

# **EUROPEAN NETWORK CODE: REQUIREMENT FOR GENERATORS**

## **Mapping to GB Codes**

|                               |  |
|-------------------------------|--|
| <b>Version of RFG:</b>        | Informal Draft 14/01/2014  |
| <b>Date Mapping prepared:</b> | Article 1-23: 12 March 2014 (CMWG)<br>Article 24-end: 27 March 2014 (CWMG) |
| <b>ECCAF Meeting:</b>         | Articles 1-23: 27 March 2014   |
| <b>Sent to Code Panels:</b>   | TBC  |

All queries to ECCAF Technical Secretary, Paul Wakeley,  
[europeancodes.electricity@nationalgrid.com](mailto:europeancodes.electricity@nationalgrid.com) in the first instance

## High Level Summary – RFG

Items marked in **Green** added after the second meeting.

### **Issues to be considered by the DCRP/GCRP Workgroup (for information to ECCAF)**

**Action:** DCRP/GCRP Workgroup to consider during their work on detailed code changes.

- How D-Code/G-Code are structured going forwards:
  - Need to ensure that if requirements are in two different GB Codes they are consistent / equivalent;
  - Need to be clear where requirements for types of generators are located, i.e. a Type D at 132kV will be distribution connected in England and Wales and transmission connected in Scotland;
  - How do we interpret "Relevant Network Operator":
    - This may mean that Type D requirements are different depending on if they are in England and Wales, or Scotland at 132kV
    - **For Distribution, this is being interpreted as one set of GB requirements, and not DSO specific requirements.**
- Any references to Article 4(3) need to refer to a process in the relevant GB Code and refer to the GB Governance process, with the obligation placed on the relevant TSO or DNO as per the text<sup>1</sup>.
- **Process for use of equipment certificates for compliance will need to be considered, and how certificates from outside GB are used.**

### **Issues to be flagged to DECC / Ofgem, as they form part of the GB Framework but not the GB Codes**

**Action:** DECC/Ofgem to consider how best to take forward these issues. If they feel they are part of the GB Codes, this should be flagged to ECCAF for them to reconsider.

- Scope
  - Article 3(2), Article 3(3). Legislation required to give NRA the necessary powers. Licence changes to oblige others.
  - Article 3a(1): Secondary legislation to make requirements enforceable?
  - Article 3a(2): Obligation on DECC/Ofgem
  - Article 3a(3): Legislation required to give NRA the necessary powers
  - Article 3a(4): Generators in construction / contract: Ofgem to write / lead a one-off process to consider if someone is an 'existing' generator.
- Article 4(1): Regulatory Aspects. Are changes required to modify GB Code objectives to match European objectives?
- Article 5: Cost recovery. Ofgem to consider overall approach.
- Article 6: Confidentiality. Legal advice required. Broader issues for GB under the EU Codes
- Article 14(3): Relevant Network Operator: If obligation are placed on TSOs at 132kV enforcement mechanisms may be required in GB.
- **Article 25 (Notification for Type A): Needs to tie in with Ofgem process for FIT notifications**
- **Article 33(7) Identification of costs and benefits of application of rules to Existing Power Generating Modules - Obligation placed on Authority. Do they have the ability to do this?**

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<sup>1</sup> It is noted that a number of ECCAF members would like to re-examine the governance process for the Grid Code and D-Code in light of the arrangements used in other GB codes such as the CUSC or BSC.

- Articles 52 - 56 Derogations. Further consideration required on how Derogations will work, and how these will be addressed across- Network Codes.
- Articles 57 - 61. Transitional Arrangements for Emerging Technologies. DECC/Ofgem to run this process.

**Issues to be considered by ECCAF:**

**Action:** ECCAF to consider how to treat these issues at their next meeting and on an ongoing basis.

| Issue  | ECCAF Treatment   |
|--|---|
| Global issue of treatment and handling of definitions.<br>Queries over GB vs (multiple) EU definitions   | Definitions are an ongoing area of work for Commission / ENTSO-E / ACER so will park for now, to be become an ECCAF focus topic when more clarity is gained from the first Network Code to progress through Comitology as to how definitions will be handled on a pan-European level. ENTSO-E does hold a common repository of definitions in their meta-data repository <sup>2</sup> . |
| Article 11(4) Type D general system management requirements. At present written like central dispatch and it is not clear how they work in principle.                  | Drafting in ongoing and these articles may be affected. ECCAF will return to these articles once further clarity has been gained in the drafting.   |
| Article 18. Concern over Connection Point and how this applies in GB, as all connection points are onshore in GB   |   |
| Articles 52 – 56. Consideration needs to be given to the derogation process (Title 5) in RFG, as a similar process is expected to apply across multiple Network Codes. | <i>To be considered by ECCAF at their April Meeting.</i>  |

| Requirements for Grid Connection of Generators 14/01/2014<br>Informal Draft   | Equivalent Sections in Existing GB Codes |       |       |   |           | Changes to the GB Codes        |   | ISSUE FLAGS   |  |
|---|--|-------|-------|---|-----------|--------------------------------|---|---|--|
|   | D-Code v22                               | G83-2 | G59-3 | BSEN 50438<br>(micro gens)<br>and technical<br>drafts | Grid Code | Proposed location              | Notes   | Code issue to<br>discuss at ECCAF   | Non-code issue (send<br>to DECC/Ofgem<br>) |
|   |  |       |       |   |           |                                |   |   |  |
| <b>Title 1</b>  |  |       |       |   |           |                                |   |   |  |
| <b>GENERAL PROVISIONS</b>   |  |       |       |   |           |                                |   |   |  |
|   |  |       |       |   |           |                                |   |   |  |
| <i>Article 1</i>  |  |       |       |   |           |                                |   |   |  |
| <i>Subject matter</i>   |  |       |       |   |           |                                |   |   |  |
| This Regulation establishes a network code which defines a common framework of grid connection requirements for Power Generating Facilities, including Synchronous Power Generating Modules, Power Park Modules and Offshore Generation Facilities. It also defines a common framework of obligations for Network Operators to appropriately make use of the Power Generating Facilities’ capabilities in a transparent and non-discriminatory manner ensuring a level-playing field throughout the European Union. |  |       |       |   |           | Does not require transposition |   |   |  |
|   |  |       |       |   |           |                                |   |   |  |
| <b>Article 2</b>  |  |       |       |   |           |                                |   |   |  |
| <b>DEFINITIONS</b>  |  |       |       |   |           |                                |   |   |  |
| For the purposes of this Regulation, the definitions in Article 2 of Regulation (EC) No 714/2009, Article 2 of Commission Regulation No [000/2014 – CACM], as well as of Article 2 of Regulation 543/2013 on submission and publication of data in electricity markets <sup>3</sup> and Art. 2 of Directive 2009/72/EC shall apply. In addition, the following definitions shall apply: <b>[THE CONSISTENCY OF DEFINITIONS ACROSS NETWORK CODES IS CURRENTLY EBING REVIEWED BY ENSTSO-E AND ACER]</b>               |  |       |       |   |           |                                | Individual definitions to be managed through the GB change process. | Global issue on treatment of definitions; GB vs EU, and handling multiple EU definitions. |  |
| <b>1)Active Power</b> - is the real component of the Apparent Power at fundamental Frequency, expressed in watts or multiples thereof (e.g. kilowatts (kW) or megawatts (MW)).  |  |       |       |   |           |                                |   |   |  |
| <b>2)Active Power Frequency Response</b> - is an automatic response of Active Power output from a Power Generating Module, in response to a change in system Frequency from the nominal system Frequency.   |  |       |       |   |           |                                |   |   |  |
| <b>3)Agency</b> is The Agency for the Cooperation of Energy Regulators (ACER) as established by Regulation (EC) No 713/2009   |  |       |       |   |           |                                |   |   |  |
| <b>4)Alternator</b> – is a device that converts mechanical energy into electrical energy by means of a rotating magnetic field.   |  |       |       |   |           |                                |   |   |  |
| <b>5)Apparent Power</b> - is the product of Voltage and Current at fundamental Frequency, and the square root of three. It is usually expressed in kilovolt-amperes (kVA) or megavolt-amperes (MVA) and consists of a real component (Active Power) and an imaginary component (Reactive Power).  |  |       |       |   |           |                                |   |   |  |

<sup>3</sup> ABI ...

[illegible]

[illegible]



[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

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| <i>Article 3a</i>   |  |       |       |   |           |   |       |                                   |  |
| <i>Application to New and Existing generators</i>   |  |       |       |   |           |   |       |                                   |  |
| 1. The requirements set forth by this Network Code shall apply to New Power Generating Modules in a Member State which are considered to significant according to the provisions of this Network Code unless otherwise provided in this Network Code.   |  |       |       |   |           | Scope statement in all documents where the requirements are placed e.g. G-Code, D-Code, Engineering Recommendations   |       |                                   | May require secondary legislation, for 'enforcement mechanism' for new small generators (i.e. not licenced generators) |
| 2. Member States and national regulatory authorities shall ensure that existing Power Generating Modules continue to be bound by such technical requirements that apply to them (including applicable derogations) pursuant to legislation in force in the respective Member States or contractual arrangements in force at the time of entry into force of this Network Code, including any provisions therein for the change of such requirements.  |  |       |       |   |           |   |       |                                   | Decc/Ofgem need to ensure that existing requirements are maintained.   |
| 3. Notwithstanding paragraph (1) and (2) the requirements set forth by this Network Code may be made applicable to Existing Power Generating Modules in a Member State, but only in case of factual change such as the evolution of system requirements including penetration of renewable energy sources, smart grids, distributed generation, demand response and taking account of the legitimate expectations of existing generating modules. The extent of the applicability of this Network Code to Existing Power Generating Modules shall be decided by the National Regulatory Authority following a proposal from the relevant TSO. |  |       |       |   |           | New process (for retrospectively) in G-Code and D-Code /ER – maybe in existing Governance sections<br><br>Potentially an additional obligation on existing generators / DNOs to provide information to TSOs to allow them to complete the CBA |       |                                   | Legislation required for NRA to have necessary powers  |
| (a) The Relevant TSO shall propose the application of this Network Code to Existing Power Generating Modules only following a public consultation.  |  |       |       |   |           |   |       |                                   |  |
| (b) The proposal by the Relevant TSO shall be based on a sound and transparent quantitative Cost-Benefit Analysis. This Cost-Benefit Analysis shall be carried out in accordance with Article 33(1) to (5) and shall include  |  |       |       |   |           |   |       |                                   |  |
| i.the costs to Existing Power Generating Modules of requiring compliance with this Network Code   |  |       |       |   |           |   |       |                                   |  |
| ii.the socio-economic benefit of application of the requirements set forth by this Network Code   |  |       |       |   |           |   |       |                                   |  |
| iii.The potential of alternative measures, including network improvements to achieve the required performance.  |  |       |       |   |           |   |       |                                   |  |



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| (1) In accordance with Article 3(4) (a) and (b) above, the Relevant Network Operator is provided with sufficient evidence of the existence of binding and final contracts for the construction, assembly or purchase of the main plant of a Power Generating Module exists prior to the day, which is two years after the day of entry into force of this Network Code; or |  |       |       |   |           |  |       |                                   |   |
| (2) Following the verification performed by the National Regulatory Authority in accordance with Article 3(4) (c), it is ascertained that binding and final contracts for the construction, assembly or purchase of the main plant of a Power Generating Module exist prior to the day, which is two years after the day of entry into force of this Network Code.         |  |       |       |   |           |  |       |                                   |   |
| (e) In case the Power Generating Facility Owner does not provide the Relevant Network Operator with the confirmation within the delay set forth in Article 3(4) (a), the Power Generating Module shall be considered as a New Power Generating Module.   |  |       |       |   |           |  |       |                                   |   |
| <i>Article 3b</i>  |  |       |       |   |           |  |       |                                   |   |
| <i>Determination of significance</i>   |  |       |       |   |           |  |       |                                   |   |
| 1. The applicability and extent of the requirements with which a Power Generating Modules shall be required to comply shall be determined on the basis of the Voltage level of their Connection Point and their Maximum Capacity according to the categories set out in paragraph 2.   |  |       |       |   |           | Scope statement in all documents where the requirements are placed e.g. G-Code, D-Code, Engineering Recommendations based on outcomes below. |       |                                   |   |
| 2. Power Generating Modules which are considered to be significant are categorized as follows:   |  |       |       |   |           | Process outlined in Grid Code<br><br>Output reflected in Scope / applicability of documents as required.                                     |       |                                   |   |
| (a) A Power Generating Module is of Type A if its Connection Point is below 110 kV and its Maximum Capacity is 0.8 kW or more  |  |       |       |   |           |  |       |                                   |   |
| (b) A Power Generating Module is of Type B if its Connection Point is below 110 kV and its Maximum Capacity is at or above a threshold defined by each Relevant TSO while respecting the provisions of Article 4(3). This threshold shall not be above the threshold for Type B Power Generating Modules according to table 1.   |  |       |       |   |           |  |       |                                   |   |
| (c) A Power Generating Module is of Type C if its Connection Point is below 110 kV and its Maximum Capacity is at or above a threshold defined by each Relevant TSO while respecting the provisions of Article 4(3). This threshold shall not be above the threshold for Type C Power Generating Modules according to table 1.   |  |       |       |   |           |  |       |                                   |   |

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|  | Synchronous Area   | maximum capacity threshold from which on a Power Generating Module is of Type B | maximum capacity threshold from which on a Power Generating Module is of Type C |  | maximum capacity threshold from which on a Power Generating Module is of Type D |  |       |  |       |  |           |                   |       |
|  | Continental Europe   | 1 MW  | 50 MW   |  | 75 MW   |  |       |  |       |  |           |                   |       |
|  | Nordic   | 1.5 MW  | 10 MW   |  | 30 MW   |  |       |  |       |  |           |                   |       |
|  | Great Britain  | 1 MW  | 10 MW   |  | 30 MW   |  |       |  |       |  |           |                   |       |
|  | Ireland  | 0.1 MW  | 5 MW  |  | 10 MW   |  |       |  |       |  |           |                   |       |
|  | Baltic   | 0.5 MW  | 10 MW   |  | 15 MW   |  |       |  |       |  |           |                   |       |
|  | Table 1: Thresholds for Type B, C and D Power Generating Modules   |   |   |  |   |  |       |  |       |  |           |                   |       |
| (d) A Power Generating Module is of Type D if its Connection Point is at 110 kV or above. A Synchronous Power Generating Module or Power Park Module is of Type D as well if its Connection Point is below 110 kV and its Maximum Capacity is at or above a threshold defined by each Relevant TSO while respecting the provisions of Article 4(3). This threshold shall not be above the threshold for Type D Power Generating Modules according to table 1 |  |   |   |  |   |  |       |  |       |  |           |                   |       |
| 3.   | When TSOs define the thresholds pursuant to Paragraph 2 subparagraphs b, c and d, they shall:  |   |   |  |   |  |       |  |       |  |           |                   |       |
| (a) Be based on accurate data, in this context Power Generating Facility Owners shall assist and contribute to the determination of the threshold and provide relevant data as requested by the Relevant TSO.  |  |   |   |  |   |  |       |  |       |  |           |                   |       |
| (b) be coordinated with adjacent TSOs and DSOs   |  |   |   |  |   |  |       |  |       |  |           |                   |       |
| (c) follow public consultation by the Relevant TSO   |  |   |   |  |   |  |       |  |       |  |           |                   |       |
| (d) be subject to the approval of the National Regulatory Authority respecting the provisions of Article 4(3).   |  |   |   |  |   |  |       |  |       |  |           |                   |       |
| 4.   | The Relevant TSO shall have the right to re-assess the determination of the thresholds referred to in Paragraph 2 subparagraphs b, c and d if relevant circumstances have changed materially, but not more often than every three years and respecting the provisions of Article 4(3). |   |   |  |   |  |       |  |       |  |           |                   |       |
| Following any change to thresholds any Power Generating Module that has been moved to a new type will not automatically have to comply retroactively with the additional requirements but will be subject to the same procedure as applied to Existing Power Generating Modules in line with Article 3a  |  |   |   |  |   |  |       |  |       |  |           |                   |       |

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|   |  |       |       |   |           |   |       |                                   |   |
| <i>Article 3c</i>   |  |       |       |   |           |   |       |                                   |   |
| <i>Application to Offshore synchronous power generating modules, pump storage power generating modules, combined heat and power facilities, and industrial sites</i>  |  |       |       |   |           |   |       |                                   |   |
| 1. Offshore connected Synchronous Power Generating Modules shall meet the requirements for onshore synchronous Power Generating Modules unless modified by the Relevant Network Operator while respecting the provisions of Article 4(3). The categories to be taken into account for Offshore Power Park Modules for the purpose of this Network Code are defined in Article 18(3).  |  |       |       |   |           | Scope statement in all documents where the requirements are placed e.g. G-Code, D-Code, Engineering Recommendations |       |                                   |   |
| 2. Pump-storage Power Generating Modules shall fulfil all requirements in both generating and pumping operation mode. Synchronous Compensation Operation of Pump-Storage Power Generating Modules shall not be limited in time by technical design of the Power Generating Modules. Pump-Storage variable speed Power Generating Modules shall fulfil all requirements applicable to synchronous Power Generating Modules and in addition those set forth in Article 15(2) (b), if they are of Type B, C or D.  |  |       |       |   |           | Scope statement in all documents where the requirements are placed e.g. G-Code, D-Code, Engineering Recommendations |       |                                   |   |
| 3. Without prejudice to the general applicability of the requirements set forth in this Network Code, a Power Generating Facility Owner, the Network Operator of an industrial site and the Relevant Network Operator to whose Network the Network of the industrial site is connected to, shall have the right in coordination with the Relevant TSO, with respect to Power Generation Modules which are embedded in the Networks of industrial sites, to agree while respecting the provisions of Article 4 (3) on conditions for disconnection of such Power Generating Modules together with critical loads, which secure production processes, from the Relevant Network Operator's Network. The only objective of such an agreement shall be to secure production processes of such a site in case of disturbed conditions in the Relevant Network Operator's Network. The requirements of this Network Code, notwithstanding such an agreement, shall apply to Power Generating Modules embedded in the Networks of such industrial sites. |  |       |       |   |           | Process in G-Code / D-Code  |       |                                   |   |
| 4. Without prejudice to the general applicability of the requirements set forth in this Network Code, a requirement of this Network Code shall not apply to Power Generating Modules of facilities for combined heat and power production (CHP) embedded in the Networks of industrial sites in the following cumulative circumstances:   |  |       |       |   |           | Scope statement in all documents where the requirements are placed e.g. G-Code, D-Code, Engineering Recommendations |       |                                   |   |
| – the primary purpose of these facilities is to produce heat for production processes of this industrial site;  |  |       |       |   |           |   |       |                                   |   |
| – the generation of heat and power are rigidly coupled to each other, i. e. any change of heat generation results inadvertently in a change of Active Power generation and vice versa;  |  |       |       |   |           |   |       |                                   |   |
| – the Power Generating Modules are of Type A, B or C according to Article 3(6) (a) to (c); and  |  |       |       |   |           |   |       |                                   |   |

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| – the requirement is related to the capability maintain constant Active Power output or to modulate Active Power output other than Article 8(1) (c) and (e).  |  |       |       |   |           |  |       |                                   |   |
| For the avoidance of doubt, combined heat and power generating facilities will be regarded on their electrical Maximum Capacity.  |  |       |       |   |           |  |       |                                   |   |
| <i>Article 4</i>  |  |       |       |   |           |  |       |                                   |   |
| <i>Regulatory Aspects</i>   |  |       |       |   |           |  |       |                                   |   |
| 1. Where network operators or national regulatory authorities are required by this Network Code to determine or approve requirements they shall, in accordance with Directive 2009/72/EC, notably Art. 37 (1) and 6 thereof,  |  |       |       |   |           | Change in Grid-Code, D-Code and Engineering Recommendation governance to allow this process / criteria to be applied |       |                                   | Maybe licence changes for Code objectives     |
| (a) apply of the principles of proportionality and non-discrimination   |  |       |       |   |           |  |       |                                   |   |
| (b) ensure the maximum transparency   |  |       |       |   |           |  |       |                                   |   |
| (c) assign costs to the real originator of those costs to the extent possible   |  |       |       |   |           |  |       |                                   |   |
| (d) apply principle of optimisation between the highest overall efficiency and lowest total costs for all involved parties  |  |       |       |   |           |  |       |                                   |   |
| 2. Network Operators shall respect the responsibility allocated to the Relevant TSO according to national legislation to ensure system security when taking decisions or entering into agreements with Power Generating Facility Owner in accordance with this code.  |  |       |       |   |           |  |       |                                   |   |
| Where appropriate further details to ensure that the first subparagraph is respected may be specified either by national legislation or in agreements between the Relevant TSO and the Network Operators in its Control Area.   |  |       |       |   |           |  |       |                                   |   |
| 3. Where reference is made to this paragraph, the terms and conditions for connection and access to networks or their methodologies shall be established by the responsible National Regulatory Authorities, or, if applicable, by the Member States, in accordance with the rules of national law implementing Directive 2009/72/EC, notably Art. 37 (1) and 6 thereof, and with the principles of transparency, proportionality and non-discrimination.   |  |       |       |   |           |  |       |                                   |   |
|   |  |       |       |   |           |  |       |                                   |   |
| <i>Article 5</i>  |  |       |       |   |           |  |       |                                   |   |
| <i>Recovery of Costs</i>  |  |       |       |   |           |  |       |                                   |   |
| The costs related to the obligations in this network code borne by regulated Network Operators shall be assessed by National Regulatory Authorities in line with Article 37 (1) of Directive 72/2009/EC. Network Operators shall, within three months of a request, provide such additional information as reasonably requested by National Regulatory Authorities to facilitate the assessment of the costs incurred. Costs assessed as efficient, reasonable and proportionate shall be recovered as determined by National Regulatory Authorities. |  |       |       |   |           |  |       |                                   | Ofgem to<br>define<br>approach.               |

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| <i>Article 6</i>  |   |       |       |   |           |  |       |                                |   |
| <i>Confidentiality Obligations [to be aligned to CACM]</i>  |   |       |       |   |           |  |       |                                |   |
| 1. Each Relevant Network Operator, Relevant TSO, Relevant DSO or Relevant CDSO shall preserve the confidentiality of the information and data submitted to them in fulfilment of the obligations under this Network Code and shall use them exclusively for the purpose they have been submitted in compliance with this Network Code, notably to verify the compliance of requirements set forth in this Network Code. |   |       |       |   |           | Possible code changes to G-Code / D-Code arising from legal advice |       |                                | Legal advice required.<br>Broader issues of ensuring the GB requirements for data / confidentiality are acceptable with the EU requirements |
| 2. Notwithstanding the above, disclosure of such information and data may occur a Relevant Network Operator, a Relevant TSO, Relevant DSO or a Relevant CDSO shall disclose information if required under EU or national law to disclose,. The disclosure shall be reported to the owner of such information and data.  |   |       |       |   |           |  |       |                                |   |
| 3. In case of disclosure for other purposes than those described in Article 6(1) or (2), a Relevant Network Operator, a Relevant TSO, Relevant DSO or a Relevant CDSO shall seek the consent of the owner of such information and data. This consent cannot be unreasonably withheld.   |   |       |       |   |           |  |       |                                |   |
|   |   |       |       |   |           |  |       |                                |   |

