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

Jun 2018

Project Reference

NIA_WWU_047

Project Registration

Project Title

Gas demand forecasting – Phase 2

Project Reference

NIA_WWU_047

Project Licensee(s)

Wales & West Utilities

Project Start

June 2018

Project Duration

0 years and 5 months

Nominated Project Contact(s)

Wales & West Utilities – Bethan Winter Cadent – Lorna Millington NGN – Chris Hogg SGN – Alex Webb

Project Budget

£208,667.00

Summary

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Nominated Contact Email Address(es)

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Problem Being Solved

Scenarios being developed across the GB Energy Industry highlight significant uncertainty in the quantity and types of energy likely to be used in the future. A consistent message is that future gas customer usage patterns will be increasingly difficult to predict and will require the gas networks to provide more flexibility in response to more variable customer demands.Examples include:

- Increase use of Gas Power Stations responding to the intermittency of renewable generation such as solar and wind and / or sudden increased generation requirements to support the charging of electric vehicles
- New gas usage patterns in homes with hybrid heating systems which may be optimised to use air source heat pumps where renewable electricity is available, but which would revert to gas heating when green power is unavailable or cooler temperatures mean that air source heat pumps are less efficient
- Use of gas for vehicles, where there is currently very little good data on usage patterns and arrangements are under development
- Increased connections of combined heat and power units where customers are able to support the power networks through

engaging with electricity balancing products which incentivise customers to limit their use of power at peak times. We anticipate increased use of the gas network to power on-site generation in response

- Forecasting at a more local level as different areas / cities develop independent approaches to delivering lower carbon solutions

Legacy gas industry long term forecasting do not consider the variety of customer types we are now connecting to our networks. Demand variability was generally attributed to domestic loads with peaks at breakfast and tea-time. Industrial and power generation loads were assumed to have a more consistent profile, with less variability.

WWU has recently developed an in-house investment decision support tool that allows us to assess the impact of changing customer requirements on our network, when considering maximum load, minimum load and likely hourly profiles.

Minimum load is more important than it has been historically in order to help us understand how to manage green gas entry onto our network.

The model has been externally validated and is providing useful information. However, good input data on the long term volume and characteristics of different load types, which are required for the model have been difficult to obtain, especially at a local level.

Our proposal is to undertake a 3 stage project to review and improve our long term forecasting processes in a way that will support existing needs and provide data to support the use of our new investment model.

This PEA document is in relation to stage 2 which will be managed in this phase following the completion of the stage 1 gap analysis which was carried out by WWU under NIA funding. Stage 3 is shown below for a possible future follow on project.

Stage 1: Gap analysis. Understanding the importance of gaps (i.e. scale of impact on gas demand forecasts) and the effort required to address gaps (i.e. which gaps are short term vs long term priorities.

Following Stage 1, gaps were segmented into ‘research gaps’ and ‘technical gaps’. The gaps requiring further detailed research to address (‘research gaps’), that would likely have a high impact on gas demand, were presented to and discussed with the other GDNs. A number of these gaps have been prioritised for detailed research and analysis in stage 2. ‘Technical gaps’ (extensions to the functionality of existing models, new models to be created) will be considered in Stage 3.

Stage 2: Addressing the prioritised gaps from Stage 1. After the gap analysis, and prioritisation of gaps to focus on, detailed research will be carried out on each gap to fully understand the nature and impact of each gap on future gas demand. This will require building robust & credible forecasts (rather than using scenarios) for the uptake of different technologies (e.g. gas vehicles, EVs, industrial scale CHP, hybrid heat pumps, etc.). This will involve understanding the impact of policy developments, customer attitudes & technology developments. Stage 2 will also carry out research to understand the timing of demand / timing of the impact caused by these gaps, and it will also identify where on the gas network (localised vs across network; higher pressure vs lower pressure) the gaps will have an impact. This analysis will improve the quality of the assumptions and inputs going into gas demand modelling – supporting the development of better and more accurate long term forecasts for gas demand.

Stage 3: Reviewing and addressing technical gaps. Stage 2 will deliver much better quality inputs for existing models – enhancing gas demand forecasts. In stage 3, any technical gaps / improvements required (e.g. adding new functionality to models, or building new models) will be reviewed, prioritised and addressed.

Method(s)

Specific areas of demand / supply as documented below will be subject to further, more detailed analysis based on a wider range of sources and using input from a wider range of stakeholders / geographies through collaboration with other GDNs.

