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NAP Virtual OC2 Forum 2025

02/09/2025

NESO
National Energy System Operator

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Agenda

Time	Topic	Presenter
10:00 - 10:10	Introduction	Gabriel Diaz
10:10 - 10:15	Customer update	Charlotte Horne
10:15 - 11:00	System Access Reform	Graham Stein Rich Mather
11:00 - 11:45	Constraint Management	Matt Chapman Partha Sarkar Ronny Grimaldo
11:45 - 12:15	Generator Compliance - Network Access coordination	Daniela Ferreira
12:15 – 12:35	Q&A	Ann Thoppil
12:35 – 12:40	Close	Gabriel Diaz

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Customer Update

Charlotte Horne

Customer Experience Manager

- Continue to recognise and **understand** our customers across System Operations.
- **Bi-annual customer satisfaction survey** (SATS) to gather important feedback from our customers.
- Monitor and track this data to **analyse trends** and **identify opportunities** for how we work with you.
- Continuing to mature our **customer centricity**, and how we measure and develop our key relationships.
- **Approaching next survey** to gather more recent feedback around your experiences working with NESO.
- Please keep an eye out for your opportunity to provide your valuable input later this month.

We are always open to feedback and suggestions on how we can work better together.

Please provide feedback from today via Slido.

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SYSTEM ACCESS REFORM

4

Agenda

1. An introduction to system access
2. Why there is a need for System Access Reform
3. Introduction to the System Access Reform programme
4. How we will deliver System Access Reform
5. Project overviews
6. Our ask of you
7. Q&A

ABOUT SYSTEM ACCESS REFORM

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An introduction to system access

System access planning and delivery is **the coordinated design, scheduling, and oversight of planned network outages across Great Britain's transmission system to enable:**

- Maintenance and asset replacement
- Network upgrades
- New connections

System access supports essential works being delivered on time, safely, and with minimal impact on system reliability, market operations, and the electricity consumer.

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Why there is a need for System Access Reform

Estimates indicate that transmission network build must progress at **more than four times the rate of the last decade**, **delivering twice as much in half the time** to enable the delivery of the UK Government's ambitions:

Clean Power 2030

Net Zero 2050

Energy Security

Economic Growth

This rate of transmission network build will only be possible with **an industry-wide plan and assurance on the provision of system access at the right times**.

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Introduction to the System Access Reform (SAR) programme

The system access reform programme consists of three interlinked projects. These will enable the industry **to proactively respond to key challenges for system access planning as a critical enabler of the UK Government's ambition for a cleaner and greener energy industry.**

Three Projects sit under the SAR progamme		
Transmission Acceleration	6-Year System Access Forward-Look	End-to-End System Access Transformation
Will formalise, accelerate and conclude the ongoing delivery of the 40+ actions and recommendations from the Transmission Acceleration Project response to the Electricity Commissioner's report.	Will pilot a more holistic, transparent, and stakeholder-centric planning framework for system access and the enablement of the UK Government's Clean Power 2030 objectives.	Will review the end-to-end system access approach and iteratively design scalable solutions that can accommodate the future needs of the transmission network.

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How we will deliver System Access Reform

System Access Reform has been designed as a cross-industry programme led by the **National Energy System Operator** (*NESO*), **National Grid Electricity Transmission** (*NGET*), **Scottish Power Energy Networks** (*SPEN*) and **Scottish & Southern Electricity Networks** (*SSEN*) in **collaboration with wider industry.**

A Programme Director has been appointed from NESO alongside Senior Programme Leads from each of the TOs:

Graham Stein
SAR Programme Director

John Wilson
NGET Senior Programme Lead

Martin Cammidge
SPEN Senior Programme Lead

Jim Molley
SSEN Senior Programme Lead

Multi-disciplinary teams are being formed to deliver each of the three projects, which sit under the System Access Reform programme.

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Transmission Acceleration

The Transmission Acceleration project is focused on **halving the end-to-end transmission build time from 14 years to 7 years**. The goal is to **incrementally improve access planning, scheduling, governance, data transparency and efficiency** with a set of **agreed** and **consulted actions** and **recommendations** across four strategic planning workstreams:

Outage Planning 1	Outage Planning 2	Outage Planning 3	Outage Planning 4
Winter Emergency Return to Service	SQSS Reform	Long-Term Project Design	Outage Planning Reform

Expected outcomes include:

A coordinated, monitored, and resourced delivery programme that accelerates the implementation of priority actions across planning, consenting, supply chain, workforce, financing, and stakeholder engagement.

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6-Year System Access Forward-Look

The 6-Year System Access Forward-Look project aims to establish a **rolling, strategic plan** that **captures majority of foreseeable system access requirements** over a **six-year horizon**.

The project:

- Is a critical enabler of the UK Government's Clean Power 2030 ambition
- Is designed to provide long-term certainty and coordination across the electricity transmission sector
- Complements the Connections Reform programme

Expected outcomes:

- Transparent, more efficient, and readiness-based allocation of access windows where possible
- An approach that is consistently applied across all Users and network works, based on earlier visibility of the access request pipeline

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End-to-End System Access Transformation

The End-to-End System Access Transformation project is designed **to fundamentally reimagine how system access is planned and provided across the electricity transmission network**.

Its purpose is to create a service model that:

Is digital-first

Is stakeholder-centric

Addresses the current fragmentation and inefficiencies in system access planning

Expected outcomes include:

- A strategic, stakeholder-centric, digitally-enabled approach to system access planning and provision
- A more transparent, coordinated, and resilient system access framework
- Enablement of critical UK Government ambitions including Clean Power 2030, Net Zero 2050 and Energy Security

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Our ask of you

System Access Reform **is only possible with strong collaboration across the sector.**

We want to work closely with you moving forward, to:

- ✓ Include your voice in our solution design
- ✓ Learn your existing pain points in the system access process
- ✓ Share updates on progress
- ✓ Establish feedback loops regarding solution design
- ✓ Provide early insight into opportunities and potential challenges to navigate as part of System Access Reform

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Constraints & Constraints Actions

Matt Chapman &
Partha Sarkar

NESO
National Energy System Operator

What is a constraint?

A way of representing pre- or post-fault network congestion based on the capability of transmission lines to transfer power (MW) from A to B. The degree to which this is possible will be the constraint limit.

Position of the boundary:

- Cuts through the critical fault
- Cuts through the critical overload
- Encompasses "effective" plant

"Effective Plant":

- Generators driving an overload
- Demand driving an overload
- Reactive equipment
- Substations with effective running arrangements
- Quad-boosters & SSSCs

