Energy Innovation Summit 2024

BLADE
Black Start Demonstrator using Offshore Wind

Content

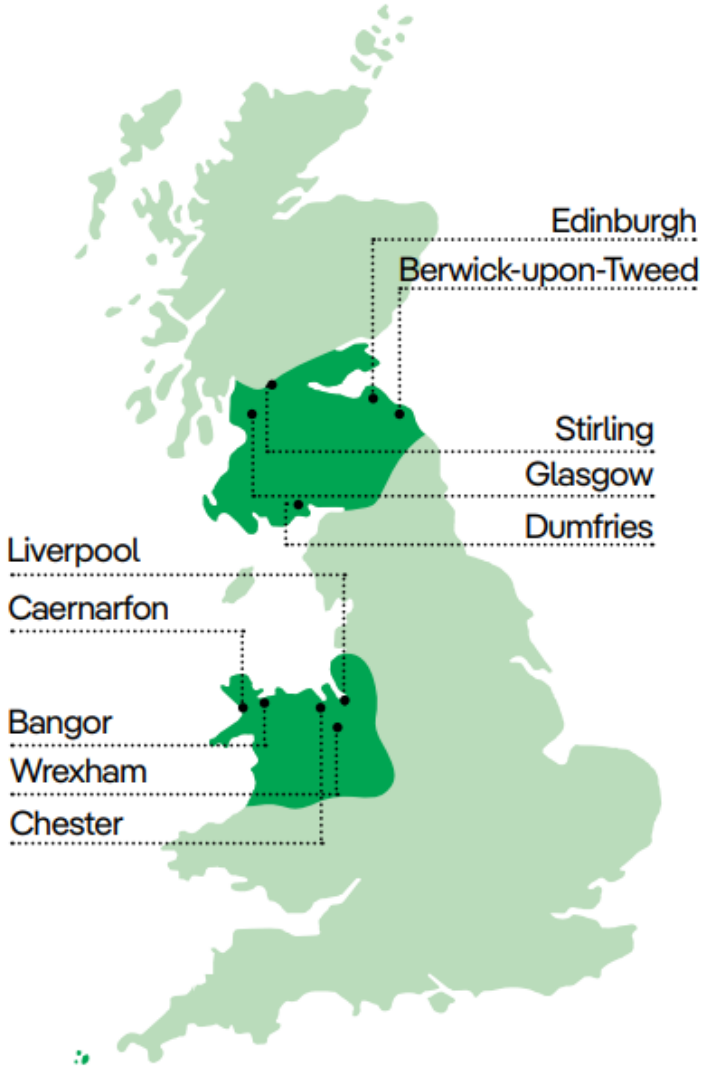
About us

We are SP Energy Networks. As a Distribution and Transmission Network Operator we keep electricity flowing to homes and businesses throughout Central and Southern Scotland, North and Mid Wales, Merseyside, Cheshire and North Shropshire.

We do this through the network of Overhead Lines and Underground Cables which we own and maintain. No matter who you pay your bill to, we're the people to contact if you have a power cut, need a new or upgraded power connection or spot an issue with our equipment.

Our three regulated electricity businesses are:

- SP Transmission PLC (SPT)
- SP Distribution PLC (SPD)
- SP Manweb PLC (SPM)



Introduction to BLADE

What is the need for BLADE?

Why do we need to explore grid restoration from OSW?

1. Retiring of carbon intensive black start assets
2. New requirements for energy system restoration
3. Huge growth in offshore wind and grid forming technology readiness
4. Lack of clear guidance

What needs to be demonstrated / developed?

1. Technical feasibility of new black start technologies
2. Commercial viability for service providers
3. Procedural clarity
4. Regulatory clarity

What are the benefits to NESO / GB consumers?

