“WE HAD TO DO SOMETHING”

Some highlights from SPEN’s NPO restoration initiatives

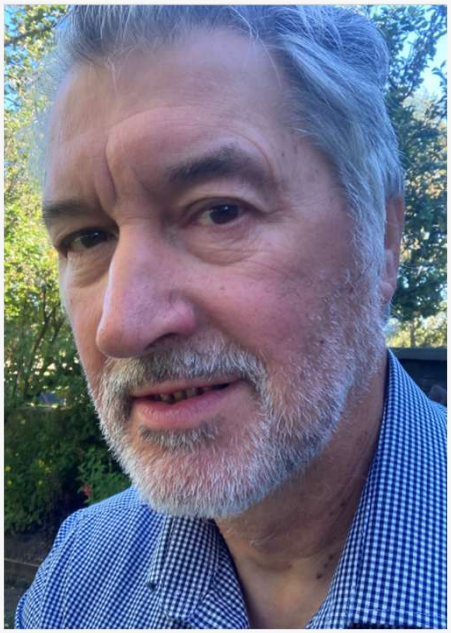
Eric Leavy – Head of Transmission Network Planning SPEN

cigre

For power system expertise

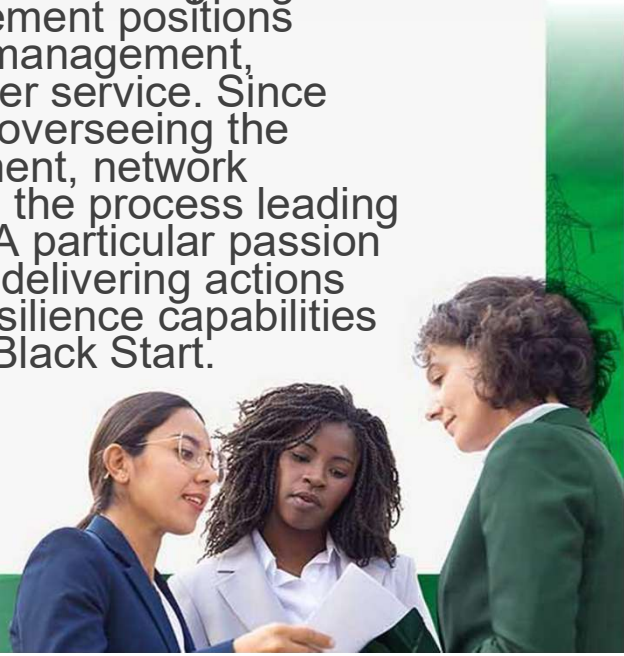
CIGRE UK Technical Conference November 2025 – Austin Court Birmingham

Eric Leavy



I live in East Lothian and have spent over 50 years since graduation from the University of Strathclyde working in a wide variety of roles in the Scottish Power Transmission and Distribution networks.

I have been involved in all aspects of construction, maintenance, asset management and network operations as a working engineer and then in various middle and senior management positions having responsibility for field staff, contractor management, operational control room activities and customer service. Since 2010 I have been responsible for leading and overseeing the development of major transmission reinforcement, network modernisation and connections proposals and the process leading to approval of these schemes for investment. A particular passion since the early days has been supporting and delivering actions towards enhancing network restoration and resilience capabilities including all fault responses up to nationwide Black Start.



KEY TIMELINE 1

2005 -BETTA GO LIVE - NGET BECOMES NESO
2010 -CRUACHAN LONGANNET TRIAL
2015 -LONGANNET CLOSURE ANOUNCED -SCOTTISH GOVERNMENT SEEKING SoS ASSURANCES -
SPEN INITIATES REGULAR DIALOG ON NPO ISSUES WITH ITS KEY STAKEHOLDERS (SHETL/ NGET/ Sc GOV/ UK GOV/ LOCAL EMERGENCY PLANNING FORUMS)
2016 - LONNGANNET CLOSES / SPT PROPOSES PHOENIX / E3C
BLACK START NATIONAL TASK GROUP FORMED
2019 – NGET-SO agree SPEN as NETWORK DR PROJECT PARTNER (live network trials lead)
OCTOBER 2020 - DERSALLOCH VSM BLACK START TRIALS
APRIL 21 - NEW ESRS DECLARED (by Sec. of State)

2016 - PHOENIX Proposals for IMPROVING SPT NETWORK RESILIENCE

Synchronous condensers provide network services such as:

- Inertia (frequency control)
- Fault level
- Dynamic voltage control

A - Convert synchronous generators at Longannet to synchronous condensers

- First in GB
- Extensive re-purpose of redundant plant components

Option dismissed as incompatible - due to imminent demolition risks

B - Develop a Novel HIBRID Synch Comp project to explore concept

- Stat com +/- 70 MVar plus rotating machine + 70 / - 34 MVar
- Integrated control system