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Types of constraint

Thermal

Limited by the power capacity of the transmission line

Can be export or import

Voltage

Limited by SQSS steady-state or step-change limit

More onerous in areas with a lack of reactive compensation

Stability

Limited by the rotor angle stability of synchronous generators

Is becoming more onerous with lower system inertia

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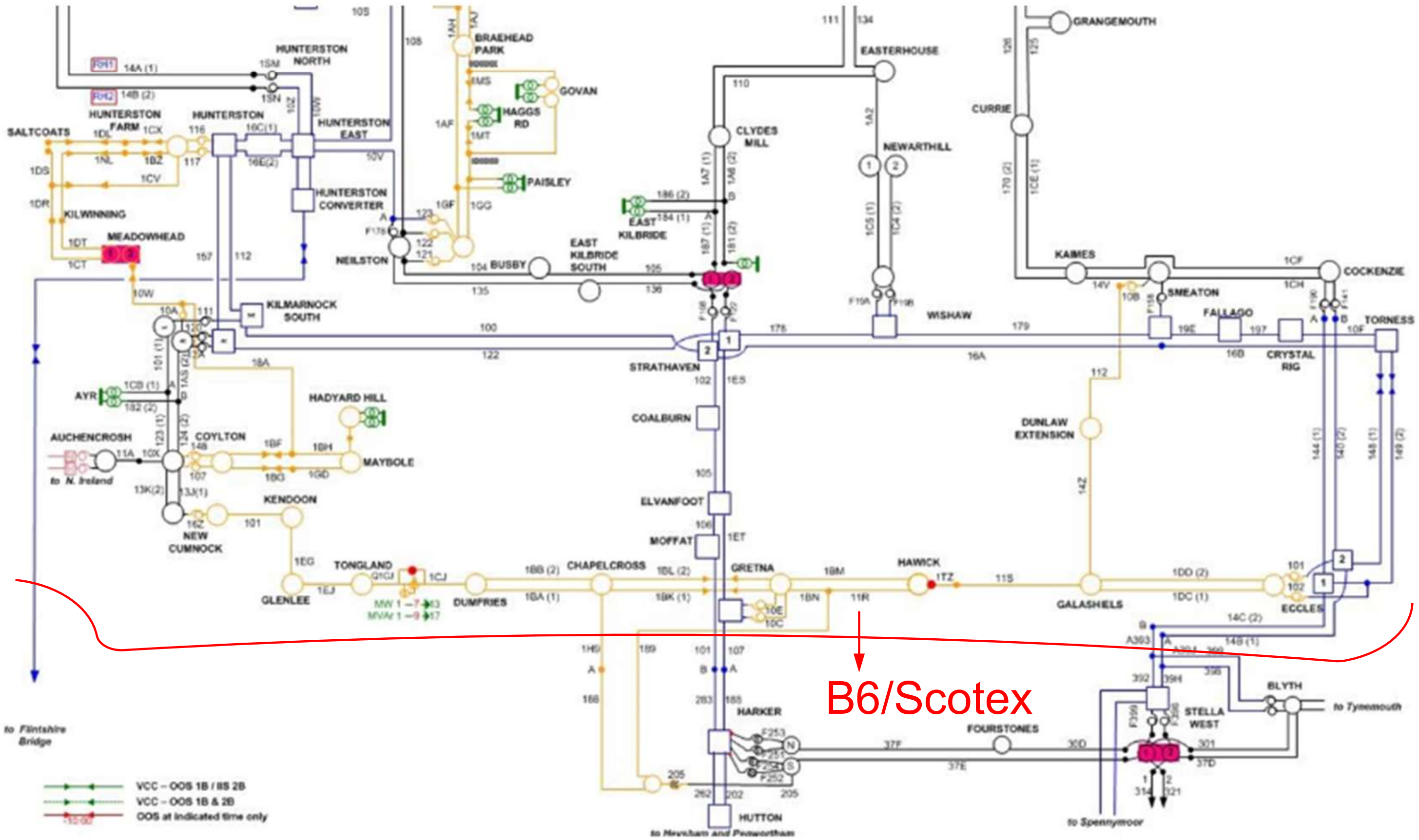
B6 Constraint – Anglo-Scottish Border

- Typically, a thermal export constraint.
- Often a stability constraint during Winter – based on the transient stability of synchronous generators.
- Can also be a voltage constraint.
- Consists of 2x 400kV AC Double Circuits and the Western Link HVDC.



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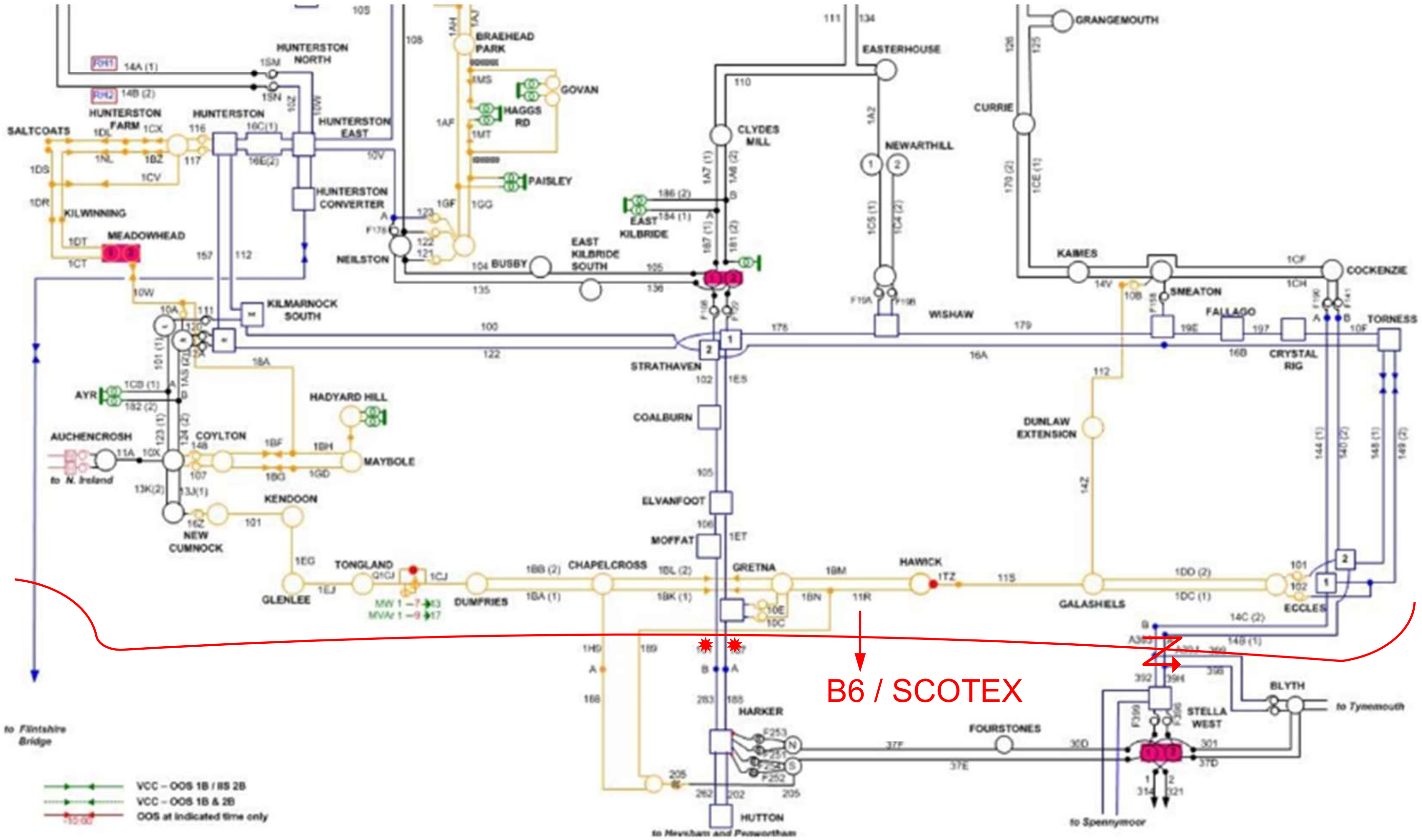
Thermal constraint on B6

- Firstly, ensure pre-fault power transfer is within the thermal capability of circuits
- Consider a double circuit fault on the East OR West Coast double-circuit.
- The generation in Scotland does not change immediately and now flows down the West OR East Coast double circuit and the Western Link HVDC.



