Newsletter

Issue 29: July 2022

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The National HVDC Centre

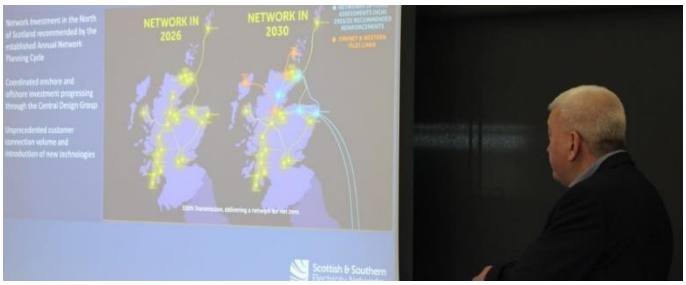
Welcome to our Summer Newsletter, and it's great to be back having large in-person events here at the Centre. This month's newsletter focusses on one of the biggest of these, our annual HVDC Operators' Forum (back from a 2-year hiatus), together with a number of major project announcements relating to key innovations that Centre is spearheading going forward, and also the re-starting or our in-person training courses *(see below).*

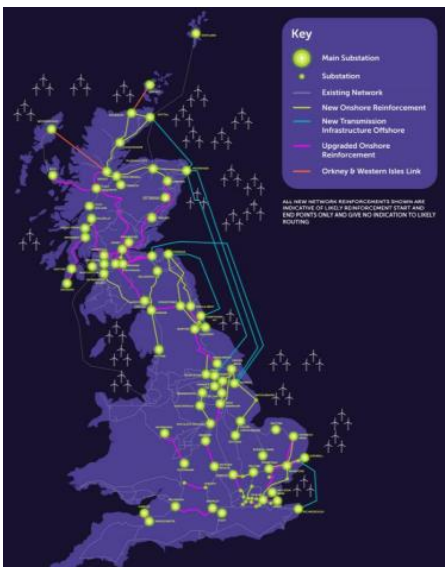
The HVDC Operators' Forum 2022 *(21 - 22 June) [attendees photographed above]*

The HVDC Operators' Forum has been our flagship annual event at the Centre, which since 2017 has expanded in audience and numbers steadily. As a result of the COVID pandemic, our last event was back in 2019, and it was great to see both new and old faces, and feel the energy from all giving updates on a wide range of project work, innovation and delivery in all things HVDC.

The session began with the Manager of the HVDC Centre, Simon Marshall, providing a welcome to the Centre, together with an overview of what the Centre is and does.

Roddy Wilson (right) then presented a SSEN Transmission update on project delivery; addressing the up to 13 GW of planned transfer of power out of the north of Scotland, and 23 GW of power transfer out of Scotland overall by 2030. This represents growth exceeding fourfold capacity available today, and most via HVDC "bootstrap" reinforcements – see figure (right).





There were also discussions of other reinforcements by David Barron and Afshin Pashai at NGET.

The morning session followed with Lyle Flynn updating on the delivery of the Kergord site on Shetland, due to commission in 2024 (below).

Introduction to RTDS® Real-Time Simulation *(25 – 27 October 2022)*

We are planning to run a 3-day 'Introduction to RTDS®' training course in October, in-person, at the Centre.

If you are interested in attending, please register your interest as soon as possible, as there is a limited number of places.

Course details:

- Title: Introduction to RTDS® Real-Time Simulation
- Dates: 25 - 27 October 2022
- Register: https://forms.office.com/r/QMmFj3xiQa

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Multi-vendor, Multi-terminal demonstration at The National HVDC Centre

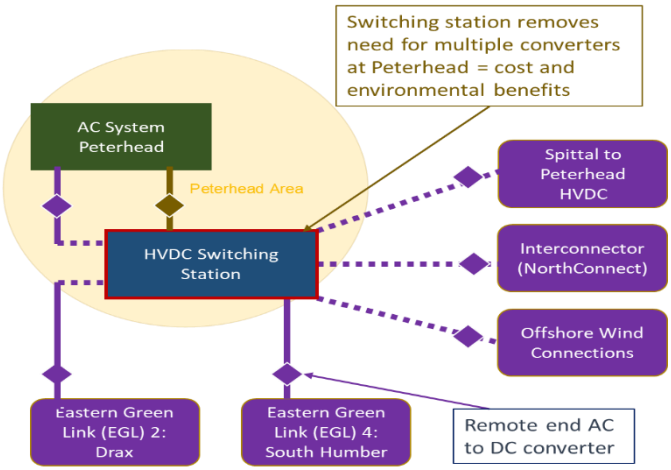
The Centre's Technology Manager, Ben Marshall (right), presented on the past, present and future of Multi-vendor, Multi-terminal offshore grid designs, to expand the capability of transmitting offshore wind power on, for example, the east coast of GB.

