

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

Entire

Project Reference

NIA_WPD_017

Project Licensee(s)

Western Power Distribution East Midlands, Western Power Distribution South Wales, Western Power Distribution South West, Western Power Distribution West Midlands

Project Start Date

Jun 2016

Project Duration

4 Years

Nominated Project Contact(s)

Matthew Watson - Innovation & Low Carbon Networks Engineer

Project Budget

£1,965,000

Problem(s)

With the successful completion of previous trials that have sought to determine the principals of Demand Response and interaction with customers to modify behaviour, Entire will progress the understanding of customers and their operational priorities. The trials have so far been limited in their scope with only small sample groups being engaged to offer quite limited functionality specifically for distribution constraint management. As the name 'Entire' suggests, we will now extend the previously limited scope to fully develop the skills, relationships and systems necessary for a DNO to provide a comprehensive DSR capability.

Method(s)

Building on the successes and the learning achieved during the commercial trials in Project FALCON, this project aims to develop and test a comprehensive DSR Aggregation capability to manage generators and customer loads. Based on our previous small scale interventions using a very manually controlled DSR arrangement it has been proven that DSR can potentially provide a valuable tool in the management of transient or temporary network issues, particularly where the case is uncertain for a large capital investment. We are therefore seeking to develop our understanding and capability of DSR both in terms of advanced systems that would support BaU operation, but also the operational framework that would allow DNOs to participate more widely in DSR schemes operated by other parties, including National Grid. BaU use of DSR is likely to require regulatory approval and new policies from a governance perspective as well as new systems capabilities to operate and manage. Finally, this is not an engineering based solution and therefore skills development in the commercial DSR markets will also feature as a key deliverable.

Scope

DNOs have been running limited scope trials in order to assess the potential of DSR as an enhancement to existing network operations. These have to date not addressed the issue of customer participation in multiple DSR schemes and the need for a service provider that can aggregate and optimise capacity to meet the requirements of multiple schemes (SO, TO, DNO & Supplier) and maximise value to asset owners. If this is not addressed it is unlikely that DNOs will be in a position to recruit participants for the exclusive purpose of constraint management due to higher, or more frequent, income stream from non-DNO sources. Further, this is likely to have the negative effect of promoting an unnecessary competitive market between TO, TSO, DNO and suppliers. Prior DSR trials have so far been limited in their scope with only small sample groups being engaged to offer quite limited functionality specifically for distribution constraint management. As the name 'Entire' suggests, we will now extend the previously limited scope to fully develop and test the skills, relationships and systems necessary for a DNO to provide a comprehensive DSR capability. We will

be doing this in areas within the WPD network that are may be due a significant capital upgrade but where the certainty of immediate need is absent. The project will also demonstrate how DSR can be used to defer capital investment which can sometimes take up to 10 years.

In order to achieve this, the 'Entire' project scope includes;

- Recruit team / place contracts with partners.
- Develop connection policies / DSR contracts / technology and systems to facilitate services.
- Regulatory rules and financial reward structure for developing and operating multifunctional DSR programme.
- Comprehensive knowledge of all legacy embedded generation and its impact on network and updating of asset records.
- Stakeholder engagement and interaction including recruitment of DSR programme participants.
- Standardisation of all participating generation to latest G59-3 code in support of HSE directive.
- 'Interaction with' and 'enrolment in' external DSR programmes to optimise commercial Establishing direct relationships with the largest demand customers to understand their usage, flexibility and possible changes. This will be combined with advice around ASC (Approved Supply Capacity) and DSR to reduce their costs and introduce new revenue opportunities.
- Identifying the skills gaps and organisational structure issues that are required to be addressed to operate a commercial DSR programme and ongoing migration to DSO.
- Measuring direct impact of LV connected DSR on 33kV & 132kV infrastructure and establishing financial 'use case'.
- Use of WPD owned generation assets to test the new DSR technology and processes before contracting with customers' assets.
- Assess results and report.

Objective(s)

The trial will identify and address many of the key challenges a DNO is presented with as they develop DSR and other commercial service capabilities within what is a traditional engineering and asset management organisation. In doing so WPD will create a roadmap for WPD's other regions as well as other DNOs to assist development of a commercial service capability and deliver increased value to their customers.

In order to start this transition, it is necessary to ensure that the data held regarding customers with generation or sufficient volumes of flexibility to affect the network operation, is accurate and comprehensive. It is therefore our intention to carry out a deep audit of customer assets within the trial zones and ensure that they are compliant with the current standards, while taking advantage of this interaction to engage with them to educate and where appropriate recruit for demand side management activity. By carrying out this project we will ensure that the underlying assumptions regarding our networks are correct and that we have increased visibility of dynamic users that will effect operational decisions as we migrate to local system operation.