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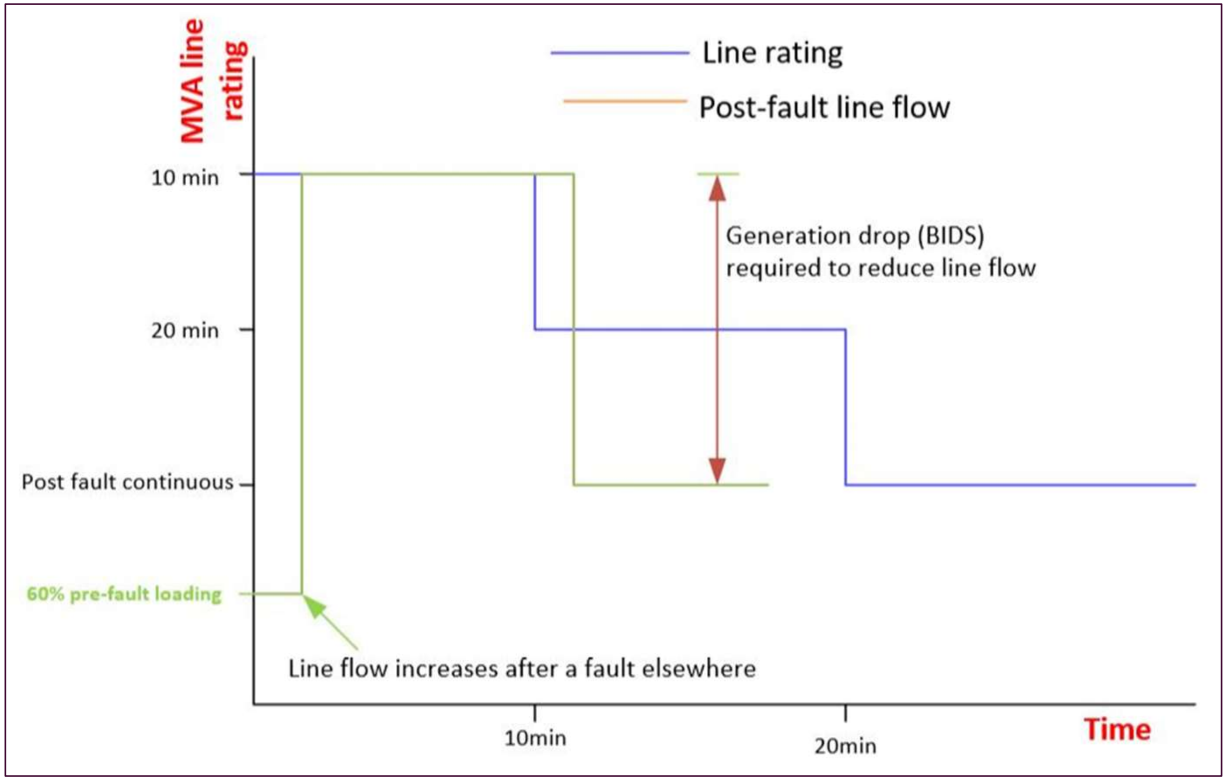
Post-fault loading of a thermal constraint on B6

- Circuits typically have 10-minute and 20-minute short term ratings, as well as a “post-fault continuous” rating which is 100% of the circuit’s capacity.
- Short term ratings are based off the temperature of the conductor – this is a product of insulating temperature (typically air) and electrical current flowing through the circuit.



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Post fault actions

Following a fault, control room will take actions to return circuits below 100% rating

Change substation running arrangement either by closing or opening switch

Reduce generation based on cost order and its effectiveness on the overload and to balance will need to increase generation elsewhere

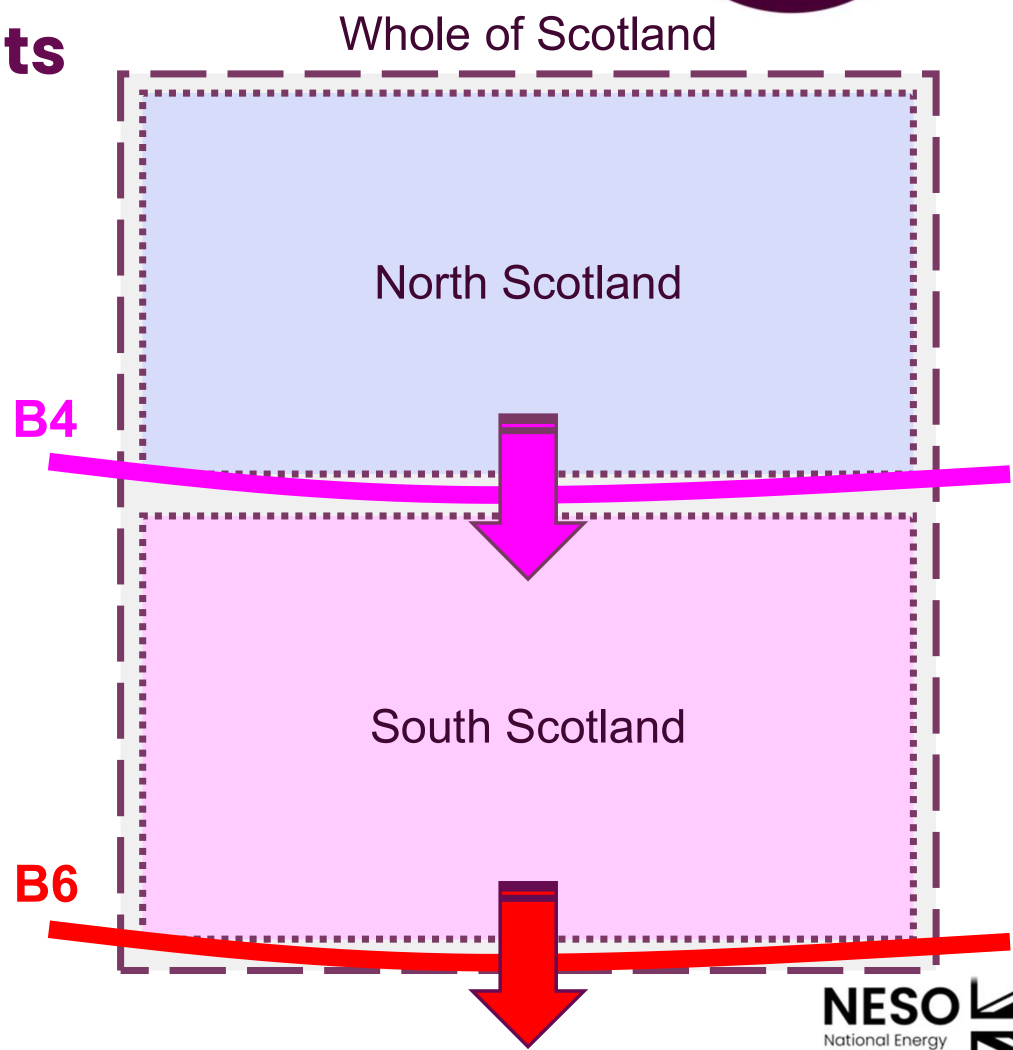
Change Quad Booster (Phase shifter) tap position

Constraints behind constraints

For a thermal constraint, if bids are taken in North Scotland instead of South Scotland, both the B4 and B6 constraints can be resolved in a single action. Although bids will still be taken in cost merit order to provide the highest level of customer value.

