

# How the TOs are Developing and Delivering HVDC Future Network Solutions

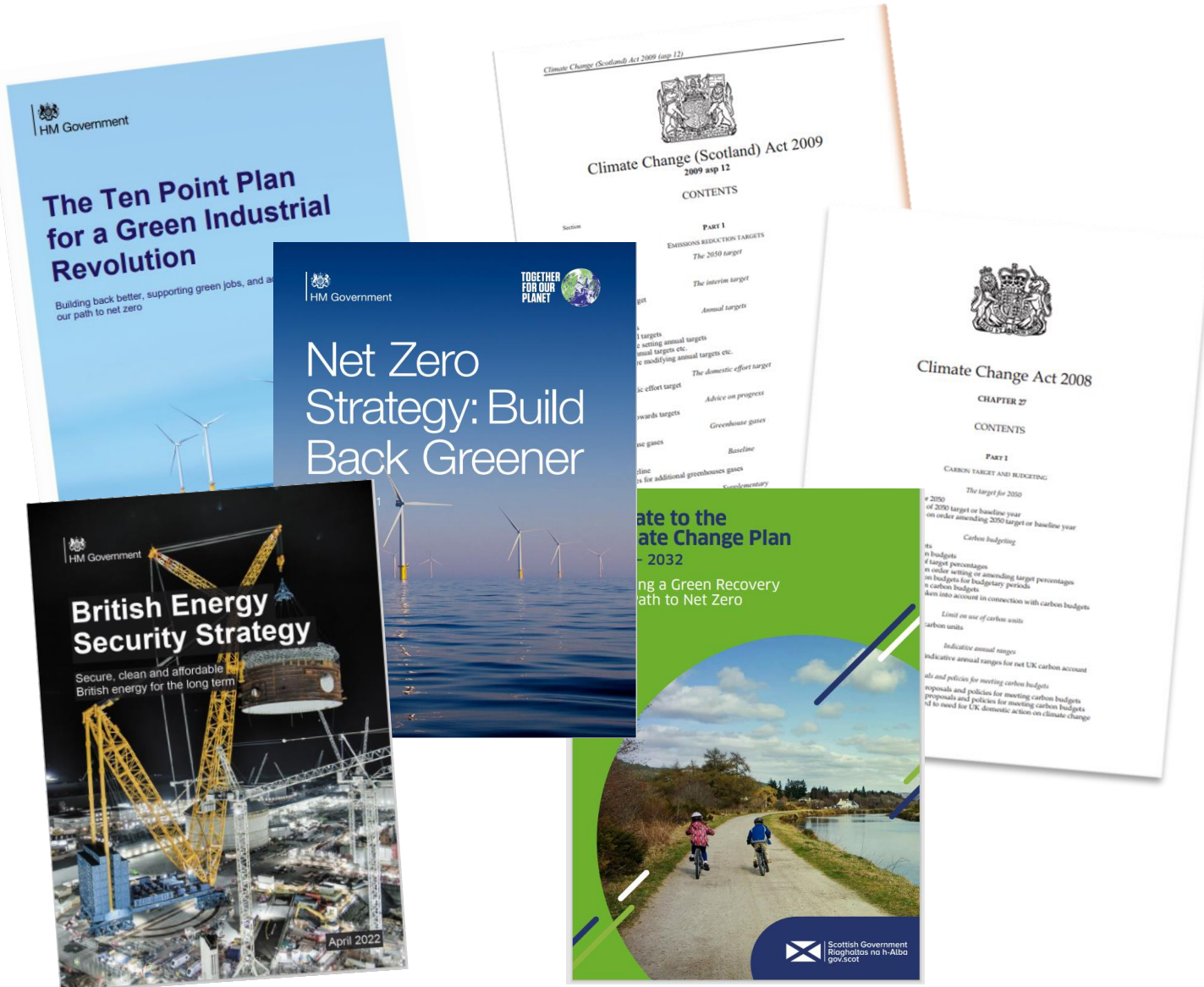
**Bless Kuri**  
Head of Transmission System Planning & Investment

**SSEN Transmission**

HVDC Operators Forum  
The National HVDC Centre  
14 – 15 June 2023



# RENEWABLE GENERATION TARGETS AND NET ZERO



- ✓ Scottish Government's Net Zero goal by 2045
- ✓ UK Government's Net Zero by 2050 and Net Zero power by 2035
- ✓ UK Government's 50GW by 2030 offshore wind target
- ✓ Scottish Government's 11GW offshore wind by 2030 target
- ✓ Scottish Government's 8-12GW of onshore wind by 2030 target

# THE GENERATION MIX IS GREENING RAPIDLY

...WITH IMPLICATIONS FOR SYSTEM CHARACTERISTICS

GB Major energy technologies (ESO FES 2022)

	2022/23	2030/31	2040/41	2050/51
Battery Storage	1224	13820	15728	15728
CCGT/BIOMAS & CCS (Gas & Biomass)	29896	15700	7010	7010
Pumped Storage	2470	4700	5900	5900
Nuclear	6075	4570	8120	8120
Onshore Wind	8096	22334	24845	24845
Offshore Wind	14902	50209	88320	88320
Solar	55	5821	7349	7349
Interconnector	7400	19450	25950	27350

