



Welcome to this special edition of the HVDC Centre newsletter which focusses on the HVDC Operators' Forum 2023.

Almost reflecting the scale of the Net Zero challenge itself, this year saw an unprecedented attendance at the National HVDC Centre's annual Operators' Forum; over 60 of us. The events' overall objective was to discuss our collective progress and insights delivering Net Zero. A huge thanks to all attending; and particular thanks to Thomas Hughes from the Dept Energy Security & Net Zero who kicked off the event with the keynote speech "Setting the National Ambition".



Introductory Presentations (Note: all underlined text have embedded links to the presentations):

- [Welcome and Overview of the Event](#) *Ben Marshall, The National HVDC Centre*
- [Setting the National Ambition](#) *Thomas Hughes, Department for Energy Security & Net Zero*

Event Chair: Ben Marshall

Session 1: How to design HVDC for net zero

Our first session on day one covered the topic of How to design HVDC for net zero. In this session we had 4 speakers giving the perspective of different parts of the industry.

- [Session Introduction and Context](#)

We started with Graham Stein from National Grid ESO who gave an overview of their Holistic Network Design (HND) work. This covered the recommendation to design the network to cope with the growth in offshore wind including several HVDC links.

- [A Holistic Network Design to Support Offshore Wind Deployment for Net Zero](#)

The second presentation was from Bless Kuri from SSEN Transmission. He talked about how the TOs plan to build the large amounts of HVDC that the system needs and the HND recommended.

- [How the TOs are Developing and Delivering HVDC Future Network Solutions](#)

The third presentation was from Daniel Yates and Ciara Ritson-Courtney from the Carbon Trust who gave a view of developers in their role as the offshore wind accelerator. They talked through the largest challenges that developers see in developing their project and HVDC connections.

- [Developer Insights on Projects in HVDC Delivery](#)

The final presentation of the session was from HyunKeun Ku from the South Korea TSO, KEPCO. HyunKeun gave an international perspective of system need and planning to complement the earlier GB centric presentations.

- [KEPCO's HVDC Utilisation and Operation Plan for Net-zero](#)

Session Chair: Ben Gomersall

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Session 2: How to Provide Enhanced Network Support

The afternoon of day one focused on enhanced network support, both in terms of the need and the opportunity to provide using HVDC and related technologies.

Shurooque Baloch, National Grid ESO, spoke about network challenges as we progress to Net Zero, highlighting various ESO initiatives like the Operability Strategy Report and Markets Roadmap.

- [Network Challenges as we Progress to Net Zero](#)

Steven Conner, SSEN Transmission, highlighted some of the challenges integrating several new HVDC links into the relatively weak system in the north of Scotland, noting the need for new approaches to modelling and analysis.

- [HVDC Integration Challenges in North of Scotland](#)

Sam Gibson, Mutual Energy, reflected on experience at the Moyle Interconnector with the provision of new ancillary services, giving insight on both technical and market issues.

- [Moyle Interconnector Ancillary Services](#)

Eric Leavy, SP Energy Networks, focused on improving restoration capability in a converter dominated network, arguing that real-life demonstration is the only way to be sure something is going to work.

- [Improving Restoration Capability in a Converter Dominated Network](#)

Razvan Pabat-Stroe, EPRI International, shared recent results in providing enhanced network support with HVDC, highlighting new capabilities and the need for appropriate guidance to follow in real-time operations.

- [Recent Results in Providing Enhanced Network Support Through HVDC](#)

The speakers took questions throughout and in a closing panel session covered a range of topics raised by the audience.



The session demonstrated the value of this event in bringing together a group of experts to share their experience and learning with industry colleagues.

Session Chair: Colin Foote

Session 3: How to Specify and Build Multi-Vendor Multi-Terminal Schemes

The morning session of the 2nd day focused on how to specify a multi-vendor-multi-terminal HVDC system.

Ian Cowan (on behalf of Perry Hofbauer), SSEN Transmission, presented how to specify the Aquila HVDC project on the east coast of Great Britain. In particular, the DC switching station has been introduced to show how a Multi-



Vendor-Multi-Terminal HVDC grid can be planned in a "safe-to-fail" manner.

- [How to Specify Multi-Vendor Multi-Terminal HVDC Schemes](#)



Ben Marshall, The National HVDC Centre, shared the "Aquila Interoperability Package" as well as "Network DC", to support the decision making to deploy the first MVMT-HVDC grid on the GB power system. He further introduced the involvement of the HVDC Centre with other major EU innovation projects towards interoperability of MVMT-HVDC, including InterOpera, HVDC-WISE and Ready4DC.

- [How Innovation Projects are Paving the Way: Project Aquila, InterOPERA, HVDC-WISE and Ready4DC](#)

Alberto Bertinato, SuperGrid Institute, presented a methodology to define the functional requirements for future HVDC grids and provide an illustrative use case. A systematic approach was presented to showcase the stages of workflow to holistically plan an HVDC grid.

