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Challenges performing interaction studies

With the increase of power electronic interfaced devices interaction studies are mandatory for maintaining the power system stability. As interactions can cause unwanted system behavior including outages and even component damages, their early identification is of highest importance. The results of these studies are also used to design or re-design the control parameters of software-controlled devices.
Performing the studies requires information from all relevant parties. The complete set of information needs to be available to all the system designers of the involved vendors respecting the protection of intellectual property.
In the past several ways how to organize and distribute the different tasks have been used. It turned out that the involvement of independent third parties is a feasible but time-consuming approach.
With the expected increasing complexity of today's power systems, a methodology how to perform interaction studies with multi-vendor involvement in a fast manner is extremely important.

Requirements for the models of multi-vendor interaction studies

To be able to perform interaction studies with multiple vendors, the participants must commit to exchange relevant information and models under individual project agreements and under the control of the relevant TSO(s) / HVDC system owners. This also includes the definition and agreement of roles and responsibilities for all stakeholders within the specific project.
To allow vendors contributing original software it is crucial to assure that vendors' IP rights are protected by confidentiality agreements as well as by relevant software mechanisms where applicable.
This allows that relevant functionality of the individual systems is represented appropriately and at an agreed level of detail. Optimizing the level of detail is important to keep the computation time at acceptable levels.
The HVDC vendors within T&D Europe fully commit to comply with the above-mentioned requirements. But to be successful, the support of all stakeholders, including the relevant regulation bodies, is essential.

Optimized workflow for interaction studies in multi-vendor setups

To support the development of power electronic dominated systems, such as HVDC grids, the existence and acceptance of an optimized workflow to tackle interaction phenomena is urgently needed.
To perform the corresponding studies with more than one vendor contributing, the following workflow consisting of three stages has turned out to be efficient:

Stage 1:
The vendors exchange an initial model via the TSO(s) / HVDC system owners based on the signed project agreement.

Stage 2:
Each vendor performs the required interaction studies independently from the others, implements necessary adjustments in its system and communicates results of special interest.

Stage 3:
The vendors' relevant results and findings of the interaction studies are evaluated between the vendors together with the TSO(s) / HVDC system owners. This forum is also used to design proper solutions eliminating any unwanted behavior.
In case of conflicts which cannot be solved directly between these parties, the backup solution to involve an independent mediator can still be chosen at any time.

In summary this workflow is a key enabler for extended multi-vendor HVDC systems and HVDC grids because it is leading to:

- Fast project execution due to vendors tuning their controls directly using models from other vendors
- Maintaining clear responsibilities between all parties involved