NIA Project Registration and PEA Document

Date of Submission

Feb 2014

Project Reference Number

NIA_NGET0139

Project Registration

Project Title

PV Monitoring: Phase 1

Project Reference Number

NIA_NGET0139

Project Licensee(s)

National Energy System Operator

Project Start

April 2014

Project Duration

0 years and 7 months

Nominated Project Contact(s)

Jack Barber

Project Budget

£80,091.00

Summary

The pilot will involve three sites. Each site will require a solar panel with metered kW output, a weather station to record solar radiation and communications to deliver data back to National Grid Wokingham. Two of the sites will be National Grid House and Deeside substation. These have been chosen to utilise existing infrastructure; this minimises setup costs but it also tests different potential starting scenarios. National Grid House currently has 165 kW of solar panels. Deeside Substation currently has a weather station.

Both will require only a partial set-up. The third site will be a second National Grid substation. This will have neither solar panels nor a weather station and will require a full setup. The table below summarises the infrastructure needed for each site under the pilot.

Where required, a solar panel of a nominal capacity of 1kW will be installed. Solar panels will be from a common manufacturer and installed by a standard domestic provider; this is to best represent domestic installations.

The other aspects of the project will be delivered using infrastructure developed for the Strategic Asset Management program (SAM). To deliver SAM, Asset Management has established a standard for weather stations; and has developed a remote data network linking National Grid sites (RAMM). These will be utilised for this project. Once collected, data will be transferred and stored in the Energy Forecasting System (EFS).

Third Party Collaborators

Imperial College London

IESCO

Problem Being Solved

The introduction of the Feed-in Tariff in April 2010 triggered a boom in solar photovoltaic (PV) generation. The total UK capacity has since grown to over 2,000 MW from 400,000 sites. Despite this, PV generation remains almost completely invisible to National Grid. All installations are connected to the distribution networks; even the largest sites are below the thresholds for requiring transmission system metering. As a result National Grid does not receive any metered data from PV sites. With no visibility of the generation output, National Grid is unable to develop forecasting models and therefore can not effectively account for PV in balancing the system.

Embedded PV generation suppresses electricity demand; this effect is highly volatile as the output depends on local levels of solar radiation. Daytime demands clearly show the effects of embedded solar generation. Demand forecast error has increased steadily over the last three years. Mean absolute forecast error at afternoon peak for before summer time 2013 was 422 MW, approximately 100 MW higher than the average pre-2012 level. This corresponds with an increase in installed solar capacity of approximately 1,500 MW. The increase in forecast error is not solely due to the increase in embedded solar generation, but it is likely to be a significant factor. A similar deterioration in performance has not been experienced for overnight demands. PV generation is a steadily growing problem for electricity demand forecasting. PV capacity is projected to reach 5,000 MW by 2020. Unless measures are made to understand and quantify solar generation output, forecast performance will deteriorate further.

Method(s)

Research & Development

By installing solar panels at three National Grid sites it will be possible to monitor and collate real-time output data. This will be linked to National Control at Wokingham. This project is the first step towards setting up a GB wide PV monitoring network using National Grid sites. Over time the network will provide the metered data necessary to effectively manage PV on the transmission system. It will provide the essential metered generation and weather data with which to develop forecast models. These will be used to forecast the national PV generation; feeding into the National Demand forecast. The live data feed will also enable us to calculate a simulated National solar generation output to display in the control room. The three pilot sites will prove the methodology for a wide scale roll-out.

Scope

The pilot will involve three sites. Each site will require a solar panel with metered kW output, a weather station to record solar radiation and communications to deliver data back to National Grid Wokingham. Two of the sites will be National Grid House and Deeside substation. These have been chosen to utilise existing infrastructure; this minimises setup costs but it also tests different potential starting scenarios. National Grid House currently has 165 kW of solar panels. Deeside Substation currently has a weather station. Both will require only a partial set-up. The third site will be a second National Grid substation. This will have neither solar panels nor a weather station and will require a full setup. The table below summarises the infrastructure needed for each site under the pilot.

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Objective(s)

The objectives for the project are to increase the visibility of effect of embedded solar generation on the GB network on demand forecasting, and reduce thereby reduce the level of reserve required to secure the balance of the system.

Consumer Vulnerability Impact Assessment (RIIO-2 Projects Only)

n/a

Success Criteria

The project will be deemed a success based on the following criteria:

- set up three pilot sites for PV monitoring

- establish reliable real-time data feed between each site and Wokingham National Control
- understand the challenges and costs of solar panel installation; weather station installation; communications involved in the set-up of the project
- establish the feasibility of this approach to collate and monitor metered generation and weather data necessary to develop forecast models and estimate solar generation
- if proven viable,the development of a methodology for wider scale roll-out .

Project Partners and External Funding

n/a

Potential for New Learning

Very little research has been carried out to determine how PVs impacts on the UK's power networks. This project will form the basis with which to establish a larger scale PV monitoring network. This is needed in order to build up an understanding of how PV behaves in the UK; such that it can be appropriately accounted for in demand forecasting.

The PV monitoring network will provide information regarding the range of solar panels types on the market, their effect on demand at a regional level and to use the PV monitoring data to construct the models needed to estimate real time GB solar output.

Scale of Project

The scale of the project will involve initial installation of solar panel and communication infrastructure at the selected sites before desk-top analysis can begin.

Technology Readiness at Start

TRL4 Bench Scale Research

Technology Readiness at End

TRL7 Inactive Commissioning

Geographical Area

The project will be based at three National Grid sites; National Grid House in Warwick, Deeside Substation in Wales and a third as yet undetermined substation. The information from the sites will be collated and monitored at National Control, Wokingham, Berkshire.

Revenue Allowed for the RIIO Settlement

None

Indicative Total NIA Project Expenditure

The total NIA project expenditure will be £80,091.

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 project is expected to reduce demand forecast error that results from embedded solar generation. This will reduce system balancing costs.

Currently the issue causes an increase in demand forecast error estimated at 100 MW for a typical summer day. This equates to approximately 200,000 MWh of energy error over a year. Assuming an energy price of £50 per MWh, the annual cost of the issue is £10 million. This cost will increase with rising solar generation capacity. On the basis that this methodology is rolled out across GB and results in a 10% reduction in related forecast error, this would lead to a £1 million reduction in annual balancing costs.

Please provide a calculation of the expected benefits the Solution

Base Cost - £10 million (annual cost)

Method Cost - £580,100 (£80,100 project/£500,000 implementation)

Difference - £9.42 million

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

If successful this method could be replicated across all parts of the GB electricity network.

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

Using this methodology, roll out to 25 sites across GB to provide a representative view of embedded solar PV across the country would cost in the order of £500,000.

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

Development in this area will improve National Demand forecast performance. This is publically available and published on the BM Reports website. PV forecasting could also be useful to DNO's in understanding impacts from increasing PV uptake in their networks.

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.

No other similar projects are currently being carried out.

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