Ensure a resilient, robust net-zero energy system

Reduced system emissions for consumers

Provide a competitive alternative for national power outage services to be borne by consumers

Consortium

A powerful consortium of transmission networks, system operators, technology suppliers and offshore wind developers

The breadth of the consortium is ***essential*** for integrated restoration methodology

Onshore networks

SP Energy Networks

Scottish & Southern Electricity Networks

Offshore network designers

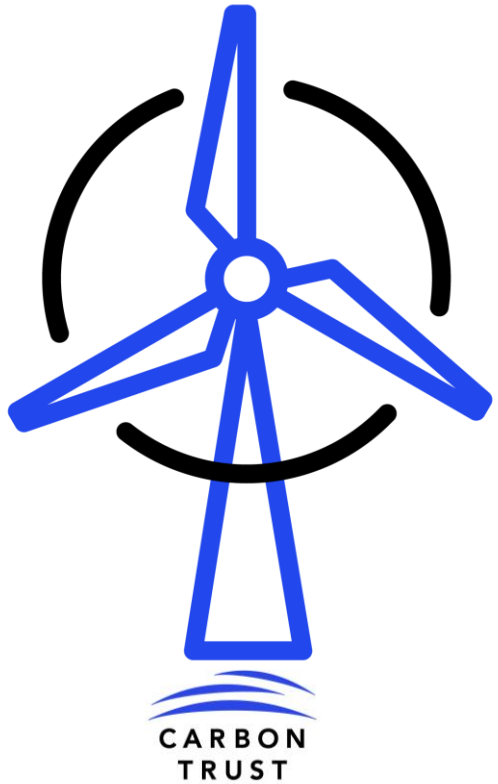
The National HVDC Centre

TSOs (Advisory Role)

TenneT

nationalgridESO

Rte



Offshore wind developers

EDF renewables

EnBW

equinor

Ørsted

OW Ocean Winds

RWE

ScottishPower Renewables

Shell

sse Renewables

TotalEnergies

VATTENFALL

Research institutes

University of Strathclyde Glasgow

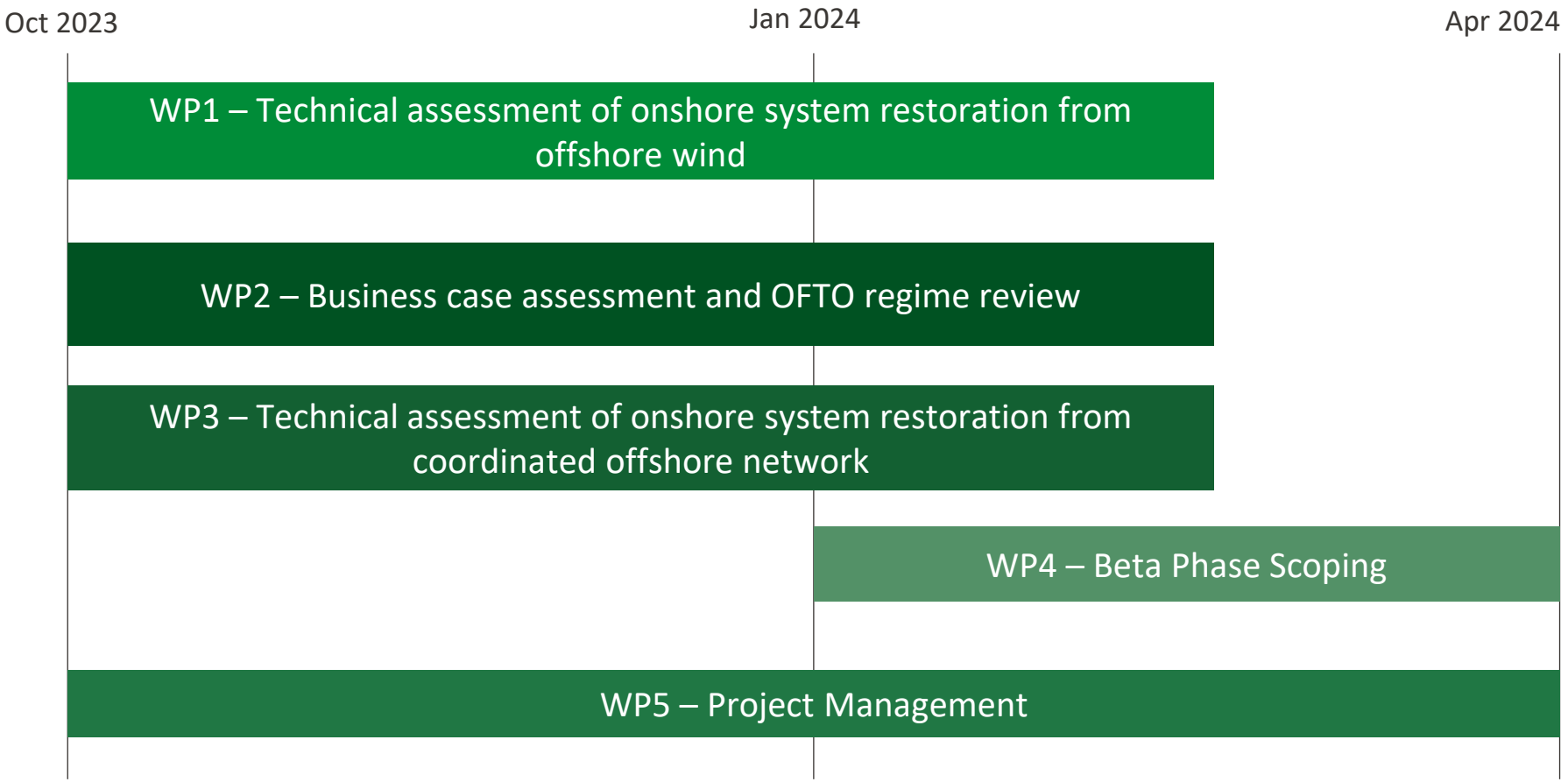
Technology suppliers (Advisory Role)