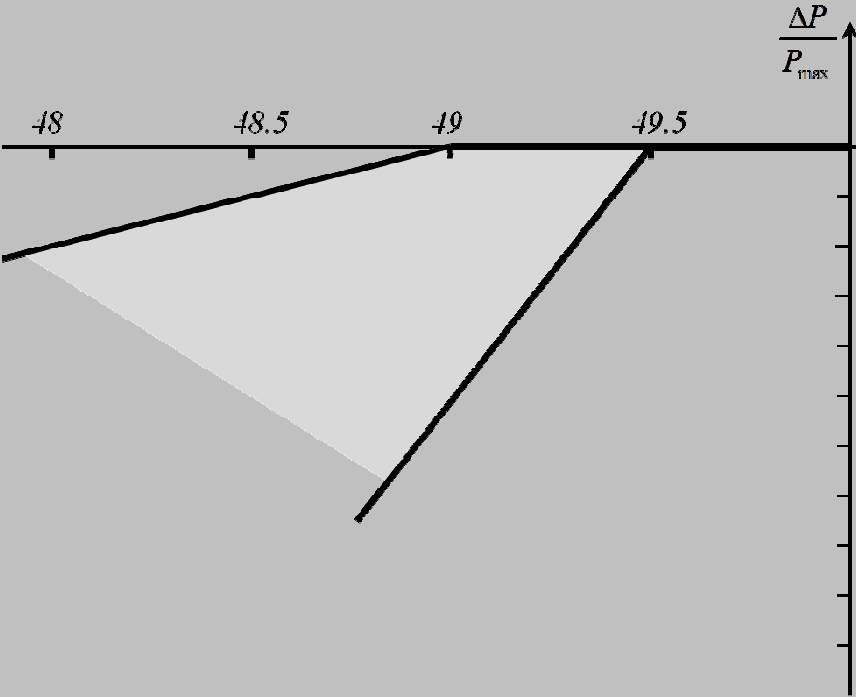
| Requirements for Grid Connection of Generators 14/01/2014<br>Informal Draft  | Equivalent Sections in Existing GB Codes             |   |  |   |  | Changes to the GB Codes   |       | ISSUE FLAGS                       |   |
|--|--|---|--|---|--|---|-------|-----------------------------------|---|
|  | D-Code v22   | G83-2   | G59-3  | BSEN 50438<br>(micro gens)<br>and technical<br>drafts   | Grid Code  | Proposed location   | Notes | Code issue to<br>discuss at ECCAF | Non-code<br>issue (send<br>to DECC/Ofgem<br>) |
| Title 2  |  |   |  |   |  |   |       |                                   |   |
| REQUIREMENTS   |  |   |  |   |  | Provisions of Article 4(3) need to refer to governance of Codes   |       |                                   |   |
|  |  |   |  |   |  |   |       |                                   |   |
| Chapter 1  |  |   |  |   |  |   |       |                                   |   |
| GENERAL REQUIREMENTS   |  |   |  |   |  |   |       |                                   |   |
|  |  |   |  |   |  |   |       |                                   |   |
| Article 8  |  |   |  |   |  |   |       |                                   |   |
| General requirements for type A power generating modules   |  |   |  |   |  |   |       |                                   |   |
| Type A Power Generating Modules shall fulfil the following requirements referring to Frequency stability:  |  |   |  |   |  | Scope statement in all documents where the requirements are placed e.g. G-Code, D-Code, Engineering Recommendations |       |                                   |   |
| 1. With regard to Frequency ranges:  |  |   |  |   |  |   |       |                                   |   |
| (a) A Power Generating Module shall be capable of remaining connected to the Network and operating within the Frequency ranges and time periods specified by table 2.  | DPC4.2.2<br>Frequency and Voltage<br><br>ESQCR 27    | 5.3.1 Interface Protection Settings and Test Requirements | 7.3.4<br>9.1.3<br>9.1.4<br>9.1.5<br>9.3.2<br>9.3.7<br>10.5.5<br>10.5.6 | BSEN 50438<br>4.2.3 Continuous frequency operation range<br>4.2.4 Response to under-frequencies<br>4.2.5 Power response to over-frequency<br><br>Requirements for gens:<br>4.4 Normal operating range<br>4.4.1 General<br>4.4.2 Operating frequency range | CC.6.1.3 – Frequency Range                                       | Grid Code / D-Code  |       |                                   |   |
| (b) Respecting the provisions of Article 4(3), wider Frequency ranges or longer minimum times for operation may be agreed between the Relevant Network Operator in coordination with the Relevant TSO and the Power Generating Facility Owner to ensure the best use of the technical capabilities of a Power Generating Module if needed to preserve or to restore system security. | DOC9.4.1.1<br>DPC7.4.1.5<br>DPC7.4.3.6<br>DPC7.4.3.7 |   | 10.2 Protection Requirements   | -   | CC.6.3.12 – Narrower / Wider frequency range as agreed with NGET | Process in Grid Code / D-Code<br><br>Requirements in Grid-Code / D-Code   |       |                                   |   |
| (c) The Power Generating Facility Owner shall not unreasonably withhold consent to apply wider Frequency ranges or longer minimum times for operation taking account of their economic and technical feasibility.  |  |   |  |   |  | Grid Code / D-Code  |       |                                   |   |

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|  | D-Code v22                               | G83-2   | G59-3  | BSEN 50438<br>(micro gens)<br>and technical<br>drafts   | Grid Code   | Proposed location   | Notes | Code issue to<br>discuss at ECCAF | Non-code<br>issue (send<br>to DECC/Ofgem<br>) |
| (d) Without prejudice to the provisions of Article 8(1) (a) point 1), a Power Generating Module shall be capable of automatic disconnection at specified frequencies, if required by the Relevant Network Operator. The terms and settings for automatic disconnection shall be agreed between the Relevant Network Operator and the Power Generating Facility Owner, respecting Article 4(3).   |  |   |  |   | CC.6.3.13 – Disconnection outside 47 – 52Hz Frequency range                         | Process in Grid Code / D-Code<br><br>Requirements in Grid-Code / D-Code |       |                                   |   |
| 2. With regard to the rate of change of Frequency withstand capability, a Power Generating Module shall be capable of staying connected to the Network and operating at rates of change of Frequency, other than triggered by rate-of-change-of-Frequency-type of loss of mains protection, up to a value defined by the Relevant TSO respecting the provisions of Article 4(3). This rate-of-change-of-Frequency-type of loss of mains protection will be defined by the Relevant Network Operator in coordination with the Relevant TSO and subject to notification to the National Regulatory Authority. The modalities of that notification shall be determined in accordance with the applicable national regulatory framework. | DPC7.4.3.4<br>DPC7.4.3.8                 | 5.3.3<br>Frequency Drift<br>and Step Change<br>Stability Test | 10.2 Protection<br>Requirements<br>10.3.13<br>10.3.14<br>10.3.15 | Requirements<br>for gens:<br><br>4.5.2 Rate of<br>change of<br>frequency<br>(ROCOF)<br>immunity | CC.6.3.12 – Rate<br>of change of<br>Frequency relay<br>settings agreed<br>with NGET | Process in Grid Code / D-Code<br><br>Requirements in Grid-Code / D-Code |       |                                   |   |

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| Table 2: Minimum time periods for which a Power Generating Module shall be capable of operating for different frequencies deviating from a nominal value without disconnecting from the Network. | Synchronou<br>s Area  | Frequency<br>Range | Time period  |  |       |       |   |           | Process in Grid Code /<br>D-Code |       |                                   |   |
|  | Continental<br>Europe | 47.5 Hz – 48.5 Hz  | To be defined by each<br>provisions of Article m                 |  |       |       |   |           |                                  |       |                                   |   |
|  |                       | 48.5 Hz – 49.0 Hz  | To be defined by each<br>provisions of Article 4<br>period for 4 |  |       |       |   |           |                                  |       |                                   |   |
|  |                       | 49.0 Hz – 51.0 Hz  | Ur   |  |       |       |   |           |                                  |       |                                   |   |
|  |                       | 51.0 Hz – 51.5 Hz  | 30   |  |       |       |   |           |                                  |       |                                   |   |
|  | Nordic                | 47.5 Hz – 48.5 Hz  | 30   |  |       |       |   |           |                                  |       |                                   |   |
|  |                       | 48.5 Hz – 49.0 Hz  | To be defined by each<br>provisions of Article m                 |  |       |       |   |           |                                  |       |                                   |   |
|  |                       | 49.0 Hz – 51.0 Hz  | Ur   |  |       |       |   |           |                                  |       |                                   |   |
|  |                       | 51.0 Hz – 51.5 Hz  | 30   |  |       |       |   |           |                                  |       |                                   |   |
|  | Great Britain         | 47.0 Hz – 47.5 Hz  | 20   |  |       |       |   |           |                                  |       |                                   |   |
|  |                       | 47.5 Hz – 48.5 Hz  | 90   |  |       |       |   |           |                                  |       |                                   |   |
|  |                       | 48.5 Hz – 49.0 Hz  | To be defined by each<br>provisions of Article m                 |  |       |       |   |           |                                  |       |                                   |   |
|  |                       | 49.0 Hz – 51.0 Hz  | Ur   |  |       |       |   |           |                                  |       |                                   |   |
|  |                       | 51.0 Hz – 51.5 Hz  | 90   |  |       |       |   |           |                                  |       |                                   |   |
|  |                       | 51.5 Hz – 52.0 Hz  | 15   |  |       |       |   |           |                                  |       |                                   |   |
|  | Ireland               | 47.5 Hz – 48.5 Hz  | 90   |  |       |       |   |           |                                  |       |                                   |   |
|  |                       | 48.5 Hz – 49.0 Hz  | To be defined by each<br>provisions of Article m                 |  |       |       |   |           |                                  |       |                                   |   |
|  |                       | 49.0 Hz – 51.0 Hz  | Ur   |  |       |       |   |           |                                  |       |                                   |   |
|  |                       | 51.0 Hz – 51.5 Hz  | 90   |  |       |       |   |           |                                  |       |                                   |   |
|  | Baltic                | 47.5 Hz – 48.5 Hz  | To be defined by each<br>provisions of Article m                 |  |       |       |   |           |                                  |       |                                   |   |
|  |                       | 48.5 Hz – 49.0 Hz  | To be defined by each<br>provisions of Article 4<br>period for 4 |  |       |       |   |           |                                  |       |                                   |   |
|  |                       | 49.0 Hz – 51.0 Hz  | Ur   |  |       |       |   |           |                                  |       |                                   |   |
|  |                       | 51.0 Hz – 51.5 Hz  | To be defined by each<br>provisions of Article m                 |  |       |       |   |           |                                  |       |                                   |   |
|  |                       |                    |  |  |       |       |   |           |                                  |       |                                   |   |
| 3. With regard to the Limited Frequency Sensitive Mode - Overfrequency (LFSM-O) the following shall apply:   |                       |                    |  | DOC5.6.2.2                               |       |       |   | BC.3.7.2  | Process in Grid Code             |       |                                   |   |



[illegible]

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|  <p>Figure 2 – Maximum power capability reduction with falling Frequency. The diagram represents the boundaries defined by the Relevant TSO while respecting the provisions of Article 4(3).</p>   |  |  |   |  |  |  |   |                                   |  |
| <p>6. The Power Generating Module shall be equipped with a logic interface (input port) in order to cease Active Power output within 5 seconds following an Instruction from the Relevant Network Operator. The Relevant Network Operator shall have the right to define requirements for equipment to make this facility operable remotely while respecting the provisions of Article 4(3)</p>  | DOC6.3<br>DOC7.3<br>DOC7.4.1<br>DOC7.4.2 |  |   |  | Not specified – Electronic and verbal Instructions given to BMU's and Large Power Stations | Obligation in <b>D-Code/G-Code</b> as appropriate.             | Procedure for how to use the right to issue instruction D-Code/G-Code |                                   |  |
| <p>7. The Relevant TSO shall define while respecting the provisions of Article 4(3) the conditions under which a Power Generating Module shall be capable of connecting automatically to the Network. These conditions shall include:</p> <ul style="list-style-type: none"> <li>– Frequency ranges, within which an automatic connection is admissible, and a corresponding delay time</li> <li>– maximum admissible gradient of increase of Active Power output</li> </ul> | DPC7.3.1                                 | 5.3.4 Automatic Reconnection<br>A1.3.5 Reconnection<br>B1.3.5 Reconnection | 10.2.3<br>10.5.14<br>11.5 Synchronizing and Operational Control | BSEN:<br>4.7 Connection and starting to generate electrical power<br>4.7.1 General<br>4.7.2 Automatic reconnection |  | Process in Grid Code<br><br>Requirements in Grid-Code / D-Code |   |                                   |  |

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| Automatic connection is allowed unless determined otherwise by the Relevant Network Operator in coordination with the Relevant TSO.  |   |       |   | after tripping<br>4.7.4<br>Synchronisation<br>Requirements<br>for generating<br>plants<br>4.10 Connection<br>and starting to<br>generate<br>electrical power<br>4.10.1 General<br><br>4.10.2 Automatic<br>reconnection<br>after tripping<br><br>4.10.4<br>Synchronisation |  |  |       |                                   |   |
|  |   |       |   |   |  |  |       |                                   |   |
|  |   |       |   |   |  |  |       |                                   |   |
| Article 9  |   |       |   |   |  |  |       |                                   |   |
| General requirements for type B power generating modules   |   |       |   |   |  |  |       |                                   |   |
| 1. Type B Power Generating Modules shall fulfil the requirements set out in Article 8.   |   |       |   |   |  | Scope / Structure of documents   |       |                                   |   |
| 2. Type B Power Generating Modules shall fulfil the following requirements referring to Frequency stability:   | Applicable<br>DCode sections<br>as Article 8 (6)                    |       |   |   | Not specified –<br>Electronic and<br>verbal<br>Instructions<br>given to BMU's<br>and Large Power<br>Stations |  |       |                                   |   |
| (a) In order to be able to control Active Power output, the Power Generating Module shall be equipped with an interface (input port) in order to be able to reduce Active Power output as instructed by the Relevant Network Operator or the Relevant TSO. |   |       |   |   |  | Obligation in <b>D-Code/G-Code</b> as appropriate.<br><br>Procedure for how to use the right to issue instruction D-Code/G-Code<br><br>Possible market implications, so may be consequential <b>BSC changes.</b> |       |                                   |   |
| (b) Respecting the provisions of Article 4(3) the Relevant Network Operator shall have the right to define the requirements for further equipment to make this facility operable remotely.   |   |       |   |   |  | Process in Grid Code<br><br>Requirements in Grid-Code / D-Code   |       |                                   |   |
| 3. Type B Power Generating Modules shall fulfil the following requirements referring to robustness of Power Generating Modules :   | DPC7.4.4 Fault<br>Ride Through<br>and Phase<br>Voltage<br>Unbalance |       | 10.5.3Under<br>Voltage<br>13.6.1System<br>Stability | Requirements<br>for gens:<br>4.5.3 Low<br>voltage ride<br>through (LVRT)  | CC.6.3.15  | Process in Grid Code / D-Code  |       |                                   |   |
| (a) With regard to fault-ride-through capability of Power Generating Modules:  |   |       |   |   |  | Requirements in Grid-Code / D-Code   |       |                                   |   |

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|  | D-Code v22                               | G83-2 | G59-3 | BSEN 50438<br>(micro gens)<br>and technical<br>drafts   | Grid Code | Proposed location       | Notes | Code issue to<br>discuss at ECCAF | Non-code<br>issue (send<br>to DECC/Ofgem<br>) |
| (1) Power Generating Modules shall be capable of staying connected to the Network and continuing stable operation after the power system has been disturbed by Secured Faults in accordance with a voltage-against-time-profile at the Connection Point for fault conditions on the defined by the Relevant TSO respecting the provisions of Article 4(3).   |  |       |       | 4.5.3.1 General   |           |                         |       |                                   |   |
| (2) The voltage-against-time-profile shall be expressed by a lower limit of the course of the phase-to-phase Voltages on the Network Voltage level at the Connection Point during a symmetrical fault, as a function of time before, during and after the fault.   |  |       |       | 4.5.3.2 PV<br>generating plant<br>Generating plant<br>with converter<br>connected<br>generating<br>technology |           |                         |       |                                   |   |
| (3) This lower limit shall be defined by the Relevant TSO respecting the provisions of Article 4(3) using parameters set out in figure 3 and within the ranges set out in tables 3.1 and 3.2.  |  |       |       | 4.5.3.3<br>Generating plant<br>with directly<br>coupled<br>generating<br>technology                           |           |                         |       |                                   |   |
| (4) Having regard to the fact that generality with regard to pre-fault operating conditions of Power Generating Modules sets constraints on fault clearance time for successful fault-ride-through performance and that longer fault clearance times sets constraints on pre-fault operating conditions for successful fault-ride-through performance, each TSO shall define and make publicly available while respecting the provisions of Article 4(3) defining the pre-fault and post-fault conditions for the fault-ride-through capability in terms of: |  |       |       |   |           |                         |       |                                   |   |
| – conditions for the calculation of the pre-fault minimum short circuit capacity at the Connection Point;  |  |       |       |   |           |                         |       |                                   |   |
| – conditions for pre-fault active and Reactive Power operating point of the Power Generating Module at the Connection Point and Voltage at the Connection Point; and   |  |       |       |   |           |                         |       |                                   |   |
| – Conditions for the calculation of the post-fault minimum short circuit capacity at the Connection Point.   |  |       |       |   |           |                         |       |                                   |   |
| (5) Upon request by a Power Generating Facility Owner a Relevant Network Operator shall provide the pre-fault and post-fault conditions to be considered for fault-ride-through capability as an outcome of the calculations at the Connection Point as defined in subparagraph 3 regarding:   |  |       |       |   |           |                         |       |                                   |   |
| – pre-fault minimum short circuit capacity at each Connection Point expressed in MVA;  |  |       |       |   |           |                         |       |                                   |   |
| – pre-fault operating point of the Power Generating Module expressed in Active Power output and Reactive Power output at the Connection Point and Voltage at the Connection Point; and   |  |       |       |   |           |                         |       |                                   |   |
| – post-fault minimum short circuit capacity at each Connection Point expressed in MVA.   |  |       |       |   |           |                         |       |                                   |   |



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|  | Voltage parameters [pu]  |                                     | Time parameters [seconds] |   |       |        |   |                                |                   |             |                                   |
|  | U <sub>ret</sub> :   | 0.05 – 0.3                          | t <sub>clear</sub> :      | 0.14 – 0.15 (or 0.25 if<br>system protection and<br>secure operation<br>requires) |       |        |   |                                |                   |             |                                   |
|  | U <sub>clear</sub> :   | 0.7 – 0.9                           | t <sub>rec1</sub> :       | t <sub>clear</sub>  |       |        |   |                                |                   |             |                                   |
|  | U <sub>rec1</sub> :  | U <sub>clear</sub>                  | t <sub>rec2</sub> :       | t <sub>rec1</sub> – 0.7   |       |        |   |                                |                   |             |                                   |
|  | U <sub>rec2</sub> :  | 0.85 – 0.9 and ≥ U <sub>clear</sub> | t <sub>rec3</sub> :       | t <sub>rec2</sub> – 1.5   |       |        |   |                                |                   |             |                                   |
|  | Table 3.1 – Parameters for figure 3 for fault-ride-through capability of Synchronous Power Generating Modules. |                                     |                           |   |       |        |   |                                |                   |             |                                   |
|  | Voltage parameters [pu]  |                                     | Time parameters [seconds] |   |       |        |   |                                |                   |             |                                   |
|  | U <sub>ret</sub> :   | 0.05 – 0.15                         | t <sub>clear</sub> :      | 0.14 – 0.15 (or 0.25 if<br>system protection and<br>secure operation<br>requires) |       |        |   |                                |                   |             |                                   |
|  | U <sub>clear</sub> :   | U <sub>ret</sub> – 0.15             | t <sub>rec1</sub> :       | t <sub>clear</sub>  |       |        |   |                                |                   |             |                                   |
|  | U <sub>rec1</sub> :  | U <sub>clear</sub>                  | t <sub>rec2</sub> :       | t <sub>rec1</sub>   |       |        |   |                                |                   |             |                                   |
|  | U <sub>rec2</sub> :  | 0.85                                | t <sub>rec3</sub> :       | 1.5 – 3.0   |       |        |   |                                |                   |             |                                   |
|  | Table 3.2 – Parameters for figure 3 for fault-ride-through capability of Power Park Modules.                   |                                     |                           |   |       |        |   |                                |                   |             |                                   |
| (6) The Power Generating Module shall be capable of remaining connected to the Network and continuing stable operation when the actual course of the phase-to-phase Voltages on the Network Voltage level at the Connection Point during a symmetrical fault, given the pre-fault and post-fault conditions according to Article 9(3) (a) points 3) and 4), remains above the lower limit defined in Article 9(3) (a) point 2), unless the protection scheme for internal electrical faults requires the disconnection of the Power Generating Module from the Network. The protection schemes and settings for internal electrical faults shall be designed not to jeopardize fault-ride-through performance. |  |                                     |                           |   |       |        |   |                                |                   |             |                                   |
| (7) While still respecting Article 9(3) (a) point 5), undervoltage protection (either fault-ride-through capability or minimum Voltage defined at the connection point Voltage) shall be set by the Power Generating Facility Owner to the widest possible technical capability of the Power Generating Module unless the Relevant Network Operator requires less wide settings according to Article 9(5) (b). The settings shall be justified by the Power Generating Facility Owner in accordance with this principle.   |  |                                     |                           |   |       |        |   |                                |                   |             |                                   |
| (b) Fault-ride-through capabilities in case of asymmetrical faults shall be defined by each TSO while respecting the provisions of Article 4(3).   |  |                                     |                           |   |       |        |   |                                |                   |             |                                   |
|  |  |                                     |                           |   |       |        |   |                                |                   |             |                                   |
| 4.   | Type B Power Generating Modules shall fulfil the following requirement referring to system restoration:        |                                     |                           |   |       | 10.2.3 | Requirements for gens                                 | Not specified – Electronic and |                   |             |                                   |

