Date of Submission

13th July 2015

NIA Project Registration and PEA Document

Notes on Completion: Please refer to the **NIA Governance Document** to assist in the completion of this form. Please use the default font (Calibri font size 10) in your submission. Please ensure all content is contained within the boundaries of the text areas. The full-completed submission should not exceed 6 pages in total.

Project Registration

Project Title		**Project Reference**
Sunshine Tariff		**NIA_WPD_006**
Funding Licensee(s)	**Project Start Date**	**Project Duration**
Western Power Distribution (East Midlands) Western Power Distribution (West Midlands) Western Power Distribution (South West) Western Power Distribution (South Wales)	07/2015	19 months (Feb 2017)
Nominated Project Contact(s)		**Project Budget**
Matthew Watson – WPD Innovation & Low Carbon Engineer		£325,000

Problem(s)

Distribution Network Operators have an obligation to provide connections to customers in the most cost effective manner. However, due to the high penetration of distributed generation, several areas now require extensive reinforcement before additional generation can be connected. This can add significant time and costs to projects and can often make them unfeasible.

Even with the introduction of alternative connections, where reinforcement costs are avoided on the acceptance of export constraint, the curtailment can be too severe for projects to be viable.

As such there is continued interest in ways of connecting additional generation at minimal costs without compromising the security and quality of supply to existing customers.

Method(s)

This project will investigate the feasibility of an “offset” connection agreement. With such an agreement, connection to a constrained network will be accepted with evidence that additional demand can be sourced to offset the generation.
By incentivizing domestic demand shifting to times of peak PV output (10am-4pm, April to September), generation should be absorbed locally and have no effect on constraints at higher voltage levels.
This project will trial a reduced “Sunshine Tariff” and determine the effect on demand profiles and its viability

as the basis of a connection offer.

Scope

The project will have 2 phases; the first will investigate and report on the commercial viability of the tariff, exploring current and future value streams to fund it. Whilst there is clear value to the generator we also want to explore the value for both supplier and DNO. Phase 2 is the domestic demand side response trial. With a tariff subsidised by the supplier, we will investigate the effects of the tariff on demand, exploring the extent and reliability of any increase. Four levels of intervention will be trialled, tariff only, tariff & feed-back, basic automated water heating and fully automated flexible load switching. The tariff will be managed and administered by Tempus however the customer engagement will be conducted by the local energy cooperative WREN.

We envisage that this type of connection could be of particular interest to community energy groups such as WREN who don't have the movability of commercial developers but would have the links to change customer behavior.

No generator will be connected as part of the trial due to the inherent financial risk. Instead profiles from existing generators will be used to simulate the levels of curtailment that would have been experienced and the financial consequences. Also the technical systems for regulating or disconnecting such a generator will not be trialled as the systems required are dependant on the knowledge this trial seeks to gain. The reliability of the demand side response will dictate the nature of the control. Various options will be investigated to inform future roll out however the trial of such systems is out of scope.

Objective(s)

The project will address the following questions:

1. Whether and how an offset connection agreement could be structured to be commercially viable for a generator?
2. Whether and how an offset connection agreement could be structured and implemented to provide confidence to a DNO that the network will remain within operating limits?
3. What mix of low tariff, behavioural signals and technology options would be most effective in shifting demand?
4. What scale, longevity and reliability of demand side response would be achieved by the most effective method?

Success Criteria

1. Understanding of feasibility of an offset connection agreement for both DNO and developer (including legal arrangements)
2. Understanding of the capacity, longevity and reliability of domestic demand side response
3. Recruitment of over 200 participants in the trial, on time and on budget
4. Retention of at least 80% of participants through to the end of the trial
5. Learning gained in the project successfully disseminated.

Technology Readiness Level at Start	**Technology Readiness Level at Completion**
5	7

Project Partners and External Funding

1. Regen SW – lead partner, providing project management services
2. WREN (Wadebridge Renewable Energy Network) – customer engagement and recruitment
3. Tempus Energy – the supplier providing the Sunshine Tariff including providing smart meters and a

data platform.

Potential for New Learning

This project will generate significant extra learning on a possible new connection type, domestic demand side response, and community engagement.

The main learning of this project revolves around the viability of an offset connection to the distribution network. This will establish the reaction of domestic customers to a static ToU tariff as well as the scale of demand shifting possible. This should show the level of energy that would be curtailed and the effectiveness of an offset agreement as a means of connection. The means of regulating and establishing such a connection as well as the best way of ensuring changed customer behaviours will also be discovered. The financing of such an arrangement will also be assessed.

There will also be secondary learning regarding the impact of community led energy engagement. A community level solution to a local constraint for community benefit may have a very different response to a corporate level solution due to the embedded nature of the community group within the community it serves.

Scale of Project

At least 200 (the target is 240) households will be recruited in Wadebridge, Cornwall, to take part in the trial. This number is based on the size of the town and experience to date of the local community energy group in recruiting households for energy initiatives.

200 participants should allow us to assess whether the trial influences customer behaviour with a margin of error of approximately 7% and a 95% confidence level. This should allow us to applying the findings to the rest of the UK.

Geographical Area

The study area considered is the area fed from Wadebridge Primary substation. As there are no other in-feeds to the local network in normal running, any generation increases could be directly offset by demand on the same network.

