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

May 2018

Project Reference Number

NIA_NGTO007

Project Registration

Project Title

EPRI Research Collaboration on Electric Transportation (P18)

Project Reference Number

NIA_NGTO007

Project Licensee(s)

National Grid Electricity Transmission

Project Start

January 2018

Project Duration

1 year and 4 months

Nominated Project Contact(s)

Robin Gupta

Project Budget

£70,000.00

Summary

N/A

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Problem Being Solved

National Grid recognises that the challenges faced by the electricity industry can be more efficiently and cost-effectively addressed when approached through international collaboration initiatives. It is particularly useful when addressing challenges where the solutions require statistically diverse data sets and/or significant trialling and testing in different environments, under various conditions and/or diverse ways.

The Electric Power Research Institute (EPRI), with its wide international membership, is one of the routes through which these initiatives can be delivered, thereby maximising stakeholder value. The approach of managing collaborative projects within an internationally driven research and development initiative is beneficial to National Grid and consumers alike, because it provides valuable information, learning and knowledge that would be considerably more expensive if approached on an individual basis.

Electricity is the only widely available and domestically produced form of energy for vehicle transportation that addresses the simultaneous needs for fuel diversity, energy security, reduced greenhouse gas emissions, and improved air quality. The transition of vehicle transportation energy from petroleum to electricity represents a paradigm shift for electric utilities to the role of fuel provider for vehicles. and It also represents a significant opportunity.

The early market for electric vehicles (EVs) has been characterized by modest but steadily increasing sales, high vehicle reliability and customer satisfaction, and a rapid evolution of both vehicle and charging technologies. Compared to the first mass-produced EVs, new vehicle models can charge at faster rates and travel with greater range per charge. A variety of EV models ranging from sedans to bucket trucks are seeing increased usage in fleet applications. Mass-market, 200-plus mile range EVs are being launched. In addition, public charging infrastructure to support EVs is expanding, with the installation of thousands of public and workplace charging stations. A fast-charging network is also beginning to emerge, using direct current (DC) electricity at levels of 50 kW to 120 kW to charge EVs in as little as 20 minutes.

Nearly all major automakers are reaching out to the utility industry to help develop and standardize EV charging infrastructure and to help educate their mutual customer. The customer, meanwhile, is also looking to the utility for guidance as an impartial trusted energy advisor. Residential, commercial, and industrial customers – fleet managers, employers, retail stores, developers, local governments, and others – are seeking guidance on the design, location, and installation of charging infrastructure. Utilities need to understand the system impacts and customer requirements associated with plug-in vehicles, and prepare their grid to support the rollout and adoption of EVs. This program will help us address these challenges.

The transition of transportation energy from petroleum to electricity represents a paradigm shift for electric utilities to the role of fuel provider for vehicles and, as a Transmission Owner, National Grid will need to be prepared to meet these challenges. We however have a limited understanding of the electric vehicle and infrastructure technologies, economic and environmental impacts of electric transportation, and understanding of the societal perception, preferences and possibilities that will determine the requirements for this technology.

Method(s)

The EPRI research programme on Electric Transportation (P18) covers three key areas, of which National Grid is interested in the following two:

• Technical Research and Development
The electric transportation program wills provide fundamental information and the support necessary to bring the benefits of electrification to the vehicle transportation industry. Building from the results of the other two project sets within the programme, this project set incorporates key learnings into a collection of customisable tools, data collection, and impartial analysis that will enable us to determine the need for, and develop (if necessary) implementable vehicle transportation programs specific to our service territory. The elements provided through this research are key components for decisions and development of utility-specific electric transportation strategies and provide the basis for development of related tactics that, when implemented, may advance and accelerate the adoption of electric vehicle transportation technologies and the realisation of the subsequent benefits. There are four distinct projects in this area:
• P18.044: EV Charging & Infrastructure Technology
• P18.045: EV Grid Integration
• P18.046: Commercial and Industrial Electric Transportation, Data Collection & Analysis
• P18.047: Environmental Impacts & Analysis