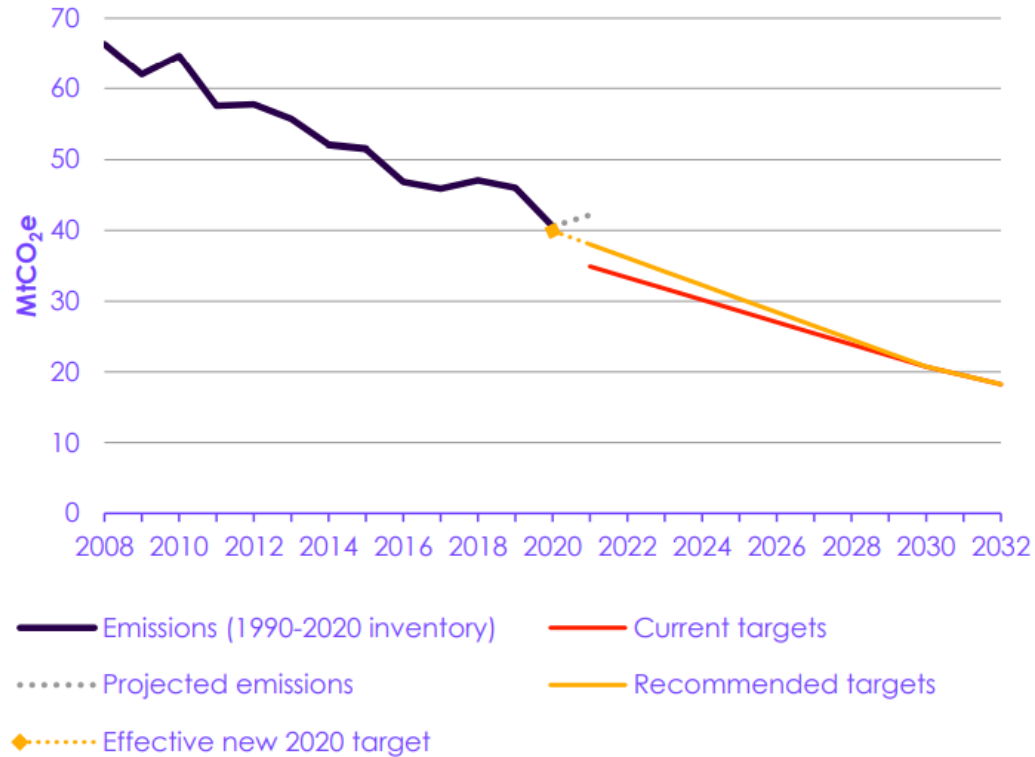


## North of Scotland

Major energy technologies (ESO FES 2022)

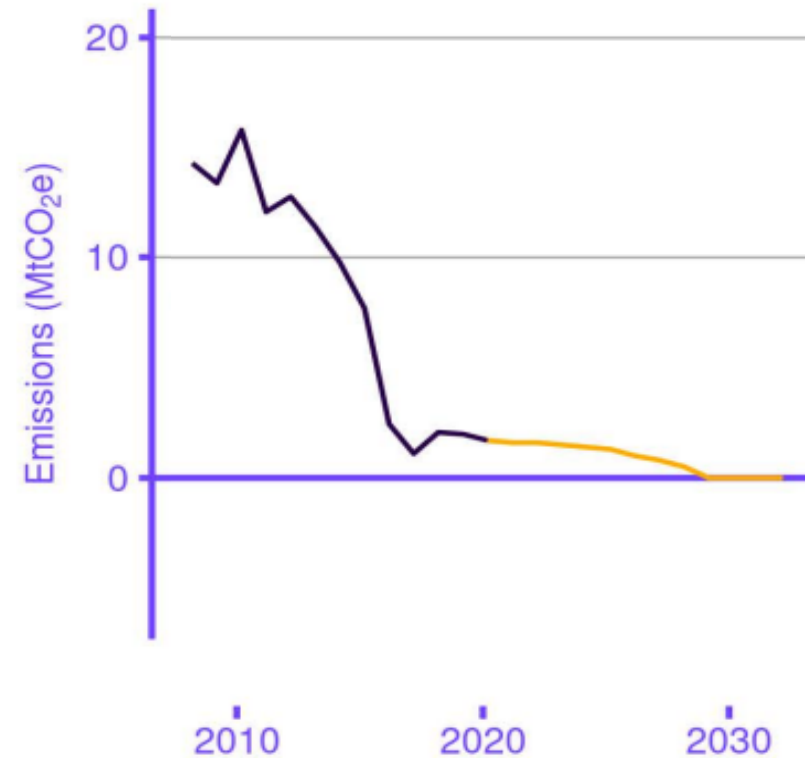
	2022/23	2030/31	2040/41	2050/51
Battery Storage	236	1420	1525	1525
CCGT/BIOMAS & CCS (Gas & Biomass)	1207	937	937	910
Hydro	1219	1225	1225	1225
Pumped Storage	300	2046	2646	2646
Onshore Wind	3532	10023	10960	10960
Offshore Wind	2738	9198	23653	23653

## Greenhouse Gas Emissions: Scotland – All Sectors



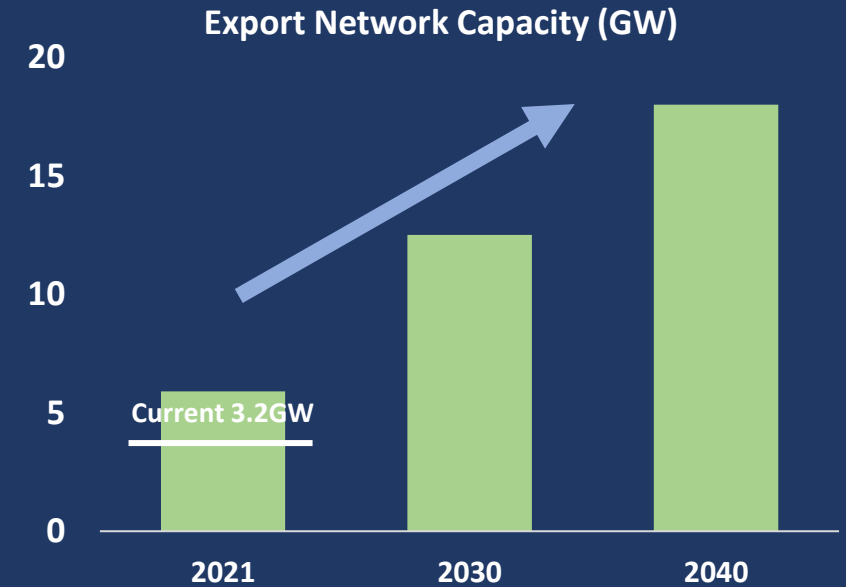
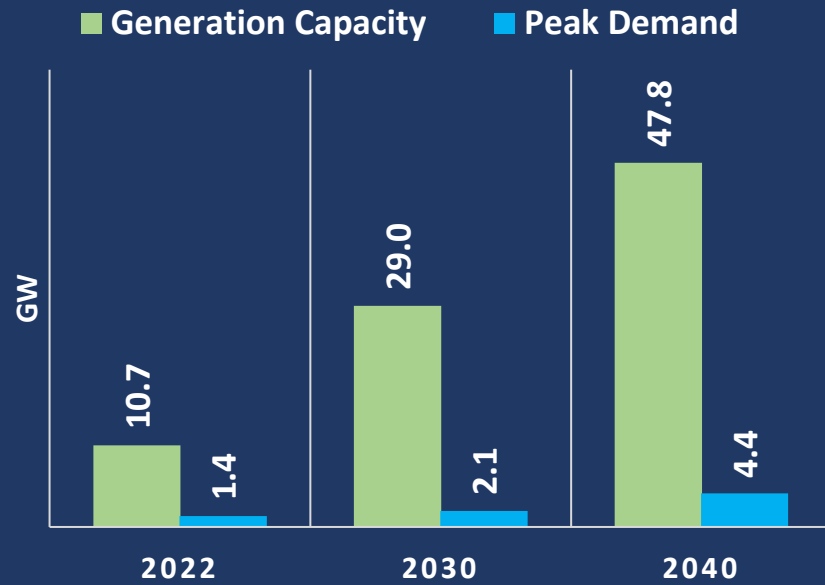
Source: Progress in reducing emissions in Scotland: 2022 report to Parliament, Climate Change Committee, Dec 2022. Accessed 8 Feb2023

