A.5.4.2 (a), (b), (c), (d), (e) and (f) individually is clearly identifiable. (PC.A.5.4.2(g))	Diagram	□		DPD II							
# Harmonic Assessment Information (PC.A.5.4.2(h)) (as defined in IEC 61400-21 (2001)) for each Power Park Unit :-											
# Flicker coefficient for continuous operation		□		DPD I							
# Flicker step factor		□		DPD I							
# Number of switching operations in a 10 minute window		□		DPD I							
# Number of switching operations in a 2 hour window		□		DPD I							
# Voltage change factor		□		DPD I							
# Current Injection at each harmonic for each Power Park Unit and for each Power Park Module	Tabular format	□		DPD I							
Note:- Generators who own or operate DC Connected Power Park Modules shall supply all data for their DC Connected Power Park Modules as applicable to Power Park Modules .											

SCHEDULE 1 – POWER GENERATING MODULE, GENERATING UNIT (OR CCGT MODULE), POWER PARK MODULE, DC CONNECTED POWER PARK MODULE, HVDC SYSTEM AND DC CONVERTER TECHNICAL DATA

PAGE 14 OF 19

HVDC SYSTEM AND DC CONVERTER STATION TECHNICAL DATA

HVDC SYSTEM OR DC CONVERTER STATION NAME _____

DATE: _____

Data Description	Units	DATA to RTL		Data Category	DC Converter Station Data
(PC.A.4)		CUSC Contract	CUSC App. Form		
HVDC SYSTEM AND DC CONVERTER STATION DEMANDS:					
Demand supplied through Station Transformers associated with the DC Converter Station and HVDC System [PC.A.4.1]	MW MVA _r	☐		DPD II DPD II	
- Demand with all DC Converters and HVDC Converters within and HVDC System operating at Rated MW import.	MW MVA _r	☐		DPD II DPD II	
- Demand with all DC Converters and HVDC Converters within an HVDC System operating at Rated MW export.					
Additional Demand associated with the DC Converter Station or HVDC System supplied through the National Electricity Transmission System . [PC.A.4.1]	MW MVA _r	☐		DPD II DPD II	
- The maximum Demand that could occur.	MW MVA _r	☐		DPD II DPD II	
- Demand at specified time of annual peak half hour of The Company	MW MVA _r	☐		DPD II DPD II	
Demand at Annual ACS Conditions .		☐			
- Demand at specified time of annual minimum half-hour of The Company	Text	☐	■	SPD+	
Demand .		☐			
DC CONVERTER STATION AND HVDC SYSTEM DATA	Text		■	SPD+	
		☐			
Number of poles, i.e. number of DC Converters or HVDC Converters within the HVDC System		☐	■	SPD+	
Pole arrangement (e.g. monopole or bipole)			■		
Details of each viable operating configuration	Diagram	☐	■	SPD	
Configuration 1	Diagram	☐			
	Diagram	☐			

Configuration 2	Diagram	☐			
Configuration 3	Diagram	☐			
Configuration 4	Diagram	☐			
Configuration 5		☐			
Configuration 6	Diagram				
Remote ac connection arrangement		☐			

**SCHEDULE 1 – POWER PARK MODULE, GENERATING UNIT (OR CCGT MODULE),
POWER PARK MODULE, DC CONNECTED POWER PARK MODULE, HVDC SYSTEM
AND DC CONVERTER TECHNICAL DATA**

PAGE 15 OF 19

Data Description	Units	DATA to RTL		Data Category	Operating Configuration					
		CUSC Contract	CUSC App. Form		1	2	3	4	5	6
DC CONVERTER STATION AND HVDC SYSTEM DATA (PC.A.3.3.1d)										
DC Converter or HVDC Converter Type (e.g. current or Voltage source)	Text	□	■	SPD						
Point of connection to the National Electricity Transmission System (or the Total System if Embedded) of the DC Converter Station or HVDC System configuration in terms of geographical and electrical location and system voltage	Text	□	■	SPD						
If the busbars at the Connection Point are normally run in separate sections identify the section to which the DC Converter Station or HVDC System configuration is connected	Section Number	□	■	SPD						
	MW			SPD +						
Rated MW import per pole [PC.A.3.3.1]	MW	□	■	SPD +						
Rated MW export per pole [PC.A.3.3.1]		□	■							

Data Description	Units	DATA to RTL		Data Category	Operating Configuration					
		CUSC Contract	CUSC App. Form		1	2	3	4	5	6
ACTIVE POWER TRANSFER CAPABILITY (PC.A.3.2.2)										
Registered Capacity	MW	☐	☒	SPD						
Registered Import Capacity	MW	☐	☒							
Minimum Generation	MW	☐	☒	SPD						
Minimum Import Capacity	MW	☐	☒							
Maximum HVDC Active Power	MW									
Transmission Capacity	MW	☐		SPD						
Minimum Active Power Transmission Capacity	MW	☐		SPD						
Import MW available in excess of Registered Import Capacity and Maximum Active Power Transmission Capacity	MW	☐		SPD						
Time duration for which MW in excess of Registered Import Capacity is available	Min	☐		SPD						
Export MW available in excess of Registered Capacity and Maximum Active Power Transmission Capacity .	MW	☐		SPD						
Time duration for which MW in excess of Registered Capacity is available	Min	☐		SPD						

SCHEDULE 1 –POWER GENERATING MODULE, GENERATING UNIT (OR CCGT MODULE), POWER PARK MODULE, DC CONNECTED POWER PARK MODULE, HVDC SYSTEM AND DC CONVERTER TECHNICAL DATA

PAGE 16 OF 19

Data Description	Units	DATA to RTL		Data Category	Operating Configuration					
		CUSC Contract	CUSC App. Form		1	2	3	4	5	6
DC CONVERTER AND HVDC CONVERTER TRANSFORMER [PC.A.5.4.3.1]										
Rated MVA	MVA	☐		DPD II						
Winding arrangement		☐		DPD II						
Nominal primary voltage	kV	☐		DPD II						
Nominal secondary (converter-side) voltage(s)	kV			DPD II						
Positive sequence reactance										
Maximum tap	% on MVA	☐		DPD II						
Nominal tap	% on MVA	☐		DPD II						
Minimum tap	% on MVA	☐		DPD II						
Positive sequence resistance										
Maximum tap	% on MVA	☐		DPD II						
Nominal tap	% on MVA	☐		DPD II						
Minimum tap	% on MVA	☐		DPD II						
Zero phase sequence reactance	% on MVA	☐		DPD II						
Tap change range	+% / -%	☐		DPD II						
Number of steps				DPD II						

**SCHEDULE 1 – POWER GENERATING MODULE, GENERATING UNIT (OR
CCGT MODULE), DC CONNECTED POWER PARK MODULE, HVDC SYSTEM,
POWER PARK MODULE AND DC CONVERTER TECHNICAL DATA**

PAGE 17 OF 19

Data Description	Units	DATA to RTL		Data Category	Operating configuration					
		CUSC Contract	CUSC App. Form		1	2	3	4	5	6
DC NETWORK [PC.A.5.4.3.1 (c)] Rated DC voltage per pole Rated DC current per pole Details of the DC Network described in diagram form including resistance, inductance and capacitance of all DC cables and/or DC lines. Details of any line reactors (including line reactor resistance), line capacitors, DC filters, earthing electrodes and other conductors that form part of the DC Network should be shown.	kV A Diagram	☐ ☐ ☐		DPD II DPD II DPD II						
DC CONVERTER STATION AND HVDC SYSTEM AC HARMONIC FILTER AND REACTIVE COMPENSATION EQUIPMENT [PC.A.5.4.3.1 (d)] For all switched reactive compensation equipment Total number of AC filter banks Diagram of filter connections Type of equipment (e.g. fixed or variable) Capacitive rating; or Inductive rating; or Operating range Reactive Power capability as a function of various MW transfer levels	Diagram Text Diagram Text MVar MVar MVar Table	☐ ☐ ☐ ☐ ☐ ☐ ☐	■ ■ ■	DPD II DPD II DPD II DPD II DPD II DPD II DPD II						

SCHEDULE 1 – POWER GENERATING MODULE, GENERATING UNIT (OR CCGT MODULE), POWER PARK MODULE, DC CONNECTED POWER PARK MODULE, HVDC SYSTEM AND DC CONVERTER TECHNICAL DATA

Data Description	Units	DATA to RTL		Data Category	Operating configuration					
		CUSC Contract	CUSC App. Form		1	2	3	4	5	6
CONTROL SYSTEMS [PC.A.5.4.3.2]										
Static $V_{DC} - P_{DC}$ (DC voltage – DC power) or Static $V_{DC} - I_{DC}$ (DC voltage – DC current) characteristic (as appropriate) when operating as –Rectifier –Inverter										
Details of rectifier mode control system, in block diagram form together with parameters showing transfer functions of individual elements.	Diagram Diagram	☐ ☐		DPD II DPD II						
Details of inverter mode control system, in block diagram form showing transfer functions of individual elements including parameters.	Diagram	☐		DPD II						
Details of converter transformer tap changer control system in block diagram form showing transfer functions of individual elements including parameters. (Only required for DC Converters and HVDC Systems connected to the National Electricity Transmission System .)	Diagram	☐		DPD II						
Details of AC filter and reactive compensation equipment control systems in block diagram form showing transfer functions of individual elements including parameters. (Only required for DC Converters and HVDC Systems connected to the National Electricity Transmission System .)	Diagram	☐		DPD II						
Details of any frequency and/or load control systems in block diagram form showing transfer functions of individual elements including parameters.	Diagram	☐		DPD II						
Details of any large or small signal modulating controls, such as power oscillation damping controls or sub-synchronous oscillation damping controls, that have not been submitted as part of the above control system data.	Diagram	☐		DPD II						
Details of HVDC Converter unit models and/or control systems in block diagram form showing transfer functions of individual elements including parameters.	Diagram	☐		DPD II						
Details of AC component models and/or control systems in block diagram form showing transfer functions of individual elements including parameters.	Diagram	☐ ☐		DPD II						
Details of DC Grid models and/or control systems in block diagram form showing transfer functions of individual elements including parameters.	Diagram	☐		DPD II						
Details of Voltage and power controller and/or control systems in block diagram form showing transfer functions of individual elements including parameters.	Diagram	☐		DPD II						
Details of Special control features if applicable (e.g., power oscillation damping (POD) function, subsynchronous torsional interaction (SSTI) control and/or control systems in block diagram form showing transfer functions of individual elements including parameters.	Diagram	☐		DPD II						
	Diagram	☐		DPD II						

Data Description	Units	DATA to RTL		Data Category	Operating configuration					
		CUSC Contract	CUSC App. Form		1	2	3	4	5	6
Details of Multi terminal control, if applicable and/or control systems in block diagram form showing transfer functions of individual elements including parameters.	Diagram	☐		DPD II						
Details of HVDC System protection models as agreed between The Company the HVDC System Owner and/or control systems in block diagram form showing transfer functions of individual elements including parameters.	Diagram	☐		DPD II						
Transfer block diagram representation of the reactive power control at converter ends for a voltage source converter		☐								
Transfer block diagram representation of the reactive power control at converter ends for a voltage source converter.		☐								
		☐								
		☐								
		☐								
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SCHEDULE 1 – POWER GENERATING MODULE, GENERATING UNIT (OR CCGT MODULE), POWER PARK MODULE, DC CONNECTED POWER PARK MODULE, HVDC SYSTEM AND DC CONVERTER TECHNICAL DATA

PAGE 19 OF 19

Data Description	Units	DATA to RTL		Data Category	Operating configuration					
		CUSC Contract	CUSC App. Form		1	2	3	4	5	6
LOADING PARAMETERS [PC.A.5.4.3.3]										
MW Export										
Nominal loading rate	MW/s			DPD I						
Maximum (emergency) loading rate	MW/s			DPD I						
MW Import										
Nominal loading rate	MW/s			DPD I						
Maximum (emergency) loading rate	MW/s			DPD I						
Maximum recovery time, to 90% of pre-fault loading, following an AC system fault or severe voltage depression.	s	□		DPD II						
Maximum recovery time, to 90% of pre-fault loading, following a transient DC Network fault.	s	□		DPD II						

NOTE: **Users** are referred to Schedules 5 & 14 which set down data required for all **Users** directly connected to the **National Electricity Transmission System**, including **Power Stations**. **Generators** undertaking **OTSDUW Arrangements** and are utilising an **OTSDUW DC Converter** are referred to Schedule 18.

SCHEDULE 2 - GENERATION PLANNING PARAMETERS

PAGE 1 OF 3

This schedule contains the **Genset Generation Planning Parameters** required by **The Company** to facilitate studies in **Operational Planning** timescales.

For a **Generating Unit** including those within a **Power Generating Module** (other than a **Power Park Unit**) at a **Large Power Station**, the information is to be submitted on a unit basis and for a **CCGT Module** or **Power Park Module** at a **Large Power Station** the information is to be submitted on a module basis, unless otherwise stated.

Where references to **CCGT Modules** or **Power Park Modules** at a **Large Power Station** are made, the columns "G1" etc should be amended to read "M1" etc, as appropriate.

Restoration Contractors, data only needs to be provided by a **Restoration Contractor** where they are not a **CUSC Party** and the data has not been submitted. In this case the data to be submitted would be pursuant to the the terms of the **Anchor Restoration Contract** or **Top Up Restoration Contract** if required.

Power Station: _____

Generation Planning Parameters

DATA DESCRIPTION	UNITS	DATA to RTL		DATA CAT.	GENSET OR STATION DATA						
		CUSC Contract	CUSC App. Form		G1	G2	G3	G4	G5	G6	STN
<u>OUTPUT CAPABILITY</u> (PC.A.3.2.2) Registered Capacity on a station and unit basis (on a station and module basis in the case of a CCGT Module or Power Park Module at a Large Power Station)	MW	☐	☒	SPD							
Maximum Capacity on a Power Generating Module basis and Synchronous Generating Unit basis and Registered Capacity on a Power Station basis)	MW	☐	☒	SPD							
Minimum Generation (on a module basis in the case of a CCGT Module or Power Park Module at a Large Power Station)	MW	☐	☒	SPD							
Minimum Stable Operating Level (on a module basis in the case of a Power Generating Module at a Large Power Station)	MW	☐	☒	SPD							
MW available from Power Generating Modules and Generating Units or Power Park Modules in excess of Registered Capacity or Maximum Capacity	MW	☐	☒	SPD							
<u>REGIME UNAVAILABILITY</u>											
These data blocks are provided to allow fixed periods of unavailability to be registered.											
<u>Expected Running Regime.</u> Is Power Station normally available for full output 24 hours per day, 7 days per week? If No please provide details of unavailability below. (PC.A.3.2.2.)		☐	☒	SPD							
Earliest Synchronising time: OC2.3.2.1(a)											
Monday	hr/min	☒		OC2							-
Tuesday – Friday	hr/min	☒		OC2							-
Saturday – Sunday	hr/min	☒		OC2							-
Latest De-Synchronising time: OC2.3.2.1(a)											
Monday – Thursday	hr/min	☒		OC2							-
Friday	hr/min	☒		OC2							-
Saturday – Sunday	hr/min	☒		OC2							-

SYNCHRONISING PARAMETERS											
OC2.3.2.1(a) Notice to Deviate from Zero (NDZ) after 48 hour Shutdown	Mins	■		OC2							
Station Synchronising Intervals (SI) after 48 hour Shutdown	Mins	■			-	-	-	-	-	-	
Synchronising Group (if applicable)	1 to 4	■		OC2							-

SCHEDULE 2 - GENERATION PLANNING PARAMETERS

PAGE 2 OF 3

DATA DESCRIPTION	UNITS	DATA to RTL		DATA CAT.	GENSET OR STATION DATA						
		CUSC Contract	CUSC App. Form		G1	G2	G3	G4	G5	G6	STN
Synchronising Generation (SYG) after 48 hour Shutdown <i>PC.A.5.3.2(f) & OC2.3.2.1(a)</i>	MW	■		DPD II & OC2							-
De-Synchronising Intervals (Single value) <i>OC2.3.2.1(a)</i>	Mins	■		OC2	-	-	-	-	-	-	
<u>RUNNING AND SHUTDOWN PERIOD LIMITATIONS:</u>											
Minimum Non Zero time (MNZT) after 48 hour Shutdown <i>OC2.3.2.1(a)</i>	Mins	■		OC2							
Minimum Zero time (MZT) <i>OC2.3.2.1(a)</i>	Mins			OC2							
Existing AGR Plant Flexibility Limit (Existing AGR Plant only)	No.			OC2							
80% Reactor Thermal Power (expressed as Gross-Net MW) (Existing AGR Plant only)	MW			OC2							
Frequency Sensitive AGR Unit Limit (Frequency Sensitive AGR Units only)	No.			OC2							
<u>RUN-UP PARAMETERS</u> <i>PC.A.5.3.2(f) & OC2.3.2.1(a)</i> <u>Run-up rates</u> (RUR) after 48 hour Shutdown: (See note 2 page 3) MW Level 1 (MWL1) MW Level 2 (MWL2)					(Note that for DPD only a single value of run-up rate from Synch Gen to Registered Capacity is required)						
	MW	■		DPD II OC2							-
	MW	■		DPD II OC2							-
RUR from Synch. Gen to MWL1	MW/Mins	■		DPD II OC2							
RUR from MWL1 to MWL2	MW/Mins	■		OC2							
RUR from MWL2 to RC	MW/Mins	■		OC2							
<u>Run-Down Rates (RDR):</u>					(Note that for DPD only a single value of run-down rate from Registered Capacity to de- synch is required)						
MWL2	MW	■		DPD II OC2							
RDR from RC to MWL2	MW/Min	■		DPD II OC2							
MWL1	MW	■		DPD II OC2							
RDR from MWL2 to MWL1	MW/Min	■		DPD II OC2							
RDR from MWL1 to de-synch	MW/Min	■		DPD II OC2							

SCHEDULE 2 - GENERATION PLANNING PARAMETERS

PAGE 3 OF 3

DATA DESCRIPTION	UNITS	DATA to RTL		DATA CAT.	GENSET OR STATION DATA						
		CUSC Contract	CUSC App. Form		G1	G2	G3	G4	G5	G6	STN
<u>REGULATION PARAMETERS</u> OC2.3.2.1(a) Regulating Range Load rejection capability while still Synchronised and able to supply Load .	MW MW	■ ■		DPD II DPD II							
<u>GAS TURBINE LOADING PARAMETERS:</u> OC2.3.2.1(a) Fast loading Slow loading	MW/Min MW/Min	■ ■		OC2 OC2							
<u>CCGT MODULE PLANNING MATRIX</u>				OC2	(please attach)						
POWER PARK MODULE PLANNING MATRIX				OC2	(please attach)						
Power Park Module Active Power Output/ Intermittent Power Source Curve (e.g., MW output / Wind speed)				OC2	(please attach)						

NOTES:

- (1) To allow for different groups of **Gensets** within a **Power Station** (e.g., **Gensets** with the same operator) each **Genset** may be allocated to one of up to four **Synchronising Groups**. Within each such **Synchronising Group** the single synchronising interval will apply but between **Synchronising Groups** a zero synchronising interval will be assumed.
- (2) The run-up of a **Genset** from synchronising block load to **Registered Capacity** or **Maximum Capacity** is represented as a three stage characteristic in which the run-up rate changes at two intermediate loads, MWL1 and MWL2. The values MWL1 & MWL2 can be different for each **Genset**.

SCHEDULE 3 - LARGE POWER STATION OUTAGE PROGRAMMES, OUTPUT USABLE AND INFLEXIBILITY INFORMATION PAGE 1 OF 1

(Also outline information on contracts involving **External Interconnections**)

For a **Generating Unit** at a **Large Power Station** the information is to be submitted on a unit basis and for a **CCGT Module** or **Power Park Module** at a **Large Power Station** the information is to be submitted on a module basis, unless otherwise stated.

In the case of **Restoration Contractors**, data only needs to be provided by a **Restoration Contractor** where such a **Restoration Contractor** is not a **CUSC Party** and the data has not been submitted previously. In this case, the data to be submitted would be would be pursuant to the the terms of the **Anchor Restoration Contract** or **Top Up Restoration Contract**.

DATA DESCRIPTION	UNITS	TIME COVERED	UPDATE TIME	DATA CAT	DATA to RTL	
<u>OUTPUT PROFILES</u>						
					CUSC Contract	CUSC App. Form
In the case of Large Power Stations whose output may be expected to vary in a random manner (e.g., wind power) or to some other pattern (e.g., Tidal) sufficient information is required to enable an understanding of the possible profile	MW	F. yrs 1 - 7	Week 24	SPD		

Notes: 1. The week numbers quoted in the Update Time column refer to standard weeks in the current year.

SCHEDULE 4 - LARGE POWER STATION DROOP AND RESPONSE DATA

PAGE 1 OF 1

GOVERNOR DROOP AND RESPONSE (PC.A.5.5 ■ CUSC Contract)

The Data in this Schedule 4 is to be supplied by **Generators** with respect to all **Large Power Stations, HVDC System Owners** and by **DC Converter Station** owners (where agreed), whether directly connected or **Embedded**

DATA DESCRIPTION	NORMAL VALUE	MW	DATA CAT	DROOP%			RESPONSE CAPABILITY		
				Unit 1	Unit 2	Unit 3	Primary	Secondary	High Frequency
MLP1	Designed Minimum Operating Level or Minimum Regulating Level (for a CCGT Module or Power Park Module , on a modular basis assuming all units are Synchronised)								
MLP2	Minimum Generation or Minimum Stable Operating Level (for a CCGT Module or Power Park Module , or Power Generating Module on a modular basis assuming all units are Synchronised)								
MLP3	70% of Registered Capacity or Maximum Capacity								
MLP4	80% of Registered Capacity or Maximum Capacity								
MLP5	95% of Registered Capacity or Maximum Capacity								
MLP6	Registered Capacity or Maximum Capacity								

Notes:

- The data provided in this Schedule 4 is not intended to constrain any **Ancillary Services Agreement**.
- Registered Capacity** or **Maximum Capacity** should be identical to that provided in Schedule 2.
- The Governor **Droop** should be provided for each **Generating Unit** (excluding **Power Park Units**), **Power Park Module**, **HVDC Converter** or **DC Converter**. The Response Capability should be provided for each **Genset** or **DC Converter**.
- Primary, Secondary** and **High Frequency Response** are defined in CC.A.3.2 or ECC.A.3.2 and are based on a frequency ramp of 0.5Hz over 10 seconds. **Primary Response** is the minimum value of response between 10s and 30s after the frequency ramp starts, **Secondary Response** between 30s and 30 minutes, and **High Frequency Response** is the minimum value after 10s on an indefinite basis.
- For plants which have not yet **Synchronised**, the data values of MLP1 to MLP6 should be as described above. For plants which have already **Synchronised**, the values of MLP1 to MLP6 can take any value between **Designed Operating Minimum Level** or **Minimum Regulating Level** and **Registered Capacity** or **Maximum Capacity**. If MLP1 is not provided at the **Designed Minimum Operating Level**, the value of the **Designed Minimum Operating Level** should be separately stated.
- For the avoidance of doubt **Transmission DC Converters** and **OTSDUW DC Converters** must be capable of providing a continuous signal indicating the real time frequency measured at the **Transmission Interface Point** to the **Offshore Grid Entry Point** (as detailed in CC.6.3.7(e)(vii) and CC.6.3.7(e)(viii) or ECC.6.3.3.1.1(f) to enable **Offshore Power Generating Modules, Offshore Generating Units, Offshore Power Park Modules** and/or **Offshore DC Converters** to satisfy the frequency response requirements of CC.6.3.7 or ECC.6.3.7.
- Alternative governor settings shall be supplied by **Generators, HVDC System Owners** and **DC Converter Owners** where operation is required as part of **System Restoration** - as required in CC.6.3.5 or ECC.6.3.5.2 and ECC.6.3.5.5(vii).

