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

Jul 2015

Project Reference Number

NIA_WPD_009

Project Registration

Project Title

Project SYNC (Solar Yield Network Constraints)

Project Reference Number

NIA_WPD_009

Project Licensee(s)

National Grid Electricity Distribution

Project Start

September 2015

Project Duration

2 years and 6 months

Nominated Project Contact(s)

Roger Hey - WPD Futuer Networks Manager

Project Budget

£864,000.00

Summary

As with other DR projects the scope can be limited by the necessity to gain the support and engage with customer's willingness to participate. WPD will however identify suitable areas in the South West franchise area, where there are current issues arising from high penetration levels of solar generation coupled with insufficient load at times of high yield.The trial will be limited to half hourly metered supplies. Particular focus will be centred on large energy users who are expected to have greater volumes of potentially beneficial latency within their processes as well as a comprehensive presence across the affected areas.Initial work will be required to develop an attractive proposition that will be acceptable to I&C site operators to vary their electrical load so that it is more compatible with peak output from embedded renewables on the same 33kV feeders. It is expected that public engagement will be primarily direct to customers but aggregator routes will also be investigated to verify if they can meet the trial service requirements. The various methods will be applied over a two year trial period to establish the most effective when measured against the key criteria:

- Cost of operation
- Reliability / effectiveness
- Ease of participant recruitment
- Ease of ongoing operation.

Preceding Projects

PRJ_395 - Flexible Approaches for Low Carbon Optimised Networks (FALCON)

Third Party Collaborators

Smart Grid Consultancy

Problem Being Solved

WPD is faced with an immediate and growing challenge in its South West region where adoption of distributed renewable generation

has a significant destabilising impact on the network at various voltage levels. Problems include voltage rise through to reverse power flows at 11kV & 33kV. This also has a serious limiting effect in permitting any further generation to be connected to the network even with additional management provided by WPD's new alternative connections policies. Furthermore the linkage between the issues being experienced at Distribution level and the knock on impact upstream to the TO & SO is not yet understood.

Method(s)

WPD will develop a new DR (Demand Response) programme in the affected areas to test the impact of:

- Reducing generation output
- Increasing Customer Demand

These actions will be tested using a number of different incentives and methodologies:

- Automated demand increase / generation limiting in line with variation in solar yields
- Predetermined mandatory periods where a minimum demand threshold needs to be exceeded or generation limited
- Manually dispatched response signals from a WPD control facility
- Creation of suitable ToU (Time of Use) tariffs

These actions will be contracted and incentivised using different mechanisms, such as:

- DUoS variations
- Pay as you go
- Annual offsetting of standing charges or advance benefit on connection setup
- Penalties for under performance

Scope

As with other DR projects the scope can be limited by the necessity to gain the support and engage with customer's willingness to participate. WPD will however identify suitable areas in the South West franchise area, where there are current issues arising from high penetration levels of solar generation coupled with insufficient load at times of high yield.
The trial will be limited to half hourly metered supplies. Particular focus will be centred on large energy users who are expected to have greater volumes of potentially beneficial latency within their processes as well as a comprehensive presence across the affected areas.
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- Cost of operation
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Objective(s)

The objectives of the trial are to validate the following:

- Customers can be incentivised to alter their behavior to manage operational issues arising from excess embedded generation.
- DR can be used as a reliable and economic alternative to manage generation constraints.
- Generation can be adequately absorbed through customer behavior changes to address immediate issues and potentially facilitate further connections.
- Which methods of operation and customer proposition are most successful at achieving the above?
- Develop contracts, processes, skills and systems to manage the above trials along with potential migration path to business as usual if.
- Compatibility of DR Service / incentives with Energy Storage developers.
- Establish is adequate consumer flexibility exists to have a meaningful impact on generation constraints.
- Identify compatibility or conflicts that such a scheme may have with TO, SO & market.

Consumer Vulnerability Impact Assessment (RIIO-2 Projects Only)

n/a

Success Criteria

The success criteria will be assessed over four key performance indicators:

- Development of suitable proposition to present to customers along with associated contracts and public engagement collateral.
- Engagement of appropriate I&C customers with the ability to have the desired impact on network loads through behavior change.
- Demonstrable improvement in the currently experienced issues including high voltage, reverse power, power factor and thermal constraints.
- The services tested offer comparable or improved performance over conventional reinforcement
  - Speed of deployment
  - Reliability
  - Better value for consumers

Project Partners and External Funding

n/a

Potential for New Learning

n/a

Scale of Project

The project will identify generation constrained 33kV transformers supplying the South West franchise area in order to establish a suitable area with sufficient diversity of I&C customers to provide a relevant customer sample. It would be desirable to apply the trials in two areas giving greater diversity, enabling a demonstration of the principles in a predominantly rural vs more populous environment.