## Greenhouse Gas Emissions: Scotland – Electricity



Source: Progress in reducing emissions in Scotland: 2022 report to Parliament, Climate Change Committee, Dec 2022. Accessed 8 Feb2023

# ACUTE NEED FOR BULK POWER TRANSFER FROM NoS



# GB TRANSMISSION SYSTEM PLANNING



- SSEN Transmission develops transmission network reinforcement options in the north of Scotland to meet power transfer requirements identified by NGENSO
- The power transfer requirements are determined from the Future Energy Scenarios (FES) prepared by NGENSO
- SSEN Transmission, together with SPT and NGET submit transmission network reinforcement options to NGENSO
- NGENSO undertakes a GB-wide CBA to determine economic reinforcements and their optimum timing



---

# Holistic Network Design

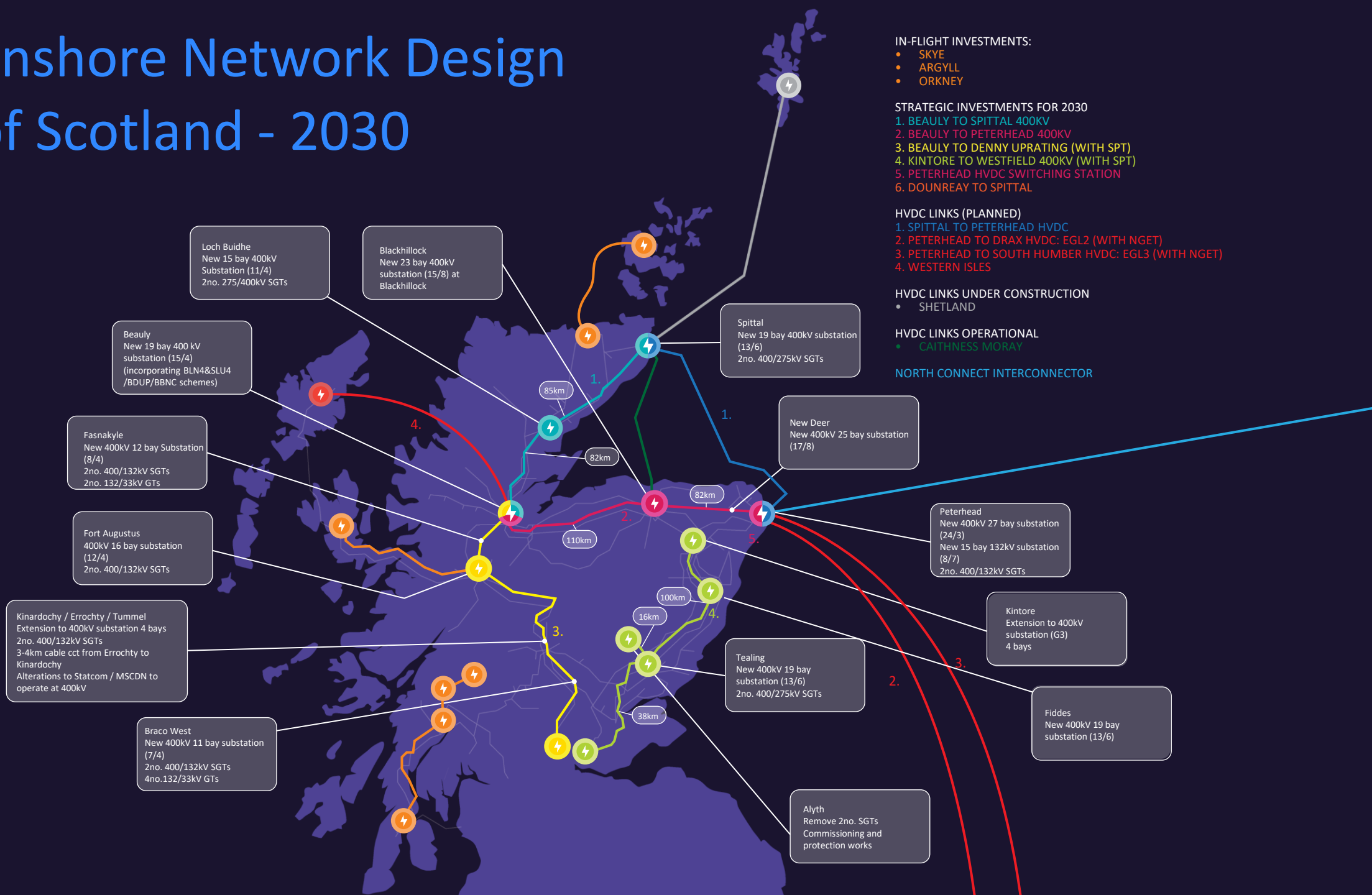
---

- Extension of the onshore planning framework to include offshore
- Clear offshore wind targets set for 2030
- Design, delivery and ownership model for the offshore network different from onshore
- Aggressive pace!