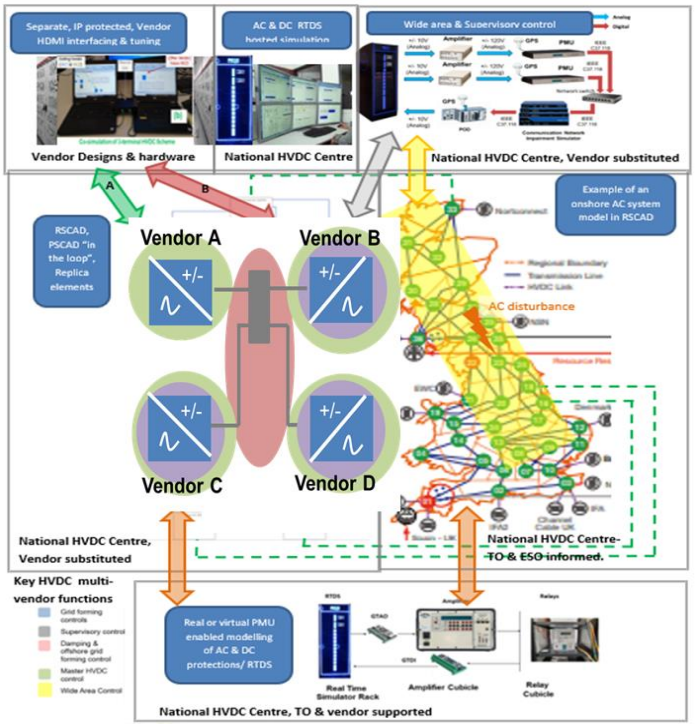
At the Centre we are using real-time EMT simulation tools to combine generic models of the building blocks of multi-terminal DC systems, which can later be substituted with real vendor hardware or real-time software models. This provides a solid foundation for a multi-terminal demonstration project.

Ben announced that a project was to be taken forward within the "GB Interoperability Expert Working Group" where vendors, all TOs and ESO would support the Centre in demonstrating how multi-vendor components can be combined in simulation then ultimately with hardware-in-the loop.

Pathway to 2030: Project Aquila

The Centre is proud to announce it is supporting SSEN Transmission and industry partners in the delivery of a multi-terminal, multi-vendor demonstration related to the Eastern Green Link projects and other activity surrounding Peterhead substation in the North-East of Scotland.



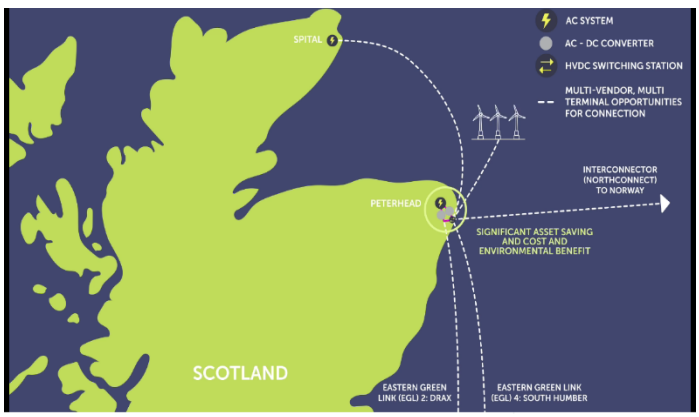


This demonstration is founded upon the construction of a DC switching station enabling structured and staged delivery of multi-terminal, multi-vendor HVDC systems.

It has been recognised by the Government as one of the "Pathfinder" projects in the Offshore Transmission Network Review.

