

NIA Project Registration and PEA Document

Date of Submission

Apr 2019

Project Reference Number

NIA_NGSO0025

Project Registration

Project Title

Residential Response

Project Reference Number

NIA_NGSO0025

Project Licensee(s)

National Energy System Operator

Project Start

April 2019

Project Duration

1 year and 1 month

Nominated Project Contact(s)

Adam Sims

Project Budget

£587,000.00

Summary

The project will develop new approaches for testing, monitoring and managing portfolios of residential-scale assets for participation in ESO Balancing Services.

Nominated Contact Email Address(es)

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Problem Being Solved

The current testing and metering requirements to access Balancing Services can be prohibitively expensive for residential-scale assets. It is especially costly to ensure compliance to the following requirements:

- installing frequency meters on individual assets;
- individual asset testing;
- stringent metering specifications to meet required tolerances.

An additional challenge is the level of flexibility that providers need to secure to manage their portfolios close to real time to provide the contracted service to the ESO. Traditional service provision involves single assets providing delivery of the whole service, with testing and performance monitoring arrangements being contractually linked to that asset. This means that were anything to happen to an asset, which may impact its performance, the ESO would deem its visibility critical to system security. Newly available technology allows for services to be provided by a portfolio of smaller assets, with testing and performance monitoring contractually linked to the assets making up that portfolio. As providers manage their portfolio of assets in real time to maintain service provision, the requirements for the monitoring and ESO visibility of that portfolio need reviewing.

Method(s)

The project will:

- Design new ways to test and commission large numbers of residential-scale assets that ensures System Operator requirements are met in a more economical way
- Determine the data requirements for portfolio assets to back up performance-based assessment of large portfolios
- Trial alternative low-cost approaches to frequency and energy measurement for large portfolios that meet ESO requirements.

“Residential Response” is a collaboration between National Grid Electricity System Operator (ESO), Intelligent Energy Technology Services, Upside Energy Ltd, Moixa Technology Limited, Lightsource Labs holdings Limited, and Element Energy.

Scope

The project will develop new approaches for testing, monitoring and managing portfolios of residential-scale assets for participation in ESO Balancing Services.

Objective(s)

At the end of the project, we will

- Recommend updates to the approvals and commissioning process for onboarding new assets, ensuring these are fit for purpose for large portfolios.
- Determine and agree the procedures for data capture and requirements for portfolio assets to back up performance-based assessment of portfolios managed close to real-time.
- Evaluate, develop, and test options for measuring power and frequency that meet NGENSO requirements for verifying service provision.

Consumer Vulnerability Impact Assessment (RIIO-2 Projects Only)

n/a

Success Criteria

- New arrangements for onboarding of portfolio of assets acceptable to all parties
- Procedures for real time portfolio management agreed by all parties
- Alternative approaches to frequency and power measurement agreed by all parties

Project Partners and External Funding

National Grid Electricity System Operator
Intelligent Energy Technology Services,
Upside Energy Ltd,
Moixa Technology Limited,
Lightsource Labs holdings Limited, and
Element Energy.

There is no external funding.

Potential for New Learning

This is the first project which recognizes the unique challenges with onboarding and management of large portfolios of residential-scale assets. Understanding the barriers to portfolio-based approaches is the first step to ensuring equitable market access, and has the potential to significantly expand the supply base for ancillary services, increasing market liquidity and competition, and reducing costs.

This learning will also be of great value for Distribution Network Operators, as they start to develop their own markets for flexibility.

Scale of Project

The project is focused on large portfolios of (relatively) small residential energy assets that can be engaged in provision of ancillary services. Such assets may range from 100's of watts to ca 5-7kW each. In aggregate, portfolios could be many 100s of MW in scale.

Technology Readiness at Start

TRL3 Proof of Concept

Technology Readiness at End

TRL6 Large Scale

Geographical Area

The project will cover all of GB. The geographical area of any trial will be determined during the course of the project.

Revenue Allowed for the RIIO Settlement

None.

Indicative Total NIA Project Expenditure

£587,000

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)

Lower bills than would otherwise be the case

Utility grade frequency meters are designed to be used in multi-MW assets. For residential assets, a £500 meter is a significant cost per unit. This cost could be reduced by using lower-grade meters, or alternatively a lower number of high accuracy regional meters could provide the response signal required. The options could reduce the cost per asset below £50/unit.

