NIA Project Registration and PEA Document

Date of Submission

Aug 2021

Project Reference Number

NIA_UKPN0075

Project Registration

Project Title

Empower

Project Reference Number

NIA_UKPN0075

Project Licensee(s)

UK Power Networks

Project Start

September 2021

Project Duration

1 year and 6 months

Nominated Project Contact(s)

Rona Mitchell

Project Budget

£520,000.00

Summary

Historically the DNOs' role and interaction with customers was mostly led by the need to manage and respond to outages. As we transition to a DSO and customers choose to interact with the network for other services, it is important to reconfigure our services to address the needs of all our customers. It is fundamental for network services to be inclusive and fair, to make sure that no one is left behind as we transition to a net zero future. The increased uptake of low carbon technologies (LCT) integrated into our network may result in higher network costs with the distributional effects of this not being fully understood. Present cost structures of connections and DUoS charges might not be equitable for those who find it difficult to access new LCTs, exacerbating the issues faced by vulnerable customers. There is a need to increase our understanding of customer vulnerability in a world that is transitioning to net zero.

Nominated Contact Email Address(es)

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Problem Being Solved

Tackling fuel poverty is one of the four strategic focus areas of the UK Power Networks' social sustainability programme, however accurately identifying affected customers is one of the biggest challenges for UK Power Networks in providing effective support. The current method relies on using fuel poverty statistics and retrieving data through local trusted partner organisations that understand what is happening on the ground (for example charities, local community support groups, National Energy Action, Ground Works) and help us identify customers who are struggling. Through these partnerships we are able to reach vulnerable customers and provide personalised support on income maximisation (for example benefits checking, tariff switching, grant applications). This identification process is relatively expensive and difficult to scale to the large number of customers that are in or expected to be in fuel poverty.

The challenge of identification and supporting those in fuel poverty has been exacerbated by recent socio-economic conditions resulting from the COVID-19 pandemic. Faster and more efficient methods of detecting customers in or at the risk of fuel poverty are needed so we may provide effective support.

Method(s)

This project draws on Energy System Catapult's (ESC) existing deep understanding of fuel poverty, combining this with the best data available, including utilising Data Communication Company's (DCC) Smart Meter System data, linking this with other data sources, and applying the latest Artificial Intelligence (AI) & data science techniques by UrbanTide (UT) to identify households at risk of fuel poverty. The project will consume anonymised DCC data via a data sharing agreement between DCC and UT. UK Power Networks and ESC will only receive aggregated outputs from UT throughout the project.

The project will draw on findings and research undertaken by UT as part of the Small Business Research Initiative (SBRI) Modernising Energy Data Applications Phase 1 competition including ensuring ethical data access from DCC's data. DCC will provide the System Meta Data sharing processes and the compliance and government management around releasing that same data. DCC's internal analytics team and domain experts will also peer review and provide feedback on the AI outputs to ensure the results are accurate and meaningful and improve the quality of results.

The outlined work programme will define, develop and co-create a new software tool, and embed the final solution into business processes, ensuring that UK Power Networks can be confident it will deliver against requirements. The project seeks to accelerate the identification process and develop a broader impact assessment framework of suitable interventions.

Identifying and supporting more customers in vulnerable circumstances will provide UK Power Networks an opportunity to promote energy efficiency as a way to reduce energy bills. Uptake of energy efficiency has a direct positive impact on the network from decrease in load and consequent deferral of network reinforcement.

In addition, a new commercial arrangement with Urban Tide will enable UK Power Networks to use the most up to date data on fuel poverty, allowing UK Power Networks to manage a changing landscape and provide effective support.

Scope

This project seeks to, for the first time, combine UK-wide smart meter system data with cross-sector data to identify at street level fuel poverty risk levels. The scope is in the work packages as follows:

WP1 – Project Management (running throughout project)

WP2 - User requirements and data discovery

WP2.1 – Define Requirements

WP2.2 – Data Discovery

WP3 – Design and development of a software tool

WP3.1 – Co-creation

WP3.2 – Data Science

WP4 - Iterative testing and development of software tool

WP4.1 – Does it help them

WP4.2 – Does it find them

WP5 – Embed software

WP5.1 – Share Findings

WP5.2 – Scale-up and embed

The project will draw upon the expertise of UrbanTide (artificial intelligence), Energy Systems Catapult (fuel poverty) and Data Communications Company (existing smart meter data).

Objective(s)

The project objectives are to:

1. Use data to efficiently find consumers at risk of fuel poverty; and

2. Understand and develop more effective support packages that meet consumer needs.

The expected outcome is to develop a software tool that will provide wider social value beyond electricity through supporting customers in fuel poverty and ensuring no one is left behind in the energy transition. This will be done by developing a street level accurate identification of vulnerable customers in our area, and identifying levels and mechanisms of support that could be offered to them. The project will create a software tool that uses cross-sector data, artificial intelligence and consumer research to meet the above objectives of the project through testing and implementation. The tool will be usable by UK Power Networks by incorporating into BAU and will be available to other DNOs through a software-as-a-service model (in particular to use UrbanTide's uSmart AI platform to access, store and process real time data).

