Energy Networks Innovation Process
Annual Project Progress Report Document

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Project Title *(This cannot be changed once registered)*	Project Reference
Demand Diversification Service for LMAs Phase 2 – Commercial Trials	NIA_SSEN_0078

Funding Licensee(s)	Project Start Date
Scottish Hydro Electric Power Distribution	September 2024

Project Duration	Year
12 months	2024-2025

Nominated Project Contact(s)
Tim Sammon, Innovation Programme Delivery Manager at SSEN

1. Scope

If the proposed DDS models are anywhere near as successful and enduring as the diversity provided by RTS then they can be expected to provide the same level of benefits, that is £1 billion of reinforcement costs deferred over the next 40 years.

Phase 2 will refine the DDS models introduced in Phase 1 and conduct commercial trials with FSPs to validate that:

- The basis of estimating the value of providing a DDS to the network is robust and can be used when pricing a Business as Usual (BaU) service – initially based on the reinforcement cost for the network assets that are constrained.
- The value for providing a DDS will incentivise FSPs to provide a service that delivers a reliable and enduring demand diversification.
- FSPs can offer products or tariffs based on DDS that provide greater choice for consumers and the opportunity to financially benefit from providing the DNO with demand diversification.
- DDS will enable the creation of competitive markets in the areas where they are introduced.
- The proposed commercial terms are fit for purpose when implemented as a BaU service – creating new service types that fall under the Open Networks Flexibility Service Agreement.

These will be achieved through three workstreams:

<u>Field Trials</u>

The viability of each DDS will be tested over a minimum of 11 months to establish if parties react as expected, whether the service is capable of delivering the required level of diversification and if there are any unintended consequences. Each DDS will be tested under a variety of conditions to establish how to best set up the DDS as a BaU service, e.g. establishing AC based on the number of consumers in their local portfolio and their demand. Participating FSPs will be required to recruit a number of their customers with smart meters (for settlement) and schedulable loads to participate in the trial. The Field Trials will also uncover if there are any technology requirements essential to the deployment of each of DDS as a BaU service, e.g. sharing of real-time networking monitoring for the DCR model.

<u>Virtual Networks</u>

One of the potential downsides of recruiting consumers is finding a critical mass in an area of the network to provide realistic feedback on whether DDS can have a meaningful impact on the diversity in that part of the network. To overcome this, the project will work with the Power Networks Distribution Centre (PNDC) and the Energy Systems Catapult Living Laboratory (LL) to model virtual networks using real world data captured from the LL participants. This will enable multiple network configurations to be analysed with a variety of types of load and levels of DDS penetration.

<u>Analysis, Insights and Final Report</u>

The outcomes of the field trials and virtual network workstreams will be evaluated with a particular focus on the implications for the future design of BaU DDSs 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 introducing DDS as a BaU service.

There will be significant re-use of the 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.

2. Objective(s)

Primary Objective

To design and run commercial trials to establish the feasibility of introducing DDSs as a means of reducing peak demand. If DDSs can provide at least the level of diversification of the existing solution in LMA areas, mandated diversification schedules would no longer be required and the enabling LMA notices could be liberated through a structured programme of moving consumers to non-LMA settlement codes.

Secondary Objectives

To establish:

- What barriers to entry, if any, deter new FSP entrants or prevent consumers from participating in DDSs, e.g. requirement for a smart meter.
- The commercial models that are of interest to FSPs and whether the level of incentive required to ensure the demand is diversified can be justified by the DNO and enable DDS to be procured as a BaU enduring service.
- The engagement of consumers and associated propositions so they contract with FSPs, schedule their Flexibility repeatably, and the FSP can provide accurate demand forecasting with volume sustainability.
- If the products or tariffs offered by FSPs provide greater choice for consumers and the opportunity to financially benefit from providing the DNO with demand diversification.
- The minimum viable market size for a location based on the proportion of flexible load to the total load at a network location.
- The DDS penetration level required to replace the level of diversification from existing LMAs and trigger the removal of an existing LMA and how it is measured.
- Whether the technology and data to settle the DDS delivered by the FSPs in each SP using half-hourly or more frequent metering is available.
- Whether FSPs can respond to DNO signals (forecast or unanticipated network congestion) and if this encourages herding or hunting behaviours.
- If the behaviour of an FSP is different if they are aware they have a dominant position.
- The effect of dominant FSPs and whether they have an unfair advantage.
- How to easily integrate DDSs into BaU operations.
- If there are unintended consequences from the deployment of some DDSs, if any have a higher success rate (and why), and whether multiple DDSs can operate in the same location.
- How DDS can be designed/modified to address significant network growth.

