Newsletter

Issue 19: December 2019

The National HVDC Centre

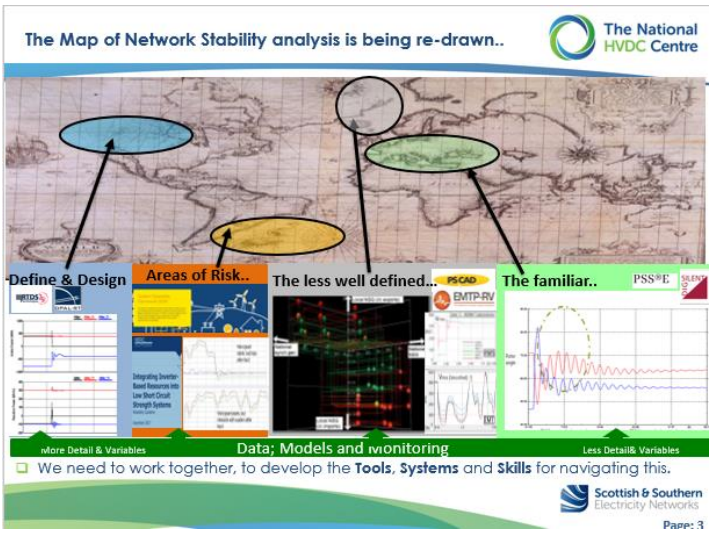
Welcome to the Winter edition of our newsletter; this bumper-edition of our newsletter shares our activity and future events. Let us know if you'd like to know more about any of these areas by contacting us at *info@hvdccentre.com*, or visiting us at *www.hvdccentre.com*

Convertor Analysis: An Emerging Consensus

Whilst I've only been at the Centre since October, across over 24 years in the industry I've seen the value of combining **power system models with control hardware** to ensure we have a understanding of how convertors perform (and why).

Within the industry this topic has, until recently, seen limited focus. What has surprised me since joining the Centre is how quickly this has changed; detailed modelling and simulation is now a 'hot topic', as illustrated by:

- An emerging consensus within **GB technical codes** of the need for **improved data and modelling** to support control interaction risk and protection function, with workgroup time being allocated to developing proposals;
- The agreement for modifications to proceed in GB technical codes to support delivering a **GB-Grid Forming Converter Capability**, delivering inertia and other Network beneficial stability support capabilities;
- Increasing recognition of the challenges of conventional converter controls and the need for **"whole system" Functional System Testing (FST)** of connections (to validate the overall performance of the integrated system); and
- An emerging consensus across manufacturers of the value that **Replica-supported enhanced FST** can bring, and the use of Replica to support: commissioning, compliance and operations.



At our recent PSCAD webinar I described the challenge using the analogy of 16th century maritime explorers discovering the whole world for the first time (see map above). These early sailors needed to navigate between the environment they knew to new uncharted waters. Like us they needed new tools and techniques to do so to avoid new hazards and maximise new opportunities. For ourselves, the tools of good data, actual system behaviour and validated models, are key to navigating this exciting future; whilst also effectively dealing with the areas of risk along the way.

As you'll see in this newsletter, across the work we are doing (from supporting the ESOs stability pathfinder, to assisting HVDC connections), the Centre stands ready to aid you in your journey across this new map of stability analysis.

Ben Marshall

Maximising HVDC Support for Black Start

On 4 December 2019, the HVDC Centre published the full report commissioned by the Scottish Government, which [is now available on our website.]

Oluwole Daniel Adeuyi

RTDS® Training

On 5-7 November 2019, we held our third RTDS® training session of the year, with attendees from Transmission Owners and the ESO. Across the course, trainees were taught how to use the RTDS platform alongside our practical experience of conducting analysis and integrating Hardware In the Loop with simulations.

The RTDS Simulator and RSCAD software is sometimes perceived to focus on manufacturer test environments and university research; however this training illustrated the importance of RTDS for Network Owners, Operators and Developers to understand Factory Acceptance Test activity (i.e. to be an "informed buyer"). The course also sought to illustrate the key differences between conducting RTDS, off-line EMT and RMS simulations.

We are planning to run a similar course next year (with additional content from our latest activities), scheduled for November 2020.

MD Rahman, Bharath Ponnalagan & Ian Cowan

PSCAD Training

Across the 12-14 November 2019 the Centre hosted training in PSCAD, one of the premier platforms for EMT analysis supported by manufacturers of HVDC and other converter-based generation and FACTS technologies.

This 3-day course ranged from traditional forms of Electro Magnetic Transient (EMT) analysis, such as energisation, switching and overvoltage, to studies examining the control behaviour and interaction of synchronous and non-synchronous generation, FACTs devices and HVDC specifically; attended by 18 power system engineers from across all Transmission Owners and the Electricity System Operator.

All Network owners and the Electricity System operator have ambitions to enhance their EMT modelling environments across the RIIO-T2 period and courses such as this support and inform that transition.

