**Date of Submission**

**October 2015**

# NIA Project Registration and PEA Document

*Notes on Completion:* Please refer to the appropriate NIA Governance Document to assist in the completion of this form. The full completed submission should not exceed 6 pages in total.

## Project Registration

| Project Title | Project Reference |
|---|---|
| Enhanced Voltage Control | NIA_ENWL011 |

| Project Licensee(s) | Project Start Date | Project Duration |
|---|---|---|
| Electricity North West Limited | Nov 2015 | 3 Years |

| Nominated Project Contact(s) | Project Budget |
|---|---|
| Geraldine Bryson (geraldine.bryson@enwl.co.uk) | £800,000 |

**Problem(s)**

The LCNF Second Tier project, CLASS, has now reached a conclusion and has proved there is a relationship between voltage and demand which can be exploited to reduce peak demand and assist with balancing generation.
Although CLASS provided a fit for purpose technical solution it is recognised that other solutions more appropriate for business as usual rollout and the services required could be available.
Part A of this project will further develop the technical solutions to meet the required CLASS functionality. These technical solutions could include local and / or centralised solutions.
Separately, the government targets for reduction in CO2 emissions and the use of renewable energy has led to a significant increase in large scale generation connected to the 11kV and 33kV distribution networks. This increase in generation has resulted in difficulties controlling the voltages supplied to customers. Voltage control is normally carried out using on-load tapchangers fitted to 33/11kV transformers and fixed tapchangers on distribution transformers and this arrangement has proved sufficient for the passive networks operated by DNOs for many years. The connection of generation can lead to extreme conditions such as maximum demand, minimum generation which results in low volts and minimum demand, maximum generation which results in high volts. To add to the complexity each of these conditions could occur simultaneously on different feeders from the same transformer.
Part B of this project will devise and apply new settings which can cater for this increase in generation.
Part C of this project will investigate the technical feasibility of a solution to offer new generators a “voltage managed” connection which will help to solve the voltage issues described above.

**Method(s)**

The project consists of 3 parts.
Part A – Alternate Technical Solution for BaU Deployment of CLASS
This part of the project will investigate the different possible solutions to deliver the functional requirements requested by a separately developed commercial framework. The preferred solution will be trialled at two sites on the Electricity North West network to perfect the installation requirements. The output will be a suite of documents to allow the purchase, installation and commissioning of the technical solution.
Part B – Advanced AVC settings for Generation
This part of the project will review and amend Electricity North West’s voltage control policy to devise new settings for generator connections. These new settings will investigate the practicalities of both local and centralised application and the use of functions such as Load Drop Compensation. These new settings will also need to be aligned with the CLASS functionalities as defined in Part

A. The new settings will be trialled at a number of primary substations on the Electricity North West network. To confirm the correct operation of the new settings measurements will be taken on the network close to customers to ensure there is no adverse impact on the voltage.
Part C – Technical Solution for Voltage Managed Connections
This part of the project will investigate the technologies required to enable a Network Operator to offer a new generator a voltage managed connection. The output of this part will be a functional specification for the technical solution.

**Scope**

This project will define the technical requirements to allow a GB rollout of the CLASS learning. The project will also provide new AVC settings for generator connections and investigate a technical solution to enable the offering of voltage managed connections for generators.

**Objective(s)**

- Devise appropriate technical solutions to meet functional requirements for CLASS.
- Trial technical solutions as necessary on the Electricity North West network.
- Produce relevant documentation to allow future installations.
- Devise new settings for generator connections.
- Application of new settings at a number of primary substations on the Electricity North West network.
- Develop a functional specification for a technical solution to enable the offering of voltage managed connection.