3. Success Criteria

- Sufficient FSPs contribute to successful trials to understand the pros and cons of the DDSs.
- Confirmation that each of the DDSs is technically feasible.
- Understand the appetite of FSPs to provide a similar BaU service and whether each DDSs is commercially attractive.
- Stakeholder feedback confirms that there is sufficient interest to establish viable markets.
- Next steps for introducing DDS as a BaU service are clearly understood.

4. Performance compared to the original project aims, objectives and success criteria

Details of how the Project is investigating/solving the issue described in the NIA Project Registration Pro-forma. Details of how the Project is performing/performed relative to its aims, objectives and success criteria.

The aim of the project is to consider numerous challenges that need to be addressed before the new DDSs can be introduced to the market, including:

- Determine if sufficient FSPs (primarily suppliers or aggregators) be willing to participate in DDSs to provide choice and establish viability and enable the LMA notices to be removed
- Determine if the coverage and reliability of the Smart Meter network, or standard telecoms networks, is suitable to support technical solutions that interact with consumer meters or smart devices and provide schedule changes or demand data to understand network utilisation
- Determine if the FSP products or offerings based on behind the meter scheduling solutions provide the level of certainty required for reliable and enduring demand diversification
- With the possibility of FSPs scheduling loads (existing storage heaters or future low carbon technologies), determine if DDSs provide the diversification certainty and stability required by DNOs to avoid, reduce or defer network investment counterfactual options
- Determine the appropriate level and location of network monitoring, and the refresh rate needed to support FSPs in managing consumer demand and scheduling
- Determine the DDS consumer proposition and establish how can it be explained to ensure the positive intentions and needs are understood

<u>Aim 1</u>

Determine if sufficient FSPs (primarily suppliers or aggregators) be willing to participate in DDSs to provide choice and establish viability and enable the LMA notices to be removed

- The Field Trials have been slow to get started due to issues with resources, however, we have three suppliers and two aggregators that want to get involved, and another two suppliers that are interested in keeping up to date with the project and its findings. This will be enough to get sufficient data for analysis, however, having more is optimal, so we will continue to approach flex providers.

<u>Aim 2</u>

Determine if the coverage and reliability of the Smart Meter network, or standard telecoms networks, is suitable to support technical solutions that interact with consumer meters or smart devices and provide schedule changes or demand data to understand

- No explicit testing has been conducted on the reliability of the Smart Meter Network. However, comms and data issues with the participants in the Virtual Network Trials have emphasised the importance of designing the Demand Diversification Services and supporting contracts and business processes to allow for issues with data quality e.g. built in scheduling to ensure diversification takes place in the absence of comms or data issues.

<u>Aim 3</u>

Determine if the FSP products or offerings based on behind the meter scheduling solutions provide the level of certainty required for reliable and enduring demand diversification

- As part of the Virtual Network Trials, two FSPs that schedule and optimise behind the meter (storage heaters and heat pumps) have successfully provided demand data for their portfolio. There have been issues with data communication links dropping out, resulting in lost or buffered data. However, this is no difference to issues with smart meter data. In all instances, the customer's load has still been scheduled, so the diversification has still been reliable and enduring.
- The enduring requirement, i.e. that FSPs continue to provide the service, cannot be trialled. The financial incentives or disincentives will be one aspect of this and will be reviewed as part of the economic modelling process. Additionally, contracts for this service will need to be carefully considered, so that it is clear there is a social responsibility to maintaining the service and a need to withdraw from the service in a controlled way to enable the DNO to put in place alternative measures.

