Scottish and Southern Energy Power Distribution

Date of Submission

March 2016

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	Project Reference
Management of plug-in vehicle uptake on distribution networks	NIA_SSEPD_0026

Project Licensee(s)	Project Start Date	Project Duration
Electricity North West Limited, Northern Powergrid, Scottish Hydro Electric Power Distribution, Scottish Power Energy Networks, Southern Electric Power Distribution, UK Power Networks, Western Power Distribution	Mar 2016	22 Months

Nominated Project Contact(s)	Project Budget
David MacLeman	£430,000

Problem(s)

The evidence from the LCNF project I2EV, also known as “My Electric Avenue” suggests that the advent of plugged-in vehicles (PIVs) will cause an impact on the local electricity network, which could require investment by DNOs. Mapping and modelling of the I2EV results, a project which was funded through the LCNF Tier 2 mechanism, indicates that 312,000 GB LV feeders (around 30%) will need reinforcement by 2050. In addition, transformers and other upstream assets will need upgrading. Industry trends towards higher power charging for vehicles with increasing battery capacities may further exacerbate this issue. A demand side response solution, in the form of Esprit, has been shown to work, and to work sympathetically with the network, PIVs and people – albeit with one type of vehicle charge. It is likely that the roll out of this mechanism will facilitate increased numbers of PIVs that can connect onto the network without causing damage, in the most cost efficient and expedient fashion. The I2EV closedown report examines in detail the foregoing points. The future roll out needs consideration, specifically, the infrastructure / algorithm in the charging points needs to be rolled out ahead of need, and will require careful communications with customers.

At present there is no standardised method of communicating with PIV chargers and a number of manufacturers have developed proprietary systems. Left alone, this will lead to a multitude of system types with little commonality which would make adoption of Esprit-type charge control much more difficult in the future. In order to ensure that Esprit is available when needed, we are setting out a plan, which will be developed through engagement across industry. There are two potential approaches:

1. Ensure the Esprit-type capability is included in PIV chargers as they are installed
2. Retrofit Esprit-type capability to PIV chargers in target locations as a need arises

These approaches require very different strategies and will rely on engagement between the automotive and utilities sectors – and customers – to ensure their success. There are questions to be answered about the balance between regulation and incentives to make this happen: A balance between ensuring a critical need is met, and ensuring that PIV charger manufacturers are rewarded for their input, and customers are rewarded for their contribution.

This project has been developed to provide the optimum solution to these challenges.

Method(s)

Currently there are numerous manufacturers of EV chargers on the market in Great Britain. Each is broadly proprietary and has varying ability to take external signals from the DNO to ramp down or switch off charging at times of peak network load.

The purpose of this project is to define an ENA Engineering Recommendation (or equivalent) that will allow the range of future chargers to interact with a common device located in the local distribution substation for the purpose of load management on the network. It will require agreement on the approach (i.e. algorithm functionality) and communication channels, as well as any commercial arrangements (i.e. who pays for the infrastructure, who pays when the device is enacted in the future).
In doing so, this Method will allow the DNO the ability to signal to vehicles into the future, avoiding either costly reinforcement, or the need to retrofit chargers for a communicable alternative when the need arises.
Adoption mechanism: The key aim of this project is to present the engineering options to a set of stakeholders, with an understanding of the benefits and drawbacks of each, and seek opinions as to the most viable for all concerned. The project will then move towards a single most viable solution. It is at this point that consideration is given to the adoption mechanism. It is noted that this project does not seek to trial a solution and therefore will not have to hand the low level technical knowledge required to form a detailed engineering specification that would allow full interoperability between multiple vendors. This project will draft an Engineering Recommendation (or equivalent, e.g. IET Code of Practice) which, if adopted, would provide a signal to potential vendors of the functionality required by a DNO to manage PIV charging load. Before specifications can be drafted to such a level of detail to allow full interoperability between vendors it would be necessary to trial the solution, and through that, work through any implementation issues. This would ultimately ensure that the solution is fit for purpose and has been rigorously tested in the field.
The outputs will be:
1. Provision of industry agreed material to inform an ENA Engineering Recommendation standard (or equivalent) available to third parties for supply and manufacture of the home end and the substation end controllers (the Solution).
2. Data to enable deployment of a standard (or equivalent) comprehensive enough to allow different vendors' systems to be interoperable on the same LV network. A functional specification describing the system components and operation to allow vendors to produce a compliant Solution.
3. Evidence of UK EV industry acceptance of the standard's (or equivalent) Solution components, including OEM engagement and clear path to adoption.
4. Customer Messaging Strategy to facilitate customer understanding and buy-in to PIV-network demand response tools to improve customer acceptance of the solution(s).

