

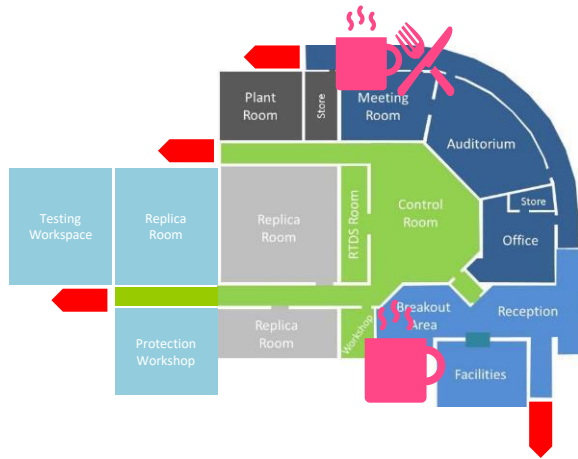
The National HVDC Centre *Operators Forum- welcome and Overview of Event.*

12/13 June 2024

Ben Marshall, Technology Manager

Content

- 1) Welcome & Housekeeping (9.30am-9.32am)
- 2) Safety moment (9.32am-9.35am)
- 3) Recap- last Operators Forum (9.35am- 9.37am)
- 4) Major developments since last Operators Forum (9.37-9.35am)
- 5) Key themes for this Operators Forum (9.35- 9.50am)
- 6) Any Questions?



Fire Safety

- **Exits:** Familiarise yourself with the nearest exits.
- **Assembly Point:** The fire assembly point is on the pavement outside the main gate.
- **Call points, extinguishers & blanket.**



Note: Weekly Fire Alarm Test is every Thursday at 9:00am

Caution: Hot Water

Please take care with our:

- Boiling water tap; and
- Kitchen sink tap is also very hot.



First Aid

- There are first-aid kits, burns kits and a defibrillator on site.
- Simon Marshall, Colin & Fabian, are trained first-aiders, please contact them for assistance.

Safety Rules

- Reverse Park
- Sign-In & Out
- Assess Risks
- Report All Incidents/Hazards
- Accept Challenges

There's a lot of people here today, so-



- Please keep mobile phones on silent and feel free to pop in and out of the Auditorium as you need to, as discreetly as you can.



- Please be courteous to speakers and questions- don't shout over/ interject, we have allocated time for Q&A and panel interactions across the event.



- Please be conscious of keeping to time when presenting and similarly during coffee breaks.



- Please use flipcharts/ room white board to record any further questions, observation/discussion points, expectations- we will come back to these across the event where we can.

Safety Moment- Forsmark Nuclear Plant

13th May 2024- Transmission fault near Forsmark nuclear power station, which tripped unit1- failed to “ride-through”, resulting in a 1GW loss. Unit 2 was on maintenance at the time; otherwise it would have seen the same electrical disturbance- in that case the total loss could have been around 2GW instead, exceeding Nordic Grid max loss.



Why is this relevant?

- Forsmark was built in the early 1980s when a converter dominated system was not envisaged.
- Legacy generation relies on (don't just provide!) system strength, to ride-through an event.
- This is why current injections into a fault are needed- to ensure the general stability of a network is maintained.
- HVDC are the largest single converters on the future network. Their performance now and in the future is critical.

Nordic grid, like our own is becoming increasingly converter dominated. Increasingly more EMT analysis in planning and supporting operation- e.g. see link to Fingrid's recent experience and approach [Webinar: Measures to Address Stability Issues in Fingrid - ESIG](#)



Recap- last Ops Forum- the “how”.

How do we get to Net Zero?



1. How to design HVDC for Net-Zero

- National Ambition, HND, TSO & Developer, International work

2. How to provide enhanced Network support

- ESO initiatives, Networks, integration, new services

3. How to specify and build Multi-terminal, Multi-vendor networks

- “Safe to fail”, sequenced activity, promoting standardisation

4. How Vendors are preparing for this-

- Project Aquila, InterOPERA, READY4DC, GTSOC & virtual replicas

5. How to deliver at Pace

- Standardise, modular, multi-vendor, supply chain, long term certainty.

6. How to develop Skills

- Industrial qualifications, Academic courses, industrial Doctorates, early years skills.

So “how” has it been going?



How to design for Net Zero?

