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

Mar 2019

Project Reference Number

NIA_SPEN_0037

Project Registration

Project Title

Electric Vehicle Uptake Modelling (EV-Up)

Project Reference Number

NIA_SPEN_0037

Project Licensee(s)

SP Energy Networks Distribution

Project Start

February 2019

Project Duration

2 years and 7 months

Nominated Project Contact(s)

Nicol Gray

Project Budget

£625,000.00

Summary

EV-Up will allow Network Licencees to better understand the impact of Electric Vehicles (EVs), and the ability of customers to transition to using EVs.

Nominated Contact Email Address(es)

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Problem Being Solved

The transition to electrified transport along with greater penetration of other Low Carbon Technologies such as heat pumps will put increasing pressure on the low voltage networks as demand increases in the future. To ensure that the network continues to provide the level of service required for customers there is an increasing need to improve forecasting to enable investment decisions to be made at the lowest overall cost, whilst minimising network risk. However currently with immature EV market conditions and rapid technology change, accurate forecasting is extremely challenging and there is a need to model a range of adoption scenarios over an extended timeframe which increases this complexity.

Currently Network Operators have limited ability to accurately forecast where and when customers will transition to EVs and importantly how this will impact on the distribution networks. Improved forecasting is critical to ensure that our future networks meet customer expectations and can deliver the increased demand expected. In addition this forecasting is also essential to ensure that investments are delivered on time, minimising the risk to the network, and ensuring value for money for customers.

Method(s)

Working with Field Dynamics, this project will look to better understand customers' ability to transition to electrified transport by combining each household's ability to park off street with key demographic information; such as age profile and economic activity. It

will also help inform understanding of customers' ability to transition to electrified heat by combining each households' adjacent spatial characteristics and current heating type with the aforementioned key demographic information. Combining this information will enable SPEN to have greater understanding on the probability of specific areas to transition to EVs and decarbonised heat, greatly improving future demand profiling for domestic customers and understanding of what network reinforcement solutions could be adopted.

The project will investigate the following areas;

- Probability of an owner of an EV being able to park and charge at home
- Probability of a household to be able install a Heat Pump
- The demographic of the Low Carbon Technology owner, including income and behaviours
- ·The make and model of the vehicles (and corresponding battery size)
- The type of heat pump likely to be installed (Air source, Ground source etc.)

Field Dynamics propose to supplement existing network forecasting tools with output from a model deployed on Field Dynamics Accelerated Insight Platform. This will provide scenarios using a combination of detailed parking probability data, demographics and vehicle data, heating types and adjacent spatial availability, which will be updated and improved in collaboration with SPEN as the innovation project progresses.

The solution will enhance forecasting accuracy; help with resilience planning, which in turn will more accurately inform LV infrastructure upgrades and replacement programmes.

Scope

There will be Two distinct project phases – firstly covering the SPM licence area with the second phase focused on the SPD area.

1.a. Setting up and integrating the model output into SPEN's environment

1.b. Additional sprints to improve the model by refining or adding business rules based on additional site surveys and other validation exercises for SPM licence area

1.c. cost benefit analysis update

2. Additional sprints and subsequent validation work for SPD licence area

SPEN has a number of network forecasting tools and initial information about where EVs and Heat Pumps are currently registered, but there is a requirement for a more granular view in order to accurately forecast and look ahead. NIA project Network Constraints Early Warning System (NCEWS) has developed a solution to create a basic LV connectivity model, with the ability to backfill missing data; ensuring the LV network is topologically sound so that data can be aggregated from household level up to flex a range of scenarios.

Field Dynamics will work collaboratively to define and setup the initial model with a roadmap for further iteration, all with the goal of improving accuracy. Model output will then be absorbed as a new data set into existing systems to enhance existing understanding.

Objective(s)

EV-Up will contribute to the development of data sets to improve our understanding of customers' ability to transition to Electric Vehicles (EVs) based on off-street parking opportunity and customer demographics. This will enable improved understanding on the likely network areas which will see increased domestic demand and better inform future investment programmes. In addition the dataset will complement existing work being carried out in other innovation projects such as NCEWS and Charge.

SPEN are adding forecasting of Heat Pump uptake as SPEN require examination on whether this will improve the usefulness of EV uptake forecasting. It is anticipated that where EV uptake coincides with Heat Pump uptake is where the greatest networks problems are likely to arise. Therefore, it is pivotal SPEN are able to model/forecast effects of both EVs and Heat pumps simultaneously.