Further details may be found a:

https://vimeo.com/722976957/941e3ef4e9 and Offshore Transmission Network Review: Pathfinder projects - GOV.UK (www.gov.uk)



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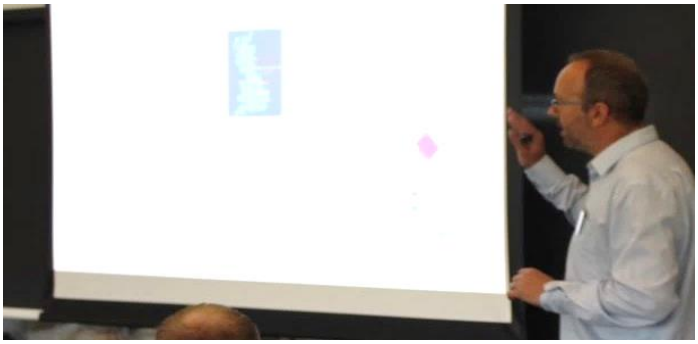
SOFIA Offshore windfarm

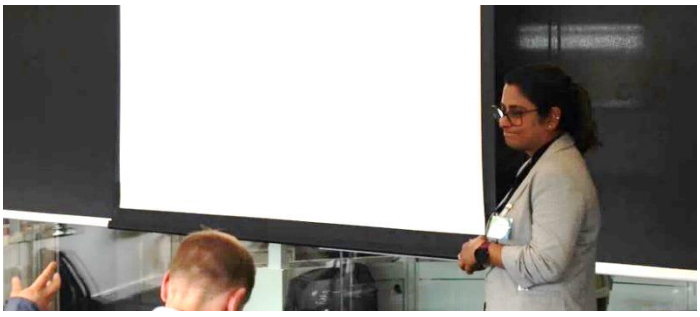
Chris Smith (below) from RWE introduced the design, implementation and management of interoperability within the context of the Sofia and Dogger Bank projects.



These are HVDC connected windfarms co-located at Lackenby and it has been concluded that prior to connection both will purchase control and protection replicas, to be hosted in the first instance at RTEi's facility at Lyon, where real-time hardware-in-the-loop studies in RTDS would be conducted. Chris also highlighted some of the critical path issues in construction, including the availability of cable laying and platform deployment vessels suitable for the scale of the increasing HVDC capacity (1320 MW on a single platform).

Scottish Power Renewables update

Echoing many of these themes, but also identifying opportunities for new services available from the use of HVDC replica hardware, Priyanka Mohapatra (below) from SPR provided an update across the wide range of renewables projects currently advancing new power electronic control and performance capabilities, including a world first demonstration of grid forming and black start from a wind farm, and the array of future projects set to go forward across Crown Estates and Scotwind leasing rounds.



Priyanka also referenced the plans to use a replica of the East Anglia 3 project at The National HVDC Centre both to support the project and realise new service opportunities across black start and stability services; these topics and recent developments in Grid Code and stability contracting were also discussed in an ESO presentation at the Forum.

Multi-vendor interoperability experiences

In presentations from Sverre Skalleberg Gjerde and Sebastien Dennetiere (below), key insights were provided on how interoperability analysis is conducted, managed and implemented. RTEi's first-hand experience of supporting Equinor's Johann Svestrup project was covered along with further insights relating to planned and future wind farm de-risking, emphasising how with the correct tools, planning and organisation de-risking of projects was not only possible, but being actively delivered.

Mutual Energy update

Continuing the themes of service benefit, Mutual Energy highlighted the range of commissioning activities they had conducted on a control system update set to enhance the range of services offered to SONI and ESO. This had included pro-active use of a replica to de-risk programme and demonstrate new capabilities, with further demonstration and de-risking to be hosted at The National HVDC Centre.

These and other presentations on the day brought to life the scale of HVDC delivery now in front of us, and in a poignant update on National Grid Ventures activities, Chris Smith, highlighted the importance of welfare on increasingly large and time-pressured sites.

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R&D and Tool Development

Our HVDC Operators' Forum also covered a number of key innovative look-aheads.

Paul Forsyth from RTDS® Technologies (right) highlighted new battery storage and hydrogen electrolyser models within RSCAD, the new capabilities in RTDS interfacing that limit I/O needs within future replica platforms, and a game-changing new capability within RTDS to host encrypted code or offline PSCAD model elements within a real-time simulation, the so called "software-in-the-loop" approach.

Ian Cowan (right) at the Centre took the audience through the world first delivery of a "software-in-the-loop" technique in project analysis, where an encrypted vendor wind farm control model had been integrated within real-time simulation in support of commissioning analysis for the island connections to Shetland. This was all evidence of the innovation and capabilities in the toolset - if the requirement is clear, the capability will follow.

New Vendor Developments in Support of HVDC Pace and Scale

The Operators' Forum closed with presentations from vendors, Carl Barker from GE (virtually owing to train disruptions), and Paul Tooth and his colleagues from Siemens, both summed up the themes of the two days, eloquently describing the supply and scaling challenges together with the key challenge of achieving multi-vendor, multi-terminal solutions to achieve the grids of tomorrow.

