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## NIA Project Registration and PEA Document

### Date of Submission

Feb 2022

### Project Reference Number

NIA\_UKPN0078

## Project Registration

### Project Title

Right to Heat

### Project Reference Number

NIA\_UKPN0078

### Project Licensee(s)

UK Power Networks

### Project Start

February 2022

### Project Duration

3 years and 3 months

### Nominated Project Contact(s)

Sofia Goncalves

### Project Budget

£952,774.25

## Summary

A project with the objectives to develop and demonstrate a template for best practice for decarbonising heating in urban social housing settings by unlocking the commercial value of LCTs for consumers. The project will also complete social research to assess the impact on consumers in vulnerable situations along with providing consumers with advice and coaching.

### Nominated Contact Email Address(es)

innovation@ukpowernetworks.co.uk

## Problem Being Solved

The decarbonisation of homes will result in shifting demand patterns that impact network operation and planning. Consumers will need to understand how best to operate new assets to ensure that they receive the best outcomes in terms of comfort, convenience and cost. Energy efficiency will also play a part in the decarbonisation of homes and an understanding of the benefits for consumers is valuable as this will reduce their overall energy consumption. There is a risk that vulnerable customer groups will be marginalised and will be unable to access the knowledge or technology that enables them to manage their energy bills, leaving those least able to pay burdened with the highest prices for energy. This problem may be exacerbated by physical constraints (such as lack of internal, external or roof space) in implementing low carbon assets within housing archetypes that are typical of urban social housing stock.

It is becoming clear that optimised behind the meter interactions between generation, storage and demand assets can deliver significant bill savings for consumers and have a significant impact on demand profiles for both gas and electricity. Solar photovoltaic (PV), battery storage and heat pumps are being deployed at increasing volumes and now the optionality of installing hybrid gas boiler/heat pump systems is becoming a reality. The ENA/Navigant 'Pathways to Net Zero' report also highlights the importance of hybridisation, with 22 million domestic systems forecast in use by 2050.

Previous projects have explored hybrid heating systems in larger, owner occupied homes, but evidence is lacking from high density, smaller dwellings particularly from a whole system lens where electricity and gas can co-exist to offer a level playing field to social

housing tenants such that they can participate in the energy transition and future markets. In addition to the housing archetypes, more understanding is required in the flexibility that these different assets working together can provide. Critical data on the ability of vulnerable customers to obtain the same benefits as others, informing policy, best practice and technology requirements, is also lacking.

This project will address the following questions in dense housing archetypes:

- How can solar PV, battery and hybrid gas boiler/heat pump assets best be operated to deliver consumer benefits?
- How do gas and electricity networks best plan for and support the resulting demand profiles?
- How can gas and electricity networks help to ensure that the benefits can be made available to all consumers, minimising the risk of adverse outcomes for vulnerable or fuel poor consumers?
- How can gas and electricity networks best use the flexibility services offered by smart control solutions to manage network capacity?
- What carbon benefits can be achieved through the deployment of such technologies in social housing?

Although Electric Vehicles (EVs) will play a part in achieving Net Zero, they have not been considered for the project as the housing type being focussed on is unlikely to have access to off-street parking.

## Method(s)

This project, in collaboration with gas network SGN, social housing provider Stonewater, technology partner Passiv UK, and smart market SME Social Energy, will deliver low carbon interventions that aim to create a template for best practice decarbonisation of gas network connected social housing.

The solution will be based on a hybrid system that sees a heat pump working alongside a traditional boiler. Generally these will be two individual units; however in smaller, physically constrained homes typically found in urban environments a two-unit system may be unsuitable and this project will demonstrate the use of single unit hybrids previously used in the HyCompact project. This project will trial these units in social housing building archetypes coupled with additional low carbon technologies (LCTs) and supported by a smart market mechanism.

The project will seek to demonstrate lower consumer bills, significant carbon reduction, impacts on gas network demand profiles, electricity network demand profiles and the requirements necessary to support electricity network flexibility services. The project will track consumer outcomes, including vulnerable customers, and will undertake social research to explore the variation of outcomes across different household groups within the social housing portfolio. Part of this will look to ensure the households involved are provided with 'coaching/engagement' on being safe and empowered energy consumers, ensuring that we measure the learning outcomes of the social tenant before and after the trial, in line with being socially responsible energy networks.