Electricity Networks Commissioner – Companion Report Findings and Recommendations

June 2023

European offshore network transmission infrastructure needs
 TEN-E Offshore Priority Corridor: Northern Seas
 TEN-E Offshore Priority Corridor: BEMIP Offshore Grids
 TEN-E Offshore Priority Corridor: Atlantic Offshore Grids
 TEN-E Offshore Priority Corridor: South and West
 TEN-E Offshore Priority Corridor: South and East
 Methodology
 Stakeholders Engagement Report

Decision

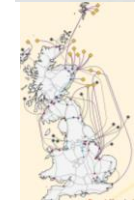
ofgem Making a positive difference for energy consumers

Decision on the Regulatory Framework for the Non-Standard Interconnectors of the Offshore Hybrid Asset pilot scheme

Publication date: 8 February 2024
 Contact: Kevin Wagner, Nick Pittarello
 Team: Future Interconnection
 Email: Cap.Floor@ofgem.gov.uk

Beyond 2030

A national blueprint for a decarbonised electricity system in Great Britain



How to provide enhanced network support?

National Grid ESO Stability Market Design: Final Outcomes

July 2023

PRESENTATION OF THE FINAL OUTCOMES

AFRY

Distributed ReStart

Energy restoration for tomorrow

Who we are | What we do | Our work and impact | News and insights | Contact

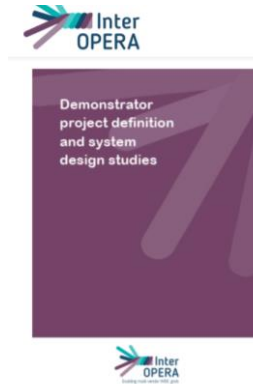
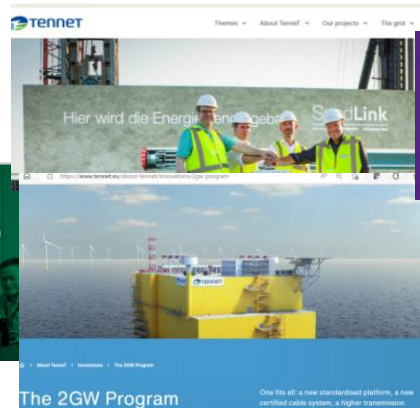
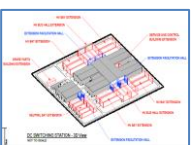
Black Start Demonstration from Offshore Wind (SIF BLADE)

New Dynamic Response Services

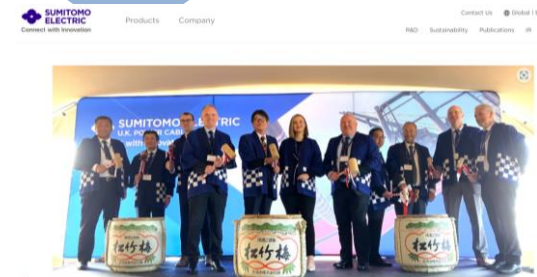
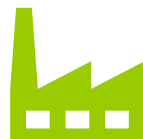
Provider Guidance v7
 March 2024

So “how” has it been going?

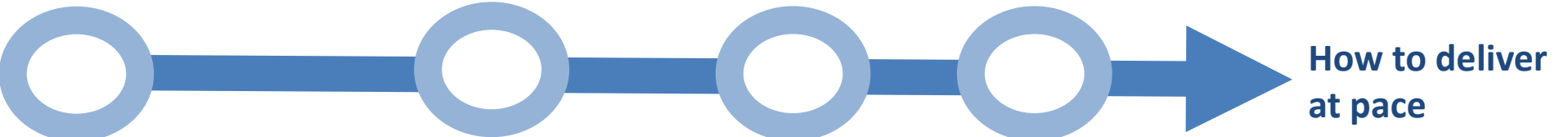
How to Specify and build multi-terminal?



How vendors are preparing



So “how” has it been going?





Major milestones in delivery of key contracts for 2030 Scottish electricity transmission network plans



Major milestones in securing the supply chain required to help deliver Government 2030 targets

#NoTransitionWithoutTransmission



Principles for Interconnector Development

Phase 2

Contributors from the Green Grids Initiative (GGI) Asia-Pacific Working Group
 Edited by Sebastian Michael, Matthew Wilkinson, and Marisa Stewart

50Hertz, Energinet Commence Tendering for Bornholm Energy Island

SUPPLY CHAIN

November 30, 2023, by Adrian Merritt

Danish and German transmission system operators (TSOs) Energinet and 50Hertz have started the tendering process for the delivery of HVDC equipment and cables for the joint project, Bornholm Energy Island.