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| (a) With regard to capability of reconnection after an incidental disconnection due to a Network disturbance, respecting the provisions of Article 4(3) the Relevant TSO shall define the conditions under which a Power Generating Module shall be capable of reconnecting to the Network after an incidental disconnection has taken place due to a Network disturbance.  |  |       | 10.5.14<br>11.5<br>Synchronizing<br>and Operational<br>Control                                   | 4.10 Connection<br>and starting to<br>generate<br>electrical power<br>4.10.1 General<br>4.10.2 Automatic<br>reconnection<br>after tripping<br>4.10.4<br>Synchronisation   | verbal<br>Instructions<br>given to BMU's<br>and Large Power<br>Stations  | Process in Grid Code<br><br>Requirements in Grid-<br>Code / D-Code |       |                                   |   |
| (b) Installation of automatic reconnection systems shall be subject to prior authorization by the Relevant Network Operator subject to reconnection conditions specified by the Relevant TSO.   |  |       |  |   |  | Requirements in Grid-<br>Code / D-Code                             |       |                                   |   |
| 5. Type B Power Generating Modules shall fulfil the following general system management requirements:   |  |       |  |   |  |  |       |                                   |   |
| (a) With regard to control schemes and settings   | DPC 7.2.2  |       | 9.3.4  |   | For Directly<br>Connected<br>Generators -<br>specified<br>through<br>appropriate<br>clauses in the<br>Grid Code,<br>Bilateral<br>Connection<br>Agreement and<br>appropriate<br>commissioning<br>procedures such<br>as TP106.                                 | Process in Grid Code /<br>D-Code                                   |       |                                   |   |
| (1) While respecting the provisions of Article 4(3), schemes and settings of the different control devices of the Power Generating Module relevant for transmission system stability and to enable emergency actions shall be coordinated and agreed between the Relevant TSO, the Relevant Network Operator and the Power Generating Facility Owner.   | DPC7.2.3   |       | 9.5.1<br>9.5.6   |   |  | Requirements in Grid-<br>Code / D-Code                             |       |                                   |   |
| (2) While respecting the provisions of Article 4(3), any changes to the schemes and settings of the different control devices of the Power Generating Module, relevant for transmission system stability and to enable emergency actions, shall be coordinated and agreed between the Relevant TSO, the Relevant Network Operator and the Power Generating Facility Owner, in particular if they concern the circumstances referred to under Article 9(5) (a) point 1).   |  |       |  |   |  |  |       |                                   |   |
| (b) With regard to electrical protection schemes and settings:  | DPC4.4.4<br>Protection   |       | 10.6 Typical<br>Protection<br>Application<br>Diagrams<br>11.3 Site<br>Responsibility<br>Schedule | Req for gens<br>The interface<br>protection<br>system has<br>following main<br>objectives:<br>• prevent the<br>power<br>production of the<br>generating plant<br>to result in an<br>overvoltage<br>situation in the<br>distribution<br>network it is<br>connected to.<br>Such<br>overvoltages | For Directly<br>Connected<br>Generators -<br>Protection<br>requirements are<br>defined under<br>CC.6.2.2, with<br>further details<br>specified in the<br>Bilateral<br>Agreement and<br>finally through<br>the<br>Commissioning<br>Panel process of<br>TP106. | Process in Grid Code /<br>D-Code                                   |       |                                   |   |
| (1) The Relevant Network Operator shall define the schemes and settings necessary to protect the Network taking into account the characteristics of the Power Generating Module. While respecting the provisions of Article 4(3), protection schemes relevant for the Power Generating Module and the Network and settings relevant for the Power Generating Module shall be coordinated and agreed between the Relevant Network Operator and the Power Generating Facility Owner. The protection schemes and settings for internal electrical faults shall be designed not to jeopardize the performance of a Power Generating Module according to this Network Code requirements otherwise. | DPC6.3<br>Protection<br>Requirements<br><br>DPC7.4.3<br>Protection<br>Requirements<br><br>DPC7.4.4 Fault<br>Ride Through<br>and Phase<br>Voltage<br>Unbalance<br>DPC7.4.5 System |       |  |   |  | Requirements in Grid-<br>Code / D-Code                             |       |                                   |   |

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| (2) Electrical protection of the Power Generating Module shall take precedence over operational controls taking into account system security, health and safety of staff and the public and mitigation of the damage to the Power Generating Module.  | Stability                                |       |       | could cause damages to equipment connected to the distribution network as well as the distribution 1245 network itself; Interface protection and setting is detailed |           |                         |       |                                |                                      |
| (3) Protection schemes may protect against the following aspects:   |  |       |       |  |           |                         |       |                                |                                      |
| – external and internal short circuit;  |  |       |       |  |           |                         |       |                                |                                      |
| – asymmetric load (Negative Phase Sequence);  |  |       |       |  |           |                         |       |                                |                                      |
| – stator and rotor overload;  |  |       |       |  |           |                         |       |                                |                                      |
| – over-/underexcitation;  |  |       |       |  |           |                         |       |                                |                                      |
| – over-/undervoltage at the Connection Point;   |  |       |       |  |           |                         |       |                                |                                      |
| – over-/undervoltage at the Alternator terminals;   |  |       |       |  |           |                         |       |                                |                                      |
| – inter-area oscillations;  |  |       |       |  |           |                         |       |                                |                                      |
| – inrush Current;   |  |       |       |  |           |                         |       |                                |                                      |
| – asynchronous operation (pole slip);   |  |       |       |  |           |                         |       |                                |                                      |
| – protection against inadmissible shaft torsions (for example, subsynchronous resonance);   |  |       |       |  |           |                         |       |                                |                                      |
| – Power Generating Module line protection;  |  |       |       |  |           |                         |       |                                |                                      |
| – unit transformer protection;  |  |       |       |  |           |                         |       |                                |                                      |
| – backup schemes against protection and switchgear malfunction;   |  |       |       |  |           |                         |       |                                |                                      |
| – overfluxing (U/f);  |  |       |       |  |           |                         |       |                                |                                      |
| – inverse power;  |  |       |       |  |           |                         |       |                                |                                      |
| – rate of change of Frequency; and  |  |       |       |  |           |                         |       |                                |                                      |
| – neutral Voltage displacement.   |  |       |       |  |           |                         |       |                                |                                      |
| (4) While respecting the provisions of Article 4(3), Changes to the protection schemes relevant for the Power Generating Module and the Network and to the setting relevant for the Power Generating Module shall be agreed between the Network Operator and the Power Generating Facility Owner and be concluded prior to the introduction of changes. |  |       |       |  |           |                         |       |                                |                                      |
| (c) With regard to priority ranking of protection and control, the Power Generating Facility Owner shall organize its protections and control devices in compliance with the following priority ranking (from highest to lowest):   |  |       |       |  |           |                         |       |                                |                                      |
| (1) Network system and Power Generating Module protection;  |  |       |       |  |           |                         |       |                                |                                      |
| (2) Synthetic Inertia, if applicable;   |  |       |       |  |           |                         |       |                                |                                      |
| (3) Frequency control (Active Power adjustment);  |  |       |       |  |           |                         |       |                                |                                      |

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| (4) Power Restriction; and  |  |       |       |   |   |   |       |                                   |   |
| (5) Power gradient constraint.  |  |       |       |   |   |   |       |                                   |   |
| (d) With regard to information exchange:  |  |       |       |   | Operational<br>Metering<br>requirements<br>specified under<br>CC.6.5.6 and the<br>Bilateral<br>Connection<br>Agreement.                                       |   |       |                                   |   |
| (1) Power Generating Facilities shall be capable of exchanging information between the Power Generating Facility Owner and the Relevant Network Operator and/or the Relevant TSO in real time or periodically with time stamping as defined by the Relevant Network Operator and/or the Relevant TSO while respecting the provisions of Article 4(3).   |  |       |       |   |   |   |       |                                   |   |
| (2) The Relevant Network Operator in coordination with the Relevant TSO shall define while respecting the provisions of Article 4(3) the contents of information exchanges and the precise list and time of data to be facilitated.   |  |       |       |   |   |   |       |                                   |   |
|   |  |       |       |   |   |   |       |                                   |   |
| Article 10  |  |       |       |   |   |   |       |                                   |   |
| General requirements for Type C power generating modules  |  |       |       |   |   |   |       |                                   |   |
| 1. Type C Power Generating Modules shall fulfil the requirements listed in Articles 8 and 9, except Article <sup>4</sup> 8(1) (f) and Article 9(2) (a).   |  |       |       |   |   | Scope statement in all documents where the requirements are placed e.g. G-Code, D-Code, Engineering Recommendations |       |                                   |   |
| 2. Type C Power Generating Modules shall fulfil the following requirements referring to Frequency stability:  | Applicable<br>DCode sections<br>as Article 8 (6) |       |       | Annex C<br>(informative)<br>C.2 Frequency<br>Sensitive Mode |   |   |       |                                   |   |
| (a) With regard to Active Power controllability and control range, the Power Generating Module control system shall be capable of adjusting an Active Power Setpoint as instructed to the Power Generating Facility Owner by the Relevant Network Operator or the Relevant TSO.   |  |       |       |   | CC.6.3.6(a),<br>CC.6.3.7,<br>CC.6.3.12 and<br>CC.A.3<br>Limited<br>Frequency<br>Sensitive Mode<br>Under Frequency<br>is not covered<br>under the Grid<br>Code | Process in Grid Code /<br>D-Code<br><br>Requirements in Grid-<br>Code / D-Code                                      |       |                                   |   |
| The Relevant Network Operator or the Relevant TSO shall define the period within which the adjusted Active Power set point must be reached. The relevant TSO shall define within a tolerance (subject to the availability of the prime mover resource) applying to the new Setpoint and the time within which it shall be reached. Manual, local measures shall be possible in the case that any automatic remote control devices are out of service. |  |       |       |   |   |   |       |                                   |   |
| The Relevant Network Operator or the Relevant TSO shall notify the period within the adjusted Active Power set point is to be reached and the tolerance level to the National Regulatory Authority. The modalities of that notification shall be determined in accordance with the applicable national regulatory framework.  |  |       |       |   |   |   |       |                                   |   |

<sup>4</sup> Currently no Article 8(1)f in RFG. Likely a typo.

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| (b) In addition to Article 8(1) (c) the following requirements shall apply to Type C Power Generating Modules with regard to Limited Frequency Sensitive Mode – Underfrequency (LFSM-U):   |  |       |       |   |           |                         |       |                                   |   |
| (1) The Power Generating Module shall be capable of activating the provision of Active Power Frequency Response at a Frequency threshold and with a Droop determined by the Relevant TSO   |  |       |       |   |           |                         |       |                                   |   |
| – The Frequency threshold determined by the TSO shall be between 49.8 Hz and 49.5 Hz inclusive   |  |       |       |   |           |                         |       |                                   |   |
| – The Droop settings determined by the TSO shall be between 2 – 12 %.  |  |       |       |   |           |                         |       |                                   |   |
| This is represented graphically at figure 4.   |  |       |       |   |           |                         |       |                                   |   |
| (2) When determining the frequency threshold and droop requirements applicable to generators the relevant TSO shall take account of the fact that actual delivery of Active Power Frequency Response in LFSM-U mode depends on.  |  |       |       |   |           |                         |       |                                   |   |
| – ambient conditions when the response is to be triggered  |  |       |       |   |           |                         |       |                                   |   |
| – the operating conditions of the Power Generating Module, in particular limitations on operation near Maximum Capacity at low frequencies according to Article 8(1) (e) and   |  |       |       |   |           |                         |       |                                   |   |
| – the availability primary energy sources.   |  |       |       |   |           |                         |       |                                   |   |
| (3) The frequency threshold and a Droop determined by the TSO notified to the national regulatory authority. The precise modalities of that notification shall be determined in accordance with the applicable national regulatory framework.                                    |  |       |       |   |           |                         |       |                                   |   |
| (4) The activation of Active Power Frequency Response by the Power Generating Module shall not be unduly delayed. This delay shall be justified by the Power Generating Facility Owner to the Relevant TSO if greater than 2 seconds.  |  |       |       |   |           |                         |       |                                   |   |
| (5) In the LFSM-U mode the Power Generating Module shall be capable of providing a power increase up to its Maximum Capacity.  |  |       |       |   |           |                         |       |                                   |   |
| (6) Stable operation of the Power Generating Module during LFSM-U operation shall be ensured. The LFSM-U reference Active Power shall be the Active Power output at the moment of activation of LFSM-U and shall not be changed unless triggered by frequency restoration action |  |       |       |   |           |                         |       |                                   |   |







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| (5) The Power Generating Module shall be capable of providing full Active Power Frequency Response for a period between 15 min and 30 min specified by the relevant TSO. In specifying the period the TSO shall have regard to Active Power headroom and primary energy source of the Power Generating Module.   |   |  |  |       |  |                         |                   |             |                                |
| (6) Within the time limits of Article 10(2) (c) point 6), Active Power control shall not have any adverse impact on the Frequency response of Power Generating Units.  |   |  |  |       |  |                         |                   |             |                                |
| (7) The parameters specified by the TSO in accordance with sub paragraphs 1, 3 and 5 shall be notified to the National Regulatory Authority. The modalities of that notification shall be determined in accordance with the applicable national regulatory framework.  |   |  |  |       |  |                         |                   |             |                                |
|  |   |  |  |       |  |                         |                   |             |                                |
|  |   |  |  |       |  |                         |                   |             |                                |
|  | Parameters  |  | Ranges or values   |       |  |                         |                   |             |                                |
|  | Active Power range related to Maximum Capacity (Frequency response range) $\frac{ \Delta P_1 }{P_{max}}$  |  | 1.5 – 10 %   |       |  |                         |                   |             |                                |
|  | Maximum admissible initial delay $t_1$ unless justified otherwise for generation technologies with Inertia  |  | 2 seconds  |       |  |                         |                   |             |                                |
|  | Maximum admissible initial delay $t_1$ unless justified otherwise for generation technologies without Inertia   |  | as specified by the Relevant TSO while respecting the provisions of Article 4(3) |       |  |                         |                   |             |                                |
|  | Maximum admissible choice of full activation time $t_2$ , unless longer activation times are admitted by the Relevant TSO due to system stability reasons |  | 30 seconds   |       |  |                         |                   |             |                                |
| Table 5: Parameters for full activation of Active Power Frequency Response resulted from Frequency step change (explanation for figure 6).   |   |  |  |       |  |                         |                   |             |                                |
|  |   |  |  |       |  |                         |                   |             |                                |
| (d) With regard to Frequency restoration control, the Power Generating Module shall provide functionalities compliant to specifications defined by the Relevant TSO while respecting the provisions of Article 4(3), aiming at restoring Frequency to its nominal value and/ or maintain power exchange flows between control areas at their scheduled values. |   |  |  |       |  |                         |                   |             |                                |

[illegible]

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| (b) Without prejudice to Article 8(1) (e), Power Generating Modules shall be capable of remaining connected to the Network and operating without power reduction, as long as Voltage and Frequency remain within the specified limits pursuant to this Regulation.  | Existing Protection   |       | Stabilizers<br>9.1.3<br>10.5.13 |   | active power during nominal voltage and frequency changes.<br>CC.6.3.10 and CC.6.3.15.3 (ii) covers the ability of the Generator to withstand the negative phase sequence loading incurred by system back up protection |  |       |                                   |   |
| (c) Power Generating Modules shall be capable of withstanding single-phase or three-phase auto-reclosures on meshed Network lines, if applicable to the Network to which they are connected. Details of this capability shall be subject to coordination and agreements on protection schemes and settings according to Article 9(5) (b). |   |       |                                 |   |   |  |       |                                   |   |
| 5. Type C Power Generating Modules shall fulfil the following requirements referring to system restoration:   | Black Start Station: A Power Station which is registered pursuant to a CUSC Bilateral Agreement with NGC, as having a Black Start Capability.<br><br>DPC7.4.8<br>DOC9.1.1<br>DOC9.4.1.4<br>DOC9.4.1.5<br><br>DOC9.4.3.7<br><br>DOC9.5 Re-synchronisation of De-synchronised Islands |       | 9.2.5                           |   | CC.6.3.5 and Black Start Contracts  | Grid-Code<br>D-Code<br><br>Black Start contracts<br>Maybe consequential change to DCUSA/CUSC and Black Start Contracts |       |                                   |   |
| (a) With regard to Black Start Capability:  |   |       |                                 |   |   |  |       |                                   |   |
| (1) Black Start Capability is not mandatory.  |   |       |                                 |   |   |  |       |                                   |   |
| (2) Power Generating Facility Owners shall provide a quotation for providing Black Start Capability if the Relevant TSO requests such a quotation. The Relevant TSO may make such a request if it considers system security to be at risk due to a lack of Black Start Capability in its Control Area.                                    |   |       |                                 |   |   |  |       |                                   |   |
| (3) A Power Generating Module with a Black Start Capability shall be able to start from shut down without any external electrical energy supply within a timeframe determined by the Relevant Network Operator in coordination with the Relevant TSO while respecting the provisions of Article 4(3).                                     |   |       |                                 |   |   |  |       |                                   |   |
| (4) A Power Generating Module with a Black Start Capability shall be able to synchronise within the Frequency limits defined in Article 8(1) and Voltage limits defined by the Relevant Network Operator or defined by Article 11(2) where applicable.  |   |       |                                 |   |   |  |       |                                   |   |
| (5) A Power Generating Module with a Black Start Capability shall be capable of automatically regulating dips of Voltage caused by load connections.  |   |       |                                 |   |   |  |       |                                   |   |
| (6) A Power Generating Module with a Black Start Capability shall:  |   |       |                                 |   |   |  |       |                                   |   |
| – be capable of regulating load connections in block load;  |   |       |                                 |   |   |  |       |                                   |   |
| – control Frequency in case of overfrequency and underfrequency within the whole Active Power output range between Minimum Regulating Level and Maximum Capacity as well as at houseload level;   |   |       |                                 |   |   |  |       |                                   |   |
| – be capable of parallel operation of a few Power Generating Modules within one island; and   |   |       |                                 |   |   |  |       |                                   |   |

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| – control Voltage automatically during the system restoration phase.  |  |       |       |   |           |                         |       |                                   |   |
| (b) With regard to capability to take part in Island Operation:   |  |       |       |   |           |                         |       |                                   |   |
| (1) Power generating modules shall be capability of taking part in Island Operation, if required by the Relevant Network Operator in coordination with the Relevant TSO while respecting the provisions of Article 4(3)   |  |       |       |   |           |                         |       |                                   |   |
| – The Frequency limits for island operation shall be those defined in accordance with Article 8(1).   |  |       |       |   |           |                         |       |                                   |   |
| – The Voltage limits for island operation in accordance with to Article 10(3) or Article 11(2) where applicable.  |  |       |       |   |           |                         |       |                                   |   |
| (2) Power Generating Modules shall be able to operate in FSM during Island Operation, as defined in Article 10(2) (b).  |  |       |       |   |           |                         |       |                                   |   |
| In the case of a power surplus, Power Generating Modules shall be capable of reducing the Active Power Output from its previous operating point to any new operating point within the P-Q-Capability Diagram. In this regard the Power generating Module shall be capable of reducing Active Power output to at least 55 % of its Maximum Capacity.   |  |       |       |   |           |                         |       |                                   |   |
| (3) The method of detection of change from interconnected system operation to Island Operation shall be agreed between the Power Generating Facility Owner and the Relevant Network Operator in coordination with the Relevant TSO while respecting the provisions of Article 4(3). The agreed method of detection may not rely solely on the Network Operator’s switchgear position signals. |  |       |       |   |           |                         |       |                                   |   |
| (c) With regard to quick re-synchronization capability:   |  |       |       |   |           |                         |       |                                   |   |
| (1) In case of disconnection of the Power Generating Module from the Network, the Power Generating Module shall be capable of quick re-synchronization capability in line with the protection strategy agreed between the Relevant Network Operator in coordination with the Relevant TSO and the Power Generation Facility Owner in the event of disturbances to the system.                 |  |       |       |   |           |                         |       |                                   |   |
| (2) A Power Generating Module with a minimum re-synchronization time after its disconnection from any external power supply greater than 15 minutes shall be designed to trip to houseload from any operating point in its P-Q-Capability Diagram. In this case the identification of houseload operation shall not be based solely on the Network Operator’s switchgear position signals.    |  |       |       |   |           |                         |       |                                   |   |

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| (3) Power Generating Modules shall be capable of continuing operation following tripping to houseload, irrespective of any auxiliary connection to the external Network. The minimum operation time shall be defined by the Relevant Network Operator in coordination with the Relevant TSO taking into consideration the specific characteristics of the prime mover technology.  |   |       |       |   |  |                                    |       |  |   |
| 6. Type C Power Generating Modules shall fulfil the following general system management requirements:  |   |       |       |   |  | Process in Grid Code / D-Code      |       |  |   |
| (a) With regard to loss of angular stability or loss of control, a Power Generating Module shall be capable of disconnecting automatically from the Network in order to support preservation of system security and/or to prevent damage from the Power Generating Module. The Power Generating Facility Owner and the Relevant Network Operator in coordination with the Relevant TSO shall agree on the criteria to detect loss of angular stability or loss of control. | DPC7.4.2 Control Arrangements<br><br>DPC7.4.5.3 |       | 9.7.6 |   | CC.6.2.2.3.4 and Bilateral Connection Agreements | Requirements in Grid-Code / D-Code |       |  |   |
| (b) With regard to instrumentation:  |   |       |       |   | CC6.5.6  |                                    |       |  |   |
| (1) Power Generating Facilities shall be equipped with a facility to provide fault recording and dynamic system behaviour monitoring of the following parameters:  |   |       |       |   |  |                                    |       |  |   |
| – Voltage;   |   |       |       |   |  |                                    |       |  |   |
| – Active Power;  |   |       |       |   |  |                                    |       |  |   |
| – Reactive Power; and  |   |       |       |   |  |                                    |       |  |   |
| – Frequency.   |   |       |       |   |  |                                    |       |  |   |
| The Relevant Network Operator shall have the right to define while respecting the provisions of Article 4(3) quality of supply parameters to be complied with provided a reasonable prior notice is given.   |   |       |       |   |  |                                    |       |  |   |
| (2) While respecting the provisions of Article 4 (3), the settings of the fault recording equipment, including triggering criteria and the sampling rates shall be agreed between the Power Generating Facility Owner and the Relevant Network Operator in coordination with the Relevant TSO.   |   |       |       |   | CC.6.6.1 and through the Bilateral Agreement     |                                    |       | Query over Relevant Network Operators; for example – different requirements depending on which Network you are connected to, for example a 132KV in Scotland is T-Connection; 132KV in E+W is D-connected. |   |

