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NIA Project Registration and PEA Document

Date of Submission

Dec 2015

Project Reference Number

NIA_SPEN0010

Project Registration

Project Title

EVOLUTION

Project Reference Number

NIA_SPEN0010

Project Licensee(s)

SP Energy Networks Distribution

Project Start

December 2015

Project Duration

6 years and 1 month

Nominated Project Contact(s)

James Yu (Future Networks Manager)

Project Budget

£2,400,000.00

Summary

The high level scope of this project is to demonstrate the UK's first trial of the Distribution System Operator concept: exhibiting how operating a localised balancing market can reduce customer bills through efficient provision of services and optimised network performance while facilitating cost effective growth in local generation, demand side response and energy storage services.

To deliver this SP Energy Networks has identified several discrete Work Packages, each subject to stage gate reviews, to be delivered under the project:

Work Package 1: Market Design

WP 1 will focus on the design of the DSO Market. The key tasks in this work package include

- Detailed assessment of existing marketing including existing procedures and services
- Identify high level requirements for new contractual arrangements

- Identify contractual and regulatory requirements
- Identify incentive scheme for trial
- Consult and map responsibilities, financial and data flows between stakeholders including Ofgem, National Grid, Demand Response Commercial Aggregators, Generation Developers, Industrial and Commercial Customers.

The market design work package is focussed on identifying process improvements and integrating market requirements with smart commercial interventions to develop the market under the GSP.

The market design will determine the appropriate level of incentives to apply to DSO participants. The work package will begin with a literature review of existing DSO market structures around the world and then consider the specifics of the SPD/SPT licence area.

Work Package 2: Technical Solution Design

The technical solution design will focus on the interface between different market participants. It will consider the key enablers and will be focussed upon the enabling technologies that are required in order to get the appropriate visibility and control of devices and DER to undertake the trial. Enablers include communications, control systems, trading platform, interaction with National Grid, balancing & settlements and billing.

The key tasks in this work package include:

- Identify high level requirements for the new system interfaces
- Design the interface with SO, implementing processes for solicitation services to National Grid Energy Balancing System (EBS)
- Design the interface with customers
- Design control and communications processes

Work Package 3: Industry Consultation and Dissemination

WP 3 will involve disseminating the project knowledge including market principle recommendations to the wider industry.

The key tasks included in this work package include:

- Knowledge dissemination
- Industry consultation and recommendations
- Closedown report

Nominated Contact Email Address(es)

innovate@spenergynetworks.co.uk

Problem Being Solved

The operation of the electricity system for the GB System Operator (SO) is dramatically changing. The unprecedented rise of intermittent distributed generation and micro-generation is moving a significant proportion of the UK's generation mix from a few large transmission connected generators to thousands of devices scattered throughout the distribution network. While a few of the larger distribution connected generators require Transmission Entry Capacity (TEC) and join the Balancing Mechanism a significant proportion do not. The cost of integrating a small generator to the Balancing Mechanism is exactly the same regardless of size and this represents a significant barrier to participation. With less of the generation capacity visible and controllable to the SO at a time when demand profiles are changing, reducing and becoming less predictable due to micro-generation the challenge of system operation is increasing. The challenges are well documented in National Grid's System Operability Framework and are felt in increasing system operation costs. This is a consequence of greater system services being required but available from an ever decreasing population of the generation mix.

SP Energy Networks' Accelerating Renewable Connections (ARC) project has examined the interaction between distribution and transmission networks. Whilst the project has been successful in accelerating the penetration of renewable generation via the use of Active Network Management (ANM), it has also highlighted the need for coordination, visibility and control of all assets connected to the distribution network. Without control by one entity i.e. the DSO, an uncoordinated approach has a real effect of adversely distorting the balancing mechanism. Whereby National Grid as National System Operator may instruct a distributed generation resource to reduce output however the ANM under the GSP would see this as available headroom capacity and allocate as appropriate thus the net effect being zero however by having one entity controlling all distribution network assets and facilitating a local balancing market this can be avoided, enabling a more efficient energy balancing system as well as opening up the market to a greater number of actors.