These and the other presentations may be found in:
[Operators' Forum 2022 – Library Categories – The National HVDC Centre]

DC Network Efficiency and Design

Bruno Luscan and Willian Leon Garcia, from the Super Grid Institute, who like ourselves are partners in the Network-DC project, discussed the opportunities available for optimised AC-DC network control and the approaches they have developed for optimising DC network techno-economic efficiency across areas of DC protection and associated design.

This was followed by Qiteng Hong, of the University of Strathclyde, highlighting the protection benefits of new grid forming control approaches using a testbed developed by his team, and Sean Kelly from Transmission Excellence Ltd illustrating how minor changes in control system software to introduce an "Advanced Vector Control" can improve transient voltage stability (see left, anticlockwise).

Finally, Mohamed Golshani from GE illustrated how PMU data can be used to improve HVDC control decisions based on estimation of network strength.

We would like to thank all of the 2022 Operators' Forum attendees for supporting this event and making it such a success with a particular thanks to the presenters for taking the time to share their experience and expertise with the delegates. We look forward to doing it all again next year so please save the dates of the 14 and 15 June 2023

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Blackhillock Site Visit

Amongst a busy few months a number of our team were able to take the opportunity to visit the Blackhillock site during a planned outage to gain rare access to the valve hall of the site in addition to receiving a broader tour from the HVDC engineering team within SSEN Transmission. All found the site visit insightful and useful, despite the long journey and challenging timing necessitated in fitting in with the needs of an active project.

Shangen Tian

Distributed ReStart

This Network Innovation Competition project, led by National Grid ESO with partners SP Energy Networks (SPEN) and TNEI, is exploring how distributed energy resources could support system restoration.

The Centre is facilitating hardware in the loop testing of a prototype Distribution Restoration Zone Controller (DRZC), including the use of new facilities for testing communications delays and interruptions.

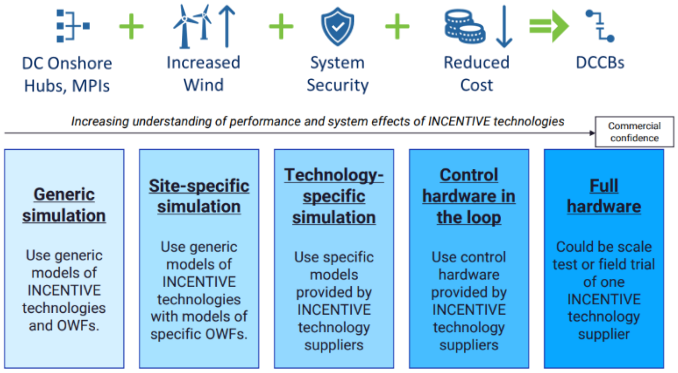
Colin Foote & Fabian Moore

New Starters

We are delighted to welcome: Colin Foote, Asif Khan, and Suresh Rangasamy (in order, below) to our expanding team at the Centre.

With academic, networks, and vendor experience, together with strong backgrounds in a range of areas supporting HVDC project de-risking, they further strengthen our team at the Centre.

Alpha Phase approval for Network-DC and INCENTIVE SIF projects



The Network-DC and INCENTIVE projects received approval this month to proceed to the “alpha phase” of delivery, which will now occur across August 2022 - February 2023, following completion of the "discovery phase" activity this April.

Network-DC explores use-cases and implementing activities unlocking the first use of DC circuit breaker and associated technologies in GB, and in its alpha phase will simulate and inform technical specification and a “dry run” invitation to tender with the vendor community.

INCENTIVE is investigating efficient options for stability support that can be provided across multiple devices in conjunction with import of offshore wind, and in its alpha phase will seek to test performance and refine cost-benefit evaluation for these solutions.

Each project has already produced useful findings and if delivered in full will enhance readiness of new solutions enabling solutions beyond 2030 for the integration of large-scale offshore wind and their HVDC networks.

Ian Cowan

Formal Opening of HVDC Centre Extension

Throughout the difficult construction period of the pandemic, the Centre was increasing its hosting capability in the knowledge of the new replica and other hosting needs emerging.

Our extension was formally opened on 26 July by UK Government Minister Malcolm Offord, together with Rob McDonald, Managing Director of SSEN Transmission.

https://www.ssen-transmission.co.uk/news-views/articles/2022/7/extension-to-world-leading-hvdc-centre-officially-opened-by-uk-government-minister-for-scotland/

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