SCHEDULE 5 - USERS SYSTEM DATA

PAGE 1 OF 11

The data in this Schedule 5 is required from **Users** who are connected to the **National Electricity Transmission System** via a **Connection Point** (or who are seeking such a connection). **Generators** undertaking **OTSDUW** should use **DRC** Schedule 18 although they should still supply data under Schedule 5 in relation to their **User's System** up to the **Offshore Grid Entry Point**.

Table 5 (a)

DATA DESCRIPTION	UNITS	DATA to RTL		DATA CATEGORY
USERS SYSTEM LAYOUT (PC.A.2.2) A Single Line Diagram showing all or part of the User's System is required. This diagram shall include:- (a) all parts of the User's System, whether existing or proposed, operating at Supergrid Voltage, and in Scotland and Offshore, also all parts of the User System operating at 110kV and greater, (b) all parts of the User's System operating at a voltage of 50kV and greater, and in Scotland and Offshore greater than 30kV, or higher which can interconnect Connection Points, or split bus-bars at a single Connection Point, (c) all parts of the User's System between Embedded Medium Power Stations or Large Power Stations or Offshore Transmission Systems connected to the User's Subtransmission System and the relevant Connection Point or Interface Point, (d) all parts of the User's System at a Transmission Site. The Single Line Diagram may also include additional details of the User's Subtransmission System, and the transformers connecting the User's Subtransmission System to a lower voltage. With The Company's agreement, it may also include details of the User's System at a voltage below the voltage of the Subtransmission System. This Single Line Diagram shall depict the arrangement(s) of all of the existing and proposed load current carrying Apparatus relating to both existing and proposed Connection Points, showing electrical circuitry (i.e., overhead lines, underground cables, power transformers and similar equipment), operating voltages. In addition, for equipment operating at a Supergrid Voltage, and in Scotland and Offshore also at 110kV and greater, circuit breakers and phasing arrangements shall be shown.		CUSC Contract	CUSC App. Form	SPD
		■	■	
		■	■	
		■	■	
		■	■	
		■	■	
		■	■	

SCHEDULE 5 - USERS SYSTEM DATA

PAGE 2 OF 11

Table 5(b)

DATA DESCRIPTION	UNITS	DATA EXCH		DATA CATEGORY
		CUSC Contract	CUSC App. Form	
<u>REACTIVE COMPENSATION</u> (PC.A.2.4)				
For independently switched reactive compensation equipment not owned by a Relevant Transmission Licensee connected to the User's System at 132kV and above, and also in Scotland and Offshore , connected at 33kV and above, other than power factor correction equipment associated with a customer's Plant or Apparatus :				
Type of equipment (e.g., fixed or variable)	Text	■	■	SPD
Capacitive rating; or	MVAr	■	■	SPD
Inductive rating; or	MVAr	■	■	SPD
Operating range	MVAr	■	■	SPD
Details of automatic control logic to enable operating characteristics to be determined	text and/or diagrams	■	■	SPD
Point of connection to User's System (electrical location and system voltage)	Text	■	■	SPD
<u>SUBSTATION INFRASTRUCTURE</u> (PC.A.2.2.6(b))				
For the infrastructure associated with any User's equipment at a Substation owned by a Relevant Transmission Licensee or operated or managed by The Company :-				
Rated 3-phase rms short-circuit withstand current	kA	■	■	SPD
Rated 1-phase rms short-circuit withstand current	kA	■	■	SPD
Rated Duration of short-circuit withstand	s	■	■	SPD
Rated rms continuous current	A	■	■	SPD

SCHEDULE 5 – USERS SYSTEM DATA

PAGE 3 OF 11

Table 5 (c)

DATA DESCRIPTION		UNITS	DATA EXCH		DATA CATEGORY
LUMPED SUSCEPTANCES (<i>PC.A.2.3</i>)			CUSC Contract	CUSC App. Form	
Equivalent Lumped Susceptance required for all parts of the User's Subtransmission System which are not included in the Single Line Diagram .			■	■	
This should not include:			■	■	
(a)	independently switched reactive compensation equipment identified above.		■	■	
(b)	any susceptance of the User's System inherent in the Demand (Reactive Power) data provided in Schedule 1 (Generator Data) or Schedule 11 (Connection Point data).		■	■	
Equivalent lumped shunt susceptance at nominal Frequency .		% on 100 MVA	■	■	SPD

SCHEDULE 5 – USERS SYSTEM DATA

PAGE 4 OF 11

USER'S SYSTEM DATA

Circuit Parameters (PC.A.2.2.4) (■ CUSC Contract & ■ CUSC Application Form)

The data below is all **Standard Planning Data**. Details are to be given for all circuits shown on the **Single Line Diagram**

Table 5 (d)

Years Valid	Node 1	Node 2	Rated Voltage kV	Operating Voltage kV	Positive Phase Sequence % on 100 MVA			Zero Phase Sequence (self) % on 100 MVA			Zero Phase Sequence (mutual) % on 100 MVA		
					R	X	B	R	X	B	R	X	B

Notes

1. Data should be supplied for the current, and each of the nine succeeding Financial Years. This should be done by showing for which years the data is valid in the first column of the Table.

SCHEDULE 5 – USERS SYSTEM DATA

PAGE 5 OF 11

USERS SYSTEM DATA

Transformer Data (PC.A.2.2.5) (■ CUSC Contract & ■ CUSC Application Form)

The data below is all **Standard Planning Data**, and details should be shown below of all transformers shown on the **Single Line Diagram**. Details of Winding Arrangement, Tap Changer and earthing details are only required for transformers connecting the **User's** higher voltage system with its Primary Voltage System.

Table 5 (e)

Years valid	Name of Node of Connection	Transformer	Rating MVA	Voltage Ratio		Positive Phase Sequence Reactance % on Rating			Positive Phase Sequence Resistance % on Rating			Zero Sequence Reactance % on Rating	Winding Arr	Tap Changer			Earthing Details (delete as app)*
				HV	LV	Max Tap	Min Tap	Norm Tap	Max Tap	Min Tap	Norm Tap			Range +% to -%	Step size %	Type (delete)	
																ON/OFF	Direct/Res/Rea
																ON/OFF	Direct/Res/Rea
																ON/OFF	Direct/Res/Rea
																ON/OFF	Direct/Res/Rea
																ON/OFF	Direct/Res/Rea
																ON/OFF	Direct/Res/Rea

*If Resistance or Reactance please give impedance value

Notes

1. Data should be supplied for the current, and each of the nine succeeding Financial Years. This should be done by showing for which years the data is valid in the first column of the Table
2. For a transformer with two secondary windings, the positive and zero phase sequence leakage impedances between the HV and LV1, HV and LV2, and LV1 and LV2 windings are required.

SCHEDULE 5 –USERS SYSTEM DATA
PAGE 6 OF 11

USER’S SYSTEM DATA

Switchgear Data (PC.A.2.2.6(a)) (■ CUSC Contract & CUSC Application Form ■)

The data below is all **Standard Planning Data**, and should be provided for all switchgear (i.e., circuit breakers, load disconnectors and disconnectors) operating at a **Supergrid Voltage**, and also in Scotland and **Offshore**, operating at 132kV. In addition, data should be provided for all circuit breakers irrespective of voltage located at a **Connection Site** which is owned by a **Relevant Transmission Licensee** or operated or managed by **The Company**.

Table 5(f)

Year s Valid	Connectio n Point	Switc h No	Rated Volutag e kV rms	Operatin g Votage kV rms	Rated short- circuit breaking current		Rated short- circuit peak making current		Rated rms continuou s current (A)	DC time constant at testing of asymmetrica l breaking ability (s)
					3 Phas e kA rms	1 Phas e kA rms	3 Phas e kA	1 Phas e kA		

Notes

1. Rated Voltage should be as defined by IEC 694.
Data should be supplied for the current, and each of the nine succeeding Financial Years. This should be done by showing for which years the data is valid in the first column of the Table

SCHEDULE 5 –USERS SYSTEM DATA

PAGE 7 OF 11

Table 5(g)

DATA DESCRIPTION	UNITS	DATA to RTL		DATA CATEGORY
<u>PROTECTION SYSTEMS</u> (PC.A.6.3) The following information relates only to Protection equipment which can trip or inter-trip or close any Connection Point circuit breaker or any Transmission circuit breaker. The information need only be supplied once, in accordance with the timing requirements set out in PC.A.1.4 (b) and need not be supplied on a routine annual basis thereafter, although The Company should be notified if any of the information changes.		CUSC Contract	CUSC App. Form	
(a) A full description, including estimated settings, for all relays and Protection systems installed or to be installed on the User's System ;		▪		DPD II
(b) A full description of any auto-reclose facilities installed or to be installed on the User's System , including type and time delays;		▪		DPD II
(c) A full description, including estimated settings, for all relays and Protection systems installed or to be installed on the Power Generating Module, Power Park Module or Generating Unit's generator transformer, unit transformer, station transformer and their associated connections;		▪		DPD II
(d) For Generating Units (other than Power Park Units) having a circuit breaker at the generator terminal voltage clearance times for electrical faults within the Generating Unit zone must be declared.		▪		DPD II
(e) Fault Clearance Times: Most probable fault clearance time for electrical faults on any part of the Users System directly connected to the National Electricity Transmission System .	msec	▪		DPD II
(f) Alternative Protection data as submitted under (a) to (e) above in respect of System Restoration		▪		DPD II

DATA DESCRIPTION	UNITS	DATA to RTL		DATA CATEGORY
POWER PARK MODULE/UNIT PROTECTION SYSTEMS Details of settings for the Power Park Module/Unit protection relays (to include): (PC.A.5.4.2(f))		CUSC Contract	CUSC App. Form	
(a) Under frequency,		▪		DPD II
(b) Over Frequency,		▪		DPD II
(c) Under Voltage, Over Voltage,		▪		DPD II
(d) Rotor Over current,		▪		DPD II
(e) Stator Over current,		▪		DPD II
(f) High Wind Speed Shut Down Level,		▪		DPD II
(g) Rotor Underspeed,		▪		DPD II

(h)	Rotor Overspeed.		▪		DPD II

SCHEDULE 5 - USERS SYSTEM DATA

PAGE 8 OF 11

Information for Transient Overvoltage Assessment (DPD I) (PC.A.6.2 ■ CUSC Contract)

The information listed below may be requested by **The Company** from each **User** with respect to any **Connection Site** between that **User** and the **National Electricity Transmission System**. The impact of any third party **Embedded** within the **Users System** should be reflected.

- (a) Busbar layout plan(s), including dimensions and geometry showing positioning of any current and voltage transformers, through bushings, support insulators, disconnectors, circuit breakers, surge arresters, etc. Electrical parameters of any associated current and voltage transformers, stray capacitances of wall bushings and support insulators, and grading capacitances of circuit breakers;
- (b) Electrical parameters and physical construction details of lines and cables connected at that busbar. Electrical parameters of all plant e.g., transformers (including neutral earthing impedance or zig-zag transformers if any), series reactors and shunt compensation equipment connected at that busbar (or to the tertiary of a transformer) or by lines or cables to that busbar;
- (c) Basic insulation levels (BIL) of all **Apparatus** connected directly, by lines or by cables to the busbar;
- (d) Characteristics of overvoltage **Protection** devices at the busbar and at the termination points of all lines, and all cables connected to the busbar;
- (e) Fault levels at the lower voltage terminals of each transformer connected directly or indirectly to the **National Electricity Transmission System** without intermediate transformation;
- (f) The following data is required on all transformers operating at **Supergrid Voltage** throughout **Great Britain** and, in Scotland and **Offshore**, also at greater than 110kV: three or five limb cores or single phase units to be specified, and operating peak flux density at nominal voltage.
- (g) An indication of which items of equipment may be out of service simultaneously during **Planned Outage** conditions.

Harmonic Studies (DPD I) (PC.A.6.4 ■ CUSC Contract)

The information given below, both current and forecast, where not already supplied in this Schedule 5 may be requested by **The Company** from each **User** if it is necessary for **The Company** to evaluate the production/magnification of harmonic distortion on the **National Electricity Transmission System** and **User's** systems. The impact of any third party **Embedded** within the **User's System** should be reflected:

- (a) Overhead lines and underground cable circuits of the **User's Subtransmission System** must be differentiated and the following data provided separately for each type:
 - Positive phase sequence resistance
 - Positive phase sequence reactance
 - Positive phase sequence susceptance
- (b) for all transformers connecting the **User's Subtransmission System** to a lower voltage:
 - Rated MVA
 - Voltage Ratio
 - Positive phase sequence resistance
 - Positive phase sequence reactance

SCHEDULE 5 – USERS SYSTEM DATA

PAGE 9 OF 11

- (c) at the lower voltage points of those connecting transformers:

Equivalent positive phase sequence susceptance

Connection voltage and MVar rating of any capacitor bank and component design parameters if configured as a filter

Equivalent positive phase sequence interconnection impedance with other lower voltage points

The minimum and maximum **Demand** (both MW and MVar) that could occur

Harmonic current injection sources in Amps at the Connection voltage points

Details of traction loads, e.g., connection phase pairs, continuous variation with time, etc.

- (d) an indication of which items of equipment may be out of service simultaneously during **Planned Outage** conditions

Voltage Assessment Studies (DPD I) (PC.A.6.5 ■ CUSC Contract)

The information listed below, where not already supplied in this Schedule 5, may be requested by **The Company** from each **User** with respect to any **Connection Site** if it is necessary for **The Company** to undertake detailed voltage assessment studies (e.g., to examine potential voltage instability, voltage control co-ordination or to calculate voltage step changes). The impact of any third party **Embedded** within the **Users System** should be reflected:

- (a) For all circuits of the **User's Subtransmission System**:

Positive Phase Sequence Reactance

Positive Phase Sequence Resistance

Positive Phase Sequence Susceptance

MVar rating of any reactive compensation equipment

- (b) for all transformers connecting the **User's Subtransmission System** to a lower voltage:

Rated MVA

Voltage Ratio

Positive phase sequence resistance

Positive Phase sequence reactance

Tap-changer range

Number of tap steps

Tap-changer type: on-load or off-circuit

AVC/tap-changer time delay to first tap movement

AVC/tap-changer inter-tap time delay

SCHEDULE 5 – USERS SYSTEM DATA

PAGE 10 OF 11

- (c) at the lower voltage points of those connecting transformers:-

Equivalent positive phase sequence susceptance

MVA_r rating of any reactive compensation equipment

Equivalent positive phase sequence interconnection impedance with other lower voltage points

The maximum **Demand** (both MW and MVA_r) that could occur

Estimate of voltage insensitive (constant power) load content in % of total load at both winter peak and 75% off-peak load conditions

Short Circuit Analyses:(DPD I) (PC.A.6.6 ■ CUSC Contract)

The information listed below, both current and forecast, and where not already supplied under this Schedule 5, may be requested by **The Company** from each **User** with respect to any **Connection Site** where prospective short-circuit currents on equipment owned by a **Relevant Transmission Licensee** or operated or managed by **The Company** are close to the equipment rating. The impact of any third party **Embedded** within the **User's System** should be reflected:-

- (a) For all circuits of the **User's Subtransmission System**:

Positive phase sequence resistance

Positive phase sequence reactance

Positive phase sequence susceptance

Zero phase sequence resistance (both self and mutuals)

Zero phase sequence reactance (both self and mutuals)

Zero phase sequence susceptance (both self and mutuals)

- (b) for all transformers connecting the **User's Subtransmission System** to a lower voltage:

Rated MVA

Voltage Ratio

Positive phase sequence resistance (at max, min and nominal tap)

Positive phase sequence reactance (at max, min and nominal tap)

Zero phase sequence reactance (at nominal tap)

Tap changer range

Earthing method: direct, resistance or reactance

Impedance if not directly earthed

- (c) at the lower voltage points of those connecting transformers:-

The maximum **Demand** (in MW and MVA_r) that could occur

Short-circuit infeed data in accordance with PC.A.2.5.6(a) unless the **User's** lower voltage network runs in parallel with the **Subtransmission System**, when to prevent double counting in each node infeed data, a π equivalent comprising the data items of PC.A.2.5.6(a) for each node together with the positive phase sequence interconnection impedance between the nodes shall be submitted.

SCHEDULE 5 – USERS SYSTEM DATA

PAGE 11 OF 11

Dynamic Models:(DPD II) (PC.A.6.7 ■ CUSC Contract)

The information listed below, both current and forecast, and where not already supplied under this Schedule 5, may be requested by **The Company** from each **EU Code User** or in respect of each **EU Grid Supply Point** with respect to any **Connection Site**

- (a) Dynamic model structure and block diagrams including parameters, transfer functions and individual elements (as applicable)
- (b) Power control functions and block diagrams including parameters, transfer functions and individual elements (as applicable)
- (c) Voltage control functions and block diagrams including parameters, transfer functions and individual elements (as applicable)
- (d) Converter control models and block diagrams including parameters, transfer functions and individual elements (as applicable)

SCHEDULE 6 – USERS OUTAGE INFORMATION

PAGE 1 OF 3

DATA DESCRIPTION	UNITS	DATA to RTL		TIMESCALE COVERED	UPDATE TIME	DATA CAT.
Details are required from Network Operators of proposed outages in their User Systems and from Generators with respect to their outages, which may affect the performance of the Total System (e.g., at a Connection Point or constraining Embedded Large Power Stations or constraints to the Maximum Import Capacity or Maximum Export Capacity at an Interface Point) (OC2.3.1.3.2(a) & (b)). Outages of Plant and Apparatus of Restoration Contractors and key Plant and Apparatus of a Network Operator's System associated with a Distribution Restoration Zone Plan also need to be co-ordinated with outages on the National Electricity Transmission System. This includes data from Network Operators and Restoration Contractors which would impact the ability to operate a Local Joint Restoration Plan or Distribution Restoration Zone Plan. (The Company advises Network Operators of National Electricity Transmission System outages affecting their Systems) Network Operator informs The Company if unhappy with proposed outages) (The Company draws up revised National Electricity Transmission System (outage plan advises Users of operational effects) Generators and Non-Embedded Customers provide Details of Apparatus owned by them (other than Gensets) at each Grid Supply Point (OC2.3.1.3.3) (The Company advises Network Operators of outages affecting their Systems) (OC2.3.1.3.3) Network Operator details of relevant outages affecting the Total System (OC2.3.1.3.3) Details of:- Maximum Import Capacity for each Interface Point Maximum Export Capacity for each Interface Point Changes to previously declared values of the Interface Point Target Voltage/Power Factor (OC2.3.1.4(c)). (The Company informs Users of aspects that may affect their Systems) (OC2.3.1.4) Users inform The Company if unhappy with aspects as notified (OC2.3.1.4) (The Company issues final National Electricity Transmission System (outage plan with advice of operational) (OC2.3.1.4) (effects on Users System) Generator, Network Operator and Non-Embedded Customers to inform The Company of changes to outages previously requested Details of load transfer capability of 12MW or more between Grid Supply Points in England and Wales and 10MW or more between Grid Supply Points		■	CUSC Contract	Years 2-5	Week 8 (Network Operator etc) Week 13 (Generators)	OC2 OC2 PC.A.5.7.2
		■		Years 2-5	Week 28)	
		■		"	Week 30	OC2
		■		"	Week 34)	
		■		Year 1	Week 13	OC2
		■		Year 1	Week 28)	
		■		Year 1	Week 32	OC2
		■		Year 1	Week 32	OC2
	MVA / MW MVA / MW V (unless power factor control	■		Year 1	Week 34)	
		■		Year 1	Week 36	OC2
		■		Year 1	Week 49	OC2
				Week 8 ahead to year end	As occurring	OC2
				Within Yr 0	As The Company request	OC2

DATA DESCRIPTION	UNITS	DATA to RTL	TIMESCALE COVERED	UPDATE TIME	DATA CAT.
in Scotland. Details of:- Maximum Import Capacity for each Interface Point Maximum Export Capacity for each Interface Point Changes to previously declared values of the Interface Point Target Voltage/Power Factor	MVA / MW MVA / MW V (unless power factor control		Within Yr 0	As occurring	OC2

Note: **Users** should refer to **OC2** for full details of the procedure summarised above and for the information which **The Company** will provide on the **Programming Phase**.

SCHEDULE 6 – USERS OUTAGE INFORMATION

PAGE 2 OF 3

The data below is to be provided to **The Company** as required for compliance with the applicable **Assimilated Law** (Chapter III, Article 8(1) of the retained REMIT Implementing Regulation 1348/2014).