Consumer Vulnerability Impact Assessment (RIIO-2 Projects Only)

Not applicable.

Success Criteria

The project will be deemed successful when we have:

· Summarised key indicative behaviours for people in, or entering, fuel poverty from the various data sets that will be used

· Prototyped algorithms that are adapted and retrained to effectively identify consumers in, or entering, fuel poverty.

· Optimised and verified customer support processes and updated working practices to deliver support in future

· Created dissemination material in the form of a final report and webinars

Project Partners and External Funding

The following project partners approached us with joint proposal for this project and hence are the preferred partners:

1. UrbanTide

2. Energy Systems Catapult

Urban Tide and Energy Systems Catapult are contributing approximately £50k each to complete this project.

Potential for New Learning

The project expects to generate the following learning:

· An understanding of the diversity of situations that can make a household fuel poor and how those differences can be spotted using smart data

· How households themselves perceive their needs and the use of their data to support them

· Develop a first of its kind consumer-led method to detect the risk of people falling into fuel poverty as well as experiencing fuel poverty

· The value of smart meter system data to accurately identify fuel poverty and fuel poverty risk as part of a wider data integration solution

· Given the above, how the network can modify or enhance its services to provide the most appropriate type of service to its

customers.

The learnings will be shared via knowledge dissemination event.

Scale of Project

The project will cover all three licence areas of UK Power Networks. Because of the nature of software projects, reducing the scale of the geographic area covered would only lead in a small reduction in project costs, but have a large impact on the potential benefits of the project. The scale of this project was chosen to maximise the potential benefits relative to the NIA investment. The proposed scale of the project will ensure that the solution is ready to be replicated across other network licence areas in GB as our three licence areas would encapsulate different socio-economic demographics seen across the country.

If the project was conducted at a smaller scale there would be less potential for new learning as key elements of the solution would not be developed and the true value of the data intelligence created could not be understood.

Technology Readiness at Start

TRL6 Large Scale

Technology Readiness at End

TRL8 Active Commissioning

Geographical Area

The project will cover all three licence areas of UK Power Networks (EPN, SPN, and LPN) in terms of data collection and dissemination.

Revenue Allowed for the RIIO Settlement

No funding was included for fuel poverty support, specifically better identification activities.

Indicative Total NIA Project Expenditure

The project will require £468,000 of NIA funding.

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)

The high level network benefits from this project mostly come from the potentially deferred reinforcement costs. The more customers we are able to provide support to who are in or entering fuel poverty, the higher possibility we have of making them aware of and potentially taking action on the importance of energy efficiency. We anticipate that in the savings in the remainder of RIIO-ED1 and in RIIO-ED2 are £2.2m.

Please provide a calculation of the expected benefits the Solution

NPV = Base Cost – (Method Cost – Benefits)

In RIIO-ED1, we expect the following:

- NPV = £1.2m – (£0.5m - £0.2m) = £0.9m where:

o Base Cost = £1.2m

o Method Cost = £0.5m, which is the NPV of project costs

o Benefits = £0.2m, which is the NPV of anticipated benefits coming from engagement with fuel poor customers

In RIIO-ED2, we expect the following:

- NPV = £15.0m – (£10.6m - £2.0m) = £6.4m where:

o Base Cost = £15.0m

o Method Cost = £10.6m

Benefits = £2.0m, which is the NPV of the anticipated benefits coming from network reinforcement deferral and customer satisfaction

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

This will be applicable across GB. As of 2019 data, there are 3.18 million households in fuel poverty in England. All of these households could benefit from the learnings generated by Empower.

BEIS Annual Fuel Poverty Statistics in England, 2021 (2019 data)

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

One of the goals of this project is to develop an enduring and scalable solution that can be rolled out to other organisations. It is expected that the cost for other networks to replicate will be a minimum of £18k with additional costs for customisation. Ongoing costs are expected to be about £96k annually.

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

The proposed project has the potential to generate lessons that can be shared with all GB DNOs. Lessons that will be shared are expected to include:

- How AI and data analytics can be used to identify customers in or entering fuel poverty.

- How service needs to change to meet the changing requirements of the fuel poor customer. An example is to provide awareness of energy efficiency and encourage to implement it. This will help reduce energy bills for the customers and also reduce load on the network.

We will disseminate lessons learned from the project via our regular Innovation reporting channels, as well as the project closedown report.

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.

N/A

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

There are a number of highly innovative aspects of the project

·   The uSmart AI platform's enablement architecture makes it easier and cheaper (when compared with generalised AI product offerings) to develop and test AI and Machine Learning (ML) techniques when linking IoT and other data sources

·   Market evolution of AI and ML has advanced techniques and application of these techniques whilst maintaining affordability. This means that the techniques applied in this project have not been applied before as they are emerging in the marketplace enabling the best possible detection and prediction.

