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NIA Project Registration and PEA Document

Date of Submission

Jan 2024

Project Reference Number

NIA_SSEN_0072

Project Registration

Project Title

Demand Diversification Service for LMAs

Project Reference Number

NIA_SSEN_0072

Project Licensee(s)

Scottish and Southern Electricity Networks Distribution

Project Start

February 2024

Project Duration

0 years and 8 months

Nominated Project Contact(s)

Kevin Stewart

Project Budget

£330,500.00

Summary

Load Managed Areas (LMAs) were introduced in response to the successful use of storage heating to maintain network integrity. However, as the industry has matured, they are no longer always fit for purpose. Specifically:

1.LMAs are often considered to be too restrictive for consumers, limiting tariff options and some new Low Carbon Technologies(LCTs).

2.LMAs restrict consumers' ability to participate in flexibility markets or allow the stacking of value from the full range of flexibilityservices that are emerging in the marketplace.

Alternative market-based methods of diversifying demand are being considered. This project will test the concept of procuring demand diversification services, where Flexibility Service Providers (FSPs) are contracted to schedule consumer's load to keep aggregated demand within network capacity.

Third Party Collaborators

baringa

Nominated Contact Email Address(es)

fnp.pmo@sse.com

Problem Being Solved

LMAs were introduced to enable Distribution Network Operators (DNOs) to avoid or defer the need for network reinforcement due to the increased load from the connection of new storage heating load in the 1980s. In SHEPD, this has historically been achieved using Radio Tele-switches (RTS) to control the charging of the electric storage heaters. In particular, RTS allowed this new un-diversified

pre-programmed switched load to be connected in remote and island communities without the need for significant network investment. The RTS system combined with LMA diversification schedules has helped to avoid significant reinforcement costs since its inception and has benefited consumers by giving them access to lower cost off-peak electric heating. Whilst these systems have been successfully managing demand, they are becoming increasingly incompatible with current network and wider market operation:

1. LMAs by their nature limit the ability of consumers and their suppliers to monetise the value of their flexibility as they are locked into fixed demand schedules.
2. The additional complexity and restrictions of an LMA restrict the range of suppliers and tariffs that consumers in these areas can access.
3. While the imminent retiral of the RTS system has been resolved using the new 5-terminal SMETS2 smart meters that provide the same programmable scheduling functionality, this does not support the addition of other loads (such as electric vehicle chargers or heat pumps) to constrained parts of the distribution network.

To resolve these issues and ensure that the network remains within its safe operating limits, this project will investigate new and innovative flexibility mechanisms, also called Demand Diversification Services (DDSs), where FSPs could be contracted to manage schedulable consumer loads within agreed limits. Additionally, this will allow suppliers to utilise the controllable loads to provide other flexibility offerings within the limitations of the diversification service, thereby stacking value. Given that these will initially be implemented in areas where there is a known network constraint, this solution must maintain the demand diversification that came from the RTS system, while allowing consumers to access new products more easily from a broader range of FSPs.

However, there are numerous challenges that need to be addressed before the new DDSs can be introduced to the market, these include answering the following unknowns:

• Will enough FSPs, which could include suppliers or aggregators, be willing to offer the required services to create choice and a viable market in areas where the network is constrained and an LMA is in place?
• Will the coverage and reliability of the Smart Meter network, or standard telecoms networks, be suitable to support technical solutions that require interacting with consumer meters or smart devices; either to change schedules or aggregate demand data to understand network utilisation?
• With the possibility of the FSPs being responsible for scheduling loads, whether current storage heaters or future low carbon technologies, will the pricing mechanisms of the DDSs provide the certainty and stability required by DNOs given the long timelines for network investment counterfactual options?
• How much network monitoring will be required? On what network assets? And what update frequency will be needed to support FSPs managing their consumer demand and scheduling?
• How should a Demand Diversification Service be explained to consumers to ensure that the positive intentions and need is understood and trusted?

If successful, this new approach will allow the continued deferment of reinforcement costs – possibly even avoiding them altogether. There is also significant potential to replicate this approach to manage network constraints which will arise outside of the current LMAs from the rapid uptake of other schedulable assets, such as electric vehicles (EVs), heat pumps (HPs) or even network peaks caused by more dynamic tariffs. Therefore, the DDS solution could be utilised in a much wider range of network topologies not just in LMAs.

This proposed flexibility-based solution is different from other flexibility solutions in that it won't be a new use case but will be replacing a system that has been in operation for circa 40 years. The solution must at least deliver the same capabilities as the RTS system, provide a better outcome for the consumers in LMAs, whilst maintaining value for all network consumers.