SIEMENS Gamesa RENEWABLE ENERGY

SIEMENS energy

SP Energy Networks Scottish & Southern Electricity Networks The National HVDC Centre University of Strathclyde Glasgow CARBON TRUST SIEMENS Gamesa RENEWABLE ENERGY SIEMENS energy TenneT nationalgridESO Rte EDF renewables EnBW equinor OW Ocean Winds Ørsted RWE ScottishPower Renewables Shell sse Renewables TotalEnergies VATTENFALL

Alpha Phase activities



Alpha Outcomes

WP1 findings – onshore system restoration from offshore wind

SP Energy Networks

Key take-away of system restoration findings

- Alpha work has **assessed feasibility of restoring Scottish Central Belt from a new-build windfarm**
- **Can we do it? Yes we can!** (Although significant uncertainties remain for Beta)

Alpha phase findings

Scenarios feasibility

Self-starting offshore wind farm and onshore energisation are both **viable options to provide restoration services**

Availability

A large part of the Scottish Central Belt (Glasgow and Edinburgh) **can be restored with average wind speeds** with minimal energy storage required

Next for Beta?

There is still work to do such as further simulations, defining the role of energy storage and other network equipment, control room coordination…

WP2 findings – regulation and OFTO regime

Alpha Phase Findings

No significant regulatory gaps identified; however new regulations are being introduced around time of Beta phase
Further monitoring in next phase required

No prohibitive roadblocks in OFTO regime expected to undermine offshore wind market participation
Further monitoring in next phase required

Market requirements need to be defined and updated
Proposed updates in next phase

Key take-away of regulation and OFTO findings

- No significant roadblocks identified, but continued monitoring work in Beta Phase will be necessary

WP2 findings – cost-benefit analysis

Key take-away of cost-benefit findings

- **Restoration contribution from offshore wind is required** for GB restorations under the ESO's Future Energy Scenarios (FES).
- Currently **this capability does not exist.** Therefore, to achieve the FES, either:
  a) This capability needs to be developed in SIF BLADE Beta and **urgently deployed at scale**
  b) Or low carbon thermal generation (which doesn't yet exist as a technology) must be built *purely* to support system restoration, which would be expensive