In the 2024-25 Fiscal year, B4 was the costliest and most constrained boundary on the network, hence, there has been a lower wind capacity within the whole of B6 after securing to the B4 limit.

Therefore, B6 is far less likely to be an active constraint and real-time, and this has contributed to the infrequent arming of the B6 inter-trip over the past 12-18 months.



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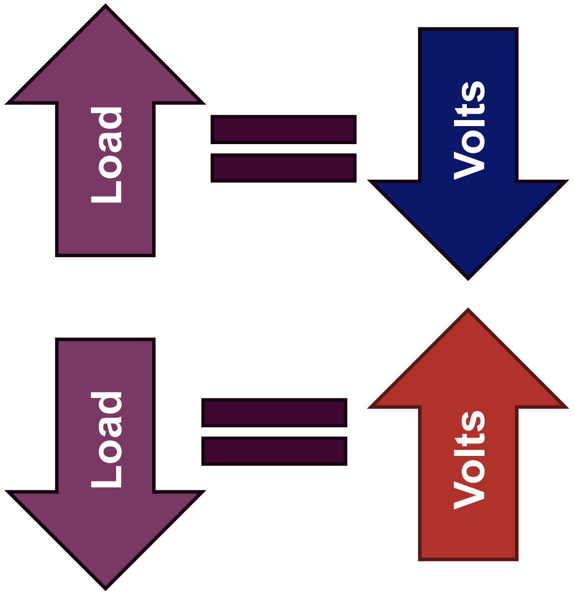
Causes of Voltage and Stability constraints on B6

Unlike a thermal constraint, unacceptable voltage or generator instability must be avoided completely with pre-fault action or resolved immediately by automatic action to ensure that voltage standards are not breached.



Voltage Issues

High voltage issues on the transmission system are also driven by **low load** and **high embedded generation**.

Low voltage issues on the transmission system are typically seen post-fault due to **high thermal loading**.

Rotor Angle Stability

Low voltage (<1.00 per unit) in the region. Typically, a region with low interconnection and high power transfer.

Post-fault, a **longer fault clearance time** will cause **greater instability** to the generator.

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Resolving Constraints around B6

Pre-Fault

- Maximise Westen HVDC link loading to its full capacity
- Insert series capacitors located east & west coast double circuits as it helps to reduce the line impedance and increases transfer capability

Post-Fault

- Arm Anglo Scottish auto close scheme (ASACS) shunt capacitors - these shunt capacitors switches in following fault to improve voltage and helps power transfer
- Arm wind-farms on inter-trip to further increase power transfer capability
- When all actions are exhausted bids (based on merit cost order) are taken to reduce power transfer to the desired limit

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Constraints Forecasting & Optimisation

Ronny Grimaldo

NESO
National Energy System Operator

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Aim of Presentation

- **Sanction Costing Process**
    - Inputs for Cost Assessment
    - Costing Tool
- **SO:TO Optimisation Incentive (STCP11.4)**
    - ODI Service Type
    - How money is saved
- **Commercial Contracts**
    - Contract Process

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Sanction Costing Process

- CF&O collaborates with network planners to assess and process outage requests submitted by Transmission Owners.
- Key steps include:
  - Assessment with and without proposed outages
  - Submission of requests and TO justifications to the Constraint Forecast & Optimisation (CF&O) team.
  - Constraint Cost assessment calculation using technical and market data
  - Drafting Sanction Paper - Balancing consumer benefits and system costs
  - Approvals required according to Delegation of Authority
  - Upon Approval - Final sign-in of the outage into the system plan

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Inputs to Perform Cost Assessment per Boundary

- Duration of the Outage & Emergency Return to Service (ERTS) parameters
- Wind Capacity and expected Generation Profile:
  - Generator Outage & Generator Operational Data (MEL,SEL,MNZT,MZT,NDZ)
  - Market Intelligence. (Argus Report/Internal Market Report)
  - Historical Generation Profile & ENCC daily Operational report.
  - Wind Forecast
- Conventional Generation Capacity Available
  - SEL (Export Constraint)
  - MEL (Import Constraint)
- Market Data:
  - Bid Prices (Export Constraint)
  - Offer Prices (Import Constraint)
  - Replacement Cost.
- Assessment Data:
  - Constrain Limit with Outage
  - Constraint Limit without Outage
  - Demand Profile

Costing Tool Example for Export Constraint Cost

Tools are available for both export and import constraint cost calculations, ensuring accurate financial forecasting

Constraint Name	Boundary		
Outage Duration	10 days		
Wind Capacity	2950MW		
Accessible wind	2000MW		
Wind Location	E&W		
Load Factor	February		
	1	2	3
Profile Block Length	8h	8h	8h
Constraint limit	7450MW	7450MW	7450MW
Intact limit	8750MW	8750MW	8750MW
Constraint Generation	6600MW	4500MW	2000MW
Constraint SEL	4000MW	4000MW	2000MW
Generation Bids	£60/MWh	£60/MWh	£60/MWh
Wind Bids	-£95/MWh	-£95/MWh	-£95/MWh
Replacement Cost	£90/MWh	£90/MWh	£90/MWh
Demand	360MW	270MW	180MW
			DO NOT CHANGE DATA IN ROW
Is the outage operationally secure?	secure	secure	secure
total pullback available	4600	2500	2000
total pullback required	1740	0	0
contingency			

Outage Cost	Forecast	100% Wind	0% Wind
Daily	£ 50,766.19	£ 312,000.00	£ -
Duration	£ 507,661.90	£ 3,120,000.00	£ -

		Forecast						
Load Factor	Probability	1	2	3	4	5	6	Total
0.00	2.03%	£ -	£ -	£ -	£ -	£ -	£ -	£ -
0.05	11.66%	£ -	£ -	£ -	£ -	£ -	£ -	£ -
0.10	8.91%	£ -	£ -	£ -	£ -	£ -	£ -	£ -
0.15	8.18%	£ -	£ -	£ -	£ -	£ -	£ -	£ -
0.20	9.29%	£ -	£ -	£ -	£ -	£ -	£ -	£ -
0.25	6.80%	£ -	£ -	£ -	£ -	£ -	£ -	£ -
0.30	6.81%	£ -	£ -	£ -	£ -	£ -	£ -	£ -
0.35	6.39%	£ -	£ -	£ -	£ -	£ -	£ -	£ -
0.40	6.79%	£ -	£ -	£ -	£ -	£ -	£ -	£ -
0.45	6.53%	£ 1,841.34	£ -	£ -	£ -	£ -	£ -	£ 1,841.34
0.50	4.36%	£ 2,771.00	£ -	£ -	£ -	£ -	£ -	£ 2,771.00
0.55	3.90%	£ 3,864.76	£ -	£ -	£ -	£ -	£ -	£ 3,864.76
0.60	2.82%	£ 3,794.49	£ -	£ -	£ -	£ -	£ -	£ 3,794.49
0.65	3.33%	£ 5,661.97	£ -	£ -	£ -	£ -	£ -	£ 5,661.97
0.70	3.29%	£ 6,747.02	£ -	£ -	£ -	£ -	£ -	£ 6,747.02
0.75	1.92%	£ 4,612.41	£ -	£ -	£ -	£ -	£ -	£ 4,612.41
0.80	0.84%	£ 2,308.82	£ -	£ -	£ -	£ -	£ -	£ 2,308.82
0.85	1.94%	£ 6,042.04	£ -	£ -	£ -	£ -	£ -	£ 6,042.04
0.90	1.20%	£ 3,733.71	£ -	£ -	£ -	£ -	£ -	£ 3,733.71
0.95	1.82%	£ 5,691.18	£ -	£ -	£ -	£ -	£ -	£ 5,691.18
1.00	1.19%	£ 3,697.46	£ -	£ -	£ -	£ -	£ -	£ 3,697.46
Total	100.00%	£ 50,766.19	£ -	£ -	£ -	£ -	£ -	£ 50,766.19