The magnitude of the controllable load that will be provided by customers will require to be in excess of 5MW per trial zone in order to demonstrate an adequate impact on the current conditions being experienced due to excess generation. This will require to be operated over two years in order to test the initial principals and then modify and validate the results.

Data will be captured at each network level to determine the impact of the DR actions taken:

- Customer site / 11kV
- 11kV / 33kV transformer
- 33kv / 132kV transformer

Technology Readiness at Start

TRL6 Large Scale

Technology Readiness at End

TRL8 Active Commissioning

Geographical Area

A number of generation constraints have been identified throughout the South West area. These now exist across the majority of the SW franchise area with the exception of within the urban areas of Bristol & Bath. The initial analysis stage of the trial network will identify at least one location in this area suitable to carry out operational aspects.

Revenue Allowed for the RIIO Settlement

None

Indicative Total NIA Project Expenditure

£665,100

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)

If an innovative commercial solution is not achieved then there would be significant capital costs expected to resolve the difficulties resulting from excess localised generation. Depending on the scale of the generation excesses the negative impacts could be experienced in multiple locations.
Primary Transformer replacement - Reverse power flow capability of the Primary Transformer, normally caused by the associated tap changer being inadequate for 100% of the rating of the reverse power flow. Roughly £300 - £500K depending on extent of civils works with timescale of 12 months
33kV circuit - Reconstruction of the affected 33kV circuits with stout poles and larger conductor. Costs could be anything depending on the scale of the problem, however indicatively £1.1m for a 10km with a timescale of 24 months.
132kV circuit reinforcement - 132kV circuits also have lower summer ratings. However at this level we must consider a fault simultaneously to a maintenance outage. This can create very difficult conditions on the network with multiple BSPs supported by single circuits in some cases. Cost example based on H-Route. Overlay the affected 132kV cable circuits with larger cable. Cost approximately £4.6M with timescale of 3-4 years

Please provide a calculation of the expected benefits the Solution

For the trial we will assume a base cost associated with Primary Transformer and 33kV Circuit.

Base Cost	£1,100,000
Method Cost	£ 500 MWh
Equivalent	2,200 hours of DSR
3 years / 400MWh per annum	£ 600,000
Saving	£ 500,000

This is grossly simplified as much of the method cost is OPEX and therefore will largely only be incurred when being utilised, avoiding the risk of stranded assets. In the event that the trial proves successful, a review of the current arrangements for DUoS & GDUoS would result in generators paying the majority of the costs associated with customer payments for running DSR. There is also an undetermined value to the UK as a whole by enabling the connection of additional renewable energy sources that would otherwise experience long term delays.

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

The final Workstream 3 report published Ofgem in 2011 contains a table detailing 'Scenario Driving Change Parameters'. This

highlights that the period to 2020 will have challenging impact requiring DNOs utilise innovative techniques to manage concentrations of DG. The issue is upgraded to significant impact in the period to 2030, with the suggested approach to utilise advanced innovative techniques.
One of the prominent benefits of a DR programme is that it is scalable but also can be deployed in a targeted manner. The capital costs associated with a BaU programme are centralised in order to establish the systems, training and general capability. Thereafter the services are delivered under performance contracts and as such costs are directly related to volumes of DR received. It is expected that all DNOs will have concentrations of DG located within their networks, predominantly renewables from solar and wind which are likely to result in generation constraints and negative impacts on the network. This is only expected to increase due to the growth of the renewable energy sector and the continued appetite to develop further DG.

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

Please see above.

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

WPD will develop a standard method for assessing the requirement and policies covering the technical and commercial deployment of the most effective solutions. These will include:

- Detailed customer proposition
- Financial business case
- Customer Contract
- High Level Design for back office and billing settlement
- Informing regulation development and industry codes

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

WPD has previously launched several alternative connections policies to enable greater capacity of renewable generation to be connected to the distribution networks.

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

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.

n/a

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

n/a

Relevant Foreground IPR

n/a

Data Access Details

n/a

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

n/a

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

n/a

This project has been approved by a senior member of staff

☑ Yes