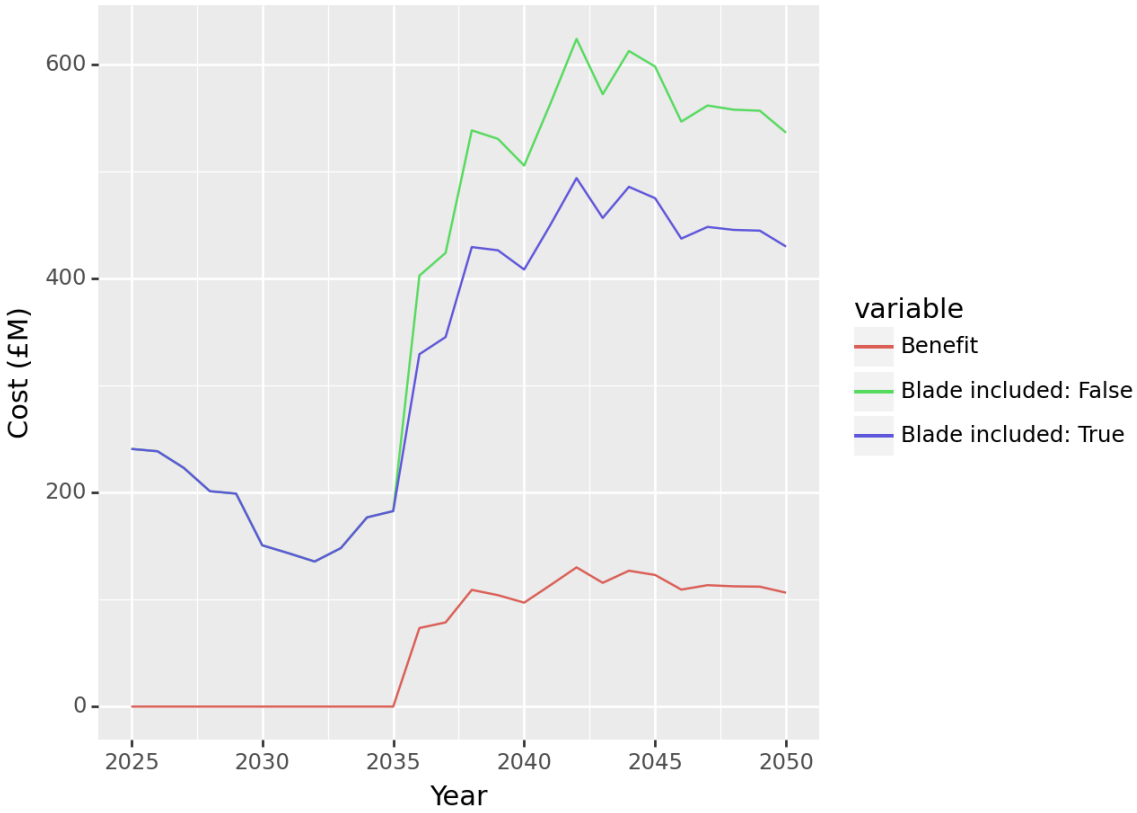


Figure1 : Cost comparison output of CBA with and without SIF BLADE

WP3 findings – onshore system restoration from coordinated offshore network

Key take-away of coordinated offshore network findings

- **Demonstrated multi-terminal HVDC coordinated restoration capability** through study scenarios, but raises need for detailed specification
- **Specifications need to be developed urgently** to ensure this capability is included in the future offshore network **before it is built**

