View this in your browser

NEWSLETTER
May 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.

Updates from Work Packages

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

Work Package 1 has published a comprehensive guideline describing the interaction study processes to mitigate interoperability risks in multi-vendor, multi-terminal HVDC systems. This deliverable is the result of two years of intensive and collaborative work between all project partners.

In the first quarter of 2025, the team continued dry-run testing in both offline and real-time environments. These tests seek to show that a smooth transition from single-vendor to multi-vendor simulation platforms is possible.

In offline testing, the IEEE/CIGRE DLL method - used for vendors supplied within InterOPERA - has yielded promising results during the single-vendor tests. This confirms the potential for use in commercial projects from both a system owner's and a vendor's perspective. InterOPERA had previously identified this method – defined in CIGRE's publication "Technical Brochure No. 958" – as a key enabler for long-term, multi-party use of models for interaction studies.

For real-time testing, the teams successfully installed additional replicas at TU Delft (Hitachi and Siemens Energy replicas) and at RTE (Scibreak replica), and the single-vendor tests are progressing well. In the coming months, the remaining replicas will be delivered to both labs, and the team will update the models if necessary to start the first multi-vendor tests.

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

An updated version of the report "Functional requirements for HVDC grid systems and subsystems" has been published. This document is an important step toward achieving interoperability by design and provides a basis for several upcoming InterOPERA activities. These include developing detailed functional specifications for the demonstrator, recommendations for future updates to the network codes, and technical specifications for procurement in multi-vendor multi-terminal HVDC systems.

Preparations for Phase II and interaction studies are progressing well. The team is optimising the type and number of tests to cover important use cases while delivering high quality and sticking to their schedule. We are also planning and prioritising activities to enable effective collaboration between the laboratories (TU Delft and RTE), vendors, and other contributors.

Two new tasks are underway and will run until the project ends. The first focuses on developing connection network code recommendations for DC connection points in multi-vendor multi-terminal HVDC systems, aiming to propose solid and proven DC terminal connection requirements. The second focuses on a compliance verification, connection process and benchmark model. It aims to develop a detailed step-by-step process for verifying compliance with functional requirements, helping TSOs to tender future multi-vendor HVDC projects and providing equipment manufacturers with clear acceptance criteria and compliance methods for the DC point of connection.

This second task also involves the development of an open-source, intellectual property-free offline ElectroMagnetic Transients (EMT) simulation model of the multi-vendor HVDC demo system, allowing vendors to test their equipment in the InterOPERA environment, ensuring a level playing field for any new vendor after the project ends.

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

Work Package 3 delivered several important technical advancements paving the way for the demonstrator phase and reinforcing collaboration across all project partners.

First, the detailed specifications for all subsystems in the demonstrator’s three-terminal configuration have been completed. This represents a major reference point, enabling each vendor to start their internal engineering work. The parties are now finding consensus to ensure a shared understanding on the specifications. The team plans to publish an updated, more comprehensive version of the document “Functional requirements for HVDC grid system and subsystems” by the end of July.

Second, the dynamic system studies produced the first results, offering insights into the expected behaviour of the demonstrator under different operating scenarios. The project partners successfully completed the review process of these dynamic system studies, which is an important step toward system validation and integration readiness.

Finally, preparation for the upcoming test phrase is accelerating. We have started the works to monitor and control the coordinated test. Vendors and TSOs are refining the

number of tests to be executed, ensuring that each of the use cases defined by the project is adequately covered, while avoiding unnecessary duplication. This is an essential step to ensure interoperability of assets across the different test environments. This collaborative approach, involving TSOs and laboratories where the tests will be performed, is essential to the success of the validation phase.

Work Package 4 “Cooperation framework and governance”

The team has made solid progress on the practical implementation of the data and model sharing framework. With the governance structure for data and model sharing now in place, we are focusing on developing a practical system that supports joint multi-model simulation while respecting Intellectual Property considerations. A dedicated working group is drafting a set of requirements for such a system on the InterOPERA website.

Following consultations with various stakeholders, the team will also update the Multi-Party Cooperation Framework. The new version will ensure the framework remains useful after InterOPERA comes to an end. There will be a particular focus on the adequacy of the clauses supporting procurement activities and establishing a clear governance structure for ongoing collaboration.

The Patent Risk Taskforce has completed an internal search of patents referenced in the functional requirements. So far, the identified risks associated with patents seem to be limited. The next steps are to confirm this assessment and stress-test the mitigation process to ensure it remains robust for future updates of the functional requirements.

Work Package 5 “Procurement Strategy and Future Projects Preparation”

Work Package 5 has completed a thorough market screening, which included direct interviews with key industry players. Insight from these discussions, along with feedback on the initial draft of the tender options, led to a major revision of both the reference project and the procurement approach. Moving forward, the team will focus on implementing multi-vendor switching stations as a key objective of the procurement strategy.

On the Legal and Contractual side, the team identified the most suitable tendering procedures for procuring multi-terminal multi-vendor HVDC systems. These procedures come with specific strengths and limitations, which we mapped to guide future decision-making. The team also defined the key contractual clauses essential in HVDC procurement and started shaping the framework for risk allocation and stakeholder responsibilities. These legal foundations are essential for smooth collaboration among all parties involved, especially as projects become more complex and integrate more vendors.

In February, Work Package 5 held a kick-off workshop with project members to draw up requirements and expectations for writing technical specifications focused on interoperability in multi-terminal multi-vendor HVDC systems. Participants agreed that specifications need a clear and appropriate structure and that requirements must be

verifiable. As the industry continues to discuss harmonised technical specifications for (offshore) HVDC systems, InterOPERA's outputs must align with long-term sector needs. The team reviewed existing system breakdowns, functional structures, and requirement formats, and held an internal online workshop in April to jointly decide on the most suitable structure to use in InterOPERA. The resulting specifications template will then be filled with technical requirements. The team is preparing a definition and evaluation process for the term "interoperability by design".

Also in February we got to work on a new task on 'interoperability studies required for procurement'. We brought together numerous parties from InterOPERA, including vendors, TSOs, research institutes, and developers. The starting point was a compilation of all study types typically carried out in HVDC projects, which was based on previous work from Work Packages 1, 2, and 3. Now, we are classifying these studies to identify those most relevant to interoperability. The next steps will involve selecting the interoperability studies that address the highest risks for a project (e.g. costs, delays) and defining mitigation measures. The objective is to ensure an acceptable level of risk for all parties, making the signing of binding contracts easier.

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**

Co-funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or CINEA. Neither the European Union nor the granting authority can be held responsible for them.

Co-funded by the European Union