<u>Aim 4</u>

With the possibility of FSPs scheduling loads (existing storage heaters or future low carbon technologies), determine if DDSs provide the diversification certainty and stability required by DNOs to avoid, reduce or defer network investment counterfactual options

- The trials to date are clearly showing that FSPs can have an impact on the aggregate demand on a network asset. The question of what price they will do this for and whether it is comparable to the network investment counterfactual options has still to be modelled.

Aim 5

Determine the appropriate level and location of network monitoring, and the refresh rate needed to support FSPs in managing consumer demand and scheduling

- It has already been ascertained that almost real-time data feeds from network monitoring is not feasible nor cost-effective. The current open data portal receives updates every ten minutes. This will impact the Dynamic Congestion Response (DCR) model, as ten minutes might be too late to react to a spike in demand that threatens asset security.
- Trials have shown that day ahead optimisation can still have an impact on the demand profile. This may be a safer solution than real-time.

Aim 6

Determine the DDS consumer proposition and establish how can it be explained to ensure the positive intentions and needs are understood

- In the Virtual Network Trials, the two aggregator FSPs have very clear propositions – to optimise the customers heating, improve comfort and reduce energy costs. DDS is viewed by them as an additional revenue stream and offering to customers.
- Suppliers are only beginning to be actively engaged now, as the preparations for the Field Trials get underway. To date there has been no indication as to how suppliers will present DDS to their customers.

Objectives performance to date

Objective	Performance
Design and run commercial trials to establish the feasibility of introducing DDSs as a means of reducing peak demand. If DDSs can provide at least the level of diversification of the existing solution in LMA areas, mandated diversification schedules would no longer be required and the enabling LMA notices could be liberated through a structured programme of moving consumers to non-LMA settlement codes.	The Virtual Network Trials have been progressing well using an Agile/Sprint methodology to enable the project to pivot on priorities or focus from one sprint to the next. The trials are driven by detailed DDS design and trial design documents, which clearly outline the services and how they will be tested. Regular reviews are held to compare the project objectives with the outcomes to date and plans for future sprints. To date the trials are on track. A need to incorporate more thorough economic modelling has been identified and incorporated into the plan for the Virtual Network Trial sprint.
Define the barriers to entry, if any, deter new FSP entrants or prevent consumers from participating in DDSs, e.g. requirement for a smart meter.	To date, the technical requirements for the DCR model (to monitor and re-schedule in near real-time) is seen to be a barrier for those organisations that don't have the IT infrastructure in place to support these requirements.
Determine the commercial models that are of interest to FSPs and whether the level of incentive required to ensure the demand is diversified can be justified by the DNO and enable DDS to be procured as a BaU enduring service.	Yet to be assessed.
Establish the engagement of consumers and associated propositions so they contract with FSPs, schedule their Flexibility repeatably, and the FSP can provide accurate demand forecasting with volume sustainability.	There is some sign of trial fatigue from the Living Lab volunteers that need to be more actively engaged by responding to signals from the Energy Systems Catapult. This is thought to be reflective of real-world flexing and is therefore a concern for any proposition that relies on consumer behaviour. On the other hand, those propositions that automate the consumers demand (storage heaters and heat pumps) are proving to be more reliable.
Determine if the products or tariffs offered by FSPs provide greater choice for consumers and the opportunity to financially benefit from providing the DNO with demand diversification.	No visibility of this yet. Hopefully FSP intentions will become clearer during the Field Trials.
Determine the minimum viable market size for a location based on the proportion of flexible load to the total load at a network location.	Yet to be assessed.
Determine the DDS penetration level required to replace the level of diversification from existing LMAs and trigger the removal of an existing LMA and how it is measured.	Yet to be assessed but is likely to be location specific and very dependent on the percentage of flexible loads. The offerings from the FSPs and customer engagement will also play a significant part.
Establish whether the technology and data to settle the DDS delivered by the FSPs in each SP using half-hourly or more frequent metering is available.	It has been shown already the half-hourly demand data from smart meters, or behind the meter alternatives, is good enough for settlement.