ERTS	6
Exposure	£585,661.90

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Costing Tool Example for Import Constraint Cost

Constraint Name	Name
Outage Duration	10 days
Wind Capacity	1500MW
Accessible wind	1350MW
Wind Location	Scotland
Load Factor	September

	P		
	1	2	3
Profile Block Length	8h	8h	8h
Constraint limit	2350MW	2350MW	2350MW
Intact limit	2500MW	2500MW	2500MW
Constraint Generation	500MW	500MW	500MW
Constraint MEL	2000MW	2000MW	2000MW
Generation Offers	£150/MWh	£150/MWh	£150/MWh
Replacement Cost	£60/MWh	£60/MWh	£60/MWh
Demand	3500MW	2625MW	1750MW

DO NOT CHANGE DATA IN ROW

Is the outage operationally secure?	secure	secure	secure
total pullon available	1500	2850	2850
total pullon required	650	0	0
extra pull-on required			

Outage Cost	Forecast	0% Wind	100% Wind
Daily	£ 76,093.75	£ 108,000.00	£ -
Duration	£ 722,890.63	£ 1,026,000.00	£ -

		Forecast						
Load Factor	Probability	1	2	3	4	5	6	Total
0.00	0.01%	£ 9.37	£ -	£ -	£ -	£ -	£ -	£ 9.37
0.05	19.01%	£ 20,531.25	£ -	£ -	£ -	£ -	£ -	£ 20,531.25
0.10	12.39%	£ 13,378.13	£ -	£ -	£ -	£ -	£ -	£ 13,378.13
0.15	8.78%	£ 9,487.50	£ -	£ -	£ -	£ -	£ -	£ 9,487.50
0.20	8.81%	£ 9,515.63	£ -	£ -	£ -	£ -	£ -	£ 9,515.63
0.25	8.39%	£ 9,065.63	£ -	£ -	£ -	£ -	£ -	£ 9,065.63
0.30	6.45%	£ 6,965.63	£ -	£ -	£ -	£ -	£ -	£ 6,965.63
0.35	5.73%	£ 5,156.25	£ -	£ -	£ -	£ -	£ -	£ 5,156.25
0.40	5.51%	£ 1,984.38	£ -	£ -	£ -	£ -	£ -	£ 1,984.38
0.45	5.89%	£ -	£ -	£ -	£ -	£ -	£ -	£ -
0.50	4.81%	£ -	£ -	£ -	£ -	£ -	£ -	£ -
0.55	3.95%	£ -	£ -	£ -	£ -	£ -	£ -	£ -
0.60	3.53%	£ -	£ -	£ -	£ -	£ -	£ -	£ -
0.65	2.34%	£ -	£ -	£ -	£ -	£ -	£ -	£ -
0.70	1.83%	£ -	£ -	£ -	£ -	£ -	£ -	£ -
0.75	1.41%	£ -	£ -	£ -	£ -	£ -	£ -	£ -
0.80	0.88%	£ -	£ -	£ -	£ -	£ -	£ -	£ -
0.85	0.26%	£ -	£ -	£ -	£ -	£ -	£ -	£ -
0.90	0.02%	£ -	£ -	£ -	£ -	£ -	£ -	£ -
0.95	0.00%	£ -	£ -	£ -	£ -	£ -	£ -	£ -
1.00	0.00%	£ -	£ -	£ -	£ -	£ -	£ -	£ -
Total	100.00%	£ 76,093.75	£ -	£ -	£ -	£ -	£ -	£ 76,093.75

ERTS	6
Exposure	£749,890.63

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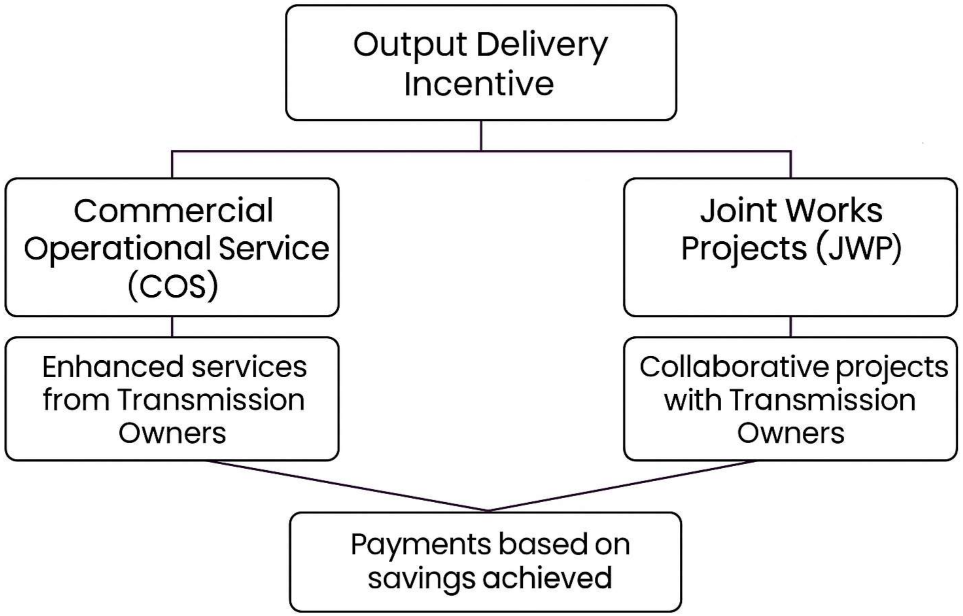
STCP11.4 – Enhanced Service Provision Process

- STCP11.4, guided by OFGEM's Output Delivery Incentives (ODIs), incentivizes Electricity Transmission Owners (ETOs) to work with NESO to proactively reduce constraint costs
- The STCP11.4 specify the procedures and process associated with buying a service.
- Service Type:
  - Commercial Operational Service (COS)
  - Joint Works Projects (JWP)
- Services are applicable to both long-term (years 1–6) and in-year (year 0) planning timescales
- Initiatives may be proposed by either NESO or TO.

STCP11.4 ODI Service Type



- COS may include, but is not limited to:
  - Temporary bypass circuit breaker or circuits (topology changes).
  - Off-line build rather in-line build
  - Temporary Intertripping schemes.
  - Dynamic Line Rating (DLR) technology

- JWP may include, but is not limited to:
  - Transmission Upgrades
  - Shared investment in technologies
  - Schemes to improve system operability
  - Integration of services across boundaries or regions.