Method(s)

This innovation project will look at addressing two of the barriers to the replication of the demand diversification achieved in the current LMAs using a market-based mechanisms, while enabling consumers increased opportunities to participate in flexibility markets via tariffs and new services from suppliers and other market entities.

1) Technical trial of the metering infrastructure - leveraging the work by suppliers to replace RTS meters with newer versions of the SMETS2 Smart Meters that have scheduling capabilities. While this technology has already been tested and approved as a replacement for RTS meters, it will not enable the lifting of LMA restrictions. However, the two-way nature of the communications does provide new possibilities for using real-time demand data at consumer level to provide more nuanced solutions than the current RTS group schedules in the LMA notice. Suppliers, the DCC and partners are working to understand connectivity issues. However, their analysis is unlikely to cover the potential for real-time use of the network. Technical trials will be established, in partnership with suppliers, in a variety of areas to test the availability and reliability of the Smart Meter Network in these areas and, if applicable, understand the impact of communication dropouts on the consumer and supplier if they were to be using a DDS in the future. This can be applied to all schedulable loads and so will be relevant to all distribution networks that must plan for communication intermittency and outages when managing these loads.

2) Development of new Commercial Arrangements for DDS - The project will look to develop and test new commercial arrangements that incentivise FSPs to provide DDS, based on the agreed requirements, in areas that are identified as constrained now or in the near future. The proposed types of flexibility mechanisms to be tested are discussed in section 2.3 Scope. The viability of each flexibility mechanism will be tested in desktop simulation exercises, where various contractual and financial mechanisms will be roleplayed through a set period to establish if there are any unintended consequences and if all parties react as expected to the market mechanisms that are being proposed.

Other methods may be identified as the project progresses. If so, these will be assessed and evaluated, including engagement with any additional stakeholders.

There will be three main workstreams in the project:
• Detailed analysis of the SHEPD network, from Grid Supply Point (GSP) right down to the Low Voltage network, to identify exactly where there are network constraints and how much headroom each part of the network has. Importantly, this will include the integration of network capacity and demand datasets with worst-case scenario RTS demand datasets (where all RTS demand synchronises due a failure in the RTS signal) and Distribution Future Energy Scenario (DFES) datasets (to future proof any solution) to better understand how demand has changed since LMAs were originally introduced and may change as we move to Net Zero.
• Setup and management of the technical trials
• Setup, execution, and management of the simulation exercises, to assess the suitability of the commercial arrangements being developed.

Data Quality Statement
One of the objectives of the project is to establish the tolerances each of the flexibility mechanisms has with data quality issues. All participating FSPs will be required to share their data quality issues to provide clear insights in the final analysis.

Measurement Quality Statement
Another of the objectives of the project is to establish if the viability of any of the flexibility mechanisms is significantly impacted by the availability of measurement data from either consumer meters and/or network monitoring equipment. Additionally, the project should answer if the measurement data, either from Smart Meters or network monitoring, needs to be real-time, half-hourly, etc. All participating FSPs will be required to share their measurement requirements and conclusions to provide clear insights in the final analysis.

Scope

Technical
Work with range of relevant stakeholders which could include suppliers, aggregators, DCC and others to understand the data and technical requirements to support the proposed DDS
• What network data will participants require?
• Does data need to be real-time?
• What happens to the consumers scheduled load if connectivity is lost?
• Will a Data Governance Policy need to be developed?

To answer these questions, we will support limited technical trials (20-30 consumer with the correct, schedulable smart meter in their home) with suppliers. Established within areas of the network with suitable monitoring, the outcome of the trials will be recommendations for full commercial trials and the issues that will have to be remediated to enable further trials or Business As Usual (BAU) services.

To date, two Flexibility Mechanisms have been discussed as the basis of potential commercial services with FSPs. These will drive the scope of the initial simulation exercises in the project:
• Allocated Capacity – where each FSP is given a Maximum Demand Limit (MDL) based on units consumed and number of consumers in each area. They commit to manage their local portfolio of demand below the MDL for a fixed period in return for a Service Payment. The benefits of this mechanism are that the risk to the network is minimal and that it is clear what each FSP is responsible for.
• Dynamic Congestion Response – FSPs respond to real time network limitation levels, rescheduling smart loads to avoid these periods (and high flex-prices) and making use of other times with low loading and low wholesale prices. The benefit of this mechanism is that network utilisation may be higher, potentially deferring the need for reinforcing until later. However, there is a shared responsibility for keeping aggregate demand within network capacity.
Desktop exercises and a simulation workshop will be used to understand if either of these mechanisms are suitable as the basis of future DDSs. The expected outcomes are an understanding of participant actions when providing the service and unintended consequences from the aggregation of all participant actions.

