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NIA Project Registration and PEA Document

Date of Submission

Nov 2019

Project Reference Number

NIA_SGN0152

Project Registration

Project Title

Peak Power Forecast

Project Reference Number

NIA_SGN0152

Project Licensee(s)

SGN

Project Start

November 2019

Project Duration

0 years and 4 months

Nominated Project Contact(s)

Colin Thomson, Energy Futures Manager

Project Budget

£28,324.00

Summary

This essential research into the potential scale and impact of embedded electricity generation likely to be connected to SGN's network. The innovation is using electricity capacity market analysis methods to determine the likely scale of peaking plant in our footprint. This will be based on a review of the capacity market behaviour, analysis of the attractiveness of investment in the different technologies regionally with consideration of the shortfall in energy capacity identified in the FES scenarios. Novel techniques proposed potentially provide an innovative method for demand forecasting are not certain of success but will likely inform our proposed uncertainty mechanism in GD2.

Nominated Contact Email Address(es)

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Problem Being Solved

The UK recognises the challenge of climate change and has resolved, by 2050, to reduce carbon emissions by 80% of their level in 1990. Work is being carried out across all the Gas Distribution Networks (GDN) focusing on decarbonisation of the network. As part of this, GDN's need to establish the potential changes that low carbon solutions may have on gas demand.

The capacity mix is in a state of transition towards increased electricity connections to intermittent generation, which is creating new opportunities for flexible technologies. Capacity margins are tightening as large generation closes to meet emission limits. Downstream renewable technologies will make up a greater share of annual generation. Aging thermal generation and increased penetration of intermittent renewables will necessitate increased balancing actions being taken by system operators to ensure reliable electricity supply. However, decarbonising energy using only electricity has key challenges:

1. The peak generation required for heat is much higher than current power network capacity. Reliability and security of supply is also arguably more critical in heat delivery and satisfying demand in a reliable level could create huge redundancy in generation and lots of "lost" energy.
2. The ramp up in energy requirements of >10x multiplier between 5-7am would be much more difficult to manage on the electricity network and would mean much more storage would be required. Batteries are unlikely to be able to scale up for the requirements and are far more expensive than gas.

3. Transport, i.e. battery electric vehicles (BEV) is exacerbating the problem and BEV usage patterns are not yet clear given the early stage of market development.

4. There are parts of energy demand that may be difficult to convert to electricity. Industry, for example, is very difficult to decarbonise due to the high instantaneous demand requirements.

To prepare for the potential increase in electricity demand and therefore, gas demand, we need to establish the future impact that additional peaking plant connections required will have on the gas network.

Additional electricity generation capacity and reinforcements to the electricity networks are needed to meet the large diurnal and seasonal swings in heat demand, which are currently served by natural gas. With increased peak power, we need to forecast the impact on the capacity market, new network connections required to support peaking plants and the impact more peak power will have on gas demand.

Method(s)

This project aims to carry out essential research and development into how much peak power capacity is forecast to be deployed from SGN's gas network in the short, medium and longer term. The analysis will provide a forecast up until the end of price control RIIO-GD2 (2021-2026).

Scope

This project will perform a series of assessments to establish the forecasts of the capacity of small gas engines for peak power in the short, medium and long term, with a focus to the end of the RIIO-GD2 period.

- An analysis of future developments of peaking plants
 - An assessment of capacity shortfall in National Grid's Future Energy Scenarios and the impact of the capacity market suspension in this gap by.
 - An assessment of the regional development of gas peaker capacity.
 - An assessment of constraints and barriers in each region, such as the ability to receive an economically attractive electricity connection offer. This will be based on publicly available information, such as DNO heat maps.
- An assessment of the potential impact of regulatory change, such as reform to Transmission Network Use of system (TNUoS) and Distribution Use of System (DUoS) charges via Ofgem's Targeted Charging Review and Electricity Network Access project.

Objective(s)

The specific objectives for this project are to:

- Establish the requirement of new flexible capacity
 - Establish the future of the Capacity Market and the impact on GDN's
 - Establish the changes to capacity that would be required to accommodate any current gas demand shortfall
 - Establish the regional development of gas capacity and future considerations, such as connection charges the estimated number of peaking power in SGN's footprint.
- This critical research and development project into peak power forecasting is a requirement as part of the pathway to decarbonisation and the outcomes and outputs from the project will be support the GD2 business case submission. The reporting will provide key information into the future analysis of capacity of peaking plants, the impact this will have on demand and the GB capacity market and an analysis of regional development of gas capacity. The actions required to accommodate changes in demand for electricity generation can then be established.

