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

Jul 2015

Project Reference Number

NIA_NPG_004

Project Registration

Project Title

Development of An Improved Distribution Load Estimates Methodology

Project Reference Number

NIA_NPG_004

Project Licensee(s)

Northern Powergrid

Project Start

April 2015

Project Duration

0 years and 8 months

Nominated Project Contact(s)

Alan Creighton (Alan.Creighton@Northernpowergrid.com)

Project Budget

£40,000.00

Summary

The scope of analysis may identify observed trends in the following, but not definitive, list of areas:

Trends influenced by internal factors:

- Consistent increase / decrease in demand
- Increased variation in the change of demand
- Flattening of demand profiles
- Increasing / reducing diversity
- Demand at satellite and source substations
- Increasing / reducing power factor
- Changes in seasonal demand variations
- Increasing influence of generation

Trends influenced by external factors:

- Demand and economic growth/downturn
- Demand and geographic location
- Demand and temperature or weather conditions
- Demand and geographic location
- Demand and customer type (domestic, industrial, commercial)

The nature of this research based study means that scope is likely to be altered, although probably in a relatively subtle manner, as the study proceeds. Any such changes will be agreed with the Northern Powergrid contact at the regular review & feedback meetings.

Nominated Contact Email Address(es)

yourpowergrid@northernpowergrid.com

Problem Being Solved

Annually the maximum half hourly demand is established for all EHV/HV and higher voltage substations to present a snapshot of the peak demand at that substation in the previous 12 months and provide a platform for estimating future network demands, identification of substations operating above, or forecast to operate above their nominated capacity and thus require reinforcement. This demand information is summarised in the Northern Powergrid Limited Distribution Load Estimates (DLEs).

The data collected in the DLEs effectively summarises, but also masks, many underlying uncertainties and because of these it is difficult to tease out the key underlying demand trends at individual and groups of substations. In practice the measured maximum demand at can vary materially year on year without there being any apparent underlying reason or identifiable and forecastable trend.

This means that it can be difficult to develop a load related investment plan which is robust and stable year on year. This can lead to inefficiencies which are potentially reflected in non-optimum investment plans which may increase costs un-necessarily. The uncertainties associated with network demand are expected to increase with the deployment of smart grids and the continuing influence of climate change, economic development and changing demographics.

The output of the project is development and delivery of a revised DLE methodology that materially increases the accuracy and robustness of the demand forecasts compared with the current Northern Powergrid Limited method. This will facilitate enhanced robustness of the associated investment planning decisions both internally and externally in the future.

Method(s)

The method proposed seeks to gain a deeper understanding of underlying historic demand trends of customers supplied by the Northern Powergrid distribution networks so that their future needs can be better understood and forecast.

This project, through level doctoral research, applies current and new computational / statistical analysis tools and techniques to the available demand data with a view to identifying the presence or otherwise of underlying trends within the data itself or linked to other parameters that are not evident from the current methodology. The specific details of the analyses to be undertaken are not defined at this stage in order to permit a high degree of flexibility for interpretation as is appropriate for research.

The majority of sensors proposed are already used by Northern Powergrid, the key area of development is the integration of all the sensors into one system, allowing the correlation between variables to be explored and trends in circuit breaker performance to be identified.

Scope

The scope of analysis may identify observed trends in the following, but not definitive, list of areas:

Trends influenced by internal factors:

- Consistent increase / decrease in demand
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The nature of this research based study means that scope is likely to be altered, although probably in a relatively subtle manner, as the study proceeds. Any such changes will be agreed with the Northern Powergrid contact at the regular review & feedback meetings.

Objective(s)

The key objective is to assess the feasibility of the development and delivery of a revised DLE methodology that materially increases the accuracy and robustness of the demand forecasts compared with the current Northern Powergrid and industry standard methodologies. This will facilitate enhanced robustness of investment planning decisions both internally and externally in the future.

Where this is feasible, to then deliver a fully documented new tool / model and process for forecasting demand which is materially more accurate / more robust to internal and external challenge than the present process.

Consumer Vulnerability Impact Assessment (RIIO-2 Projects Only)

n/a

Success Criteria

The project success criteria are defined as production and publication of the following:

- Review of the state of the art and analysis options
- Report describing the findings from the data analysis
- Improved algorithm identification and associated documentation
- Case study reports, methodology refinement report, sensitivity analysis report using the improved algorithm
- Evaluation and benchmarking report

Development of spreadsheet model(s) together with supporting documentation and user guidance which can be used to apply the algorithms.

Project Partners and External Funding

n/a

Potential for New Learning

n/a

Scale of Project

The project is relatively small data-focussed research project, conducted with a single university based postgraduate researcher plus institutional support.

Technology Readiness at Start

TRL3 Proof of Concept

Technology Readiness at End

TRL4 Bench Scale Research

Geographical Area

The project aims to study data gathered through the SCADA system and from other sources that represent the whole of the Northern Powergrid network. The nature of the project and study undertaken is not geographically specific.

Revenue Allowed for the RIIO Settlement

None

Indicative Total NIA Project Expenditure

The estimated value of the project is £133,000. Of this £93,000 has been spent before 1 April 2015, with the remaining £40,000

being spent as part of the NIA framework.

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 main deliverable is to develop a means of improving the robustness of the forecasting process which is otherwise likely to become more uncertain in the future due to the deployment of Low Carbon Technologies. The current NPG EHV reinforcement plan is on average across the ED1 period £10m per annum. If improved robustness of demand forecasting enables 10% of this work to be deferred by one year, the resultant saving would be in the region of £5,000 per annum. The emphasis of the work is on being able to make more robust, better focussed investment decisions rather than to provide cost reductions., although the improvement in the quality of decision making should improve our ability to keep costs down in future.

Please provide a calculation of the expected benefits the Solution

Research project N/A

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

The Method could be applied across all Network Licensees.

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

Implementation costs are potentially very low, with large scale investment to implement not required. In the event of a successful outcome it is estimated roll-out for the entire GB network could be achieved for less than £70k, the majority of which would be expenditure for knowledge sharing.

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 produce distribution load estimates in order to inform their investment planning and also to inform the Grid Code 'Week 24' data submission to National Grid. The load estimates produced by all DNOs are subject to the same uncertainties. The insight provided by this research could be potentially used by all licensed DNOs to improve the quality of their planning, optimising future network investment costs.

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 meets the identified requirement to reduce costs in general and of connections in particular.

☑ 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.

n/a

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

- [x] Yes