Evaluation & Dissemination
The outcomes of the technical and commercial workstreams will be evaluated with a particular focus on the implications for the future design of priced contract mechanisms and how these will compare with the cost to reinforce constrained parts of the network. The outcome of both workstreams will also influence a route map for the next phase.
There will be significant re-use of the Energy Networks Association (ENA) Flexibility Service Agreements (FSAs), and one of the project outcomes will be new Service Type templates suitable for the DDSs, ensuring alignment with the ENA Open Network Project principles.

Objective(s)

To establish if LMAs can be removed with the introduction of DDS; enabling consumers within current LMAs to fully participate in the electricity market and transition to LCTs at their discretion.

To establish if potential DDS providers are interested in signing up to such services and under what provisions.

To establish if there are any unintended consequences.

Through a small-scale pilot, to better understand the suitability of the current SMETS2 infrastructure to provide the granularity required for a more dynamic scheduling of loads to support the new DDS.

Through desktop exercises and a simulation with stakeholders, to gather feedback, tease out unintended consequences, and gauge interest from providers.

To establish a Minimum Viable Product in terms of service, market participants and consumer participants – understand level of demand participation to achieve the desired outcomes.

To identify the next steps required, including follow-up innovation projects, to bring DDS closer to a BAU deployment.

Consumer Vulnerability Impact Assessment (RIIO-2 Projects Only)

This project will not adversely impact vulnerable consumers. No consumers on the Priority Services Register will be included in the trials.

Success Criteria

• Confirm any new DDS is technically feasible through the current SMETS2 infrastructure.
• Engaged with stakeholders and gathered feedback that confirms that there is enough interest to establish workable market mechanisms.
• Enough suppliers contribute to the trials and simulation exercise to understand the DDSs and therefore are willing to provide services when the need is operational/BAU rather than an innovation trial.
• Recommendations for what to do next.

Project Partners and External Funding

• Any Flexibility Service Provider (Suppliers and Aggregators) participating in the trials.

Potential for New Learning

Capability of SMETS2 infrastructure to support new DDSs
Unintended consequences from DDS implementation
New FSA Service Types

Scale of Project

Limited trial and desktop study to inform the route forward.

Technology Readiness at Start

TRL2 Invention and Research

Technology Readiness at End

TRL3 Proof of Concept

Geographical Area

Limited trials
Ideally, multiple trials will run in different parts of the SHEPD network.

Revenue Allowed for the RIIO Settlement

No revenue has been allowed for this purpose in RIIO-ED2.

Indicative Total NIA Project Expenditure

£330,500k

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:

Successful implementation of DDS has potential to widen participation in flexibility markets which will support the energy transition.

How the Project has potential to benefit consumer in vulnerable situations:

DDS is looking to minimise the potential additional complexity and restrictions that an LMA has on the range of suppliers and tariffs that consumers in these areas can access. Successful implementation of DDS could help increase supply competition in these areas, resulting in more competitive pricing for consumers, including those in vulnerable situations, such as consumers struggling with fuel poverty. DDS would contribute to ensuring that no customer is left behind in the transition to Net Zero.

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)

N/A

Please provide a calculation of the expected benefits the Solution

N/A – Research project. If successful, this will avoid significant network reinforcement.

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

While this is an issue for the north of Scotland, the method may be replicable across GB as we move to Net Zero.

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

N/A – Research project.

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

Learnings could be useful to all DNOs
• Capability of SMETS2 infrastructure to support new DDSs
• Unintended consequences of implementing new DDSs
• New FSA Types
• Appetite of providers to engage in this flexibility market

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

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.

Whilst this is a flexibility project, it is to develop new services that do not already exist, i.e., demand diversification services to manage network constraints. Will achieve industry alignment by sharing and taking feedback from the ENA Open Networks Project. Where appropriate, learnings from other projects will be incorporated, i.e. Transition.

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

This cannot be funded from BAU as DDS are not currently available in the market and there is uncertainty of the capability of SMETS2 to support the proposed DDSs
Developing new flexibility service types

Relevant Foreground IPR

Not in this phase. However, as we engage with potential providers, we will gauge if this is relevant for future phases.

Data Access Details

The results of the technical trials (and the data it is based on) will be made available as part of the final report. SSEN’s NIA Data

Sharing Policy is available at https://ssen-innovation.co.uk/wp-content/uploads/2022/04/Network-Innovation-Competition-NIC-and-Network-Innovation-Allowance-NIA-Data-Sharing-Procedure-PR-NET-ENG-020.pdf.

Please identify why the Network Licensees will not fund the project as apart of it's business and usual activities

The DDSs do not exist and need to be proven before they can be funded as BAU.

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

It is unproven and NIA allows us to explore the feasibility of the service.

This project has been approved by a senior member of staff

☑ Yes