Newsletter

Issue 35: December 2023 Edition

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The National HVDC Centre

Christmas at the HVDC Centre

Welcome to our Winter edition of the HVDC Centre Newsletter.

'tis the season to be busy, it seems; as we hit a number of significant project milestones, support a range of dissemination activities and begin to plan out those for next year. As always, we welcome your feedback. Contact us to follow up on any of these or other topics.

Offshore Wind HVDC Interaction Studies

East Anglia is an area of comparatively low demand and net export to the wider transmission system area that already features a range of generation technologies, both conventional and power electronic sources. In the transition to Net Zero, there is expected to be nuclear power remaining alongside a significant increase in power electronic connections; the largest contributions coming from offshore wind and interconnectors in the area.

There are several parts of GB where offshore wind farms will connect through new HVDC links. With converter stations in close proximity, performance of each individual project at its onshore connection point is likely to depend on overall performance of all projects and their interaction with the rest of the power system.

The National HVDC Centre is conducting a study to explore possible control system interaction risks between multiple HVDC converter stations. The studies are using the PSCAD software to build suitable models of the network area of interest with the new HVDC converter stations and conduct a range of studies to assess interaction risks. The purpose of this work is to identify risks and possible mitigations in a time frame suitable to inform project designs.

Colin Foote

2024 HVDC Operators' Forum

We are pleased to announce the date of the 2024 HVDC Operators' Forum:

12-13 June 2024

As we move into the delivery phase of GB's ambitious network development programme, this event will focus on the following themes:

- GB's network development programme (incl. ASTI projects and the Holistic Network Design);
- The commissioning of Europe's first multi-terminal VSC scheme;
- Multi-vendor interoperability demonstration;
- Design and specification of offshore DC hubs; and
- Standardisation of converter stations and cable design.

This event is intended for TOs/TSOs, renewables developers, manufacturers and people involved in the delivery and operation of HVDC projects.

If you wish to attend, please register your interest using the link below.

We very much encourage attendees to share their project learnings; if you are willing to present about your project (on any of the above themes) please indicate on the registration form, thank you.

Date: 12-13 June 2024
Time: 9:30am on 12th to 4:30pm on 13th
Register: https://forms.office.com/e/XNbCBzLYjK

Linda Rowan

The National HVDC Centre

HVDC Training

On 21 November we welcomed people from all three onshore Transmission Owners, the System Operator and two offshore wind farm developers to the Centre to attend a one-day training course on Introduction to HVDC and Project Delivery.

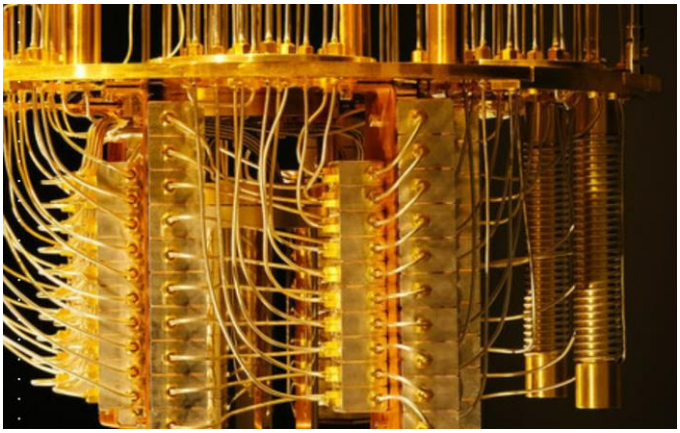
Our team of experts shared their knowledge across a range of topics, covering the fundamentals of HVDC technologies, modelling and simulation challenges, and how the industry is delivering and de-risking the large number of projects currently underway.

Feedback was overwhelmingly positive and there is great demand for further training. We'll be arranging new training courses in 2024 so keep an eye on our website or LinkedIn page for more information.