Consumer Vulnerability Impact Assessment (RIIO-2 Projects Only)

n/a

Success Criteria

The project will be considered a success if the learning provides the required level of information to

make an informed decision on the viability of the solution to become business as usual

Project Partners and External Funding

Field Dynamics

Potential for New Learning

Whilst EV-Up will not on its own be able to provide all the answers it will improve understanding and create a datum which will allow for future related work and complement existing projects. This project will contribute to addressing our Innovation Strategy 'smarter flexible network' vision to enable our customers to take advantage of new technologies and opportunities, enabling the connections of more low carbon technologies and paving the way for a low carbon economy.

The outcome of the project will be an enhanced business case model outlining where the transition will happen which in turn will lead to improved investment plans and customer benefits.

Scale of Project

The forecasting project is intending to test a novel solution to help network companies prepare for the transition to electrified transport at a scale which maximises the benefits whilst ensuring customers get value for money.

Technology Readiness at Start

TRL5 Pilot Scale

Technology Readiness at End

TRL7 Inactive Commissioning

Geographical Area

SPD & SPM

Revenue Allowed for the RIIO Settlement

No revenue highlighted in RIIO settlement

Indicative Total NIA Project Expenditure

£325,000

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)

EV-Up will go somewhere towards providing more granular data to enable more precise understanding of future network investment requirements, essential to facilitate the transition to electrified transport. Recently completed innovation projects, such as SSENs My Electric Avenue, in addition to studies by the ENA and SPEN suggest that significant network investment will be required. SPENs internal forecast suggest in SPD somewhere between £400m – £600m investment will be required to fully facilities the transition to electric vehicles between now and 2032. However this number could be significantly reduced through the use of innovative solutions, such as smart charging, and improved forecasting and modelling understanding.

Please provide a calculation of the expected benefits the Solution

If we assume that improved forecasting and modelling can reduce the need for future network investment by 1%, this would represent a significant saving for customers. (c£6m). In addition identifying network areas which are likely to becoming overloaded earlier will deliver operation benefits to SPEN, improve customer service and reduce potential CI/CML impacts.

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

The learnings from EV-Up will be applicable for all UK networks operators and will provide a method to allow for improved network forecasting and modelling. It is estimated that by 2030 there may be in excess of 10million EVs on the roads in the UK. As other recent innovation projects, such as Electric Nations and My Electric Avenue have established, this transition to electrified transportation will lead to increasing strain on the LV distribution network and will required improved network forecasting and planning for all UK DNOs. EV Up will therefore provide a method which will be replicable for all networks operators.

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

The costs to roll out this solution will be at the discretion of the respective DNOs and their internal policy requirements. However further investigation into the potential benefits this solution could offer UK customers will be established as the project progresses.

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 learnings from EV-Up will be applicable for all UK networks operators and will provide a method to allow for improved network forecasting and modelling. The challenges outlined by this project are applicable to the relevant Network Licencees, who can therefore leverage the learnings from this project.

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.

Whilst learning from other innovation projects will be leveraged SPEN believes there is no duplication – EV-Up takes a highly innovative approach at looking at the impact of EVs on local distribution networks by leveraging advanced GIS and demographic information – this combination has not to our knowledge been trialled before.

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

EV-Up takes a highly innovative approach at looking at the impact of EVs on local distribution networks by leveraging advanced GIS

and demographic information – this combination has not to our knowledge been trialled before or at the scale proposed. Currently Network Operators have limited ability to accurately forecast where and when customers will transition to EVs and importantly how this will impact on the distribution networks particularly for those with off street parking opportunity. Whilst we can improve monitoring on these networks there is currently limited solutions to predict when customers may transition and these tend to be based on broad assumptions such as housing type. Ev Up will take a highly innovative approach, leveraging advances in GIS computing and available demographic information to provide greater understanding on the likely uptake and potential impact on the network.

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

EV Up takes a novel approach at answer the question of where and when EV clustering is likely to occur, and has the potential to improve our long term understanding on future demand requirements. However there is significant uncertainty on the rate of uptake and ultimate scale of EVs and the potential impact on electricity networks in the future. This impact will be a function of: the rate of uptake; charging technology; customer charging behaviour and; the level of EV charging management that can be implemented.

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

EV Up by combining network, customers and local demographic information will have the potential to lead to a direct impact on the distribution network, influencing the need for future network reinforcement. However NIA support is essential as there are significant risks which warrant further investigation and development. These include; an uncertain business case in the current price control period as a consequence of limited opportunity for anticipatory network investment – risk associated with regional or locally specific building types which may result in the proposed benefits being unachievable – political uncertainty adversely impacting EV uptake rates.

This project has been approved by a senior member of staff

☑ Yes