

NIA Project Registration and PEA Document

Date of Submission

Jan 0001

Project Reference

NIA_SHET_0032

Project Registration

Project Title

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Project Licensee(s)

Scottish & Southern Electricity Networks

Project Start Date

May 2020

Project Duration

0 years and 11 months

Nominated Project Contact(s)

SSEN - Colin Mathieson

Project Budget

£580,000.00

Summary

The GB power system is rapidly evolving as conventional synchronous generation is decommissioned and ever greater levels of renewable sources are connected leading to a much lower level of system inertia and lower short circuit levels. At the same time there are increasing numbers of HVDC links and Flexible AC Transmission systems (FACTS) devices being connected in close proximity in parts of the system. The potential for adverse control interactions between these devices is rising and needs careful consideration within the context of a potentially weaker GB system.

Conventional phasor-based 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 as a solution and is seen as a key way of de-risking the integration of the technologies described above.

Nominated Contact Email Address(es)

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Problem(s)

Conventional phasor-based 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 as a solution and is seen as a key way of de-risking the integration of the technologies described above.

Method(s)

Manitoba Hydro International (MHI) is a world leader in power system simulation and has developed a way to study electromagnetic transient (EMT) behaviour on large systems, like the full GB transmission system, using the PSCAD simulation software. This project proposes to have MHI develop and validate a full-scale model in PSCAD for the GB transmission system.

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.

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.

Success Criteria

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

Technology Readiness Level at Start

TRL 5

Technology Readiness Level at End

TRL 7

Potential for New Learning

True

Scale of Project

The development of the PSCAD model of the whole UK system is applicable to all three Transmission Owners, hence the presentation of a joint project proposal.

Geographical Area

GB

Revenue Allowed for the RIIO Settlement

No allowance has been made for developing a GB EMT model.

Indicative Total NIA Project Expenditure

£580,000.00

Project Eligibility Assessment 1

Specific Requirements 1

NIA Project must have the potential to have a Direct Impact on a Network Licensee's network or the operations of the System Operator and involve the Research, Development, or Demonstration of at least one of the following (please tick which applies):

- ☐ A specific piece of new (i.e. unproven in GB, or where a Method has been trialled outside the GB the Network Licensee must justify repeating it as part of a Project) equipment (including control and communications systems and software)
- ☐ A specific novel arrangement or application of existing licensee equipment (including control and/or communications systems and/or software)
- ☐ A specific novel operational practice directly related to the operation of the Network Licensee's System
- ☐ A specific novel commercial arrangement

Specific Requirements 2

- ☒ Has the Potential to Develop Learning That Can be Applied by all Relevant Network Licensees

Please explain how the learning that will be generated could be used by relevant Network Licenses.

Learning will be shared from the project in the normal manner, reports and dissemination events.

Please describe what specific challenge identified in the Network Licensee's innovation strategy that is being addressed by the Project.

TOTEM addresses the Network Reliability/Availability and Efficiency challenge as it will improve the modelling ability of the network and enable voltage quality issues to be studied in much greater detail.

Is the default IPR position being applied?

- ☒ Yes

Project Eligibility Assessment 2

Potential Benefit to Customers

Please provide an estimate of the saving if the Problem is solved.

N/A

Please provide a calculation of the expected financial benefits of a Development or Demonstration Project (not required for Research Projects). (Base Cost - Method Cost, Against Agreed Baseline).

N/A

Please provide an estimate of how replicable the Method is across GB in terms of the number of sites, the sort of site the method could be applied to, or the percentage of the Network Licensees system where it could be rolled-out.

The models will cover the whole GB Transmission system.

Please provide an outline of the costs of rolling out the Method across GB.

N/A

Additional Governance Requirements

Please identify

i) Please identify why the project is innovative and has not been tried before

ii) Please identify why the Network Licensee will not fund such a Project as part of its business as usual activities

iii) Please identify why the Project can only be undertaken with the support of the NIA, including reference to the specific risks (eg commercial, technical, operational or regulatory) associated with the Project

This project has been approved by a senior member of staff

☒ Yes