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Initiative on Development of EMT Network Model for User Studies

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The Grid Code ECC.6.3.17 requires the User to ensure its High Voltage Direct Current (HVDC) converters (including controllers) within the HVDC system do not cause negatively or lightly damped resonances or interactions on the National Electricity transmission System (NETS). National Energy System Operator (NESO) published guidance notes for model exchange for converter based plant interaction studies (January 2023)¹. The current practice is that NESO to provide Root Mean Square (RMS) model for the User, in association with the relevant Transmission Owner (TO). User then convert the RMS model provided by NESO to Electromagnetic Transient (EMT) model to carry out interaction studies.

To ensure there are no negative interactions, NESO requires the sharing of detailed EMT models from nearby Users. Grid Code requires Generators and High Voltage Direct Current (HVDC) Interconnector Owners (Users) connected since September 2022, to provide detailed and validated Electromagnetic Transient (EMT) models and that could be shared with other Users. This requirement aims to ensure grid stability and facilitate studies related to oscillations and interactions.

However, NESO has the following challenges:

- EMT models for Users connected before September 2022 are not available. NESO is working through Grid Code Modification to get the retrospective EMT models. NESO is also working on STC code modification to get the required EMT models for TO assets.
- EMT models for certain Users may be received by NESO through Bilateral Connection Agreement (BCA) or Non-Disclosure Agreements (NDAs). However, sharing models, particularly third-party models, can be challenging and often involves lengthy discussions regarding Non-Disclosure Agreements (NDAs) and Intellectual Property (IP) protection.

To address the challenges associated with NDAs, NESO has been exploring a project focused on the feasibility of running a large EMT network area on a cloud-based platform. This platform would allow vendor plant owners to connect their plant models to a designated point in the NETS and perform EMT studies without exposing sensitive network data or that of other Original Equipment Manufacturers (OEMs). This initiative aims to enable new connections to conduct EMT studies prior to commissioning, thereby preempting potential system interactions.

It is important to note that the cloud-based platform project is still in its early stages and will require considerable time before it becomes part of Business as Usual (BAU). In the meantime, recently, NESO has undertaken a trial project to provide an EMT network model to a User for conducting Sub Synchronous Control Interaction (SSCI) and Transient Overvoltage (TOV) studies. This approach contrasts with the typical scenario where the

¹ <https://www.neso.energy/document/261766/download>

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User develops the EMT model for detailed interaction studies. The primary reasons for this initiative include:

- This trial project presents an opportunity for NESO to prepare for future scenarios where similar efforts will be necessary when a web-based connection portal is established for User interaction studies.
- The project has provided valuable insights regarding resource requirements, approximate timelines for completion, and the identification of technical limitations and assumptions.
- In cases where nearby vendor models are unavailable, generic models can serve as an alternative. This trial has allowed NESO to enhance its experience in developing Generic EMT models.
- The experience gained from EMT network model development will be particularly beneficial in a scenario where two new Users are connecting one after the other in proximity. This can enable the NESO to provide the same EMT network model to both connections.

In conclusion, this trial provided key learnings and capabilities to NESO on the development of EMT models for User to carry out interaction studies. Please note that currently NESO is continuing to provide RMS model only for User as specified in the guidance document.

NESO is committed to enhancing grid stability and facilitating seamless interactions among Users through the development of robust EMT modelling practices. The ongoing initiatives, including the exploration of a cloud-based platform and the recent trial project, are pivotal steps towards achieving these goals. NESO will continue to engage with industry stakeholders to ensure that the evolving needs of the electricity network are met effectively and efficiently. We appreciate the collaboration and support of all stakeholders as we work towards a more resilient and stable electricity system.