# HND: Onshore Network Design

## North of Scotland - 2030



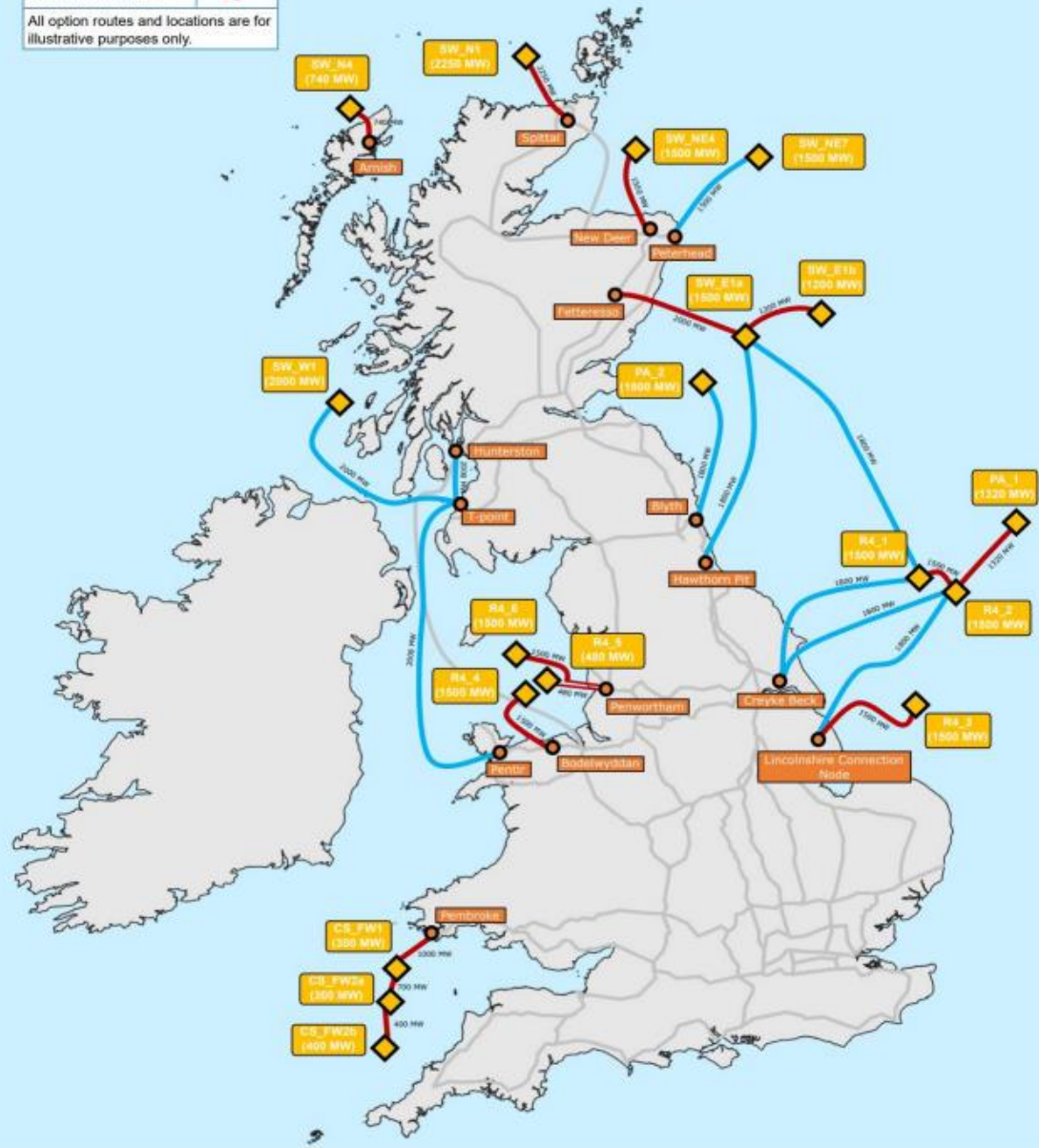


# HND: GB Offshore Network Design

## 2030

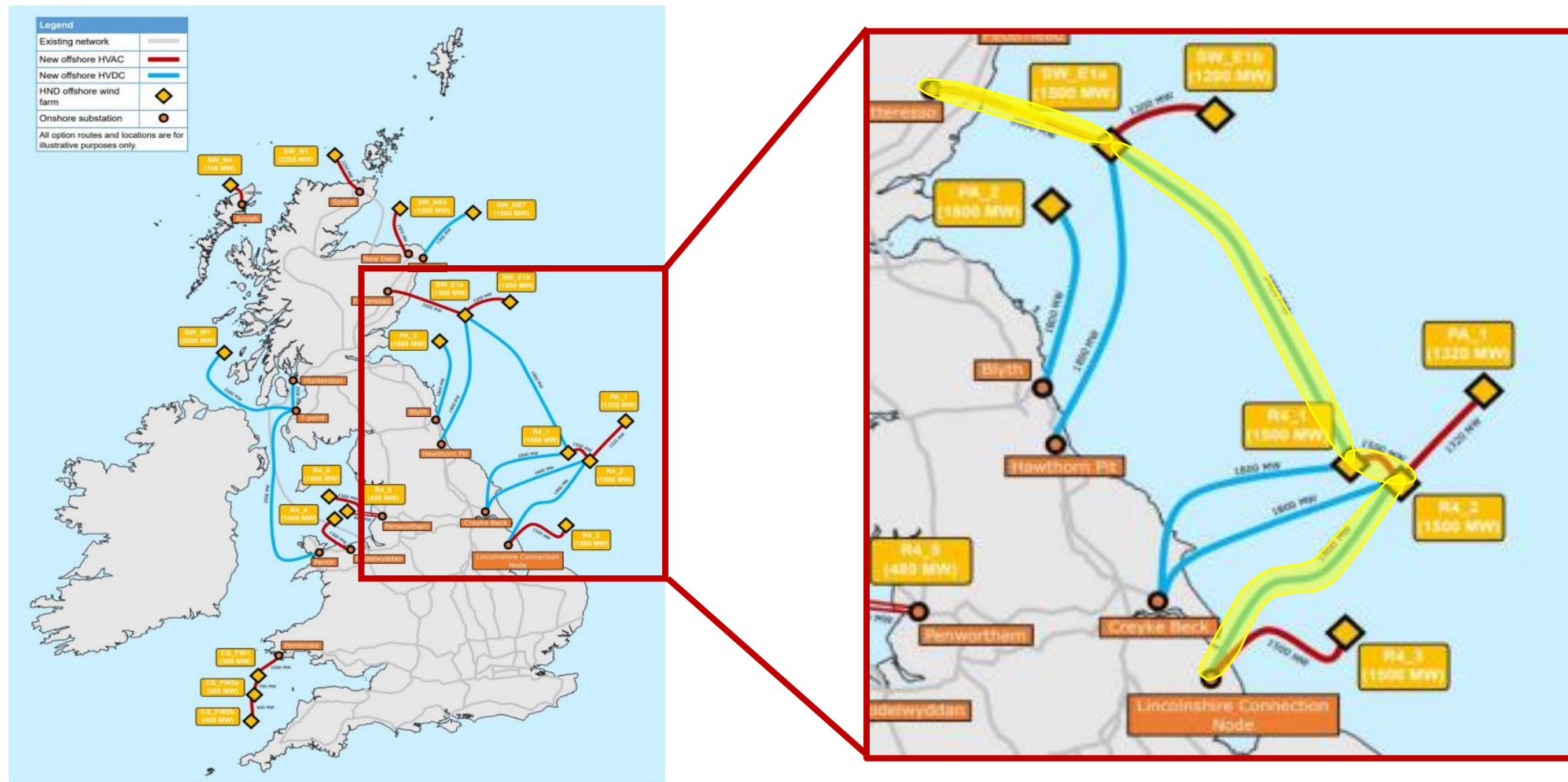
Legend	
Existing network	
New offshore HVAC	
New offshore HVDC	
HND offshore wind farm	
Onshore substation	

All option routes and locations are for illustrative purposes only.



- Deliver a new complex design at pace!
- A mix of radial and interconnected offshore transmission assets
- High level design
- Decisions on asset classification and delivery bodies
- Multiple parties involved