Scope

This project will seek to inform an ENA Engineering Recommendation (or equivalent) for the connection, charging and control of new, large, PIV load to domestic properties. The focus of this project is on the collaborative approach required to achieve consensus on a solution that can be used to facilitate the roll out of controlled PIV charging. In doing so, it will enable significantly larger numbers of PIV charging on today's local electricity distribution networks, with sizeable reduction in reinforcement costs and customer bills/disruption.
The practical output will be a functional specification to describe the system, providing vendors with the information needed to build a trial system. Note that a detailed specification to allow full interoperability between vendors would be produced as a next step once the solution was successfully trialled and therefore lies outside the scope of this project. The output(s) will be achieved through:
? Desk-based research into existing national and international Protocols and Standards in the PIV space: specifically charging types and charging protocols either in development, in trial, or live. To investigate what is available, or in development today, with a view to establishing a preferred approach for a GB wide adoption.
? Dialogue with PIV manufacturers and charging point manufacturers to develop a roadmap of the likely vehicle charging requirements for different types of PIV (ideally 2015-2030+), including size (kW), battery capacity (kWh), likely charging location, etc.
? Develop an outline 'standard' for the connection and control of PIVs on distribution networks, together with options for deployment (e.g. Engineering Recommendation, Code of Practice, incentive mechanism, etc.)
? Test the outline 'standard' for the connection and control of PIVs on distribution networks with a broad audience, e.g. automotive community (LowCVP, OLEV, DfT, TfL etc.), Ofgem, ENA, IET and other stakeholders to be agreed, via consultation under the auspice of the Automotive-Utilities Working Group / other as identified. This will determine (a) the appropriateness of the outline standard, and (b) how the 'standard' should be deployed.
? Develop a communications strategy for enabling deployment. Customer Engagement Plan and Data Protection Strategy to be produced in support.
? Submission of material to the ENA, with endorsement by Automotive-Utilities Working Group to evidence industry and cross-sector support.
? Development of policy documents to validate the learning and facilitate embedding practices into the DNO for two use cases: restoration post fault / planned investment and management.
Completion of the foregoing tasks will enable the creation of an endorsed common solution for control of electric vehicle charging infrastructure giving a sizeable benefit to the DNOs and their customers.

Objective(s)

The principal objective of this project is to agree content to inform an Engineering Recommendation (or equivalent) with a number of influential stakeholders. Once agreed, the content can be passed to the ENA to endorse the agreed approach of managing PIV uptake on electricity distribution networks. The secondary objective will be to agree on the message and approach for communicating with the PIV buyer, the media and other key stakeholders.

Success Criteria

The success criteria is defined as:
1. Industry accepted solution for managing PIV uptake on distribution networks that will avoid significant infrastructure costs or disruption
2. Industry accepted customer messaging strategy and recommendations for implementation

Technology Readiness Level at Start	Technology Readiness Level at Completion
8	9

Project Partners and External Funding

SSEPD: DNO lead, acting as sponsor to the project but in partnership with
• Western Power Distribution
• UK Power Networks
• Northern Powergrid
• Scottish Power Energy Networks
• Electricity North West .