ECR ARTICLE No.	DATA DESCRIPTION	USERS PROVIDING DATA	FREQUENCY OF SUBMISSION
7.1(a)	Planned unavailability of the Apparatus belonging to a Non-Embedded Customer where OC2.3.6 (a) applies - Unavailable demand capacity during the event (MW) - Estimated start date and time (dd.mm.yy hh:mm) - Estimated end date and time (dd.mm.yy hh:mm) - Reason for unavailability from the list below: . Maintenance . Failure . Shutdown . Other	Non-Embedded Customer	To be received by The Company as soon as reasonably possible but in any case, to facilitate publication of data no later than 1 hour after a decision has been made by the Non-Embedded Customer regarding the planned unavailability
7.1(b)	Changes in actual availability of the Apparatus belonging to a Non-Embedded Customer where OC2.3.6 (b) applies - Unavailable demand capacity during the event (MW) - Start date and time (dd.mm.yy hh:mm) - Estimated end date and time (dd.mm.yy hh:mm) - Reason for unavailability from the list below : . Maintenance . Failure . Shutdown . Other	Non-Embedded Customer	To be received by The Company as soon as reasonably possible but in any case, to facilitate publication of data no later than 1 hour after the change in actual availability
8.1	Year Ahead Forecast Margin information as provided in accordance with OC2.3.1.2.6 - Output Usable	Generator	In accordance with OC2.3.1.2.6
14.1(a)	Registered Capacity or Maximum Capacity for Generating Units or Power Generating Modules with greater than 1 MW Registered Capacity or Maximum Capacity provided in accordance with PC.4.3.1 and PC.A.3.4.3 or PC.A.3.1.4 - Registered Capacity or Maximum Capacity (MW) - Production type (from that listed under PC.A.3.4.3)	Generator	Week 24
14.1(b)	Power Station Registered Capacity for units with equal or greater than 100 MW Registered Capacity provided in accordance with PC.4.3.1 and PC.A.3.4.3 - Power Station name - Location of Generating Unit - Production type (from that listed under PC.A.3.4.3) - Voltage connection levels - Registered Capacity or Maximum Capacity (MW)	Generator	Week 24
14.1(c)	Estimated output of Active Power of a BM Unit or Generating Unit for each per Settlement Period of the next Operational Day provided in accordance with BC1.4.2 - Physical Notification	Generator	In accordance with BC1.4.2

15.1(a)	Planned unavailability of a Generating Unit where OC2.3.6(c) applies - Power Station name - Generating Unit and/or Power Generating Module name - Location of Generating Unit and/or Power Generating Module - Generating Unit Registered Capacity (MW) - Production type (from that listed under PC.A.3.4.3) - Output Usable (MW) during the event - Start date and time (dd.mm.yy hh:mm) - Estimated end date and time (dd.mm.yy hh:mm) - Reason for unavailability from the list below: . Maintenance . Shutdown . Other	Generator	To be received by The Company as soon as reasonably possible but in any case, to facilitate publication of data no later than 1 hour after a decision has been made by the Generator regarding the planned unavailability
15.1(b)	Changes in availability of a Generating Unit and/or Power Generating Module where OC2.3.6 (d) applies - Power Station name - Generating Unit and/or Power Generating Module name - Location of Generating Unit and/or Power Generating Module - Generating Unit Registered Capacity and Power Generating Module Maximum Capacity (MW) - Production type (from that listed under PC.A.3.4.3) - Maximum Export Limit (MW) during the event - Start date and time (dd.mm.yy hh:mm) - Estimated end date and time (dd.mm.yy hh:mm) - Reason for unavailability from the list below: . Maintenance . Shutdown . Other	Generator	To be received by The Company as soon as reasonably possible but in any case, to facilitate publication of data no later than 1 hour after the change in actual availability
15.1(c)	Planned unavailability of a Power Station where OC2.3.6(e) applies - Power Station name - Location of Power Station - Power Station Registered Capacity (MW) - Production type (from that listed under PC.A.3.4.3) - Power Station aggregated Output Usable (MW) during the event - Start date and time (dd.mm.yy hh:mm) - Estimated end date and time (dd.mm.yy hh:mm) - Reason for unavailability from the list below: . Maintenance . Shutdown . Other	Generator	To be received by The Company as soon as reasonably possible but in any case, to facilitate publication of data no later than 1 hour after a decision has been made by the Generator regarding the planned unavailability
15.1(d)	Changes in actual availability of a Power Station where OC2.3.6 (f) applies - Power Station name - Location of Power Station - Power Station Registered Capacity (MW) - Production type (from that listed under PC.A.3.4.3) - Power Station aggregated Maximum Export Limit (MW) during the event - Start date and time (dd.mm.yy hh:mm) - Estimated end date and time (dd.mm.yy hh:mm) - Reason for unavailability from the list below: . Maintenance . Shutdown . Other	Generator	To be received by The Company as soon as reasonably possible but in any case, to facilitate publication of data no later than 1 hour after the change in actual availability

15.1(e)	Outage data from a Network Operator relating to an outage on the Network Operator's System or an outage of a Restoration Contractor's Plant and Apparatus (not already supplied) which would prevent the operation of a Restoration Plan . Outages of Plant and Apparatus of Restoration Contractors and key Plant and Apparatus of a Network Operator's System associated with a Distribution Restoration Zone Plan also need to be co-ordinated with outages on the National Electricity Transmission System	Network Operators and Restoration Service Contractors	In accordance with the requirements of OC2

SCHEDULE 7 - LOAD CHARACTERISTICS AT GRID SUPPLY POINTS

PAGE 1 OF 1

All data in this schedule 7 is categorised as **Standard Planning Data (SPD)** and is required for existing and agreed future connections. This data is only required to be updated when requested by **The Company**.

DATA DESCRIPTION	UNITS	DATA to RTL		DATA FOR FUTURE YEARS						
				Yr 1	Yr 2	Yr 3	Yr 4	Yr 5	Yr 6	Yr 7
FOR ALL TYPES OF DEMAND FOR EACH GRID SUPPLY POINT The following information is required infrequently and should only be supplied, wherever possible, when requested by The Company (PC.A.4.7) Details of individual loads which have Characteristics significantly different from the typical range of domestic or commercial and industrial load supplied: (PC.A.4.7(a)) Sensitivity of demand to fluctuations in voltage And frequency on National Electricity Transmission System at time of peak Connection Point Demand (Active Power) (PC.A.4.7(b)) Voltage Sensitivity (PC.A.4.7(b)) Frequency Sensitivity (PC.A.4.7(b)) Reactive Power sensitivity should relate to the Power Factor information given in Schedule 11 (or for Generators, Schedule 1) and note 6 on Schedule 11 relating to Reactive Power therefore applies: (PC.A.4.7(b)) Phase unbalance imposed on the National Electricity Transmission System (PC.A.4.7(d)) - maximum - average Maximum Harmonic Content imposed on National Electricity Transmission System (PC.A.4.7(e)) Details of any loads which may cause Demand Fluctuations greater than those permitted under Engineering Recommendation P28, Stage 1 at the Point of Common Coupling including Flicker Severity (Short Term) and Flicker Severity (Long Term) (PC.A.4.7(f))		CUSC Contract	CUSC App. Form							
		☐								
		☐		(Please Attach)						
		☐								
	MW/kV MVar/kV	☐								
	MW/Hz MVar/Hz	☐								
		☐								
	%	☐								
	%	☐								
	%	☐								
		☐								

SCHEDULE 8 - DATA SUPPLIED BY BM PARTICIPANTS
PAGE 1 OF 1

CODE	DESCRIPTION
BC1	Physical Notifications
BC1 & BC2	Export and Import Limits
BC1	Bid-Offer Data
BC1	Dynamic Parameters (Day Ahead)
BC2	Dynamic Parameters (For use in Balancing Mechanism)
BC1 & BC2	Other Relevant Data

- No information collated under this Schedule will be transferred to the **Relevant Transmission Licensees**

SCHEDULE 9 - DATA SUPPLIED BY THE COMPANY TO USERS

PAGE 1 OF 1

(Example of data to be supplied)

CODE	DESCRIPTION
CC or ECC	Operation Diagram
CC or ECC	Site Responsibility Schedules
PC	Day of the peak National Electricity Transmission System Demand Day of the minimum National Electricity Transmission System Demand
OC1.7	From 31 December 2026 and during normal system operation, The Company shall publish on a daily basis, 60% and 100% of the peak National Demand , under pre System shutdown conditions for the following day, based on the latest forecast that would feed into the System Restoration Regional targets by means of messages inputted by The Company to the Balancing Mechanism Reporting Service (BMRS) . From 31 December 2026 and during System Restoration , The Company shall publish for each System Restoration Region , the Demand that is used to calculate the National Demand on an hourly basis on a reasonable endeavours basis by means of messages inputted by The Company to the Balancing Mechanism Reporting Service (BMRS) .
OC2	Surpluses and Output Useable (OU) requirements for each Generator over varying timescales Equivalent networks to Users for Outage Planning Negative Reserve Active Power Margins (when necessary) Operating Reserve information
BC1	Demand Estimates, Indicated Margin and Indicated Imbalance , indicative Synchronising and Desynchronising times of Embedded Power Stations to Network Operators , special actions.
BC2	Bid-Offer Acceptances, Ancillary Services instructions to relevant Users , Emergency Instructions
BC3	Location, amount, and Low Frequency Relay settings of any Low Frequency Relay initiated Demand reduction for Demand which is Embedded .

- No information collated under this Schedule will be transferred to the **Relevant Transmission Licensees**
- In respect of OC1, the data would also be supplied to **Restoration Contractors**

DATA TO BE SUPPLIED BY THE COMPANY TO USERS

PURSUANT TO THE **ESO LICENCE**

1. The **ESO Licence** (condition C12: Production of information about the **National Electricity Transmission System**) requires **The Company** to publish annually an **Electricity Ten Year Statement** which is designed to provide **Users** and potential **Users** with information to enable them to identify opportunities for continued and further use of the **National Electricity Transmission System**.

When a **User** is considering a development at a specific site, certain additional information may be required in relation to that site which is of such a level of detail that it is inappropriate to include it in the **Electricity Ten Year Statement**. In these circumstances, the **User** may contact **The Company** who will be pleased to arrange a discussion and the provision of such additional information relevant to the site under consideration as the **User** may reasonably require.

2. The **ESO Licence** also requires **The Company** to offer terms for an agreement for connection to and use of the **National Electricity Transmission System** and further information will be given by **The Company** to the potential **User** in the course of the discussions of the terms of such an agreement.

SCHEDULE 10 - DEMAND PROFILES AND ACTIVE ENERGY DATA
PAGE 1 OF 2

The following information is required from each **Network Operator** and from each **Non-Embedded Customer**. The data should be provided in calendar week 24 each year (although **Network Operators** may delay the submission until calendar week 28).

DATA DESCRIPTION	F. Yr. 0	F. Yr. 1	F. Yr. 2	F. Yr. 3	F. Yr. 4	F. Yr. 5	F. Yr. 6	F. Yr. 7	UPDATE TIME	DATA CAT
<u>Demand Profiles</u>	(PC.A.4.2) (■ – CUSC Contract & ■ CUSC Application Form)									
Total User's system profile (please delete as applicable)	Day of User's annual Maximum demand at Annual ACS Conditions (MW)									
	Day of annual peak of National Electricity Transmission System Demand at Annual ACS Conditions (MW)									
	Day of annual minimum National Electricity Transmission System Demand at average conditions (MW)									
0000 : 0030									Wk.24	SPD
0030 : 0100									:	
0100 : 0130									:	
0130 : 0200									:	:
0200 : 0230									:	:
0230 : 0300									:	:
0300 : 0330									:	:
0330 : 0400									:	:
0400 : 0430									:	:
0430 : 0500									:	:
0500 : 0530									:	:
0530 : 0600									:	:
0600 : 0630									:	:
0630 : 0700									:	:
0700 : 0730									:	:
0730 : 0800									:	:
0800 : 0830									:	:
0830 : 0900									:	:
0900 : 0930									:	:
0930 : 1000									:	:
1000 : 1030									:	:
1030 : 1100									:	:
1100 : 1130									:	:
1130 : 1200									:	:
1200 : 1230									:	:
1230 : 1300									:	:
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1730 : 1800									:	:
1800 : 1830									:	:
1830 : 1900									:	:
1900 : 1930									:	:
1930 : 2000									:	:
2000 : 2030									:	:
2030 : 2100									:	:
2100 : 2130									:	:
2130 : 2200									:	:
2200 : 2230									:	:
2230 : 2300									:	:
2300 : 2330									:	:
2330 : 0000									:	:

SCHEDULE 10 - DEMAND PROFILES AND ACTIVE ENERGY DATA
PAGE 2 OF 2

DATA DESCRIPTION	Out-turn		F.Yr. 0	Update Time	Data Cat	DATA to RTL	
	Actual	Weather Corrected.				CUSC Contract	CUSC App. Form
(PC.A.4.3) <u>Active Energy Data</u> Total annual Active Energy requirements under average conditions of each Network Operator and each Non-Embedded Customer in the following categories of Customer Tariff:- LV1 LV2 LV3 EHV HV Traction Lighting User System Losses Active Energy from Embedded Small Power Stations and Embedded Medium Power Stations				Week 24	SPD	■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■	■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■

NOTES:

1. 'F. yr.' means '**Financial Year**'

2. **Demand and Active Energy Data (General)**

Demand and **Active Energy** data should relate to the point of connection to the **National Electricity Transmission System** and should be net of the output (as reasonably considered appropriate by the **User**) of all **Embedded Small Power Stations**, **Medium Power Stations** and **Customer Generating Plant**. Auxiliary demand of **Embedded Power Stations** should be included in the demand data submitted by the **User** at the **Connection Point**. **Users** should refer to the **PC** for a full definition of the **Demand** to be included.

3. **Demand** profiles and **Active Energy** data should be for the total **System** of the **Network Operator**, including all **Connection Points**, and for each **Non-Embedded Customer**. **Demand Profiles** should give the numerical maximum demand that in the **User's** opinion could reasonably be imposed on the **National Electricity Transmission System**.

4. In addition the demand profile is to be supplied for such days as **The Company** may specify, but such a request is not to be made more than once per calendar year.

SCHEDULE 11 - CONNECTION POINT DATA

PAGE 1 OF 5

The following information is required from each **Network Operator** and from each **Non-Embedded Customer**. The data should be provided in calendar week 24 each year (although **Network Operators** may delay the submission until calendar week 28).

Table 11(a)

Connection Point:

Connection Point Demand at the time of - (select each one in turn) (Provide data for each Access Period associated with the Connection Point)	a) maximum Demand b) peak National Electricity Transmission System Demand (<i>specified by The Company</i>) c) minimum National Electricity Transmission System Demand (<i>specified by The Company</i>) d) maximum Demand during Access Period e) specified by either The Company or a User
Name of Transmission Interface Circuit out of service during Access Period (<i>if reqd.</i>).	PC.A.4.1.4.2

DATA DESCRIPTION (CUSC Contract □ & CUSC Application Form ■)	Outturn	Outturn Weather Corrected	F.Yr 1	F.Yr 2	F.Yr 3	F.Yr 4	F.Yr 5	F.Yr 6	F.Yr 7	F.Yr 8	DATA CAT
Date of a), b), c), d) or e) as denoted above.											PC.A.4.3.3
Time of a), b), c), d) or e) as denoted above.											PC.A.4.3.3
Connection Point Demand (MW)											PC.A.4.3.1
Connection Point Demand (MVar)											PC.A.4.3.1
Deduction made at Connection Point for Small Power Stations, Medium Power Stations and Customer Generating Plant (MW)											PC.A.4.3.2(a)
Reference to valid Single Line Diagram											PC.A.4.3.5
Reference to node and branch data.											PC.A.2.2

Note: The following data block can be repeated for each post fault network revision that may impact on the Transmission System.

Reference to post-fault revision of Single Line Diagram											PC.A.4.5
Reference to post-fault revision of the node and branch data associated with the Single Line Diagram											PC.A.4.5
Reference to the description of the actions and timescales involved in effecting the post-fault actions (e.g. auto-switching, manual, teleswitching, overload protection operation etc)											PC.A.4.5

Access Group:

Name of associated Connection Point within the same Access Group :											PC.A.4.3.1
Demand at associated Connection Point (MW)											PC.A.4.3.1
Demand at associated Connection Point (MVar)											PC.A.4.3.1
Deduction made at associated Connection Point for Small Power Stations, Medium Power Stations and Customer Generating Plant (MW)											PC.A.4.3.2(a)

SCHEDULE 11 - CONNECTION POINT DATA

PAGE 2 OF 5

Table 11(b)

Embedded Generation Data											
Connection Point:											
DATA DESCRIPTION	Outturn	Outturn Weather Corrected	F.Yr 1	F.Yr 2	F.Yr 3	F.Yr 4	F.Yr 5	F.Yr 6	F.Yr 7	F.Yr 8	DATA CAT
<u>Small Power Station, Medium Power Station and Customer Generation Summary</u>	For each Connection Point where there are Embedded Small Power Stations, Medium Power Stations or Customer Generating Stations the following information is required:										
No. of Small Power Stations, Medium Power Stations or Customer Power Stations											PC.A.3.1 .4(a)
Number of Generating Units within these stations											PC.A.3.1 .4(a)
Summated Capacity of all these Generating Units											PC.A.3.1 .4(a)
Where the Network Operator's System places a constraint on the capacity of an Embedded Large Power Station											
Station Name											PC.A.3.2 .2(c)
Generating Unit											PC.A.3.2 .2(c)
System Constrained Capacity											PC.A.3.2 .2(c)(i)
Reactive Despatch Network Restriction											PC.A.3.2 .2(c)(ii)

Where the Network Operator's System places a constraint on the capacity of an Offshore Transmission System at an Interface Point											
Offshore Transmission System Name											PC.A.3.2.2(c)
Interface Point Name											PC.A.3.2.2(c)
Maximum Export Capacity											PC.A.3.2.2(c)
Maximum Import Capacity											PC.A.3.2.2(c)

SCHEDULE 11 - CONNECTION POINT DATA

PAGE 3 OF 5

Table 11(c)

For each Embedded Small Power Station of 1MW and above, the following information is required, effective 2015 in line with the Week 24 data submissions.												
DATA DESCRIPTION	An Embedded Small Power Station reference unique to each Network Operator	Connection Date (Financial Year for generator connecting after week 24 2015)	Generator unit Reference	Technology Type / Production type	CHP (Y/N)	Registered capacity in MW (as defined in the Distribution Code)	Lowest voltage node on the most up-to-date Single Line Diagram to which it connects or where it will export most of its power	Where it exports electricity from wind PV or storage, the geographical location of the primary or higher voltage substation to which it connects	Control mode	Control mode voltage target and reactive range or target pf (as appropriate)	Loss of mains protection type	Loss of mains protection settings
DATA CAT	PC.A.3.1.4 (a)		PC.A.3.1.4 (a)	PC.A.3.1.4 (a)	PC.A.3.1.4	PC.A.3.1.4 (a)	PC.A.3.1.4 (a)	PC.A.3.1.4 (a)	PC.A.3.1.4 (a)	PC.A.3.1.4 (a)	PC.A.3.1.4 (a)	PC.A.3.1.4 (a)

SCHEDULE 11 - CONNECTION POINT DATA

PAGE 4 OF 5

NOTES:

1. 'F.Yr.' means '**Financial Year**'. F.Yr. 1 refers to the current financial year.
2. All **Demand** data should be net of the output (as reasonably considered appropriate by the **User**) of all **Embedded Small Power Stations**, **Embedded Medium Power Stations** and **Customer Generating Plant**. Generation and / or Auxiliary demand of **Embedded Large Power Stations** should not be included in the demand data submitted by the **User**. **Users** should refer to the **PC** for a full definition of the **Demand** to be included.
3. Peak **Demand** should relate to each **Connection Point** individually and should give the maximum demand that in the **User's** opinion could reasonably be imposed on the **National Electricity Transmission System**. **Users** may submit the **Demand** data at each node on the **Single Line Diagram** instead of at a **Connection Point** as long as the **User** reasonably believes such data relates to the peak (or minimum) at the **Connection Point**.

In deriving **Demand** any deduction made by the **User** (as detailed in note 2 above) to allow for **Embedded Small Power Stations**, **Embedded Medium Power Stations** and **Customer Generating Plant** is to be specifically stated as indicated on the Schedule.
4. **The Company** may at its discretion require details of any **Embedded Small Power Stations** or **Embedded Medium Power Stations** whose output can be expected to vary in a random manner (e.g. wind power) or according to some other pattern (e.g. tidal power)
5. Where more than 95% of the total **Demand** at a **Connection Point** is taken by synchronous motors, values of the **Power Factor** at maximum and minimum continuous excitation may be given instead. **Power Factor** data should allow for series reactive losses on the **User's System** but exclude reactive compensation network susceptance specified separately in Schedule 5.
6. Where a **Reactive Despatch Network Restriction** is in place which requires the generator to maintain a target voltage set point this should be stated as an alternative to the size of the **Reactive Despatch Network Restriction**.

7.

SCHEDULE 11 - CONNECTION POINT DATA
PAGE 5 OF 5

Table 11 (d)

Embedded Small Power Stations <1MW

Network Operator	

Fuel Type	Aggregate Registered Capacity Total MW	Number of PGMs	Comments
Biomass			
Fossil brown coal/lignite			
Fossil coal-derived gas			
Fossil gas			
Fossil hard coal			
Fossil oil			
Fossil oil shale			
Fossil peat			
Geothermal			
Hydro pumped storage			
Hydro run-of-river and poundage			
Hydro water reservoir			
Marine			
Nuclear			
Other renewable			
Solar			
Waste			
Wind offshore			
Wind onshore			
Other			

SCHEDULE 12 - DEMAND CONTROL

PAGE 1 OF 2

The following information is required from each **Network Operator** and where indicated with an asterisk from **Externally Interconnected System Operators** and/or **Interconnector Users** and a **Pumped Storage Generator** and **Generators** in respect of **Electricity Storage Modules**. Where indicated with a double asterisk, the information is only required from **Suppliers**. Where indicated by a hash symbol (#), the information should not be provided by **Network Operators** after the **PSM Implementation Date**.

DATA DESCRIPTION	UNITS		UPDATE TIME	
<u>Demand Control</u>				
Demand met or to be relieved by Demand Control (averaging at the Demand Control Notification Level or more over a half hour) at each Connection Point .				
Demand Control at time of National Electricity Transmission System weekly peak demand				
Amount	MW	) F.yrs 0 to 5	Week 24 #	OC1
Duration	Min	)		
For each half hour	MW	Wks 2-8 ahead	1000 Mon	OC1
For each half hour	MW	Days 2-12 ahead	1200 Wed	OC1
For each half hour	MW	Previous calendar day	0600 daily	OC1
<u>**Customer Demand Management</u> (at the Customer Demand Management Notification Level or more at the Connection Point)				
For each half hour	MW	Any time in Control Phase		OC1
For each half hour	MW	Remainder of period	When changes occur to previous plan	OC1
For each half hour	MW	Previous calendar day	0600 daily	OC1
**In Scotland, Load Management Blocks For each block of 5MW or more, for each half hour	MW	For the next day	11:00	OC1

SCHEDULE 12 - DEMAND CONTROL

PAGE 2 OF 2

DATA DESCRIPTION	UNITS	TIME COVERED	UPDATE TIME	DATA CAT.
*Demand Control or Pump <u>Tripping Offered as Reserve</u>				
Magnitude of Demand or pumping load or Electricity Storage charging load which is tripped	MW	Year ahead from week 24 #	Week 24 #	DPD I
System Frequency at which tripping is initiated	Hz	"	"	"
Time duration of System Frequency below trip setting for tripping to be initiated	S	"	"	"
Time delay from trip initiation to Tripping	S	"	"	"
Electricity Storage Module data				
Maximum Capacity	MW	"	"	"
		"	"	"
Maximum Import Power	MW	"	"	"
Registered Import Capability	MW	"	"	"
Charge Time	Min	"	"	"
		"	"	"
Discharge time	Min	"	"	"
Operating periods	Min	"	"	"
<u>Emergency Manual Load</u> <u>Disconnection</u>				
Method of achieving load disconnection	Text	Year ahead from week 24 #	Annual in week 24 #	OC6
Annual ACS Peak Demand (Active Power) at Connection Point (requested under Schedule 11 - repeated here for reference)	MW	"	"	"
Cumulative percentage of Connection Point Demand (Active Power) which can be disconnected by the following times from an instruction from The Company				
5 mins	%	"	"	"
10 mins	%	"	"	"
15 mins	%	"	"	"
20 mins	%	"	"	"
25 mins	%	"	"	"
30 mins	%	"	"	"

Notes:

- 1. **Network Operators** may delay the submission until calendar week 28.
- 2. No information collated under this Schedule will be transferred to the **Relevant Transmission Licensees** (or **Generators** undertaking **OTSDUW**).

