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

Dec 2018

Project Reference Number

NIA_NGSO0021

Project Registration

Project Title

Development of GB electric vehicle charging profiles

Project Reference Number

NIA_NGSO0021

Project Licensee(s)

National Energy System Operator

Project Start

December 2018

Project Duration

0 years and 7 months

Nominated Project Contact(s)

Dave Wagstaff

Project Budget

£60,000.00

Summary

There is currently limited public availability of annual Electric Vehicle (EV) charging profiles in Great Britain that are based on actual charger use. This means that currently available charging profiles do not adequately represent EV charging behavior within Great Britain (GB). This project will look to improve demand forecasting for electric vehicles by developing a series of hourly annual profiles

Third Party Collaborators

Environmental Resources Management (ERM)

PodPoint

Charge Master

Nominated Contact Email Address(es)

box.so.innovation@nationalgrid.com

Problem Being Solved

There is currently limited public availability of annual Electric Vehicle (EV) charging profiles in Great Britain that are based on actual charger use. This means that currently available charging profiles do not adequately represent EV charging behavior within Great Britain (GB) and therefore are not suitable for inclusion within the Future Energy Scenarios (FES).

The National Grid System Operator produces new Future Energy Scenarios each year to identify a range of credible scenarios for the next 30 years and beyond. These scenarios consider how much energy we might need as consumers and where it could come from. The FES look at what such changes might mean for the GB energy system.

Method(s)

This project will look to improve demand forecasting for electric vehicles by developing a series of hourly annual profiles reflecting:

- un-incentivised current electric vehicle charging behaviour
- without large proportions of “smart-charging” (i.e. a baseline)
- without the effects of project specific goals potentially skewing the results
- without observer (Hawthorne) effects potentially distorting the results
- across different charger sizes (kW)
- across different location types in GB
- covering each of the 8,760 hours in a year

These profiles will be created from historic charging data from the charger network providers identifying the current pattern of usage by charger type and location type.

Scope

The project proposes to request charging data from charge point operators. The project will process the charging data and create hourly profiles covering one full year for:

- a single GB charging profile (regardless of charger size, location type); and
- a limited number of other chargers varying by location type and charger size.

The format of these profiles would show the:

- deviation away from the annual average for the charger size and location type for each hour within the year (8.760 periods); and
- percentage utilisation rate by hour for each charger size and location type.

This will provide a fuller profile for the demand from chargers across GB and allow this demand to be compared between different geographical regions and charger sizes.

Objective(s)

The objectives for this projects are as follows:

- Contact charge point operators regarding data availability and willingness to supply data with the project
- Collect anonymised charging activity from charge point operators covering a minimum of one full calendar year (same period from each of the networks i.e. 2017-2018)

    1. start and end date and time of each charging instance
    2. kWh supplied in each charging instance
    3. identifying charger size (kW)
    4. identifying location type (residential, destination, road-size etc.)
    5. Identifying post code district (i.e. first part of the post code e.g. CV34)

- Analysis of the individual charging data including:

    1. cleaning of the data sets provided
    2. erroneous data types, formatting, errors, misalignments etc.
    3. analysis of the charging data to produce a 8760 hour profile of the charging instances data split by:

 hour bar within the year (8760 hours)
 charge type (kW)
 charger location (Residential, road-side, destination etc.)
 proportion of annual charging that occurs at that hour bar (%)
 deviation away from the annual average energy (multiplication factor from average).
 addition split of the above by postcode district (i.e. first part of the post code) if possible.

Consumer Vulnerability Impact Assessment (RIIO-2 Projects Only)

n/a

Success Criteria

Although electric vehicle charging currently exists, it is little understood at a whole system level for Great Britain. This project will be a

success if it can close the understanding gap with regards to current electric vehicle charging patterns.

Project Partners and External Funding

Element Energy will be undertaking the analysis of the data and constructing the profiles.

This project is supported by the Office for Low Emission Vehicles (OLEV), Department for Transport (DfT) and Transport Scotland.

There is no external funding for this project.

