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

Feb 2014

Project Reference Number

NIA_NGET0114

Project Registration

Project Title

Industrial and Commercial Gas & Electric Scenario Modeling

Project Reference Number

NIA_NGET0114

Project Licensee(s)

National Energy System Operator

Project Start

November 2013

Project Duration

1 year and 1 month

Nominated Project Contact(s)

Stephen Marland & Tony Nixon

Project Budget

£542,250.00

Summary

National Grid have made continuing use of econometric methods to develop scenarios that support asset investment and maintenance processes. Such techniques assume that recent historical relationships between energy and economic growth remain a sound basis for future demand scenario development. As the energy market becomes increasingly subject to Government intervention policy such methods are becoming less reliable.

National Grid now make use of “bottom up” modeling for the residential scenarios, matching consumer to energy trends. Developing similar models for the commercial and industrial sectors remains a challenge due to the highly complex and numerous sub-customer groups and limitations on public data available for scenario development. In addition, there is an increasing focus is being placed on the geographical breakdown of demand. This is driven by changing consumer behaviours and technology take up alongside the increased capacities of embedded generation causing a more varied picture of demand across the country.

Enhancing our modeling capabilities and our understanding of the antecedents and consequences of demand both at a GB level and on a geographical basis would help us make more informed decisions regarding network investment. The provision of a better split of demand will also help in our stakeholder engagement, particularly; with our interactions with other networks (TO, DNO, GDNs) that aim to compare demand projections.

Third Party Collaborators

Arup

Oxford Economics

Nominated Contact Email Address(es)

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Problem Being Solved

National Grid have made continuing use of econometric methods to develop scenarios that support asset investment and maintenance processes. Such techniques assume that recent historical relationships between energy and economic growth remain a sound basis for future demand scenario development. As the energy market becomes increasingly subject to Government intervention policy such methods are becoming less reliable.

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Method(s)

ARUP and Oxford Economics have been identified through the procurement event.

The proposal represents an innovative approach in combining the benefits of a robust macro-economic model to capture the future direction of demand from an economic perspective, with a bottom up technological model that captures the detailed potential of energy savings.

The top down “enhanced” approach enables the evaluation of the key components of energy demand including a comprehensive view of industry outputs, prices, exports, imports, investment, and supply chain linkages that influence market scale relative to global competitiveness. The top down is linked to the bottom up model to explain the changes in demand due to energy efficiency or technology adaptation. Furthermore the models will be developed to interrogate, and then build up an aggregate demand projection from multiple (up to 30) industrial and commercial sub-sectors dependant upon varying energy drivers.

The bottom up model will be supported with an up to date database of energy savings and technology measures enabling a review of demand changes from various policy developments or technology price / performance amendments. ARUP will make use of public data and leverage their own research in developing the models and databases. Furthermore ARUP will engage with industry experts through a series of workshops in order to augment the datasets for completeness. This engagement will include working with other internal and external projects to ensure compatibility (as appropriate) and prevent duplication.

A separate module will be developed to split the annual demand into daily and half hourly profiles for heat, power and gas demand by sector. The module is integrated with the bottom up technology model and separate demand side management modules to provide a within day view of demand. The modules will break demand down by region enabling a geographical view that is key for our stakeholder engagement and network investment.

The results of the project will be used to feed into other National Grid projects in order to define boundaries i.e. EDAM 2, and used in Future Energy Scenarios.

Scope

The project is intended to:

1. Provide a model to be used for **heat, gas** and **electric** demand scenario development inclusive of the **Commercial** and **Industrial** sectors for Great Britain to 2050.

Market Economic Dependencies

2. Highlight key sector growth / decline linkages and supply chain interdependencies i.e. a reduction in production at industry A leads to lower production demands upstream – multi sector reductions i.e. construction sector depends on.....

3. The level of exports and UK demands on UK production along with the key drivers that underpin production levels are to be identified by each sector i.e. population, fuel price, policy, competition etc. Key points for transition such as limits for demand elasticity i.e. the cost levels sufficient to displace production in favour of competition, age levels in demographics that influence public sector building use such as education, healthcare etc.

4. The model is to highlight constraints for relevant sectors – leasing arrangements, capital cost of plant in relocating out of the UK, indigenous product demand, transport costs etc.

5. Consider the existing assumptions and projections regarding energy efficiency rollout rates (Insulation), building refurbishment (replacement of building with new and associated building regulation impact), and examine how various levels of energy efficiency can impact on overall energy demand.