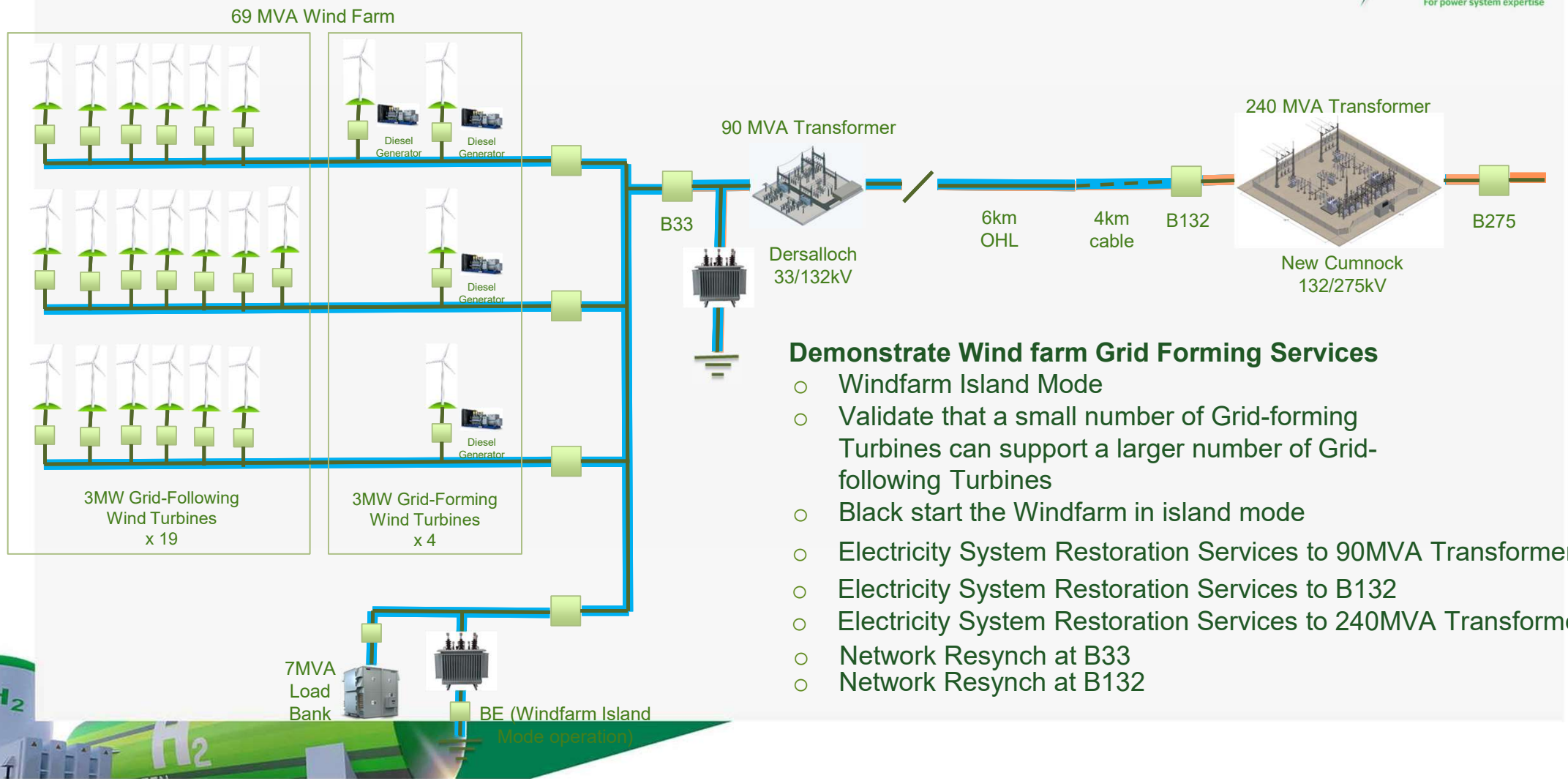
NIC Funding awarded November 2016

- ► NEILSTON S.S subsequently chosen as suitable 275kV Point Of Connection

PHOENIX

Figure 18: H-SC at Neilston denoted

Electricity System Restoration Service – Dersalloch WFM



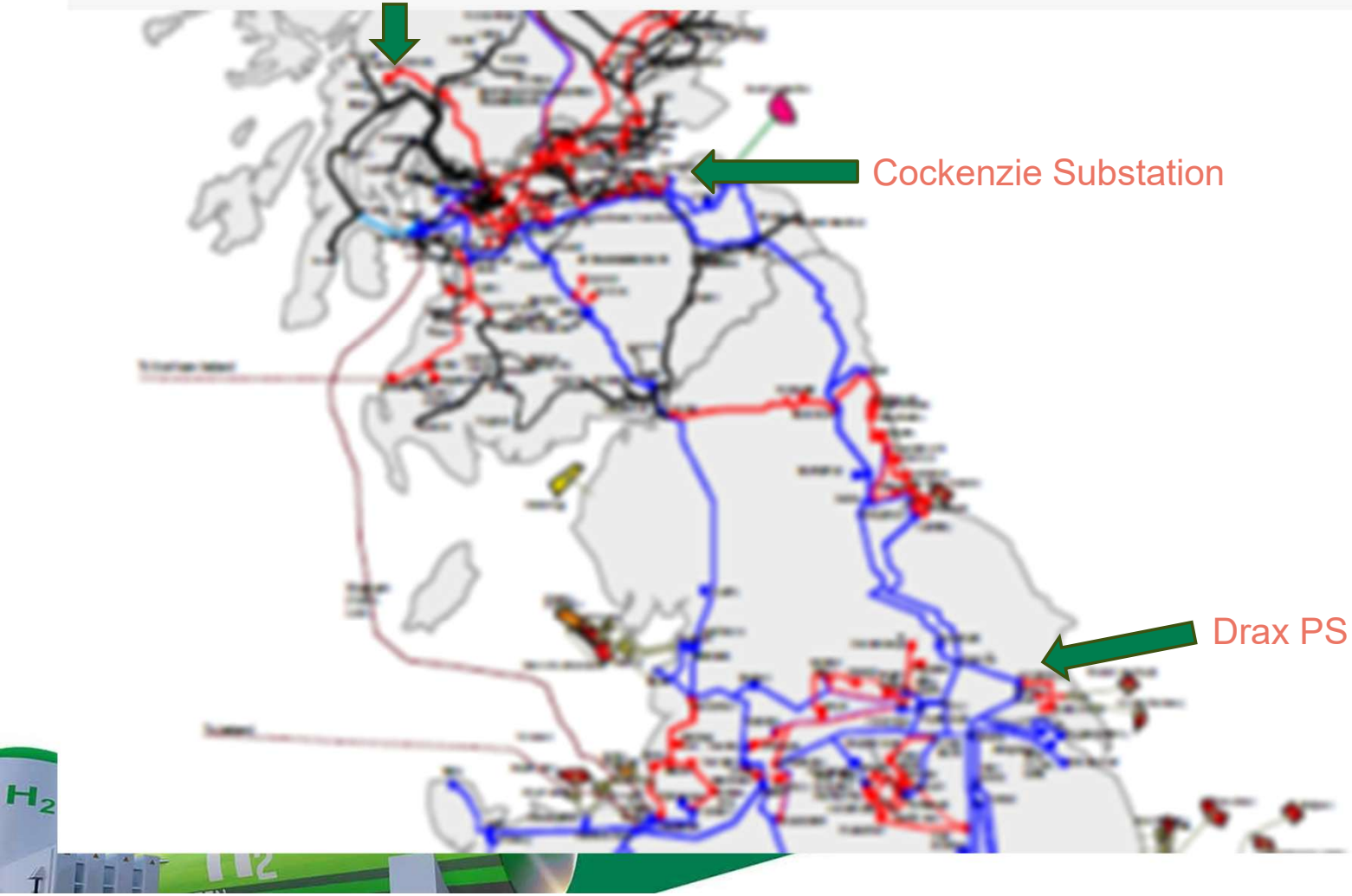
Demonstrate Wind farm Grid Forming Services

- Windfarm Island Mode
- Validate that a small number of Grid-forming Turbines can support a larger number of Grid-following Turbines
- Black start the Windfarm in island mode
- Electricity System Restoration Services to 90MVA Transformer
- Electricity System Restoration Services to B132
- Electricity System Restoration Services to 240MVA Transformer
- Network Resynch at B33
- Network Resynch at B132

