

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\_UKPN0036

## Project Registration

### Project Title

Timed Connection Software Development

### Project Reference Number

NIA\_UKPN0036

### Project Licensee(s)

UK Power Networks

### Project Start

May 2018

### Project Duration

1 year and 11 months

### Nominated Project Contact(s)

Sung Pil Oe

### Project Budget

£475,339.00

## Summary

There is an increasing interest from commercial and fleet vehicle operators to adopt Electric Vehicles (EVs) as their primary mode of transportation. This shift to electric transport brings with it the requirement for significant upgrade to the power supply to the location where the EVs will be charged. A couple of examples are outlined below:

- Case Study 1: 500kVA prior connection supply, 1.25MVA fixed maximum capacity expected after reinforcement upgrade, costing £600,0000
- Case Study 2: 250kVA prior connection supply, 2.5MVA fixed maximum capacity expected after reinforcement upgrade, costing £261,600

As outlined above, the power demand of the commercial EV fleet operators tends to be large and concentrated. The implications being:

- Significant capacity required from the electricity network
- Potential for reinforcement to be triggered causing a financial impact on customers
- Potential for extended timelines of EV deployment in response to upgrades

### Nominated Contact Email Address(es)

innovation@ukpowernetworks.co.uk

## Problem Being Solved

There is an increasing interest from commercial and fleet vehicle operators to adopt Electric Vehicles (EVs) as their primary mode of transportation. This shift to electric transport brings with it the requirement for significant upgrade to the power supply to the location where the EVs will be charged. A couple of examples are outlined below:

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## Method(s)

The current design of customer connection relies on the assumption of maximum demand at any time and on any day.

Maximum demand is determined from full customer load requirement (kW) and historic maximum demand (kW). In reality, the demand on the network varies through the day and is foreseeable on certain networks. By analysing the network 'peak demand' by time of day there is an opportunity to match consumer demands during 'off-peak' periods while reducing reinforcement needs.

The new proposed approach would include the following steps:

1. Connecting customer states their charging requirements. e.g: a delivery fleet charging station may request 2MVA charging capacity from 11pm-6am daily, but daytime charging capacity of 1MVA.
2. Timed connection software tool assesses capacity and network constraints based on historic data without the assumption of 'any time, any day'. This is reviewed against customer requirements of charging and opportunities of 'off peak' charging are identified
3. Customer is offered a timed connection based on the software's prediction of headroom and time while the network reinforcement is deferred.

## Scope

Develop and deliver a long-term enduring solution to analysing the network for opportunities for timed connections. The software solution will identify the discrete periods in a 24-hour timescale when the typical peak demand on network is and how much additional load can be accommodated within and outside these periods. We will test and pilot the tools with a small dedicated team.

Deliverables:

- Technical requirements for timed connections tool
- Design document for the timed connections tool
- Working version of the timed connections tool
- Acceptance testing results

## Objective(s)

Objectives and outcomes of the project include:

- Develop and deliver a long-term enduring solution to analysing the network for opportunity for timed connections. The software solution will identify the discrete periods in a 24-hour timescale what the typical peak demand on network is and how much additional load can be accommodated
- Identify an appropriate solution (stand-alone or integrated to existing systems) and vendor with a suitable operation and maintenance arrangement
- Determine the system requirements with the main users (UK Power Networks' planning teams) and smart-grid development team
- Establish an enduring policy for the application (i.e. how and when to offer customers this solution) and assessment (i.e. how to use the tool) of timed connections
- Roll-out the tool and deliver training as necessary to encourage super user adoption

## Consumer Vulnerability Impact Assessment (RIIO-2 Projects Only)

n/a

## Success Criteria

Deliverables defined in scope are achieved:

- Technical requirements are defined from the UK Power Networks planning and smart grid teams.
- Design and policy documents are created
- Working version of tool created which fulfils technical requirements
- User acceptance testing of the tool is carried out and, if appropriate, business roll-out initiated.

## Project Partners and External Funding

Project partners:

-CGI, Capula, TCS

As noted in the 'scale of project' section, this project is being raised to support a larger project, which includes over £2.5m of Innovate UK funding. The Innovate UK project budget does not include an allowance to complete the tasks that form the NIA project.

## Potential for New Learning

This project will develop learning in the area of increasing the proportion of connection offers which do not require reinforcement. As well as more efficiently identifying LV capacity on individual networks it can help facilitate other LV smart solutions and advantages of timed usage and additional loads.