To launch the course, a Webinar was held on the 12 November led by Dr Dharshana Muthumuni (pictured above) a co-developer of PSCAD, who discussed the growing relevance of EMT analysis in particular with respect to network stability and device interaction assessment. He also discussed recent examples of large network area PSCAD analysis within the context of the GB system, relating to both HVDC and FACTS integration topics.

The slides of the event are [available on our website], and a follow-up webinar is being arranged [12 December 2020 at 3pm UK time] on the topic of Subsynchronous Torsional Interaction analysis: [Click here for joining instructions].

Oluwole Daniel Adeuyi

PROMOTioN WP9- Demonstration of DC grid protection reaches key milestone

Across 2-6 December 2019, The National HVDC Centre has attended the final half-yearly meeting of the PROMOTioN project. This was hosted by DTU in Roskilde, Denmark. Presentations were given on progress to date across the whole of PROMOTioN, including details of the many steps towards realising a HVDC Grid. Ian, pictured, detailing the protection performance tests undertaken within our Work Package, WP9.

Within our Work Package further analysis is planned across spring next year, followed by a public demonstration event scheduled for 5- 7 May 2020, an event which will be held at the HVDC Centre. This will showcase the readiness of DC grid protection schemes. The PROMOTioN Final Conference (an open event to interested parties) has had the date set as the 26 - 27 of May 2020, this will provide a summary of the findings from the whole PROMOTioN project, including the suggested forward road map.

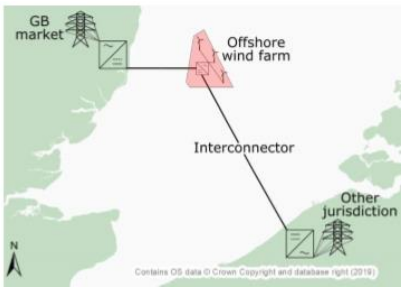
Bharath Ponnalagan & Ian Cowan

To find our more, please contact us to discuss or to arrange a visit:
01236 687240 | info@hvdccentre.com | hvdccentre.com

Offshore Wind Industry Council (OWIC) delivers key recommendations for way forward.

In November 2019, the final versions of both a offshore technology review report (produced by the HVDC Centre) and an overview paper on the challenges in meeting future offshore renewables targets, were released to Ofgem and BEIS.

These reports include key messages on the need for co-ordinating efficient anticipatory investment to drive the delivery of integrated offshore schemes, arrangements for offshore wind integration into interconnector projects (below) together with the need for advance technical workstreams to de-risk the engineering challenges associated with the scale and complexity of the networks, including the associated control & protection required to deliver these integrated networks.

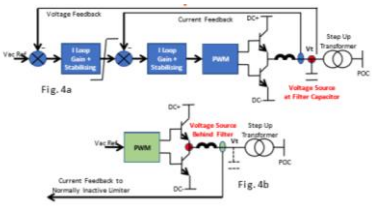


These reports have been well received and, as a result, we have been requested to support follow-up work between OWIC and the ESO. This work will develop region specific case studies to illustrate the cost-benefit of anticipatory investment, and the necessary development steps.

Oluwole Daniel Adeuyi & Ben Marshall

Virtual Synchronous Machines (VSM): Grid Code change process submitted.

On 25 November 2019, the final VSM Grid Code Expert working group meeting was held at which the scope of specification for GB Grid Forming Convertors was finalised. This working group included inputs from the Centre, including analysis on the drivers for specification and on the requirements of any specification.



The resulting specification will now enter into a modification process, targeting April 2020 for submission of Grid Code revisions for determination by Ofgem. Ahead of entering the code, provisions for data exchange and compliance testing will be finalised. Upon becoming code, this will provide a foundation for the use of Convertors, including HVDC, to provide Stability Support services such as those identified in the ESO's Stability Pathfinder. Further information on this working group can be found on the ESO's website.

Based on the success of this group, and to address broader aspects of data exchange related to the planning and compliance management of convertors, a further Grid Code Expert Working group has been proposed, again involving the Centre, due to form in early January 2020

Ben Marshall

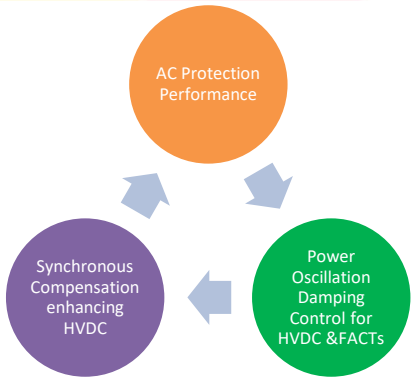
2020 Research Programme- Call for Proposals

On 29 November 2019, the Centre released its third annual call for research proposals for that support the de-risking of HVDC integration.

Three focused areas of investigation have been identified in consultation with network owners and the system operator.