- No framework for coordinated offshore network design

# What we start from- HND1



TO delivery

1. Fetteresso to an offshore platform E1a location
2. Offshore Platform E1a to Offshore platform R4\_1
3. Offshore Platform R4\_1 to Creyke Beck

c.120 km  
c. 275 km  
c. 200 km



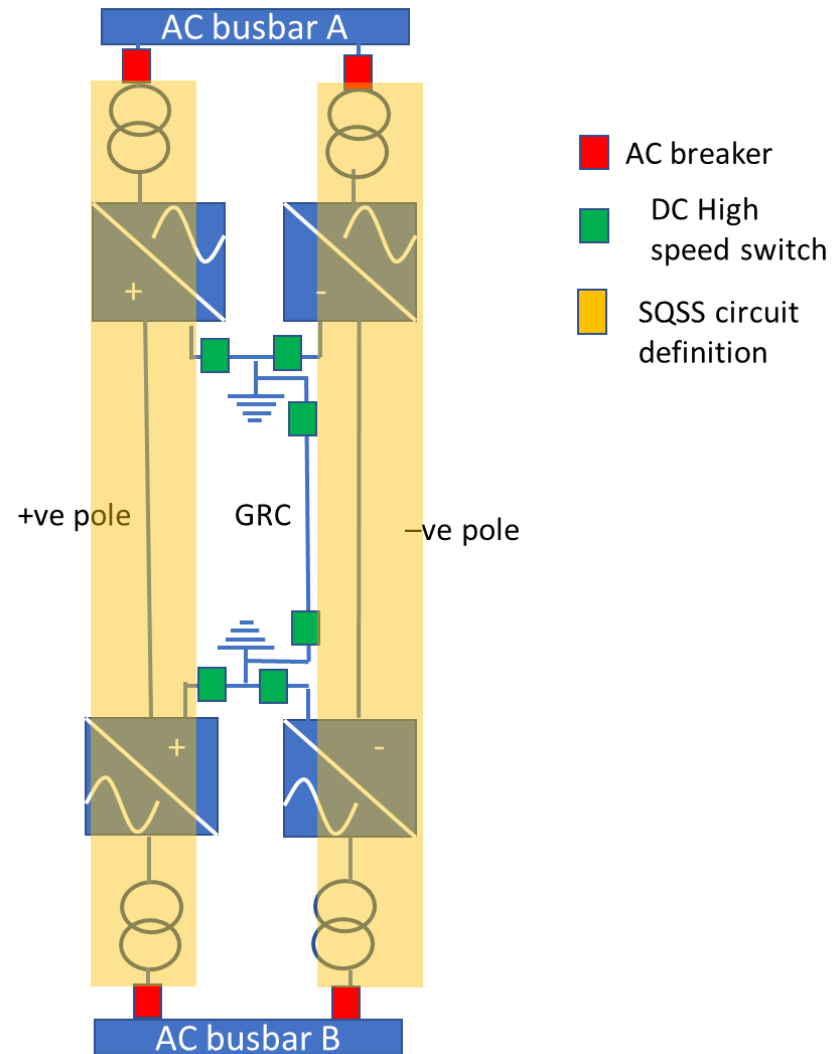
# Detailed Network Design



- **Onshore:**
  - Progressing within established framework
  - Stakeholder engagement progressing
- **Offshore:**
  - Establishing framework and codes, engaging with Government and Regulator
  - Coordinating of designs at early stage