1. Consolidation of all domestic analysis to understand the combined effect of all potential residential measures / changes including electric heat pump (ASHP, GSHP), hybrid heat pumps, gas heat pumps, heat networks, energy efficiency deployment, new build housing / new connections

2. More detailed look at the location of deployment of different measures (i.e. where, geographically, on the network are things likely to happen & and what pressure levels will the impacts be seen)

3. More detailed look at electric and gas vehicles including, uptake rates, clustering and charging options (infrastructure, location, charging behaviours)

4. Analysing the combined effect of HPs and EVs (the electrification and gasification of heat and transport) focussing on the load profiles of both HPs and EVs, diversification of these load profiles, and consideration of the time of use tariffs / DSR / flexing the load profiles

5. Reviewing and challenging the relationship between annual gas demand and peak gas demand

6. Scenarios around the future generation mix and the electricity output by different fuel types

7. More detailed analysis on green gas injection

8. Assess potential Impacts of policy / incentive change, what happens if,….

9. Forecasting commercial / industrial separately, possible as part of gap 5 or between 1 and 2, consider growth strategy

Scope

• Location: All of UK can be considered, one of the outcomes of phase 1 was to consider whether sub-LDZ forecasting would provide additional value vs the additional effort / cost. This was shown to be a requirements for a subset of demand / supply types only.
• A range of new customer types / behaviours to be considered including, power generation, CHP, industrial Review of existing UK future of gas scenarios and storage solutions
• Assessment of existing, as well as new/alternative, WWU forecasting models
• Report on implications of findings, presentation and recommendation for future developments

Objective(s)

For each prioritised gap, Delta-ee proposes:

1. developing a detailed list of actions required to plug the gap

2. carrying out primary and secondary research to gather existing information around the key gaps

3. developing forecasts for the uptake of different technologies, considering residential, commercial and industrial sectors separately.

4. disaggregating / mapping forecasts at the national level to a more regional / local level – to help understand where on the gas network impacts are likely to be seen

5. reporting the data / results of the analysis in an easy to use format that can feed efficiently into existing models.

Consumer Vulnerability Impact Assessment (RIIO-2 Projects Only)

n/a

Success Criteria

Produce evidence based forecasts by load type that are required to feed use as inputs to the WWU Investment Model

Project Partners and External Funding

Phase 2 of this project is a collaborative project between WWU (lead), Cadent, NGN and SGN. The project is wholly funded by NIA.

Potential for New Learning

• Provide clear understanding of the materiality of customer behaviour changes on our network in order that we can focus forecasting development on those that are likely to be highest impact
• Develop a forecasting strategy and plan to deliver improvements to modelling capability and process

Scale of Project

This project is done at the relevant scale which is a desk top study.

Technology Readiness at Start

TRL3 Proof of Concept

Technology Readiness at End

TRL3 Proof of Concept

Geographical Area

The research could have an impact on all geographical areas of the network

Revenue Allowed for the RIIO Settlement

None

Indicative Total NIA Project Expenditure

The total Project cost is £208,667; with external costs: £156,500 and Internal costs: £52,167

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 research project will provide long term savings to GB customers by providing better long term planning decisions. Optimising capacity management and network design through use of improved forecasts has the potential to reduce the risk of unnecessary investment.

Please provide a calculation of the expected benefits the Solution

Research Project

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

Research Project

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

Research 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

n/a

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

☑ 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.

All Networks are aware of and are participating in a variety of research projects within the area of “Future Role Of Gas”. Various elements of these project may have overlapping research area, but with very different objectives for the research outputs.

The outcomes from Phase 1 have been shared with all GDNs and this phase is collaborative

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 innovative aspect of this project is that we are looking to forecast loads and behaviour by load type. This is unique as legacy forecasting has previously focussed on load size because loads tended to be either: Domestic – followed a domestic usage pattern with peaks at breakfast and tea-time OR Industrial / Power Gen – which were assumed to be process loads or base load generation and hence have a flatter usage pattern. Going forward we anticipate ‘smarter’ customer behaviour by switching between energy sources for e.g. hybrid heating and Demand Side Response and more dynamic user behaviour e.g.at a peaking power plant in response to the intermittency of renewable generation.

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

There is uncertainty about the long term volume and characteristics of different load type and how this will affect the mode, this uncertainty is a risk to the GDN's

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 detailed plan that will be produced as part of the project should ensure that the model is improved for future network investments, however we cannot be certain of this until the analysis has been completed, which is a risk to all networks.

This project has been approved by a senior member of staff

☑ Yes