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| (3) The dynamic system behaviour monitoring shall include an oscillation trigger, specified by the Relevant Network Operator in coordination with the Relevant TSO, detecting poorly damped power oscillations.   |  |       |  |   | Specified through the<br>Planning and<br>Registration<br>Code<br>the<br>Code<br>Data |                         |       |                                   |   |
| (4) The facilities for quality of supply and dynamic system behaviour monitoring shall include arrangements for the Power Generating Facility Owner, the Relevant Network Operator and/or the Relevant TSO to access the information. While respecting the provisions of Article 4 (3) the communications protocols for recorded data shall be agreed between the Power Generating Facility Owner and the Relevant Network Operator and Relevant TSO. |  |       |  |   |  |                         |       |                                   |   |
| (c) With regard to the simulation models:   | DPC 7.3.3(a)<br><br>DPC7.3.1             |       | 6.3.6<br>6.3.7<br>6.3.8<br>6.3.9<br>6.3.10 |   |  |                         |       |                                   |   |
| (1) Power Generating Facility Owner shall provide simulation models which properly reflect the behaviour of the Power Generating Module in both steady-state and dynamic simulations (50 Hz component) or in electromagnetic transient simulations when requested by the Relevant Network Operator.   |  |       |  |   |  |                         |       |                                   |   |
| (2) The models provided by the Power Generating Facility Owner shall contain the following sub-models, depending on the existence of the mentioned components:  |  |       |  |   |  |                         |       |                                   |   |
| – Alternator and prime mover;   |  |       |  |   |  |                         |       |                                   |   |
| – Speed and power control;  |  |       |  |   |  |                         |       |                                   |   |
| – Voltage control, including, if applicable, Power System Stabilizer (PSS) function and Excitation Control System;  |  |       |  |   |  |                         |       |                                   |   |
| – Power Generating Module protection models as agreed between the Relevant Network Operator and the Power Generating Facility Owner, while respecting the provisions of Article 4(3); and   |  |       |  |   |  |                         |       |                                   |   |
| – Converter models for Power Park Modules.  |  |       |  |   |  |                         |       |                                   |   |
| (3) The request to by the Relevant Network Operator referred to in the first subparagraph shall be coordinated with the relevant TSO and respect the provisions of article 4(3). It shall include:  |  |       |  |   |  |                         |       |                                   |   |
| – the format in which models shall be provided  |  |       |  |   |  |                         |       |                                   |   |
| – the provision of documentation of models structure and block diagrams   |  |       |  |   |  |                         |       |                                   |   |

| Requirements for Grid Connection of Generators 14/01/2014<br>Informal Draft  | Equivalent Sections in Existing GB Codes |       |                                  |   |           | Changes to the GB Codes  |       | ISSUE FLAGS                       |   |
|--|--|-------|----------------------------------|---|-----------|--|-------|-----------------------------------|---|
|  | D-Code v22                               | G83-2 | G59-3                            | BSEN 50438<br>(micro gens)<br>and technical<br>drafts | Grid Code | Proposed location  | Notes | Code issue to<br>discuss at ECCAF | Non-code<br>issue (send<br>to DECC/Ofgem<br>) |
| – an estimate of the minimum and maximum short circuit capacity at the connection point, expressed in MVA, as an equivalent of the Network.  |  |       |                                  |   |           |  |       |                                   |   |
| The Relevant Network Operator or Relevant TSO shall verify the models provided against the results of compliance tests referred to in Title 4 Chapters 2, 3 and 4.   |  |       |                                  |   |           |  |       |                                   |   |
| The models shall be used verify compliance of Power Generating Modules with the requirements of this Network Code including but not limited to Compliance Simulations as of Title 4 Chapters 5, 6 and 7 and for use in studies for continuous evaluation in system planning and operation.   |  |       |                                  |   |           |  |       |                                   |   |
| (4) The Power Generating Facility Owner shall provide Power Generating Module recordings to the Relevant Network Operator or Relevant TSO if requested while respecting the provisions of Article 4(3). The Relevant Network Operator or Relevant TSO may make such a request, while respecting the provisions of Article 4(3) in order to compare the response of the models with such recordings.  |  |       |                                  |   |           |  |       |                                   |   |
| (d) With regard to the installation of devices for system operation and/or security, if the Relevant Network Operator or the Relevant TSO considers additional devices necessary to be installed in a Power Generating Facility in order to preserve or restore system operation or security, the Relevant Network Operator or Relevant TSO and the Power Generating Facility Owner shall investigate this request and, while respecting the provisions of Article 4(3), agree on an appropriate solution. | DPC7.5.4.4                               |       | 9.1.3<br>9.2.3<br>9.2.4<br>9.2.5 |   | BCA       | CUSC for changes to<br>Bilateral agreements                                    |       |                                   |   |
| (e) The Relevant Network Operator in coordination with the Relevant TSO shall define while respecting the provisions of Article 4(3) minimum and maximum limits on rates of change of Active Power output (ramping limits) in both up and down direction for a Power Generating Module taking into consideration the specific characteristics of the prime mover technology.   |  |       |                                  |   | BC1.A.1.1 | Process in Grid Code /<br>D-Code<br><br>Requirements in Grid-<br>Code / D-Code |       |                                   |   |

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|   | D-Code v22                               | G83-2 | G59-3  | BSEN 50438<br>(micro gens)<br>and technical<br>drafts | Grid Code        | Proposed location   | Notes | Code issue to<br>discuss at ECCAF   | Non-code<br>issue (send<br>to DECC/Ofgem<br>) |
| (f) Earthing arrangement of the neutral-point at the Network side of step-up transformers shall be in accordance with the specifications of the Relevant Network Operator.  | DPC4.4.2<br>Earthing                     |       | 8 EARTHING<br>8.1General<br>8.1.1 The earthing arrangements of the Generating Plant shall satisfy the requirements of DPC4 of the Distribution Code.<br>Specific requirements for HV and LV connected generating plant given |   | CC.6.3.11        | Process in Grid Code / D-Code<br><br>Requirements in Grid-Code / D-Code   |       |   |   |
| (g) Power Generating Facility Owners intending to change plant and equipment of the Power Generating Module that may have an impact on the grid connection and on the interaction, such as turbines, Alternators, converters, high-voltage equipment, protection and control systems (hardware and software), shall notify such changes in advance the Relevant Network Operator in case it is reasonable to foresee that these intended changes may be affected by the requirements of this Network Code   | DPC7.5.4<br><br>DPC8.2.2                 |       | Changes at the Installation  |   | Limited - PC.4.4 | Process in Grid Code / D-Code<br><br>Requirements in Grid-Code / D-Code   |       | What is the process for 'existing' generators that significantly change. They aren't caught by this article as they weren't "new" in the first place. |   |
| (h) Before the proposed changes are implemented shall, while respecting the provisions of Article 4(3), agree on these requirements are implemented with the Relevant Network Operator in coordination with the Relevant TSO. In case of modernisation or replacement of equipment in existing Power Generating Modules the new equipment shall comply with the respective requirements which are relevant to the planned work. While respecting the provisions of Article 4 (3), the use of existing spare components that do not comply with the requirements has to be agreed with the Relevant Network Operator in coordination with the Relevant TSO in each case. | DGC11.2                                  |       | 12.6.3<br>12.6.4   |   |                  | Process in Grid Code / D-Code<br><br>Requirements in Grid-Code / D-Code   |       |   |   |
|   |  |       |  |   |                  |   |       |   |   |
|   |  |       |  |   |                  |   |       |   |   |
| Article 11  |  |       |  |   |                  |   |       |   |   |
| GENERAL REQUIREMENTS FOR TYPE D POWER GENERATING MODULES  |  |       |  |   |                  |   |       |   |   |
| 1. In addition to fulfilling the requirements listed in Article 8, excluding Article 8(1) (f), (g), Article 9, excluding Article 9(2) (a) and Article 10 excluding Article 10(3) (a), and, Type D Power Generating Modules shall fulfil the requirements in this Article unless referred to otherwise in this Article.  |  |       |  |   |                  | Scope statement in all documents where the requirements are placed e.g. G-Code, D-Code, Engineering Recommendations |       |   |   |
| 2. Type D Power Generating Modules shall fulfil the following requirements referring to Voltage stability:  |  |       |  |   | CC.6.1.4         | Process in Grid Code / D-Code   |       |   |   |
| (a) With regard to Voltage ranges:  | ESQCR:                                   |       | 9.5 Voltage  |   |                  |   |       |   |   |

| Requirements for Grid Connection of Generators 14/01/2014<br>Informal Draft  | Equivalent Sections in Existing GB Codes                             |       |                          |   |           | Changes to the GB Codes            |       | ISSUE FLAGS                       |   |
|--|--|-------|--------------------------|---|-----------|------------------------------------|-------|-----------------------------------|---|
|  | D-Code v22   | G83-2 | G59-3                    | BSEN 50438<br>(micro gens)<br>and technical<br>drafts | Grid Code | Proposed location                  | Notes | Code issue to<br>discuss at ECCAF | Non-code<br>issue (send<br>to DECC/Ofgem<br>) |
| (1) While still respecting the provisions according to Articles 9(3) (a) and 11(3) (a), a Power Generating Module shall be capable of staying connected to the Network and operating within the ranges of the Network Voltage at the Connection Point, expressed by the Voltage at the Connection Point related to nominal Voltage (per unit), and the time periods specified by tables 6.1 and 6.2. | Declaration of phases, frequency and voltage at supply terminals 27. |       | Limits and Control 9.5.1 |   |           | Requirements in Grid-Code / D-Code |       |                                   |   |
| (2) Notwithstanding the first subparagraph the Relevant TSO in Spain may require power generating modules to remain connected to the network in the voltage range between 1.05 pu – 1.0875 pu for an unlimited period  |  |       |                          |   |           |                                    |       |                                   |   |

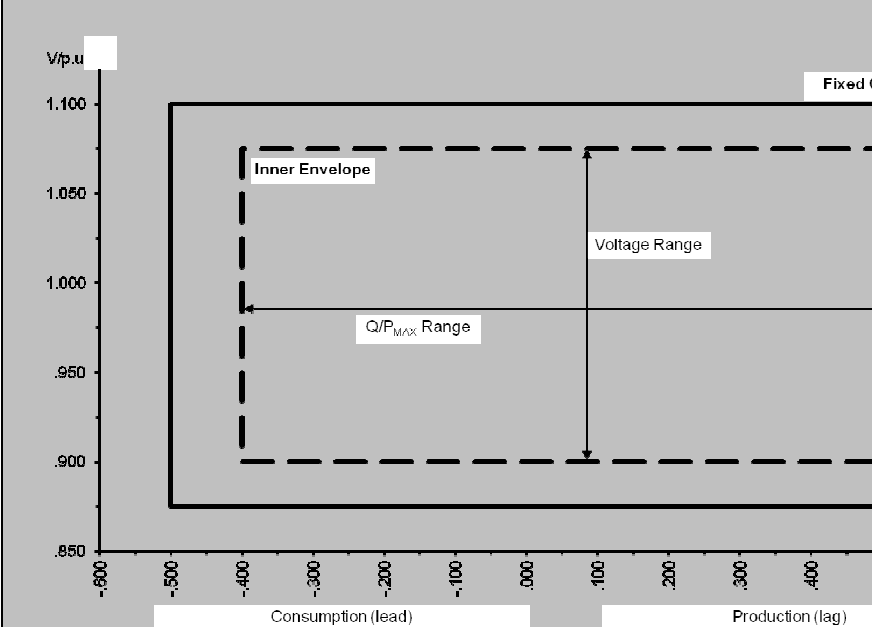
| Requirements for Grid Connection of Generators 14/01/2014<br>Informal Draft   |   |                    | Equivalent Sections in Existing GB Codes |       |       |   |           | Changes to the GB Codes |       | ISSUE FLAGS                       |   |
|---|---|--------------------|--|-------|-------|---|-----------|-------------------------|-------|-----------------------------------|---|
|   |   |                    | D-Code v22                               | G83-2 | G59-3 | BSEN 50438<br>(micro gens)<br>and technical<br>drafts | Grid Code | Proposed location       | Notes | Code issue to<br>discuss at ECCAF | Non-code<br>issue (send<br>to DECC/Ofgem<br>) |
|   | Synchronous Area  | Voltage Range      |  |       |       |   |           |                         |       |                                   |   |
|   | Continental Europe  | 0.85 pu – 0.90 pu  |  |       |       |   |           |                         |       |                                   |   |
|   |   | 0.90 pu – 1.118 pu |  |       |       |   |           |                         |       |                                   |   |
|   |   | 1.118 pu – 1.15 pu |  |       |       |   |           |                         |       |                                   |   |
|   | Nordic  | 0.90 pu – 1.05 pu  |  |       |       |   |           |                         |       |                                   |   |
|   |   | 1.05 pu – 1.10 pu  |  |       |       |   |           |                         |       |                                   |   |
|   | Great Britain   | 0.90 pu–1.10 pu    |  |       |       |   |           |                         |       |                                   |   |
|   | Ireland   | 0.90 pu – 1.118 pu |  |       |       |   |           |                         |       |                                   |   |
|   | Baltic  | 0.85 pu – 0.90 pu  |  |       |       |   |           |                         |       |                                   |   |
|   |   | 0.90 pu – 1.12 pu  |  |       |       |   |           |                         |       |                                   |   |
|   |   | 1.12 pu – 1.15 pu  |  |       |       |   |           |                         |       |                                   |   |
|   | Table 6.1: This table shows the minimum time periods a Power Generating Module shall be capable of operating for Voltages deviating from the nominal value at the Connection Point without disconnecting from the Network. (The Voltage base for pu values is from 110 kV to 300 kV (excluding).) |                    |  |       |       |   |           |                         |       |                                   |   |
|   |   | Synchronous Area   | Voltage Range                            |       |       |   |           |                         |       |                                   |   |
| Continental Europe  |   | 0.85 pu – 0.90 pu  |  |       |       |   |           |                         |       |                                   |   |
|   |   | 0.90 pu – 1.05 pu  |  |       |       |   |           |                         |       |                                   |   |
|   |   |                    |  |       |       |   |           |                         |       |                                   |   |
| Nordic  |   | 1.05 pu – 1.10 pu  |  |       |       |   |           |                         |       |                                   |   |
|   |   | 0.90 pu – 1.05 pu  |  |       |       |   |           |                         |       |                                   |   |
| Great Britain   |   | 1.05 pu – 1.10 pu  |  |       |       |   |           |                         |       |                                   |   |
|   |   | 0.90 pu – 1.05 pu  |  |       |       |   |           |                         |       |                                   |   |
| Ireland   |   | 0.90 pu – 1.05 pu  |  |       |       |   |           |                         |       |                                   |   |
| Baltic  |   | 0.88 pu – 0.90 pu  |  |       |       |   |           |                         |       |                                   |   |
|   |   | 0.90 pu – 1.10 pu  |  |       |       |   |           |                         |       |                                   |   |
|   |   | 1.10 pu – 1.15 pu  |  |       |       |   |           |                         |       |                                   |   |
| Table 6.2: This table shows the minimum time periods a Power Generating Module shall be capable of operating for Voltages deviating from the nominal value at the Connection Point without disconnecting from the Network. (The Voltage base for pu values is from 300 kV to 400 kV.) |   |                    |  |       |       |   |           |                         |       |                                   |   |
|   |   |                    |  |       |       |   |           |                         |       |                                   |   |

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|--|--|-------|--|---|-----------|------------------------------------|-------|-----------------------------------|---|
|  | D-Code v22                               | G83-2 | G59-3  | BSEN 50438<br>(micro gens)<br>and technical<br>drafts | Grid Code | Proposed location                  | Notes | Code issue to<br>discuss at ECCAF | Non-code<br>issue (send<br>to DECC/Ofgem<br>) |
| (b) In order to ensure the best use of the technical capabilities of a Power Generating Module if needed to preserve or to restore system security.  | DPC4.2.3.1                               |       | 10.1.3<br>10.2<br>Protection<br>Requirements |   |           |                                    |       |                                   |   |
| (1) While respecting the provisions of Article 4(3), wider Voltage ranges or longer minimum times for operation may be agreed between the Relevant Network Operator in coordination with the Relevant TSO and the Power Generating Facility Owner  |  |       |  |   |           |                                    |       |                                   |   |
| (2) If wider Voltage ranges or longer minimum times for operation are economically and technically feasible, the Power Generating Facility Owner shall not be unreasonably withhold agreement.   |  |       |  |   |           |                                    |       |                                   |   |
| (c) Without prejudice sub paragraph (a), the Relevant Network Operator in coordination with the Relevant TSO shall have the right to specify, while respecting the provisions of Article 4(3), Voltages at the Connection Point at which a Power Generating Module shall be capable of automatic disconnection. The terms and settings for automatic disconnection shall be agreed between the Relevant Network Operator and the Power Generating Facility Owner, while respecting the provisions of Article 4(3). |  |       |  |   |           |                                    |       |                                   |   |
| 3. Type D Power Generating Modules shall fulfil the following requirements referring to robustness of Power Generating Modules:  |  |       |  |   | CC.6.3.15 | Process in Grid Code / D-Code      |       |                                   |   |
| (a) With regard to fault-ride-through capability of Power Generating Modules:  |  |       |  |   |           | Requirements in Grid-Code / D-Code |       |                                   |   |
| (1) The Power generating Module shall be capable of operating in accordance with a voltage-against-time-profile defined by the TSO, while respecting the provisions of Article 4(3).   |  |       |  |   |           |                                    |       |                                   |   |
| The voltage-against-time-profile defined by the TSO shall be set using parameters in figure 3 according to tables 7.1 and 7.2 except for Power Generating Modules connected to the Transmission Network  |  |       |  |   |           |                                    |       |                                   |   |
| The voltage-against-time-profile defined by the TSO shall be set using parameters in figure 3 according to tables 3.1 and 3.2 except for Power Generating Modules connected to the Distribution Network  |  |       |  |   |           |                                    |       |                                   |   |
| (2) Each TSO shall define, while respecting the provisions of Article 4(3), the pre-fault and post-fault conditions for the fault-ride-through capability according to Article 9(3) (a) point 3). The defined pre-fault and post-fault conditions for the fault-ride-through capability shall be made publicly available.  |  |       |  |   |           |                                    |       |                                   |   |



| Requirements for Grid Connection of Generators 14/01/2014<br>Informal Draft   | Equivalent Sections in Existing GB Codes |       |        |   |                | Changes to the GB Codes   |       | ISSUE FLAGS                       |   |
|---|--|-------|--------|---|----------------|---|-------|-----------------------------------|---|
|   | D-Code v22                               | G83-2 | G59-3  | BSEN 50438<br>(micro gens)<br>and technical<br>drafts                                     | Grid Code      | Proposed location   | Notes | Code issue to<br>discuss at ECCAF | Non-code<br>issue (send<br>to DECC/Ofgem<br>) |
| (c) Synchronization of Power Generating Modules shall be possible at frequencies within the ranges set out in table 2.  |  |       |        |   |                |   |       |                                   |   |
| (d) While respecting the provisions of Article 4(3), the Relevant Network Operator and the Power Generating Facility Owner shall agree on the settings of synchronization devices to be concluded prior to operation of the Power Generating Module. This agreement shall address:  |  |       |        |   |                |   |       |                                   |   |
| – Voltage,  |  |       |        |   |                |   |       |                                   |   |
| – Frequency,  |  |       |        |   |                |   |       |                                   |   |
| – phase angle range,  |  |       |        |   |                |   |       |                                   |   |
| – phase sequence,   |  |       |        |   |                |   |       |                                   |   |
| – deviation of Voltage and Frequency.   |  |       |        |   |                |   |       |                                   |   |
|   |  |       |        |   |                |   |       |                                   |   |
| Chapter 2   |  |       |        |   |                |   |       |                                   |   |
| REQUIREMENTS FOR SYNCHRONOUS POWER GENERATING MODULES   |  |       |        |   |                |   |       |                                   |   |
|   |  |       |        |   |                |   |       |                                   |   |
| Article 12  |  |       |        |   |                |   |       |                                   |   |
| Requirements for Type B synchronous power generating modules  |  |       |        |   |                |   |       |                                   |   |
| 1. In addition to fulfilling the requirements listed in Articles 8 and 9, Type B Synchronous Power Generating Modules shall fulfil the requirements in this Article.  |  |       |        |   |                | Scope statement in all documents where the requirements are placed e.g. G-Code, D-Code, Engineering Recommendations |       |                                   |   |
| 2. Type B Synchronous Power Generating Modules shall fulfil the following requirements referring to Voltage stability:  | DPC7.4.2<br>Control<br>Arrangements      |       | 11.4.2 | Requirements<br>for Generating<br>Plant:<br>4.7.2 Voltage<br>support by<br>reactive power |                | Grid-Code / D-Code  |       |                                   |   |
| (a) With regard to Reactive Power capability the Relevant Network Operator shall have the right to define while respecting the provisions of Article 4(3) the capability of a Synchronous Power Generating Module to provide Reactive Power.  |  |       |        |   | CC.6.3.2(a)    |   |       |                                   |   |
| (b) With regard to the Voltage control system, a Synchronous Power Generating Module shall be equipped with a permanent automatic excitation control system in order to provide constant Alternator terminal Voltage at a selectable Setpoint without instability over the entire operating range of the Synchronous Power Generating Module. |  |       |        |   | CC.6.3.8(a)(i) |   |       |                                   |   |