Colin Foote

Quantum Computing

In December, the Centre hosted a workshop on Quantum Computing with the Digital Catapult. We invited experts from the field of quantum computing and from GB network companies to come together to discuss how we can work together in future.



The team from the Digital Catapult gave us an update on the current state of technology for quantum computing. Then the Centre discussed our future innovation plans for a full GB real time digital twin and the high computation need in that project.

We then had a workshop to discuss what future collaboration could be done to support each other. We are considering adding a work package in our future innovation project to explore this further.

Ben Gomersall

INCENTIVE Update

The first consortium meeting for the INCENTIVE project was held on 16 October in Glasgow.

The consortium boasts members such as SSEN Transmission, National Grid ESO, University of Strathclyde, Frazer-Nash Consultancy and The Carbon Trust, which represents the Offshore Wind Accelerator (OWA) partners, EnBW Energie Baden-Württemberg AG, Equinor, Ørsted, RWE, ScottishPower, Shell, SSE Renewables, TotalEnergies, Vattenfall, bp, Ocean Winds, along with the Advisory Panel partner. It was wonderful to meet many of the project partners in person, while some joined us online.

Project INCENTIVE is in beta phase building on the positive findings of the previous discovery phase and alpha phase.

The project combines two R&D programmes – Ofgem's Strategic Innovation Fund (SIF) and The Carbon Trust's Offshore Wind Accelerator (OWA). This project is researching technologies that will allow renewable generators to provide inertia and other stability services to the electricity system.

The HVDC Centre is leading the technical assessment of Work Package 3, which involves using a high-performance computer to carry out a larger number of testing cases on the grid-forming STATCOM with storage system and grid-forming Battery Energy Storage System (BESS).

This aims to investigate the inertia and stability performance of STATCOM with energy storage system and grid-forming BESS.

For more information, please visit:
https://www.hvdccentre.com/innovation-projects/incentive-innovative-control-and-energy-storage-for-ancillary-services-in-offshore-wind/

Shangen Tian

The National HVDC Centre

Network DC

The HVDC Centre is participating in two of the Strategic Innovation Fund (SIF) Round One projects that have progressed to the Beta Phase (following successful Discovery and Alpha Phases). The SIF is Ofgem's mechanism for funding large innovation projects and the Centre is proud to be involved in these pioneering activities.

Network DC is investigating the feasibility and value of introducing DC Circuit Breakers (DCCBs) to the emerging network of HVDC connections around GB, particularly on the east coast where multiple north-south connections will overlap with numerous offshore wind connections and international interconnectors. As part of the Beta Phase, a tender will be issued to invite one or more manufacturers of DCCBs to get involved in the project, including developing the control and protection philosophy for DC grids, and supplying replica control equipment for testing at the Centre.

We are working closely with SSEN Transmission, who lead the project, and partners Mott MacDonald, SuperGrid Institute, University of Edinburgh, Carbon Trust and National Grid ESO. We have also been engaging with several international manufacturers ahead of the tender.

For more information, please visit:
https://www.hvdccentre.com/innovation-projects/network-dc-circuit-breakers/

Colin Foote

Guest Lecture

To promote awareness of HVDC technology as an enabler towards the net-zero target of GB, Dr. Dong Chen delivered a guest lecture to the masters students of Imperial College London on 15 December 2023.

Titled as "HVDC and GB Power System", during this lecture the future plans for the GB power system to transmit bulk offshore wind power via multi-terminal HVDC grids was introduced along with the role of the HVDC Centre in de-risking the development.

As an example, "Aquila Interoperability" was showcased as a typical project carried out by the Centre. The guest lecture was followed by a research seminar on a stability methodology to enable HVDC interoperability.

Dong Chen

HVDC-WISE General Meeting

The second general meeting of the HVDC-WISE project was hosted by RSE in Milan in November 2023; attendees were present from all the major project partners spanning most of Europe. With the project entering its second year, the two-day event was a good opportunity for the various work packages to provide an update to the wider group. Overall, the project is progressing well with the team on target to meet key milestones.