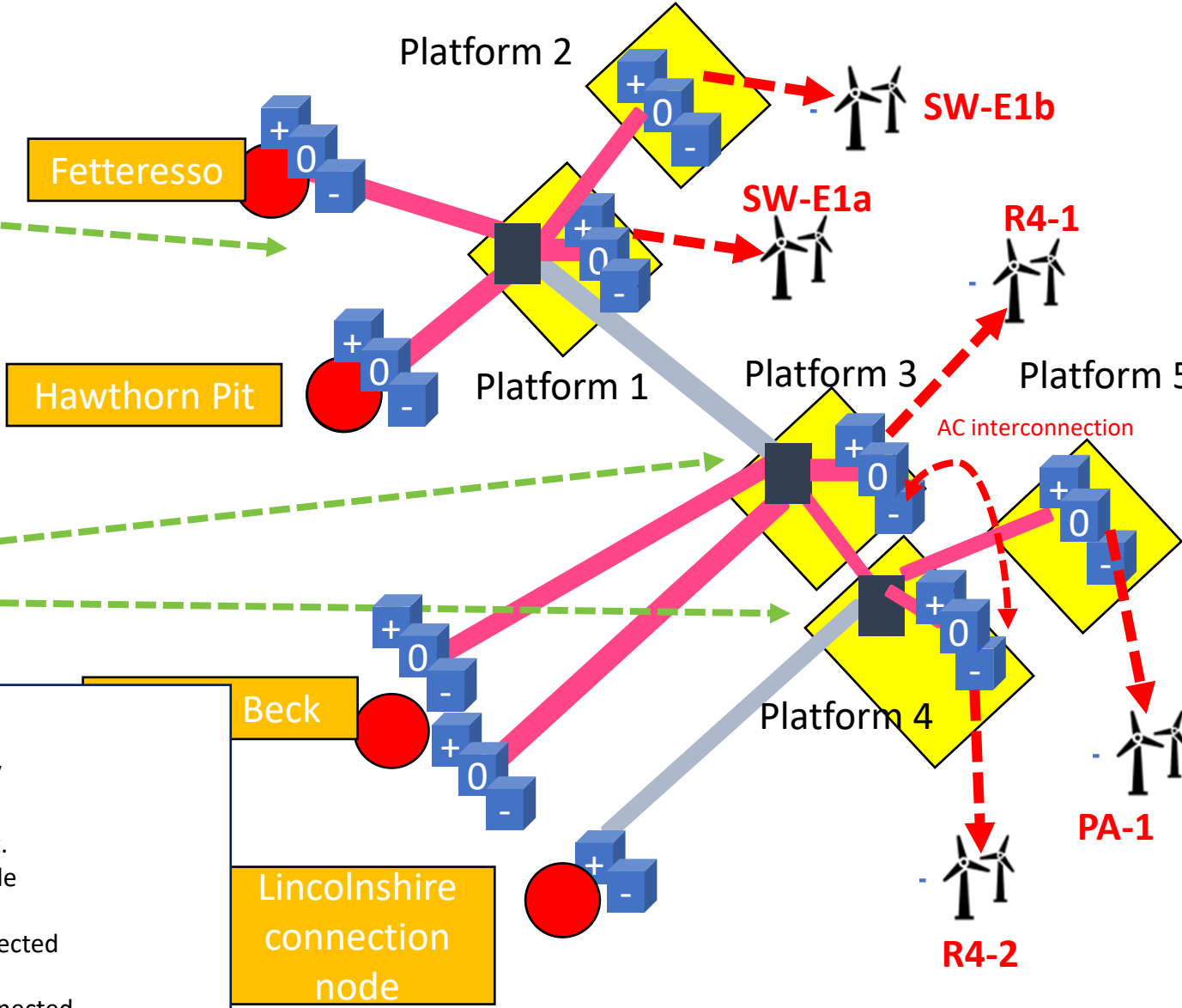
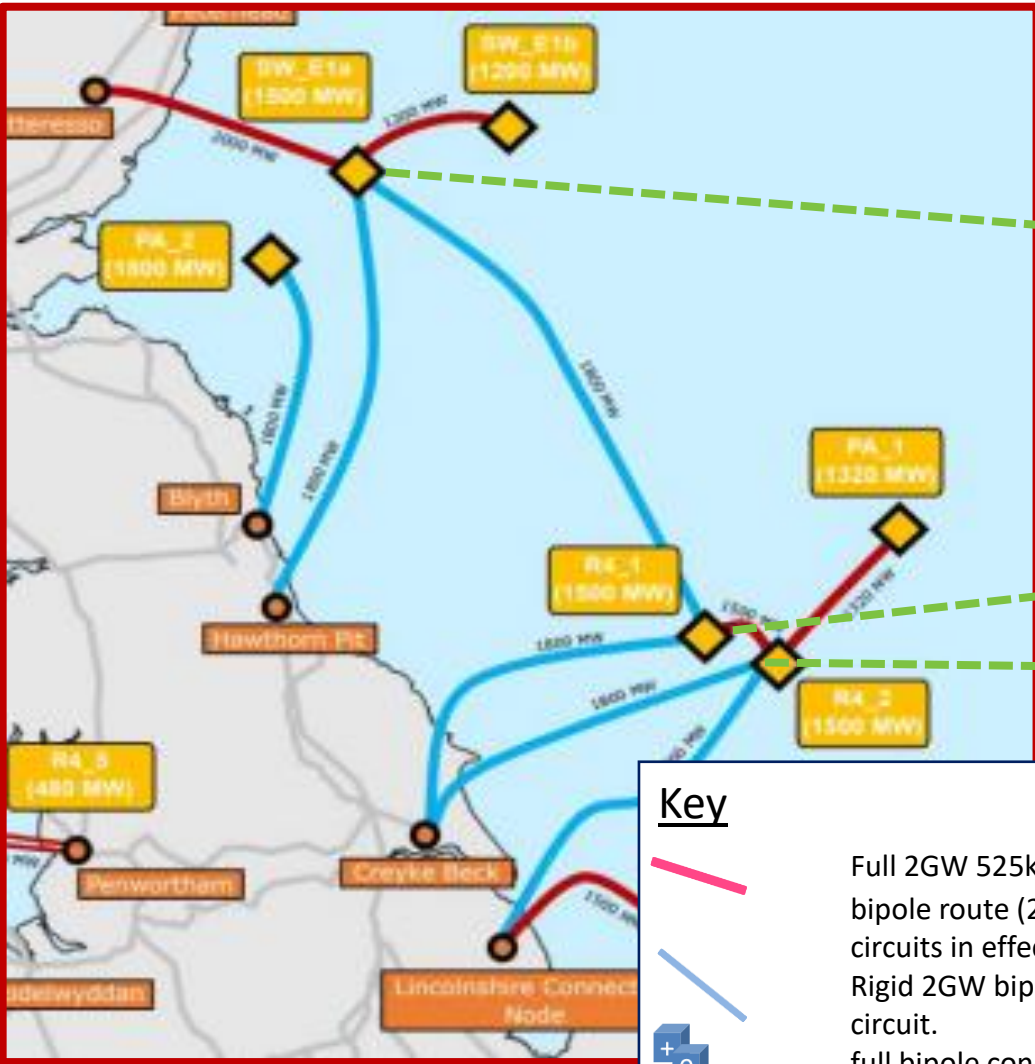
# REVIEWING THE SECURITY STANDARD

