Date of Submission

Feb 2019

NIA Project Registration and PEA Document

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.

Project Registration

Project Title

Reflect Uncertainties around E-Vehicle Charging to Optimize Network Forecasting

Project Reference

ENWL 022

Project Licensee(s)

Electricity North West Limited

Project Start Date

March 2019

Project Duration

2 years and 0 months

Nominated Project Contact(s)

Innovation Team

Project Budget

£192,500.00

Nominated Contact Email Address(es)

InnovationTeam@enwl.co.uk

Problem(s)

The forecasting of electric vehicle (EV) charging requires a better understanding not only on the future volumes of private and commercial EVs, but also on the location and capacity of the charging adopted. Although planned developments to electrify bus fleets and taxis provide some certainty to distribution network planners on where ultra fast chargers (i.e. >20kW up to 450kW) could be connected in the future, it is still uncertain when EVs will charge, where other ultra fast chargers will appear and how much of the EV charging will take place via slow and fast charging.

Understanding and modelling these uncertainties at a regional level (e.g. traffic flows affecting en route charging, home and depot parking space availabilities) is critical for Electricity North West, as these uncertainties need to be framed and reflected in the forecasting scenarios that are used for the strategic planning of the network.

Method(s)

A three-stage approach is proposed to produce prototype tools and associated methodologies that can be used by Electricity North West and other DNOs to reflect EV charging uncertainties in demand forecasts. The three stages can be summarized as follows:

Stage 1: Detailed scoping of requirements, plus identification of potential methods to incorporate probabilistic or other types of assessment within the business as usual scenarios;

Stage 2: Methodology development, including ability to use EV charging profiles produced from trials and analyses carried out by projects such as the NIA funded 'Recharge the Future' (UKPN) and the 'CarConnect' (WPD). Production of full prototype for the Grid and Primary network of Electricity North West (i.e. all GSPs, BSPs and primary substations);

Stage 3: Specifications for final tools for the Grid and Primary network, recommendations for future updates using additional data inputs (e.g. monitoring data for EV charging, development plans etc).

Scope

The Reflect project will improve the electricity demand forecasting for EV charging by reflecting the regional uncertainties around slow (<20 kW) and ultra fast (up to 450kW) charging in the forecasting scenarios and consequential cost and risk assessments. The project aims to use EV charging profiles produced from trials and analysis carried out by projects such as the Recharge the Future and the CarConnect projects will enhance the scenario-based forecasting methodology to include probabilistic assessments. The developed methodologies will allow Cost Benefit Analysis (CBA) tools such as the Real-Options CBA (ROCBA) tool to reflect the uncertainties around slow and ultra fast EV charging in risk and cost assessments.

Objectives(s)

The Reflect project will develop the forecasting methodologies to model the uncertainties around slow EV charging from the LV networks (e.g. home and destination charging) versus ultra fast parking (e.g. at service stations).

This project supports the following primary objectives:

· develop methodologies and tools that consider regional characteristics to frame uncertainties around slow and ultra fast charging;
· introduce the use of probabilistic assessments within the scenario-based forecasting approaches followed by DNOs;
· consideration of traffic flow data in modeling;
· interoperability with EV charging profiles produced by analyses and trials from other UK and European projects (e.g. UKPN's Recharge the Future and WPD's CarConnect projects).

Success Criteria

The process will be successful if:
· it delivers partial prototypes of load estimates that consider both slow and ultra fast EV charging;
· it improves the currently followed scenario-based forecasting approach by considering via probabilities the likely effects of ultra fast charging of EVs on future demand uptakes; and,
it provides specifications on how the uncertainties modelling in the developed methodology can be used to enhance CBA processes.

Technology Readiness Level at Start

TRL 2

Technology Readiness Level at Completion

TRL 6

Project Partners and External Funding

There are no project partners or external funding, but other DNOs will be invited to review elements of the developing methodology

Potential for New Learning

There is potential for new learning in the following areas:
· better assessment of the contribution of EV charging to available network capacity during peak demand and minimum loading;
· enhancement of existing scenario-based forecasting methodologies (e.g. the one developed by ATLAS NIA project: www.enwl.co.uk/ATLAS) with probabilistic assessments to improve the modeling of uncertainties;
· provide a framework for DNOs to understand how regional characteristics (e.g. traffic flows, access of domestic customers to off street parking etc) can affect their demand forecasts and associated load related reinforcements; and,
understanding weakness of currently developed and used scenarios to properly frame future uncertainties from EV charging in overall electricity demand uptakes.

Scale of Project

The methodology, new input sources and tool specifications will be developed for the whole Electricity North West area, covering all Grid Supply Points, Bulk Supply Points and primary substations.