In addition to meeting updates, a workshop was hosted with the University of Strathclyde and the HVDC Centre sharing their experience on stability analysis of systems containing grid-forming devices and the implications for the modern network. This workshop prompted interesting discussion around the future of the GB and European power systems.

Following this, members from RWTH Aachen presented their work surrounding common interface modelling which allows for power system models to be converted between different software packages utilising a common library of classes. The presentation showcased various example cases with verifications of translated models against the originals.

Callum Henderson

Project Aquila: CIGRE and other dissemination

As Project Aquila moves from the analysis to test and implementation stages, we took stock on progress and next steps in a CIGRE UK webinar on 25 October, co-hosted with SSEN Transmission.

The work was well received and prompted the publication of an article in the latest CIGRE B4 newsletter.

This quarter also marks the conclusion of the Horizon 2020 project READY4DC on preparations for interoperability in Europe, with final papers produced discussing Project Aquila; see Publications - READY4DC

Ben Marshall & Dong Chen

The National HVDC Centre

CMS Replica

It is a busy period for the Caithness-Moray-Shetland HVDC link with the Shetland end due to be commissioned in 2024. The HVDC Centre has played an important role in preparing for, and de-risking, the upcoming energisation by hosting multiple testing activities utilising the CMS Replica hosted at the Centre.

It is great to see the Replica, connected to our world-class real-time simulation environment, delivering value to GB customers as intended and fulfilling the purpose for which the Centre was originally created.

Further testing and training is planned for the new year as SSEN Transmission prepare for energisation of the first multi-terminal VSC system in Europe.

Colin Foote

Supporting Interconnector Policy: COP28 and Beyond

COP28 saw a contribution from the Centre which may have gone un-noticed. The Centre inputted into and reviewed a UK Government supported Green Grids Initiative paper on the principles of the lifecycle management of interconnectors: [67825b_9855d6c1dfa54e449bf99be50d5e672b.pdf (greengridsinitiative.net)]

Material related to HVDC considerations of development and supply has been included in a "playbook" of resources to educate and enable the Net Zero Transition.

Complementing this, the Centre has recently completed a detailed study of non-standard interconnector behaviours in real-time simulation, evidencing the performance and opportunities available; this then supporting Ofgem and industry engagement relating to this topic ahead of the first pathfinder projects being taken forward.

Green Grids Initiative
#NoTransitionWithoutTransmission

Ben Marshall, Asif Khan, Nikhil Sharma & Wasim Ahmad

Moyle Replica

It has also been a busy period for the Moyle Replica providing operational support to the project, illustrating the capability of replicas to mimic real-world performance and provide further insights relating to it. December marks one year of hosting the Moyle Replica and it is great to see it being put to productive use across that period.

Fabian Moore

National HVDC supports IET RPG Conference

15-17 November saw a busy period of support from the Centre to the IET conference on Renewable Power Generation.

On 15 November a tutorial on the "Art of the Possible" for HVDC network design and operation was delivered by Ben Marshall, followed by Dong Chen chairing a session of the conference on "DC and Microgrid" which included the publication of a paper on the second of three areas of patented multi-terminal design relating to the operation of a DC network during unbalance caused by the effect of restoration following outage or fault.

Finally on 17 November a technical visit to the Centre took place allowing 20 visitors insight into what we do here and why.

Ben Marshall & Dong Chen

Welcome

We are delighted to welcome our latest simulation engineer to the HVDC Centre team:

Xiaozuo Huang joins the Centre from the University of Strathclyde. She continues to pursue her PhD in the intricate realm of controls for converters in HVDC systems and micro-grids. Xiaozuo is no stranger to the complexities of control design, protection design, and stability enhancement for converter-based system. With her experience, she is poised to make contributions to our team across a range of projects.