**Success Criteria**

1. Successful trial of the business as usual technical solution for CLASS.
2. All relevant documents produced to allow purchase, installation and commissioning of the technical solution.
3. Settings devised for generator connections.
4. Successful trial of new settings for generator connections on a number of primary substations.
5. New voltage control policy incorporating the new settings.
6. New functional specification for a technical solution to enable the offering of voltage managed connection.

| Technology Readiness Level at Start | Technology Readiness Level at Completion |
|---|---|
| 4 | 9 |

**Project Partners and External Funding**

**Potential for New Learning**

The project will deliver the relevant specifications, installation procedures, commissioning procedures and settings policy to implementation the CLASS functionality and cater for new generation applications. All of this documentation will be made available to allow other DNOs to adapt them for their own use.

**Scale of Project**

This project will cover the 33kV and 11kV networks of Electricity North West.

**Geographical Area**

North West of England

**Revenue Allowed for in the RIIO Settlement**

Zero

**Indicative Total NIA Project Expenditure**

£800,000

## Project Eligibility Assessment

**Specific Requirements 1**

**1a. A 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 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 Licensees System | ☒ |
| A specific novel commercial arrangement | ☒ |

**Specific Requirements 2**

**2a. Has the Potential to Develop Learning That Can be Applied by all Relevant Network Licensees** ☒

**Please answer one of the following:**

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

Electricity North West will produce and make available the relevant specifications, installation procedures, commissioning procedures and settings policy to implementation the CLASS functionality and cater for new generation applications.

Electricity North West aims to liaise with the other Network Licensees to ensure the business as usual solutions meet, as far as is reasonably practicable, their requirements.

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

This project directly addresses the heart of our innovation strategy by "maximising the use of existing assets". Through the use of both the CLASS functionality and the advanced AVC settings for generation we can create the necessary voltage headroom to allow connections without the need for costly and time consuming reinforcement.

**2b. Is the default IPR position being applied?**

| | |
|---|---|
| Yes | ☒ |
| No | ☐ |

**If no, please answer i, ii, iii before continuing:**

i) Demonstrate how the learning from the Project can be successfully disseminated to Network Licensees and other interested parties

ii) Describe any potential constraints or costs caused or resulting from, the imposed IPR arrangements

iii) Justify why the proposed IPR arrangements provide value for money for customers

**2c. Has the Potential to Deliver Net Financial Benefits to Customers** ☒

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

£537,000 per primary substation

ii) 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).

The new technical solution for CLASS will be deployed to defer the need to reinforce a primary substation.
The financial saving can then be calculated as
Cost of Reinforcement – Cost to deploy new CLASS technical solution.
Additionally this project can provide benefits to both customers and Network Operators in other areas:
The functionality of the CLASS solution allows Network Operators to provide services to National Grid which will help with system balancing.
The elements of the project looking and new AVC settings and solutions for voltage managed contracts will allow Network Operators to offer cheaper connection contracts and facilitate the increase in renewable generation required to meet the Carbon Plan.

iii) 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.

CLASS methodology could be deployed at all primary substations on the GB network. In Electricity North West we have 410 suitable substations. Assuming all other Network Operators have a similar number then the CLASS method could be deployed at 5740 sites.

The methodology for calculating the alternative settings for generator connections and the technical solution for voltage managed connections can be applied to any generation connection on the 11kV network.

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

In Electricity North West we have 410 primary substations. Assuming all other DNOs have a similar number there is 5740 substations at which is it possible to deploy CLASS.

The cost of deploying CLASS at one primary substation is £23k.

Assuming we deploy CLASS at all GB sire the total cost to GB would be £23k x 5740 = £132.02M.

The alternative settings for generator connections and technical solution for voltage managed connections will not result in a cost to GB but rather manifest as a saving to the generator in the form of reduced reinforcement costs associated with the new connection.

**2d. Does Not Lead to Unnecessary Duplication** 

i) Please demonstrate below that no unnecessary duplication will occur as a result of the Project.

Part A of this project is a follow on to the Electricity North West, second tier funded CLASS project and is essential to ensure a successful GB rollout.
A review of the registered projects has not revealed any work in the area of protection settings for generation therefore we can see no duplication for Part B of this project.

ii) If applicable, justify why you are undertaking a Project similar to those being carried out by any other Network Licensees.