- Services Providers include:
  - SP Transmission Plc
  - Scottish Hydro Electric Transmission Plc
  - National Grid Electricity Transmission Plc

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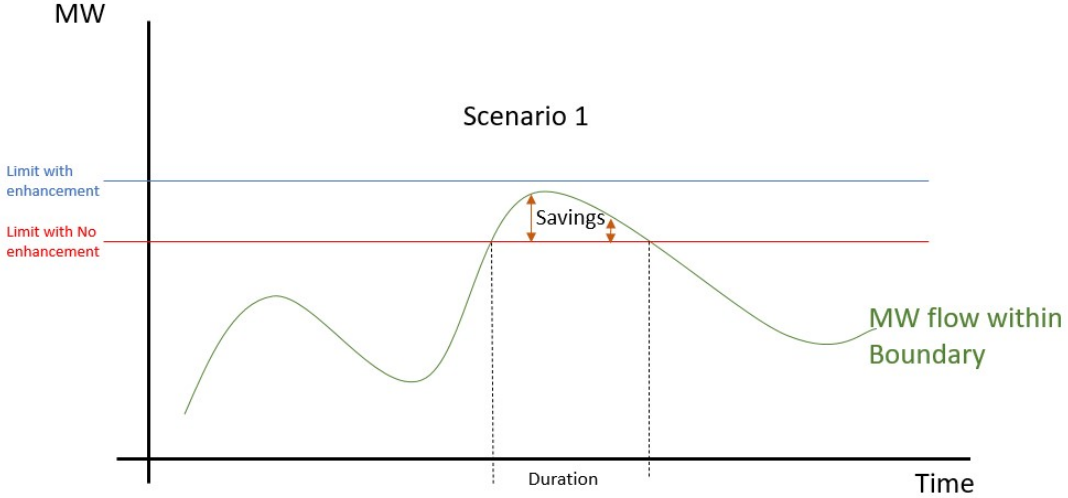
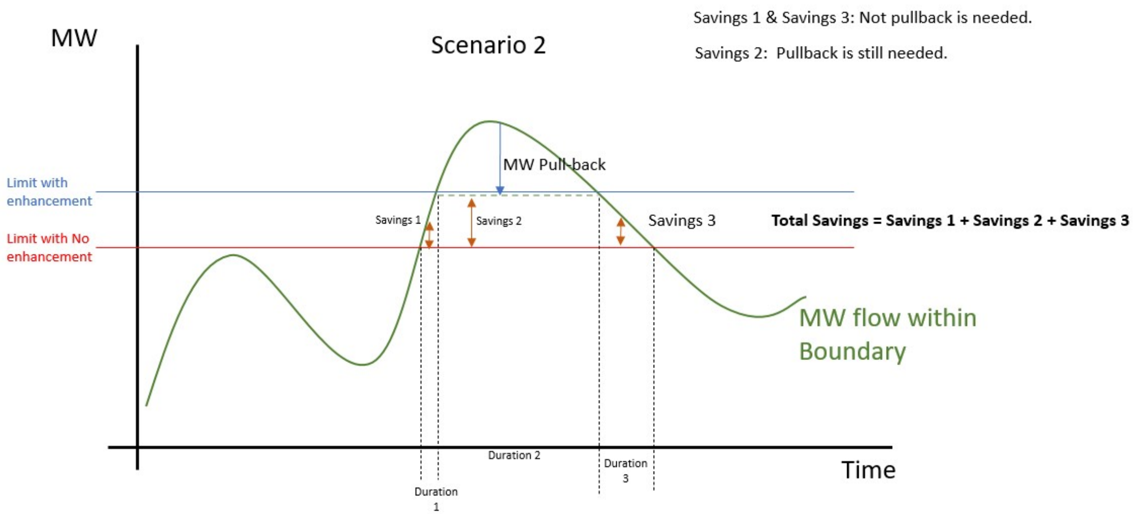
How Money is saved using STCP11.4 – Enhanced Service Provision Process





- ETOs Reward Calculation comprises 50:50 weighting on Forecast Savings and Outturn Savings with a 90:10 sharing factor in favour of consumers

- NESO looking into extend the STCP11.4 process to the whole of GB (DNOs, DCCs, DERs & DSO).

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Commercial Contract Arrangements

- NESO manages contracts for:
  - Generation Disconnection.
  - Managing Import/export Constraint.
  - Voltage Support.
  - Commercial Intertrip

- Type of Contracts:
  - Optional.
  - Firm

- Reasons to pursue a Contract:
  - Reduce Balancing and Constraint Costs.
  - NESO can secure competitive prices through advance agreement rather than instructing a generator in the BM.

Contract Process

- Process Steps:
  - Identification of system requirement via planning .
  - Preparation of a requirement paper by the CF&O team
  - Initiation of tender process by the Contract Manager
    - Publish Requirement.
    - Open Tender
    - Tender Submission deadline
    - Assessment of tender submissions and selection of service provider by CF&O.
    - Approval of Sanction Paper and publication of contract award
    - Drafting, revision, and signing of contract to commence service delivery.

Information on the Future Development of the System

Electricity Ten Year Statement (ETYS) | NESO

The Electricity Ten Year Statement (ETYS) is NESO's view of future transmission requirements and the capability of Great Britain's National Electricity Transmission System (NETS) over the next ten years.

The ETYS is important in helping us to understand where investment and development are needed to help us achieve our net zero ambitions. Our key messages explain that the key system needs insights from our latest Future Energy Scenarios (FES) analysis.

Holistic Network Design for Offshore Wind | NESO

The Holistic Network Design (HND) is a first of its kind, integrated approach for connecting 23GW of offshore wind to Great Britain.

By considering future offshore generation out to 2030, infrastructure can be planned to bring power to the grid cohesively, ensuring maximum benefit for consumers, local communities and the environment.

The HND provides a recommended offshore and onshore design for a 2030 electricity network, that facilitates the Government's ambition for 50GW of offshore wind by 2030

Transitional Centralised Strategic Network Plan (tCSNP) | NESO

We have been enhancing our approach to planning the GB electricity transmission network through a series of transitional CSNPs. These are a bridge to the enduring CSNP and also perform the role of the Network Options Assessment (NOA).

The tCSNP provides our recommendation for which network reinforcement projects should receive investment, and when. While we provide economic recommendations that will enable the flow of electricity around the transmission system to facilitate the evolving energy landscape, we are not responsible for making the final decision on what, where, and when to invest.

Web Map | NESO

Our interactive network map showcases our network recommendations for Great Britain's electricity transmission system, reflecting the latest insights from Beyond 2030. The map is for illustrative purposes only

Future Energy Scenarios | NESO

Future Energy Scenarios (FES) 2025: Pathways to Net Zero provides an independent view of a range of future pathways for the whole energy system, exploring a range of routes to net zero in 2050 for energy demand and supply.

It has become an important publication in the energy sector and is the result of a programme of close engagement with stakeholders across the industry, alongside our own extensive research and analysis

Strategic Spatial Energy Planning (SSEP) | NESO

Strategic Spatial Energy Planning will help speed up the journey for Great Britain to switch to clean, affordable and reliable energy. It will do this by giving businesses, investors, people, and government a clearer picture of what our future energy system will look like.

The SSEP will provide a pathway for electricity and hydrogen generation and storage types, locations, capacities, and timings.

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Generator Compliance – Network Access Coordination

Daniela Ferreira

NESO
National Energy System Operator

Contents

1. Why Compliance Matters
2. Grid Code and Technical Requirements
3. Impact of Compliance on Network Access Planning

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1. Why Compliance Matters

Compliance Enabling Net Zero

All customers that are party to a Bilateral Agreement and Construction Agreement with NESO in respect of a new generation connection will be required to demonstrate compliance with the relevant requirements of these agreements together with the relevant requirements of the Grid Code prior to receiving Operational Notifications for their connection.

The Compliance process ensures the reliable integration of **new generation** into the GB electricity system, embracing **new technologies** while maintaining **security and resilience** to support the transition to a **Net Zero Energy System**.