SCHEDULE 12A - AUTOMATIC LOW FREQUENCY DEMAND DISCONNECTION

PAGE 1 OF 1

Time Covered: Year ahead from week 24

Data Category: OC6

Update Time: Annual in week 24

Grid Supply Point	GSP Demand MW	Low Frequency Demand Disconnection Blocks MW									Residual demand MW
		1 48.8Hz	2 48.75Hz	3 48.7Hz	4 48.6Hz	5 48.5Hz	6 48.4Hz	7 48.2Hz	8 48.0Hz	9 47.8Hz	
GSP1											
GSP2											
GSP3											
Total demand disconnected per block	MW %										
Total demand disconnection		MW (% of aggregate demand of MW)									

Note: All demand refers to that at the time of forecast **National Electricity Transmission System** peak demand.

Network Operators may delay the submission until calendar week 28

No information collated under this schedule will be transferred to the **Relevant Transmission Licensees** (or **Generators** undertaking **OTSDUW**).

SCHEDULE 13 - FAULT INFEED DATA

PAGE 1 OF 2

The data in this Schedule 13 is all **Standard Planning Data**, and is required from all **Users** other than **Generators** who are connected to the **National Electricity Transmission System** via a **Connection Point** (or who are seeking such a connection). A data submission is to be made each year in Week 24 (although **Network Operators** may delay the submission until Week 28). A separate submission is required for each node included in the **Single Line Diagram** provided in Schedule 5.

DATA DESCRIPTION	UNITS	F.Yr 0	F.Yr. 1	F.Yr. 2	F.Yr. 3	F.Yr. 4	F.Yr. 5	F.Yr. 6	F.Yr. 7	DATA to RTL	
SHORT CIRCUIT INFEED TO THE NATIONAL ELECTRICITY TRANSMISSION SYSTEM FROM USERS SYSTEM AT A CONNECTION POINT										CUSC Contract	CUSC App. Form
(PC.A.2.5)											
Name of node or Connection Point										☐	☒
Symmetrical three phase short-circuit current infeed											
- at instant of fault	kA									☐	☒
- after subtransient fault current contribution has substantially decayed	Ka									☐	☒
Zero sequence source impedances as seen from the Point of Connection or node on the Single Line Diagram (as appropriate) consistent with the maximum infeed above:											
- Resistance	% on 100									☐	☒
- Reactance	% on 100									☐	☒
Positive sequence X/R ratio at instance of fault										☐	☒
Pre-Fault voltage magnitude at which the maximum fault currents were calculated	p.u.									☐	☒

SCHEDULE 13 - FAULT INFEED DATA
PAGE 2 OF 2

DATA DESCRIPTION	UNITS	F.Yr 0	F.Yr. 1	F.Yr. 2	F.Yr. 3	F.Yr. 4	F.Yr. 5	F.Yr. 6	F.Yr. 7	DATA to RTL	
<u>SHORT CIRCUIT INFEED TO THE NATIONAL ELECTRICITY TRANSMISSION SYSTEM FROM USERS SYSTEM AT A CONNECTION POINT</u>										CUSC Contract	CUSC App. Form
Negative sequence impedances of User's System as seen from the Point of Connection or node on the Single Line Diagram (as appropriate). If no data is given, it will be assumed that they are equal to the positive sequence values.											
- Resistance	% on 100									☐	☒
- Reactance	% on 100									☐	☒

SCHEDULE 14 - FAULT INFEEED DATA (GENERATORS INCLUDING UNIT TRANSFORMERS AND STATION TRANSFORMERS)

PAGE 1 OF 5

The data in this Schedule 14 is all **Standard Planning Data**, and is to be provided by **Generators**, with respect to all directly connected **Power Stations**, all **Embedded Large Power Stations** and all **Embedded Medium Power Stations** connected to the **Subtransmission System**. A data submission is to be made each year in Week 24.

Fault infeeds via Unit Transformers

A submission should be made for each **Generating Unit** (including those which are part of a **Synchronous Power Generating Module**) with an associated **Unit Transformer**. Where there is more than one **Unit Transformer** associated with a **Generating Unit**, a value for the total infeed through all **Unit Transformers** should be provided. The infeed through the **Unit Transformer(s)** should include contributions from all motors normally connected to the **Unit Board**, together with any generation (e.g. **Auxiliary Gas Turbines**) which would normally be connected to the **Unit Board**, and should be expressed as a fault current at the **Generating Unit** terminals for a fault at that location.

DATA DESCRIPTION	UNITS	F.Yr. 0	F.Yr. 1	F.Yr. 2	F.Yr. 3	F.Yr. 4	F.Yr. 5	F.Yr. 6	F.Yr. 7	DATA to RTL	
(PC.A.2.5)										CUSC Contract	CUSC App. Form
Name of Power Station										☐	☒
Number of Unit Transformers										☐	☒
Symmetrical three phase short-circuit current infeed through the Unit Transformers(s) for a fault at the Generating Unit terminals											
- at instant of fault	kA									☐	☒
- after subtransient fault current contribution has substantially decayed	kA									☐	☒
Positive sequence X/R ratio at instance of fault										☐	☒
Subtransient time constant (if significantly different from 40ms)	ms									☐	☒
Pre-fault voltage at fault point (if different from 1.0 p.u.)										☐	☒
The following data items need only be supplied if the Generating Unit Step-up Transformer can supply zero sequence current from the Generating Unit side to the National Electricity Transmission System											
Zero sequence source impedances as seen from the Generating Unit terminals consistent with the maximum infeed above:											
- Resistance	% on 100									☐	☒
- Reactance	% on 100									☐	☒

SCHEDULE 14 - FAULT INFEEED DATA (GENERATORS INCLUDING UNIT TRANSFORMERS AND STATION TRANSFORMERS)

PAGE 2 OF 5

Fault infeeds via Station Transformers

A submission is required for each **Station Transformer** directly connected to the **National Electricity Transmission System**. The submission should represent normal operating conditions when the maximum number of **Gensets** are **Synchronised** to the **System**, and should include the fault current from all motors normally connected to the **Station Board**, together with any Generation (e.g. **Auxiliary Gas Turbines**) which would normally be connected to the **Station Board**. The fault infeed should be expressed as a fault current at the hv terminals of the **Station Transformer** for a fault at that location.

If the submission for normal operating conditions does not represent the worst case, then a separate submission representing the maximum fault infeed that could occur in practice should be made.

DATA DESCRIPTION	UNITS	F.Yr. 0	F.Yr. 1	F.Yr. 2	F.Yr. 3	F.Yr. 4	F.Yr. 5	F.Yr. 6	F.Yr. 7	DATA to RTL	
(PC.A.2.5)										CUSC Contract	CUSC App. Form
Name of Power Station										☐	☒
Number of Station Transformers										☐	☒
Symmetrical three phase short-circuit current infeed for a fault at the Connection Point											
- at instant of fault	kA									☐	☒
- after subtransient fault current contribution has substantially decayed	kA									☐	☒
Positive sequence X/R ratio At instance of fault										☐	☒
Subtransient time constant (if significantly different from 40ms)	ms									☐	☒
Pre-fault voltage (if different from 1.0 p.u.) at fault point (See note 1)										☐	☒
Zero sequence source Impedances as seen from the Point of Connection Consistent with the maximum Infeed above:											
- Resistance	% on 100									☐	☒
- Reactance	% on 100									☐	☒

Note 1. The pre-fault voltage provided above should represent the voltage within the range 0.95 to 1.05 that gives the highest fault current

Note 2. % on 100 is an abbreviation for % on 100 MVA

SCHEDULE 14 - FAULT INFEED DATA (GENERATORS INCLUDING UNIT TRANSFORMERS AND STATION TRANSFORMERS)

PAGE 3 OF 5

Fault infeeds from Power Park Modules

A submission is required for the whole **Power Park Module** and for each **Power Park Unit** type or equivalent. The submission shall represent operating conditions that result in the maximum fault infeed. The fault current from all motors normally connected to the **Power Park Unit's** electrical system shall be included. The fault infeed shall be expressed as a fault current at the terminals of the **Power Park Unit**, or the **Common Collection Busbar** if an equivalent **Single Line Diagram** and associated data as described in PC.A.2.2.2 is provided, and the **Grid Entry Point**, or **User System Entry Point** if **Embedded**, for a fault at the **Grid Entry Point**, or **User System Entry Point** if **Embedded**.

Should actual data in respect of fault infeeds be unavailable at the time of the application for a **CUSC Contract** or **Embedded Development Agreement**, a limited subset of the data, representing the maximum fault infeed that may result from all of the plant types being considered, shall be submitted. This data will, as a minimum, represent the root mean square of the positive, negative and zero sequence components of the fault current for both single phase and three phase solid faults at the **Grid Entry Point** (or **User System Entry Point** if **Embedded**) at the time of fault application and 50ms following fault application. Actual data in respect of fault infeeds shall be submitted to **The Company** as soon as it is available, in line with PC.A.1.2

DATA DESCRIPTION	UNITS	F.Yr. 0	F.Yr. 1	F.Yr. 2	F.Yr. 3	F.Yr. 4	F.Yr. 5	F.Yr. 6	F.Yr. 7	DATA to RTL	
(PC.A.2.5)										CUSC Contract	CUSC App. Form
Name of Power Station										☐	☒
Name of Power Park Module										☐	☒
Power Park Unit type										☐	☒
A submission shall be provided for the contribution of the entire Power Park Module and each type of Power Park Unit or equivalent to the positive, negative and zero sequence components of the short circuit current at the Power Park Unit terminals, or Common Collection Busbar, and Grid Entry Point or User System Entry Point if Embedded for (i) a solid symmetrical three phase short circuit (ii) a solid single phase to earth short circuit (iii) a solid phase to phase short circuit (iv) a solid two phase to earth short circuit at the Grid Entry Point or User System Entry Point if Embedded. If protective controls are used and active for the above conditions, a submission shall be provided in the limiting case where the protective control is not active. This case may require application of a non-solid fault, resulting in a retained voltage at the fault point.										☐	☒
										☐	☒
										☐	☒
										☐	☒
										☐	☒
										☐	☒

SCHEDULE 14 - FAULT INFEED DATA (GENERATORS INCLUDING UNIT TRANSFORMERS AND STATION TRANSFORMERS)
PAGE 4 OF 5

DATA DESCRIPTION	UNITS	F.Yr. 0	F.Yr. 1	F.Yr. 2	F.Yr. 3	F.Yr. 4	F.Yr. 5	F.Yr. 6	F.Yr. 7	DATA to RTL	DATA DESCRIPTION
										CUSC Contract	CUSC App. Form
- A continuous time trace and table showing the root mean square of the positive, negative and zero sequence components of the fault current from the time of fault inception to 140ms after fault inception at 10ms intervals	Graphical and tabular kA versus s									☐	☒
- A continuous time trace and table showing the positive, negative and zero sequence components of retained voltage at the terminals or Common Collection Busbar , if appropriate	pu versus s									☐	☒
- A continuous time trace and table showing the root mean square of the positive, negative and zero sequence components of retained voltage at the fault point, if appropriate	pu versus s									☐	☒

SCHEDULE 14 - FAULT INFEEED DATA (GENERATORS INCLUDING UNIT TRANSFORMERS AND STATION TRANSFORMERS)

PAGE 5 OF 5

DATA DESCRIPTION	UNITS	F.Yr. 0	F.Yr. 1	F.Yr. 2	F.Yr. 3	F.Yr. 4	F.Yr. 5	F.Yr. 6	F.Yr. 7	DATA to RTL	DATA DESCRIPTION
										CUSC Contract	CUSC App. Form
For Power Park Units that utilise a protective control, such as a crowbar circuit,											
- additional rotor resistance applied to the Power Park Unit under a fault situation	% on MVA									☐	☒
- additional rotor reactance applied to the Power Park Unit under a fault situation.	% on MVA									☐	☒
Positive sequence X/R ratio of the equivalent at time of fault at the Common Collection Busbar										☐	☒
Minimum zero sequence impedance of the equivalent at a Common Collection Busbar										☐	☒
Active Power generated pre-fault	MW									☐	☒
Number of Power Park Units in equivalent generator										☐	☒
Power Factor (lead or lag)										☐	☒
Pre-fault voltage (if different from 1.0 pu) at fault point (See note 1)	pu									☐	☒
Items of reactive compensation switched in pre-fault										☐	☒

Note 1. The pre-fault voltage provided above should represent the voltage within the range 0.95 pu to 1.05 pu that gives the highest fault current

SCHEDULE 15 – MOTHBALLED POWER GENERATING MODULE, MOTHBALLED GENERATING UNIT, MOTHBALLED POWER PARK MODULE (INCLUDING MOTHBALLED DC CONNECTED POWER PARK MODULES), MOTHBALLED HVDC SYSTEMS, MOTHBALLED HVDC CONVERTERS, MOTHBALLED DC CONVERTERS AT A DC CONVERTER STATION AND ALTERNATIVE FUEL DATA

PAGE 1 OF 3

MOTHBALLED POWER GENERATING MODULES, MOTHBALLED GENERATING UNIT, MOTHBALLED POWER PARK MODULE (INCLUDING MOTHBALLED DC CONNECTED POWER PARK MODULES), MOTHBALLED HVDC SYSTEMS, MOTHBALLED HVDC CONVERTERS OR MOTHBALLED DC CONVERTER AT A DC CONVERTER STATION AND ALTERNATIVE FUEL DATA

The following data items must be supplied with respect to each **Mothballed Power Generating Module, Mothballed Generating Unit, Mothballed Power Park Module (including Mothballed DC Connected Power Park Modules), Mothballed HVDC Systems, Mothballed HVDC Converters or Mothballed DC Converters at a DC Converter station**

Power Station _____ **Generating Unit, Power Park Module or DC Converter**
 Name (e.g. Unit 1) _____

DATA DESCRIPTION	UNITS	DATA CAT	GENERATING UNIT DATA						
			<1 month	1-2 months	2-3 months	3-6 months	6-12 months	>12 months	Total MW being returned
MW output that can be returned to service	MW	DPD II							

Notes

1. The time periods identified in the above table represent the estimated time it would take to return the **Mothballed Power Generating Module, Mothballed Generating Unit, Mothballed Power Park Module (Mothballed DC Connected Power Park Modules), Mothballed HVDC Systems, Mothballed HVDC Converters or Mothballed DC Converter** at a **DC Converter Station** to service once a decision to return has been made.
2. Where a **Mothballed Power Generating Module, Mothballed Generating Unit, Mothballed Power Park Module** (including a **Mothballed DC Connected Power Park Module**), **Mothballed HVDC System, Mothballed HVDC Converter or Mothballed DC Converter** at a **DC Converter Station** can be physically returned in stages covering more than one of the time periods identified in the above table then information should be provided for each applicable time period.
3. The estimated notice to physically return MW output to service should be determined in accordance with **Good Industry Practice** assuming normal working arrangements and normal plant procurement lead times.
4. The MW output values in each time period should be incremental MW values, e.g. if 150MW could be returned in 2 – 3 months and an additional 50MW in 3 – 6 months then the values in the columns should be Nil, Nil, 150, 50, Nil, Nil, 200 respectively.
5. Significant factors which may prevent the **Mothballed Power Generating Module, Mothballed Generating Unit, Mothballed Power Park Module (Mothballed DC Connected Power Park Module), Mothballed HVDC System, Mothballed HVDC Converter or Mothballed DC Converter** at a **DC Converter Station** achieving the estimated values provided in this table, excluding factors relating to **Transmission Entry Capacity**, should be appended separately.

SCHEDULE 15 – MOTHBALLED POWER GENERATING MODULES, MOTHBALLED GENERATING UNIT, MOTHBALLED POWER PARK MODULE (INCLUDING DC CONNECTED POWER PARK MODULES), MOTHBALLED HVDC SYSTEMS, MOTHBALLED HVDC CONVERTERS, MOTHBALLED DC CONVERTERS AT A DC CONVERTER STATION AND ALTERNATIVE FUEL DATA

PAGE 2 OF 3

ALTERNATIVE FUEL INFORMATION

The following data items for alternative fuels need only be supplied with respect to each **Generating Unit** whose primary fuel is gas including those which form part of a **Power Generating Module**.

Power Station _____ **Generating Unit Name (e.g. Unit 1)**

DATA DESCRIPTION	UNITS	DATA CAT	GENERATING UNIT DATA			
			1	2	3	4
Alternative Fuel Type (*please specify)	Text	DPD II	Oil distillate	Other gas*	Other*	Other*
CHANGEOVER TO ALTERNATIVE FUEL For off-line changeover:						
Time to carry out off-line fuel changeover	Minutes	DPD II				
Maximum output following off-line changeover	MW	DPD II				
For on-line changeover:						
Time to carry out on-line fuel changeover	Minutes	DPD II				
Maximum output during on-line fuel changeover	MW	DPD II				
Maximum output following on-line fuel changeover	MW	DPD II				
Maximum operating time at full load assuing:						
Typical stock levels	Hours	DPD II				
Maximum possible stock levels	Hours	DPD II				
Maximum rate of replacement of depleted stocks of alternative fuels on the basis of Good Industry Practice	MWh (electrical)/day	DPD II				
Is changeover to alternative fuel used in normal operating arrangements?	Text	DPD II				
Number of successful changeovers carried out in the last Financial Year (*delete as appropriate)	Text	DPD II	0 / 1-5 / 6-10 / 11-20 / >20 **	0 / 1-5 / 6-10 / 11-20 / >20 **	0 / 1-5 / 6-10 / 11-20 / >20 **	0 / 1-5 / 6-10 / 11-20 / >20 **

SCHEDULE 15 – MOTHBALLED POWER GENERATING MODULES, MOTHBALLED GENERATING UNIT, MOTHBALLED POWER PARK MODULE (INCLUDING MOTHBALLED DC CONNECTED POWER PARK MODULES), MOTHBALLED HVDC SYSTEMS, MOTHBALLED HVDC CONVERTERS MOTHBALLED DC CONVERTERS AT A DC CONVERTER STATION AND ALTERNATIVE FUEL DATA

PAGE 3 OF 3

DATA DESCRIPTION	UNITS	DATA CAT	GENERATING UNIT DATA			
			1	2	3	4
CHANGEOVER BACK TO MAIN FUEL						
For off-line changeover:						
Time to carry out off-line fuel changeover	Minutes					
For on-line changeover						
Time to carry out on-line fuel changeover	Minutes					
Maximum output during on-line fuel changeover	MW					

Notes

1. Where a **Generating Unit** has the facilities installed to generate using more than one alternative fuel type details of each alternative fuel should be given.
2. Significant factors and their effects which may prevent the use of alternative fuels achieving the estimated values provided in this table (e.g. emissions limits, distilled water stocks etc.) should be appended separately.

- No information collated under this Schedule will be transferred to the **Relevant Transmission Licensees**

SCHEDULE 16 – SYSTEM RESTORATION INFORMATION

PAGE 1 OF 2

PART I

SYSTEM RESTORATION INFORMATION (EXCLUDING PARTIES PARTICIPATING IN DISTRIBUTION RESTORATION ZONES)		
The following data/text items are required from each Generator for each BM Unit at a Large Power Station as detailed in PC.A.5.7. Data is not required for Restoration Contractors Plant and Apparatus. The data should be provided in accordance with PC.A.1.2 and also, where possible, upon request from The Company during a System Restoration. For Restoration Contractors who are party to a Distribution Restoration Zone Plan, the data submitted should be supplied as part of Schedule 16 Part III of this Data Registration Code.		
Data Description	Units	Data Category
<i>(PC.A.5.7.1) (■ CUSC Contract)</i>		
Assuming all BM Units were running immediately prior to the Total Shutdown or Partial Shutdown and in the event of loss of all external power supplies, provide the following information:		
a) Expected time for the first and subsequent BM Units to be Synchronised , at time intervals of 12 hours, 24 hours, 36 hours, 48 hours and 72 hours from the restoration of external power supplies, assuming external power supplies are not available at the User's Site .	Tabular or Graphical	DPD II
b) Describe any likely issues that would have a significant impact on a BM Unit's time to be Synchronised arising as a direct consequence of the inherent design or operational practice of the Power Station and/or BM Unit , e.g. limited barring facilities, time from a Total Shutdown or Partial Shutdown at which batteries would be discharged or the availability of primary fuel supplies .	Text	DPD II
Block Loading Capability:		
c) Provide estimated Block Loading Capability from 0MW to Registered Capacity and the time between each incremental step of each BM Unit based on when the unit was running immediately prior to the Shutdown) and at time intervals of 12 hours, 24 hours, 36 hours, 48 hours and 72 hours after the BM Unit had been Shutdown . The Block Loading Capability should be valid for a frequency deviation of 49.5Hz – 50.5Hz. The data should identify any required 'hold' points.	Tabular or Graphical	DPD II

SCHEDULE 16 – SYSTEM RESTORATION INFORMATION

PAGE 2 OF 2

PART I

SYSTEM RESTORATION INFORMATION (EXCLUDING PARTIES PARTICIPATING IN DISTRIBUTION RESTORATION ZONES) The following data/text items are required from each HVDC System Owner or DC Converter Station Owner for each HVDC System and DC Converter as detailed in PC.A.5.7. Data is not required for Restoration Contractors Plant and Apparatus . The data should be provided in accordance with PC.A.1.2 and also, where possible, upon request from The Company during a System Restoration .		
Data Description (PC.A.5.7.1) (■ CUSC Contract)	Units	Data Category
Assuming all BM Units were running immediately prior to the Total Shutdown or Partial Shutdown and in the event of loss of all external power supplies, provide the following information:		
a) Expected time for the first and subsequent BM Units to be Synchronised , at time intervals of 12 hours, 24 hours, 36 hours, 48 hours and 72 hours from the restoration of external power supplies, assuming external power supplies are not available at the User's Site .	Tabular or Graphical	DPD II
b) Describe any likely issues that would have a significant impact on a BM Units time to be Synchronised arising as a direct consequence of the inherent design or operational practice of the HVDC System or DC Converter Station and/or BM Unit , e.g. time from a Total Shutdown or Partial Shutdown at which batteries would be discharged.	Text	DPD II
Block Loading Capability:		
c) Provide estimated incremental Active Power steps, from no load to Rated MW and the time between each incremental step which an HVDC System or DC Converter Station can instantaneously supply without causing it to trip or go outside the Frequency range of 47.5Hz – 52Hz (or an otherwise agreed Frequency range). The time between each incremental step shall also be provided. In addition data shall be provided from 0MW to Registered Capacity for each BM Unit which was running immediately prior to the Shutdown and at time intervals of 12 hours, 24 hours, 36 hours, 48 hours and 72 hours after the BM Unit had been Shutdown . The data supplied should be valid for a Frequency deviation of 49.5Hz – 50.5Hz and should identify any required 'hold' points.	Tabular or Graphical	DPD II
Governor Setting Information		
From 2025 onwards, Generators , HVDC System Owners and DC Converter owners, shall supply the governor setting information in accordance with the applicable requirements of CC.6.3.7 (h) or ECC.6.3.7.3.8.	Text	DPD II

SCHEDULE 16 – SYSTEM RESTORATION INFORMATION

PAGE 1 OF 1

PART II

DISTRIBUTION RESTORATION ZONE INFORMATION (PC.A.5.7.2 – DPD)		
Where a Network Operator has a Distribution Restoration Zone Plan in place, the following data specified shall be submitted by Network Operators and Restoration Contractors , party to a Distribution Restoration Zone Plan . Restoration Contractors shall, where reasonably practicable, submit the relevant information to the Network Operator who shall then supply that information to The Company .		
Data Description (PC.A.5.7.2)	Units	Data Category
The expected time for each Restoration Contractor's Plant to connect to the Network Operator's System following a Total Shutdown or Partial Shutdown . The assessment should include the Restoration Contractor's ability to reconnect or re-synchronise all their Plant , to the Total System at time intervals of 12 hours, 24 hours, 36 hours, 48 hours and 72 hours from the restoration of external power supplies.	Tabular or Graphical	DPD II
Additionally, the data and supporting text should highlight any specific issues (eg those that would affect the time before which the Restoration Contractor's Plant could be energised) that may arise as time progresses from Shutdown without external supplies being restored or the availability of primary fuel supplies.	Tabular or Graphical	DPD II
Block Loading Capability		
Provide estimated Block Loading Capability from 0MW to Registered Capacity and the time between each incremental step of each Restoration Contractor's Plant and Apparatus based on when the Restoration Contractor's Plant and Apparatus was running immediately prior to the Shutdown) and at time intervals of 12 hours, 24 hours, 36 hours, 48 hours and 72 hours after the Restoration Contractor's Plant and Apparatus had been Shutdown . The Block Loading Capability should be valid for a frequency deviation of 49.5Hz – 50.5Hz. The data should identify any required 'hold' points.	Tabular or Graphical	DPD II
Governor Setting Information		
From 2025 onwards, Restoration Contractors , Generators , HVDC System Owners and DC Converter owners, shall supply the governor setting information in accordance with the applicable requirements of CC.6.3.7 (h) or ECC.6.3.7.3.8.	Tabular or Graphical	DPD II

SCHEDULE 16 – SYSTEM RESTORATION INFORMATION

PAGE 1 OF 3

PART III

All **Users** and **Restoration Contractors** are required to confirm annually they comply with the applicable requirements of OC5.7. In the case of **Generators, HVDC System Owners, DC Converter owners, and Non-Embedded Customers**, this confirmation shall be provided in their week 24 submission. In the case of **Network Operators** prior to the **PSM Implementation Date**, this confirmation shall be provided in their week 24 submission; after the **PSM Implementation Date** this confirmation shall be provided in their week 28 submission.