The roles of our project partners are well defined. UK Power Networks will lead this project and partnering with SGN, using NIA funding and bringing all key partners together to deliver the expected learnings and outcomes for our customers. Additionally we will also facilitate customer engagement and technical impact assessment from the electricity network perspective by actively monitoring the installations. SGN as the gas distribution network in the south will run technical analysis on requirements and impact on the gas network. Stonewater will facilitate the trials by leveraging their social housing portfolio, supported by funding from either the Local Authority Delivery (LAD) scheme or the Social Housing Decarbonisation Fund (SHDF) secured by Stonewater. Passiv UK will provide the required technology in terms of the single unit hybrids and smart controls for running these. Social Energy bring in their expertise to offer smart market based mechanisms to the residents, combining it with an in-market solar PV and battery solutions.

More specifically the project will:

- Select trial participant location(s), engage and recruit up to 25 homes;
- Survey the home, design, specify and install the LCTs;
- Design the use cases to be tested in the field trial;
- Develop communications interface between Passiv UK's existing smart heating controls software and Social Energy's aggregation platform;
- Trial and field test the equipment;
- Gather feedback on consumer impact;
- Evaluate the impact on social housing customers and fuel poverty;
- Evaluate the energy efficiency status of these homes and understanding of further potential benefits from improvements (measures will not be trialled as part of the project); and
- Provide analysis and reporting of results.

All data used within this project is for the purposes described above, and therefore quality will be measured on this basis. The project

will follow all data quality rules, logging, and prioritising issues as they arise in line with the approved methodology set out in our Enterprise Data Management Policy, which forms part of the UK Power Networks Integrated Management System.

Data quality will be measured across five dimensions where applicable:

- Accuracy
- Completeness
- Consistency
- Validity
- Uniqueness

Data quality rules for each of the appropriate data quality dimensions above will be set by the project, measuring them closely on a regular basis to identify quality issues.

Data quality issues will be logged in a central location and prioritised using an approved matrix which combines the importance of the issue, and the amount of data affected, this gives an indication of the issue's impact on the project and wider business, considering factors such as:

- The impact on the health and safety of the public and employees
- Whether it may result in a breach of our licence conditions or relevant regulations
- The impact on UK Power Networks' reputation
- The impact on our operations and efficiency
- The financial impact, including project delays and charges from external service providers

The project will then seek support for resolving the issues in priority order. All data and background information will be stored centrally and securely in a project specific Sharepoint folder or in our Enterprise Data Store if required by the wider business in accordance with data protection requirements.

## Scope

The proposed project has been broken down into the work packages outlined below:

- **WP1** – Project Management and reporting: planning, risk management, reporting, financial control, consumer engagement planning, contracting, procurement, dissemination.
- **WP2** – Project Partner Onboarding: Mobilization meetings with project partners and assessment of technology integration from the different providers.
- **WP3**-Detailed Project Design: use case definition, technical specification, trial planning and experimentation planning, home recruitment initiated.
- **WP4** – Site selection, surveys and Installations: Technical site selection and surveys, installation and commissioning, hybrid control refinement: Passiv UK and Worcester Bosch service integration and optimisation, Levelize services development,
- **WP5** – Field trial & Experimentation: Post trial surveys, consumer engagement, experimentation plan delivery, metering and monitoring data collection (including pre-trial data for both gas and electricity) and analysis, customer support and solution exploitation plan;
- **WP6** – Tenant Engagement & Social Research: impact assessment on consumers in vulnerable situations, value assessment for current and future consumers. This work package also includes evaluation of the energy efficiency status of trial homes and future potential benefits through improvement; and

## Objective(s)

The objectives of the project are to:

- Establish the asset, installation, and operational costs of using an integrated solar PV, battery storage and single unit hybrid heating system to deliver optimised grid flexibility services;
- Establish the suitability of such solutions in a dense social housing setting;
- Demonstrate whole system benefits for both gas and electricity of large-scale deployment of such low cost, integrated solutions with an aggregated domestic demand side response (dDSR) control system and capture the impact on the sensitivities used in future energy system modelling;
- Capture and analyse consumer feedback on the comfort levels provided and other aspects such as noise, visual appearance, installation experience and bill impact;

- Assess any special measures required to support vulnerable customers and protect their benefits; and
- Assess the ability for consumers to realise bill savings and carbon savings.