KEY TIMESCALE 2

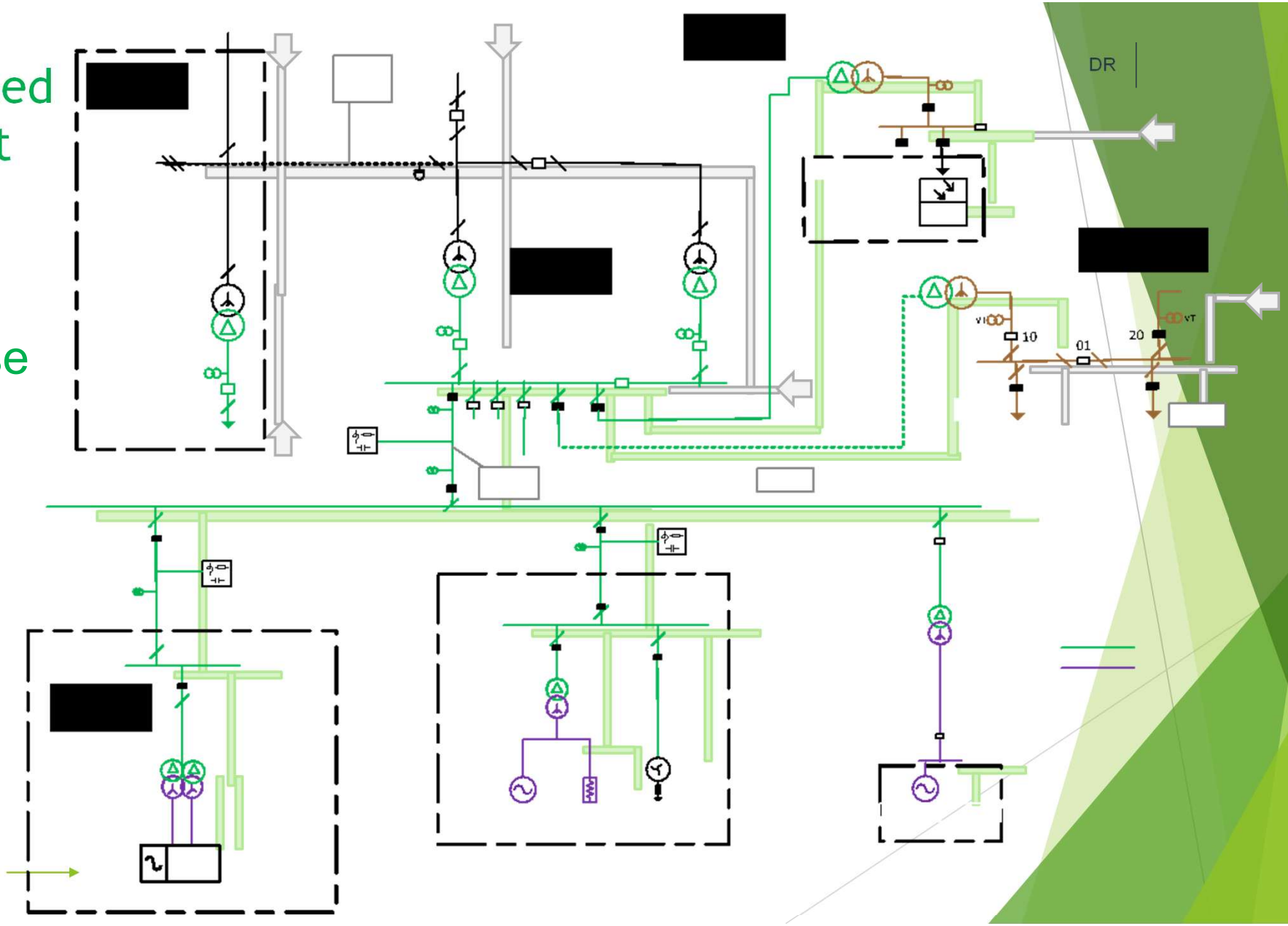
MARCH 22 -ARGYLE- YORKSHIRE CORRIDOR- LIVE TRIAL
APRIL 22 -KENDOON DR FINAL TRIALS
JUNE 23 - REDHOUSE DR FINAL TRIALS
2023 -SPEN JOIN SIF BLADE CONSORTIUM FOR DISCOVERY PHASE
2024 – NEW LICENCE OBLIGATIONS FOR NETWORK OWNERS
(MUST DESIGN TO ENABLE RESTORATION)
GRID CODE MODIFICATIONS TO PROVIDE FACILITIES THAT ENABLE RESTORATION DELIVERY to ERS (GC 0156)
2024 - SPEN NETWORK INVESTMENT PLANNING FOR IMPLEMENTATION OF DISTRIBUTED RESTART SCHEMES
2024 -SIF BLADE ALPHA WORKSTREAM
2025 -SIF BLADE BETA WORKSTREAM