Geographical Area

The whole of Electricity North West's distribution services area (see above 'scale of project').

Revenue Allowed for in the RIIO Settlement

None

Indicative Total NIA Project Expenditure

£175,000

Project Eligibility Assessment

Specific Requirements 1

1a. A 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 the GB the Network Licensee must justify repeating it as part of a Project) equipment (including control and communications systems and software)	
A specific novel arrangement or application of existing licensee equipment (including control and/or communications systems and/or software)	X
A specific novel operational practice directly related to the operation of the Network Licensee's System	

A specific novel commercial arrangement	

Specific Requirements 2

2a. Has the Potential to Develop Learning That Can be Applied by all Relevant Network Licensees

Please explain how the learning that will be generated could be used by relevant Network Licenses.

The project will deliver the methodology, prototypes and specifications for an enduring business solution to reflect uncertainties around EV charging on forecasting scenarios and network planning. This will be tailored to Electricity North West systems and data, but available to all DNOs as all DNOs face the same challenges and may wish to use the project outputs for their own purposes.

Please describe what specific challenge identified in the Network Licensee's innovation strategy that is being addressed by the Project.

Electricity North West published its updated innovation strategy in September 2018 This Project addresses aspects of the challenges described in the Changing Energy Usage' section.

2b. Is the default IPR position being applied?

Yes	X

2c. Has the Potential to Deliver Net Financial Benefits to Customers?

Yes	X

Please provide an estimate of the saving if the Problem is solved.

This project is about developing the approach to deliver loading information which is currently absent, without excessive cost to the DNO, in order to enable well-justified and efficient load-related expenditure in future. That is the Problem being solved.

The Project is not specifically about saving money, as due to changes in the outlook for load growth, such as the speed of progress with electrification of transport sector, the justified expenditure may be higher or lower than the business plan submission. However by providing credible loading information, it enables efficient decisions on many tens of millions of pounds of investment, as described in the next section.

Please provide a calculation of the expected financial benefits of a Development or Demonstration Project (not required for Research Projects). (Base Cost - Method Cost, Against Agreed Baseline).

The scale of reinforcement expenditure for Electricity North West over 8 years in the RIIO-ED1 well justified business plan is around £100m. The outputs of this project will provide the evidence to ensure an efficient spend during RIIO-ED2 and beyond, where the electrification of transport is a critical component of the electricity demand growth.

Please provide an estimate of how replicable the Method is across GB in terms of the number of sites, the sort of site the method could be applied to, or the percentage of the Network Licensees system where it could be rolled-out.

The demand forecasting methods that are expected to be developed within this project would be applicable to the strategic network planning in every GB DNO. Nonetheless, they may be more or less applicable depending on data availability (i.e. network data, time-series monitored demand data, traffic flow data).

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

As outlined above, this would depend on the DNO's existing data and systems, but a budget estimate of £100-175k per license area, so a GB roll-out cost of around £1.2 to 1.8m.

2d. Does not Lead to Unnecessary Duplication

Yes	X

Please demonstrate below that no unnecessary duplication will occur as a result of the Project.

The project will learn from work done in EV related projects, especially regarding the use of EV charging profiles produced by other projects (e.g. NIA projects like Recharge the Future –UKPN and CarConnect – WPD) as inputs to the proposed methodology. However there is no duplication as no other project has tried to develop a methodology that models the interactions between slow and ultra fast charging, by modeling uncertainties taking into account regional traffic flows and local characteristics (e.g. volumes of domestic and commercial customers, access to off street parking etc).

If applicable, justify why you are undertaking a Project similar to those being carried out by any other Network Licensees.

N/A

Additional Governance Requirements

Please identify

that the project is innovative (ie not business as usual) and has an unproven business case where the risk warrants a limited Research and Development or Demonstration Project to demonstrate its effectiveness	X

i) Please identify why the project is innovative and has not been tried before

No known research has been undertaken by British or world wide industrial party to 1) model uncertainties around the amount of slow versus ultra fast charging in network planning; and, 2) use this modeling in CBAs to support the decision making process in network planning.

ii) Please identify why the Network Licensee will not fund such a Project as part of its business as usual activities

This project is not part of an existing business as usual project. Research work is required to develop new methodologies and associated prototype tools that need to be developed and tested before any business as usual implementation.

iii) Please identify why the Project can only be undertaken with the support of the NIA, including reference to the specific risks (eg commercial, technical, operational or regulatory) associated with the Project

This work has not been undertaken anywhere before and the results could have significant impact on busines planning. The results of this project area also of benefit to all DNOs making NIA the most appropriate route.

This project has been approved by a senior member of staff