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.

# NIA Project Registration and PEA Document

### Date of Submission

Jun 2021

### Project Reference

NIA_ENWL_027

## Project Registration

### Project Title

Enhanced LFDD

### Project Reference

NIA_ENWL_027

### Project Licensee(s)

Electricity North West

### Project Start

June 2021

### Project Duration

1 year and 7 months

### Nominated Project Contact(s)

InnovationTeam@enwl.co.uk

### Project Budget

£300,000.00

### Summary

The project intends to explore the use of the SuperTAPP SG relays currently installed at a majority of ENWs primary substation to provide a more granular LFDD service. In addition, by using the relays in conjunction with measuring equipment the direction of the power flows can be taken into account, allowing sites which are net exporters to remain connected.

### Nominated Contact Email Address(es)

innovation@enwl.co.uk

### Problem Being Solved

The increasing prevalence of distributed generation on the network means that the current, traditional block shedding response to a frequency event is no longer suitable, and in fact can be counterproductive. By shedding the large blocks of demand, typically at a 33kV bulk supply point (BSP) the potential loss of embedded generation connected to the DNO network can mean that insufficient load is shed, and in some cases remove sites that could represent net exporters from the system.The increasing prevalence of distributed generation on the network means that the current, traditional block shedding response to a frequency event is no longer suitable, and in fact can be counterproductive. By shedding the large blocks of demand, typically at a 33kV bulk supply point (BSP) the potential loss of embedded generation connected to the DNO network can mean that insufficient load is shed, and in some cases remove sites that could represent net exporters from the system.

## Method(s)

The project intends to explore and trial the use of the SuperTapp SG relay currently installed at the majority of ENW's 11kV primary substations – ENW's standard AVC relay and which has already demonstrated its capability to provide frequency-based responses - to provide a more granular LFDD service, thereby reducing the size of any individual load block. In addition, by using the relays in conjunction with additional network monitoring and measuring equipment, the direction of the power flows at a substation could be taken into account through a dynamic approach to providing LFDD, allowing sites which are net exporters to remain connected.

## Scope

The project will carry out the following:

Design and test firmware updates for the SuperTAPP SG relays to allow provision of the LFDD function

Design a number of variations of LFDD schemes around the relay that takes levels of generation into account
Carry out a set of test installations at a number of Electricity North West primaries

Test the functionality of the relays in situ, using methods which do not put customers at risk, i.e. using accepted protection testing methods such as secondary injection with the trip links removed

Carry out a desktop study to show the costs and benefits of rolling out this approach network wide

Investigate the possibility of using a centralized LFDD response scheduler application to adjust the number of sites required for each LFDD block, including consideration of how these adjustments might be made

## Objective(s)

Demonstrate the ability of the relay to provide a LFDD response that complies with required standards for operation

Identify a scheme design that provides the appropriate response whilst accounting for power flows

Test this scheme on real world installations at around six primary substations fed from a common BSP and which have high levels of connected generation.
Identify future possible improvements to the scheme and a next phase of this project

## Consumer Vulnerability Impact Assessment (RIIO-2 Projects Only)

N/A

## Success Criteria

Design of potential options for delivering intelligent LFDD at a primary level

Successful FAT of the updated relays to demonstrate the technical compliance with the LFDD requirements

Update of a group of primaries to the new firmware, along with monitoring on high generation circuits

Site testing of the new firmware to prove operability in real world scenario's

Report detailing the outcomes of the testing, identifying potential future improvements, setting out any possible changes to the Grid Code pinpointed by the trials

## Project Partners and External Funding

Fundamentals

## Potential for New Learning

If successful, the project will demonstrate the viability of delivering LFDD at the primary level with intelligence built in to keep any significant generation online

## Scale of Project

This project will cover the design of the proposed schemes and the updating of the installed equipment at the primaries fed from a single BSP along with on-site testing to prove the efficacy of the solution.

## Technology Readiness at Start

TRL7 Inactive Commissioning

## Technology Readiness at End

TRL9 Operations

## Geographical Area

North West UK

## Revenue Allowed for the RIIO Settlement

£0

## Indicative Total NIA Project Expenditure

£270000

# Project Eligibility Assessment Part 1

There are slightly differing requirements for RIIO-1 and RIIO-2 NIA projects. This is noted in each case, with the requirement numbers listed for both where they differ (shown as RIIO-2 / RIIO-1).

## Requirement 1

Facilitate the energy system transition and/or benefit consumers in vulnerable situations (Please complete sections 3.1.1 and 3.1.2 for RIIO-2 projects only)

Please answer **at least one** of the following:

## How the Project has the potential to facilitate the energy system transition:

N/A

## How the Project has potential to benefit consumer in vulnerable situations:

N/A

## Requirement 2 / 2b

Has the potential to deliver net benefits to consumers

Project must have the potential to deliver a Solution that delivers a net benefit to consumers of the Gas Transporter and/or Electricity Transmission or Electricity Distribution licensee, as the context requires. This could include delivering a Solution at a lower cost than the most efficient Method currently in use on the GB Gas Transportation System, the Gas Transporter's and/or Electricity Transmission or Electricity Distribution licensee's network, or wider benefits, such as social or environmental.

