

Energy Networks Innovation Process Annual Project Progress Report Document



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Annual Project Progress Report Document

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Project Title (This cannot be changed once registered) NIA_SHET_0032 TOTEM (Transmission Owner Tools for EMT Modelling)	Project Reference NIA_SHET_0032
Funding Licensee(s) National Grid Electricity Transmission National Grid Electricity System Operator Scottish Hydro Electric Transmission SP Transmission	Project Start Date May 2020
Project Duration 11 months	Year 2021
Nominated Project Contact(s) SSEN – Colin Mathieson	

1. Scope

The project scope will be to;

Develop PSCAD Models of the GB transmission system across the three licence areas;
Develop new tools for automatic reduction of the PSCAD model to produce both static and dynamic equivalents of the reduced areas;
Develop new tools for configuration and quick initialisation of the EMT models to support future work by the Transmission Owners (TOs);
Determine the detailed requirements and establish shared computing resources that provide the TOs with a facility that can be used to conduct the most detailed and computationally intensive studies of the full GB system;
Perform illustrative studies based on the developed PSCAD network including;
- sub-synchronous resonance investigations
- control instability studies
- switching studies on a selection of substations

Participate in a knowledge transfer workshop to provide the TOs with the capability to use the models, extend them as required in the future, and perform a range of studies.

2. Objective(s)

The objectives of the project are as follows:

- Build and validate a PSCAD model of the GB transmission network and from that derive separate models for each of the three TO licence areas;
- Deliver tools for PSCAD model manipulation and analysis that will support the TOs in their use of the GB model;
- Provide the GB TOs with the knowledge and understanding required to adopt the models and put them into use; and
- Establish shared computing resources for running the most complex models.

3. Success Criteria

The project will be successful if a working PSCAD model can be created and used to perform illustrative studies.

4. Performance compared to the original project aims, objectives and success criteria

Project background

Conventional phasor-based Root Mean Square (RMS) simulation tools have limitations in studying weak, low inertia systems due to the level of detail that is represented. A move to developing more detailed electromagnetic transient (EMT) based models which will address these concerns is proposed in this project, if successful it will de-risk the integration of the technologies that reduce the system inertia.

Project progress

Build and validate a Power Systems Computer Aided Design (PSCAD) model of the GB transmission network and from that derive separate models for each of the three TO licence areas.

A Supplier has been selected and we are in the final stages of negotiating a 4-Party Agreement between the Supplier and the three GB Transmission Operators (TO). We have had discussion with the Supplier to explore the computer capacity that will be required to run the PSCAD model. This has been helpful as a means of gaining knowledge into how the PSCAD model operates along with the physical dimensions and space that will be required to house the associated IT infrastructure.

Inter-Party work has also been ongoing between the three GB TOs to decide on the type and format of the present system models that need to be collected ready to be shared with the Supplier. The National Grid Electricity System Operator (NGESO) has also attended these discussions as a means of keeping them informed as the end PSCAD model will be shared with them also. So far agreement has been reached on the point in time the new PSCAD model will reflect. Reaching agreement on these technical and practical aspects of the power system will help to minimise design errors and ensure the onward timely build of the PSCAD model by the Supplier.

5. Required modifications to the planned approach during the course of the project

The first modification requested was for the inclusion of National Grid Electricity System Operator (NGESO), along with a NGESO NIA spend allocation of £35k.

There will be a second modification, made after the end of March 2021, to request an extension to the project duration. The request is in relation to the length of time it has taken to develop the 4-Party Agreement which incorporates all Parties individual contractual requirements suitably. The necessary Legal resource support has been impacted upon, given other more urgent contractual work amendments associated with Covid-19.

6. Lessons learnt for future projects

The learning captured during this project is outlined below;

- Over the course of developing the 4-Party Agreement, which requires finding common ground between the individual GB TOs, has emphasised the different contracting approaches that each of the GB TOs use. The deliverables associated with this Project are highly technical and require the procurement of specific computing equipment to sit internally within each of the GB TO Parties premises. Given the surrounding complexity of the Project it was not suitable for placement with an external third-Party to project manage. The benefits with using a third-Party to co-ordinate would have enabled a simpler interface contractually i.e. each of the GB TO's would have contracted separately with the third-Party project management organisation, then the third-Party would have contracted the PSCAD model Supplier.

7. The outcomes of the project

The project has positively developed;

- A multi-Party Agreement which enables the GB Transmission Owners to work together to acquire and validate a new system model that will enhance, as well as de-risk the integration of technologies that lower the system inertia.

8. Data Access & Quality Details

See Network Innovation Competition (NIC) and Network Innovation Allowance (NIA) Data Sharing Procedure at <https://www.ssen.co.uk/InnovationLibrary/Distribution/>

9. Foreground IPR

Please note that the new models that will be developed via this Project will be shared under the present mechanisms that the Transmission Owners must adhere to.