The outcomes of the project are:

- Develop and demonstrate a template for best practice for decarbonising homes in urban social housing settings by unlocking the commercial value of LCT for consumers; and
- Provide a public full operational data set, reporting on performance and gas and electricity network impacts and support project dissemination and promotion activities.

The above will assist in identifying the next steps towards a commercial roll-out solution of integrated, smart, grid-aware, multi-vector heating, generation and storage solutions for social housing providers. In addition to this we will better understand the customer journey required in such a rollout and how best to ensure benefits reach vulnerable customers.

## Consumer Vulnerability Impact Assessment (RIIO-2 Projects Only)

The solutions and best practice blueprints developed during this project are expected to have the following effects on consumers in vulnerable situations:

- 1) Providing the social housing landlords a better understanding on the suitability of these specific solutions in a dense social housing setting in terms of costs and technical feasibility which will be reflected on their tenants having more opportunities of being exposed to these LCTs in their homes.
- 2) Increase customers awareness and learnings on new low carbon technologies available, by maintaining engagement with tenants throughout the trial and by participating in surveys, interviews and questionnaires relating to their experience with the technologies installed at their home.
- 3) The ability for consumers to realise bill savings, carbon reductions and comfort benefits due to warmer homes because of a more efficient heating system.

## Success Criteria

The project will be deemed successful when we have:

- Demonstrated the integration of a single unit hybrid heating system with other LCTs such as solar PV or battery storage including the commercial value for customers;
- Demonstrated the ability to install and operate such systems in dense social housing;
- Gained insights into the means of balancing the interests of the consumer, social housing provider, supplier, and network operators when seeking to deliver a cost effective decarbonisation strategy for social housing providers;
- Demonstrated the ability for such benefits to be maintained for vulnerable consumers without any detriment when providing flexibility services; and
- Understood the customer journey including additional support required for vulnerable customers in the energy transition.

## Project Partners and External Funding

The project partners for the project have estimated contributions to the total project spending as follows:

- Passiv UK: **£47,300**
- Worcester Bosch: **£50,000**
- Orbit Housing: **£100,000**
- Levelise: **£50,000**

## Potential for New Learning

There is limited data on the performance of low carbon services in dense social housing situations, primarily due to the unsuitability of heat pump solutions in this type of housing stock. Compact hybrids have the potential to resolve some of the issues of heat pumps and traditional hybrids by removing the need for an external unit.

This technology is newly emerging and while some data is being collected from the HyCompact project, this project will collect more data targeted on hard to treat homes and with enhancements to the control approach that builds on the learnings from HyCompact.

It has already been evidenced that significant consumer bill savings can be achieved through the deployment of solar PV and battery

solutions. However there is still little data on how these systems best integrate with hybrid heating systems and no evidence on best approaches with compact hybrids.

There is no data on the potential of this technology mix, which may form the template for large scale upgrading of the current gas boiler stock in social housing, delivering benefits across different consumer groups and the safeguards required to protect vulnerable customers from exclusion or poor outcomes. The project will provide valuable learning to support future networks engagements with vulnerable consumers through the decarbonisation journey.

This project will gather in-home performance data and demonstrate aggregated dDSR simulations. This will enable both UK Power Networks and SGN to update their modelling approach based on the actual performance of the units from the field trial. It is our expectation that data from this project will have a significant impact on the sensitivities used in future energy system modelling.

The outputs will inform social landlords on the consumer and commercial implications of such an approach to decarbonising their housing stock. This will further our understanding of the role of hybridisation and behind the meter asset integration in achieving a cost-effective transition to Net Zero carbon emissions for consumers, installers, energy networks and the wider economy.

## Scale of Project

The scale of the project is to install compact unit hybrid heating systems, solar PV and battery storage in up to 25 homes. This will enable the project to gather real life data combined with aggregated dDSR simulations. It will also provide a greater understanding on the scalability of such a solution for social housing and provide insights into the additional support that may be required for vulnerable customers.

If the project were of a smaller scale then there would be less potential for key learnings including the suitability for such a solution to be widely used by other social housing providers across Great Britain.

## Technology Readiness at Start

TRL5 Pilot Scale

## Technology Readiness at End

TRL7 Inactive Commissioning

## Geographical Area

Trial homes will be located in both UK Power Networks' and SGN's licence areas.

