Notes on Completion: Please refer to the appropriate NIA Governance Document to assist in the completion of this form. The full completed submission should not exceed 6 pages in total.

NIA Project Registration and PEA Document

Date of Submission

Apr 2021

Project Reference Number

NIA_ENWL_024

Project Registration

Project Title

Smart Heat

Project Reference Number

NIA_ENWL_024

Project Licensee(s)

Electricity North West

Project Start

April 2021

Project Duration

1 year and 1 month

Nominated Project Contact(s)

InnovationTeam@enwl.co.uk

Project Budget

£492,670.00

Summary

Under a range of future heating scenarios, it is likely that electrification of heat will result in a significant increase in load on the electricity network with little apparent diversity which will trigger significant network reinforcement unless alternative solutions are identified. This project will investigate the impact of heat on electricity networks by drawing on analysis from other work and combining with customer engagement to explore the motivations and connection considerations around heat pumps and further testing the acceptability of different methods for network management and flexibility. The project will use the learning from the Celsius and Smart Street projects to assess how smart network management can exploit existing network capacity, for example, by using variable thermal ratings, voltage control and demand flexibility, and will produce a CBA of methods to manage and mitigate the impacts of electrical heating demand, including variable rating and flexibility.

Preceding Projects

ENWLEN01 - Celsius

Third Party Collaborators

LCP Delta

Ricardo

Impact Research

Nominated Contact Email Address(es)

innovation@enwl.co.uk

Problem Being Solved

The UK has a target of achieving net zero greenhouse gas emissions by 2050 and in the North West local leaders have set more challenging targets. In order to meet these targets significant decarbonisation will need to take place in the heating sector which is likely to result in the future residential heating market looking very different from the current gas-dominated market. Under a range of future heating scenarios, it is likely that electrification of heat will result in a significant increase in load on the electricity network with little apparent diversity which will trigger significant network reinforcement unless alternative solutions are identified.

Method(s)

This small-scale research project will investigate the impact of heat on Electricity North West's network by drawing on the analysis from other work (e.g. the WPD Peak Heat project) and combining this with customer engagement to explore the motivations and connection considerations around heat pumps and further testing the acceptability of different methods for network management and flexibility.

The project will use the learning from ENWL's Celsius and Smart Street projects to assess how smart network management can exploit existing network capacity, for example, by using variable thermal ratings, voltage control and demand flexibility, and will produce a CBA of methods to manage and mitigate the impacts of electrical heating demand, including variable rating and flexibility.

Scope

This project is a desktop research and analysis piece based around the following tasks:

- Future low carbon heating market scenarios and network impacts
- Best practice in understanding, connections and managing heat pumps
- Characterising heat flexibility
- Assessing customer impact
- Investigating the use of enhanced variable ratings
- Cost benefit analysis
- Recommendations for future work

Objective(s)

This research project will help to improve understanding of future heating markets, the impact these will have on the electricity network and the opportunities for mitigating those impacts using demand side flexibility and smart network management via variable thermal rating.

Consumer Vulnerability Impact Assessment (RIIO-2 Projects Only)

N/A

Success Criteria

Production of a report detailing:

- Future heat landscape scenarios;
- Best practice for the connection and management of electric heating technologies;
- The impact of low carbon electric heating on network assets, and the potential of leveraging variable thermal ratings;
- The likely availability of flexibility from heat;
- An understanding of customer needs around heating;
- An assessment of the costs and benefits of approaches to mitigate the impact of electric heating load on networks;
- Recommendations for further work.

Project Partners and External Funding

The project will be carried out by Delta-EE and Ricardo.

Delta-EE delivers a range of research services covering amongst other things Heat and Flexibility and will draw on this expertise to inform this project.

Ricardo has a wealth of past experience in asset related research project including working with Electricity North West on our Celsius project and will draw on this learning to inform this project.

Potential for New Learning

The learning from this project could help improve our understanding of our customers relationships with heat and how this can be leveraged along with network solutions to manage the connection of electric heating demand.

Scale of Project

This project will be a desktop study, including customer engagement, exploring the impacts and acceptability of different methods for network management and flexibility on networks with heat.

Technology Readiness at Start

TRL1 Basic Principles

Technology Readiness at End

TRL5 Pilot Scale

Geographical Area

North West of England

Revenue Allowed for the RIIO Settlement

N/A

Indicative Total NIA Project Expenditure

£443,403

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 outputs of this project could be used to facilitate the connection of heating demand without the need for expensive reinforcement. One of the outputs of the project will be a CBA to quantify the benefits of using this Method.

Please provide a calculation of the expected benefits the Solution

N/A as this is a research project.

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

As the electrification of heating is an issue facing all DNOs this Method could be rolled out across the entire GB network

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

Not known at this stage – this will be quantified as part of the project outputs.

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 decarbonisation of heat is a problem being faced by all Network Operators and the outputs from this project can be used by the other Network Operators to inform their own business processes around the connection and management of electric heating.

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

This project addresses the objective to “Facilitate the use of low carbon technologies” which is part of our “Net zero and the energy transition” theme.

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.

There are a small number of projects in the Heat space and sharing of the project scope with the ENA Innovation Managers group as well as reviewing the Smarter Networks Portal has not revealed any duplication.

The project will use the outputs from the WPD Peak Heat project (via Delta-EE).
UKPN and NG ESO have both expressed interest in the outputs of the project, they will be project stakeholders to ensure learning is not duplicated and is replicable.

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

The electrification of heating is still a relatively immature area and there is currently a lot of unknowns as to the impact of this load on the network and how network operators can manage this increased demand. The learning from this project could help inform business processes around the connection and management of heat demand.

Relevant Foreground IPR

None

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

This is a low TRL research project with an unquantified business case.

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

This project has learnings which are applicable to all GB network operators and as such NIA offers the best route for this research

This project has been approved by a senior member of staff

☑ Yes