·   The DCC system metadata, which indicates for example when emergency credit is activated or a prepayment meter is topped up, will be the best quality and most complete secure sharing of the data to date. The release of such data is emerging along with Government guidelines for data protection, data sharing and sector specific initiatives such as the Energy Data Taskforce.

·   It will also be the largest in terms of the number of messages with billions of individual actions being shared. This will be regularly update as the increasing number of smart meters installed reached 16 million in July 2021 up 1 million since February of the same year.

These innovative aspects combine to create a truly unique project which is understood to be the first of its kind globally, not just in the UK.

Below are a few projects that relate to fuel poverty and how Empower differs from these:

1.   energywise: This UK Power Networks project explored how DNOs can work collaboratively with energy suppliers and local trusted organisations to deliver appropriate services to communities of low income households who may be struggling with their energy bills. It did not bring in a variety of other data sets to identify at a street level where our fuel poor customers are.

2.   Urban Energy Club: This UK Power Networks project is testing how the virtual allocation of shared assets can support a more inclusive approach of procuring network flexibility from domestic customers living in blocks of flats. It is not focussing on efficiently identifying customers in or entering fuel poverty.

3.   Fuel Poverty in a Smart Energy world: This Energy Systems Catapult project used in-home smart and other energy data to identify behaviours of fuel poor households, including behaviours that could be used to understand if a household was struggling. This work did not include non-energy sector data and did not try to design better support (from a network operator or other party) as a result of the behaviours exhibited. This was the first, and only, of its kind to understand individual households' behaviour in fuel poverty using smart energy data.

4.   Sustainability First Public Interest Advisory Group: this project identified a range of use cases for anonymised smart meter energy data to support the public interest and describe some possible uses of aggregated/anonymised smart meter data. It does not prototype or test the validity of doing this and does not discuss how networks could use this data for addressing fuel poverty.

5.   Better use of data and advanced statistics/machine learning in delivering benefits to the fuel poor, (2020), Deloitte LLP. This previous research sets the scene for the use of Machine Learning in addressing fuel poverty. It provides feasibility assessments on elements such as the models to be used and the resultant frameworks that need put in place to ensure the AI/ML can be utilised it does not consider real implementation factors which our project will including the application with UK Power Networks and the responses/impact for consumers through ESC expertise.

6.   BMI: A Behavior Measurement Indicator for Fuel Poverty Using Aggregated Load Readings from Smart Meters, (2020), Paul Fergus and Carl Chalmers, Department of Computer Science, Liverpool John Moores University, Byrom Street, L3 3AF, P.Fergus, C.Chalmers. The previous research approach utilises more detailed smart meter consumption data, including appliance usage data. Our proposal utilises more easily accessible smart meter system data to provide an instant UK wide viewpoint based on the data itself. Our solution is considered more scalable and provides the at-scale implementation roadmap, which is much less clear than the previous research.

7.   UKRI - Modernising Energy Data Applications (MEDA): UrbanTide leads the consortium, and we have just completed a feasibility project funded by UKRI, part of the MEDA programme. Urban Tide's project uSmart ZERO explores the feasibility of reducing household emissions and fuel poverty by utilising AI and combining smart meter system data with other data sources. This report presents a high-level evaluation of potential benefits and disbenefits across different stakeholder groups and economic, environmental and social dimensions..

Vulnerability and Energy Networks, Identification and Consumption Evaluation (VENICE): This Western Power Distribution NIA project is a research project at low TRL (2-3) as opposed to Empower (TRL 6-8). The PEA indicates that the project is desktop based research, with no development of tools. Whilst it is in a similar topic area to Empower, we believe that the projects are distinct and that there will be minimal duplication. UK Power Networks will engage with Western Power Distribution throughout the project durations to share learnings.

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

In section 3.2 of the NIA Governance document, the DNOs are encouraged to pursue different types of Methods and Solutions. Significant data discovery and development is required to ensure usable outputs are created. Further, using artificial intelligence and data science to quickly and efficiently identify not just current customers in fuel poverty, but those that may go into fuel poverty, needs to be tested.

Due to the risk involved in the project and not fully knowing whether the benefits can be delivered across UK Power Networks' license areas, these activities would not form part of business as usual activities. In order to progress an innovative project which carries significant risk in implementation, additional innovation funding is required as a stimulus.

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

The project can only be undertaken as an innovation project given the uncertainty of the use of AI and data analytics to predict areas of current or future fuel poverty.

As noted in the NIA Guidance, certain projects are speculative in nature and yield uncertain commercial returns. This is the case for with this project. There is a commercial risk that the work conducted in the project does not lead faster and more efficient identification

of customers who are or will be in fuel poverty. This could be due to the fact that the solution has not reached the level of maturity required for business-as-usual application.

This risk is being mitigated against through early engagement with stakeholders. If the project is successful, it will develop learning to appropriately identify. The specific details regarding the benefits are captured under section 2b of this document.

This project has been approved by a senior member of staff

☑ Yes