Success Criteria

NETWORK: Identify, audit and update all generation connected to the 11kV network within the trial zone(s). This should enable the return of any unused export capacity to network planners. Identify all connected generation above 150kW and identify where these may affect dynamic network operation. We will also interact with other WPD initiatives to advise where increased telemetry may be required to monitor active locations in the network and update future forecasting models.

SYSTEMS: Identify, develop and demonstrate new policies, processes and systems that are required in order for WPD to operate standalone DSR services. (monitor, control, meter and settle)

OPERATIONAL: Identify new skills and roles that currently don't exist within the DNO organisational structure and either train existing staff to address gap or create appropriate job specifications for future recruitment.

COMMERCIAL: Develop an economic business model for combined internal and external DSR service provision that demonstrates enhanced value to customers. This will integrate savings with additional opportunities that could generate new incremental revenues from third party DSR schemes and cost avoidance. Broadening the scope of what a DNO can do with DSR we would expect to achieve improved efficiencies for overall GB system operation.

MARKET: Agree a new set of conditions that allow and incentivise DNOs to operate DSR services that not only address internal constraint issues but incentivise the efficient use of these new capabilities to support overall GB System operation requirements. This will enable the use of customer assets and WPD's own stand by generation to participate in external DSR schemes, including SO balancing services.

KNOWLEDGE: Document and share all key learning that is achieved in order that the results should be replicable across all UK Distribution Networks.

Technology Readiness Level at Start

6

Technology Readiness Level at Completion

8

Project Partners and External Funding

The project will be managed internally with the continued support of DSR specialist expertise. These will be provided at a significantly discounted rate by Smart Grid Consultancy who have already successfully delivered projects for WPD and continue to provide essential support for ongoing commercial trials.

In the event that WPD successfully enrol in external DSR programmes that generate income, any profits after operational costs not funded under LCNI will be used to offset the overall cost of the trial.

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:

- Furthering the work already done to determine the potential of commercial intervention alongside or as an alternative to engineering solutions
- Establishing best practice methodology and new policies relating to engaging customers in active network management.
- Attitudinal analysis and performance assessment of participants within commercial techniques.
- Financial impact assessment of commercial techniques.
- Development of new related policies, processes and systems to support commercial techniques.
- Development and documentation of new systems to enable successful learning to be replicated.

Scale of Project

We have identified two locations where a new GSP is likely to be necessary but will take several years to complete. During this period the projected load growth may alter the classification under P2/6 and require a large capital investment to necessitate increased resilience in lieu of the new GSP being commissioned. We will therefore be seeking to contract 20 – 30 MW of demand response capacity that will be used to suppress the peak demand periods during the winter season while the GSPs are developed. This will enable the uncertainty of short term demand increases to be managed by an operational cost and avoid a large capital investment that will be superseded when the GSPs go live in several years.

Geographical Area

We have identified two locations in the WPD East Midlands area.

At the first of the two locations demand is currently 250.5MVA placing it within Class D of Engineering Recommendation P2/6. ER P2/6 stipulates that under a second circuit outage scenario (N-2) a third of a Class D group demand, in this case 83.5MVA, must be restored within three hours. According to studies carried out by PSD (Primary System Design), the existing circuits and running arrangement are capable of maintaining 65% of the group demand under N-2 conditions without any interruptions. We are therefore able to confirm that the GSP is currently compliant. However, once unused ASCs as well as new demands are taken into consideration, the group very quickly transitions from Class D to Class E under worse case scenarios. ER P2/6 stipulates that under N-2 conditions, a Class E group demand must be restored immediately in its entirety.

Revenue Allowed for in the RIIO Settlement

None

Indicative Total NIA Project Expenditure

- Planning - £85K; Project design and governance; Supplier engagement ; Network Analysis.
- Build - £950K; Regulatory approvals to enable operational phase to include services to 3rd parties; Remote asset interface, central dispatch; Metering and data collection; Back Office Systems (performance / financial); Customer contact and communication; Policy development; Field engineer 'App' development; Staff Training; Upgrades to WPD stand-by assets for DSR.
- Testing - £50K
- Operate - £800K; Customer payments for DNO constraint actions (£390K); Trial administration; Knowledge Management; Enhanced customer data records.
- Report - £80K; Stakeholder interviews ;Closedown reports; Public dissemination.

Total Project Cost £1,965,000

Partner Funding - £ 400,000

WPD Contribution (10%) - £ 117,500

Participant Payments - £ 390,000

NIA Funding £ 1,057,500

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 Licensees.