• Technical Deployment
This project set concentrates on research related to short- and long-term electric vehicle (EV) charging and infrastructure technology, integration of EVs and EV charging with the grid, data collection and analysis of EV performance and driver behaviour, and commercial and industrial electric transportation, as well as the deep scientific understanding of the environmental and economic impacts of EVs and related analysis. All are needed to help provide us with the information required to make decisions in support of the EV market.
• P18.043: PEV Infrastructure, Grid Impact, Environmental & Market Research, Analysis & Support

Scope

EPRI research projects span across multiple years. Because of this approach, not all of the deliverables for this project will be in 2018. Nevertheless, there is scope for the delivery of a number of valuable outputs, reports and guidance documents in 2018. The full scope of research within each project is listed below:

Technical Research and Development

• P18.044: EV Charging & Infrastructure Technology: R&D will include the monitoring and/or evaluation of EV charging infrastructure, e.g., AC and DC charging stations, vehicle-to-home or vehicle-to-grid devices, smart charging, and related technologies.

• P18.045: EV Grid Integration: R&D will include activities such as the development, deployment, and evaluation of smart EV charging, studying issues such as implications of TOU (Time Of Use) rates, demand response communications, costs, benefits, use cases etc. Additional potential activities will develop and deploy open standards implementation of V2G power and communications technologies as well EVs as Distributed Energy Resources (DERs).

• P18.046: Commercial and Industrial Electric Transportation, Data Collection & Analysis: R&D will include potential activities such as the research, development, deployment, and evaluation of commercial and industrial electric transportation, including technology development, standards support and leadership, field demonstration, and data collection and analysis.

• P18.047: Environmental Impacts & Analysis: This project seeks to conduct accurate, impartial analysis and reporting of emissions related to the use of electric vehicles, as wells as provide tools to model future environmental impacts.

Technical Deployment

• P18.043: EV Infrastructure, Grid Impact, Environmental & Market Research, Analysis & Support: R&D will include potential projects such as developing localised; Geographic Information Systems (GIS) maps of charging stations (current and future), localized PEV sales projections, load boundary conditions from EV charging, a range of infrastructure requirements, PEV infrastructure cost impact model, and grid impacts: tools and analysis, localised environmental assessment, and economic benefits.

Objective(s)

The objectives for 2018 include the enrolment of National Grid onto EPRI's Electric Transportation Programme (P18) and the delivery of a selection of associated reports and guidance documents. Key deliverables include:

• Technical Research and Development

• P18.044: EV Charging & Infrastructure Technology: Research in this project set helps provide an impartial view of EV charging devices, networks, and related infrastructure, both short-term and long-term for plug-in vehicles of varying sizes and market segments to advance electrification of the transportation industry.

• P18.045: EV Grid Integration: Research in this project will help provide, develop, and refine the fundamental background, standards and technology that will enable scalable open standards-based smart charging of EVs in a geographic area. This knowledge supports the smooth integration of EVs into the transmission system.

• P18.046: Commercial and Industrial Electric Transportation, Data Collection & Analysis: R&D will include potential activities such as the research, development, deployment, and evaluation of commercial and industrial electric transportation, including technology development, standards support and leadership, field demonstration, and data collection and analysis.

• P18.047: Environmental Impacts & Analysis: Research in this project will help provide, develop, and refine the understanding of the environmental impacts of electric vehicles, e.g., greenhouse gases, air quality, etc. through a deep and current understanding of the electricity transmission system.

Technical Deployment

• EV Infrastructure, Grid Impact, Environmental & Market Research, Analysis & Support: Impartial, scientific research, development, evaluation, and analysis of EV charging and related infrastructure technology are needed to help support the EV market.

Consumer Vulnerability Impact Assessment (RIIO-2 Projects Only)

n/a

Success Criteria

Key success criteria include the delivery and presentation of:

Technical Research and Development
• P18.044: EV Charging & Infrastructure Technology: This project will provide impartial, scientific research, development, evaluation, and analysis of EV charging and related infrastructure technology through shared analysis and annual updates.

• P18.045: EV Grid Integration: This project will provide impartial, scientific research, development, evaluation, and analysis of managed EV charging and its related grid impact through a number of reports.

• P18.046: Commercial and Industrial Electric Transportation, Data Collection & Analysis: This project will deliver two reports (R&D reports on Buses and Trucks as well as Other Commercial and Industrial Electric Transportation) and data collection and analysis of the bus and truck dataset.