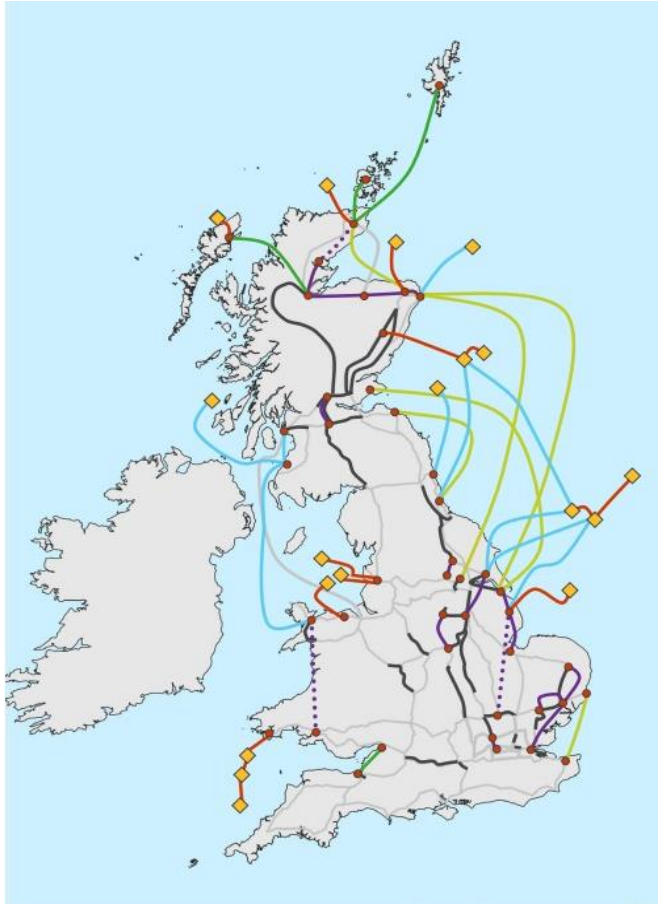


Figure 2: NGESO

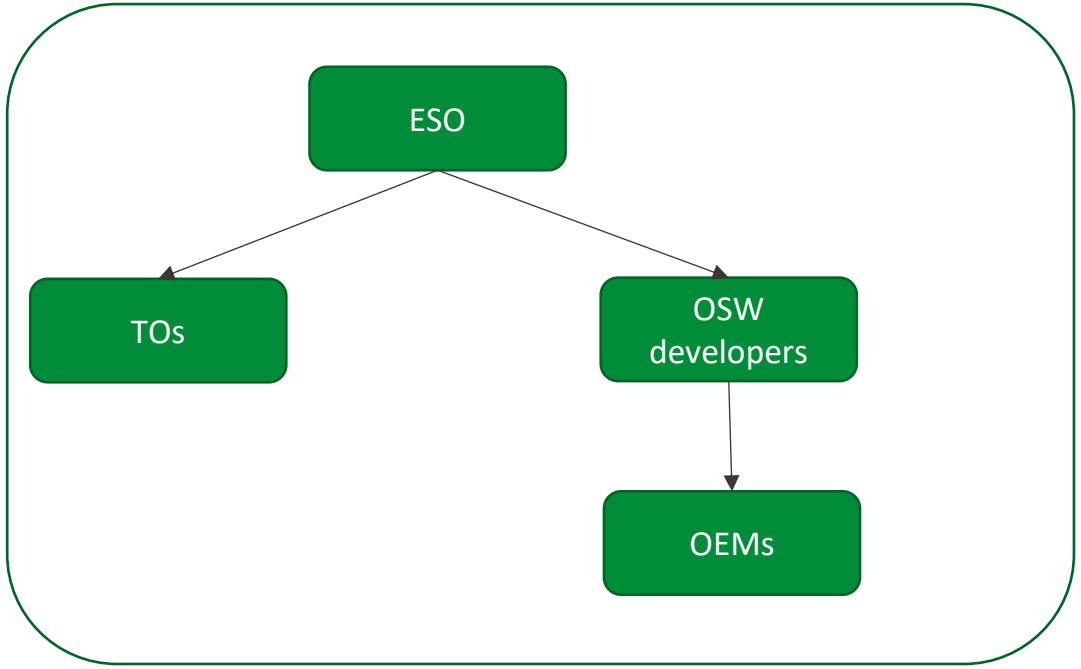
Plan for Beta

Need for Beta Phase

- **Urgency** for offshore wind farms to provide restoration services
- Significant **uncertainties** around technical requirements, TRL, market requirements and commercial arrangements
- Novel **integrated / whole system** approach required for Net Zero-compatible restoration