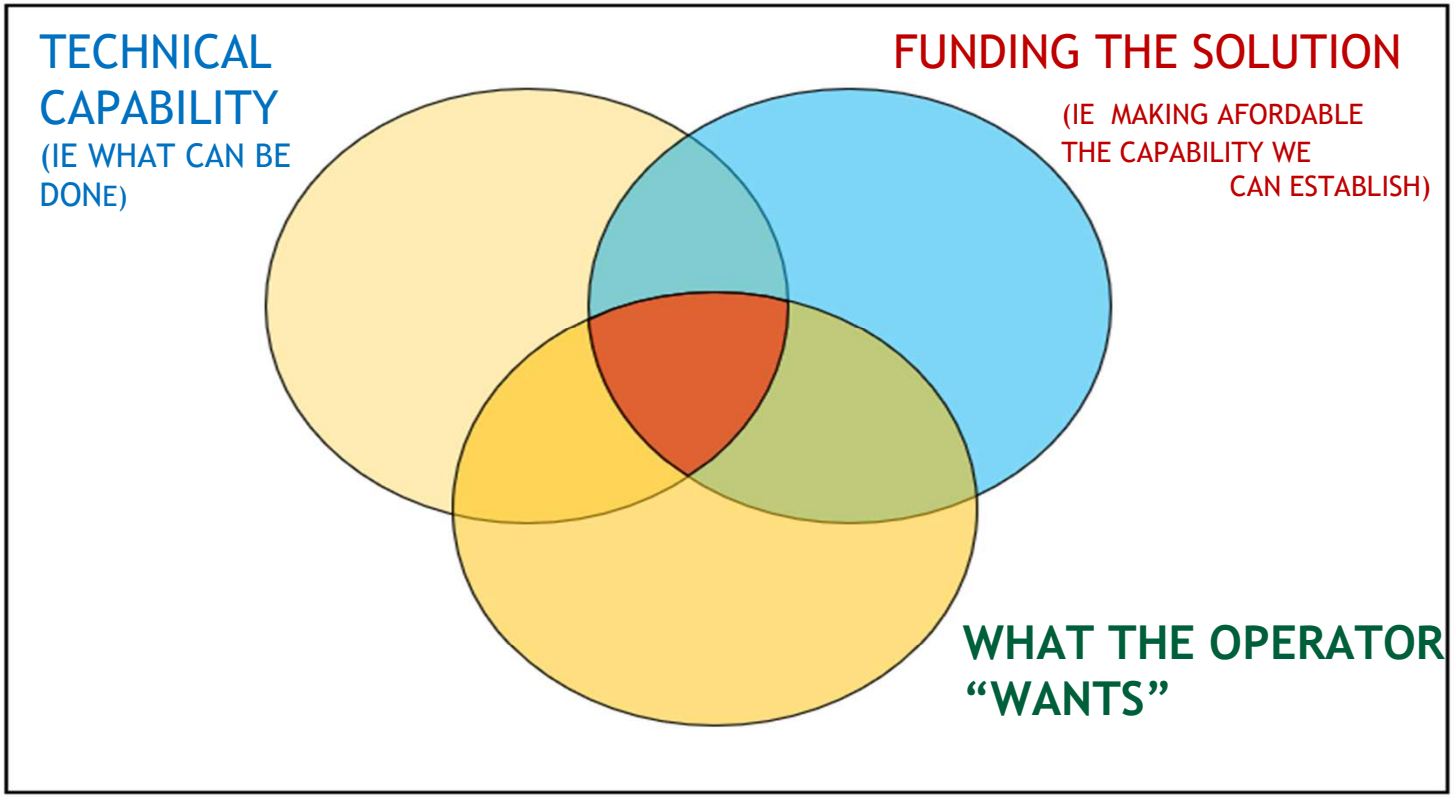
Transmission corridor energisation trial



Distributed Restart Trials

Redhouse Phase 3




TECHNICAL CAPABILITY
(IE WHAT CAN BE DONE)
FUNDING THE SOLUTION
(IE MAKING AFORDABLE THE CAPABILITY WE CAN ESTABLISH)
WHAT THE OPERATOR "WANTS"

Restoration is complex, needing skill/practice !

The “High Wire” act serves to illustrate some of the complexity and interactions which have to be mastered
Performance expected is not being achieved by simply avoiding individual downside risks !

- All involved know the plan and what their role is
- Keep in mind to start off they each had to get into position on the wire
- One person having a wobbly incident will interact with all the others
- Note that the wire has been constrained -also the act are not being subjected to uncontrolled interference
- Each individual is getting immediate and multiple feedback paths via human senses
- They have trained as a team, developed memory muscle, understand their role and practiced as a team.

Why do we need SIF Blade?

GC0156: Facilitating the Implementation of the Electricity System Restoration Standard

New UK Standards for Restoration

- May 24 – GC0156 ESR Standard
- NESO has new legal requirement
  - **restore 60%** of demand within **24hrs**
  - **100%** of demand in **5 days**

What Does it mean for Scotland?