• P18.047: Environmental Impacts & Analysis: This project will deliver an analysis into Next Generation Environmental Impact and a number of tools to model future environmental impacts.

• Technical Deployment

• P18.043: This project will deliver an a number of reports which will provide an impartial view of the local EV market and the necessary facts from research, development, deployment, data collection and analysis, and the environmental and economic assessments necessary to launch and support transportation electrification programs as technologies reach market launch at various times.

Project Partners and External Funding

Each project facilitated by an EPRI programme is funded through collaborators, including National Grid, that contribute to the development of the project portfolio and then express interest in to be involved with a specific project once the portfolio is decided. The total combined contribution to P18 in 2018 is $3.5m.

Potential for New Learning

EPRI's varied programme enables new learning to be generated relating to Electric Transportation which will be beneficial to all network licensees given the UK Governments EV targets. Each project provides opportunities for extensive learning.

Scale of Project

The project work-streams associated with this project are predominantly laboratory or desk based projects, with a minimal amount of site trials, if and when required. Because of this approach, there is no scope to reduce the scale of the projects any further.

Technology Readiness at Start

TRL2 Invention and Research

Technology Readiness at End

TRL3 Proof of Concept

Geographical Area

The research undertaken by EPRI is predominantly carried out in the US, with some work in the UK, although the programme also reviews the latest research from across the world. Additional testing facilities in Canada may be used, where appropriate.

Revenue Allowed for the RIIO Settlement

None

Indicative Total NIA Project Expenditure

The total indicative NIA expenditure is £70,000 for 2018.

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)

Each project work-stream will have different financial savings based on the outcomes and potential benefits gained. Each EPRI programme that National Grid joins has been through several stages of review that consider the potential to deliver financial benefits.

In the first instance, within EPRI's governance, the Research Advisory Committee provides guidance on policies and issues that impact the power industry to inform the content of the research programmes.

Within National Grid, the Technical Lead for each aspect of the GB Transmission Network undertakes a review of the proposed EPRI programme, relevant to their technical expertise and responsibilities, and evaluates which provide potential value from a GB perspective as part of an annual review of which programmes to participate in.

The work-packages within P18 are expected to generate valuable learning which can help address the challenges of an electrified transportation system.

Please provide a calculation of the expected benefits the Solution

Not required for research projects.

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

Each project will generate learning which can be applied to all of the GB Electricity Networks to address the challenges of an electrified transportation system across the transmission and distribution networks.

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

The direct cost of making a policy or procedure change could range from as little as ten thousand to hundreds of thousands of pounds depending on the complexity of the change implications. The wider cost implications arising from such changes will be dependent on the specific outcomes generated from the project and typically will be subject to further stages of demonstration prior to roll out. Further information regarding roll out costs can be provided prior to demonstration stage.

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

Nearly all major automakers are reaching out to the utility industry to help develop and standardise EV charging infrastructure and to help educate their mutual customer. The customer, meanwhile, is also looking to the utility for guidance as an impartial trusted energy advisor. Therefore, the learning from the EPRI Electric Transportation programme will be relevant to all network licensees.

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

This project fits within the value area of the Electricity Innovation Strategy:
Service Delivery - Developing new service-based propositions and business models
☑ 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.

By participating in collaborative projects through EPRI National Grid can ensure that unnecessary duplication with other projects under NIA is avoided.

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

The upcoming transition of transportation energy from petroleum to electricity represents a paradigm shift for electric utilities to the role of fuel provider for vehicles and, as a Transmission Owner, National Grid will need to be prepared to meet these challenges. The learning from this project will help us, and other Network Licensees, to better address these.

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

The nature of a research programme means it inherently carries a risk that the research may be unsuccessful and/or identify unforeseen barriers to implementation and National Grid is unable to consider research of this scale as business-as-usual. However, the risks associated with EPRI research programmes are mitigated by the consortium approach and, therefore, this project meets the criteria for NIA funding.

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

The approach of managing collaborative projects within an internationally driven research and development initiative is beneficial to National Grid and consumers alike, because it provides valuable information, learning and knowledge that would be considerably more expensive if approached on an individual basis. This learning will be relevant to all Network Licencees and will be shared appropriately to benefit the industry and is, therefore, best and appropriately supported by the NIA.

This project has been approved by a senior member of staff

☑ Yes