Consumer Vulnerability Impact Assessment (RIIO-2 Projects Only)

n/a

Success Criteria

The success criteria for the project is as follows:

- Delivery of research report with key capacity results established
 - Delivery of research report assessing the implications for electricity generation if gas demand shortfall is not met
- Delivery of research report on the uptake and drivers of gas engine capacity at a regional, GDN, level, describing the relative attractiveness of regions and potential ranges for gas engine uptake in SGN's footprint

Project Partners and External Funding

Potential for New Learning

This project is expected to provide all network licensees with an understanding of the future impact that peak power will have on the gas network. With increased peak power, networks need to forecast the impact on the capacity market, new network connections required to support peaking plants and the impact more peak power will have on gas demand.

Scale of Project

At this stage of the project, the work completed will be a desktop exercise.

Technology Readiness at Start

TRL2 Invention and Research

Technology Readiness at End

TRL3 Proof of Concept

Geographical Area

This project will be a desktop study undertaken by Baringa at their premises.

Revenue Allowed for the RIIO Settlement

This project is a low TRL, therefore it is not possible to provide a detailed finance analysis. The overall project has been broken down into two work phases. This project seeks to evidence the requirements for this research, development and demonstration to be built into RIIO-GD2.

Indicative Total NIA Project Expenditure

The total project expenditure will be £28,324

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)

This is a research study, therefore currently financial benefits to customers cannot be estimated.

Please provide a calculation of the expected benefits the Solution

N/A

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

N/A

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

There are no costs associated with sharing the conclusion and recommendations of this study with the other Network Licensees. The very early technology readiness level means that it is not possible to estimate the costs of deployment at this stage.

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

All Network Licensees will be able to use the learning from this project as the outputs will be presented in a clearly defined report that will be available on the Smarter Networks portal.

This will then potentially provide Network Licensees further understanding of the future impact that peak power will have on the gas network. With increased peak power, networks need to forecast the impact on the capacity market, new network connections required to support peaking plants and the impact more peak power will have on gas demand.

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 will address the challenges outlined under theme 1, Future of gas. Currently the network provides storage capacity to respond to large daily and seasonal swings in demand. As the economy decarbonises, we must ensure homes and businesses are served by network and can support other energy sources. Gas networks underpin decarbonisation of the whole energy system, including electricity. By forecasting peak power connections, GDN's can plan for major changes in demand.

- Has the Potential to Develop Learning That Can be Applied by all Relevant Network Licensees

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 review of all other Network Licensees Innovation Funding Incentive (IFI) Annual Reports and NIA projects has been performed and no similar projects have been identified. A similar review of current academic literature and journals has also been performed to avoid any potential overlap with the current project.

SGN have also engaged with the project supplier and informed them that they must not work on another NIA project on the same topic with any other Network Licensees. The supplier has provided clarity that no unnecessary duplication of this project is currently being undertaken across GB.

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

To prepare for the potential increase in electricity demand and therefore, gas demand, we need to establish the future impact that additional peaking plant connections will have on the gas network. Additional electricity generation capacity and reinforcements to the electricity networks are needed to meet the large diurnal and seasonal swings in heat demand, which are currently served by natural gas. With increased peak power, we need to forecast the impact on the capacity market, new network connections required to support peaking plants and the impact more peak power will have on gas demand. The innovation is using electricity capacity market analysis methods to determine the likely scale of peaking plant in our footprint. This will be based on a review of the capacity market behaviour, analysis of the attractiveness of investment in the different technologies regionally with consideration of the shortfall in energy capacity identified in the Future Energy scenarios. Novel techniques proposed potentially provide an innovative method for demand forecasting are not certain of success but will likely inform our proposed uncertainty mechanism in GD2.

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

This research goes beyond SGN business as usual activities and will enable preparation for future changes to the network. The results may have an impact on future challenges to business as usual activities, however currently this work will not affect gas distribution procedures.

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 is required out with SGN business as usual activities, and therefore SGN does not currently have the budget required to support it. Without this research, there is the risk that the network will not be prepared for future increases in gas demand, caused by the anticipated acceleration in electricity. With peaking power plants due to add unprecedented atypical loads to the gas network, it is important that relevant research is conducted in a timely manner to ensure appropriate asset investments can be made by SGN to guarantee security of supply for its customers in a safe and cost-effective manner.

This project has been approved by a senior member of staff

Yes