- [Introduction to the methodology used to develop generic functional requirements for the MTDC building blocks, in the context of the North Sea Wind Power Hub initiative](#)

Session Chair: Dong Chen

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Session 4: How HVDC Suppliers are Preparing for Multi-Vendor Multi-Terminal

This session focussed on the tangible steps in technology development and products that are supporting the multi-terminal multi-vendor DC grids of the future.

The session was spread across two rooms allowing for some "hands-on" demonstrations in addition to the presentations themselves. Christian Wikstrom (Hitachi) and Steve Langdon (Mitsubishi) shared perspectives on earlier interoperability and DC Circuit Breaker work emphasising the technology readiness, and Ben Rennings (Siemens) announced the publication of their HVDC textbook seeking to bring a common structure to the discussion of DC networks.

Presentations:

- [Hitachi Energy](#) (Christian Wikstrom)
- [Mitsubishi Electric](#) (Steve Langdon)
- [Siemens Energy](#) (Ben Rennings)
- [RTDS Technologies Inc](#) (Stella Zhang)
- [GE Vernova](#) (Carl Barker)

Within the Centre's extension, completed less than a year ago, Stella Zhang (RTDS®) and Carl Barker (GE) stepped through demonstration of the newly realised capability to host confidential vendor protection and control code reflecting real vendor solutions in a "black boxed" real time environment, known as Giga Transceiver System On a Chip (GTSOC). Carl explained how his team had developed and tested the ability to represent GE's 2 GW Bipole converter with real project parameters within this environment, becoming a new standard product.



This external GTSOC supercomputer augments the RTDS environment to allow multiple wind arrays, solar, battery and even HVDC controllers to be run in real-time alongside replicas, protection and wide area control and offers a new capability to support early design studies.

Session Chair: Ben Marshall

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Session 5: How to deliver at pace

In our fifth session we decided to give the attendees a break from PowerPoint and have a discussion on how to deliver at pace.

- [Session Introduction and Context](#)

To facilitate this discussion, we had a panel of TSOs, manufacturers and government to start the discussion before we brought in everybody else in the room. The panel members were:

- Nico Klötzl, TenneT TSO GmbH;
- Marko Grizelj, Siemens Energy;
- David Barron, National Grid Electricity Transmission;
- Ian Cowan, SSEN Transmission;
- Carl Barker, GE Grid Solutions; and
- Thomas Hughes, Department for Energy Security & Net Zero.



Over the hour we discussed four key themes:

- How does standardisation help deliver at pace and scale?
- Is multi-vendor interoperability a nice to have or a need to have?
- Can projects halve the time it takes to consent and deliver?
- Supply chain is looking increasingly tight, how can it be grown sustainably?

My key take aways from the session were:

- That supply chains for HVDC are tight and whilst standardisation helps it is not the whole answer.
- Germany has developed a long-term plan that allowed them to place forward orders for 22 converters.
- Multi-vendor interoperability is going to be needed but there is still work to be done to make it happen.

Thanks to all the panel members for taking part.

Session Chair: Ben Gomersall

Session 6: How to Develop HVDC Skills

The final session of the forum focused on HVDC skills and training, led by the Centre's Colin Foote and Professors Mike Barnes and Lie Xu from Manchester and Strathclyde Universities, respectively.

- An interactive discussion on what needs done and how to do it

The emphasis was on audience participation with a series of online polls and open questions used to gather input and prompt discussion.



Unsurprisingly, there was consensus on the need to do more in skills development and increasing the number and capability of people working in HVDC, with control and protection and AC/DC system integration identified as the topics of highest priority for improvement.



Unfortunately, the majority view was that our organisations are not providing the quality of training we would like, with on-the-job training identified as the highest priority for improvement despite being considered the most effective training method (when done right).

However, the desire is there, with many Forum participants noting they are constantly learning new things while also providing support and guidance to colleagues.

The HVDC Centre already plays an important role in skills development through events like the Operators' Forum and our training courses but look out for further development in this area over the coming months.

Session Chair: Colin Foote

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Thank you

Thank you to everyone who attended, for your active participation and engagement, which made for a very collaborative event.

We are already looking forward to, and planning, the HVDC Operators' Forum 2024!



Welcome

We are delighted to welcome some new people to the HVDC Centre team:



Peach Phurappa has joined the team as a Research Engineer through the IDCORE : InDustrial CDT for Offshore Renewable Energy programme, led by the University of Edinburgh in partnership with University of Exeter, University of Strathclyde and the Scottish Association for Marine Science (SAMS).

The Centre will be hosting her while she carries out her Engineering Doctorate research in "Collective HVDC control visualisation and optimisation" over the next three years.

Isioma Okoh recently joined the team as Commercial Manager, she comes with a wealth of experience in the commercial division of the oil and gas industry with a critical focus on standardisation of the commercial processes of the HVDC Centre.



Greg Clapperton has just finished his 4th year at the University of Strathclyde in Electrical and Electronic Engineering, and joins the Centre on a summer placement to gain insight into the HVDC transmission sector before returning to university to finish his MEng degree.