SCHEDULE 16 – SYSTEM RESTORATION INFORMATION PART III (3 Pages)						
Assurance Activity	Grid Code Reference	Parties Involved	Frequency of Assurance Activity	The Company Witness required	Date of test result submission/visit	Annual Statement of Compliance (Y/N/Not applicable)
System Restoration Power Island review	OC9.4.7.6 OC5.7.4.2(iv)	Relevant Transmission Licensees, Network Operators and The Company	Every 3 years	Not applicable		
System Restoration Power Island availability assessment	OC9.4.7.6 OC5.7.4.2(iv)	Relevant Transmission Licensees, Network Operators and The Company	Yearly	Not applicable		
Remote Synchronisation test - TO/DNO	OC5.7.2.1(g) OC5.7.2.3 (d)	Relevant Transmission Licensees, relevant Network Operators, Restoration Contractors and The Company	Every 3 years	No		
Low Frequency Demand Disconnection Relay test	CC.A.5.4.3 / ECC.A.5.4.3	Relevant Transmission Licences, relevant Network Operators, Non-Embedded Customers and The Company	Every 3 years although this may be extended to no more than every five years if considered to be required for operational purposes	No		
Anchor Restoration Contractor test	OC5.7.2.1 /OC5.7.2.2 /OC5.7.2.3	Relevant Transmission Licensees, Network Operators, Anchor Restoration Contractors and The Company	Every 3 years	Yes		
Top Up Restoration Contractor test	OC.5.7.2.4	Relevant Transmission Licensees, Network Operators, Top Up Restoration Contractors and The Company	Every 3 years	Yes		
Resilience to Partial Shutdown or Total Shutdown of Restoration Contractor	OC9.4.7.6.2 OC5.7.4.2(iii) CC/ECC.7.11	Restoration Contractors and The Company	Yearly	No		
Quick Resynchronisation	OC5.7.2.5	EU Generators in respect of Type C	Yearly	Yes		

SCHEDULE 16 – SYSTEM RESTORATION INFORMATION
PART III
(3 Pages)

Assurance Activity	Grid Code Reference	Parties Involved	Frequency of Assurance Activity	The Company Witness required	Date of test result submission/visit	Annual Statement of Compliance (Y/N/Not applicable)
Unit Test		and Type D Power Generating Modules , relevant Network Operators and The Company				
Distribution Restoration Zone Control System test	OC5.7.2.6	Network Operators , Restoration Contractors and The Company	Every 3 years	Yes		
Dead Line Charge test	OC5.7.2.1(g)(a) OC5.7.2.3(d)(a)	Transmission Licensees , relevant Network Operators Anchor Restoration Contractors and The Company	Every 3 years	Yes		
Remote Synchronisation test - Restoration Contractor	OC5.7.2.1(g)(b) OC5.7.2.3(d)(b)	Relevant Transmission Licensees , relevant Network Operators , Restoration Contractors and The Company	Every 3 years	Yes		
Assurance Visits	OC5.7.4 OC5.7.5	The Company , Relevant Transmission Licensees , relevant Network Operators to visit Restoration Contractors	Every 3 years	Yes		
Voice Systems Resilience test or equivalent	OC5.7.4.2(vi)	CUSC Parties , relevant Network Operators , Relevant Transmission Licensees Restoration Contractors and The Company	Yearly	No		
Critical Tools and Facilities control systems resilience demonstration –power resilience including power resilience demonstration & connectivity and alarm event handling	OC.5.7.4.2(iii) OC5.7.4.2(ix) OC5.7.4.3 CC.7.10.7 ECC.7.10.7	CUSC Parties , relevant Network Operators , Relevant Transmission Licensees , Restoration Contractors and The Company	Every 3 years	No		
Control systems resilience demonstration – diagram & topology	OC5.7.2.6	CUSC Parties , relevant Network Operators , Relevant Transmission Licensees , Restoration Contractors and The Company	Every 3 years (as set out in the DRZCS RES)'	No		
Cyber-Security	CC.7.10.6 ECC.7.10.6 OC.5.7.4.2(iii) OC5.7.4.2(x)	CUSC Parties , relevant Network Operators , Relevant	Yearly	No		

SCHEDULE 16 – SYSTEM RESTORATION INFORMATION
PART III
(3 Pages)

Assurance Activity	Grid Code Reference	Parties Involved	Frequency of Assurance Activity	The Company Witness required	Date of test result submission/visit	Annual Statement of Compliance (Y/N/Not applicable)
		Transmission Licensees, Restoration Contractors and The Company				
Telephony services test as per CC/ECC.6.5.4.	CC.6.5.1 – CC.6.5.5 ECC.6.5.1 – ECC.6.5.5 OC.5.7.4.2(vi) OC5.7.4.2(xi) OC5.7.4.2(xii)	CUSC Parties, relevant Network Operators, relevant Transmission Licensees, Restoration Contractors and The Company	Yearly (or as in accordance with CC/ECC.6.5.4.)	No		
Resilience to Partial Shutdown or Total Shutdown of CUSC Parties	OC5.7.4 OC5.7.5	CUSC Parties and The Company	Yearly	No		
Restoration Procedure review	OC9.4.7.6.2 OC5.7.4.2(iv)	The Company, Relevant Transmission Licensees, relevant Network Operators, CUSC Parties and Restoration Contractors	Every 3 years	Not applicable		
LJRP & DRZP reviews	OC9.4.7.6 OC5.7.4.2(iv)	The Company, Network Operators, Transmission Licensees and Restoration Plan signatories	Every 3 years	Not applicable		
Awareness training for Restoration Contractor and CUSC Parties	OC9.4.7.6.2 OC5.7.4	The Company, relevant Network Operators, Transmission Licensees, CUSC Parties and Restoration Contractors	Every 3 years	Not applicable		
Cross industry training	OC9.4.7.6.2 OC5.7.4	The Company, Network Operators, Transmission Licensees, CUSC Parties and Restoration Contractors	Every 3 years	Not applicable		

SCHEDULE 17 - ACCESS PERIOD DATA
PAGE 1 OF 1

(PC.A.4 - CUSC Contract ■)

Submissions by **Users** using this Schedule 17 shall commence in 2011 and shall then continue in each year thereafter

Access Group	

Asset Identifier	Start Week	End Week	Maintenance Year (1, 2 or 3)	Duration	Potential Concurrent Outage (Y/N)

Comments

SCHEDULE 18 - OFFSHORE TRANSMISSION SYSTEM DATA

PAGE 1 OF 24

The data in this Schedule 18 is required from **Generators** who are undertaking **OTSDUW** and connecting to a **Transmission Interface Point**.

DATA DESCRIPTION	UNITS	DATA to RTL		DATA CAT.	GENERATING UNIT OR STATION DATA						
		CUSC Cont ract	CUSC App. Form		F.Yr0	F.Yr1	F.Yr2	F.Yr3	F.Yr4	F.Yr5	F.Yr 6
INDIVIDUAL OTSDUW DATA											
Interface Point Capacity (PC.A.3.2.2 (a))	MW MVA _r	☐	☒								
Performance Chart at the Transmission Interface Point for OTSDUW Plant and Apparatus (PC.A.3.2.2(f)(iv))		☐	☒								
OTSDUW DEMANDS											
Demand associated with the OTSDUW Plant and Apparatus (excluding OTSDUW DC Converters – see Note 1)) supplied at each Interface Point. The User should also provide the Demand supplied to each Connection Point on the OTSDUW Plant and Apparatus. (PC.A.5.2.5)											
- The maximum Demand that could occur.	MW MVA _r	☐		DPD I							
- Demand at specified time of annual peak half hour of National Electricity Transmission System Demand at Annual ACS Conditions.	MW MVA _r	☐		DPD I DPD II DPD II							
- Demand at specified time of annual minimum half-hour of National Electricity Transmission System Demand.	MW MVA _r	☐		DPD II DPD II							
(Note 1 – Demand required from OTSDUW DC Converters should be supplied under page 2 of Schedule 18).											

SCHEDULE 18 - OFFSHORE TRANSMISSION SYSTEM DATA

PAGE 2 OF 24

OTSDUW USERS SYSTEM DATA

DATA DESCRIPTION	UNITS	DATA to RTL		DATA CATEGORY
		CUSC Contract	CUSC App. Form	
OFFSHORE TRANSMISSION SYSTEM LAYOUT (PC.A.2.2.1, PC.A.2.2.2 and P.C.A.2.2.3)				
A Single Line Diagram showing connectivity of all of the Offshore Transmission System including all Plant and Apparatus between the Interface Point and all Connection Points is required.		■	■	SPD
This Single Line Diagram shall depict the arrangement(s) of all of the existing and proposed load current carrying Apparatus relating to both existing and proposed Interface Points and Connection Points , showing electrical circuitry (i.e. overhead lines, underground cables (including subsea cables), power transformers and similar equipment), operating voltages, circuit breakers and phasing arrangements		■	■	SPD
Operational Diagrams of all substations within the OTSDUW Plant and Apparatus		■	■	SPD
SUBSTATION INFRASTRUCTURE (PC.A.2.2.6)				
For the infrastructure associated with any OTSDUW Plant and Apparatus				
Rated 3-phase rms short-circuit withstand current	kA	■	■	SPD
Rated 1-phase rms short-circuit withstand current	kA	■	■	SPD
Rated Duration of short-circuit withstand	s	■	■	SPD
Rated rms continuous current	A	■	■	SPD
LUMPED SUSCEPTANCES (PC.A.2.3)				
Equivalent Lumped Susceptance required for all parts of the User's Subtransmission System (including OTSDUW Plant and Apparatus) which are not included in the Single Line Diagram.		■	■	
This should not include:		■	■	
(a) independently switched reactive compensation equipment identified above.		■	■	
(b) any susceptance of the OTSDUW Plant and Apparatus inherent in the Demand (Reactive Power) data provided on Page 1 and 2 of this Schedule 14.		■	■	
Equivalent lumped shunt susceptance at nominal Frequency .	% on 100 MVA	■	■	

SCHEDULE 18 - OFFSHORE TRANSMISSION SYSTEM DATA
PAGE 3 OF 24

OFFSHORE TRANSMISSION SYSTEM DATA
Branch Data (PC.A.2.2.4)

Node 1	Node 2	Rated Voltage (kV)	Operating Voltage (kV)	Circuit	PPS PARAMETERS			ZPS PARAMETERS			Maximum Continuous Ratings			Length (km)
					R1 %100 MVA	X1 %100 MVA	B1 %100 MVA	R0 %100 MVA	X0 %100 MVA	B0 %100 MVA	Winter (MVA)	Spring Autumn (MVA)	Summer (MVA)	

Notes

- 1. For information equivalent STC Reference: STCP12-1m Part 3 – 2.1 Branch Data
- 2. In the case where an overhead line exists within the OTSDUW Plant and Apparatus the Mutual inductances should also be provided.

SCHEDULE 18 - OFFSHORE TRANSMISSION SYSTEM DATA
PAGE 4 OF 24

OFFSHORE TRANSMISSION SYSTEM DATA

2 Winding Transformer Data (PC.A.2.2.5)

The data below is **Standard Planning Data**, and details should be shown below of all transformers shown on the **Single Line Diagram**

HV Node	HV (kV)	LV Node	LV (kV)	Rating (MVA)	Transformer	Positive Phase Sequence Reactance % on 100MVA			Positive Phase Sequence Resistance % on 100MVA			Tap Changer			Winding Arr	Earthing method (Direct/ Res/ Reac)	Earthing Impedance method
						Max Tap	Min Tap	Nom Tap	Max Tap	Min Tap	Nom Tap	Range +% to -%	Step size %	Type			

Notes

1 For information the corresponding STC Reference is STCP12-1: Part 3 – 2.4 Transformers

SCHEDULE 18 - OFFSHORE TRANSMISSION SYSTEM DATA
PAGE 5 OF 24

USERS SYSTEM DATA (OTSUA)

Auto Transformer Data 3-Winding (PC.A.2.2.5)

The data below is all **Standard Planning Data**, and details should be shown below of all transformers shown on the **Single Line Diagram**

HV NODE	V _H (kV)	LV NODE	V _L (kV)	PSS/E Circuit	Rating (MVA)	Tran- s- form- er	Positive Phase Sequence Reactance % on 100MVA			Positive Phase Sequence Resistance % on 100MVA			Taps			Win- ding Arra- nge- ment	Earth- ing Impe- dance metho- d	EQUIVALENT ZPS PARAMETERS (FLIP)						The Com- pany Shee- t	The Com- - pany Code
							Max Tap	Min Tap	Nom Tap	Max Tap	Min Tap	Nom Tap	Range +% to - %	Step size %	Type (Onlo- ad Offlo- ad)			ZOH		ZOL		ZOT Dfit X/R=20			
																		R _{OH} % 100 MVA	X _{OH} % 100 MVA	R _{OL} % 100 MVA	X _{OL} % 100 MVA	R _{OT} % 100 MVA	X _{OT} % 100 MVA		

Notes

1.For information STC Reference: STCP12-1: Part 3 - 2.4 Transformers

SCHEDULE 18 - OFFSHORE TRANSMISSION SYSTEM DATA
PAGE 6 OF 24

OFFSHORE TRANSMISSION SYSTEM DATA

Circuit Breaker Data (PC.A.2.2.6(a))

The data below is all **Standard Planning Data**, and should be provided for all **OTSUA** switchgear (i.e. circuit breakers, load disconnectors and disconnectors)

Circuit Breaker Data								Assumed Operating Times			Conti- nuos Rating (A)	3 Phase				1 Phase				DC time constant at testing of asymmet rical breaking ability (s)
Location	Name	Rated Voltage	Oper- ating Voltage	Make	Model	Type	Year Comm- issioed	Circuit Breaker (ms)	Minimum Protection & Trip Relay (ms)	Total Time (ms)		Fault Rating (RMS Symmeric al) (3 phase MVA)	Fault Break Rating (RMS Symmertri cal) (3 phase) (kA)	Fault Break Rating (Peak Asymmetri cal) (3 phase) (kA)	Fault Make Rating (Peak Asymmetri cal) (3 phase) (kA)	Fault Rating (RMS Symmeric al) (1 phase MVA)	Fault Break Rating (RMS Symmertri cal) (1 phase) (kA)	Fault Break Rating (Peak Asymmetri cal) (1 phase) (kA)	Fault Make Rating (Peak Asymmetri cal) (1 phase) (kA)	

SCHEDULE 18 - OFFSHORE TRANSMISSION SYSTEM DATA**PAGE 7 OF 24****OFFSHORE TRANSMISSION SYSTEM DATA**REACTIVE COMPENSATION EQUIPMENT (PC.A.2.4(e))

Item	Node	kV	Device No.	Rating (MVar)	P Loss (kW)	Tap range	Connection Arrangement

Notes:

1. For information STC Reference: STCP12-1: Part 3 - 2.5 Reactive Compensation Equipment
2. Data relating to continuously variable reactive compensation equipment (such as statcoms or SVCs) should be entered on the SVC Modelling table.
3. For the avoidance of doubt this includes any AC Reactive Compensation equipment included within the OTSDUW DC Converter other than harmonic filter data which is to be entered in the harmonic filter data table.

<i>PC.A.2.4.1(e)</i>	A mathematical representation in block diagram format to model the control of any dynamic compensation plant. The model should be suitable for RMS dynamic stability type studies in which the time constants used should not be less than 10ms.

SCHEDULE 18 - OFFSHORE TRANSMISSION SYSTEM DATA
PAGE 8 OF 24

OFFSHORE TRANSMISSION SYSTEM DATA
REACTIVE COMPENSATION - SVC Modelling Data (PC.A.2.4.1(e)(iii))

HV Node	LV Node	Control Node	Nominal Voltage (kV)	Target Voltage (kV)	Max MVar at HV	Min MVar at HV	Slope %	Voltage Dependent Q Limit	Normal Running Mode	R1 PPS_R	X1 PPS_X	R0 ZPS_R	Z0 ZPS_X	Trasnf Winding Type	Connection (Direct/ Tertiary)

Notes:

1.For information the equivalent STC Reference is: STCP12-1: Part 3 - 2.7 SVC Modelling Data

SCHEDULE 18 - OFFSHORE TRANSMISSION SYSTEM DATA

PAGE 9 OF 24

OFFSHORE TRANSMISSION SYSTEM DATA

Harmonic Filter Data (including **OTSDUW DC Converter** harmonic Filter Data)

(PC.A.5.4.3.1(d) and PC.A.6.4.2)

[illegible]

Notes:

1. For information STC Reference: STCP12-1: Part 3 - 2.8 Harmonic Filter Data

SCHEDULE 18 - OFFSHORE TRANSMISSION SYSTEM DATA

PAGE 10 OF 24

Information for Transient Overvoltage Assessment (DPD I) (PC.A.6.2 ■ CUSC Contract)

The information listed below may be requested by **The Company** from each **User** undertaking **OTSDUW** with respect to any **Interface Point** or **Connection Point** to enable **The Company** to assess transient overvoltage on the **National Electricity Transmission System**.

- (a) Busbar layout plan(s), including dimensions and geometry showing positioning of any current and voltage transformers, through bushings, support insulators, disconnectors, circuit breakers, surge arresters, etc. Electrical parameters of any associated current and voltage transformers, stray capacitances of wall bushings and support insulators, and grading capacitances of circuit breakers;
- (b) Electrical parameters and physical construction details of lines and cables connected at that busbar. Electrical parameters of all plant e.g., transformers (including neutral earthing impedance or zig-zag transformers if any), series reactors and shunt compensation equipment connected at that busbar (or to the tertiary of a transformer) or by lines or cables to that busbar;
- (c) Basic insulation levels (BIL) of all **Apparatus** connected directly, by lines or by cables to the busbar;
- (d) Characteristics of overvoltage **Protection** devices at the busbar and at the termination points of all lines, and all cables connected to the busbar;
- (e) Fault levels at the lower voltage terminals of each transformer connected to each **Interface Point** or **Connection Point** without intermediate transformation;
- (f) The following data is required on all transformers within the **OTSDUW Plant and Apparatus**.
- (g) An indication of which items of equipment may be out of service simultaneously during **Planned Outage** conditions.

Harmonic Studies (DPD I) (PC.A.6.4 ■ CUSC Contract)

The information given below, both current and forecast, where not already supplied in this Schedule 14 may be requested by **The Company** from each **User** if it is necessary for **The Company** to evaluate the production/magnification of harmonic distortion on **National Electricity Transmission System**. The impact of any third party **Embedded** within the **User's System** should be reflected:-

- (a) Overhead lines and underground cable circuits (including subsea cables) of the **User's OTSDUW Plant and Apparatus** must be differentiated and the following data provided separately for each type:-
 - Positive phase sequence resistance
 - Positive phase sequence reactance
 - Positive phase sequence susceptance
- (b) for all transformers connecting the **OTSDUW Plant and Apparatus** to a lower voltage:-
 - Rated MVA
 - Voltage Ratio
 - Positive phase sequence resistance
 - Positive phase sequence reactance

SCHEDULE 18 - OFFSHORE TRANSMISSION SYSTEM DATA**PAGE 11 OF 24**

- (c) at the lower voltage points of those connecting transformers:-

Equivalent positive phase sequence susceptance

Connection voltage and MVA rating of any capacitor bank and component design parameters if configured as a filter

Equivalent positive phase sequence interconnection impedance with other lower voltage points

The minimum and maximum **Demand** (both MW and MVA) that could occur

Harmonic current injection sources in Amps at the Connection Points and Interface Points

- (d) an indication of which items of equipment may be out of service simultaneously during **Planned Outage** conditions

Voltage Assessment Studies (DPD I) (PC.A.6.5 ■ CUSC Contract)

The information listed below, where not already supplied in this Schedule 14, may be requested by **The Company** from each **User** undertaking **OTSDUW** with respect to any **Connection Point** or **Interface Point** if it is necessary for **The Company** to undertake detailed voltage assessment studies (e.g. to examine potential voltage instability, voltage control co-ordination or to calculate voltage step changes on the **National Electricity Transmission System**).

- (a) For all circuits of the **User's OTSDUW Plant and Apparatus**:-

Positive Phase Sequence Reactance

Positive Phase Sequence Resistance

Positive Phase Sequence Susceptance

MVA rating of any reactive compensation equipment

- (b) for all transformers connecting the **User's OTSDUW Plant and Apparatus** to a lower voltage:-

Rated MVA

Voltage Ratio

Positive phase sequence resistance

Positive Phase sequence reactance

Tap-changer range

Number of tap steps

Tap-changer type: on-load or off-circuit

AVC/tap-changer time delay to first tap movement

AVC/tap-changer inter-tap time delay

- (c) at the lower voltage points of those connecting transformers

Equivalent positive phase sequence susceptance

MVA rating of any reactive compensation equipment

Equivalent positive phase sequence interconnection impedance with other lower voltage points

The maximum **Demand** (both MW and MVA) that could occur

Estimate of voltage insensitive (constant power) load content in % of total load at both winter peak and 75% off-peak load conditions

SCHEDULE 18 - OFFSHORE TRANSMISSION SYSTEM DATA

PAGE 12 OF 24

Short Circuit Analyses:(DPD I) (PC.A.6.6 ■ CUSC Contract)

The information listed below, both current and forecast, and where not already supplied under this Schedule 14, may be requested by **The Company** from each **User** undertaking **OTSDUW** with respect to any **Connection Point** or **Interface Point** where prospective short-circuit currents on **Transmission** equipment are close to the equipment rating.