| Requirements for Grid Connection of Generators 14/01/2014<br>Informal Draft |   | Equivalent Sections in Existing GB Codes |       |       |   | Changes to the GB Codes |   | ISSUE FLAGS |                                   |
|---|---|--|-------|-------|---|-------------------------|---|-------------|-----------------------------------|
|   |   | D-Code v22                               | G83-2 | G59-3 | BSEN 50438<br>(micro gens)<br>and technical<br>drafts | Grid Code               | Proposed location   | Notes       | Code issue to<br>discuss at ECCAF |
| 3.  | Type B Synchronous Power Generating Modules shall fulfil the following requirements referring to robustness of Power Generating Modules and post fault Active Power recovery after fault-ride-through, the Relevant TSO shall define while respecting the provisions of Article 4(3) magnitude and time for Active Power recovery the Power Generating Module shall be capable of providing.  |  |       |       |   | CC.6.3.15               | Process in Grid Code /<br>D-Code<br><br>Requirements in Grid-<br>Code / D-Code                                      |             |                                   |
|   |   |  |       |       |   |                         |   |             |                                   |
|   |   |  |       |       |   |                         |   |             |                                   |
| Article 13  |   |  |       |       |   |                         |   |             |                                   |
| Requirements for Type C Synchronous power generating modules                |   |  |       |       |   |                         |   |             |                                   |
| 1.  | In addition to fulfilling the requirements listed in Articles 8, 9, 10 and 12, except for Article 8(1) (f), Article 9(2) (a) and Article 12(2) (a), Type C Synchronous Power Generating Modules shall fulfil the requirements in this Article.  |  |       |       |   |                         | Scope statement in all documents where the requirements are placed e.g. G-Code, D-Code, Engineering Recommendations |             |                                   |
| 2.  | Type C Synchronous Power Generating Modules shall fulfil the following requirements referring to Voltage stability:   |  |       |       |   | CC.6.3.2(a)             |   |             |                                   |
|   | (a) With regard to Reactive Power Capability, for Synchronous Power Generating Modules where the Connection Point is not at the location of the high-voltage terminals of the step-up transformer to the Voltage level of the Connection Point nor at the Alternator terminals, if no step-up transformer exists, supplementary Reactive Power may be defined by the Relevant Network Operator, while respecting the provisions of Article 4(3), to compensate for the Reactive Power demand of the high-voltage line or cable between these two points from the responsible owner of this line or cable.   |  |       |       |   |                         | Process in Grid Code /<br>D-Code<br><br>Requirements in Grid-<br>Code / D-Code                                      |             |                                   |
|   | (b) With regard to Reactive Power capability at Maximum Capacity:   |  |       |       |   |                         |   |             |                                   |
|   | (1) While respecting the provisions of Article 4(3), the Relevant Network Operator in coordination with the Relevant TSO shall define the Reactive Power provision capability requirements in the context of varying Voltage. For this purpose the Relevant Network Operator shall define a U-Q/P <sub>max</sub> -profile within the boundaries of which the Synchronous Power Generating Module shall be capable of providing Reactive Power at its Maximum Capacity. The defined U-Q/P <sub>max</sub> profile may take any shape having regard to the potential costs for power generating modules of delivering the capability of providing reactive power production at high voltages and reactive power consumption at low voltages. |  |       |       |   |                         |   |             |                                   |
|   | (2) The U-Q/P <sub>max</sub> -profile shall be defined by the Relevant Network Operator in coordination with the Relevant TSO while respecting the provisions of Article 4(3) in conformity with the following principles:  |  |       |       |   |                         |   |             |                                   |

| Requirements for Grid Connection of Generators 14/01/2014<br>Informal Draft   |                                     |   |  | Equivalent Sections in Existing GB Codes |                                     |   |   | Changes to the GB Codes |                   | ISSUE FLAGS |                                   |   |       |               |      |       |         |      |       |               |     |       |  |  |  |  |  |  |
|---|-------------------------------------|---|--|--|-------------------------------------|---|---|-------------------------|-------------------|-------------|-----------------------------------|---|-------|---------------|------|-------|---------|------|-------|---------------|-----|-------|--|--|--|--|--|--|
|   |                                     |   |  | D-Code v22                               | G83-2                               | G59-3   | BSEN 50438<br>(micro gens)<br>and technical<br>drafts | Grid Code               | Proposed location | Notes       | Code issue to<br>discuss at ECCAF | Non-code<br>issue (send<br>to DECC/Ofgem<br>) |       |               |      |       |         |      |       |               |     |       |  |  |  |  |  |  |
| – the U-Q/P <sub>max</sub> -profile shall not exceed the U-Q/P <sub>max</sub> -profile envelope, represented by the inner envelope in figure 7;   |                                     |   |  |  |                                     |   |   |                         |                   |             |                                   |   |       |               |      |       |         |      |       |               |     |       |  |  |  |  |  |  |
| – the dimensions of the U-Q/P <sub>max</sub> -profile envelope (Q/P <sub>max</sub> range and Voltage range) are defined for each Synchronous Area in table 8; and   |                                     |   |  |  |                                     |   |   |                         |                   |             |                                   |   |       |               |      |       |         |      |       |               |     |       |  |  |  |  |  |  |
| – the position of the U-Q/P <sub>max</sub> -profile envelope within the limits of the fixed outer envelope in figure 7.   |                                     |   |  |  |                                     |   |   |                         |                   |             |                                   |   |       |               |      |       |         |      |       |               |     |       |  |  |  |  |  |  |
|    |                                     |   |  |  |                                     |   |   |                         |                   |             |                                   |   |       |               |      |       |         |      |       |               |     |       |  |  |  |  |  |  |
| <i>Figure 7 – U-Q/P<sub>max</sub>-profile of a Synchronous Power Generating Module. The diagram represents boundaries of a U-Q/P<sub>max</sub>-profile by the Voltage at the Connection Point, expressed by the ratio of its actual value and its nominal value in per unit, against the ratio of the Reactive Power (Q) and the Maximum Capacity (P<sub>max</sub>). The position, size and shape of the inner envelope are indicative.</i>     |                                     |   |  |  |                                     |   |   |                         |                   |             |                                   |   |       |               |      |       |         |      |       |               |     |       |  |  |  |  |  |  |
|   |                                     |   |  |  |                                     |   |   |                         |                   |             |                                   |   |       |               |      |       |         |      |       |               |     |       |  |  |  |  |  |  |
| <table><tr><th>Synchronous Area</th><th>Maximum range of Q/P<sub>max</sub></th><th>Maximum range of steady-state Voltage level in PU</th></tr><tr><td>Continental Europe</td><td>0.95</td><td>0.225</td></tr><tr><td>Nordic</td><td>0.95</td><td>0.150</td></tr><tr><td>Great Britain</td><td>0.95</td><td>0.100</td></tr><tr><td>Ireland</td><td>1.08</td><td>0.218</td></tr><tr><td>Baltic States</td><td>1.0</td><td>0.220</td></tr></table> |                                     |   |  | Synchronous Area                         | Maximum range of Q/P <sub>max</sub> | Maximum range of steady-state Voltage level in PU | Continental Europe                                    |                         | 0.95              | 0.225       | Nordic                            | 0.95  | 0.150 | Great Britain | 0.95 | 0.100 | Ireland | 1.08 | 0.218 | Baltic States | 1.0 | 0.220 |  |  |  |  |  |  |
| Synchronous Area  | Maximum range of Q/P <sub>max</sub> | Maximum range of steady-state Voltage level in PU |  |  |                                     |   |   |                         |                   |             |                                   |   |       |               |      |       |         |      |       |               |     |       |  |  |  |  |  |  |
| Continental Europe  | 0.95                                | 0.225   |  |  |                                     |   |   |                         |                   |             |                                   |   |       |               |      |       |         |      |       |               |     |       |  |  |  |  |  |  |
| Nordic  | 0.95                                | 0.150   |  |  |                                     |   |   |                         |                   |             |                                   |   |       |               |      |       |         |      |       |               |     |       |  |  |  |  |  |  |
| Great Britain   | 0.95                                | 0.100   |  |  |                                     |   |   |                         |                   |             |                                   |   |       |               |      |       |         |      |       |               |     |       |  |  |  |  |  |  |
| Ireland   | 1.08                                | 0.218   |  |  |                                     |   |   |                         |                   |             |                                   |   |       |               |      |       |         |      |       |               |     |       |  |  |  |  |  |  |
| Baltic States   | 1.0                                 | 0.220   |  |  |                                     |   |   |                         |                   |             |                                   |   |       |               |      |       |         |      |       |               |     |       |  |  |  |  |  |  |
| Table 8: Parameters for the inner envelope in figure 7  |                                     |   |  |  |                                     |   |   |                         |                   |             |                                   |   |       |               |      |       |         |      |       |               |     |       |  |  |  |  |  |  |
| (3) The Reactive Power provision capability requirement applies at the Connection Point. For profile shapes other than rectangular, the Voltage range represents the highest and lowest values. The full Reactive Power range is therefore not expected to be available across the range of steady-state Voltages.  |                                     |   |  |  |                                     |   |   |                         |                   |             |                                   |   |       |               |      |       |         |      |       |               |     |       |  |  |  |  |  |  |

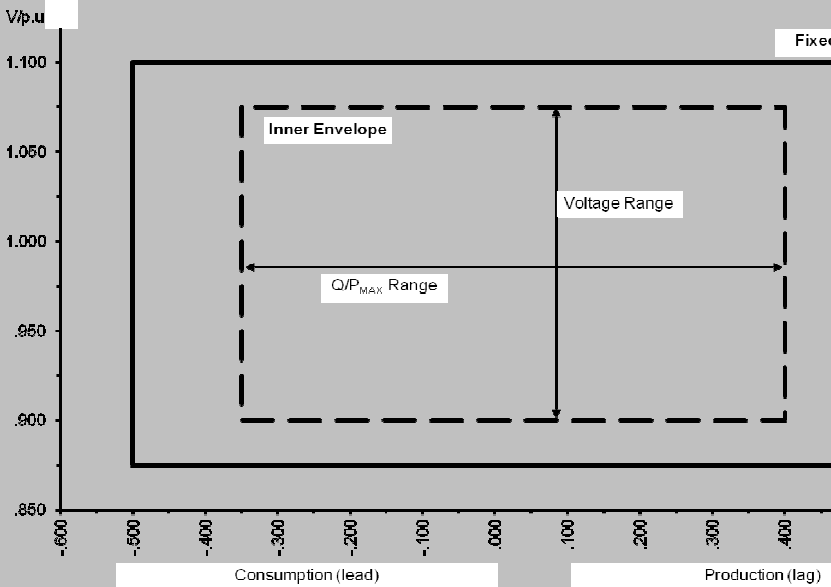
| Requirements for Grid Connection of Generators 14/01/2014<br>Informal Draft  | Equivalent Sections in Existing GB Codes |       |       |   |                        | Changes to the GB Codes   |       | ISSUE FLAGS                       |   |
|--|--|-------|-------|---|------------------------|---|-------|-----------------------------------|---|
|  | D-Code v22                               | G83-2 | G59-3 | BSEN 50438<br>(micro gens)<br>and technical<br>drafts | Grid Code              | Proposed location   | Notes | Code issue to<br>discuss at ECCAF | Non-code<br>issue (send<br>to DECC/Ofgem<br>) |
| (4) The Synchronous Power Generating Module shall be capable of moving to any operating point within its U-Q/P <sub>max</sub> profile in appropriate timescales to target values requested by the Relevant Network Operator.   |  |       |       |   |                        |   |       |                                   |   |
| (c) With regard to Reactive Power capability below Maximum Capacity, when operating at an Active Power output below the Maximum Capacity (P<P <sub>max</sub> ), the Synchronous Power Generating Modules shall be capable of operating in every possible operating point in the P-Q Capability Diagram of the Alternator of this Synchronous Power Generating Module at least down to Minimum Stable Operating Level. Even at reduced Active Power output, Reactive Power supply at the Connection Point shall fully correspond to the P-Q-Capability Diagram of the Alternator of this Synchronous Power Generating Module, taking the auxiliary supply power and the Active and Reactive Power losses of the step-up transformer, if applicable, into account. |  |       |       |   |                        |   |       |                                   |   |
|  |  |       |       |   |                        |   |       |                                   |   |
| Article 14   |  |       |       |   |                        |   |       |                                   |   |
| Requirements <sup>5</sup> for Type C synchronous power generating modules  |  |       |       |   |                        |   |       |                                   |   |
| 1. In addition to fulfilling the requirements listed in Articles 8, 9, 10, 11, 12 and 13, except for Article 8(1) (f), Article 9(2) (a), Article 10(3) (a), and Article 12(2), Type D Synchronous Power Generating Modules shall fulfil the requirements in this Article.  |  |       |       |   |                        | Scope statement in all documents where the requirements are placed e.g. G-Code, D-Code, Engineering Recommendations |       |                                   |   |
| 2. Type D Synchronous Power Generating Modules shall fulfil the following requirements referring to Voltage stability:   |  |       |       |   | CC.6.3.8 and<br>CC.A.6 |   |       |                                   |   |
| (a) While respecting the provisions of Article 4(3), the parameters and settings of the components of the Voltage control system shall be agreed between the Power Generating Facility Owner and the Relevant Network Operator in coordination with the Relevant TSO   |  |       |       |   |                        | If specified through<br>BCA: CUSC /DCUSA  |       |                                   |   |
| (b) The agreement referred to in sub paragraph (a) shall include:  |  |       |       |   |                        |   |       |                                   |   |
| (1) specifications and performance of an Automatic Voltage Regulator (AVR) with regards to steady-state Voltage and transient Voltage control;   |  |       |       |   |                        |   |       |                                   |   |
| (2) specifications and performance of the Excitation Control System:   |  |       |       |   |                        |   |       |                                   |   |
| – bandwidth limitation of the output signal to ensure that the highest Frequency of response cannot excite torsional oscillations on other Power Generating Modules connected to the Network;  |  |       |       |   |                        |   |       |                                   |   |

<sup>5</sup> Should refer to Type D; likely a typo.

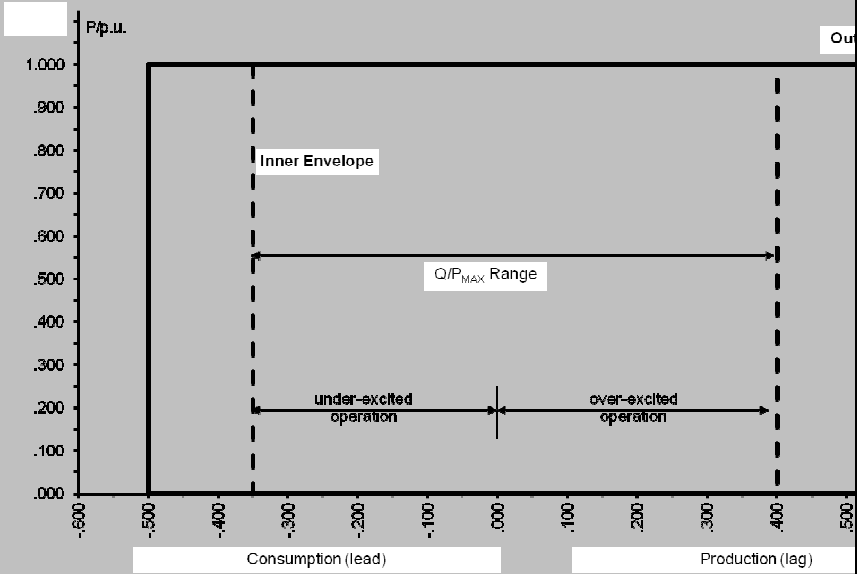
| Requirements for Grid Connection of Generators 14/01/2014<br>Informal Draft  | Equivalent Sections in Existing GB Codes |       |       |   |              | Changes to the GB Codes   |       | ISSUE FLAGS  |   |
|--|--|-------|-------|---|--------------|---|-------|--|---|
|  | D-Code v22                               | G83-2 | G59-3 | BSEN 50438<br>(micro gens)<br>and technical<br>drafts | Grid Code    | Proposed location   | Notes | Code issue to<br>discuss at ECCAF  | Non-code<br>issue (send<br>to DECC/Ofgem<br>)   |
| – an Underexcitation Limiter to prevent the Automatic Voltage Regulator from reducing the Alternator excitation to a level which would endanger synchronous stability;   |  |       |       |   |              |   |       |  |   |
| – an Overexcitation Limiter to ensure that the Alternator excitation is not limited to less than the maximum value that can be achieved whilst ensuring the Synchronous Power Generating Module is operating within its design limits;   |  |       |       |   |              |   |       |  |   |
| – a stator Current limiter; and  |  |       |       |   |              |   |       |  |   |
| – a PSS function to attenuate power oscillations, if the Synchronous Power Generating Module size is above a value of Maximum Capacity defined by the Relevant TSO while respecting the provisions of Article 4(3).  |  |       |       |   |              |   |       |  |   |
| 3. While respecting the provisions of Article 4 (3), the Relevant TSO and the Power Generating Facility Owner shall enter into an agreement regarding technical capabilities of the Power Generating Module to aid angular stability under fault conditions.                                 |  |       |       |   |              |   |       | A 132kV generator at Distribution doesn't say Relevant Network Operator.<br>A new mechanism may be required between 132kV connected and NGET. Licence / code you sign up to. | Requirement for agreement between TSO and 132kV distribution connected generators to enforce requirements |
|  |  |       |       |   |              |   |       |  |   |
|  |  |       |       |   |              |   |       |  |   |
| <b>Chapter 3</b>   |  |       |       |   |              |   |       |  |   |
| <b>REQUIREMENTS FOR POWER PARK MODULES</b>   |  |       |       |   |              |   |       |  |   |
|  |  |       |       |   |              |   |       |  |   |
| <b>Article 15</b>  |  |       |       |   |              |   |       |  |   |
| <b>REQUIREMENTS FOR TYPE B POWER PARK MODULES</b>  |  |       |       |   |              |   |       |  |   |
| 1. In addition to fulfilling the general requirements listed in Articles 8 and 9, Type B Power Park Modules shall fulfil the requirements in this Article.   |  |       |       |   |              | Scope statement in all documents where the requirements are placed e.g. G-Code, D-Code, Engineering Recommendations |       |  |   |
| 2. Type B Power Park Modules shall fulfil the following requirement referring to Voltage stability:  |  |       |       |   |              | Process: Grid-Code / D-Code   |       |  |   |
| (a) With regard to Reactive Power capability the Relevant Network Operator shall have the right to define while respecting the provisions of Article 4(3) the capability of a Power Park Module to provide Reactive Power.   |  |       |       |   | CC.6.3.2 (c) | Requirements: Grid-Code / D-Code  |       |  |   |
| (b) The Relevant Network Operator in coordination with the Relevant TSO shall have the right to require while respecting the provisions of Article 4(3) the capability of a Power Park Module to provide Fast Fault Current at the Connection Point in case of symmetrical (3-phase) faults. |  |       |       |   | CC.6.3.15    |   |       |  |   |
| (1) In this regard, the Power Park Module shall be capable of activating the supply of Fast Fault Current either by:   |  |       |       |   |              |   |       |  |   |



| Requirements for Grid Connection of Generators 14/01/2014<br>Informal Draft   | Equivalent Sections in Existing GB Codes |       |       |   |   | Changes to the GB Codes   |       | ISSUE FLAGS                       |   |
|---|--|-------|-------|---|---|---|-------|-----------------------------------|---|
|   | D-Code v22                               | G83-2 | G59-3 | BSEN 50438<br>(micro gens)<br>and technical<br>drafts | Grid Code   | Proposed location   | Notes | Code issue to<br>discuss at ECCAF | Non-code<br>issue (send<br>to DECC/Ofgem<br>) |
|   |  |       |       |   |   |   |       |                                   |   |
| Article 16  |  |       |       |   |   |   |       |                                   |   |
| Requirements for Type C power park modules  |  |       |       |   |   |   |       |                                   |   |
| 1. In addition to fulfilling the requirements listed in Articles 8, 9, 10 and 15, except for Article 8(1) (f), Article 9(2) (a), and Article 15(2) (a) unless referred to otherwise in Article 16(3) (d) points 3) and 4), Type C Power Park Modules shall fulfil the requirements in this Article.   |  |       |       |   |   | Scope statement in all documents where the requirements are placed e.g. G-Code, D-Code, Engineering Recommendations |       |                                   |   |
| 2. Type C Power Park Modules shall fulfil the following requirements referring to Frequency stability the Relevant TSO shall have the right to require, while respecting the provisions of Article 4(3), that Power Park Modules be capable of providing Synthetic Inertia to a low Frequency event.  |  |       |       |   | Not currently captured in GB Grid Code but assessed under Grid Code Frequency Response Technical Subgroup and Frequency Response Working Group. | Process: D-Code / Grid Code<br><br>Output: D-Code / Grid-Code   |       |                                   |   |
| The operating principle of control systems installed to provide synthetic inertia and the associated performance parameters shall be defined by the Relevant TSO while respecting the provisions of Article 4(3).   |  |       |       |   |   |   |       |                                   |   |
| 3. Type C Power Park Modules shall fulfil the following requirements referring to Voltage stability:  |  |       |       |   |   | Process: D-Code / Grid Code   |       |                                   |   |
| (a) With regard to Reactive Power Capability, for Power Park Modules where the Connection Point is not at the location of the high-voltage terminals of its step-up transformer nor at the terminals of the high-voltage line or cable to the Connection Point at the Power Park Module, if no step-up transformer exists, supplementary Reactive Power may be required by the Relevant Network Operator while respecting the provisions of Article 4(3) to compensate for the Reactive Power demand of the high-voltage line or cable between these two points from the responsible owner of this line or cable. |  |       |       |   | CC.6.3.2(c) and CC.6.3.4  | Output: D-Code / Grid-Code  |       |                                   |   |
| (b) With regard to Reactive Power capability at Maximum Capacity:   |  |       |       |   |   |   |       |                                   |   |
| (1) The Relevant Network Operator in coordination with the Relevant TSO shall define while respecting the provisions of Article 4(3) the Reactive Power provision capability requirements in the context of varying Voltage. For doing so, it shall define a U-Q/P <sub>max</sub> -profile that shall take any shape within the boundaries of which the Power Park Module shall be capable of providing Reactive Power at its Maximum Capacity.   |  |       |       |   |   |   |       |                                   |   |
| (2) The U-Q/P <sub>max</sub> -profile shall be defined by each Relevant Network Operator in coordination with the Relevant TSO while respecting the provisions of Article 4(3) in conformity with the following principles:   |  |       |       |   |   |   |       |                                   |   |

| Requirements for Grid Connection of Generators 14/01/2014<br>Informal Draft  | Equivalent Sections in Existing GB Codes |       |       |   |           | Changes to the GB Codes |       | ISSUE FLAGS                       |   |
|--|--|-------|-------|---|-----------|-------------------------|-------|-----------------------------------|---|
|  | D-Code v22                               | G83-2 | G59-3 | BSEN 50438<br>(micro gens)<br>and technical<br>drafts | Grid Code | Proposed location       | Notes | Code issue to<br>discuss at ECCAF | Non-code<br>issue (send<br>to DECC/Ofgem<br>) |
| – the U-Q/P <sub>max</sub> -profile shall not exceed the U-Q/P <sub>max</sub> -profile envelope, represented by the inner envelope in figure 8,  |  |       |       |   |           |                         |       |                                   |   |
| – the dimensions of the U-Q/P <sub>max</sub> -profile envelope (Q/P <sub>max</sub> range and Voltage range) shall be within the values defined for each Synchronous Area in table 9; and   |  |       |       |   |           |                         |       |                                   |   |
| – the position of the U-Q/P <sub>max</sub> -profile envelope within the limits of the fixed outer envelope in figure 8.  |  |       |       |   |           |                         |       |                                   |   |
| – The defined U-Q/P <sub>max</sub> profile may take any shape having regard to the potential costs for power generating modules of delivering the capability of providing reactive power production at high voltages and reactive power consumption at low voltages.   |  |       |       |   |           |                         |       |                                   |   |
| -  |  |       |       |   |           |                         |       |                                   |   |
|   |  |       |       |   |           |                         |       |                                   |   |
| Figure 8 – U-Q/P <sub>max</sub> -profile of a Power Park Module. The diagram represents boundaries of a U-Q/P <sub>max</sub> -profile by the Voltage at the Connection Point, expressed by the ratio of its actual value and its nominal value in per unit, against the ratio of the Reactive Power (Q) and the Maximum Capacity (P <sub>max</sub> ). The position, size and shape of the inner envelope are indicative. |  |       |       |   |           |                         |       |                                   |   |