Update July 2019:

Following extensive discussions with one of the project partners, the team created a more detailed list of technical requirements that need to be implemented as part of the development of one of the software tools supporting the time connection assessment process. Delivering some of these requirements which form part of original scope, would require more effort than originally envisaged and as a result, an extension to the current project duration and budget is needed to deliver all the expected project benefits. Specifically, there is a need to extend the project duration by 4 months to cover the additional time required to deliver all requirements as well as to make sure the project closedown activities are properly undertaken.

Update November 2019:

All the software tools required to support the timed connection assessment process have been developed and two of the planning tools have been successfully tested and signed off by the business owners. However, a third support tool has gone through several iterations of user acceptance testing and further work is required before the tool functionalities can be signed off.

Both UK Power Networks and the supplier have been focusing on the resolution of these issues that are being gradually resolved through each iteration. However, this has introduced some delays in completing the full testing of the software. As a result, a further time extension of four months is required to ensure that the final user acceptance testing is carried out successfully and the tool is fully functioning to support the timed connection assessment process. In addition, the extension will generate greater confidence in the adoption of the tool in business as usual.

## Scale of Project

This NIA project is being raised to support a larger Innovate UK project, Smart Electric Urban Logistics. The total value of the Innovate UK project is over £2.5m. The Innovate UK project budget does not include an allowance to complete the tasks that form part of the NIA project.

The scale of the project will be to develop tools that are fit-for-purpose to complete the analysis described in the 'Method' section above. We will develop the tools and test them with a small dedicated team. If successful, we will make recommendations for a roll-out to the rest of the business following the project conclusion.

## Technology Readiness at Start

TRL6 Large Scale

## Technology Readiness at End

TRL8 Active Commissioning

## Geographical Area

It is expected that initial deployment will be to areas in London where we are more likely to identify EV clustering, However the tool can be deployed anywhere across our three Licensee areas where similar connection challenges are experienced.

## Revenue Allowed for the RIIO Settlement

There is no revenue allowed in the RIIO-ED1 settlement for the development of tools to facilitate timed connections.

## Indicative Total NIA Project Expenditure

£475,339

Update July 2019:

Due to additional effort required to deliver some of the detailed requirements as part of one of the software tools' development, there is a need to extend the project budget by £75,339. Additional budget is required to cover the project partner's effort as well as project management costs during the additional project duration.

Update November 2019

No additional funding is required for the final user acceptance testing phase, therefore the total project budget is unchanged.

## 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)

It is estimated that the tools developed in this project will:

- Reduce the overhead costs associated with producing connections offers.
- Lead to cost savings for connection customers, and our wider customer base through the shared elements of reinforcement costs.
- Assuming a rollout across UK Power Networks' networks starting in 2019, the project will result in an estimated saving of £6m by the end of the ED1 period.

#### Please provide a calculation of the expected benefits the Solution

Base Cost = £3.8m which includes processing costs per connection and data cleansing using the current methods

Method Cost = £1.0m from efficiency savings as a result of the project tools

Additional Benefits = £3.2m to connection customers, based on the average difference in price between a traditional connection and a timed connection.

This results in benefits of  $(£3.8m) - (£1.0m) + (£3.2m) = £6m$  by the end of ED1.

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

It can be rolled out to all licensees when a new EV fleet connection is submitted. This tool will also be applicable to any loads that have a demand characteristics similar to commercial EV fleet charging.

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

The cost of rolling out this method across GB will be proportional to the cost of the software licence.

### 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

There has been a rise of organisations looking into electrifying their fleets, and the challenges faced are common to all DNOs. Developing tools that can enable EV fleets to be electrified in a more efficient manner could be used by all DNOs. We believe that the tools developed in this project may also be relevant to industrial and commercial connections.

#### 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.

The application of timed connections, with respect to EVs, is in its infancy. To our knowledge, the development of tools to support it has not been trialled elsewhere in GB. Therefore, to the best of our knowledge, there is no duplication.

#### 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

No tool is available in the current market to offer a timed connection based on historic timed data as well as forecasted demand. This solution has not been tried before as there has not previously been the requirement from new connections driven by the uptake of EVs or other technologies.

## 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**

As there is currently no off-the-shelf solution which offers the type of network analysis that we require, there is a significant piece of development work in this project, with associated risks. Analysis to this level of detail has not been widely carried out on the network, in part because we do not have adequate tools to complete the work. As an unproven business case, the Network Licensee believes that it is appropriate to use NIA funding to developing the solution at this stage.

### **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**

Due to the risks involved in the project, these activities would not form part of our business as usual activities. In order to progress an innovative project which carries significant risk in implementation, additional innovation funding is required as a stimulus. Finally, this part of work is part of a wider project funded by Innovate UK. This piece of work was not provided for in the Innovate UK funding.

### **This project has been approved by a senior member of staff**

Yes