(a) For all circuits of the **User's OTSDUW Plant and Apparatus:-**

- Positive phase sequence resistance
- Positive phase sequence reactance
- Positive phase sequence susceptance
- Zero phase sequence resistance (both self and mutuals)
- Zero phase sequence reactance (both self and mutuals)
- Zero phase sequence susceptance (both self and mutuals)

(b) For all transformers connecting the **User's OTSDUW Plant and Apparatus** to a lower voltage:-

- Rated MVA
- Voltage Ratio
- Positive phase sequence resistance (at max, min and nominal tap)
- Positive Phase sequence reactance (at max, min and nominal tap)
- Zero phase sequence reactance (at nominal tap)
- Tap changer range
- Earthing method: direct, resistance or reactance
- Impedance if not directly earthed

(c) At the lower voltage points of those connecting transformers:-

The maximum **Demand** (in MW and MVA_r) that could occur

Short-circuit infeed data in accordance with PC.A.2.5.6(a) unless the **User's OTSDUW Plant and Apparatus** runs in parallel with the **Subtransmission System**, when to prevent double counting in each node infeed data, a π equivalent comprising the data items of PC.A.2.5.6(a) for each node together with the positive phase sequence interconnection impedance between the nodes shall be submitted.

SCHEDULE 18 - OFFSHORE TRANSMISSION SYSTEM DATA

PAGE 13 OF 24

Fault infeed data to be submitted by **OTSDUW Plant and Apparatus** providing a fault infeed (including **OTSDUW DC Converters**) (PC.A.2.5.5)

A submission is required for **OTSDUW Plant and Apparatus** (including **OTSDUW DC Converters** at each **Transmission Interface Point** and **Connection Point**. The submission shall represent operating conditions that result in the maximum fault infeed. The fault current from all auxiliaries of the **OTSDUW Plant and Apparatus** at the **Transmission Interface Point** and **Connection Point** shall be included. The fault infeed shall be expressed as a fault current at the **Transmission Interface Point** and also at each **Connection Point**.

Should actual data in respect of fault infeeds be unavailable at the time of the application for a **CUSC Contract** or **Embedded Development Agreement**, a limited subset of the data, representing the maximum fault infeed that may result from the **OTSDUW Plant and Apparatus**, shall be submitted. This data will, as a minimum, represent the root mean square of the positive, negative and zero sequence components of the fault current for both single phase and three phase solid faults at each **Connection Point** and **Interface Point** at the time of fault application and 50ms following fault application. Actual data in respect of fault infeeds shall be submitted to **The Company** as soon as it is available, in line with PC.A.1.2.

DATA DESCRIPTION	UNITS	F.Yr. <u>0</u>	F.Yr. <u>1</u>	F.Yr. <u>2</u>	F.Yr. <u>3</u>	F.Yr. <u>4</u>	F.Yr. <u>5</u>	F.Yr. <u>6</u>	F.Yr. <u>7</u>	DATA to RTL	
(PC.A.2.5)										CUSC Contract	CUSC App. Form
Name of OTSDUW Plant and Apparatus											
OTSDUW DC Converter type (i.e. voltage or current source)											
A submission shall be provided for the contribution of each OTSDUW Plant and Apparatus to the positive, negative and zero sequence components of the short circuit current at the Interface Point and each Connection Point for (i) a solid symmetrical three phase short circuit (ii) a solid single phase to earth short circuit (iii) a solid phase to phase short circuit (iv) a solid two phase to earth short circuit If protective controls are used and active for the above conditions, a submission shall be provided in the limiting case where the protective control is not active. This case may require application of a non-solid fault, resulting in a retained voltage at the fault point.										☐ ☐ ☐ ☐ ☐	☒ ☒ ☒ ☒ ☒

SCHEDULE 18 - OFFSHORE TRANSMISSION SYSTEM DATA
PAGE 14 OF 24

DATA DESCRIPTION	UNITS	F. Yr. 0	F. Yr. 1	F. Yr. 2	F. Yr. 3	F. Yr. 4	F. Yr. 5	F. Yr. 6	F. Yr. 7	DATA to RTL	
										CUSC Contract	CUSC App. Form
- A continuous time trace and table showing the root mean square of the positive, negative and zero sequence components of the fault current from the time of fault inception to 140ms after fault inception at 10ms intervals	Graphical and tabular kA versus s									☐	☒
- A continuous time trace and table showing the positive, negative and zero sequence components of retained voltage at the Interface Point and each Connection Point , if appropriate	p.u. versus s									☐	☒
- A continuous time trace and table showing the root mean square of the positive, negative and zero sequence components of retained voltage at the fault point, if appropriate	p.u. versus s									☐	☒
Positive sequence X/R ratio of the equivalent at time of fault at the Interface Point and each Connection Point										☐	☒
Minimum zero sequence impedance of the equivalent at the Interface Point and each Connection Point										☐	☒
Active Power transfer at the Interface Point and each Connection Point pre-fault	MW									☐	☒
Power Factor (lead or lag)										☐	☒
Pre-fault voltage (if different from 1.0 p.u.) at fault point (See note 1)	p.u.									☐	☒
Items of reactive compensation switched in pre-fault										☐	☒

Note 1. The pre-fault voltage provided above should represent the voltage within the range 0.95 to 1.05 that gives the highest fault current

SCHEDULE 18 - OFFSHORE TRANSMISSION SYSTEM DATA

PAGE 15 OF 24

Thermal Ratings Data (PC.A.2.2.4)

		CIRCUIT RATING SCHEDULE		
Voltage		Offshore TO Name		Issue Date
132kV				

CIRCUIT Name from Site A – Site B

		Winter				Spring/Autumn				Summer			
OVERALL CCT RATINGS		%Nom	Limit	Amps	MVA	%Nom	Limit	Amps	MVA	%Nom	Limit	Amps	MVA
Pre-Fault Continuous		84%	Line	485	111	84%	Line	450	103	84%	Line	390	89
Post-Fault Continuous		100%	Line	580	132	100%	Line	540	123	100%	Line	465	106
Prefault load exceeds line prefault continuous rating	6hr	95%	Line	580	132	95%	Line	540	123	95%	Line	465	106
	20m		Line	580	132		Line	540	123		Line	465	106
	10m	mva	Line	580	132	mva	Line	540	123	mva	Line	465	106
	5m	125	Line	580	132	116	Line	540	123	100	Line	465	106
	3m		Line	580	132		Line	540	123		Line	465	106
Short Term Overloads	6hr	90%	Line	580	132	90%	Line	540	123	90%	Line	465	106
	20m		Line	580	132		Line	540	123		Line	465	106
	10m	mva	Line	580	132	mva	Line	540	123	mva	Line	465	106
	5m	118	Line	580	132	110	Line	540	123	95	Line	465	106
	3m		Line	580	132		Line	540	123		Line	465	106
Limiting Item and permitted overload values for different times and pre-fault loads	6hr	84%	Line	580	132	84%	Line	540	123	84%	Line	465	106
	20m		Line	590	135		Line	545	125		Line	470	108
	10m	mva	Line	630	144	mva	Line	580	133	mva	Line	495	113
	5m	110	Line	710	163	103	Line	655	149	89	Line	555	126
	3m		Line	810	185		Line	740	170		Line	625	143
	6hr	75%	Line	580	132	75%	Line	540	123	75%	Line	465	106
	20m		Line	595	136		Line	555	126		Line	475	109
	10m	mva	Line	650	149	mva	Line	600	137	mva	Line	510	116
	5m	99	Line	760	173	92	Line	695	159	79	Line	585	134
	3m		Line	885	203		Line	810	185		Line	685	156
	6hr	60%	Line	580	132	60%	Line	540	123	60%	Line	465	106
	20m		Line	605	138		Line	560	128		Line	480	110
	10m	mva	Line	675	155	mva	Line	620	142	mva	Line	530	121
	5m	79	Line	820	187	73	Line	750	172	63	Line	635	145
	3m		Line	985	226		Line	900	206		Line	755	173
	6hr	30%	Line	580	132	30%	Line	540	123	30%	Line	465	106
	20m		Line	615	141		Line	570	130		Line	490	112
	10m	mva	Line	710	163	mva	Line	655	150	mva	Line	555	127
	5m	39	Line	895	205	36	Line	820	187	31	Line	690	158
	3m		Line	1110	255		Line	1010	230		Line	845	193

SCHEDULE 18 - OFFSHORE TRANSMISSION SYSTEM DATA
PAGE 16 OF 24

	6hr											
	20m											
	10m											
	5m											
	3m											
	6hr											
	20m											
	10m											
	5m											
	3m											
Notes or Restrictions Detailed												

Notes: 1. For information the equivalent STC Reference: STCP12-1: Part 3 - 2.6 Thermal Ratings
2. The values shown in the above table is example data.

SCHEDULE 18 - OFFSHORE TRANSMISSION SYSTEM DATA

PAGE 17 OF 24

Protection Policy (*PC.A.6.3*)

To include details of the protection policy

Protection Schedules(*PC.A.6.3*)

Data schedules for the protection systems associated with each primary plant item including:

Protection, Intertrip Signalling & operating times
Intertripping and protection unstabilisation initiation
Synchronising facilities
Delayed Auto Reclose sequence schedules

Automatic Switching Scheme Schedules (*PC.A.2.2.7*)

A diagram of the scheme and an explanation of how the system will operate and what plant will be affected by the scheme's operation.

SCHEDULE 18 - OFFSHORE TRANSMISSION SYSTEM DATA
PAGE 18 OF 24

GENERATOR INTERTRIP SCHEMES (PC.A.2.2.7(b))

Substation: _____

Details of Generator Intertrip Schemes:

A diagram of the scheme and an explanation of how the system will operate and what plant will be effected by the schemes operation.

DEMAND INTERTRIP SCHEMES (PC.A.2.2.7(b))

Substation: _____

Details of Demand Intertrip Schemes:

A diagram of the scheme and an explanation of how the system will operate and what plant will be effected by the schemes operation

SCHEDULE 18 - OFFSHORE TRANSMISSION SYSTEM DATA

PAGE 19 OF 24

Specific Operating Requirements (CC.5.2.1 or ECC.5.2.1)

SUBSTATION OPERATIONAL GUIDE

Substation: _____

Location Details:

Postal Address:	Telephone Nos.	Map Ref.
Transmission Interface		
Generator Interface		

- 1. Substation Type:**

- 2. Voltage Control:** *(short description of voltage control system. To include mention of modes i.e. Voltage, manual etc. Plus control step increments i.e. 0.5% or 0.33kV)*

- 3. Energisation Switching Information:** *(The standard energisation switching process from dead.)*

- 4. Intertrip Systems:**

- 5. Reactive Plant Outage:** *(A short explanation of any system re-configurations required to facilitate the outage of any reactive plant which form part of the OTSDUW Plant and Apparatus equipment. Also any generation restrictions required).*

- 6. Harmonic Filter Outage:** *(An explanation as to any OTSDUW Plant and Apparatus reconfigurations required to facilitate the outage and maintain the system within specified Harmonic limits, also any generation restrictions required).*

SCHEDULE 18 - OFFSHORE TRANSMISSION SYSTEM DATA

PAGE 20 OF 24

OTSDUW DC CONVERTER TECHNICAL DATA

OTSDUW DC CONVERTER NAME

DATE:

Data Description	Units	DATA to RTL		Data Category	DC Converter Station Data
(PC.A.4 and PC.A.5.2.5)		CUSC Contract	CUSC App. Form		
OTSDUW DC CONVERTER (CONVERTER DEMANDS): Demand supplied through Station Transformers associated with the OTSDUW DC Converter at each Interface Point and each Offshore Connection Point Grid Entry Point [PC.A.4.1] - Demand with all OTSDUW DC Converters operating at Interface Point Capacity . - Demand with all OTSDUW DC Converters operating at maximum Interface Point flow from the Interface Point to each Offshore Grid Entry Point . - The maximum Demand that could occur. - Demand at specified time of annual peak half hour of The Company Demand at Annual ACS Conditions . - Demand at specified time of annual minimum half-hour of The Company Demand .	MW MVA MW MVA MW MVA MW MVA MW MVA	☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐		DPD II DPD II DPD II DPD II DPD II DPD II DPD II DPD II	
OTSDUW DC CONVERTER DATA	Text	☐	■	SPD+	
Number of poles, i.e. number of OTSDUW DC Converters	Text	☐	■	SPD+	
Pole arrangement (e.g. monopole or bipole)	Diagram	☐			
Return path arrangement					
Details of each viable operating configuration			■		
Configuration 1	Diagram	☐	■	SPD+	
Configuration 2	Diagram	☐	■		
Configuration 3	Diagram	☐	■		
Configuration 4	Diagram	☐	■		
Configuration 5	Diagram	☐	■		
Configuration 6	Diagram	☐	■		

SCHEDULE 18 - OFFSHORE TRANSMISSION SYSTEM DATA
PAGE 21 OF 24

[illegible]

SCHEDULE 18 - OFFSHORE TRANSMISSION SYSTEM DATA
PAGE 22 OF 24

Data Description	Units	DATA to RTL		Data Category	Operating configuration					
		CUSC Contract	CUSC App. Form		1	2	3	4	5	6
OTSDUW DC CONVERTER NETWORK DATA (PC.A.5.4.3.1 (c)) Rated DC voltage per pole Rated DC current per pole Details of the OTSDUW DC Network described in diagram form including resistance, inductance and capacitance of all DC cables and/or DC lines. Details of any line reactors (including line reactor resistance), line capacitors, DC filters, earthing electrodes and other conductors that form part of the OTSDUW DC Network should be shown.	kV A Diagram	☐ ☐ ☐		DPD II DPD II DPD II						

SCHEDULE 18 - OFFSHORE TRANSMISSION SYSTEM DATA
PAGE 23 OF 24

Data Description	Units	DATA to RTL		Data Category	Operating configuration					
		CUSC Contract	CUSC App. Form		1	2	3	4	5	6

OTSDUW DC CONVERTER CONTROL SYSTEMS (PC.A.5.4.3.2) Static $V_{DC} - P_{DC}$ (DC voltage – DC power) or Static $V_{DC} - I_{DC}$ (DC voltage – DC current) characteristic (as appropriate) when operating as –Rectifier –Inverter Details of rectifier mode control system, in block diagram form together with parameters showing transfer functions of individual elements. Details of inverter mode control system, in block diagram form showing transfer functions of individual elements including parameters (as applicable). Details of OTSDUW DC Converter transformer tap changer control system in block diagram form showing transfer functions of individual elements including parameters. Details of AC filter control systems in block diagram form showing transfer functions of individual elements including parameters Details of any frequency and/or load control systems in block diagram form showing transfer functions of individual elements including parameters. Details of any large or small signal modulating controls, such as power oscillation damping controls or sub-synchronous oscillation damping controls, that have not been submitted as part of the above control system data. Transfer block diagram representation of the reactive power control at converter ends for a voltage source converter. For Generators in respect of OTSDUW who are also EU Code Users details of OTSDUW DC Converter unit models and/or control systems in block diagram form showing transfer functions of individual elements including parameters. For Generators in respect of OTSDUW who are also EU Code Users details of AC component models and/or control systems in block diagram form showing transfer functions of individual elements including parameters. For Generators in respect of OTSDUW who are also EU Code Users details of DC Grid models and/or control systems in block diagram form showing transfer functions of individual elements including parameters. For Generators in respect of OTSDUW who are also EU Code Users details of Voltage and power controller and/or control systems in block diagram form showing transfer functions of individual elements including parameters. For Generators in respect of OTSDUW who are also EU Code Users details of Special control	Diagram	☐								
	Diagram	☐								
	Diagram	☐								
	Diagram	☐								
	Diagram	☐								
	Diagram	☐								
	Diagram	☐								
	Diagram	☐								
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	Diagram	☐								
	Diagram	☐								
	Diagram	☐								
	Diagram	☐								

Data Description	Units	DATA to RTL		Data Category	Operating configuration					
		CUSC Contract	CUSC App. Form		1	2	3	4	5	6
features if applicable (e.g. power oscillation damping (POD) function, subsynchronous torsional interaction (SSTI) control and/or control systems in block diagram form showing transfer functions of individual elements including parameters.										
For Generators in respect of OTSDUW who are also EU Code Users details of Multi terminal control, if applicable and/or control systems in block diagram form showing transfer functions of individual elements including parameters.	Diagram	☐		DPD II						
For Generators in respect of OTSDUW who are also EU Code Users details of OTSDUW DC Converter protection models as agreed between The Company and the Generator (in respect of OTSDW) and/or control systems in block diagram form showing transfer functions of individual elements including parameters.	Diagram	☐		DPD II						

SCHEDULE 18 - OFFSHORE TRANSMISSION SYSTEM DATA
PAGE 24 OF 24

Data Description	Units	DATA to RTL		Data Category	Operating configuration					
		CUSC Contract	CUSC App. Form		1	2	3	4	5	6
LOADING PARAMETERS (PC.A.5.4.3.3)										
MW Export from the Offshore Grid Entry Point to the Transmission Interface Point	MW/s	☐		DPD I						
Nominal loading rate	MW/s	☐		DPD I						
Maximum (emergency) loading rate										
Maximum recovery time, to 90% of pre-fault loading, following an AC system fault or severe voltage depression.	s	☐		DPD II						
Maximum recovery time, to 90% of pre-fault loading, following a transient DC Network fault.	s	☐		DPD II						

SCHEDULE 19 – USER DATA FILE STRUCTURE

PAGE 1 OF 2

The structure of the **User Data File Structure** is given below.

i.d.	Folder name	Description of contents
Part A: Commercial & Legal		
A2	Commissioning	Commissioning & Test Programmes
A3	Statements	Statements of Readiness
A9	AS Monitoring	Ancillary Services Monitoring
A10	Self-Certification	User Self Certification of Compliance
A11	Compliance statements	Compliance Statement
Part 1: Safety & System Operation		
1.1	Interface Agreements	Interface Agreements
1.2	Safety Rules	Safety Rules
1.3	Switching Procedures	Local Switching Procedures
1.4	Earthing	Earthing
1.5	SRS	Site Responsibility Schedules
1.6	Diagrams	Operational and Gas Zone Diagrams
1.7	Drawings	Site Common Drawings
1.8	Telephony	Control Telephony
1.9	Safety Procedures	Local Safety Procedures
1.10	Co-ordinators	Safety Co-ordinators
1.11	RISSP	Record of Inter System Safety Precautions
1.12	Tel Numbers	Telephone Numbers for Joint System Incidents
1.13	Contact Details	Contact Details (fax, tel, email)
1.14	Restoration Plan	Local Joint Restoration Plan (incl. <u>System Restoration</u> if applicable)
1.15	Maintenance	Maintenance Standards
Part 2: Connection Technical Data		
2.1	DRC Schedule 5	DRC Schedule 5 – Users System Data
2.2	Protection Report	Protection Settings Reports
2.3	Special Automatic Facilities	Special Automatic Facilities e.g. intertrip
2.4	Operational Metering	Operational Metering
2.5	Tariff Metering	Tariff Metering
2.6	Operational Comms	Operational Communications
2.7	Monitoring	Performance Monitoring
2.8	Power Quality	Power Quality Test Results (if required)

SCHEDULE 19 – USER DATA FILE STRUCTURE**PAGE 2 OF 2**

Part 3: Generator Technical Data		
3.1	DRC Schedule 1	DRC Schedule 1 - Generating Unit, Power Generating Module, HVDC System and DC Converter Technical Data
3.2	DRC Schedule 2	DRC Schedule 2 - Generation Planning Data
3.3	DRC Schedule 4	DRC Schedule 4 – Frequency Droop & Response
3.4	DRC Schedule 14	DRC Schedule 14 – Fault Infeed Data – Generators
3.5	Special Generator Protection	Special Generator Protection e.g. Pole slipping; islanding
3.6	Compliance Tests	Compliance Tests & Evidence
3.7	Compliance Studies	Compliance Simulation Studies
3.8	Site Specific	Bilateral Connections Agreement Technical Data & Compliance
3.9	DRC Schedule 20	DRC Schedule 20 - Grid Forming Plant Data
Part 4: General DRC Schedules		
4.1	DRC Schedule 3	DRC Schedule 3 – Large Power Station Outage Information
4.2	DRC Schedule 6	DRC Schedule 6 – Users Outage Information
4.3	DRC Schedule 7	DRC Schedule 7 – Load Characteristics
4.4	DRC Schedule 8	DRC Schedule 8 – BM Unit Data (if applicable)
4.5	DRC Schedule 10	DRC Schedule 10 –Demand Profiles
4.6	DRC Schedule 11	DRC Schedule 11 – Connection Point Data
Part 5: OTSDUW Data and Information (if applicable and prior to OTSUA Transfer Time)		
		Diagrams Circuits Plant and Apparatus Circuit Parameters Protection Operation and Autoswitching Automatic Control Systems
		Mathematical model of dynamic compensation plant

SCHEDULE 20 – GRID FORMING PLANT CAPABILITY DATA

The following data need only be supplied by **Users** (be they a **GB Code User** or **EU Code User**) or **Non-CUSC Parties** who wish to offer a **Grid Forming Capability** as provided for ECC.6.3.19.3. Where such a **Grid Forming Capability** is provided then the following data items and models are to be supplied in respect of each **Grid Forming Plant**.

DATA DESCRIPTION		GRID FORMING PLANT DATA		
		1	2	3
Submission of Network Frequency Perturbation Plot and Nichols Chart for each GBGF-I (PC.A.5.8.1)	Graphs			
High level equivalent architecture diagram of Grid Forming Plant (PC.A.5.8.1)	Diagram			
GBGF-I Grid Forming Plant Block Diagram (Laplace Operator) in the general form shown in Figure PC.A.5.8.1 or as agreed with The Company . When submitting either Figure PC.A.5.8.1 (a) or Figure PC.A.5.8.1 (b), each User or Non-CUSC Party can use their own design, that may be very different to Figures PC.A.5.8.1 (a) or PC.A.5.8.1 (b), but should contain all relevant functions that can include simulation models and other equivalent data and documentation	Block Diagram (Laplace Operator) Documentation			
Each User or Non-CUSC Party shall provide a model of their Grid Forming Plant which provides a true and accurate reflection of its Grid Forming Capability .	Model and documentation – format to be agreed with The Company			

In order to participate in the **Grid Forming Capability** market, **User's** and **Non-CUSC Parties** are required to provide data of their **GBGF-I** in accordance with Figures PC.A.5.8.1(a) and PC.A.5.8.1(b) **Users** and **Non-CUSC Parties** in respect of **Grid Forming Plants** should indicate if the data is submitted on a unit or aggregated basis. Table 1 below defines the notation used in Figure PC.5.8.1

Parameter	Symbol	Units
The primary reactance of the Grid Forming Unit , in pu.	X _{in} or X _{ts}	pu on MVA Rating of Grid Forming Unit
The additional reactance, in pu, between the terminals of the Grid Forming Unit and the Grid Entry Point or User System Entry Point (if Embedded).	X _{tr}	pu on MVA Rating of Grid Forming Unit
The rated angle between the Internal Voltage Source and the input terminals of the Grid Forming Unit .		radians
The rated angle between the Internal Voltage Source and Grid Entry Point or User System Entry Point (if Embedded).		radians
The rated voltage and phase of the Internal Voltage Source of the Grid Forming Unit .		Voltage - pu Phase - radians
The rated electrical angle between current and voltage at the input to the Grid transformer.		radians

Table 1

In order to participate in a **Grid Forming Capability** market, **User's** and **Non-CUSC Parties** are also required to provide the data of their **GBGF-I** in accordance with the Table below to **The Company**. The details and arrangements for **Users** and **Non-CUSC Parties** participating in this market shall be published on **The Company's Website**.