| Requirements for Grid Connection of Generators 14/01/2014<br>Informal Draft  |                    |  | Equivalent Sections in Existing GB Codes                |       |       |   |           | Changes to the GB Codes |       | ISSUE FLAGS                       |   |
|--|--------------------|--|---|-------|-------|---|-----------|-------------------------|-------|-----------------------------------|---|
|  |                    |  | D-Code v22  | G83-2 | G59-3 | BSEN 50438<br>(micro gens)<br>and technical<br>drafts | Grid Code | Proposed location       | Notes | Code issue to<br>discuss at ECCAF | Non-code<br>issue (send<br>to DECC/Ofgem<br>) |
|  | Synchronous Area   | Maximum range of<br>Q/P <sub>max</sub> | Maximum range of<br>steady-state Voltage<br>level in PU |       |       |   |           |                         |       |                                   |   |
|  | Continental Europe | 0.75                                   | 0.225   |       |       |   |           |                         |       |                                   |   |
|  | Nordic             | 0.95                                   | 0.150   |       |       |   |           |                         |       |                                   |   |
|  | Great Britain      | 0.66                                   | 0.100   |       |       |   |           |                         |       |                                   |   |
|  | Ireland            | 0.66                                   | 0.218   |       |       |   |           |                         |       |                                   |   |
|  | Baltic States      | 0.80                                   | 0.220   |       |       |   |           |                         |       |                                   |   |
| Table 9: Parameters for the inner envelope in figure 8   |                    |  |   |       |       |   |           |                         |       |                                   |   |
| (3) The Reactive Power provision capability requirement applies at the Connection Point. For profile shapes other than rectangular, the Voltage range represents the highest and lowest values. The full Reactive Power range is therefore not expected to be available across the range of steady-state Voltages.   |                    |  |   |       |       |   |           |                         |       |                                   |   |
| (c) With regard to Reactive Power capability below Maximum Capacity:   |                    |  |   |       |       |   |           |                         |       |                                   |   |
| (1) The Relevant Network Operator in coordination with the Relevant TSO shall define while respecting the provisions of Article 4(3) the Reactive Power provision capability requirements. For doing so, it shall define a P-Q/P <sub>max</sub> -profile that shall take any shape within the boundaries of which the Power Park Module shall be capable of providing Reactive Power below Maximum Capacity. |                    |  |   |       |       |   |           |                         |       |                                   |   |
| (2) The P-Q/P <sub>max</sub> -profile is defined by each Relevant Network Operator in coordination with the Relevant TSO while respecting the provisions of Article 4(3), in conformity with the following principles:   |                    |  |   |       |       |   |           |                         |       |                                   |   |
| – the P-Q/P <sub>max</sub> -profile shall not exceed the P-Q/P <sub>max</sub> -profile envelope, represented by the inner envelope in figure 9;  |                    |  |   |       |       |   |           |                         |       |                                   |   |
| – the Q/P <sub>max</sub> range of the P-Q/P <sub>max</sub> -profile envelope is defined for each Synchronous Area in table 9;  |                    |  |   |       |       |   |           |                         |       |                                   |   |
| – the Active Power range of the P-Q/P <sub>max</sub> -profile envelope at zero Reactive Power shall be 1 pu;   |                    |  |   |       |       |   |           |                         |       |                                   |   |
| – the P-Q/P <sub>max</sub> -profile can be of any shape and shall include conditions for Reactive Power capability at zero Active Power; and   |                    |  |   |       |       |   |           |                         |       |                                   |   |
| – the position of the P-Q/P <sub>max</sub> -profile envelope within the limits of the fixed outer envelope in figure 9.  |                    |  |   |       |       |   |           |                         |       |                                   |   |
| – The defined U-Q/P <sub>max</sub> profile may take any shape having regard to the potential costs for power generating modules of delivering the capability of providing reactive power production at high voltages and reactive power consumption at low voltages.   |                    |  |   |       |       |   |           |                         |       |                                   |   |
|  |                    |  |   |       |       |   |           |                         |       |                                   |   |

| Requirements for Grid Connection of Generators 14/01/2014<br>Informal Draft   | Equivalent Sections in Existing GB Codes |       |       |   |  | Changes to the GB Codes     |       | ISSUE FLAGS                       |   |
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|   | D-Code v22                               | G83-2 | G59-3 | BSEN 50438<br>(micro gens)<br>and technical<br>drafts | Grid Code                                  | Proposed location           | Notes | Code issue to<br>discuss at ECCAF | Non-code<br>issue (send<br>to DECC/Ofgem<br>) |
| (3) When operating at an Active Power output below the Maximum Capacity ( $P < P_{max}$ ), the Power Park Module shall be capable of providing Reactive Power at any operating point inside its $P$ - $Q/P_{max}$ -profile, if all units of this Power Park Module, which generate power, are technically available (i. e. not out-of-service due to maintenance or failure). Otherwise the Reactive Power capability may be less taking into consideration the technical availabilities. |  |       |       |   |  |                             |       |                                   |   |
|   |  |       |       |   |  |                             |       |                                   |   |
|    |  |       |       |   |  |                             |       |                                   |   |
| Figure 9 - $P$ - $Q/P_{max}$ -profile of a Power Park Module. The diagram represents boundaries of a $P$ - $Q/P_{max}$ -profile at the Connection Point by the Active Power, expressed by the ratio of its actual value and the Maximum Capacity in per unit, against the ratio of the Reactive Power ( $Q$ ) and the Maximum Capacity ( $P_{max}$ ). The position, size and shape of the inner envelope are indicative.  |  |       |       |   |  |                             |       |                                   |   |
|   |  |       |       |   |  |                             |       |                                   |   |
| (4) The Power Park Module shall be capable of moving to any operating point within its $P$ - $Q/P_{max}$ profile in appropriate timescales to target values requested by the Relevant Network Operator.   |  |       |       |   |  |                             |       |                                   |   |
| (d) With regard to Reactive Power control modes:  |  |       |       |   | CC.6.3.2(b), CC.6.3.8, CC.A.7 and BC2.11.2 | Process: D-Code / Grid Code |       |                                   |   |
| (1) The Power Park Module shall be capable of providing Reactive Power automatically by either Voltage Control mode, Reactive Power Control mode or Power Factor Control mode.  |  |       |       |   |  | Output: D-Code / Grid-Code  |       |                                   |   |

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|   | D-Code v22                               | G83-2 | G59-3 | BSEN 50438<br>(micro gens)<br>and technical<br>drafts | Grid Code | Proposed location       | Notes | Code issue to<br>discuss at ECCAF | Non-code<br>issue (send<br>to DECC/Ofgem<br>) |
| (2) For the purposes of Voltage Control mode, the Power Park Module shall be capable of contributing to Voltage control at the Connection Point by provision of Reactive Power exchange with the Network with a Setpoint Voltage covering at least 0.95 to 1.05 pu in steps no greater than 0.01 pu with a Slope with a range of at least 2 to 7 % in steps no greater than 0.5 %. The Reactive Power output shall be zero when the grid Voltage value at the Connection Point equals the Voltage Setpoint.   |  |       |       |   |           |                         |       |                                   |   |
| (3) The Setpoint may be operated with or without a deadband selectable in a range from zero to +-5 % of nominal Network Voltage in steps no greater than 0.5 %.   |  |       |       |   |           |                         |       |                                   |   |
| (4) Following a step change in Voltage, the Power Park Module shall be capable of achieving 90 % of the change in Reactive Power output within a time $t_1$ to be specified by Relevant Network operator while respecting the provisions of Article 4(3) in the range of 1 - 5 seconds and settle at the value defined by the operating Slope within a time $t_2$ to be specified by Relevant Network Operator while respecting the provisions of Article 4(3) in the range of 5 - 60 seconds, with a steady-state reactive tolerance no greater than 5 % of the maximum Reactive Power.  |  |       |       |   |           |                         |       |                                   |   |
| (5) For the purposes of Reactive Power Control mode, the Power Park Module shall be capable of setting the Reactive Power Setpoint anywhere in the Reactive Power range, defined by Article 15(2) (a) and by Article 16(3) (a) and (b), with setting steps no greater than 5 Mvar or 5 % (whichever is smaller) of full Reactive Power, controlling the Reactive Power at the Connection Point to an accuracy within +-5 Mvar or +-5 % (whichever is smaller) of the full Reactive Power.   |  |       |       |   |           |                         |       |                                   |   |
| (6) For the purposes of Power Factor Control mode, the Power Park Module shall be capable of controlling the Power Factor at the Connection Point within the required Reactive Power range, defined by the Relevant Network Operator according to Article 15(2) (a) or defined by Article 16(3) (a) and (b), with a target Power Factor in steps no greater than 0.01. The Relevant Network Operator shall define while respecting the provisions of Article 4(3) the target Power Factor value and the tolerance expressed in Mvar or % on the Reactive Power value issued from conversion of Power Factor value, within a period of time, following a sudden change of Active Power output. |  |       |       |   |           |                         |       |                                   |   |

| Requirements for Grid Connection of Generators 14/01/2014<br>Informal Draft  | Equivalent Sections in Existing GB Codes |       |       |   |   | Changes to the GB Codes   |       | ISSUE FLAGS  |   |
|--|--|-------|-------|---|---|---|-------|--|---|
|  | D-Code v22                               | G83-2 | G59-3 | BSEN 50438<br>(micro gens)<br>and technical<br>drafts | Grid Code   | Proposed location   | Notes | Code issue to<br>discuss at ECCAF                                | Non-code<br>issue (send<br>to DECC/Ofgem<br>) |
| (7) The Relevant Network Operator in coordination with the Relevant TSO shall define while respecting the provisions of Article 4(3) which of the above three reactive power control mode options and associated Setpoints shall apply and further equipment to make the adjustment of the relevant Setpoint operable remotely.  |  |       |       |   |   |   |       |  |   |
| (e) With regard to priority to Active or Reactive Power contribution, the Relevant TSO shall define while respecting the provisions of Article 4(3), whether Active Power contribution or Reactive Power contribution has priority during faults for which fault-ride-through capability is required. If priority is given to Active Power contribution, its provision shall be established no later than 150 ms from the fault inception. |  |       |       |   | CC.6.3.15   | Process: D-Code /<br>Grid Code<br><br>Output: D-Code /<br>Grid-Code   |       |  |   |
| (f) With regard to power oscillations damping control, if required by the Relevant TSO, while respecting the provisions of Article 4(3), a Power Park Module shall be capable of contributing to damping power oscillations. The voltage and reactive power control characteristics of Power Park Modules shall not adversely affect the damping of power oscillations.  |  |       |       |   | Specified in<br>Bilateral<br>Agreement is<br>required.<br>Generally a<br>Power System<br>Stabiliser is not<br>required to be<br>fitted to a wind<br>farm. | Process: Grid Code<br>Output: Grid Code /<br>D-Code<br><br>Possibly CUSC if in<br>Bilateral                         |       |  |   |
|  |  |       |       |   |   |   |       |  |   |
| Article 17   |  |       |       |   |   |   |       |  |   |
| Requirements for Type D power park modules   |  |       |       |   |   |   |       |  |   |
| Type D Power Park Modules shall fulfil the requirements listed in Articles 8, 9, 10, 11, 15 and 16, except for Article 8(1) (f), Article 9(2) (a), Article 10(3) (a), and Article 15(2) (a).   |  |       |       |   |   | Scope statement in all documents where the requirements are placed e.g. G-Code, D-Code, Engineering Recommendations |       |  |   |
|  |  |       |       |   |   |   |       |  |   |
| Chapter 4  |  |       |       |   |   |   |       |  |   |
| REQUIREMENTS FOR OFFSHORE POWER PARK MODULES   |  |       |       |   |   |   |       |  |   |
|  |  |       |       |   |   |   |       |  |   |
| Article 18   |  |       |       |   |   |   |       |  |   |
| General Provisions   |  |       |       |   |   |   |       |  |   |
| 1. The requirements in this Chapter apply to the connection to the Network of Power Park Modules located offshore. A Power Park Module located offshore which does not have an Offshore Connection Point shall be considered as an Onshore Power Park Module and thus shall be compliant with the requirements set forth for the Power Park Modules situated onshore.  | DPC8.2.3                                 |       |       |   | Onshore and<br>Offshore<br>requirements are<br>treated under<br>the same<br>general<br>requirements in  | Scope statement in all documents where the requirements are placed e.g. G-Code, D-Code, Engineering Recommendations |       | Query over connection point definition and to what this applies. |   |

| Requirements for Grid Connection of Generators 14/01/2014<br>Informal Draft   | Equivalent Sections in Existing GB Codes |       |       |   |  | Changes to the GB Codes   |       | ISSUE FLAGS                       |   |
|---|--|-------|-------|---|--|---|-------|-----------------------------------|---|
|   | D-Code v22                               | G83-2 | G59-3 | BSEN 50438<br>(micro gens)<br>and technical<br>drafts | Grid Code  | Proposed location   | Notes | Code issue to<br>discuss at ECCAF | Non-code<br>issue (send<br>to DECC/Ofgem<br>) |
| 2. While respecting the provisions of Article 4(3), the Offshore Connection Point of an Offshore Power Park Module shall be defined by the Relevant Network Operator.   |  |       |       |   | the GB Grid Code, for example CC.6.3.2 which covers reactive capability will cover both onshore and offshore requirements. | Process: D-Code / Grid Code   |       |                                   |   |
| 3. Offshore Power Park Modules within the scope of this Network Code shall be categorized in accordance to the following Offshore Grid Connection System configurations:  |  |       |       |   |  | Output: D-Code / Grid-Code  |       |                                   |   |
| (a) Configuration 1: AC connection to single onshore point such that one or more Offshore Power Park Modules are interconnected offshore to form an Offshore AC System and the Offshore AC System is connected to the Onshore System with one or more AC connection(s) to the same Onshore Grid Interconnection Point.  |  |       |       |   |  | Scope statement in all documents where the requirements are placed e.g. G-Code, D-Code, Engineering Recommendations |       |                                   |   |
| (b) Configuration 2: Meshed AC connections such that a number of Offshore Power Park Modules are interconnected offshore to form an Offshore AC System and the Offshore AC System is connected to the Onshore System at two or more Onshore Grid Interconnection Point locations.   |  |       |       |   |  |   |       |                                   |   |
|   |  |       |       |   |  |   |       |                                   |   |
| Article 19  |  |       |       |   |  |   |       |                                   |   |
| Frequency stability requirements applicable to offshore power park modules  |  |       |       |   |  |   |       |                                   |   |
| The Frequency stability requirements defined respectively in Article 8(1) (a), (b), (c), (d) and (e), Article 10(2) and Article 16(2) (a) shall apply to any Offshore Power Park Module.  |  |       |       |   |  | Scope statement in all documents where the requirements are placed e.g. G-Code, D-Code, Engineering Recommendations |       |                                   |   |
|   |  |       |       |   |  |   |       |                                   |   |
|   |  |       |       |   |  |   |       |                                   |   |
| Article 20  |  |       |       |   |  |   |       |                                   |   |
| Voltage stability requirements applicable to offshore power park modules  |  |       |       |   |  |   |       |                                   |   |
| 1. While still respecting the provisions according to Articles 9(3) (a) and 11(3) (a), a Offshore Power Park Module shall be capable of staying connected to the Network and operating within the ranges of the Network Voltage at the Connection Point, expressed by the Voltage at the Connection Point related to nominal Voltage (per unit), and within the time periods specified by table 10. |  |       |       |   | CC.6.1.4   | Scope statement in all documents where the requirements are placed e.g. G-Code, D-Code, Engineering Recommendations |       |                                   |   |





| Requirements for Grid Connection of Generators 14/01/2014<br>Informal Draft  | Equivalent Sections in Existing GB Codes   |   |                             |   |           | Changes to the GB Codes  |   | ISSUE FLAGS                       |   |
|--|--|---|-----------------------------|---|-----------|--|---|-----------------------------------|---|
|  | D-Code v22   | G83-2   | G59-3                       | BSEN 50438<br>(micro gens)<br>and technical<br>drafts | Grid Code | Proposed location  | Notes   | Code issue to<br>discuss at ECCAF | Non-code<br>issue (send<br>to DECC/Ofgem<br>)       |
| Article 23   |  |   |                             |   |           |  |   |                                   |   |
| General system management requirements applicable to offshore<br>power park modules  |  |   |                             |   |           |  |   |                                   |   |
|  |  |   |                             |   |           |  |   |                                   |   |
| The general system management requirements defined in Articles 9(5),<br>10(6) and 11(4) shall apply to any Offshore Power Park Module.   |  |   |                             |   |           | Scope statement in all<br>documents where the<br>requirements are<br>placed e.g. G-Code,<br>D-Code, Engineering<br>Recommendations |   |                                   |   |
|  |  |   |                             |   |           |  |   |                                   |   |
| Chapter 1  |  |   |                             |   |           |  |   |                                   |   |
| OPERATIONAL NOTIFICATION PROCEDURE FOR CONNECTION<br>OF NEW POWER GENERATING MODULES   |  |   |                             |   |           |  |   |                                   |   |
|  |  |   |                             |   |           |  |   |                                   |   |
| Article 24   |  |   |                             |   |           |  |   |                                   |   |
| GENERAL PROVISIONS   |  |   |                             |   |           |  |   |                                   |   |
| 1. The Power Generating Facility Owner shall demonstrate to<br>the Relevant Network Operator its compliance with the<br>requirements referred to in Title 2 of this Network Code by<br>completing successfully the operational notification procedure<br>for connection of each Power Generating Module as defined<br>in Articles 25 to 32.  | Guide to the<br>Distribution<br>Code:<br><br>6.5 Approval to<br>Connect<br><br>6.5.1 Readiness<br>to Connect |   |                             |   | CP1       |  |   |                                   |   |
| 2. Further details of the operational notification procedure shall<br>be defined and made publicly available by the Relevant<br>Network Operator while respecting the provisions of Article<br>4(3).   |  |   |                             |   |           | Grid-Code / D-Code<br>[not in guidance]  | GG: publicly<br>available,<br>should mean<br>freely available<br>(not at cost). |                                   |   |
|  |  |   |                             |   |           |  |   |                                   |   |
|  |  |   |                             |   |           |  |   |                                   |   |
| Article 25   |  |   |                             |   |           |  |   |                                   |   |
| Operation notification of Type A Power Generating Modules  |  |   |                             |   |           |  |   |                                   |   |
|  |  |   |                             |   |           |  |   |                                   |   |
| 1. The operational notification procedure for connection of each<br>new Type A Power Generating Module shall consist of an<br>Installation Document. Based on an Installation Document<br>obtained from the Relevant Network Operator, the Power<br>Generating Facility Owner shall fill in the required information<br>and submit it to the Relevant Network Operator. For<br>subsequent Power Generating Modules separate independent<br>Installation Documents shall be provided. | DPC7.3<br>Provision of<br>Information  | 7 Commissioning/<br>Decommissionin<br>g and<br>Acceptance<br>Testing<br>7.1 General | 6 Connection<br>Application |   |           | D-Code to include<br>process   | With some<br>changes for<br>aggregators   |                                   | Tie in to Ofgem<br>process for FIT<br>notification. |
|  |  | 5.1Connection<br>Procedure  |                             |   |           |  |   |                                   |   |

[illegible]

