

# HVDC Integration Challenges in North of Scotland



**Scottish & Southern**  
Electricity Networks

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TRANSMISSION

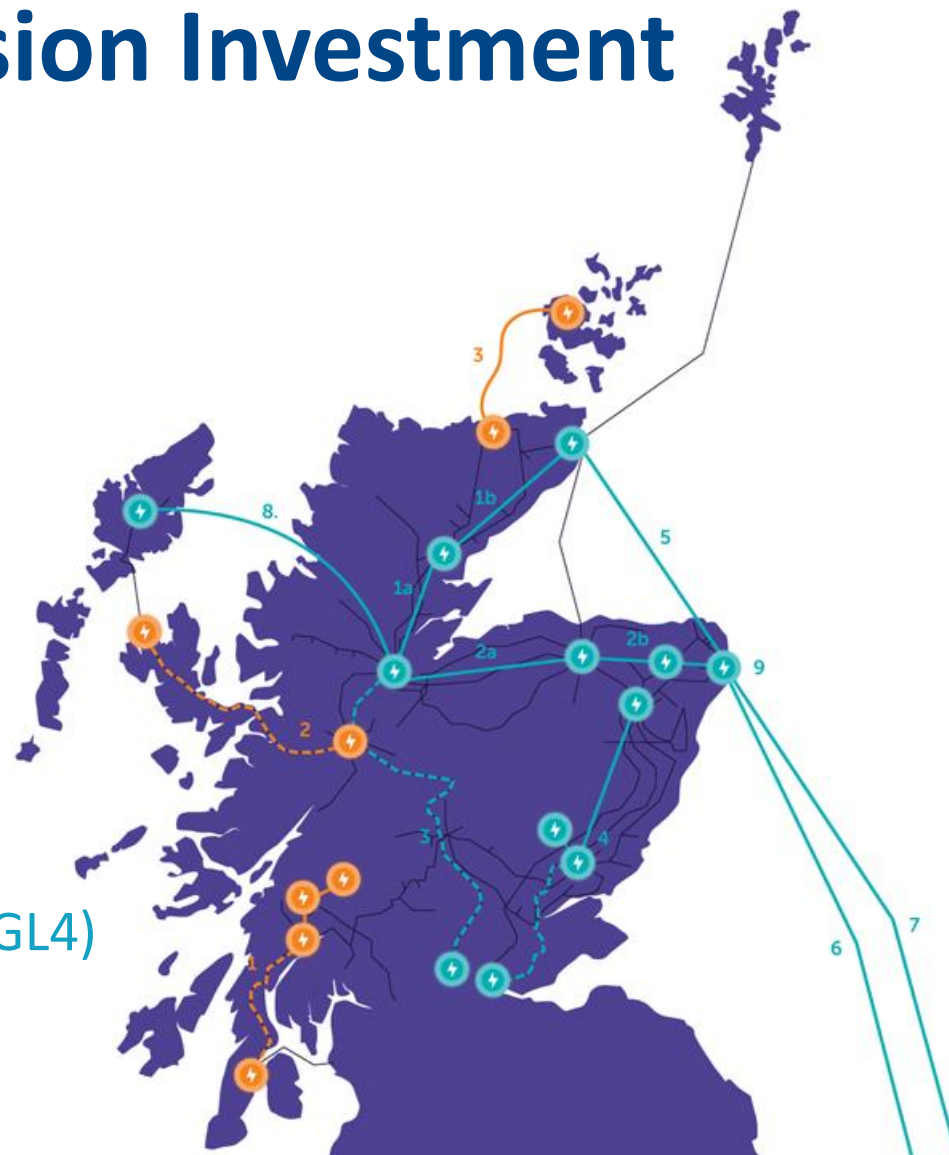
# Overview

- ASTI – Pathway to 2030 Investments
- System Integration Challenges
- Eastern Green Link 2
- What are we doing?
- Q&A opportunity

# Accelerated Strategic Transmission Investment

## Pathway to 2030 Investments

- 1a Beauly to Loch Buidhe 400kV Reinforcement
- 1b Loch Buidhe to Spittal 400kV Reinforcement
- 2a Beauly to Blackhillock 400kV Double Circuit
- 2b Blackhillock to Peterhead 400kV Double Circuit
- 3 Beauly to Denny 275kV circuit to 400kV
- 4 East Coast Onshore 400kV Phase 2 Reinforcements
- 5 Spittal to Peterhead 2GW HVDC Subsea Link
- 6 Peterhead to Drax 2GW HVDC Subsea Link (EGL2)
- 7 Peterhead to South Humber 2GW HVDC Subsea Link (EGL4)
- 8 Arnish to Beauly 1.8GW HVDC Western Isle Link
- 9 Aquila Pathfinder – Peterhead DC Switching Substation





# System Integration Challenges

- The network will see the development of:
  - Multiple HVDC Links
  - FACTS devices
  - Large level of on and offshore generation
  - New 400kV AC circuits
- This carries the complexity of integrating so many complex devices (in such a small geographical area)
  - Large number of different equipment vendors
  - Three TO owned converter stations and a third-party converter station at Peterhead
  - Several offshore wind farms and battery storage systems connecting in the New Deer/Peterhead area
- Overlapping design programmes
  - Generation and TO projects on different development programmes
  - This presents high likelihood of mismatch in availability of models and other information