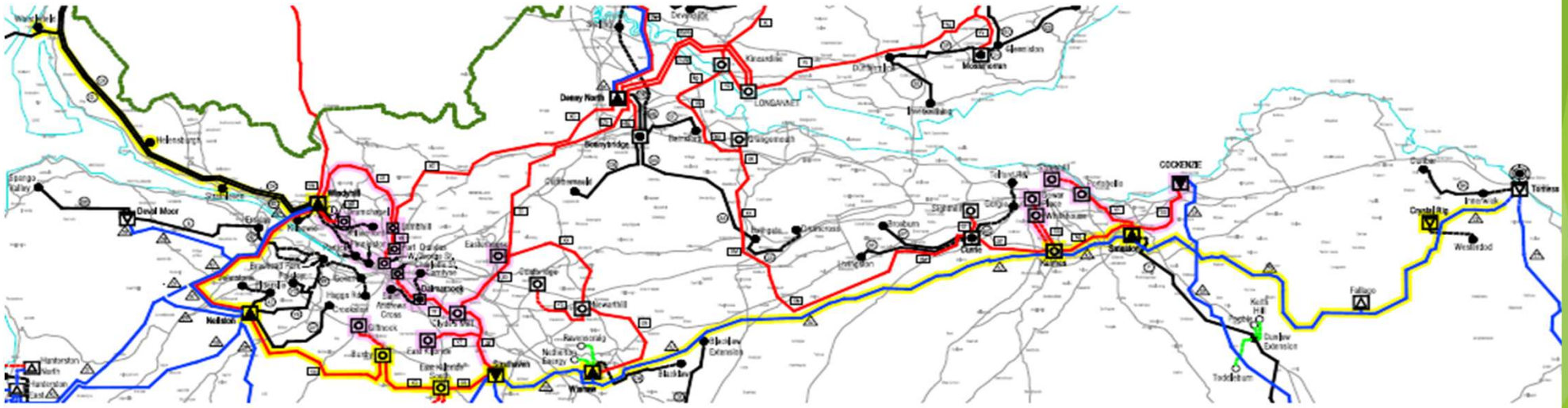
- **Limited start up capability** due to Low Carbon Generation Transition.
- **SPT Dependant on** supply from either **NGT or SSEN** to connect generation
- **Require** to develop a market for **Restoration services**

World Events have changed the focus

Electricity Supplies Front Page News

- **Low Carbon Technologies must be part of the solution going forward**
- Essential to get BLADE results to show how to restore from Offshore Wind
- No Longer just an Innovation Project
  - **Beta Delivery is a must**