Quantity	Units	Range (where Applicable)	User Defined Parameter
Type of Grid form Plant (eg Generating Unit , Electricity Storage Module , Dynamic Reactive Compensation Equipment)	N/A		
Maximum Continuous Rating at Registered Capacity or Maximum Capacity	MVA		
Primary reactance X _{in} or X _{ts} (see Table 1)	pu on MVA		

Additional reactance X_{tr} (See Table 1)	pu on MVA		
Maximum Capacity	MW		
Active ROCOF Response Power (MW) supplied or absorbed at 1Hz/s System Frequency change (which is the maximum frequency change for linear operation of the Grid Forming Plant)	MW		
Phase Jump Angle Withstand	degrees		60 degrees specified
Phase Jump Angle limit	degrees		5 degrees recommended
Phase Jump Power (MW) at the rated angle	MW		
Defined Active Damping Power for a Grid Oscillation Value of 0.05 Hz peak to peak at 1 Hz	MW		
The cumulative energy delivered for a 1Hz/s System Frequency fall from 52 Hz to 47 Hz This is the total Active Power transient output of the Grid Forming Plant	MWs or MJ		
Inertia Constant (H) using equation 1 or declared in accordance with the simulation results of ECP.A.3.9.4	MWs/MVA		
Inertia Constant (He) using equation 2 or declared in accordance with the simulation results of ECP.A.3.9.4	MWs/MVA		
Continuous Overload Capability	% on MVA		
Short Term duration Overload capability			
Duration of Short Term Overload Capability	s		
Peak Current Rating	pu		
Nominal Grid Entry Point or User System Entry Point voltage	kV		
Grid Entry Point or User System Entry Point	- Location		
Continuous or defined time duration MVA Rating	MVA		

Continuous or defined time duration MW Rating	MW		
For a GBGF-I the inverters maximum Internal Voltage Source (IVS) for the worst case condition – for example operation at maximum exporting Reactive Power at the maximum AC System voltage	pu		
Maximum Three Phase Short Circuit Infeed at Grid Entry Point or User System Entry Point	kA		
Maximum Single Phase Short Circuit Infeed at Grid Entry Point or User System Entry Point	kA		
Will the Grid Forming Plant contribute to any other form of commercial service – for example Dynamic Containment, Firm Frequency Response,	Details to be provided		
Equivalent Damping Factor.	ζ		0.2 to 5.0 allowed

Table 2

$$H = \text{Installed MWs} / \text{Rated installed MVA}$$

(equation 1)

$$H_e = (\text{Active ROCOF Response Power at 1 Hz} / \text{s} \times \text{System Frequency}) / (\text{Installed MVA} \times 2)$$

(equation 2)

SCHEDULE 21 – GENERATION AND DEMAND OUTFURN AND FORECASTS

PAGE 1 OF 3

(PC.9) Submissions by **Network Operators** using this Schedule 21 shall commence on the **PSM Implementation Date** and shall then continue in each year thereafter.

WEEK 2 SUBMISSION

Network Operator:

Connection Point:

Access Group:

Time of NETS Minimum Demand

DATA DESCRIPTION		Aggregated Energy Source	Outturn	Weather Corrected Outturn	F.Yr. 1 (Note 1)	F.Yr. 2	F.Yr. 3	F.Yr. 4	F.Yr. 5	F.Yr. 6	F.Yr. 7	F.Yr. 8	F.Yr. 9	F.Yr. 10	GC Ref:
Date of NETS Minimum Demand (provided by NESO)															PC.10.3.1.2
Time of NETS Minimum Demand (provided by NESO)															PC.10.3.1.2
Connection Point Group Demand at time of NETS Minimum Demand (MW)															PC.9.3.2.4
Connection Point Group Demand at time of NETS Minimum Demand (MVA _r)															PC.9.3.2.4
Embedded Power Station Export (Note 2 & 3)	Export from Subtransmission connected Power Stations and Customer Generating Plant (MW) Aggregated Energy Source 1														PC.9.3.2.4
	Export from Subtransmission connected Power Stations and Customer Generating Plant (MW) Aggregated Energy Source 2														PC.9.3.2.4
	Export from Subtransmission connected Power Stations and Customer Generating Plant (MW) Aggregated Energy Source n														PC.9.3.2.4
	Export from Power Stations and Customer Generating Plant connected below the Subtransmission voltage (MW) Aggregated Energy Source 1														PC.9.3.2.4
	Export from Power Stations and Customer Generating Plant connected below the Subtransmission voltage (MW) Aggregated Energy Source 2														PC.9.3.2.4
	Export from Power Stations and Customer Generating Plant connected below the Subtransmission voltage (MW) Aggregated Energy Source n														PC.9.3.2.4
Import to Embedded Electricity Storage Modules connected at Subtransmission System (MW) (Note 3)															PC.9.3.2.4
Import to Embedded Electricity Storage Module(s) connected below below the Subtransmission voltage (MW) (Note 3)															PC.9.3.2.4
Increase in the Group Demand associated with Latent Demand (Note 4)															

Provided by **NESO**

Required data

Optional data as this will be the demand data set included in the **Solved PSM**

Not required

Note 1

Note 2

Note 3

Note 4

Financial Year 1 relates to the next **Financial Year**.

Export from **Power Stations** relates to observed values for outturn and estimates for **Financial Years** 1 to 10.

The **Network Operator** should clarify their forecasting methodology regarding the import and/or export from all types of **Power Stations** on request (PC.9.3.1).

These values may be populated in due course following clarification of industry requirements. There is no currently no requirement forecast the effect of **Latent Demand**.

Extra rows may need to be inserted if necessary to include each applicable **Aggregated Energy Source**

SCHEDULE 21 – GENERATION AND DEMAND OUTTURN AND FORECASTS
PAGE 2 OF 3

Network Operator:

Connection Point:

WEEK 2 SUBMISSION

Access Group:

Time of Connection Point Summer Minimum Group Demand

DATA DESCRIPTION		Aggregated Energy Source	Outturn	Weather Corrected Outturn	F.Yr. 1 (Note 1)	F.Yr. 2	F.Yr. 3	F.Yr. 4	F.Yr. 5	F.Yr 6	F.Yr. 7	F.Yr. 8	F.Yr. 9	F.Yr. 10	GC Ref:
Date of Connection Point Summer Minimum Group Demand															PC.9.3.2.5
Time of Connection Point Summer Minimum Group Demand															
Connection Point Summer Minimum Group Demand (MW)															PC.9.3.2.5
Connection Point Summer Minimum Group Demand (MVar)															
Embedded Power Station Export	Export from Subtransmission connected Power Stations and Customer Generating Plant (MW) Aggregated Energy Source 1														PC.9.3.2.5
	Export from Subtransmission connected Power Stations and Customer Generating Plant (MW) Aggregated Energy Source 2														
	Export from Subtransmission connected Power Stations and Customer Generating Plant (MW) Aggregated Energy Source n														PC.9.3.2.5
	Export from Power Stations and Customer Generating Plant connected below the Subtransmission voltage (MW) Aggregated Energy Source 1														
	Export from Power Stations and Customer Generating Plant connected below the Subtransmission voltage (MW) Aggregated Energy Source 2														PC.9.3.2.5
	Export from Power Stations and Customer Generating Plant connected below the Subtransmission voltage (MW) Aggregated Energy Source n														
Import to Embedded Electricity Storage Modules connected at Subtransmission System (MW)															PC.9.3.2.5
Import to Embedded Electricity Storage Module(s) connected below below the Subtransmission voltage (MW)															
Increase in the Group Demand associated with Latent Demand (Note 2)															

Required data

Not required

Note 1

Financial Year 1 relates to the next Financial Year.

Note 2

These values may be populated in due course following clarification of industry requirements. There is no currently no requirement forecast the effect of Latent Demand.

Extra rows may need to be inserted if necessary to include each applicable Aggregated Energy Source

Issue 6 Revision 44

DRC
129

10 August 2026

SCHEDULE 21 – GENERATION AND DEMAND OUTTURN AND FORECASTS
PAGE 3 OF 3

WEEK 2 SUBMISSION

Network Operator:

Connection Point:

Access Group:

Time of Connection Point Summer Daylight Minimum Group Demand

DATA DESCRIPTION		Aggregated Energy Source	Outturn	Weather Corrected Outturn	F.Yr. 1 (Note 1)	F.Yr. 2	F.Yr. 3	F.Yr. 4	F.Yr. 5	F.Yr. 6	F.Yr. 7	F.Yr. 8	F.Yr. 9	F.Yr. 10	GC Ref:
Date of Connection Point Summer Daylight Minimum Group Demand															PC.9.3.2.6
Time of Connection Point Summer Daylight Minimum Group Demand															
Connection Point Summer Daylight Minimum Group Demand (MW)															PC.9.3.2.6
Connection Point Summer Daylight Minimum Group Demand (MVA _r)															PC.9.3.2.6
Embedded Power Station Export	Export from Subtransmission connected Power Stations and Customer Generating Plant (MW) Aggregated Energy Source 1														PC.9.3.2.6
	Export from Subtransmission connected Power Stations and Customer Generating Plant (MW) Aggregated Energy Source 2														PC.9.3.2.6
	Export from Subtransmission connected Power Stations and Customer Generating Plant (MW) Aggregated Energy Source n														PC.9.3.2.6
	Export from Power Stations and Customer Generating Plant connected below the Subtransmission voltage (MW) Aggregated Energy Source 1														PC.9.3.2.6
	Export from Power Stations and Customer Generating Plant connected below the Subtransmission voltage (MW) Aggregated Energy Source 2														PC.9.3.2.6
	Export from Power Stations and Customer Generating Plant connected below the Subtransmission voltage (MW) Aggregated Energy Source n														PC.9.3.2.6
Import to Subtransmission connected Electricity Storage Plant (MW)															PC.9.3.2.6
Import to Electricity Storage Plant connected below below the Subtransmission voltage (MW)															PC.9.3.2.6
Increase in the Group Demand associated with Latent Demand (Note 2)															

Required data

Not required

Note 1

Financial Year 1 relates to the next Financial Year.

Note 2

These values may be populated in due course following clarification of industry requirements. There is no currently no requirement forecast the effect of Latent Demand.

Extra rows may need to be inserted if necessary to include each applicable Aggregated Energy Source

SCHEDULE 22 – DEMAND DATA
PAGE 1 OF 1

(PC.9)

Submissions by **Network Operators** using this Schedule 22 shall commence on the **PSM Implementation Date** and shall then continue in each year thereafter.

Network Operator:			Week 2 Submission					Grid Code	PC.9.3.2.7		
Profile of the Measured Demand for Day of NETS Minimum Demand											
	Outturn	F.Yr. 1 (Note 1)	F.Yr. 2	F.Yr. 3	F.Yr. 4	F.Yr. 5	F.Yr 6	F.Yr. 7	F.Yr. 8	F.Yr. 9	F.Yr. 10
Date of NETS Minimum											
Demand Period											
From:	To:	Measured Demand (MW)									
00:00	00:30										
00:30	01:00										
01:00	01:30										
01:30	02:00										
02:00	02:30										
02:30	03:00										
03:00	03:30										
03:30	04:00										
04:00	04:30										
04:30	05:00										
05:00	05:30	Min.									
05:30	06:00										
06:00	06:30										
06:30	07:00										
07:00	07:30										
07:30	08:00										
08:00	08:30										
08:30	09:00										
09:00	09:30										
09:30	10:00										
10:00	10:30										
10:30	11:00										
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20:00	20:30										
20:30	21:00										
21:00	21:30										
21:30	22:00										
22:00	22:30										
22:30	23:00										
23:00	23:30										
23:30	00:00										
Export from all Embedded Power Stations at the half hour of NETS Minimum Demand											
	Provided by NESO										
	Required data										
Note 1 Financial Year 1 relates to the next Financial Year.											

SCHEDULE 23 – NETWORK OPERATOR DEMAND PROFILES AND ACTIVE ENERGY DATA
PAGE 1 OF 3

(PC.9)

Submissions by **Network Operators** using this Schedule 23 shall commence on the **PSM Implementation Date** and shall then continue in each year thereafter.

														WEEK 28 SUBMISSION					
Network Operator:																			
Connection Point:																Access Group:			
Time of National Electricity Transmission System (NETS) Peak Demand																			
DATA DESCRIPTION		Type of Aggregated Energy Source	Outturn	Weather Corrected Outturn	F.Yr. 1 (Note 1)	F.Yr. 2	F.Yr. 3	F.Yr. 4	F.Yr. 5	F.Yr 6	F.Yr. 7	F.Yr. 8	F.Yr. 9	F.Yr. 10	GC Ref:				
Date of NETS Peak Demand (provided by NESO)															PC.10.3.1.3				
Time of NETS Peak Demand (provided by NESO)															PC.10.3.1.3				
Connection Point Group Demand at time of NETS Peak Demand (MW)															PC.9.3.3.4				
Connection Point Group Demand at time of NETS Peak Demand (MVAr)															PC.9.3.3.4				
Embedded Power Station Export (Note 2 & 3)	Export from Subtransmission connected Power Stations and Customer Generating Plant (MW) Aggregated Energy Source 1														PC.9.3.3.4				
	Export from Subtransmission connected Power Stations and Customer Generating Plant (MW) Aggregated Energy Source 2														PC.9.3.3.4				
	Export from Subtransmission connected Power Stations and Customer Generating Plant (MW) Aggregated Energy Source n														PC.9.3.3.4				
	Export from Power Stations and Customer Generating Plant connected below the Subtransmission voltage (MW) Aggregated Energy Source 1														PC.9.3.3.4				
	Export from Power Stations and Customer Generating Plant connected below the Subtransmission voltage (MW) Aggregated Energy Source 2														PC.9.3.3.4				
	Export from Power Stations and Customer Generating Plant connected below the Subtransmission Voltage (MW) Aggregated Energy Source n														PC.9.3.3.4				
Import to Embedded Electricity Storage Modules connected at Subtransmission System (MW) (Note 3)															PC.9.3.3.4				
Import to Embedded Electricity Storage Module(s) connected below below the Subtransmission voltage (MW) (Note 3)															PC.9.3.3.4				
Increase in the Group Demand associated with Latent Demand (Note 4)																			
Note 1		Financial Year 1 relates to the next Financial Year.																	
Note 2		Export from Power Stations relates to observed values for outturn and estimates for Financial Years 1 to 10.																	
Note 3		The Network Operator should clarify their forecasting methodology regarding the import and/or export from all types of Power Stations on request (PC.9.3.1).																	
Note 4		These values may be populated in due course following clarification of industry requirements. There is no currently no requirement forecast the effect of Latent Demand.																	

Extra rows may need to be inserted if necessary to include each applicable Aggregated Energy Source

				WEEK 28 SUBMISSION											
Network Operator:															
Connection Point:															
Access Group:															
Time of Connection Point Peak Group Demand															
DATA DESCRIPTION		Aggregated Energy Source	Outturn	Weather Corrected Outturn	F.Yr. 1 (Note 1)	F.Yr. 2	F.Yr. 3	F.Yr. 4	F.Yr. 5	F.Yr. 6	F.Yr. 7	F.Yr. 8	F.Yr. 9	F.Yr. 10	GC Ref.
Date of Connection Point Peak Group Demand															PC.9.3.3.5
Time of Connection Point Peak Group Demand															PC.9.3.3.5
Connection Point Peak Group Demand (MW)															PC.9.3.3.5
Connection Point Peak Group Demand (MVA _r)															PC.9.3.3.5
Embedded Power Station Export (Note 2 & 3)	Export from Subtransmission connected Power Stations and Customer Generating Plant (MW) Aggregated Energy Source 1														PC.9.3.3.5
	Export from Subtransmission connected Power Stations and Customer Generating Plant (MW) Aggregated Energy Source 2														PC.9.3.3.5
	Export from Subtransmission connected Power Stations and Customer Generating Plant (MW) Aggregated Energy Source n														PC.9.3.3.5
	Export from Power Stations and Customer Generating Plant connected below the Subtransmission voltage (MW) Aggregated Energy Source 1														PC.9.3.3.5
	Export from Power Stations and Customer Generating Plant connected below the Subtransmission voltage (MW) Aggregated Energy Source 2														PC.9.3.3.5
	Export from Power Stations and Customer Generating Plant connected below the subtransmission voltage (MW) Aggregated Energy Source n														PC.9.3.3.5
Import to Embedded Electricity Storage Modules connected at Subtransmission System (MW) (Note 3)															PC.9.3.3.5
Import to Embedded Electricity Storage Module(s) connected below below the Subtransmission voltage (MW) (Note 3)															PC.9.3.3.5
Increase in the Group Demand associated with Latent Demand (Note 4)															
Reference to post-fault operational configuration in the PSM Scenario Document															PC.G.5.1.3.1
Reference to Outage Running arrangements associated with the operational configuration in the PSM Scenario Document															PC.G.5.1.3.1
Reference to the description of the actions and timescales involved in effecting the post-fault actions (e.g. auto-switching, manual, teleswitching, overload protection operation etc) associated with the operational configuration in the PSM Scenario Document															PC.G.5.1.3.1

Extra rows may need to be inserted if necessary to include each applicable Aggregated Energy Source

May be repeated if necessary to identify each post-fault action.

Associated Connection Point within the same Access Group :															PC.9.3.3.5
Group Demand at associated Connection Point at time of 'parent' Connection Point Peak Group Demand (MW)															PC.9.3.3.5
Group Demand at associated Connection Point at time of 'parent' Connection Point Peak Group Demand (MVA _r)															PC.9.3.3.5
Embedded Power Station Export (Note 2 & 3)	Export from Subtransmission connected Power Stations and Customer Generating Plant (MW) Aggregated Energy Source ₁														PC.9.3.3.5
	Export from Subtransmission connected Power Stations and Customer Generating Plant (MW) Aggregated Energy Source ₂														PC.9.3.3.5
	Export from Subtransmission connected Power Stations and Customer Generating Plant (MW) Aggregated Energy Source _n														PC.9.3.3.5
	Export from Power Stations and Customer Generating Plant connected below the Subtransmission voltage (MW) Aggregated Energy Source ₁														PC.9.3.3.5
	Export from Power Stations and Customer Generating Plant connected below the Subtransmission voltage (MW) Aggregated Energy Source ₂														PC.9.3.3.5
	Export from Power Stations and Customer Generating Plant connected below the subtransmission voltage (MW) Aggregated Energy Source _n														PC.9.3.3.5
Import to Embedded Electricity Storage Modules connected at Subtransmission System (MW) (Note 3)															PC.9.3.3.5
Import to Embedded Electricity Storage Module(s) connected below the Subtransmission voltage (MW) (Note 3)															PC.9.3.3.5
Increase in the Group Demand associated with Latent Demand (Note 4)															

Required data

Not required

Detailed information shall be provided in the **PSM Scenario Document**. A summary may be provided here.

- Note 1
- Note 2
- Note 3
- Note 4
- Financial Year** 1 relates to the next **Financial Year**.

Export from **Power Stations** relates to observed values for outturn and estimates for **Financial Years** 1 to 10.

The **Network Operator** should clarify their forecasting methodology regarding the import and/or export from all types of **Power Stations** on request (PC.9.3.1).

These values may be populated in due course following clarification of industry requirements. There is no currently no requirement forecast the effect of **Latent Demand**.

Extra rows may need to be inserted if necessary to include each applicable **Aggregated Energy Source**

Repeat for each **Connection Point** within the same **Access Group**

Network Operator:

Connection Point:

Access Group:

Connection Point Access Period

DATA DESCRIPTION		Aggregated Energy Source	Outturn	Weather Corrected Outturn	F.Yr. 1 (Note 1)	F.Yr. 2	F.Yr. 3	F.Yr. 4	F.Yr. 5	F.Yr 6	F.Yr. 7	F.Yr. 8	F.Yr. 9	F.Yr. 10	GC Ref:
Transmission Interface Circuit:															PC.9.3.3.6
Date of Connection Point Peak Group Demand during the Access Period															PC.9.3.3.6
Time of Connection Point Peak Group Demand during the Access Period															PC.9.3.3.6
Access Period Peak Group Demand at Connection Point (MW)															PC.9.3.3.6
Access Period Peak Group Demand at Connection Point (MVar)															PC.9.3.3.6
Embedded Power Station Export (Note 2 & 3)	Export from Subtransmission connected Power Stations and Customer Generating Plant (MW) Aggregated Energy Source 1														PC.9.3.3.6
	Export from Subtransmission connected Power Stations and Customer Generating Plant (MW) Aggregated Energy Source 2														PC.9.3.3.6
	Export from Subtransmission connected Power Stations and Customer Generating Plant (MW) Aggregated Energy Source n														PC.9.3.3.6
	Export from Power Stations and Customer Generating Plant connected below the Subtransmission voltage (MW) Aggregated Energy Source 1														PC.9.3.3.6
	Export from Power Stations and Customer Generating Plant connected below the Subtransmission voltage (MW) Aggregated Energy Source 2														PC.9.3.3.6
	Export from Power Stations and Customer Generating Plant connected below the subtransmission voltage (MW) Aggregated Energy Source n														PC.9.3.3.6
Import to Embedded Electricity Storage Modules connected at Subtransmission System (MW) (Note 3)															PC.9.3.3.6
Import to Embedded Electricity Storage Module(s) connected below the Subtransmission voltage (MW) (Note 3)															PC.9.3.3.6
Increase in the Group Demand associated with Latent Demand (Note 4)															
Reference to post-fault operational configuration in the PSM Scenario Document															PC.G.5.1.3.1
Reference to Outage Running arrangements associated with the operational configuration in the PSM Scenario Document															PC.G.5.1.3.1
Reference to the description of the actions and timescales involved in effecting the post-fault actions (e.g. auto-switching, manual, teleswitching, overload protection operation etc) associated with the operational configuration in the PSM Scenario Document															PC.G.5.1.3.1

Extra rows may need to be inserted if necessary to include each applicable Aggregated Energy Source

May be repeated if necessary to identify each post-fault action.