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|  | D-Code v22  | G83-2 | G59-3  | BSEN 50438<br>(micro gens)<br>and technical<br>drafts | Grid Code  | Proposed location       | Notes   | Code issue to<br>discuss at ECCAF | Non-code<br>issue (send<br>to DECC/Ofgem<br>) |
| Article 27   |   |       |        |   |  |                         |   |                                   |   |
| Operational notification of Type B and C Power Generating Modules  |   |       |        |   |  |                         |   |                                   |   |
| 1. The operational notification procedure for connection of each new Type B and C Power Generating Module shall comprise a Power Generating Module Document (PGMD). The PGMD shall be provided by the Power Generating Facility Owner to the Relevant Network Operator and shall include a Statement of Compliance.  | DPC7.4.9<br>Commissioning Tests<br>DPC7.5<br><br>Technical Requirements for Medium Power Stations             |       |        |   | CP.6.3 – Data to be submitted in accordance with the User Data File Structure which includes the Compliance Statement and front sheet. | Grid Code / D-Code      | PGMD is a new document.   |                                   |   |
| For subsequent Power Generating Modules separate independent PGMDs shall be provided.  |   |       |        |   |  |                         |   |                                   |   |
| 2. The format of the PGMD and the information to be provided therein shall be defined by the Relevant Network Operator while respecting the provisions of Article 4 (3). Its content shall comprise the information defined in Articles 28 to 32 for Type D Power Generating Modules, which may be simplified through delivery in a single stage of operational notification as well as reduced requirements of details. |   |       |        |   |  |                         |   |                                   |   |
| 3. The Relevant Network Operator on acceptance of a complete and adequate PGMD shall issue a Final Operational Notification to the Power Generating Facility Owner.  | From Guide to prospective Users of the DNOs Distribution System:<br>6.5.2 Confirmation of Approval to Connect |       |        |   |  |                         |   |                                   |   |
| 4. On permanent decommissioning of a Power Generating Module the Power Generating Facility Owner shall notify the Relevant Network Operator in writing.  | DDRC5.3<br>Changes to User’s Data   |       | 12.6.2 |   |  |                         |   |                                   |   |
| 5. The Relevant Network Operator shall ensure the possibility of electronic notification of operation and decommissioning of power generating modules.   |   |       |        |   |  |                         |   |                                   |   |
|  |   |       |        |   |  |                         |   |                                   |   |
|  |   |       |        |   |  |                         |   |                                   |   |
| Article 28   |   |       |        |   |  |                         |   |                                   |   |
| Operational notification of Type D Power Generating Modules  |   |       |        |   |  |                         |   |                                   |   |
| The operational notification procedure for connection for each new Type D Power Generating Module shall comprise:  |   |       |        |   | Energisation Operational Notification, Interim Operational Notification and Final Operational  | Grid Code / D-Code      | Taking lead from Grid Code as already existing similar process. |                                   |   |
|  |   |       |        |   |  |                         |   |                                   |   |
| – Energisation Operational Notification (EON);   |   |       |        |   |  |                         |   |                                   |   |
| – Interim Operational Notification (ION);and   |   |       |        |   |  |                         |   |                                   |   |

| Requirements for Grid Connection of Generators 14/01/2014<br>Informal Draft   | Equivalent Sections in Existing GB Codes                                       |       |       |   |   | Changes to the GB Codes |  | ISSUE FLAGS                       |   |
|---|--|-------|-------|---|---|-------------------------|--|-----------------------------------|---|
|   | D-Code v22   | G83-2 | G59-3 | BSEN 50438<br>(micro gens)<br>and technical<br>drafts | Grid Code   | Proposed location       | Notes  | Code issue to<br>discuss at ECCAF | Non-code<br>issue (send<br>to DECC/Ofgem<br>) |
| – Final Operational Notification (FON).   |  |       |       |   | Notification are covered under CP.1.1 and in more detail under CP.5 CP.6 and CP.7 |                         |  |                                   |   |
|   |  |       |       |   |   |                         |  |                                   |   |
|   |  |       |       |   |   |                         |  |                                   |   |
| <i>Article 29</i>   |  |       |       |   |   |                         |  |                                   |   |
| <i>Energisation Operational Notification (EON) for Type D Power Generating Modules</i>  |  |       |       |   |   |                         |  |                                   |   |
|   |  |       |       |   |   |                         |  |                                   |   |
| 1. An Energisation Operational Notification (EON) shall entitle the Power Generating Facility Owner to energise its internal Network and auxiliaries for the Power Generating Modules by using the grid connection that is defined by the Connection Point.   | Data<br>Registration<br>Code<br><br>Power Station<br>Interface<br>Arrangements |       |       |   | CP.5  | Grid-Code / D-Code      | Need to cover E+W 132kV distribution connection. |                                   |   |
| 2. An Energisation Operational Notification (EON) shall be issued by the Relevant Network Operator, subject to completion of preparation including agreement on the protection and control settings relevant to the Connection Point between the Relevant Network Operator and the Power Generating Facility Owner. |  |       |       |   |   |                         |  |                                   |   |
|   |  |       |       |   |   |                         |  |                                   |   |
|   |  |       |       |   |   |                         |  |                                   |   |
| <i>Article 30</i>   |  |       |       |   |   |                         |  |                                   |   |
| <i>Interim Operational Notification (ION) for Type D Power Generating Modules</i>   |  |       |       |   |   |                         |  |                                   |   |
| 1. An Interim Operational Notification (ION) shall entitle the Power Generating Facility Owner to operate the Power Generating Module and generate power by using the grid connection for a limited period of time.   |  |       |       |   | CP.6  | Grid-Code / D-Code      |  |                                   |   |
| 2. An Interim Operational Notification (ION) shall be issued by the Relevant Network Operator, subject to the completion of data and study review process as required by this Network Code.   |  |       |       |   |   |                         |  |                                   |   |
| 3. With respect to data and study review the Relevant Network Operator shall have the right to request the following from the Power Generating Facility Owner:  |  |       |       |   |   |                         |  |                                   |   |
| (a) itemized Statement of Compliance;   |  |       |       |   |   |                         |  |                                   |   |
| (b) detailed technical data of the Power Generating Module with relevance to the grid connection as specified by the Relevant Network Operator;   |  |       |       |   |   |                         |  |                                   |   |
| (c) Equipment Certificates of Power Generating Module, where these are relied upon as part of the evidence of compliance;   |  |       |       |   |   |                         |  |                                   |   |
| (d) simulation models as specified by Article 10(6) (c) and as required by the Relevant Network Operator while respecting the provisions of Article 4(3);   |  |       |       |   |   |                         |  |                                   |   |
| (e) studies demonstrating expected steady-state and dynamic performance as required by Title 4 Chapters 5, 6 or 7 of this Network Code; and   |  |       |       |   |   |                         |  |                                   |   |

| Requirements for Grid Connection of Generators 14/01/2014<br>Informal Draft  | Equivalent Sections in Existing GB Codes   |       |       |   |           | Changes to the GB Codes |       | ISSUE FLAGS                       |   |
|--|--|-------|-------|---|-----------|-------------------------|-------|-----------------------------------|---|
|  | D-Code v22   | G83-2 | G59-3 | BSEN 50438<br>(micro gens)<br>and technical<br>drafts | Grid Code | Proposed location       | Notes | Code issue to<br>discuss at ECCAF | Non-code<br>issue (send<br>to DECC/Ofgem<br>) |
| (f) details of intended compliance tests according to Title 4 Chapters 2, 3 and 4.   |  |       |       |   |           |                         |       |                                   |   |
| 4. The maximum period for the Power Generating Facility Owner to remain in the Interim Operational Notification (ION) status shall not exceed twenty-four months. The Relevant Network Operator is entitled to specify a shorter ION validity period while respecting the provisions of Article 4(2). The ION validity period shall be subject to notification to the National Regulatory Authority. The modalities of that notification shall be determined in accordance with the applicable national regulatory framework. ION extensions shall be granted only if the Power Generating Facility Owner has made substantial progress towards full compliance. At the time of ION extension, the outstanding issues should be explicitly identified. |  |       |       |   |           |                         |       |                                   |   |
| 5. A prolongation of the maximum period for the Power Generating Facility Owner to remain in the Interim Operational Notification (ION) status (beyond a total of twenty-four months) may be granted upon request for derogation made to the Relevant Network Operator before the expiry of that period in accordance with the derogation procedure defined in the Code.   |  |       |       |   |           |                         |       |                                   |   |
|  |  |       |       |   |           |                         |       |                                   |   |
|  |  |       |       |   |           |                         |       |                                   |   |
| <i>Article 31</i>  |  |       |       |   |           |                         |       |                                   |   |
| <i>Final Operational Notification (FON) for Type D Power Generating Modules</i>  |  |       |       |   |           |                         |       |                                   |   |
|  |  |       |       |   |           |                         |       |                                   |   |
| 1. A Final Operational Notification (FON) shall entitle the Power Generating Facility Owner to operate the Power Generating Module by using the grid connection.   |  |       |       |   | CP.7      | Grid-Code / D-Code      |       |                                   |   |
| 2. A Final Operational Notification (FON) shall be issued by the Relevant Network Operator, upon prior removal of all incompatibilities identified for the purpose of the Interim Operational Notification (ION) status and subject to the completion of data and study review process as required by this Network Code.   | From Guide to prospective Users of the DNO's Distribution System:<br><br>6.5.2 Confirmation of Approval to Connect |       |       |   |           |                         |       |                                   |   |
| 3. With respect to data and study review the following must be submitted to the Relevant Network Operator by the Power Generating Facility Owner:  | Second bullet generally covered by Data Registration Code  |       |       |   |           |                         |       |                                   |   |
| – itemized Statement of Compliance; and  |  |       |       |   |           |                         |       |                                   |   |
| – update of applicable technical data, simulation models and studies as referred to in Article 30(3) (b), (c), (d) and (e), including use of actual measured values during testing.  |  |       |       |   |           |                         |       |                                   |   |





| Requirements for Grid Connection of Generators 14/01/2014<br>Informal Draft   | Equivalent Sections in Existing GB Codes |       |       |   | Grid Code | Changes to the GB Codes |       | ISSUE FLAGS                       |   |
|---|--|-------|-------|---|-----------|-------------------------|-------|-----------------------------------|---|
|   | D-Code v22                               | G83-2 | G59-3 | BSEN 50438<br>(micro gens)<br>and technical<br>drafts |           | Proposed location       | Notes | Code issue to<br>discuss at ECCAF | Non-code<br>issue (send<br>to DECC/Ofgem<br>) |
| – net present value;  |  |       |       |   |           |                         |       |                                   |   |
| – return on investment;   |  |       |       |   |           |                         |       |                                   |   |
| – rate of return; and   |  |       |       |   |           |                         |       |                                   |   |
| – time to break-even.   |  |       |       |   |           |                         |       |                                   |   |
| (b) The Relevant TSO shall also quantify socio-economic benefits in terms of improvement of security of supply. This shall include at least :   |  |       |       |   |           |                         |       |                                   |   |
| – associated reduction in probability of loss of supply over the lifetime of the modification;  |  |       |       |   |           |                         |       |                                   |   |
| – the probable extent and duration of such loss of supply;  |  |       |       |   |           |                         |       |                                   |   |
| – the societal cost per hour of such loss of supply;  |  |       |       |   |           |                         |       |                                   |   |
| (c) The Relevant TSO shall quantify as well as benefits to the internal market in electricity, cross-border trade and integration of renewable energies including, but not limited to:  |  |       |       |   |           |                         |       |                                   |   |
| – Frequency response;   |  |       |       |   |           |                         |       |                                   |   |
| – reserve holding;  |  |       |       |   |           |                         |       |                                   |   |
| – Reactive Power provision;   |  |       |       |   |           |                         |       |                                   |   |
| – congestion management; and  |  |       |       |   |           |                         |       |                                   |   |
| – defence measures.   |  |       |       |   |           |                         |       |                                   |   |
| (d) The Relevant TSO shall quantify the costs of applying the relevant rules to Existing Power Generating Modules, including but not limited to :   |  |       |       |   |           |                         |       |                                   |   |
| – Direct costs for implementing the requirement;  |  |       |       |   |           |                         |       |                                   |   |
| – The costs associated with attributable loss of opportunity;   |  |       |       |   |           |                         |       |                                   |   |
| – The costs associated with resulting changes in maintenance and operating costs.   |  |       |       |   |           |                         |       |                                   |   |
| 5. The Relevant TSO shall summarise the analysis within three months in a report which shall include a recommendation on how to proceed.  |  |       |       |   |           |                         |       |                                   |   |
| (a) This report shall be subject to public consultation.  |  |       |       |   |           |                         |       |                                   |   |
| (b) Within 6 month of the end of the public consultation Relevant TSO shall prepare a report explaining the outcome of the consultation outcome and a proposal on the applicability of the requirement under consideration to Existing Power Generating Modules. This report shall be transmitted to the National Regulatory Authority. |  |       |       |   |           |                         |       |                                   |   |
| 6. The proposal by the Relevant TSO to the National Regulatory Authority on applicability of any requirement of this Network Code according to Article 3(2) to Existing Power Generating Modules according to Title 1 Article 3(2) shall include the following:   |  |       |       |   |           |                         |       |                                   |   |
| (a) an operational notification procedure in order to demonstrate the implementation of the requirements by the Power Generating Facility Owner;  |  |       |       |   |           |                         |       |                                   |   |
| (b) an appropriate transition period for implementing the requirements. The determination of the transition period shall take into account the category of the Power Generating Module according to Article 3(6) (a) to (e) and any underlying obstacles for efficient undertaking of the equipment modification/refitting.             |  |       |       |   |           |                         |       |                                   |   |
| 7. The Relevant National Regulatory Authority shall decide on the case within three months of receipt of the report and the recommendation of the Relevant TSO.   |  |       |       |   |           | Not Codes               |       |                                   | Obligation for Authority.                     |

| Requirements for Grid Connection of Generators 14/01/2014<br>Informal Draft  | Equivalent Sections in Existing GB Codes |       |       |   |           | Changes to the GB Codes |       | ISSUE FLAGS                       |   |
|--|--|-------|-------|---|-----------|-------------------------|-------|-----------------------------------|---|
|  | D-Code v22                               | G83-2 | G59-3 | BSEN 50438<br>(micro gens)<br>and technical<br>drafts | Grid Code | Proposed location       | Notes | Code issue to<br>discuss at ECCAF | Non-code<br>issue (send<br>to DECC/Ofgem<br>) |
| The decision of the National Regulatory Authority, if any, shall be published.   |  |       |       |   |           |                         |       |                                   |   |
| All relevant clauses in contracts and/or relevant clauses in general terms and conditions relating to the grid connection of Existing Power Generating Modules shall be amended to achieve compliance with the requirements of this Network Code, that shall apply to them according to Article 33(6). The relevant clauses shall be amended within three years after the decision of the National Regulatory Authority on the applicability according to Article 3(2). This requirement for amendment shall apply regardless of whether the relevant contracts or general terms and conditions provide for such an amendment. |  |       |       |   |           |                         |       |                                   |   |



[illegible]



[illegible]



| Requirements for Grid Connection of Generators 14/01/2014<br>Informal Draft  | Equivalent Sections in Existing GB Codes |       |       |   |  | Changes to the GB Codes |                              | ISSUE FLAGS                       |   |
|--|--|-------|-------|---|--|-------------------------|------------------------------|-----------------------------------|---|
|  | D-Code v22                               | G83-2 | G59-3 | BSEN 50438<br>(micro gens)<br>and technical<br>drafts | Grid Code  | Proposed location       | Notes                        | Code issue to<br>discuss at ECCAF | Non-code<br>issue (send<br>to DECC/Ofgem<br>) |
| <i>Article 39</i>  |  |       |       |   |  |                         |                              |                                   |   |
| <i>Compliance tests for Type C synchronous power generating modules</i>  |  |       |       |   |  |                         |                              |                                   |   |
| <i>MODULES</i>   |  |       |       |   |  |                         |                              |                                   |   |
| 1. In addition to the compliance tests for Type B Synchronous Power Generating Modules in the conditions as referred to in Article 38, Power Generating Facility Owners shall undertake to the compliance tests set out in paragraphs 2, 3, 4 and 6 in relation to Type C Synchronous Power Generating Modules.  |  |       |       |   | OC5 – Appendix 2 – Note all the tests completed under Article 39 are not necessarily the same as those under OC5 Appendix 2. For example Black Start tests are completed via a separate Black Start Contract and the GB Grid Code does not have a requirement for LFSM-U. The full tests in GB cover more than those listed in Article 39 eg Excitation tests and Power System Stabiliser Tests. | Grid Code / D-Code      | Note cumulative requirements |                                   |   |
| Where the Power generating Module provides Black Start Capability, Power Generating Facility Owners shall also undertake the Tests in Paragraph 5.   |  |       |       |   |  |                         |                              |                                   |   |
| An Equipment Certificate may be used instead of part or all of the tests, in that case the Equipment Certificate shall be provided to the Relevant Network Operator.   |  |       |       |   |  |                         |                              |                                   |   |
|  |  |       |       |   |  |                         |                              |                                   |   |
| 2. With regard to the LFSM-U response test:  |  |       |       |   |  |                         |                              |                                   |   |
| (a) The Power Generating Module shall demonstrate its technical capability to continuously modulate Active Power at operating points below Maximum Capacity to contribute to Frequency Control in case of large drop of Frequency in the system.   |  |       |       |   |  |                         |                              |                                   |   |
| (b) The test shall be carried out by simulating at appropriate Active Power load points (e.g. 80 %) with low Frequency steps and ramps big enough to activate at least 10 % of Maximum Capacity Active Power change, taking into account the Droop settings and the deadband. Simulated Frequency deviation signals shall be injected simultaneously into both the speed governor and the load controller references if required, taking into account the speed governor and the load controller scheme. |  |       |       |   |  |                         |                              |                                   |   |
| (c) The test is deemed passed, provided that the following conditions are both fulfilled:  |  |       |       |   |  |                         |                              |                                   |   |
| (1) the test results, for both dynamic and static parameters, are in line with the requirements as referred to in Article 10(2) (b); and   |  |       |       |   |  |                         |                              |                                   |   |
| (2) undamped oscillations do not occur after the step change response.   |  |       |       |   |  |                         |                              |                                   |   |
| 3. With regard to the FSM response test:   |  |       |       |   |  |                         |                              |                                   |   |
| (a) The Power Generating Module shall demonstrate its technical capability to continuously modulate Active Power over the full operating range between Maximum Capacity and Minimum Regulating Level to contribute to Frequency Control and shall verify the steady-state parameters of regulations, such as Droop and deadband and dynamic parameters, including robustness through Frequency step change response and large, fast Frequency changes.   |  |       |       |   |  |                         |                              |                                   |   |

| Requirements for Grid Connection of Generators 14/01/2014<br>Informal Draft   | Equivalent Sections in Existing GB Codes |       |       |   |           | Changes to the GB Codes   |   | ISSUE FLAGS                       |   |
|---|--|-------|-------|---|-----------|---|---|-----------------------------------|---|
|   | D-Code v22                               | G83-2 | G59-3 | BSEN 50438<br>(micro gens)<br>and technical<br>drafts | Grid Code | Proposed location   | Notes   | Code issue to<br>discuss at ECCAF | Non-code<br>issue (send<br>to DECC/Ofgem<br>) |
| (b) The test shall be carried out by simulating Frequency steps and ramps big enough to activate the whole Active Power Frequency response range, taking into account the Droop settings, the deadband and the Real Power headroom or deload (margin to Maximum Capacity in operational timescale). Simulated Frequency deviation signals shall be injected simultaneously into the references of both the speed governor and the load controller of the unit or plant control system if required, taking into account the speed governor and load controller scheme. |  |       |       |   |           |   |   |                                   |   |
| (c) The test shall be deemed to be passed if the following conditions are all fulfilled:  |  |       |       |   |           |   |   |                                   |   |
| (1) activation time of full Active Power Frequency response range as result of a step Frequency change has been no longer than required by Article 10(2) (c);   |  |       |       |   |           |   |   |                                   |   |
| (2) undamped oscillations do not occur after the step change response;  |  |       |       |   |           |   |   |                                   |   |
| (3) the initial delay time has been according to Article 10(2) (c);   |  |       |       |   |           |   |   |                                   |   |
| (4) the Droop settings are available within the range defined in Article 10(2) (c) and deadband (thresholds) is not more than the value in Article 10(2) (c); and   |  |       |       |   |           |   |   |                                   |   |
| (5) insensitivity of Active Power Frequency response at any relevant operating point does not exceed the requirements set forth in Article 10(2) (c).   |  |       |       |   |           |   |   |                                   |   |
| 4. With regard to the frequency restoration control test:   |  |       |       |   |           |   |   |                                   |   |
| (a) The Power Generating Module shall demonstrate its technical capability to participate in Frequency restoration control. The cooperation of FSM and Frequency restoration control shall be checked.  |  |       |       |   |           |   |   |                                   |   |
| (b) The test is deemed passed, provided that the test results, for both dynamic and static parameters, are in line with the requirements as referred to in Article 10(2) (d).   |  |       |       |   |           |   |   |                                   |   |
| 5. With regard to the Black Start Capability test:  |  |       |       |   |           |   |   |                                   |   |
| (a) Power Generating Modules with Black Start Capability in accordance with Article 10(5) (a), shall demonstrate this technical capability to start from shut down without any external energy supply.  |  |       |       |   |           | Grid –Code only<br>(otherwise no power<br>recovery).<br><br>Maybe CUSC for<br>contractual<br>arrangements for<br>black-start. | <b>Contradiction<br/>to the<br/>definition<br/>which refers<br/>to “electrical<br/>energy”.</b> |                                   |   |
| (b) The test is deemed passed, provided that the start-up time has been not longer than the timeframe according to Article 10(5) (a) point 2).  |  |       |       |   |           |   |   |                                   |   |
| 6. With regard to the tripping to houseload test:   |  |       |       |   |           |   |   |                                   |   |
| (a) Power Generating Modules shall demonstrate their technical capability to trip to and stably operate on house load.  |  |       |       |   |           |   |   |                                   |   |
| (b) The test shall be carried out at the Maximum Capacity and nominal Reactive Power of the Power Generating Module before load shedding.   |  |       |       |   |           |   |   |                                   |   |



| Requirements for Grid Connection of Generators 14/01/2014<br>Informal Draft   | Equivalent Sections in Existing GB Codes |       |       |   |   | Changes to the GB Codes |       | ISSUE FLAGS                       |   |
|---|--|-------|-------|---|---|-------------------------|-------|-----------------------------------|---|
|   | D-Code v22                               | G83-2 | G59-3 | BSEN 50438<br>(micro gens)<br>and technical<br>drafts | Grid Code   | Proposed location       | Notes | Code issue to<br>discuss at ECCAF | Non-code<br>issue (send<br>to DECC/Ofgem<br>) |
| <i>Article 41</i>   |  |       |       |   |   |                         |       |                                   |   |
| <i>Compliance tests for Type B power park modules</i>   |  |       |       |   |   |                         |       |                                   |   |
| 1. Power Generating Facility Owners shall undertake LFSM-O response test compliance tests in relation to Type B Power Park Modules.   |  |       |       |   |   | Grid Code / D-Code      |       |                                   |   |
| An Equipment Certificate may be used instead of part or all of the tests, in that case the Equipment Certificate shall be provided to the Relevant Network Operator.  |  |       |       |   |   |                         |       |                                   |   |
| 2. With regard to Type B Power Park Modules the LFSM-O response tests shall be carried out reflecting the choice of control scheme selected by the Relevant Network Operator.   |  |       |       |   |   |                         |       |                                   |   |
| (a) The Power Park Module shall demonstrate its technical capability to continuously modulate Active Power to contribute to Frequency Control in case of increase of Frequency in the system and shall verify the steady-state parameters of regulations, such as Droop and deadband, and dynamic parameters, including Frequency step change response. |  |       |       |   |   |                         |       |                                   |   |
| (b) The test shall be carried out by simulating Frequency steps and ramps big enough to activate at least 10 % of Maximum Capacity change in Active Power, taking into account the Droop settings and the deadband. Simulated Frequency deviation signals shall be injected to perform this test.   |  |       |       |   |   |                         |       |                                   |   |
| (c) The test shall be deemed passed, provided that the test results, for both dynamic and static parameters, are in line with the requirements as referred to in Article 8(1) (c).  |  |       |       |   |   |                         |       |                                   |   |
|   |  |       |       |   |   |                         |       |                                   |   |
|   |  |       |       |   |   |                         |       |                                   |   |
| <i>Article 42</i>   |  |       |       |   |   |                         |       |                                   |   |
| <i>Compliance tests for Type C power park modules</i>   |  |       |       |   |   |                         |       |                                   |   |
| 1. In addition to the compliance tests for Type B Power Park Modules in the conditions as referred to in Article 41, Power generation facility owners shall undertake the compliance tests set out in Paragraphs 2-9 in relation to Type C Power Park Modules   |  |       |       |   | OC5 – Appendix 3 – The GB Grid Code does not have a requirement for LFSM-U. No Power Factor Control Tests are undertaken. Power Park Modules are required to operate in Voltage Control Mode. <i>Tests are different durations and levels from GB</i> | Grid Code / D-Code      |       |                                   |   |
| An Equipment Certificate may be used instead of part or all of the tests, in that case the Equipment Certificate shall be provided to the Relevant Network Operator.  |  |       |       |   |   |                         |       |                                   |   |
| 2. With regard to the Active Power controllability and control range test:  |  |       |       |   |   |                         |       |                                   |   |
| (a) The Power Park Module shall demonstrate its technical capability to operate at a load level no higher than the Setpoint set by the Relevant Network Operator or the Relevant TSO.   |  |       |       |   |   |                         |       |                                   |   |
| (b) The test shall be deemed passed if that the following conditions are cumulatively fulfilled:  |  |       |       |   |   |                         |       |                                   |   |
| (1) the load level of the Power Park Module is kept below the Setpoint;   |  |       |       |   |   |                         |       |                                   |   |
| (2) the Setpoint is implemented according to the requirements as referred to in Article 10(2) (a); and  |  |       |       |   |   |                         |       |                                   |   |
| (3) the accuracy of the regulation is compliant with specified value according to Article 10(2) (a).  |  |       |       |   |   |                         |       |                                   |   |
| 3. With regard to the LFSM-U response test:   |  |       |       |   |   |                         |       |                                   |   |