BIPOLES UNDER N-1 SECURITY CRITERIA (SQSS REVIEW GSR030)





# Considering detailed design options (example)

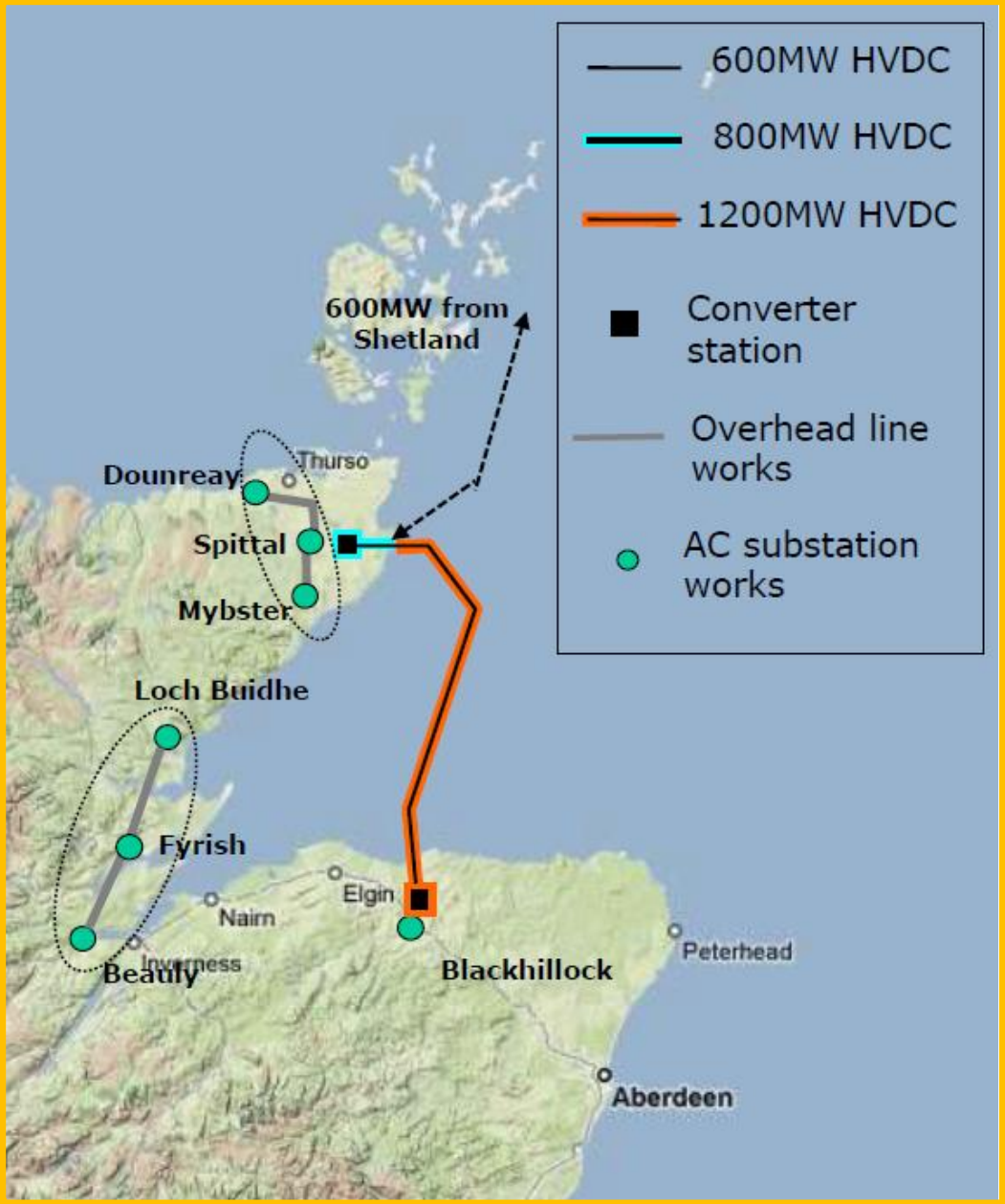
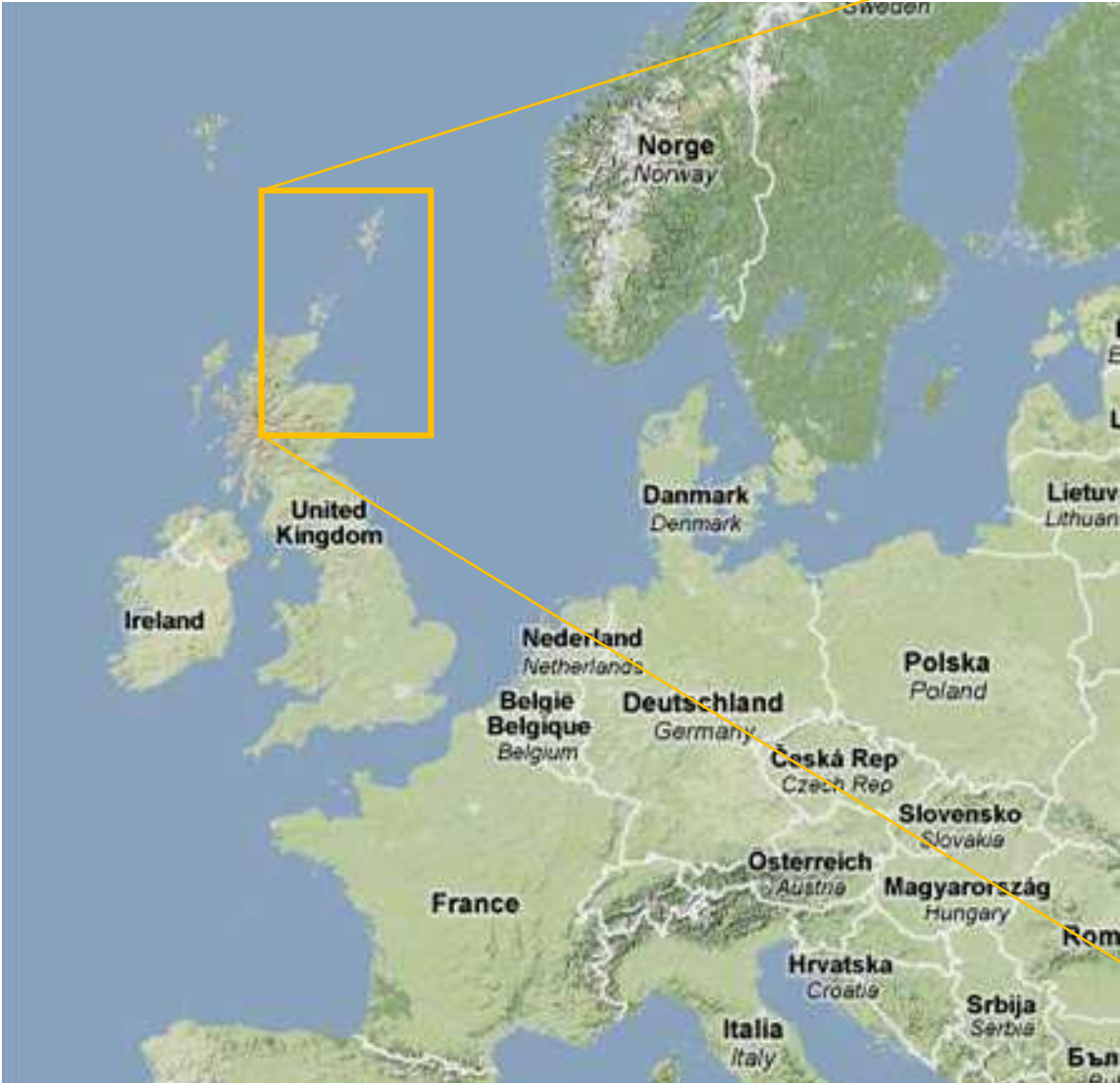