The deadline for submission of a proposal is 24 January 2020, with successful projects commencing in April 2020. Anyone interested in putting forward a proposal is invited to attend our launch webinar on 10 December 2019. Please contact us for further details or visit our website.

Oluwole Daniel Adeuyi



To find our more, please contact us to discuss or to arrange a visit:
01236 687240 | info@hvdccentre.com | hvdccentre.com

2020 Events, Conferences & Training Courses

Below are the events, conferences and courses we are planning for 2020.
For details, please visit: hvdccentre.com/events

The National HVDC Centre

January
- **30 January 2020** (*Webinar)*
  HVDC Black Start & impacts on protection function from weak networks *[hosted by the HVDC Centre & EPRI]*

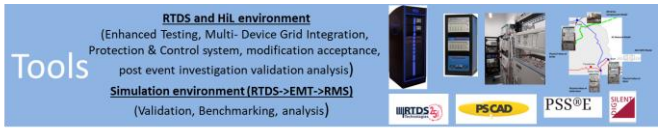
February
- **27 February 2020** (Webinar)
  Small signal and Frequency dependant impedance techniques for identifying HVDC interaction risk *[hosted by the HVDC Centre & University of Strathclyde]*

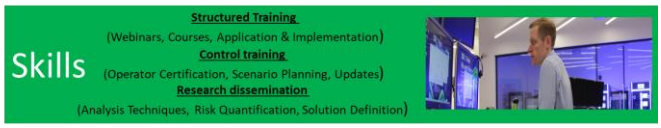
March
- **9 March 2020** (Conference)
  IET's Developments in Power System Protection (DPSP) conference. Paper and presentation on DC circuit protection: 1) RTDS HiL environment testing and 2) Multi-vendor multi-terminal interoperability tests *[presented by the HVDC Centre]*
- **26 March 2020** (Webinar)
  HVDC challenges in meeting current GB Grid Code in a weak network *[hosted by the HVDC Centre & Cardiff University]*
- **30 March 2020** (Webinar)
  Development of Stability Pathfinder test bed models *[hosted by the HVDC Centre & National Grid Electricity System Operator]*

April
- **7 April 2020** (Training Course)
  Caithness-Moray Operator training *[led by the HVDC Centre]*

May
- **5-7 May** (Event)
  HVDC Grid Protection Demonstration Event, PROMOTioN WP9 *[led by the HVDC Centre]*
- **11 May 2020** (Webinar)
  Protection validation techniques in an inverter and FACTS dominated network *[hosted by the HVDC Centre]*
- **26- 28 May 2020** (Event)
  PROMOTioN Project Final Dissemination Event, Brussels *[presentation by the HVDC Centre]*
- **29 May 2020** (Webinar)
  Guidelines for Inverter-dominated network study *[hosted by the HVDC Centre]*

June
- **11 June 2020** ('How to' Webinar)
  Frequency sweep and small signal analysis steps in PSCAD *[hosted by the HVDC Centre]*
- **16-17 June 2020** (Training Course)
  Caithness- Moray Operator *[led by the HVDC Centre]*
- **24-25 June 2020** (Event)
  Annual HVDC Operators' Forum *[hosted by the HVDC Centre]*





July
- **9 July 2020** ('How to' Webinar)
  Understanding invertor dominated voltage instability *[hosted by the HVDC Centre]*
- **16 July 2020** ('How to' Webinar)
  Sub synchronous damping solutions, effect of SCL change *[hosted by the HVDC Centre]*

August
- **2- 6 August 2020** (Conference)
  IEE PES Conference, paper and presentation: Techniques and insights associated with de-risking HVDC *[presented by the HVDC Centre]*
- **August 24-28 2020** (Conference)
  CIGRE Paris symposium, paper publication: Multi-vendor extension of Existing HVDC Schemes *[presented by the HVDC Centre]*

September
- **23-25 September** (Conference)
  RTDS European User Group meeting in Nuremberg, paper publication and presentation *[presented by the HVDC Centre]*

October
- **20-22 October 2020** (Training Course)
  RTDS advanced training *[led by the HVDC Centre]*
- **27-29 October 2020** (Training Course)
  PSCAD advanced training *[led by the HVDC Centre]*

November
- **24- 26 November 2020** (Training Course)
  Enhanced FST requirements for HVDC, FACTs and Protection in an invertor dominated system *[led by the HVDC Centre]*

December
- **4 December 2020** (Event)
  Launch of the 2021 HVDC Centre Research programme *[led by the HVDC Centre]*

2020 is set to be a busy year, not least in training and dissemination event, and we have a number of exciting new projects that we will be kicking-off in the new year. As our activities ramp-up, we are also planning to enhance the Centre's infrastructure and capacity to support a growing range of analysis.

Thank you for your interest and support; and have a great festive period.

Simon Marshall

To find our more, please contact us to discuss or to arrange a visit:
01236 687240 | info@hvdccentre.com | hvdccentre.com