SIF BLADE ALPHA - RESTORATION PATH STUDY



SIF BLADE ALPHA STUDY
BURDEN TO BE MET BY GENERATION DURING STEPWISE SYSTEM ENERGISATION

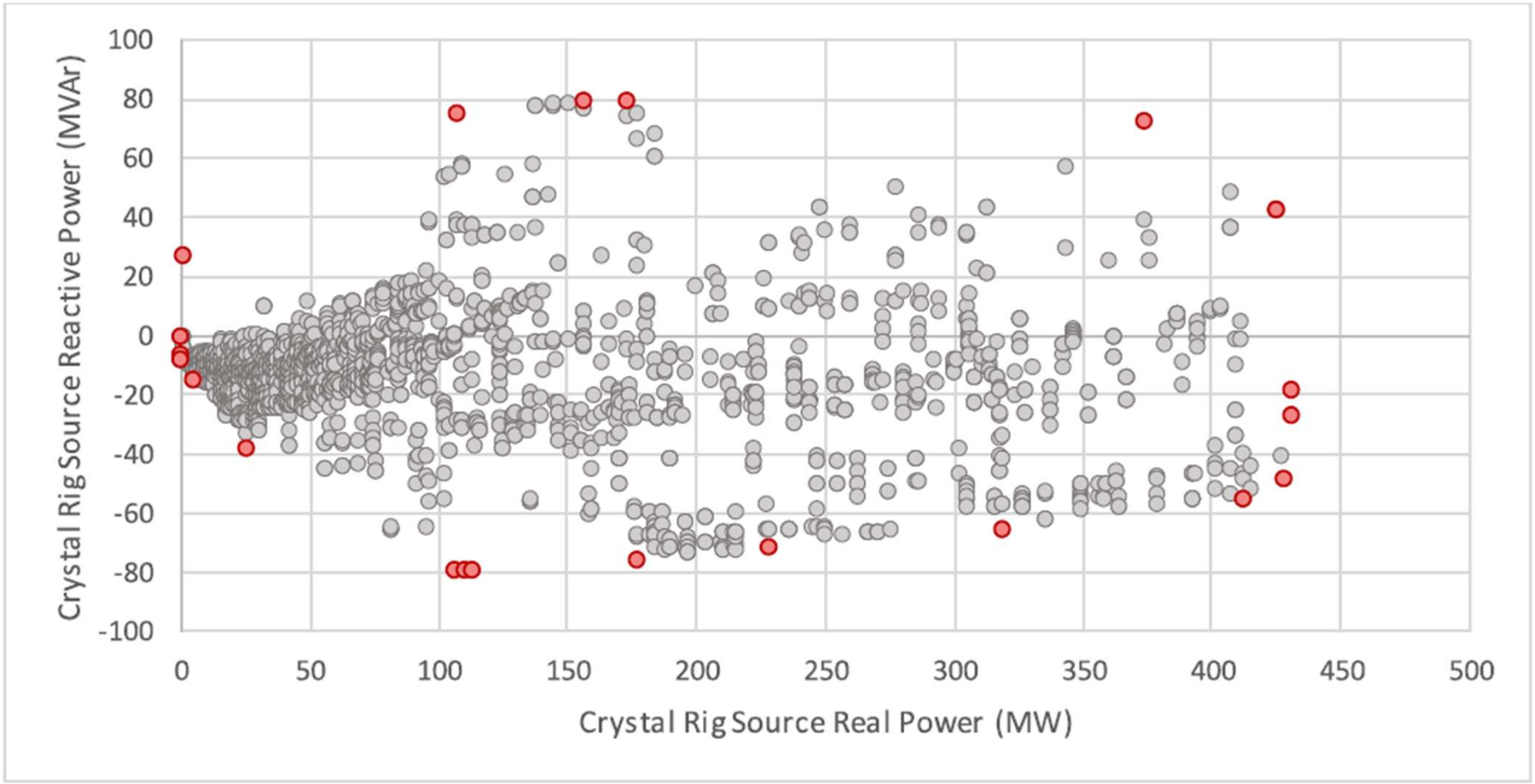
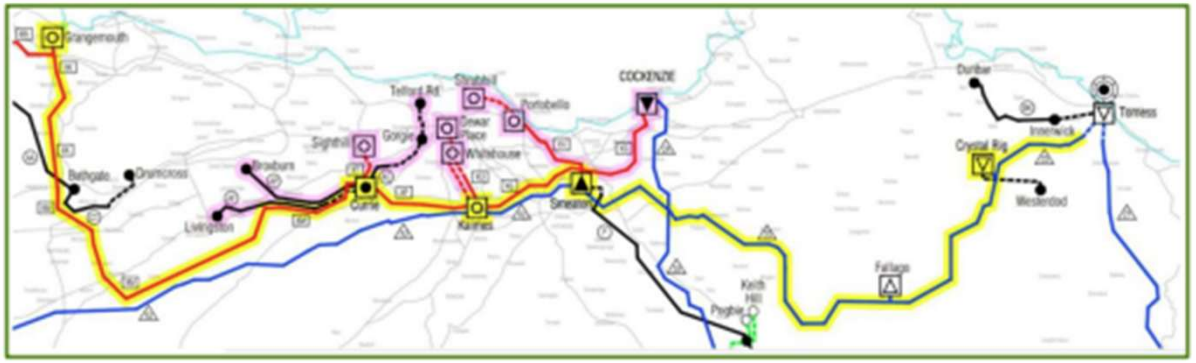


Figure 2 Steady state real and reactive power operating points for the Crystal Rig source. Grey markers indicate operating points, over all steady state studies performed. Red markers indicate the convex hull of all of the grey marker operating points.

What Will SIF Blade BETA Deliver?

Develop BESS Models and OWF models and discussed / debated / reviewed assumptions

Work with OEMs to get most accurate picture



For the scenarios undertake **extensive EMT Studies**

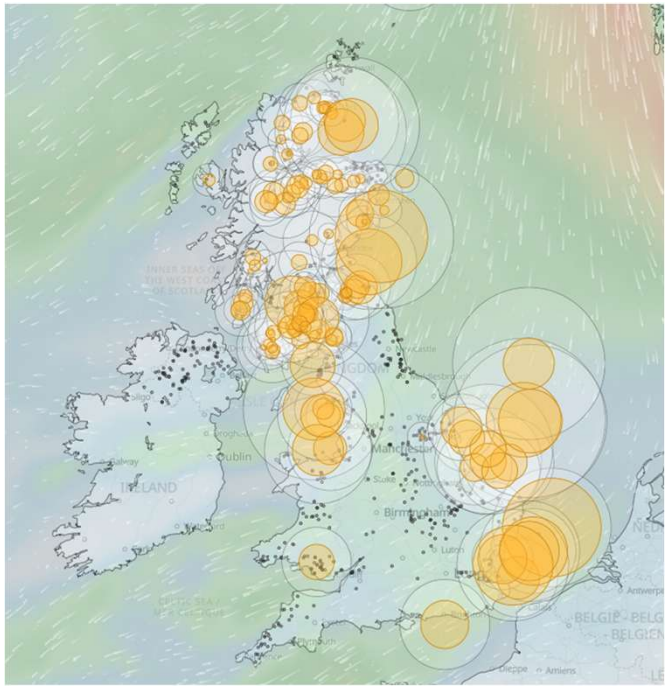
- **Evaluate** System performance
- **Determine** issues and propose solutions
- Review **Loading Step Changes**
- Review proposed switching
- Protection Challenges

Develop performance requirements for:

- GFM Sources (BESS / OWF)
- GFL Sources on initial re-energisation
- Transmission System Modifications to utilise OWF

Develop A Self Starting WF controller
Develop / Demonstrate how it can interact with the Grid
Show that OWF can be used to restore
Hardware in the loop? Live trial?