Wadebridge is in an area where the renewable energy resources (wind and sun) are very good and consequently, the distribution network is constrained and the EHV network is generally considered to be at capacity. The potential increase in demand would allow extra local generation with zero net effect on the higher voltages.

Wadebridge was also selected due to the presence of the Wadebridge Renewable Energy Network (WREN), a community energy cooperative with over 1100 members. WREN has recently had a proposed 250kW solar array project postponed due to high grid connection costs.

Other factors include the desire to connect additional local renewable generation to a constrained 11kV network and a large number of off-gas-grid customers.

Revenue Allowed for in the RIIO Settlement

NIL

Indicative Total NIA Project Expenditure

£292,500

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 Licenses.

The learning generated is directly applicable to all Network Licenses as generation connection is a part of a DNO's core business. If an offset connection agreement is proven to work, other DNO's may be interested in providing this alternative or something similar to enable connections to go ahead that would otherwise have made projects unviable.

An offset connection agreement might also provide a solution to the additional difficulties faced by community developers in getting an affordable generation connection to the network. This is something of interest to DECC and Ofgem and is being explored through the Smart Grid Forum Work Stream Six.

Should an offset connection prove viable, standard techniques and legal agreements shall be determined and made available to all Network Licensees.

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

The Sunshine tariff project addresses both the Low Carbon Networks and the Smart Grids & Meters areas of WPD's innovation strategy. The Project is detailed in section 6.8.10

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 how 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

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

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

Restrictions in grid capacity have large financial consequences on generation projects. With a standard connection the cost of reinforcement is passed onto the customer and can stretch to millions of pounds. Using the example of WREN's proposed 250kW scheme these were approx. £700k. Alternative connections allow for the reinforcement to be avoided at the expense of potential curtailment. Whilst the project capital costs are significantly lower, the cost of lost generation can be significant. With a timed connection WREN's site expects to lose £390k worth of generation over the project lifetime (approx.50% of output). An offset connection could allow the reduced capital costs whilst also reducing the lost energy.

The Low Carbon London trial found that households increased demand by an average of 0.05 kW in a half hourly settlement periods during off peak times as a result of a reduced tariff, and that the more proactive households exceeded 0.15 kW. If 25% of households in the UK shifted by the average 0.05 kW over the summer months, this could release up to 325MW of capacity for solar PV projects. If similar benefits to the project in Wadebridge were achieved this could save either £910 million of reinforcement costs or £508 million in constrained energy.

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 below costs are based on the 250kW, 11kV connection provided to WREN for a PV array.

Connection	**Cost of connection**	**Curtailment**
Full connection	£700k covering both sole use assets and apportioned costs of 33kV network upgrade.	None but initial delay to connection of 1-2 years
Timed connection	£24k for sole use assets	Apr & Sept = 30% of output 10:00-16:00 May to Aug = 0% of output 10:00-16:00 This equates to approx. 50% of export or £390k.
Offset connection	£24k for sole use assets and £55k to fund the tariff (10% of predicted profits)	Constrained as above <u>if</u> DSR does not match generation Assuming 90% of generation is matched, the curtailment would cost £78k

The base cost for the scheme would be a timed connection offer.

Base cost = Timed connection = £24k+£390k=£394k

Method cost = Offset connection = £24k+£55k+£78k=£157k

Financial benefit = £394k-£157k=£237k

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.

An offset connection agreement could be suitable in all license areas. It is likely to be more appropriate for community energy projects, as it requires local engagement and the ability to change behaviours over a period of time. A study for DECC estimates that there will be 3 GW of community energy projects by 2020. This would be equivalent to 12,000 projects of a similar size to WREN's. With the distribution network becoming increasingly constrained across the UK, a significant portion of this could benefit from an "offset" connection.

Commercial DG developers may also see the benefit in an offset connection agreement. Following the rollout of smart meters, time of use tariffs are likely to become more widespread, making local tariffs that are linked with local generation more feasible.

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

As the method is based on commercial solutions rather than technical innovation, the costs of rolling out the method across the UK would be relatively low. Once initial frameworks and agreements are established subsequent installations shouldn't be capital intensive. At most a disconnection relay and a communication link with the DNO or supplier would be needed. There will be ongoing costs of funding the tariff which must be borne by the generator however other value streams may be identified to help contribute (phase 1 of the project). Again these may require the redesign of certain billing systems however once established should have very few maintenance costs
Finally there may be additional costs for supplier to administer extra local tariffs, however this is already incorporated into the business models of several suppliers.

2c. Does Not Lead to Unnecessary Duplication ☒

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

The majority of DSR trials have looked at moving demand away from demand peaks rather than towards generation peaks. The Household Electricity Survey, commissioned by DECC, suggests that up to 19% of peak electricity demand could be shifted. As far as we are aware, only one trial has explored the use of tariffs to stimulate demand when renewable energy is plentiful and cheaper. This was carried out by UKPN and EDF as part of the Low Carbon London project and used day-ahead prices to set the tariff. The Sunshine Tariff will instead have set time periods for a reduced tariff to match the timed connection agreement. It will be associated with a local solar farm and will be directly supported by the local community energy group. As such it not only explores the effects of pricing on behaviour, but also the effect of local community engagement.

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

Whilst the project has similar aspects to Low Carbon London, the sunshine tariff will explore a far simpler static ToU tariff. It will also investigate the power of the local community to change behaviors.