Transmission Interface Circuit at the Connection Point

Associated Connection Point within the same Access Group :															PC.9.3.3.6
Group Demand at associated Connection Point (MW) at the data & time of Connection Point Peak Group Demand during the Access Period															PC.9.3.3.6
Group Demand at associated Connection Point (MVar) at the data & time of Connection Point Peak Group Demand during the Access Period															PC.9.3.3.6
Embedded Power Station Export (Note 2 & 3)	Export from Subtransmission connected Power Stations and Customer Generating Plant (MW) Aggregated Energy Source 1														PC.9.3.3.6
	Export from Subtransmission connected Power Stations and Customer Generating Plant (MW) Aggregated Energy Source 2														PC.9.3.3.6
	Export from Subtransmission connected Power Stations and Customer Generating Plant (MW) Aggregated Energy Source n														PC.9.3.3.6
	Export from Power Stations and Customer Generating Plant connected below the Subtransmission voltage (MW) Aggregated Energy Source 1														PC.9.3.3.6
	Export from Power Stations and Customer Generating Plant connected below the Subtransmission voltage (MW) Aggregated Energy Source 2														PC.9.3.3.6
	Export from Power Stations and Customer Generating Plant connected below the subtransmission voltage (MW) Aggregated Energy Source n														PC.9.3.3.6
Import to Embedded Electricity Storage Modules connected at Subtransmission System (MW) (Note 3)															PC.9.3.3.6
Import to Embedded Electricity Storage Module(s) connected below the Subtransmission voltage (MW) (Note 3)															PC.9.3.3.6
Increase in the Group Demand associated with Latent Demand (Note 4)															

	Required data
	Not required
	Detailed information shall be provided in the PSM Scenario Document . A summary may be provided here.

- Note 1 **Financial Year** 1 relates to the next **Financial Year**.
- Note 2 Export from **Power Stations** relates to observed values for outturn and estimates for **Financial Years** 1 to 10.
- Note 3 The **Network Operator** should clarify their forecasting methodology regarding the import and/or export from all types of **Power Stations** on request (PC.9.3.1).
- Note 4 These values may be populated in due course following clarification of industry requirements. There is no currently no requirement forecast the effect of **Latent Demand**.

Extra rows may need to be inserted if necessary to include each applicable **Aggregated Energy Source**

Repeat for each **Connection Point** within the same **Access Group**

Repeat for each

SCHEDULE 24 – GENERATION LARGER THAN 1 MW

PAGE 1 OF 1

(PC.9)

Submissions by **Network Operators** using this Schedule 24 shall commence on the **PSM Implementation Date** and shall then continue in each year thereafter.

[illegible]

WEEK 28 SUBMISSION		GRID CODE:		OC 6.5.3 PC.9.3.3.8
Network Operator:		Year:		
HIGH RISK OF DEMAND REDUCTIONS				
Tranche	Percentage Voltage Reduction (if VR) or Percentage Demand Reduction (if DD)	Voltage Reduction or Demand Disconnection		
		(For Tranches 1 & 2 please delete "VR" or "DD" as applicable)		
1		VR/DD		
2		VR/DD		
3		DD		
4		DD		
5		DD		
Complete either Two voltage reduction stages each of 2-4% voltage reduction and up to three demand disconnection stages each of 4-6% demand reduction or Four demand disconnection stages each of 4-6% demand reduction.				
Required data				

Network Operator:		WEEK 28 SUBMISSION	GRID CODE:	OC6.7.2 PC.9.3.3.8

Year:	

Emergency Manual Demand Disconnection

[illegible]

Required data

Optional information

Note 1 The 'Peak MW' is the net **Demand** (MW) (**Measured Demand**) at the time of **Connection Point** peak **Demand**

SCHEDULE 26 – DEMAND DATA
PAGE 1 OF 2

(PC.9)

Submissions by **Network Operators** using this Schedule 26 shall commence on the **PSM Implementation Date** and shall then continue in each year thereafter.

Network Operator:		WEEK 28 SUBMISSION		Grid Code:		PC.9.3.3.9					
Profile of the Measured Demand for Day of Network Operator's Peak Measured Demand											
		F.Yr. 1 (Note 1)	F.Yr. 2	F.Yr. 3	F.Yr. 4	F.Yr. 5	F.Yr. 6	F.Yr. 7	F.Yr. 8	F.Yr. 9	F.Yr. 10
Date of Network Operator's Peak Measured Demand											
Demand Period		Active Power (MW) Under Annual ACS Conditions									
From:	To:										
00:00	00:30										
00:30	01:00										
01:00	01:30										
01:30	02:00										
02:00	02:30										
02:30	03:00										
03:00	03:30										
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20:30	21:00										
21:00	21:30										
21:30	22:00										
22:00	22:30										
22:30	23:00										
23:00	23:30										
23:30	00:00										
Embedded Power Station Export in the half hour of Network Operator's peak Measured Demand											
Required data											
Note 1 Financial Year 1 relates to the next Financial Year.											

SCHEDULE 27 – NETWORK OPERATOR ACTIVE ENERGY DATA

PAGE 1 OF 1

Submissions by **Network Operators** using this Schedule 27 shall commence on the **PSM Implementation Date** and shall then continue in each year thereafter.

WEEK 28 SUBMISSION		Grid Code:	PC.9.3.3.11
Network Operator:		Year:	
User's Total System Active Energy			
Customer Class	Outturn	Weather Corrected Outturn	
LV1			
LV2			
LV3			
HV			
EHV			
Traction			
Public Lighting (inc in LV3)			
Total Customer Active Energy			
User System Losses			
Total User Active Energy			
Active Energy from Embedded Power Stations			
	Required data		

SCHEDULE 28 – EMBEDDED POWER STATION FORECAST CAPACITY SCHEDULE
PAGE 1 OF 1

(PC.9)

Submissions by **Network Operators** using this Schedule 28 shall commence on the **PSM Implementation Date** and shall then continue in each year thereafter.

WEEK 28 SUBMISSION												
Network Operator:												
Connection Point:												
Access Group:												
Embedded Power Stations Forecasts												
DATA DESCRIPTION	Aggregated Energy Source	F.Yr 1	F.Yr 2	F.Yr 3	F.Yr 4	F.Yr 5	F.Yr 6	F.Yr 7	F.Yr 8	F.Yr 9	F.Yr 10	DATA CAT
Forecasted Customer Generation Summary												PC.9.3.3.12
Forecast aggregate Registered Capacity from Power Stations and Customer Generating Plant connected (MW) Aggregated Energy Source 1												
Forecast aggregate Registered Capacity from Power Stations and Customer Generating Plant connected (MW) Aggregated Energy Source 2												
Forecast aggregate Registered Capacity from Power Stations and Customer Generating Plant connected (MW) Aggregated Energy Source 3												
Forecast aggregate Registered Capacity from Power Stations and Customer Generating Plant connected (MW) Aggregated Energy Source 4												
Forecast aggregate Registered Capacity from Power Stations and Customer Generating Plant connected (MW) Aggregated Energy Source 5												
Forecast aggregate Registered Capacity from Power Stations and Customer Generating Plant connected (MW) Aggregated Energy Source n												
Note 1. Values provided should be represented as cumulative values across the financial years Note 2. The F.Yr listed is the date by when the Network Operator wish to connect the generation that will be used to assess the impact on the National Electricity Transmission System Note 3. Network Operators to add additional rows where a technology type forecast is to be provided. Note 4. Information about Power Stations recorded in this table might also be recorded in schedule 23(21g) 24. Note 5. Network Operators may include forecasts of Power Stations with a Registered Capacity of less than 1 MW.												
Required data												

Extra rows may need to be inserted if necessary to include each applicable **Aggregated Energy Source**

SCHEDULE 29 – EMBEDDED GENERATION SCHEDULE
PAGE 1 OF 2

(PC.9)

Submissions by **Network Operators** using this Schedule 29 shall commence on the **PSM Implementation Date** and shall then continue in each year thereafter.

[illegible]

[illegible]

SCHEDULE 30 – EMBEDDED GENERATION CONSTRAINTS SCHEDULE
PAGE 1 OF 1

(PC.9)

Submissions by **Network Operators** using this Schedule 30 shall commence on the **PSM Implementation Date** and shall then continue in each year thereafter.

													WEEK 2 & 28 SUBMISSION		
Network Operator:															
Connection Point:															
Embedded Generation Constraints															
DATA DESCRIPTION	Outurn	Weather Corrected Outurn	F.Yr 1 (Note 1)	F.Yr 2	F.Yr. 3	F.Yr. 4	F.Yr. 5	F.Yr 6	F.Yr 7	F.Yr 8	F.Yr 9	F.Yr 10	DATA CAT		
Where the Network Operator's System places a constraint on the capacity of an Embedded Large Power Station															
Power Station Name														PC.9.3.2.9	
Generating Unit														PC.9.3.3.13	
System Constrained Capacity															
Reactive Despach Network Restriction															
Where the Network Operator's System places a constraint on the capacity of an Offshore Transmission System at an Interface Point															
Offshore Transmission System Name														PC.9.3.2.9	
Interface Point Name														PC.9.3.3.13	
Maximum Export Capacity															
Maximum Import Capacity															
	Required data														
	Not required														
Note 1 Financial Year 1 relates to the next Financial Year.															

<END OF DATA REGISTRATION CODE>

REVISIONS

(R)

(This section does not form part of the Grid Code)

- R.1 **The ESO Licence** sets out the way in which changes to the Grid Code are to be made and reference is also made to **The Company's** obligations under the General Conditions.
- R.2 All pages re-issued have the revision number on the lower left hand corner of the page and date of the revision on the lower right hand corner of the page.
- R.3 The Grid Code was introduced in March 1990 and the first issue was revised 31 times. In March 2001 the New Electricity Trading Arrangements were introduced and Issue 2 of the Grid Code was introduced which was revised 16 times. At British Electricity Trading and Transmission Arrangements (BETTA) Go-Active Issue 3 of the Grid Code was introduced and subsequently revised 35 times. At Offshore Go-active Issue 4 of the Grid Code was introduced and has been revised 13 times since its original publication. Issue 5 of the Grid Code was published to accommodate the changes made by Grid Code Modification A/10 which has incorporated the **Generator** compliance process into the Grid Code, which was revised 47 times. Issue 6 was published to incorporate all the non-material amendments as a result of modification GC0136.
- R.4 This Revisions section provides a summary of the sections of the Grid Code changed by each revision to Issue 6.
- R.5 All enquiries in relation to revisions to the Grid Code, including revisions to Issues 1, 2, 3, 4 and 5 should be addressed to the Grid Code development team at the following email address:
Grid.Code@neso.energy

Revision	Section	Related Modification	Effective Date
0	Glossary & Definitions	GC0136	05 March 2021
0	Planning Code	GC0136	05 March 2021
0	Connection Conditions	GC0136	05 March 2021
0	European Connection Conditions	GC0136	05 March 2021
0	Demand Response Services	GC0136	05 March 2021
0	Compliance Processes	GC0136	05 March 2021
0	Europeans Compliance Processes	GC0136	05 March 2021
0	Operating Code 1	GC0136	05 March 2021
0	Operating Code 2	GC0136	05 March 2021
0	Operating Code 5	GC0136	05 March 2021
0	Operating Code 6	GC0136	05 March 2021
0	Operating Code 7	GC0136	05 March 2021
0	Operating Code 8	GC0136	05 March 2021
0	Operating Code 8A	GC0136	05 March 2021
0	Operating Code 8B	GC0136	05 March 2021
0	Operating Code 9	GC0136	05 March 2021
0	Operating Code 11	GC0136	05 March 2021
0	Operating Code 12	GC0136	05 March 2021
0	Balancing Code 2	GC0136	05 March 2021

Revision	Section	Related Modification	Effective Date
0	Balancing Code 3	GC0136	05 March 2021
0	Balancing Code 4	GC0136	05 March 2021
0	Balancing Code 5	GC0136	05 March 2021
0	Data Registration Code	GC0136	05 March 2021
0	General Conditions	GC0136	05 March 2021
0	Governance Rules	GC0136	05 March 2021
1	Glossary & Definitions	GC0130	18 March 2021
1	Operating Code 2	GC0130	18 March 2021
1	Data Registration Code	GC0130	18 March 2021
1	General Conditions	GC0130	18 March 2021
2	Glossary & Definitions	GC0147	17 May 2021
2	Operating Code 6B	GC0147	17 May 2021
2	Operating Code 7	GC0147	17 May 2021
2	Balancing Code 1	GC0147	17 May 2021
2	Balancing Code 2	GC0147	17 May 2021
3	Balancing Code 2	GC0144	26 May 2021
3	Balancing Code 4	GC0144	26 May 2021
4	Preface	GC0149	03 August 2021
4	Glossary & Definitions	GC0149	03 August 2021
4	Planning Code	GC0149	03 August 2021

Revision	Section	Related Modification	Effective Date
4	European Connection Conditions	GC0149	03 August 2021
4	European Compliance Processes	GC0149	03 August 2021
4	Demand Response Services Code	GC0149	03 August 2021
4	Operating Code 2	GC0149	03 August 2021
4	Balancing Code 4	GC0149	03 August 2021
4	Data Registration Code	GC0149	03 August 2021
4	Governance Rules	GC0149	03 August 2021
5	Operating Code 7	GC0109	23 August 2021
6	Connection Conditions	GC0134	01 September 2021
6	European Connection Conditions	GC0134	01 September 2021
6	Balancing Code 2	GC0134	01 September 2021
7	Operating Code 6B	GC0150	04 October 2021
8	Operating Code 2	GC0151	08 November 2021
8	Operating Code 3	GC0151	08 November 2021
8	Operating Code 5	GC0151	08 November 2021
9	Governance Rules	GC0152	29 December 2021
10	General Conditions	Electrical Standards - EDL Instruction Interface Valid Reason Codes	20 January 2022
11	Glossary & Definitions	GC0137	14 February 2022
11	Planning Code	GC0137	14 February 2022

Revision	Section	Related Modification	Effective Date
11	Connection Conditions	GC0137	14 February 2022
11	European Connection Conditions	GC0137	14 February 2022
11	European Compliance Processes	GC0137	14 February 2022
11	Data Registration Code	GC0137	14 February 2022
12	Glossary & Definitions	GC0153	09 March 2022
12	Connection Conditions	GC0153	09 March 2022
12	European Connection Conditions	GC0153	09 March 2022
12	Operating Code 6	GC0153	09 March 2022
12	Operating Code 8A	GC0153	09 March 2022
12	Operating Code 8B	GC0153	09 March 2022
12	Operating Code 12	GC0153	09 March 2022
12	Balancing Code 2	GC0153	09 March 2022
12	Governance Rules	GC0153	09 March 2022
13	Compliance Processes	GC0138	24 June 2022
13	European Compliance Processes	GC0138	24 June 2022
13	Operating Code 5	GC0138	24 June 2022
14	Glossary & Definitions	GC0157	06 October 2022
14	European Connection Conditions	GC0157	06 October 2022
14	Operating Code 2	GC0157	06 October 2022
14	Operating Code 5	GC0157	06 October 2022

Revision	Section	Related Modification	Effective Date
14	Data Registration Code	GC0157	06 October 2022
14	No changes to published Grid Code	GC0158	06 December 2022
15	Glossary & Definitions	GC0160	07 December 2022
15	Balancing Code 1	GC0160	07 December 2022
15	Balancing Code 2	GC0160	07 December 2022
16	Planning Code	GC0141	05 January 2023
16	Connection Conditions	GC0141	05 January 2023
16	European Connection Conditions	GC0141	05 January 2023
16	Compliance Processes	GC0141	05 January 2023
16	European Compliance Processes	GC0141	05 January 2023
17	Connection Conditions	GC0148	4 September 2023
17	European Compliance Processes	GC0148	4 September 2023
17	European Connection Conditions	GC0148	4 September 2023
17	General Conditions	GC0148	4 September 2023
17	Glossary & Definitions	GC0148	4 September 2023
17	Operating Code 5	GC0148	4 September 2023
17	Operating Code 6	GC0148	4 September 2023
17	Planning Code	GC0148	4 September 2023
18	Operating Code 6	GC0161	2 October 2023
19	European Connection Conditions	GC0165	4 December 2023

Revision	Section	Related Modification	Effective Date
19	Operating Code 12	GC0165	4 December 2023
19	Data Registration Code	GC0165	4 December 2023
19	Governance Rules	GC0165	4 December 2023
20	Operating Code 6	GC0162	15 December 2023
21	Glossary & Definitions	GC0156	4 March 2024
21	Planning Code	GC0156	4 March 2024
21	Connection Conditions	GC0156	4 March 2024
21	European Connection Conditions	GC0156	4 March 2024
21	Operating Code 1	GC0156	4 March 2024
21	Operating Code 2	GC0156	4 March 2024
21	Operating Code 5	GC0156	4 March 2024
21	Operating Code 9	GC0156	4 March 2024
21	Balancing Code 2	GC0156	4 March 2024
21	Balancing Code 4	GC0156	4 March 2024
21	Data Registration Code	GC0156	4 March 2024
21	General Conditions	GC0156	4 March 2024
22	Glossary & Definitions	GC0154	2 April 2024
22	Balancing Code 1	GC0154	2 April 2024
22	Balancing Code 2	GC0154	2 April 2024
23	Glossary & Definitions	GC0170	22 April 2024

Revision	Section	Related Modification	Effective Date
23	Planning Code	GC0170	22 April 2024
23	Connection Conditions	GC0170	22 April 2024
23	European Connection Conditions	GC0170	22 April 2024
23	Operating Code 2	GC0170	22 April 2024
23	Operating Code 5	GC0170	22 April 2024
23	Operating Code 9	GC0170	22 April 2024
23	Data Registration Code	GC0170	22 April 2024
23	General Conditions	GC0170	22 April 2024
24	General Conditions	Distribution Restoration Zone Control System Standard	4 June 2024
25	Glossary & Definitions	GC0163	5 July 2024
25	European Connection Conditions	GC0163	5 July 2024
26	Glossary & Definitions	GC0171	5 September 2024
26	Compliance Processes	GC0171	5 September 2024
26	European Compliance Processes	GC0171	5 September 2024
27	Glossary & Definitions	Establishing ISOP in industry codes 2024	1 October 2024
27	Planning Code	Establishing ISOP in industry codes 2024	1 October 2024
27	Connection Conditions	Establishing ISOP in industry codes 2024	1 October 2024
27	European Connection Conditions	Establishing ISOP in industry codes	1 October 2024

Revision	Section	Related Modification	Effective Date
		2024	
27	Demand Response Services	Establishing ISOP in industry codes 2024	1 October 2024
27	Compliance Processes	Establishing ISOP in industry codes 2024	1 October 2024
27	European Compliance Processes	Establishing ISOP in industry codes 2024	1 October 2024
27	Operating Code 2	Establishing ISOP in industry codes 2024	1 October 2024
27	Data Registration Code	Establishing ISOP in industry codes 2024	1 October 2024
27	General Conditions	Establishing ISOP in industry codes 2024	1 October 2024
27	Governance Rules	Establishing ISOP in industry codes 2024	1 October 2024
28	General Conditions	Electrical Standards - EDL Instruction Interface Valid Reason Codes	7 November 2024
29	Glossary & Definitions	GC0175	28 March 2025
29	Connection Conditions	GC0175	28 March 2025
29	European Connection Conditions	GC0175	28 March 2025
29	Operating Code 7	GC0175	28 March 2025
29	Balancing Code 1	GC0175	28 March 2025

Revision	Section	Related Modification	Effective Date
29	Balancing Code 2	GC0175	28 March 2025
29	General Conditions	GC0175	28 March 2025
30	Glossary & Definitions	GC0172	3 April 2025
30	General Conditions	GC0172	3 April 2025
31	Glossary & Definitions	GC0159	8 April 2025
31	Planning Code	GC0159	8 April 2025
31	Operating Code 9	GC0159	8 April 2025
31	General Conditions	Electrical Standards - Electronic Data Transfer (EDT) Interface Specification, Communications Standards, EDL Message Interface Specification, Control Telephony Standard	8 April 2025
32	Connection Conditions	GC0177	19 May 2025
32	European Connection Conditions	GC0177	19 May 2025
32	Compliance Processes	GC0177	19 May 2025
32	European Compliance Processes	GC0177	19 May 2025
33	European Connection Conditions	GC0180	11 June 2025
33	Operating Code 6B	GC0180	11 June 2025
33	Balancing Code 1	GC0180	11 June 2025
33	Balancing Code 2	GC0180	11 June 2025
34	Glossary & Definitions	GC0166	05 November 2025

Revision	Section	Related Modification	Effective Date
34	Balancing Code 1	GC0166	05 November 2025
34	Balancing Code 2	GC0166	05 November 2025
34	General Conditions	Electrical Standards - EDL Instruction Interface Valid Reason Codes	05 November 2025
35	Glossary & Definitions	GC0183	04 December 2025
35	Operating Code 2	GC0183	04 December 2025
35	Operating Code 7	GC0183	04 December 2025
35	Balancing Code 1	GC0183	04 December 2025
36	Operating Code 2	GC0174	12 December 2025
36	Data Registration Code	GC0174	12 December 2025
37	General Conditions	Electrical Standards - EDL Message Interface Specification	13 April 2026
38	Planning Code	GC0173	05 May 2026
38	Connection Conditions	GC0173	05 May 2026
38	European Connection Conditions	GC0173	05 May 2026
38	European Compliance Processes	GC0173	05 May 2026
38	Balancing Code 3	GC0173	05 May 2026
39	Glossary & Definitions	GC0169	07 May 2026
39	Balancing Code 3	GC0169	07 May 2026
39	General Conditions	GC0169	07 May 2026

40	Glossary & Definitions	Establishing a harmonised prioritisation process in the Industry Codes	29 May 2026
40	Governance Rules	Establishing a harmonised prioritisation process in the Industry Codes	29 May 2026
41	Glossary & Definitions	GC0187	05 June 2026
41	Connection Conditions	GC0187	05 June 2026
41	European Connection Conditions	GC0187	05 June 2026
41	Compliance Processes	GC0187	05 June 2026
41	European Compliance Processes	GC0187	05 June 2026
41	Operating Code 2	GC0187	05 June 2026
41	Operating Code 5	GC0187	05 June 2026
41	Operating Code 6B	GC0187	05 June 2026
41	Balancing Code 1	GC0187	05 June 2026
41	Balancing Code 2	GC0187	05 June 2026
41	Data Registration Code	GC0187	05 June 2026
41	General Conditions	GC0187	05 June 2026
41	Governance Rules	GC0187	05 June 2026
42	Glossary & Definitions	GC0164	09 July 2026
42	Planning Code	GC0164	09 July 2026
42	European Compliance Processes	GC0164	09 July 2026
42	Operating Code 2	GC0164	09 July 2026

42	Operating Code 5	GC0164	09 July 2026
42	Operating Code 7	GC0164	09 July 2026
42	Balancing Code 1	GC0164	09 July 2026
42	Balancing Code 2	GC0164	09 July 2026
42	Data Registration Code	GC0164	09 July 2026
42	General Conditions	GC0164	09 July 2026
43	General Conditions	Electrical Standards - EDL Instruction Interface Valid Reason Codes	27 July 2026
44	Glossary & Definitions	GC0139	10 August 2026
44	Planning Code	GC0139	10 August 2026
44	Operating Code 5	GC0139	10 August 2026
44	Operating Code 6	GC0139	10 August 2026
44	Data Registration Code	GC0139	10 August 2026

< END OF REVISIONS >