Final Comments

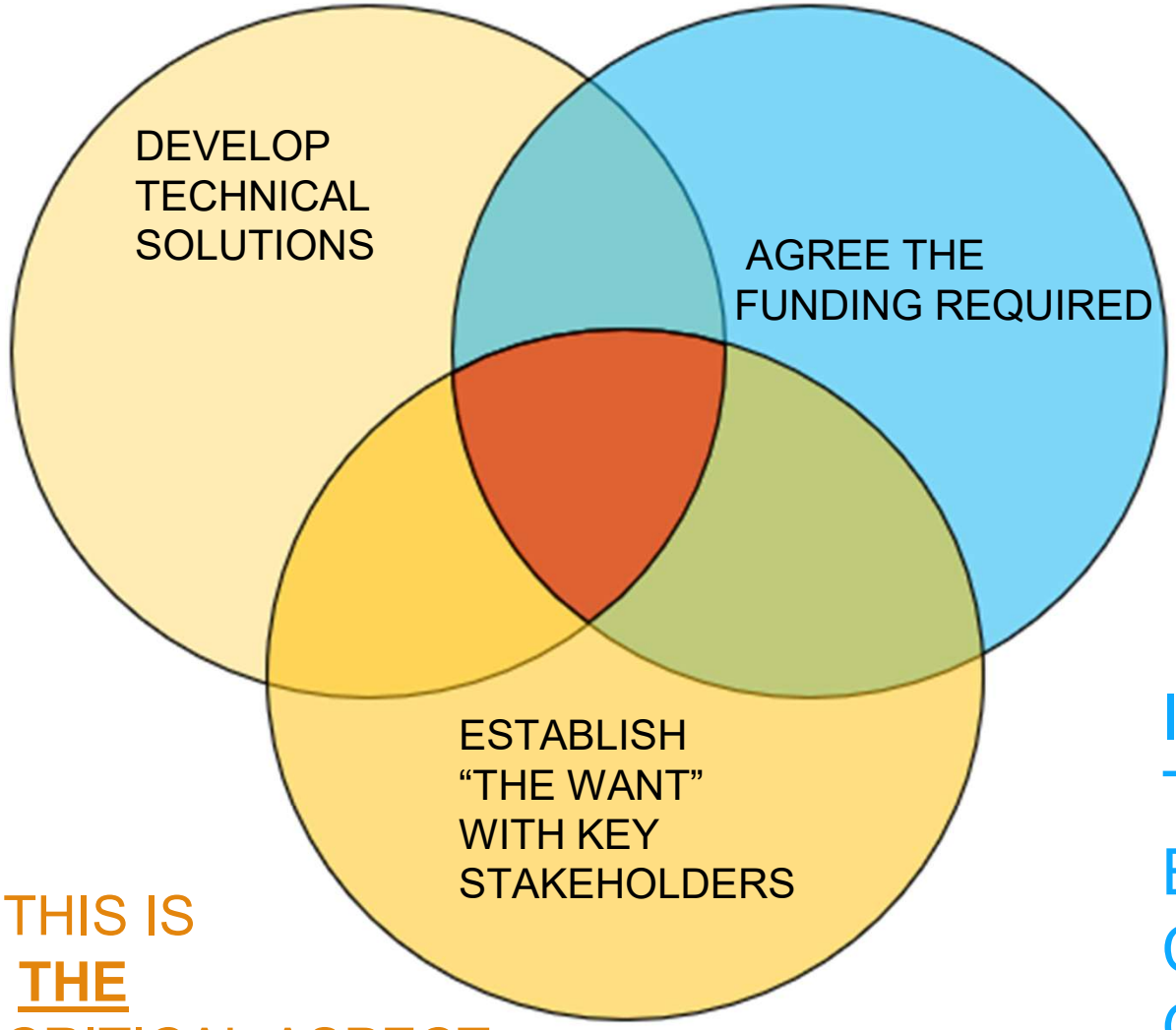


Recent Events have demonstrated the issues are **REAL**

SIF BLADE has the ability to deliver an essential Transmission solution
As the generation mix evolves ALL the elements MUST be designed for “Whole System” resilience and should the worst happen- Recovery

THE PROBLEM IS THAT PEOPLE DO NOT NECESSARILY HAVE A SHARED UNDERSTANING OF THE ISSUES !

THIS IS WHERE THE TECHY GEEKS LIVE



A CHALLENGING BUT REASONABLE PROCESS

THIS IS **THE** CRITICAL ASPECT

IT IS VITAL TO ESTABLISH COMMON GROUND