# System Integration Challenges

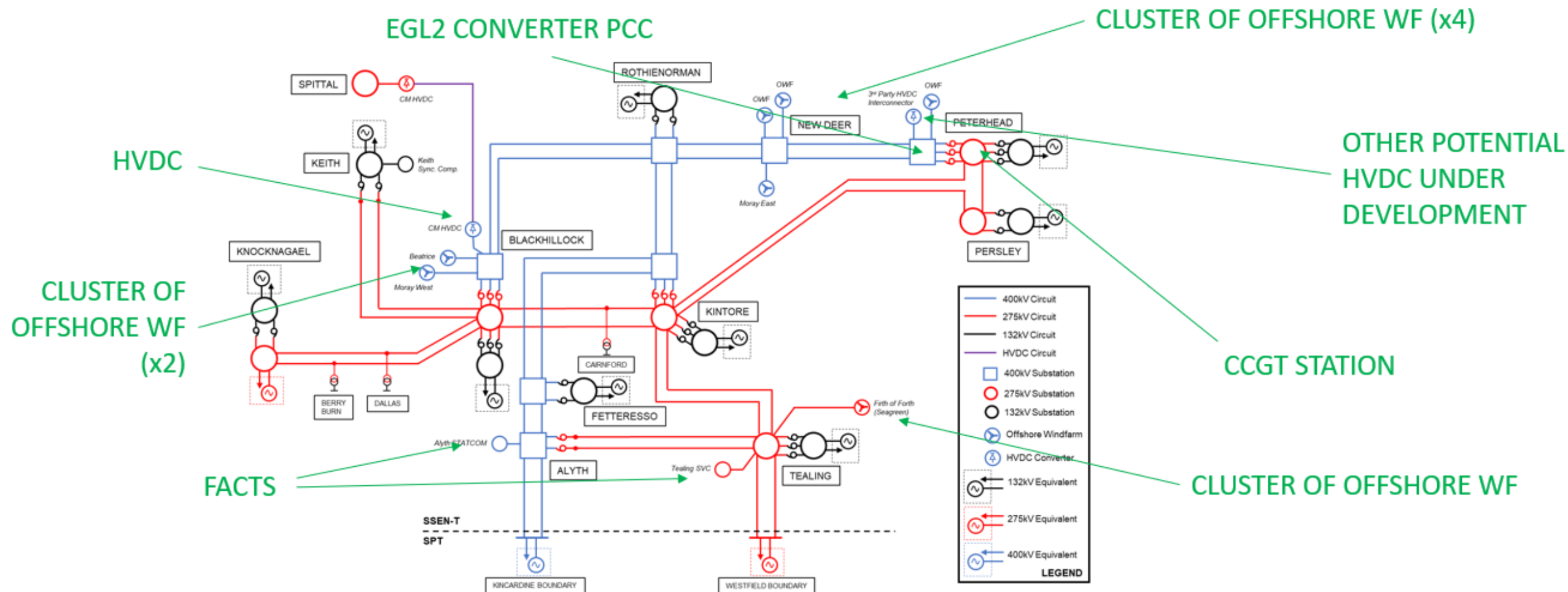
- Restrictions on sharing IP
  - Limitation on sharing dynamic models between different vendors
  - Restricts the access to models of sufficient detail
- TO and User ownership of assets
  - Requires cooperation between licensees and system users
- Control interaction phenomena
  - We have already seen some evidence of this in the north of Scotland
  - This is expected to increase in complexity

# Eastern Green Link 2



- 2GW bipole HVDC Subsea Link between Peterhead, Scotland and Drax, England
- No metallic return
- EGL2 will play a key role in helping achieve our Net-Zero targets
- Joint Venture with National Grid TO

# Eastern Green Link 2





# What are we doing?

- Identified the need for large scale EMT to unlock the insights into emerging system behaviour
- Transmission Owner Tools for EMT Modelling (TOTEM)
  - Full GB EMT (PSCAD) model
  - Making use of Parallel Network Interface to distribute the model across multiple cores to reduce the simulation time
- SSEN-T leading this innovation project
- A collaborative project between:

nationalgrid



nationalgridESO

*Technology Supplier:*





# What are we doing?

- TOTEM transition to Business as Usual (BaU)
- Development of modelling capability which is flexible to support:
  - Operational investigations
  - Long term system planning studies
- Development of several base years created from the ETYS models
  - Year 1
  - Year 5
  - Year 10
- Plans to update the model annually similar to the existing ETYS process
  - Based on the updates observed in ETYS

# What are we doing?

- Dynamic Performance Study (DPS) Phasing
  - Intended to help address modelling uncertainty
- Proposed DPS Phases
  - Internal preparatory studies
  - Phase 1 at vendor
  - Internal review
  - Phase 2 at vendor (if necessary)
- Further Future Advancements
  - Replica control systems

Thank you for your attention



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