Method(s)

EVOLUTION will develop a sustainable model for balancing services to; provide a market for greater energy storage & demand side response services under a Grid Supply Point (GSP) as well as minimising the curtailment of renewable generation. EVOLUTION will implement local system balancing through innovative commercial and technical mechanisms under a GSP. EVOLUTION will explore the wider issues around market coordination, and the affect, upon national system balancing and settlements. EVOLUTION will improve visibility and controllability to the SO by democratising the balancing services market to a wider group of consumer

participants and Distributed Energy Resources (DER) developers. By introducing a neutral market facilitator, a DSO, the cost of Balancing Mechanism participation for smaller participants will be reduced, opening the market and local grid management challenges on the distribution network, including the interaction with Active Network Management (ANM) and non-firm connections.

Scope

The high level scope of this project is to demonstrate the UK's first trial of the Distribution System Operator concept: exhibiting how operating a localised balancing market can reduce customer bills through efficient provision of services and optimised network performance while facilitating cost effective growth in local generation, demand side response and energy storage services.

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Objective(s)

Each discrete Work Package has Objectives:

WP 1: Market Design

- Produce literature review of existing DSO market structures around the world.
- Create Market Design including:
 - Requirements for new contractual arrangements
 - Incentive scheme
 - Stakeholder responsibilities, financial and data flows

WP 2: Technical Solution Design

- Create Technical Solution Design including:
 - Requirements for the new system interfaces
 - Interface with National Grid Energy Balancing System (EBS)
 - Interface with customers
 - Control and communications processes

WP 3: Industry Consultation and Dissemination

- Effectively disseminate the project learning and business process maps to ensure that the stakeholders can benefit from the delivery of the project including:
 - Detailed business process maps for alternative approaches to establishment of DSO model and services
 - Proposals for structure of future market for establishment of DSO model
 - Learning and technical documentation to support the technology deployed and how this interacts with commercial mechanisms established with DER providers/DSO/SO
 - Closedown report, consultation and recommendations to industry

Consumer Vulnerability Impact Assessment (RIIO-2 Projects Only)

n/a

Success Criteria

The project will be considered successful if the aforementioned objectives are realised.

Project Partners and External Funding

None

Potential for New Learning

Over recent years there has been extensive discussion about the expected transition of a DNO to a DSO. This has even been a major topic within the Smart Grid Forum's Work Stream 6 and 7 industry groups. In spite of this, there has been little work carried out by UK DNOs to determine the benefits and impact assessment of full DSO capability; Scope of responsibilities, Operational challenges, Inter-industry dependencies, Legal and regulatory requirements (systems and processes), Staffing and skills as well as Stakeholder engagement.

Scale of Project

SP Energy Networks have chosen to carry out this project over a period of 4 years.

Technology Readiness at Start

TRL3 Proof of Concept

Technology Readiness at End

TRL8 Active Commissioning

Geographical Area

SPD/SPT Licence Area

Revenue Allowed for the RIIO Settlement

None

Indicative Total NIA Project Expenditure

The Total NIA Project Expenditure is estimated at £2.4 million. This expenditure will be subject to review throughout the project.

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 the DSO model is implemented, the improved balancing efficiency will result in substantial financial benefits for customers. However any detailed assessment will be subsequent to this initial piece of work.

Please provide a calculation of the expected benefits the Solution

Not applicable for this research activity however Elexon's report "Actively Managed Distributed Generation and BCS Quantitative Modelling" suggested that enabling one GSP with ANM could reduce the total constraint costs across the Scotland-England boundary by up to 7%. Based upon the 2013/2014 data, this would equate to a saving of £6.3 million per annum based upon the £90.1m reported to alleviate network problems associated with the Scottish Transmission Boundary B6.

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

All UK DNOs have the ability to evolve into DSOs.

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

One of the outputs of this project will be determining the costs associated with rolling out the DSO across GB.

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

All UK DNOs have the ability to evolve into DSOs.

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

Operational and process innovation — driving efficiency and service benefits.

- 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.

To the best of our knowledge it does not duplicate any other work currently being carried out by other network licensees. The EVOLUTION NIC 2015 bid passed the Initial Screening Proposal stage.

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