| Requirements for Grid Connection of Generators 14/01/2014<br>Informal Draft  | Equivalent Sections in Existing GB Codes |       |       |   |           | Changes to the GB Codes |       | ISSUE FLAGS                       |   |
|--|--|-------|-------|---|-----------|-------------------------|-------|-----------------------------------|---|
|  | D-Code v22                               | G83-2 | G59-3 | BSEN 50438<br>(micro gens)<br>and technical<br>drafts | Grid Code | Proposed location       | Notes | Code issue to<br>discuss at ECCAF | Non-code<br>issue (send<br>to DECC/Ofgem<br>) |
| (a) The Power Park Module shall demonstrate its technical capability to continuously modulate Active Power to contribute to Frequency Control in case of large drop of Frequency in the system.  |  |       |       |   |           |                         |       |                                   |   |
| (b) The test shall be carried out by simulating the Frequency steps and ramps big enough to activate at least 10 % of Maximum Capacity Active Power change with a starting point of no more than 80 % of Maximum Capacity, taking into account the Droop settings and the deadband. Simulated Frequency deviation signals shall be injected in the Power Park Module controller scheme, taking into account both speed governor and load controller scheme, if applicable. |  |       |       |   |           |                         |       |                                   |   |
| (c) The test shall be deemed passed if the following conditions are cumulatively fulfilled:  |  |       |       |   |           |                         |       |                                   |   |
| (1) the test results, for both dynamic and static parameters, are in line with the requirements as referred to in Article 10(2) (b); and   |  |       |       |   |           |                         |       |                                   |   |
| (2) undamped oscillations after the step change response does not occur.   |  |       |       |   |           |                         |       |                                   |   |
| 4. With regard to the FSM response test:   |  |       |       |   |           |                         |       |                                   |   |
| (a) The Power Park Module shall demonstrate its technical capability to continuously modulate Active Power over the full operating range between Maximum Capacity and Minimum Regulating Level to contribute to Frequency Control and shall verify the steady-state parameters of regulations, such as insensitivity, Droop, deadband and range of regulation, as well as dynamic parameters, including Frequency step change response.                                    |  |       |       |   |           |                         |       |                                   |   |
| (b) The test shall be carried out by simulating Frequency steps and ramps big enough to activate whole Active Power Frequency response range, taking into account the Droop settings and the deadband. Simulated Frequency deviation signals shall be injected to perform this test.   |  |       |       |   |           |                         |       |                                   |   |
| (c) The test shall be deemed passed if the following conditions are cumulatively fulfilled:  |  |       |       |   |           |                         |       |                                   |   |
| (1) the activation time of full Active Power Frequency response range as result of a step Frequency change has been no longer than that required by Article 10(2) (c);   |  |       |       |   |           |                         |       |                                   |   |
| (2) undamped oscillations do not occur after the step change response;   |  |       |       |   |           |                         |       |                                   |   |
| (3) the initial delay has been according to Article 10(2) (c);   |  |       |       |   |           |                         |       |                                   |   |
| (4) the Droop settings are available within the ranges defined in Article 10(2) (c) and deadband (thresholds) is not more than the value chosen by the TSO; and  |  |       |       |   |           |                         |       |                                   |   |
| (5) the insensitivity of Active Power Frequency response does not exceed the requirement according to Article 10(2) (c).   |  |       |       |   |           |                         |       |                                   |   |
| 5. With regard to the frequency restoration control test:  |  |       |       |   |           |                         |       |                                   |   |

| Requirements for Grid Connection of Generators 14/01/2014<br>Informal Draft  | Equivalent Sections in Existing GB Codes |       |       |   |           | Changes to the GB Codes |       | ISSUE FLAGS                       |   |
|--|--|-------|-------|---|-----------|-------------------------|-------|-----------------------------------|---|
|  | D-Code v22                               | G83-2 | G59-3 | BSEN 50438<br>(micro gens)<br>and technical<br>drafts | Grid Code | Proposed location       | Notes | Code issue to<br>discuss at ECCAF | Non-code<br>issue (send<br>to DECC/Ofgem<br>) |
| (a) The Power Park Module shall demonstrate its technical capability to participate in Frequency restoration control. The cooperation of both FSM and Frequency restoration control shall be checked.  |  |       |       |   |           |                         |       |                                   |   |
| (b) The test shall be deemed passed if the test results for both dynamic and static parameters are in line with the requirements as referred to in Article 10(2) (d).  |  |       |       |   |           |                         |       |                                   |   |
| 6. With regard to the Reactive Power capability test:  |  |       |       |   |           |                         |       |                                   |   |
| (a) The Power Park Module shall demonstrate its technical capability to provide leading and lagging Reactive Power capability according to Article 16(3) (b) and (c).  |  |       |       |   |           |                         |       |                                   |   |
| (b) The Reactive Power Capability test shall be carried out at maximum Reactive Power, both leading and lagging, and concerning the verification of the following parameters:  |  |       |       |   |           |                         |       |                                   |   |
| (1) operation in excess of 60 % of Maximum Capacity for 30 min;  |  |       |       |   |           |                         |       |                                   |   |
| (2) operation within the range of 30 – 50 % of Maximum Capacity for 30 min; and  |  |       |       |   |           |                         |       |                                   |   |
| (3) operation within the range of 10 – 20 % of Maximum Capacity for 60 min.  |  |       |       |   |           |                         |       |                                   |   |
| (c) The test shall be deemed passed if the following criteria are cumulatively fulfilled:  |  |       |       |   |           |                         |       |                                   |   |
| (1) the Power Park Module has been operating no shorter than requested duration at maximum Reactive Power, both leading and lagging, in each parameter as referred to in Article 42(6) (b);  |  |       |       |   |           |                         |       |                                   |   |
| (2) the Power Park Module has demonstrated its capability to change to any Reactive Power target value within the agreed or decided Reactive Power range within the specified performance targets of the relevant Reactive Power control scheme; and |  |       |       |   |           |                         |       |                                   |   |
| (3) no action of any protection within the operation limits defined by Reactive Power capacity diagram occurs.   |  |       |       |   |           |                         |       |                                   |   |
| 7. With regard to the Voltage Control Mode test:   |  |       |       |   |           |                         |       |                                   |   |
| (a) The Power Park Module shall demonstrate its capability to operate in Voltage control mode in the conditions set forth in Article 16(3) (d) point 2).   |  |       |       |   |           |                         |       |                                   |   |
| (b) The Voltage Control Mode test shall apply concerning the verification of the following parameters:   |  |       |       |   |           |                         |       |                                   |   |
| (1) the implemented Slope and deadband of the static characteristic;   |  |       |       |   |           |                         |       |                                   |   |
| (2) the accuracy of the regulation;  |  |       |       |   |           |                         |       |                                   |   |
| (3) the insensitivity of the regulation; and   |  |       |       |   |           |                         |       |                                   |   |
| (4) the time of Reactive Power activation.   |  |       |       |   |           |                         |       |                                   |   |
| (c) The test shall be deemed passed if the following conditions are cumulatively fulfilled:  |  |       |       |   |           |                         |       |                                   |   |
| (1) the implemented Slope and deadband of the static characteristic;   |  |       |       |   |           |                         |       |                                   |   |
| (2) the range of regulation and adjustable the Droop and deadband is compliant with agreed or decided characteristic parameters, according to Article 16(3) (d);   |  |       |       |   |           |                         |       |                                   |   |

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|  | D-Code v22                               | G83-2 | G59-3 | BSEN 50438<br>(micro gens)<br>and technical<br>drafts | Grid Code       | Proposed location       | Notes | Code issue to<br>discuss at ECCAF | Non-code<br>issue (send<br>to DECC/Ofgem<br>) |
| (3) the insensitivity of Voltage Control is not higher than 0.01 pu, according to Article 16(3) (d); and   |  |       |       |   |                 |                         |       |                                   |   |
| (4) following a step change in Voltage, 90 % of the change in Reactive Power output has been achieved within the times and tolerances according to Article 16(3) (d).        |  |       |       |   |                 |                         |       |                                   |   |
| 8. With regard to the Reactive Power Control Mode test:  |  |       |       |   |                 |                         |       |                                   |   |
| (a) The Power Park Module shall demonstrate its capability to operate in Reactive Power control mode, according to the conditions referred to in Article 16(3) (d) point 3). |  |       |       |   |                 |                         |       |                                   |   |
| (b) The Reactive Power Control Mode test shall be complementary to the Reactive Power Capability test.   |  |       |       |   |                 |                         |       |                                   |   |
| (c) The Reactive Power Control Mode test shall apply concerning the verification of the following parameters:  |  |       |       |   |                 |                         |       |                                   |   |
| (1) the Reactive Power Setpoint range and step;  |  |       |       |   |                 |                         |       |                                   |   |
| (2) the accuracy of the regulation; and  |  |       |       |   |                 |                         |       |                                   |   |
| (3) the time of Reactive Power activation.   |  |       |       |   |                 |                         |       |                                   |   |
| (d) The test shall be deemed passed if the following conditions are cumulatively fulfilled:  |  |       |       |   |                 |                         |       |                                   |   |
| (1) the Reactive Power Setpoint range and step is ensured according to Article 16(3) (d); and  |  |       |       |   |                 |                         |       |                                   |   |
| (2) the accuracy of the regulation is compliant with the conditions as referred to in Article 16(3) (d).   |  |       |       |   |                 |                         |       |                                   |   |
| 9. With regard to the Power Factor Control Mode test:  |  |       |       |   |                 |                         |       |                                   |   |
| (a) The Power Park Module shall demonstrate its capability to operate in Power Factor control mode according to the conditions referred to in Article 16(3) (d) point 4).    |  |       |       |   |                 |                         |       |                                   |   |
| (b) The Power Factor Control Mode test shall apply concerning the verification of the following parameters:  |  |       |       |   |                 |                         |       |                                   |   |
| (1) the Power Factor Setpoint range;   |  |       |       |   |                 |                         |       |                                   |   |
| (2) the accuracy of the regulation; and  |  |       |       |   |                 |                         |       |                                   |   |
| (3) the response of Reactive Power due to step change of Active Power.   |  |       |       |   |                 |                         |       |                                   |   |
| a)The test shall be deemed passed if the following conditions are cumulatively fulfilled:  |  |       |       |   |                 |                         |       |                                   |   |
| (1) the Power Factor Setpoint range and step is ensured according to Article 16(3) (d);  |  |       |       |   |                 |                         |       |                                   |   |
| (2) the time of Reactive Power activation as result of step Active Power change does not exceed the requirement according to Article 16(3) (d); and                          |  |       |       |   |                 |                         |       |                                   |   |
| (3) the accuracy of the regulation is compliant with the value, as referred to in Article 16(3) (d).   |  |       |       |   |                 |                         |       |                                   |   |
| 10. With regard to the tests identified in paragraphs 7, 8 and 9 the Relevant Network Operator may select only one of the three control options for testing.                 |  |       |       |   |                 |                         |       |                                   |   |
|  |  |       |       |   |                 |                         |       |                                   |   |
|  |  |       |       |   |                 |                         |       |                                   |   |
| Article 43   |  |       |       |   |                 |                         |       |                                   |   |
| Compliance tests for Type D power park modules   |  |       |       |   |                 |                         |       |                                   |   |
| Type D Power Park Modules are subject to the compliance tests for  |  |       |       |   | As per Type C – | Grid Code / D-Code      |       |                                   |   |

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|--|--|-------|-------|---|--|-------------------------|--|--|---|
|  | D-Code v22                               | G83-2 | G59-3 | BSEN 50438<br>(micro gens)<br>and technical<br>drafts | Grid Code  | Proposed location       | Notes  | Code issue to<br>discuss at ECCAF  | Non-code<br>issue (send<br>to DECC/Ofgem<br>) |
| Type B and C Power Park Modules in the conditions as referred to in Articles 41 and 42.  |  |       |       |   | See item 67 above. The principle of Equipment Certificates is not used in GB   |                         |  |  |   |
| An Equipment Certificate may be used instead of part or all of the tests, in that case the Equipment Certificate shall be provided to the Relevant Network Operator. |  |       |       |   |  |                         |  |  |   |
|  |  |       |       |   |  |                         |  |  |   |
|  |  |       |       |   |  |                         |  |  |   |
|  |  |       |       |   |  |                         |  |  |   |
|  |  |       |       |   |  |                         |  |  |   |
| <b>Chapter 4</b>   |  |       |       |   |  |                         |  |  |   |
| <b>COMPLIANCE TESTING FOR OFFSHORE POWER PARK MODULES</b>  |  |       |       |   |  |                         |  |  |   |
|  |  |       |       |   |  |                         |  |  |   |
| <i>Article 44</i>  |  |       |       |   |  |                         |  |  |   |
| <i>Compliance testing for offshore power park modules</i>  |  |       |       |   |  |                         |  |  |   |
| The compliance tests as defined in Article 41(2), as well as in Article 42(2), (3), (4), (5) and (7), (8) and (9) shall apply to any Offshore Power Park Module.     |  |       |       |   | OC5 – Appendix 3 – specific requirements included for Offshore Power Park Modules.   | Grid Code / D-Code      | We are referring to GB AC Offshore. [not DC connected]   | All Distribution connection points are onshore; additional complexity of onshore vs offshore in current definitions. |   |
|  |  |       |       |   |  |                         |  |  |   |
|  |  |       |       |   |  |                         |  |  |   |
| <b>Chapter 5</b>   |  |       |       |   |  |                         |  |  |   |
| <b>COMPLIANCE SIMULATIONS FOR SYNCHRONOUS POWER GENERATING MODULES</b>   |  |       |       |   |  |                         |  |  |   |
|  |  |       |       |   |  |                         |  |  |   |
| <i>Article 45</i>  |  |       |       |   |  |                         |  |  |   |
| <i>Compliance simulations for Type B synchronous power generating modules</i>  |  |       |       |   |  |                         |  |  |   |
| 1. Power Generating Facility Owners shall undertake LFSM-O response test compliance tests in relation to Type B <b>Power Park Modules</b> .                          |  |       |       |   | Type B Synchronous Power Generating Modules (1MW – 10MW) are not currently covered under the GB Grid Code although the simulations carried out for Type B plant would be applied to larger GB Plant under CP-Appendix 3. | Grid-Code / D-Code      | [[TYPO?]]  |  |   |
| An Equipment Certificate may be used instead of part or all of the tests, in that case the Equipment Certificate shall be provided to the Relevant Network Operator. |  |       |       |   |  |                         | Flag to DNO / TSOs – how do we manage equipment certificates. The query is over how much may be required to be done ‘live on the system’ |  |   |









[illegible]

| Requirements for Grid Connection of Generators 14/01/2014<br>Informal Draft   | Equivalent Sections in Existing GB Codes |       |       |   |           | Changes to the GB Codes       |       | ISSUE FLAGS                       |   |
|---|--|-------|-------|---|-----------|-------------------------------|-------|-----------------------------------|---|
|   | D-Code v22                               | G83-2 | G59-3 | BSEN 50438<br>(micro gens)<br>and technical<br>drafts | Grid Code | Proposed location             | Notes | Code issue to<br>discuss at ECCAF | Non-code<br>issue (send<br>to DECC/Ofgem<br>) |
| (a) The model of the Power Generating Module shall demonstrate its capability to simulate power oscillations damping capability in the conditions as referred to in Article 16(3) (f).  |  |       |       |   |           |                               |       |                                   |   |
| (b) The simulation is deemed passed, provided that the model demonstrates compliance with the conditions of Article 16(3) (f).  |  |       |       |   |           |                               |       |                                   |   |
|   |  |       |       |   |           |                               |       |                                   |   |
|   |  |       |       |   |           |                               |       |                                   |   |
| Article 50  |  |       |       |   |           |                               |       |                                   |   |
| COMPLIANCE SIMULATIONS FOR TYPE D POWER PARK<br>MODULES   |  |       |       |   |           |                               |       |                                   |   |
| 1. In addition to the Compliance Simulations for Type B and C Power Park Modules in the conditions as referred to in Articles 49 and 50, except for the Type B fault-ride-through capability of Power Park Modules as referred to in Article 48(4), Type D Power Park Modules are subject to the Type D fault-ride-through capability of Power Park Modules Compliance Simulation. The Equipment Certificate may be used instead of part or all of the simulations below, provided that they are provided to the Relevant Network Operator. |  |       |       |   |           | Grid-Code / D-Code            |       |                                   |   |
| 2. The model of the Power Generating Module shall demonstrate its capability to simulate fault-ride-through capability in the conditions as referred to in Article 11(3) (a).   |  |       |       |   |           |                               |       |                                   |   |
| 3. The simulation is deemed passed, provided that the model demonstrates compliance with the conditions of Article 11(3) (a) respectively.  |  |       |       |   |           |                               |       |                                   |   |
|   |  |       |       |   |           |                               |       |                                   |   |
|   |  |       |       |   |           |                               |       |                                   |   |
| Chapter 7   |  |       |       |   |           |                               |       |                                   |   |
| COMPLIANCE SIMULATIONS FOR OFFSHORE POWER PARK<br>MODULES   |  |       |       |   |           |                               |       |                                   |   |
|   |  |       |       |   |           |                               |       |                                   |   |
| Article 51  |  |       |       |   |           |                               |       |                                   |   |
| COMPLIANCE SIMULATIONS APPLICABLE TO OFFSHORE<br>POWER PARK MODULES   |  |       |       |   |           |                               |       |                                   |   |
| The Compliance Simulations as defined in Article 48 (3) and (5) as well as in Article 49(4), (5) and (7) shall apply to any Offshore Power Park Module.   |  |       |       |   |           | Grid-Code / D-Code            |       |                                   |   |
|   |  |       |       |   |           |                               |       |                                   |   |
| Chapter 8   |  |       |       |   |           |                               |       |                                   |   |
| NON BINDING GUIDANCE, MONITORING, ON<br>IMPLEMENTATION AND STAKEHOLDER INVOLVEMENT  |  |       |       |   |           |                               |       |                                   |   |
| Article 51 a  |  |       |       |   |           |                               |       |                                   |   |
| NON BINDING GUIDANCE ON IMPLEMENTATION  |  |       |       |   |           |                               |       |                                   |   |
| By [24 months after entry into force of this regulation] ENTSO-E shall prepare and thereafter regularly update non-binding guidance for its members and for other network operators on the elements of this regulation where national level decisions are required. This non-binding guidance shall explain the technical issues, conditions and interdependencies which need to be considered when determining requirements at national level.   |  |       |       |   |           | Nothing required at GB level. |       |                                   |   |



[illegible]





[illegible]



[illegible]



| Requirements for Grid Connection of Generators 14/01/2014<br>Informal Draft  | Equivalent Sections in Existing GB Codes |       |       |   | Grid Code | Changes to the GB Codes |       | ISSUE FLAGS                       |  |
|--|--|-------|-------|---|-----------|-------------------------|-------|-----------------------------------|--|
|  | D-Code v22                               | G83-2 | G59-3 | BSEN 50438<br>(micro gens)<br>and technical<br>drafts |           | Proposed location       | Notes | Code issue to<br>discuss at ECCAF | Non-code<br>issue (send<br>to DECC/Ofgem<br>)                        |
| Article 59   |  |       |       |   |           |                         |       |                                   |  |
| APPLICATION FOR CLASSIFICATION AS AN EMERGING TECHNOLOGY   |  |       |       |   |           |                         |       |                                   |  |
| 1. No later than 6 months after the entry into force of the Network Code, manufacturers of Type A Power Generating Modules shall be entitled to submit a request for classification of their Power Generating Module technology as an emerging technology to the National Regulatory Authority in the Member State in which they request their Power Generating Module technology to be classified as an emerging technology.  |  |       |       |   |           |                         |       |                                   | DECC / Ofgem to run this process, which may be a continuing process. |
| 2. Together with the request pursuant to paragraph 1 the manufacturer shall provide to the relevant National Regulatory Authority the accumulated sales of the respective Power Generating Module technology within the Synchronous Areas at the date of application for classification as an emerging technology.   |  |       |       |   |           |                         |       |                                   |  |
| 3. The request submitted pursuant to paragraph 1 shall demonstrate the compliance with the eligibility criteria set forth in Article 57(2) of this Network Code.   |  |       |       |   |           |                         |       |                                   |  |
|  |  |       |       |   |           |                         |       |                                   |  |
| ARTICLE 60   |  |       |       |   |           |                         |       |                                   |  |
| ASSESSMENT AND APPROVAL OF REQUESTS FOR CLASSIFICATION AS AN EMERGING TECHNOLOGY   |  |       |       |   |           |                         |       |                                   |  |
| 1. Within 12 months after the entry into force of the Network Code, all National Regulatory Authorities of a Synchronous Area shall decide in a coordinated manner which Power Generating Modules, if any, should be classified as an emerging technology. This coordinated decision shall take into account the opinion of the Agency, to be issued within a three month period prior to the decision of the National Regulatory Authorities, following the request of all National Regulatory Authorities of the concerned Synchronous Area. |  |       |       |   |           |                         |       |                                   | DECC / Ofgem to run this process                                     |
| 2. A list of Power Generating Module technologies approved as emerging technologies shall be published by each National Regulatory Authority of a Synchronous Area.  |  |       |       |   |           |                         |       |                                   |  |
|  |  |       |       |   |           |                         |       |                                   |  |
| ARTICLE 61   |  |       |       |   |           |                         |       |                                   |  |
| REVOCATION OF CLASSIFICATION AS AN EMERGING TECHNOLOGY   |  |       |       |   |           |                         |       |                                   |  |
| 1. Starting from the date of the decision of the National Regulatory Authority pursuant to Article 60(1), the manufacturer of any Power Generating Module technology classified as an emerging technology, shall submit on a monthly basis updates of the sales of the product by Member State in the past month to the National Regulatory Authority The National Regulatory Authority shall make publicly available the cumulative Maximum Capacity of Power Generating Modules classified as emerging technologies.                         |  |       |       |   |           |                         |       |                                   | DECC / Ofgem to run this process                                     |
| 2. In the event that the cumulative Maximum Capacity of all Power Generating Modules classified as emerging technologies connected to Networks from the date of the decision of the National Regulatory Authority pursuant to Article 60(1) exceeds the threshold established pursuant to Article 58(3), the classification as an emerging technology shall be revoked by the National Regulatory Authority. The revocation decision shall be published.   |  |       |       |   |           |                         |       |                                   |  |