## Revenue Allowed for the RIIO Settlement

No funding was provided within the current RIIO settlement.

## Indicative Total NIA Project Expenditure

UK Power Networks' NIA expenditure: £337,607.78 SGN's NIA expenditure: £297,319.05 Total licensee expenditure: £634,926.83

## 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:

The project will facilitate the energy system transition by demonstrating:

- a hybrid heating system with smart controls software in social housing.
- the optimised control of electricity generation and storage assets and multi-vector heating assets.
- the ability to install and operate such systems in dense social housing.
- the ability for such systems to provide flexibility services to network operators without any deterioration in consumer outcomes.
- the ability for such systems to generate value from other flexibility markets to enhance the consumer proposition.

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

The project will outline the possible customer journey required through development and execution of a site selection process template specific to the social housing context; and development and execution of a participant recruitment and engagement plan, tailored to the needs of tenants in the social housing environment, with the intention to develop a best practice template that can be shared across with local authorities or social housing associations across the UK.

Vulnerable consumers will benefit from increased awareness and education regarding new available low carbon technologies, their benefits and impact to customers. Furthermore, vulnerable customers will benefit from the installation and maintenance of these low carbon technologies in their homes as part of the trials of the project and will also have the potential to realise energy bill savings, carbon reductions (reducing the usage of gas boiler) and comfort benefits.

### 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 come from the potentially deferred reinforcement costs. We anticipate that the savings in RIIO-ED2 are £926.92k across the UK Power Networks licence areas.

#### Please provide a calculation of the expected benefits the Solution

- ◦ Base cost for ED2 (k£): 88,565.23
- ◦ Method cost for ED2 (k£): 87,638.30
- ◦ NPV Benefit for ED2 (k£): 926.92

There are also wider social benefits in the form of:

- Financial saving low carbon technologies;
- Reduction in CO2 emissions;
- Supporting those at risk of fuel poverty or those already in fuel poverty; and
- Improved quality of life/health from reduced impact on cold weather for vulnerable customers.

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

This solution would be scalable for all on-gas social housing in Great Britain provided the homes are suitable from an installation point of view. It ensures inclusion of those at risk of being left behind and being unable to access/benefit from the proposed project solution and Net Zero transition. Although the solution is focussing on social housing, the solution can be also be scaled to all on-gas connected homes of similar archetype.

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

Costs of rollout per household will be determined as part of the 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

The project will gather in-home performance data and demonstrate aggregated dDSR. This will inform our whole system modelling and future forecasting from a network demand perspective. An understanding on the flexible nature of hybrid heating systems will help networks overcome the operability challenges faced due to the uncertain nature of Net Zero transition and support deferral of network reinforcement.

### 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.**

A check has been completed and although heating, PV and battery storage projects exist no similar projects addressing decarbonising social housing were identified on the smarter networks portal. All networks were informed of the project and no issues of duplication were raised.

The HyCompact project uses the same compact hybrid heating system as the one proposed for this project and hence learnings from HyCompact will be used to support the project.

## **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**

A method to decarbonise urban social housing at scale is yet to be developed. The project aims to demonstrate a template to achieve this while protecting vulnerable customers and unlocking commercial value to these customers.

This heating system is relatively new to the market with limited deployment in the HyCompact project. This project will trial these units in social housing building archetypes coupled with additional low carbon technologies (LCTs) and supported by a smart market mechanism.

### **Relevant Foreground IPR**

The data created, outputs and deliverables produced as part of the project will conform to the default treatment of IPR.

### **Data Access Details**

For all data access requests, please view the full Innovation Data Sharing Policy available on UK Power Networks' website here:

<https://innovation.ukpowernetworks.co.uk/wp-content/uploads/2019/11/UKPN-Innovation-Data-Sharing-Policy-7-Nov-19.pdf>

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

This project involves the deployment and trial of LCTs within customers' homes which is an activity not completed as part of both electricity or gas network's business as usual activities.

### **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**

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.

Without the aid of increased understanding of the commercial model associated with the deployment of LCTs in social housing, the commercial risk for social housing would be borne by them without support and therefore NIA funding is required.

In addition, by using NIA funding, project partners will share all findings, thus enabling wider decarbonisation across the whole of the UK and not just the project partners' networks. Through collaboration between electricity and gas networks, the project seeks to deliver societal benefit.

### **This project has been approved by a senior member of staff**

Yes