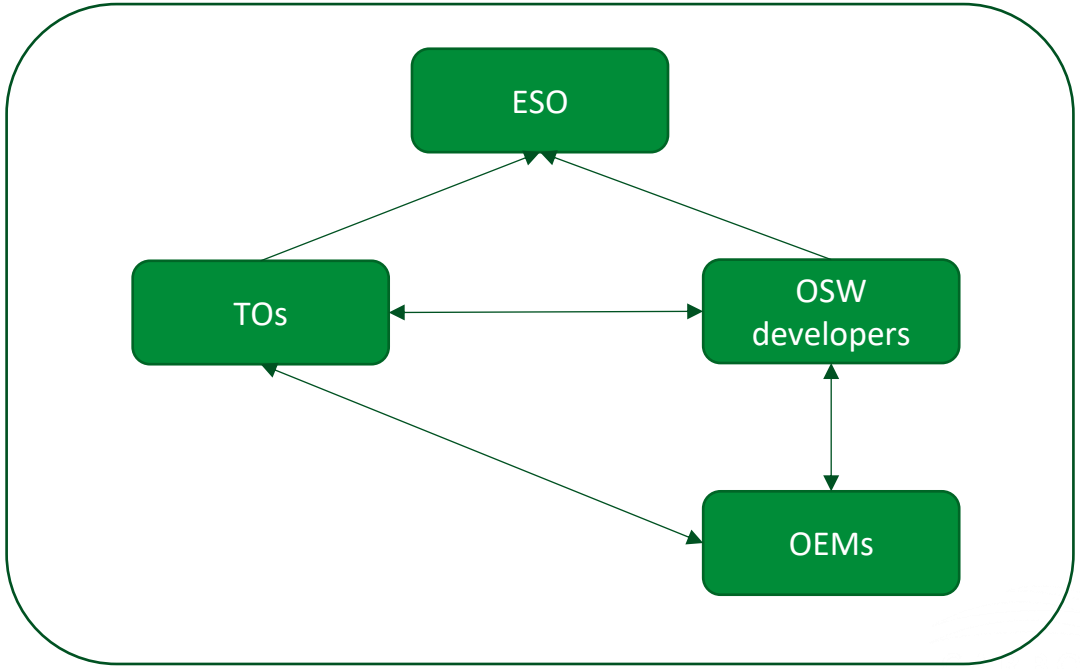
Current situation

Siloed "top down" approach



SIF BLADE Beta Phase

Integrated "bottom up" approach



Scope

Stage 1: Site-specific pre-feasibility study – assess and select options

Inputs	Solution development and technical feasibility	Solutions assessment
Technology inputs	Electrical studies	Costs
Windfarm inputs		Regulation
Grid inputs		Risks

Decision gate: detailed de-risking, verification and demonstration option selection

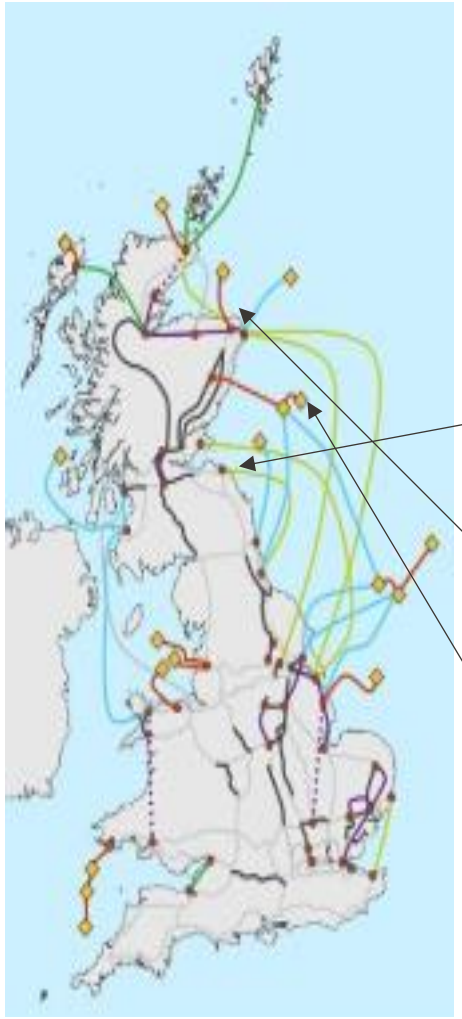
Stage 2

Detailed study, de-risking, verification, demonstration

Detailed scope TBC at end of Stage 1, but de-risk, verify and demonstrate selected option(s)

Commercialisation

- Scope first deployment / physical demonstration
- Dissemination to TOs
- Dissemination to developers and OEMs
- Dissemination to TSOs



This will be conducted in parallel at three locations, to cover different restoration methodologies:

1. **SPEN** and **SSER**: Branxton + Berwick Bank
2. **SSEN** and **Ørsted**: Peterhead + Salamander
3. **NHVDCC**: future coordinated offshore network location + generic windfarm

Conclusions

Strong need for SIF BLADE Beta Phase to build on promising findings of Alpha

We have strengthened the consortium between Alpha and Beta as needed to deliver successfully

SIF BLADE

On the basis of the Alpha Phase results, we have created an ambitious but achievable scope

Beta Phase is a truly world-leading initiative expected to deliver dramatic benefits for GB