National Grid launches £59bn frameworks for HVDC needs including £12.8bn civils works




Industrial Doctoral Centre for Offshore Renewable Energy




HVDC and GB Power System
Dong Chen
The National HVDC Centre




UK Research and Innovation

Apply for funding Manage your award
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Industrial CASE – EPSRC



Accelerating the Deployment of Offshore wind using DC technology







ENERGY & UTILITY SKILLS



Scottish & Southern Electricity Networks

Today's Operators Forum- The "What".



Morning Session

- 09:00 Teas, Coffees, Cakes and Registration
- 09:30 Welcome and Overview of the Event
Ben Marshall, The National HVDC Centre
- 10:00 Session Introduction and Context
Ben Gomersall, The National HVDC Centre
- 10:15 Latest Holistic Network Designs
Graham Stein, National Grid ESO
- 10:45 ASTI Projects
- 11:15 Coffee Break
- 11:30 Ørsted's journey & learnings of HVDC Connected Offshore Windfarms
Kaushik Hore, Ørsted
- 12:00 Interconnector Projects
Jonathan Ruddy, Greenlink Interconnector
- 12:30 LUNCH & NETWORKING

Afternoon Session

- 13:30 Session Introduction and Context
Colin Foote, The National HVDC Centre
- 13:40 The InterOPERA and HVDC-WISE projects
Donaël Muret, SuperGrid Institute
- 14:00 NEOM Grid of the Future
Grain Philip Adam, ENOWA.NEOM
- 14:20 The Development Progress of HVDC Master Controller and Plans for the First MTDC in Korea
HyunKeun Ku and Lee Jaegul, KEPCO Research Institute
- 14:40 HVDC in the USA
Geoff Love, EPRI
- 15:00 Introduction to Interactive Breakout Session
Colin Foote, The National HVDC Centre
- 15:10 Coffee Break
- 15:25 Interactive Breakout Discussion Sessions
HVDC Centre Engineers
- 16:25 Panel Review of Interactive Session
Colin Foote, The National HVDC Centre
- 17:00 Optional Informal Session

Gala Dinner
12th June 2024
Westerwood Hotel Club Room
Starting at 18:30

What's everyone else doing? What's similar/ different & why?

What are we delivering?

What does interoperability look like?

What makes scale and pace deliverable?



Morning Session

- 08:30 Teas, Coffees and Cakes
- 09:00 Welcome to Day 2
Simon Marshall, The National HVDC Centre
- 09:15 Session Introduction and Context
Ben Marshall, The National HVDC Centre
- 09:30 Technical Standardisation of HVDC Schemes
Perry Hoffbauer, SSEN Transmission
- 10:00 The TenneT 2GW program
Serkan Kabul, TenneT TSO B.V.
- 10:15 Strategic Supply Chain Engagement
Panel Session
- 10:45 Future Development of the HVDC National Centre
Simon Marshall, The National HVDC Centre
- 11:05 Coffee Break
- 11:25 Session Introduction and Context
Dong Chen, The National HVDC Centre
- 11:40 SOFIA and Dogger Bank C GWF interaction study: overview and current status
Viktor Rudon, RTE International
- 12:00 LUNCH & NETWORKING

Afternoon Session

- 13:00 Interoperability Aquila Demonstration
HVDC Centre Engineers
- 14:00 GTSOC Demo/Presentation
Sumek Elmoun, RTDS Technologies Inc.
- 14:20 HVDC Interoperability, Past, Present and Future
Carl Borker, GE Vernova
- 14:40 HVDC Interoperability updates (Aquila, InterOPERA, NEDO)
Mitsubishi Electricity Company, Hitachi Energy, Siemens Energy
- 15:00 Wrap up
Ben Marshall, The National HVDC Centre
- 15:20 Close

Next- *HVDC in GB*

Thanks for listening.
Any questions, please?

❑ For further information, please visit www.hvdccentre.com ; OR email: info@hvdccentre.com

❑ <https://www.hvdccentre.com/technical-films/>



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Follow our LinkedIn page [The National HVDC Centre](#) for regular updates.