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Inside NESO: Delivering Compliance Together

Engineering Compliance

NAP and ENCC

System access requirements, switching programmes, IET

Engineering & Customer Solutions Teams (*1)

Policy definition, SSO, Pathfinder projects, RMS and EMT modelling

Connections Compliance Managers

Overall process coordination, customer liaison, EON/ION/FON certification process

Other System Operations Teams (*2)

BMU registration, Metering, EDL/EDT, System monitoring, black start

Contract Managers

Connection Offer Agreement, supported by COAT for contract technical content

Market Services

Generation and Margin registration, DRC review, MSA / ASA / CSA contracts

*1 includes:
- Operability Policy,
- Operability Product,
- Operability Innovation,
- Network Data & Modelling,
- COAT

*2 includes:
- Systems Support and Insight,
- Technical Operations Policy,
- System Restoration

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Role of Engineering Compliance

- Support Customer Engagement Meetings
- Compliance Seminars
- Provide Guidance and Compliance Statement
- Address Customer Queries Related to Technical Aspects of the Compliance Process

- Review DRC Schedules Submissions
- Review Simulation Studies Reports
- Review RMS and EMT Models and Supporting Documentation
- Witness Factory Testing (HVDC Links and Grid Forming Inverters)
- Confirm GC compliance for ION (A&B)

- Witness Site Testing (Sync Plant – AVR/PSS)
- Review Compliance Testing Data Submissions
- Review Final Model Validation Report
- Complete MSA Table
- Confirm GC compliance for FON certificates

- Compliance Repeat Plan – Data Review
- Generator Fault Ride Through Investigations
- Loss of Infeed – Generator Response Investigations

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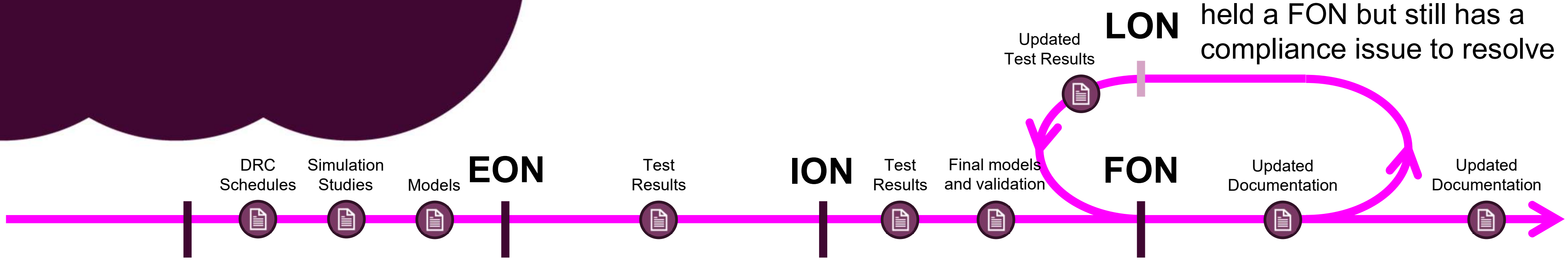
The Compliance Journey

Limited
Operational
Notification
is issued to a site that once held a FON but still has a compliance issue to resolve



Inaugural Meeting

Energisation **O**perational **N**otification is needed for the **first energisation** of a new connection

Interim **O**perational **N**otification is needed for the **first export** to the NETS for a new generator connection

Final **O**perational **N**otification is issued when all compliance issues have been resolved

User Data Submission
UDFS = User Data File Structure

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2. Grid Code and Technical Requirements

Public

Simulation Studies

CP.A.3/ECP.A.3

- Power System Stabiliser (PSS) Tuning
- Reactive Capability across the Voltage Range
- Voltage Control and Reactive Power Stability
- Fault Ride Through (FRT) and Fast Fault Current Injection (FFCI)
- Frequency Control (Load Rejection, LFSM-O, LFSM-U, FSM and de-load)
- Voltage and Frequency Controller Model Verification and Validation
- Sub-Synchronous Resonance Control and Power Oscillation Damping Control for HVDC System
- Grid Forming Plant Verification and Validation

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Control System Model Requirements

PC.A.9

Three months prior to issuing an **ION**, or one month before issuing a **LON**, the below will need to submitted:

- RMS & EMT Models
- User Guide
- Model Verification and Validation Report

User Connection Type	RMS Model	EMT Model
Directly Connected	☑	☑
Bilateral Embedded Generator Agreement (BEGA) - Large	☑	☑
Bilateral Embedded Generator Agreement (BEGA) - Medium	☑	☐
Bilateral Embedded Generator Agreement (BEGA) - Small	☐	☐
Bilateral Embedded Licence exemptible Large power station Agreement (BELLA)	☑	☑
Licence Exemptible Embedded Medium Power Stations (LEMPS)	☑	☐

- The RMS model must be **open source**. The use of any "black boxes", encrypted code, or external DLLs is not acceptable. The model can be either user-specific or a standard type, such as WEC, IEEE, or IEC.
- Prior to receiving a **FON**, a model validation study against compliance test results must be provided. This should be submitted within 3 months of the Compliance Tests being completed.
- Multiple teams must review and approve the models before an ION can be issued.
- NESO is required to share models with Transmission Owners (TOs) as mandated by the System Operator Transmission Owner Code (STC).

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Compliance Testing

ECP.A.5 – Synchronous

ECP.A.6 – Power Park Modules

ECP.A.7 – HVDC Equipment

Reactive Capability

Voltage Control

Frequency Response

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Compliance Testing

ECP.A.5 – Synchronous

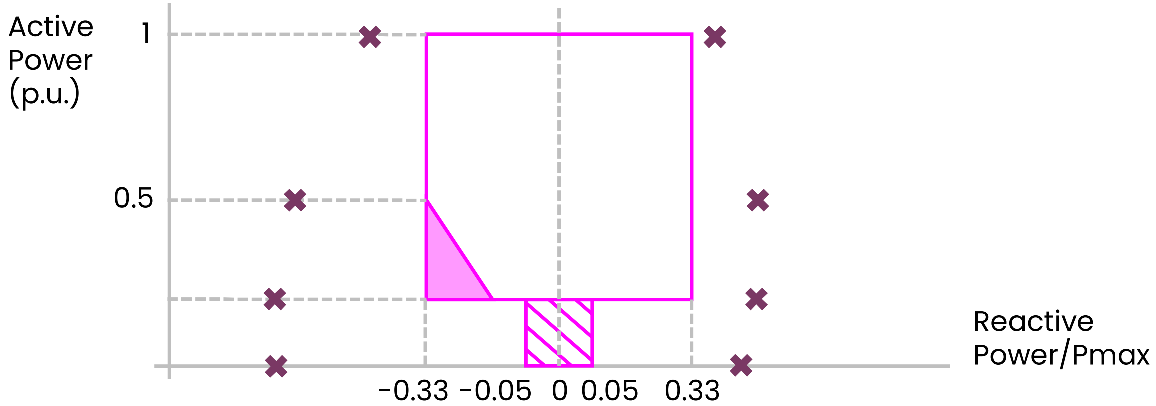
ECP.A.6 – Power Park Modules

ECP.A.7 – HVDC Equipment

Reactive Capability

Voltage Control

Frequency Response



Voltage

- A large enough voltage step to induce maximum lagging reactive power (sustained for test specific times)
- A large enough voltage step to induce maximum leading reactive power (sustained for test specific times)