Policy Intervention

6. Review the implications of how existing Government policies could influence the demands i.e. Carbon Reduction Commitment, Renewable Heat Incentive, European Trading Scheme or any other relevant assumptions or sensitivities that should be considered.

Technology Transition

7. Map out a range of realistic heating, gas and electric demand solutions, in particular, referencing the types of appliances suitable for different building / industry types with the option to expand in the future – the model should retain alternative appliance options to replace current appliances and detail the impact on the energy demand i.e. switch to alternative fuels, reduction through improved efficiency etc.

8. Consideration to be given to the use of energy and viable options where appropriate i.e. high temperature or process consumption.

9. The model should provide on site demand offsetting measures such as embedded generation but will provide details of the assumed levels calculated and assumption levels. For example, provide options for PV, CHP or other micro/macro power generation, the number, capacity and fuel usage for energy provision. Where CHP is used a breakdown of the heat and power provision and utilisation.

The model should enable the identification of plausible demand side response levels at peak electricity demand for the sectors.

Objective(s)

The approach is designed to take the best available techniques for developing various scenarios, collating best available data and developing new information to account for various complex inter-related market trends (economy, technology, social drivers) to provide a depth of analysis that will significantly enhance demand scenarios for these sectors.

Consumer Vulnerability Impact Assessment (RIIO-2 Projects Only)

n/a

Success Criteria

Delivery of enhanced modeling capabilities. Similar models have been developed in house within National Grid and are proving highly beneficial for the residential sector.

This proposal aims to enhance the process accuracy and confidence in subsequent downstream processes that influence National Grid’s gas and power demand scenarios.

Project Partners and External Funding

ARUP and Oxford Economics

The suppliers are providing external funding of £242,250

Potential for New Learning

The project is driven to enhance internal market knowledge and improve the development of National Grid scenarios that underpin business investment decisions.

Under our existing obligations National Grid shares detailed gas demand scenario information with DNs through the Offtake

Arrangements Document procedures and TO data as part of Licence obligations.

This process improvement will benefit all networks through such process improvement and we aim to use the outputs as a major part of our annual stakeholder engagements (Future Energy Scenarios (FES), Ten Year Statements, Winter Outlook).

Outputs will be disseminated through Future Energy Scenarios.

Scale of Project

The project is primarily desktop model development with stakeholder workshops.

Technology Readiness at Start

TRL2 Invention and Research

Technology Readiness at End

TRL3 Proof of Concept

Geographical Area

The project primarily involves desk top modelling and will be carried out in locations in the UK including London, Oxford and Warwick.

Revenue Allowed for the RIIO Settlement

Zero.

Indicative Total NIA Project Expenditure

The total NIA Project Expenditure is £300,000

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 project is researched based and intended to improve the accuracy of processes required by both NGG and NGET that individually would prove difficult to quantify financially.

The project will enhance processes that feed into the following areas:

- Network Development Policy and Capital Delivery Policy for NGET – avoiding inefficient investment.
- Supports the establishment of a Gas Network Development Policy equivalent.
- Offtake Capacity Submissions and Exit Capacity regime for NGG and DNs – efficiently rationalizing capacity utilization by DNs and releasing capacity on the NTS.
- Enhances the capabilities that support EMR.
- Provides credible input into scenarios that facilitate a focal point for industrial and commercial stakeholders to engage with the energy debate
- Improving stakeholder engagement and enabling better comparison of demands between networks.

Please provide a calculation of the expected benefits the Solution

Not required for research project.

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

National Grid shares the outputs from its annual scenario process across all network Licences.

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

Embedded within existing Licence costs.

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 learning from the modeling will be employed in developing Future Energy Scenarios to be shared through National Grid's annual Future Energy Scenario's (annual conference, stakeholder engagement, web-page, publication). We envisage the outputs would enable us to make better investment decisions through improved demand analysis.

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.

As far as we are aware this specific level of analysis has not been developed as part of a scenario model for use by any other UK network.

The project aims to provide a view on the potential demand changes at a macros level to 2050 and will provide a context for networking projects including EDAM 2 that concentrates on the daily (within day) variations that could influence system operator processes. The Industrial model is designed to help define demands under a wider holistic energy scenario and the transitions from year to year given scenario assumptions and trends and aimed at enabling more accurate projections used in network demand statements.

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

n/a

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

n/a

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

n/a

This project has been approved by a senior member of staff

☑ Yes