Potential for New Learning

At present there is no standardised method of controlling PIV chargers and a number of manufacturers have developed proprietary systems. Left alone, this will lead to a multitude of system types with little commonality which would make adoption of Esprit-type charge control much more difficult in the future. Alongside this, messaging to customers is critical to ensure buy-in and facilitate acceptance of demand side response with regards to connection and control of PIVs.
The new learning, captured through Learning Outcomes (LO), that the project will deliver is:
LO1 How can DNOs avoid being a barrier to PIV uptake?
LO1.1 What are the options for standardising a method of communication with PIV chargers?
LO1.2 How can the standard mechanism for the connection and control of PIVs on the distribution network be embedded into DNO practice, for two uses:
a. Restoration post fault
b. Planned investment and management
LO2 How should customers be informed to secure their buy-in to PIV demand side response?
LO2.1 How does a DNO improve customers' acceptance of the solution(s)?

Scale of Project

This project encompasses focused desk-based analysis with coordinated workshops, consultation and communication with key interested parties.

Geographical Area

Customer focus groups will be held in SHEPD/SEPD's licence area/s; no other activity will be location-specific as the majority of project work to be undertaken in desk-based research and communication.

Revenue Allowed for in the RIIO Settlement

SSEPD's RIIO-ED1 business plan included an allowance of £160,000 for smart technology associated with electric vehicles together with an allowance of £8.21 Million for network reinforcement related to Low Carbon Technologies.

Indicative Total NIA Project Expenditure

Total NIA Project Expenditure is £430,000, 90% of which (£387000) is Allowable NIA Expenditure

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 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)	☐
A specific novel operational practice directly related to the operation of the Network Licensees 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 answer one of the following:

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

The need to implement and embed demand side response to support PIV uptake is a GB-wide challenge; the learning from this project will deliver content to the ENA to inform a standardised mechanism for the control and connection of PIVs on the distribution network.

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

N/A

2b. Is the default IPR position being applied?

Yes	☒
No	☐

If no, please answer i, ii, iii before continuing:

i) Demonstrate how the learning from the Project can be successfully disseminated to Network Licensees and other interested parties

ii) Describe any potential constraints or costs caused or resulting from, the imposed IPR arrangements

iii) Justify why the proposed IPR arrangements provide value for money for customers

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

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

The GB Transform Model estimates there will be 288 interventions required on the SSEPD'S L V network in RIIO ED1.With each

intervention valued at £40,000 this gives a figure of £11.5 Million for conventional reinforcement.

However by embracing and implementing the monitoring and control technology described in this project at an overall estimated cost of £2 Million the reinforcements can be deferred leading to a saving and a financial benefit to the customers of. £9.5 Million.

ii) 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).

Base Cost	£11.5 Million
Method Cost	£2.4 Million (cost of the study plus implementation cost for charging methodology)
Financial Benefit	£9.1 Million

Additional benefits will be realised further in RIIO ED2

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iii) 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.

Given that the outcome of the project will be content to inform a standard mechanism and customer messaging strategy to support PIV uptake, the Method is fully replicable across GB DNO license areas.

The rise of EV/PIV through the 2020s is likely to strengthen the business case further as we extend into RIIO-ED2 and beyond.

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

Again using the Transform Model the costs of roll out of smart charging technology across the GB network is estimated at £16.3 Million for the RIIO-ED1 period alone.

2d. Does Not Lead to Unnecessary Duplication ☒

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

Under Task 1, a technical review of all existing standards, protocols and charging mechanisms in this area will be undertaken. This will ensure no duplication. At time of writing it is believed that there is currently no demand side standard mechanism that relates to connection and control of PIVs on electricity distribution networks.

This is a follow on from the My Electric Avenue (MEA) (I°EV) LCN Fund Tier 2 project which was focused on the scale of the potential issue, assessing a suitable solution, and understanding the customer reaction. Whilst MEA trialed a technical solution to mitigate issues arising from clusters of EVs on the network, this project will define a common methodology for controlling the impact of EVs on the LV network. There is no duplication or overlap in work areas.

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

N/A