In addition, current arrangements require each asset to go through acceptance testing before being onboarded by National Grid ESO. An indicative estimate of each test could require 0.5-1 day of time, with a cost of up to £500/unit. A key objective of this project is to identify alternative approaches to meeting acceptance testing requirements that can be implemented with a lower unit cost.

The total saving per residential installation could be up to £1000/unit. If annualised over 5 years, this equates to an annual cost of £200/year that must be offset by revenues. Indicative calculations of EV provision of FFR via vehicle-to-grid could provide between £100-£200/EV per annum. This assumes a very competitive FFR price of £5/MWh (lower than current market); the range reflects uncertainty on EV connection times. With current arrangements, it will be very difficult to generate a net profit; whereas if this project is successful, much of the revenue could be retained.

Turning residential assets profitable would unlock a huge amount of new flexibility in ESO Balancing Services. By 2030, an EV fleet of 4M vehicles could provide FFR response of approximately 2GW (assuming 5kWh per day, and 10 hour connection time). This represents a significant portion of the FFR capacity required in 2030 (NG SOF 2015). Such an increase in competition in Balancing Services would lower overall costs by several million pounds per annum, conservatively.

Reduced environmental damage

The kind of assets we believe will benefit from this approach (domestic batteries, EVs, heat pumps etc) will all contribute to lowering carbon emissions for GB, as they will mostly displace larger thermal plant.

Benefits for society as a whole

This project, if successful, will open our Balancing Services markets to a whole new raft of competitors, from startups to communities.

Please provide a calculation of the expected benefits the Solution

At this stage, it is difficult to quantify how much more liquidity could be unlocked from turning residential DSR assets profitable, and how that in turn will impact overall prices.

The reduction of the minimum capacity threshold in the Firm Frequency Response (FFR) market from 5MW to 1MW reduced costs of FFR by ~50% by increasing the number of providers by 800%.

Assuming, conservatively, that an extra 10% of flexibility capacity is introduced from the residential sector, applying the same ratio

would reduce overall balancing costs by ~£6m per annum.

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

This concept could be replicated across all DNO regions, indeed that is the ultimate aim.

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

The Method, if successful, will only lower costs of rolling out residential flexibility assets. There will be some minimal costs associated with implementing changes within ESO, but the overall system costs should come down by a factor of 10-20x.

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 trialed 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

While the ESO has the most immediate need to facilitate large portfolios of residential flexibility assets in its balancing services, the Distribution Networks will also be looking to these assets to provide flexibility. The learning from this project will be of direct use to all DNOs, and we will be engaging with our DNO colleagues throughout the project to ensure that learnings can be directly applied.

Western Power Distribution will be a strategic advisor on this project.

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

n/a

- 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.

This is the first project of its kind in GB; there is no precedent for residential assets to be used for ancillary service provision except in accordance with the current commercial framework, which leads to very high costs. ESO is committed to ensuring all work on this project will interact with and inform all other work related to the development of its Balancing Services.

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

Overhauling ESO's Balancing Services to accommodate new players is an iterative and labour-intensive process. The residential DSR market is still in its embryonic stages, as technology costs come down. There is not yet a critical mass of participants to compete, but we expect this to change rapidly over the next 3-5 years. Therefore, we want to work with the innovators in this space now, to prepare for this future market.

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

The move away from type testing and individual asset commissioning, towards a portfolio based asset management approach carries significant risk, and the right solutions must be arrived at through testing different approaches. It would not be appropriate to make such fundamental changes to commercial arrangements within BAU activities without testing different options first.

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

There is significant technical risk inherent in moving away from explicit, capacity-based asset nomination, individual frequency metering, and commissioning, and moving towards an implicit, portfolio-based approach to the provision of system critical ancillary services. Whereas acceptance testing can provide explicit evidence of an asset's capability to provide a service under all circumstances, the performance of a portfolio can only be determined implicitly. The SO will need to ensure that the requirements are sufficiently robust to cover all expected states of the asset base, which (depending on the asset) can be expected to vary diurnally and seasonally. This technical risk impacts the commercial risk borne by both the providers of such portfolio based services, and the SO who relies on their provision. Provision of the service in this way changes the distribution of responsibilities between commercial partners; the SO will have less control over determining whether an asset is able to perform the service expected – under all conditions - and instead will rely more on the supplier and an increasing volume of performance related data to demonstrate reliable service provision. Suppliers will need to balance their commercial position against the risk of portfolio under delivery

This project has been approved by a senior member of staff

Yes