

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
Project SYNC (Solar Yield Network Constraints)		NIA_WPD_009
Project Licensee(s)	Project Start Date	Project Duration
Western Power Distribution East Midlands, Western Power Distribution South Wales, Western Power Distribution South West, Western Power Distribution West Midlands	Sep 2015	2 Years 5 Months
Nominated Project Contact(s)		Project Budget
Roger Hey - WPD Future Networks Manager		£864,000

Problem(s)

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:

- 1 Reducing generation output
- 1 Increasing Customer Demand

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

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

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

- 1 DUoS variations
- 1 Pay as you go
- 1 Annual offsetting of standing charges or advance benefit on connection setup
- 1 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.

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:

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

Objective(s)

The objectives of the trial are to validate the following:

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

Success Criteria

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

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

Technology Readiness Level at Start

6

Technology Readiness Level at Completion

8

Project Partners and External Funding

Smart Grid Consultancy - As experts in this field, SGC have extensive experience in development of DSR programmes as well detailed knowledge of the overall market for DSR services. SGC have been asked to provide project management services and ensure a full transfer of the knowledge to WPD through the training of WPD staff (to transfer knowledge to BaU). SGC will provide a 50% contribution against standard day rates for resources contracted. This has an estimated value of £125,000.

Potential for New Learning

The proposed trial scope includes many areas of new learning that are of value to DNOs UK wide. These are not limited just within a

specific aspect such as the new technology, and is expected to deliver results in the following areas:

- 1 Furthering the work already done to determine the potential of commercial intervention alongside or as an alternative to engineering solutions
- 1 Establishing best practice methodology and new policies relating to engaging customers in network management.
- 1 Attitudinal analysis and performance assessment of participants within commercial techniques.
- 1 Financial impact assessment of commercial techniques.
- 1 Development of new related policies, processes and systems to support commercial techniques.
- 1 Provide invaluable knowledge to inform new regulations.

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:

- 1 Customer site / 11kV
- 1 11kV / 33kV transformer
- 1 33kV / 132kV transformer

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 in the RIIO Settlement

None

Indicative Total NIA Project Expenditure

£665,100

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.

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

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

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

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.

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

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).

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.

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.

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.

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

Please see above.

2d. Does Not Lead to Unnecessary Duplication



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

The current challenges being experienced by WPD in the SW are expected to extend out to other DNO regions as the number of opportunities for new solar in this region dwindle due to infrastructure and land limitations. However at this time they are most acute in this area and as a result this is the first project of its type in the UK. These challenges could also be experienced similarly with other intermittent renewable generation types including embedded wind.

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

N/A