WPD will develop a clear roadmap that addresses the major issues associated with the development of commercial DSR services. These challenges are very similar across all licensees as the systems and skills necessary do not exist within the core competencies of DNOs. By developing these through LCNI funding it is likely that the result will be an accelerated growth in DR services and reduced overall costs to the consumer by avoiding unnecessary duplication of learning development.

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

The commercial techniques aspects of the Tier 2 LCNF Project FALCON were successful and achieved very valuable learning regarding DR. The majority of this learning was positive, creating a clear signal that it should be pursued further but there are still many gaps between trial and BaU despite being the most advanced trial of its type. There is also a broad interest from other DNOs in determining the potential of DR and implementing within their organisations. By undertaking this project WPD can continue to lead the DNO community in development of commercial methods of managing network conditions.

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.

The impacts on customers will include increased resilience to the network by providing DSR as an additional method by which network conditions can be managed, while not detracting from any of the more conventional intervention options. This is achieved via a new method that is largely 'pay as you go' and therefore does not result in costs to customers unless it is actually instructed to be used. This allows WPD to apply DSR in instances where there are potential transient or occasional issues meaning that the case for a large capital investment is not yet proven. It can also be used where the capital works have long lead times and there is the need for an interim solution to manage the operational risks in lieu of their completion.

The interim support offered by DSR during the period in which the new GSPs will be constructed is vital as this process is expected to take up to 10 years due to the scale of the requirement. During this period of uncertainty, it is very possible that the projected load growth will breach the 300MW threshold that alters the resilience requirements for the existing GSP as set out in conditions P2/6. By using DSR to maintain peak loads we will ensure that the real time resilience is improved while keeping the peak loads within the limits set for a 'Class D' network.

It will also in the majority of cases be 'customers' that are the active participants within DNO DSR schemes and therefore they will be provided with an opportunity to generate new incremental revenue. By using third party assets, WPD will, for a very low cost, be able to increase the operational flexibility of the network that in time could be used to assist with CML & CIs as a network of DSR participants is developed.

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 Financial case for the trial 'Use Case' will be variable based upon the period of deferment and for each year the savings will grow significantly. We will be applying this model on two locations with similar investment requirements to establish a new GSP which will then reduce the projected load growth as it becomes shared between the existing and new GSPs. By taking such DSR actions we will only be incurring costs when the risk of breaching P2/6 conditions are likely and avoid any unnecessary capital costs that would be superseded by the full new GSP upgrade. The current projections being used for the financial assessment does assume a worst case scenario where embedded generation such as wind, solar or CHP are not operational during all periods of peak load and therefore the DSR operational costs are higher than would be expected. We have also limited the direct financial benefits to the differential in NPV resulting from just a 1-year deferment of the completion of new GSP from 2025 to 2026. Even on this very conservative estimate we would expect to see a benefit of over £810K per GSP. Over and above this we will also be seeking the appropriate permissions from Ofgem to be allowed to retain some of the operating profits that would result from provision of DSR services to third party DSR schemes in a similar manner to the model used by independent DSR aggregators. This would cover the ongoing costs of the new resources that a DNO requires to develop in order to provide active management and financial settlement of DSR operating capabilities. As this scales up the central costs will be amortised across all the locations where DSR is being used and has the potential to become an internal profit centre as well as reducing overall system costs.

The single year deferment model for just one of the new GSPs on which the trial economics are based project a growth rate in DSR that is capped at 1,035 MWh per year and a customer payment of £300 per MWh. The difference in NPV between completion in 2026 instead of 2025 takes into account an additional year of DSR costs at £310,500 but in spite of this the NPV is:

NPV Option "A" £20,584,636

NPV Option "B" £21,400,665

Saving £ 816,029

The model can potentially be applied in two locations that are being considered for a new GSP and therefore the savings can potentially be doubled.

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.

Over the course of LCNF and now LCNI, all DNOs have expressed a great deal of interest in Demand Side Response and most have carried out their own limited scope trials. The projects seeks to accelerate the transition to BaU for all DNOs and address many of the issues that arise from the lack of overlap with their existing core competencies.

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

DR services are highly scalable once the central systems and skills have been developed. Much of the attraction of DSR over engineering solutions is that it offers excellent economies of scale and even has the potential to become a 'profit centre' through diversification to extend the capability for enrollment in external programmes.

2d. Does Not Lead to Unnecessary Duplication



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

While there is limited activity by most DNOs in relation to DSR this is largely in the development and proving of use cases for a variety of different purposes. None of these have attempted to detail the challenges associated with creation of an enterprise scale service capability and provision of this to third parties. By doing so under LCNI we would serve to avoid future duplication of effort and by using experienced industry experts avoid errors already identified from privately funded initiatives out with the regulated business sector.

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

N/A