**Key**

- Full 2GW 525kV bipole route (2 circuits in effect).
- Rigid 2GW bipole circuit.
- full bipole connected convertor.
- rigid Bipole connected convertor.
- GIS 525kV DCSS
- AC interfaces

# Reflection back to c.2010

## Caithness – Moray HVDC link





# Regulatory Approval

- Standard processes agreed as part of the regulatory settlement too slow and cumbersome for the pace of change and scale
- Early approval critical to provide certainty of projects and engagement of supply chain
- A new approach pioneered using a new reopener mechanism: The Net Zero Reopener
- Accelerated Strategic Transmission Investment (ASTI)



# Large Onshore Transmission Investment Timeline



## Initial Needs Case Submission

If the project is eligible, Ofgem will undertake an **initial needs case (INC)** assessment at an early stage of the project's development (ideally before the application for planning consent).

The main focus at this stage is a review of the technical **requirement for the reinforcement**, the technical **options under consideration**, and the TO's **justification** for taking forward its **preferred option** for further development

## Final Needs Case Submission

Once the TO has developed its proposed project in more detail Ofgem will assess the **final needs case (FNC)** which will seek to **confirm the need** for the project and consider the **appropriateness of the technical option selected**.

This will occur **when there is greater certainty over the driver** for the project. Ofgem look at whether the **technical scope and timing of delivery** are **well justified** relative to other options and assess whether the proposal is likely to provide **long-term value for money for existing and future consumers**.

## Project Assessment

Following approval of the FNC Ofgem will undertake a **project assessment (PA)** which looks in greater depth at the preferred option, the TO's readiness to proceed and the **efficient cost allowances** that can be recovered from consumers for delivery of the project.

Ofgem will assess the TO's project programme and **risk sharing arrangements** to ensure that they will deliver the project efficiently. It will also review the final technical project plans to **assess the efficient costs that can be recovered** from consumers and specify a new **LOTI output**.

Critical that strategic investments are approved in a timely manner to keep pace with the delivery of net zero targets



# Accelerating Development

Aug  
2022

- Ofgem consultation on accelerating onshore electricity transmission investment

Sep  
2022

- Initial 2030 delivery plan submitted for onshore

Dec  
2022

- Ofgem decision on Accelerated Strategic Transmission Investment (ASTI) regulatory framework expected

Dec  
2022

- Updated 2030 delivery plan submitted

## KEY CONSIDERATIONS

Detailed network design

Consents & planning

Market Resource & Capacity

Outages





---

# Planning and Consenting

---

- Section 37 timescale reduction to 9-12 months – engagement with ECU
- T&C Planning timescale maintenance of no more than 12 months – continued engagement with local authorities
- Compulsory Purchase Order timescale reduction to 9-12 months – engagement with the Planning and Environmental Appeals Division (DPEA)
- Bird Survey Periods to 12 months – engagement with key stats
- Marine consents targeting 10 month determination period – engagement with Marine Scotland
- Offshore consents



# Working with the Supply Chain

To address global supply chain constraints, we need to think differently to accelerate delivery

- Pre-qualification Questionnaire (PQQ) commenced for 2030 supply chain
- Early appointment of Key Contractors in Development Phase with transition to Delivery
- Utilising SSE Early Contractor Involvement model with incentives offered to contractors for innovative design and construction approach
- Advanced construction activities
- Supply chain commitment
- Strategic land purchase
- Early enabling works/early physical works
- Stimulating the employment market