Establish whether FSPs can respond to DNO signals (forecast or unanticipated network congestion) and if this encourages herding or hunting behaviours.	Early trials of DCR by the Energy Systems Catapult have shown that the DCR signal did encourage herding (where all FSPs follow the price and congestion signals and move demand to the time with the lowest congestion) and as a result created larger spikes in demand.
Assess if the behaviour of an FSP is different if they are aware they have a dominant position.	Yet to be assessed.
Assess the effect of dominant FSPs and whether they have an unfair advantage.	Yet to be assessed.
Determine how to easily integrate DDSs into BaU operations.	Discussions are on-going with the Flexibility Markets and Flexibility Services teams to ensure the required BaU processes are well understood and that a transition plan is put in place.
Determine if there are unintended consequences from the deployment of some DDSs, if any have a higher success rate (and why), and whether multiple DDSs can operate in the same location.	DCR is definitely encouraging herding. The Allocated Capacity (AC) model is simple if an FSP's portfolio of customers and/or their demand remain static, however, this is unlikely; at which point the administrative burden of maintaining portfolios becomes a concern.
Determine how DDS can be designed/modified to address significant network growth.	A third model is currently being reviewed that incentivises FSPs to flatten their demand profiles. This is based on reducing the variation of the FSPs portfolio around an average demand profile.

Success Criteria performance to date

Success Criteria	Performance
Sufficient FSPs contribute to successful trials to understand the pros and cons of the DDSs.	Two suppliers and two aggregators confirmed for the Field Trials. Others are being actively engaged and may yet decide to join.
Confirmation that each of the DDSs is technically feasible.	Complete.
Understand the appetite of FSPs to provide a similar BaU service and whether each DDSs is commercially attractive.	Yet to be assessed.
Stakeholder feedback confirms that there is sufficient interest to establish viable markets.	Looking positive so far but finally commercial models will likely make or break the services.
Next steps for introducing DDS as a BaU service are clearly understood.	Being actively worked on at the moment.

5. Required modifications to the planned approach during the course of the project

The Network Licensee should state any changes to its planned methodology and describe why the planned approach proved to be inappropriate. Please confirm if no changes are required.

No changes to the planned methodology have been required to date.

6. Lessons learnt for future projects

Recommendations on how the learning from the Project could be exploited further. This may include recommendations on what form of trialling will be required to move the Method to the next TRL. The Network Licensee should also state if the Project discovered significant problems with the trialled Methods. The Network Licensee should comment on the likelihood that the Method will be deployed on a large scale in future. The Network Licensee should discuss the effectiveness of any Research, Development or Demonstration undertaken.

Tariffs have a major impact on the willingness of customers or economically-sensitive automated optimisation engines to schedule out with low price periods offered by suppliers. These tariffs are provably creating new daily peaks (overnight). Modelling by the Power Networks Development Centre has shown that 20-30% electric vehicle penetration is enough to create an overnight peak that exceeds the usual early evening peak. And the NIA_SSEN_0079 Net Zero Termination 2 Project has reported, there is evidence of this occurring in the market. Future projects should look at the impact of Time-of-Use tariffs and the negative consequences they can have at relatively low penetration levels.

7. The Outcomes of the project

When available, comprehensive details of the Project's outcomes are to be reported. Where quantitative data is available to describe these outcomes it should be included in the report. Wherever possible, the performance improvement attributable to the Project should be described. If the TRL of the Method has changed as a result of the Project this should be reported. The Network Licensee should highlight any opportunities for future Projects to develop learning further.

Not applicable at this stage.

8. Data Access & Quality Details

A description of how any network or consumption data (anonymised where necessary) gathered in the course of the Project can be requested by interested parties. This requirement may be met by including a link to the publicly available data sharing policy.

Consumption data has been collected from participants in the Energy Systems Catapult's Living Lab. This is in the format of aggregated demand data for groups with electric vehicles, heat pumps, and storage heaters, with data collected before and after the relevant flexibility service provider has scheduled according to the DDS model being tested.

For information how to request data gathered in the course of this project, see Network Innovation Competition (NIC) and Network Innovation Allowance (NIA) Data Sharing Procedure at https://ssen-innovation.co.uk/innovation-strategy/.

9. Foreground IPR

A description of any foreground IPR that have been developed by the project and how this will be owned.

N/A