## Please provide an estimate of the saving if the Problem is solved (RIIO-1 projects only)

The SHEDD project calculated a total network benefit of £6.4m p.a. based on a LFDD event every 10 years and reducing the number of customers disconnected by 10%.

Whilst that project looked at selecting I&C customers over domestic, in addition to the retention of generation. This project does not intend to go so far as the scenario's explored as part of the SHEDD modelling exercise. However, it is reasonable to assume a reduction of ~5% in the total number of customers whose supply is maintained by virtue of their being connected on the same bar as the generation site.

Using the assumptions made in calculating the SHEDD benefits we can extrapolate an expected benefit for the ENW approach of ~£6m

This is based on the same calculation used in the registration document:

£5.4m (approx. saving for LCN based on more granular LFDD) * 1.05 * 10 (license areas)/ 10 (1 event every ten years) = £6m

Where the 1.05 is a five percent improvement in the avoided load shed.

## Please provide a calculation of the expected benefits the Solution

The SHEDD project used a value of avoided lost load based on LPNs figures for the 9th August event and the VoLL work carried out by ENWL of £5.8m

£5.8m (LPN) x 10 license areas x 1.05/ 1 event every 10 years = £6.1m

Where the 1.05 is the additional savings based on avoiding the disconnection of DERs

Where a SuperTAPP relay is already installed the cost to upgrade the site to provide LFDD functionality is ~ £3k per site depending on the amount of measurement equipment required for the directional measurements

The cost of installing the SuperTAPP relay is £54k per site, however these relays are already being installed as part of other programmes
However, the use of a pure LFDD relay could reduce the cost to £4k per site, but would not have the additional AVC functionality etc.

### Please provide an estimate of how replicable the Method is across GB

Based on the assumption that the relay is available currently then the cost of rolling out the solution is limited to the firmware update and potential installation of monitoring equipment.
For the CLASS roll out the relays were installed at 258 primary substations, which covers ~60% of our customers. Extrapolating from this to cover the ten license areas the total cost would be ~ £4k * 258 * 10 = £10.3m

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

The proposed solution utilises the SuperTAPP SG relay, which is primarily an AVC unit. These types of relay will be installed as standard at on primary transformers. The cost of upgrading the existing SuperTAPP relays installed on ENWLs patch would be marginal. For other DNOs the principles demonstrated could be replicated by other means, such as a dedicated LFDD relay. Based on the 258 sites ENW installed the SuperTAPP relays in as part of the CLASS roll-out, which cover around 80% of our customer base, the GB roll out would cost around £8m providing existing SuperTAPP relays were used

### Requirement 3 / 1

Involve Research, Development or Demonstration

A RIIO-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 GB the Network Licensee must justify repeating it as part of a project) equipment (including control and communications system 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

RIIO-2 Projects

☐ A specific piece of new equipment (including monitoring, control and communications systems and software)

☐ A specific piece of new technology (including analysis and modelling systems or software), in relation to which the Method is unproven

☐ A new methodology (including the identification of specific new procedures or techniques used to identify, select, process, and analyse information)

☐ A specific novel arrangement or application of existing gas transportation, electricity transmission or electricity distribution equipment, technology or methodology

☐ A specific novel operational practice directly related to the operation of the GB Gas Transportation System, electricity transmission or electricity distribution

☐ A specific novel commercial arrangement

### Specific Requirements 4 / 2a

### Please explain how the learning that will be generated could be used by the relevant Network Licensees

n/a

### Or, please describe what specific challenge identified in the Network Licensee's innovation strategy that is being addressed by the project (RIIO-1 only)

This project will address the 'Improve Network Reliability' objective which sits in our Optimised Assets and Practices theme

### Is the default IPR position being applied?

☑ Yes

## Project Eligibility Assessment Part 2

### Not lead to unnecessary duplication

A Project must not lead to unnecessary duplication of any other Project, including but not limited to IFI, LCNF, NIA, NIC or SIF projects already registered, being carried out or completed.

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

This project builds on the ESO's SHEDD project and will be the first to trial some of the proposed outcomes on a live system

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

N/A

## Additional Governance And Document Upload

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

This project builds on the outcomes of the SHEDD project and will be the first to look to implement some of the outcomes of that project.

### Relevant Foreground IPR

None

### Data Access Details

Electricity North West's Privacy Policy and Innovation Data Sharing Policy can be found on our website.

### Please identify why the Network Licensees will not fund the project as apart of it's business and usual activities

Whilst recognising that the current method of providing LFDD is sub-optimal it still meets our obligations under the Grid code, as such there is no incentive to adjust our current approach.

### Please identify why the project can only be undertaken with the support of the NIA, including reference to the specific risks(e.g. commercial, technical, operational or regulatory) associated with the project

We are looking to develop a solution that can be shared freely with all other DNOs, as LFDD is a national response. The NIA provides the best means to easily disseminate the learning generated through this project

### This project has been approved by a senior member of staff

☑ Yes