Active Power

- 100% output (no less that 85%)
- 50% of rated maximum power
- 20% of rated maximum power
- 0% output (or DMOL)
- Steady active power output should be achieved for the duration of each test

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Compliance Testing

ECP.A.5 – Synchronous

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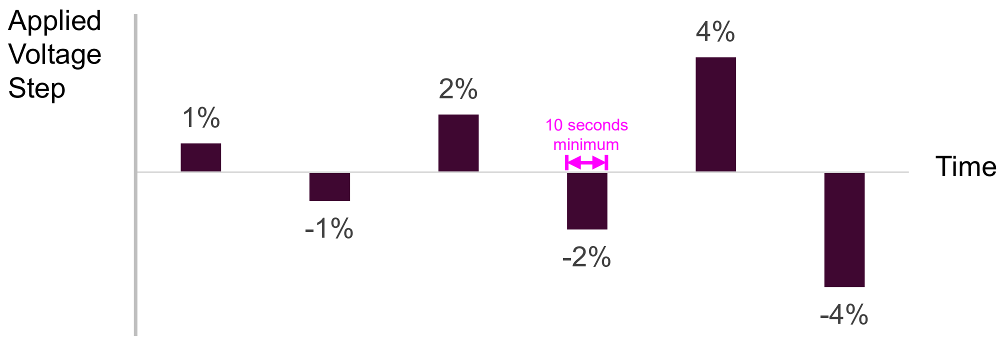
Voltage Control

Frequency Response



Droop

- The response must align with the droop setting, which must be initially set to 4%.
- A tolerance of ±0.5% is permitted, allowing a range between 3.5% and 4.5%.

Reactive Power Response Time

- Reactive power must begin responding within 0.2 seconds of voltage step injection.
- 90% of the reactive power change must be achieved within 1 second.
- Steady-state conditions must be reached within 5 seconds (or 2 seconds).

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Compliance Testing

ECP.A.5 – Synchronous

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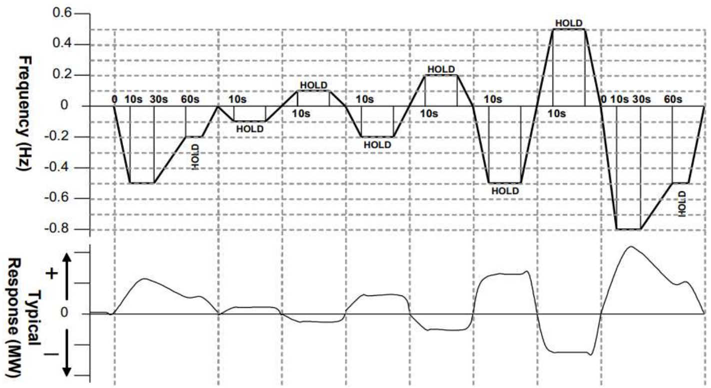

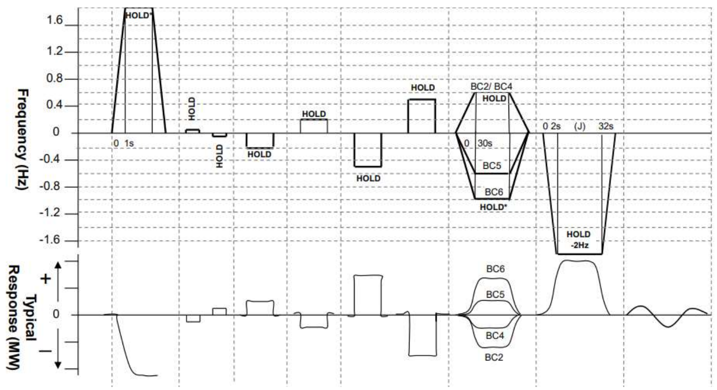

Primary Response

- The minimum level of MW response achieved between 10 - 30 seconds of the initial frequency fall.

Secondary Response

- The minimum level of MW response achieved between 30 seconds and 30 minutes of the initial frequency fall.

High Frequency Response

- The amount of MW response that is provided 10 seconds after the initial frequency increase.

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3. Impact of Compliance on Network Access Planning

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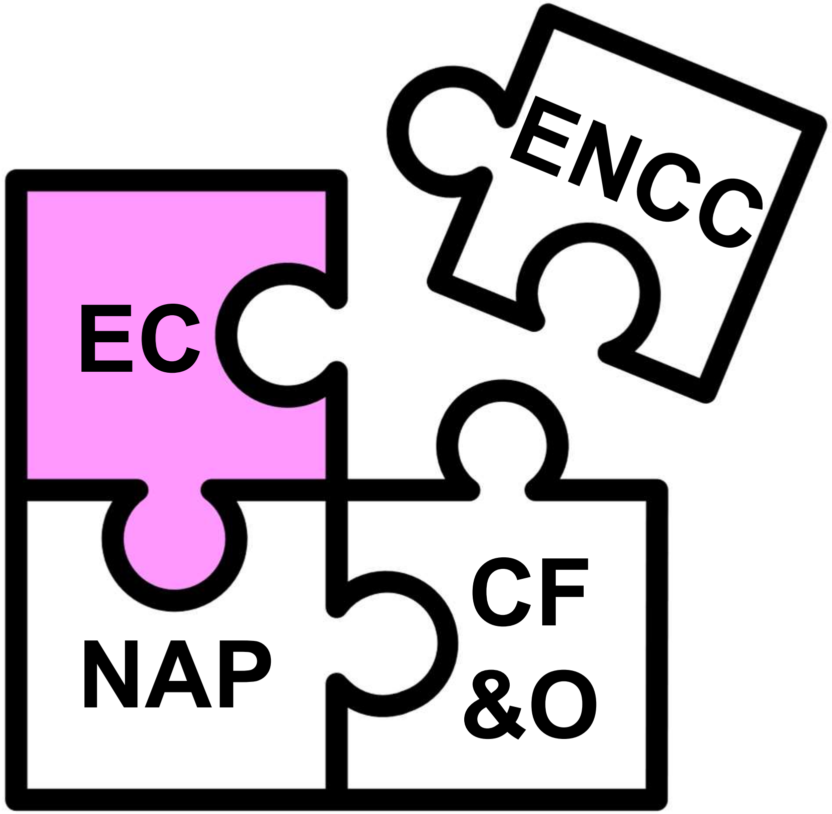
Integral Equipment Test

Any non-compliance, such as unapproved simulation studies or models, may result in **delays** to the testing schedule.

Joint Approval



EC = Engineering Compliance
ENCC = Electricity National Control Centre
NAP = Network Access Planning
CF&O = Constraints Forecasting and Optimisation

If any issues are encountered with the test results, the tests may need to be **repeated and rebooked**.

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Long Term Compliance

Both processes help secure appropriate generator behaviour and maintain representative models for accurate system studies.

The **Compliance Repeat Plan** (CRP) ensures generators remain compliant with Grid Code and Bilateral Agreement requirements by requiring updated data and self-certification of compliance every five years post-FON.

Fault investigations enable identification of FRT and FFCI compliance issues not detectable through site tests.

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Questions

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National Control Visits

Upcoming Visits:

- Wednesday October 1st, 2025
- Monday November 24th, 2025

Agenda:

- ➢ Operational Planning (NAP) Presentation (1 hour)
- ➢ Electricity National Control Centre Overview (1 hour)
- ➢ Visit to the Control Room Gallery (30 minutes)

For more info please contact Ann.Thoppil@neso.energy

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Thank you!

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