NEWSLETTER

July 2025

Co-funded by the European Commission's Horizon Europe programme, "Enabling interoperability of multi-vendor high-voltage direct current (HVDC) grids" (InterOPERA) brings 21 European partners together to unlock the potential of HVDC grids and to enable the large-scale transition of the European energy sector.

CIGRE 2025 Symposium

InterOPERA took part in the **CIGRE 2025 Symposium**, held in Trondheim from **12 to 15 May**. The event brought experts together to consider the power system transformations we need to deliver a net-zero economy by 2050.

On 14 May, InterOPERA hosted a workshop titled "InterOPERA at Crossroads: Advancing Multi-Vendor HVDC Interoperability". We outlined the project's main objectives, shared the lessons learnt during Phase I of the project, and what to expect in Phase II.

The presentations on the common frameworks, functional specifications, and interaction studies supporting HVDC interoperability led to a lively discussion on different technical and operational challenges in developing multi-vendor HVDC systems.

International Conference on Power Systems Transients 2025

InterOPERA attended the International Conference on Power Systems Transients (IPST) in June 2025, held in Guadalajara, Mexico.

Réseau de Transport d'Électricité (RTE) set out InterOPERA's objectives and shared an analysis of system interactions within multi-terminal HVDC grids. The presentation gave insights into how ElectroMagnetic Transients (EMT) simulations support the design and stability of interconnected HVDC systems – crucial to the success of InterOPERA's technical demonstrator.

A new scientific paper was also presented, titled "Design of Bipolar MT HVDC Grids: Contingency Analysis and Preliminary Dynamic Studies". It outlines a structured design study methodology aimed at characterising subsystem stresses and supporting the definition of technical specifications for InterOPERA's demonstrator.

Updates from Work Packages

Work Package 1 "Development of standardised interaction study processes and interfaces"

Over the past few months, Work Package 1 has focused on dry-run tests in both offline and in real-time environments. These tests show that moving from a single-vendor to a multi-vendor simulation platform is feasible from technical and organisational perspectives.

In offline testing, vendors updated the models to comply with earlier requirements set by Work Package 1, after which the laboratories ran several rounds of single-vendor tests. The first multi-vendor tests were also performed to check for numerical interactions between models. The exercise was a success, confirming that different vendors can participate in the same simulation without numerical conflicts, provided they meet the model delivery requirements.

In real-time testing, six out of seven replicas are now installed at TU Delft and RTE. Updates are expected in the coming months, helping the laboratories to continue the

single-vendor tests and prepare for the multi-vendor ones.

Both types of tests gave useful insights into the process and technical challenges vendors and laboratories may face. These lessons are now being fed into other Work Packages, supporting the success of the InterOPERA demonstrator.

Work Package 2 “Requirements and assessment of interoperability for multi-vendor multi-terminal HVDC systems”

Work Package 2 is defining the interface and integration framework to support a smooth and coordinated transition from single-vendor to multi-vendor testing in Phase II of the project. Regular exchanges with equipment manufacturers have been established to reach a consensus on model integration and interaction testing processes among all parties.

At the same time, work continues on preparing connection network code recommendations for multi-vendor multi-terminal HVDC systems. This task runs in parallel with the development of technical specifications for procurement processes, led by Work Package 5, a review of existing literature, and the identification of key interoperability requirements. These are due to continue until the end of the year. The outcome will be a set of general interoperability requirements, to be proposed for inclusion in future amendments of the national or EU network codes.

A verification process for multi-vendor interoperability of HVDC is also in development. This includes two main activities. First, using input from literature review and technical specifications to identify which functionalities need to be tested for compliance in a multi-vendor HVDC project and what the acceptance criteria should be. Second, creating and continuously updating a flow chart that outlines the verification process. This will guide InterOPERA’s interaction tests and help TSOs and equipment manufacturers connect subsystems at the DC point in multi-vendor projects.

Generic ElectroMagnetic Transients (EMT) offline models are being prepared. Work is also advancing on an EMT simulation platform (EMTP). This platform could allow any vendor to run offline simulations by connecting their model at the defined connection point without needing access to the full system.

Work Package 3 “Multi-vendor multi-terminal demonstrator project”

During the spring months, Work Package 3 made good progress, keeping the multi-vendor, multi-terminal demonstrator on track and setting a clear focus for the months ahead.

The dynamic system studies for the three-terminal demonstrator, led by RTE, are now complete. The final deliverable is under review and any adjustments recommended by the studies have already been made to the subsystem specifications, which now await final approval. Parallel hardware and software modelling is tracked weekly by suppliers and manages to keep its timeline on course.

The team also updated the activity plan to focus on the three-terminal configuration, optimising manpower, budget, and laboratory time. This will let the laboratories start hardware-in-the-loop simulations and physical tests at the earliest opportunity.

Partners also reviewed and simplified the use-case catalogue, merging the list of scenarios to prove real-world interoperability.

Work Package 4 “Cooperation framework and governance”

Work Package 4 has continued its work on establishing a cooperation framework and governance structure to support multi-vendor collaboration.

As for the Multi-Party Cooperation Framework (MPCF), the team has now completed a draft version of the questionnaire that will be circulated internally by the end of August. This questionnaire aims to identify the remaining gaps and gather feedback to ensure that the MPCF can evolve into an official document that can be signed by all parties involved – becoming part of future commercial contracts. It also contains a section on how the governance of the MPCF will be safeguarded after the project ends.

At the same time, the team has made progress on model and data sharing implementation, which should reach maturity during the coming months. Both RTE and TUDelft laboratories are developing a common platform to carry out interaction studies. The aim is to reduce the legal burden that is typically attached to model and data exchanges and ensure that models and data are shared in a secure way while also adhering to the confidentiality of these models.

Work Package 5 “Procurement Strategy and Future Projects Preparation”

In spring 2025, the team ran a dedicated workshop to assess the technical and commercial risks tied to an updated offshore-grid design and allotment scenario. These included project delays, interaction failures and cost or staff capacity overruns. The results now will feed into a cost-benefit analysis to develop a procurement strategy.

Following the risk workshop, Work Package 5’s legal experts began drafting the first contract clauses needed for multi-vendor HVDC projects. At the same time, the team is working closely with the technical experts to ensure the legal language matches the technical requirements on interoperability and testing needs.

Regarding the future tender preparation, the team is drafting the specifications which can later be converted into industry-standard requirement management formats. Work has begun on reviewing relevant InterOPERA deliverables to extract and sort key interoperability requirements. These will form the foundation for a specification template based on existing structures from the industry.

The team has also drawn on experience from previous tender processes involving several vendors - especially for converters, cables, and civil works - to develop a new approach to conducting interaction studies during the tender stage. This process will be tested to mitigate the highest interoperability risks.

Get in touch with us:

Want to learn more about InterOpera? Or have any questions about our work?
Get in touch at **info@interopera.eu**

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