Potential for New Learning

National Grid System Operator will use the electric vehicle demand profiles produced by this project to improve the accuracy of demand forecasting as part of its Future Energy Scenarios (FES) analysis work. These in turn will be used in the investment cases for network operators and examined via the Network Options Assessment (NOA) process.

National Grid System Operator will also aim to use the electric vehicle demand profiles as part of the forecasting of demand for the Electricity National Control Centre to improve understanding of the impact of electric vehicles.

Scale of Project

The project will predominantly involve desk-based research including data analysis activities.

Technology Readiness at Start

TRL3 Proof of Concept

Technology Readiness at End

TRL4 Bench Scale Research

Geographical Area

This project will focus on the entirety of the GB system as covered by the National Grid System Operator.

Revenue Allowed for the RIIO Settlement

None.

Indicative Total NIA Project Expenditure

NIA: £60,000

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)

This project is early stage research. Understanding consumer electric vehicle charging behaviour better could open a wider range of options for network development and commercial arrangements that could ultimately save GB consumers money.

Ofgem noted in its State of the market report 2017 that "It is highly uncertain what impact electric vehicles will have on overall and peak demand in the future,"; this project seeks to reduce this uncertainty of the impact on peak demand from electric vehicles by producing a baseline profile.

Please provide a calculation of the expected benefits the Solution

Not applicable as this is a Research project.

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

The results obtained in this project could be applied across the GB network at no additional cost

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

The Future Energy Scenarios are intended to identify a range of credible scenarios across gas and electricity on a GB-wide basis. In order to support planning of the GB electricity transmission system, FES splits the GB-level data down into regional data sets using best available data. These data sets are published in November of each year as part of the Electricity Ten Year Statement (ETYS).

The ETYS forms part of the annual electricity transmission planning cycle, and shows the likely future transmission requirements of bulk power transfer capability of the National Electricity Transmission System (NETS).

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 outcomes and learnings from this innovation project will be disseminated through the National Grid SO Innovation website, the ENA smarter networks portal, the annual Low Carbon Network Innovation (LCNI) conference.

It is expected that the outcomes from the analysis carried out in this innovation project will give GB network licensees new insights in understanding electric vehicle charging behavior.

The benefits achieved from the project learnings will be shared with the industry in the form of the Future Energy Scenarios (FES) 2019 publication. http://fes.nationalgrid.com/

Or, please describe what specific challenge identified in the Network Licensee's innovation strategy that is being addressed by the project (RIIO-1 only)

In early 2018 National Grid published the first ever System Operator Innovation Strategy, which lists 16 strategic priorities. This project addresses the following:

- Developing DSOs & whole system operability
- Improving short-term forecasting
- Optimising constraint management
- Understanding long-term behavioral change

☑ 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 record of any innovation project utilising historical data of charging covering all of GB to create annual hourly demand profiles for difference size chargers and charger locations has been identified.

Projects have been done on specific aspects of EV charging in isolation; mostly based around modifying the EV charging profile in response to network constraints, market incentives or the impact of EV charging on DNO networks.

In each of the projects, consumers were aware of and actively participated with the projects, potentially causing an observer (Hawthorne) effect.

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

Although electric vehicle charging analysis currently exists, it is little understood at a whole system level for Great Britain. Projects have been done on specific aspects of EV charging in isolation; mostly based around modifying the EV charging profile in response to network constraints, market incentives or the impact of EV charging on DNO networks. This project is different in that it will focus on the entirety of the GB system as covered by the National Grid System Operator.

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

Building hourly annual profiles based on EV charging data at a whole system level has never been tried before. National Grid currently does not have the technical specialty to carry out relevant analysis.

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

NIA funding is the chosen funding route for this innovation project for the following reasons: 1. It will facilitate collaboration with the chosen innovation partner to access their specialist skills and expertise in a cost-effective and timely manner, given the key challenges which this project is aiming to address. 2. It will allow the SO to easily disseminate the key learnings from the project to the energy sector and GB network licensees. The insights from this project are expected to benefit the SO and the energy sector in better understanding the characteristics and impact of electric vehicle charging data in enhancing demand forecast and network operability assessments. This will benefit the distribution network operators (DNOs), charge providers, suppliers etc.

This project has been approved by a senior member of staff

☑ Yes