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

Nov 2017

Project Reference Number

NIA_SPEN_0029

Project Registration

Project Title

Secondary Telecommunications Phase 3 – Trial of Hybrid Telecoms

Project Reference Number

NIA_SPEN_0029

Project Licensee(s)

SP Energy Networks Distribution

Project Start

November 2017

Project Duration

6 years and 5 months

Nominated Project Contact(s)

Watson Peat

Project Budget

£1,000,000.00

Summary

To validate and confirm the technologies are capable of supporting smart grids;

- Providing wide geographic coverage in a range of environments from dense urban to deep rural
- Providing reliable performance generally (>99.99%) and also during a black start event
- Providing communication with sufficiently low latency to support real time control of distributed assets as part of the smart grid
- A high degree of interoperability between connectivity technology and equipment vendors

To demonstrate to what extent third party solutions from mobile operators can be relied upon in terms of coverage and performance

To build upon output of previous innovation projects such as WPD's Falcon & Nexus and UKPN's 'Flexible plug and play' which focussed on a single technology solution or were desktop only exercises.

To satisfy Ofcom's requirements to justify access to an additional 400 MHz allocation as part of the spectrum release programme

Nominated Contact Email Address(es)

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Problem Being Solved

The transition from DNO to DSO will necessarily require significantly increased real time monitoring and control of remote electrical assets. This will be of critical importance in order that the continued

The project outlined in this document will demonstrate in a real environment the methods by which innovative technology solutions ,including both private and third party solutions can be deployed in combination to provide a fit-for-purpose

adoption of distributed renewable generation and electric vehicle utilization can be maximised without inadvertently destabilising the UK electricity grid or putting the security of supply at risk. The need for much improved monitoring and control in the future is well documented. However, there is currently a large gap in the capability of the supporting telecommunications systems in terms of their ability to function satisfactorily against a number of key criteria – (i) over an extremely wide geographic area (from dense urban to deep rural) (ii) with sufficiently low latency to allow control of assets rapidly enough to avoid instability in the grid (iii) sufficiently high cyber security credentials to avoid exposure from malicious third parties (iv) Capability to support connectivity to many hundreds of thousands of devices (compared to several thousand at present) as smart grids continue to evolve (v) provide connectivity cost effectively and reliably -especially the need for extended power autonomy under black start conditions (vi) to support enhanced data rates to allow real time access to the data-rich functionality of modern switch gear and relays / RTUs

Current telecommunications solutions which are available to DNOs do not adequately satisfy the 6 criteria highlighted above. This has been most recently identified in WPD's 'Project Nexus'.

Without a reliable and fit for purpose telecommunications network in place, it will not be possible to capitalize on the possibilities which are presented by the 'Smart Grid' and the DNO to DSO migration will be severely hampered. Moreover, without a satisfactory telecommunications network to support it, the switch from centralized fossil fuel generation to dynamic, distributed renewable sources and distributed storage significantly increases the risk of less reliable electricity supply in the UK.

Because of the very specific technical criteria outlined above, it is not possible to procure an 'off the shelf' solution from any of the leading telecommunications operators. In addition, those large operators are not likely to develop bespoke solutions for the DNOs, because they do not represent large enough revenue streams compared to their core business.

Previous work in this area (by SPEN, UKPN and WPD) has concluded that a single technology solution (which can cost effectively satisfy all of the technical and commercial criteria) is unlikely to be suitable. It Is likely that a hybrid approach to the solution will be most cost effective and will 'future proof' the solution to the greatest extent possible. Similarly, arguments around the pros and cons of self-build vs third party solutions are not straightforward and the optimum is probably an intelligent combination of both.

holistic solution.

Method(s)

Scope

To trial a hybrid of innovative communications solutions previously short-listed in the Secondary Communications Phase 2 project and combine them into a holistic architecture which could be deployed by UK DNOs as they transition to DSOs and support full smart grid capability.

Objective(s)

Providing a model for a cost effective solution that is financially viable and can be scaled at a modest & predictable incremental cost.

Consumer Vulnerability Impact Assessment (RIIO-2 Projects Only)

n/a

Success Criteria

Project Partners and External Funding

Potential for New Learning

Scale of Project

To deploy a combination of the following innovative telecommunications technology in a trial configuration at several locations in SPEN's licensed area –

i) Trial new spectrum proposed for release by Ofcom and MOD with high capacity scanning telemetry.

ii) Trial new spectrum proposed for release by Ofcom and MOD with private LTE technology.

iii) Internet of Things (IoT) solution from EE and Vodafone

iv) Broadband powerline carrier

v) Arqiva smart metering telecoms infrastructure

An important part of the trial will be to assess the ability for options i) and ii) above to operate co-located in unused MOD spectrum which if proved feasible will maximise the potential benefits of releasing this spectrum for energy sector use.

Assess each of the above in terms of throughput, latency, reliability, storm resilience and vendor support. Also integrate these communication systems with a selection of RTUs (including those where legacy protocol conversion may be required).

Bring together by means of a common core architecture, a primary and secondary route (typically two of the five listed above) and demonstrate seamless switching between the two during simulated failure of one route (especially focussing on the prioritisation of critical and non-critical traffic)

Produce an overview of commercial reasons why spectrum release of unused MOD allocation (406-430MHz) to the energy sector is favourable to UK-PLC – especially in terms of cost avoidance (increased risk of extended outages) and smart grid enablement.

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A high degree of interoperability between connectivity technology and equipment vendors
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To build upon output of previous innovation projects such as WPD's Falcon & Nexus and UKPN's 'Flexible plug and play' which focussed on a single technology solution or were desktop only exercises.
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Demonstrate capability of an innovative hybrid telecommunication technology approach to serve a wide geographic area
Demonstrate seamless interoperability between numerous 'last mile' connectivity solutions – including trouble free switching between connectivity types in

the event of a failure of the primary connection
Demonstrate connectivity capability (number of devices and data throughput) to support functionality (including analogue data) from state of the art RTUs and Relays throughout the MV network
Develop a business case to gain access to additional radio spectrum in the 400 MHz range in order to facilitate deployment of private wireless networks where appropriate (scanning telemetry and / or private LTE)
Demonstrate the financial benefits of a hybrid solution.
Potential project partners include: - Joint Radio Company (JRC), PNDC, 4RF, Nokia, EE, Virtual Access, WHP Telecoms, Huawei, Vodafone, LS Telkom, Arqiva
From both a technical and commercial perspective, how to optimally utilise several innovative communication technologies to satisfy the requirements of the evolving smart grid.
The project will comprise on-site trials of technology at a small number of primary substations and their associated secondary substations. The project will focus on rural areas of the network as experience has shown that these can be the most onerous locations to achieve satisfactory communications.

Technology Readiness at Start

TRL5 Pilot Scale

Technology Readiness at End

TRL7 Inactive Commissioning

Geographical Area

SPD and SPM license areas. In particular, attention will focus on rural areas of Southern Scotland and North Wales

Revenue Allowed for the RIIO Settlement

N/A

Indicative Total NIA Project Expenditure

£700,000

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)

Significant financial benefits to customers can be expected as a result of the project. The real time dynamic monitoring of existing plant is likely to significantly reduce the number of network re-enforcement schemes which would otherwise need to be implemented. The ability to connect more small scale renewable generation at the periphery of the network and to make use of electric vehicles is of clear financial benefit to customers.

Please provide a calculation of the expected benefits the Solution

The benefits from the deployment of smart grid have been estimated at up to £20bn by 2050. Telecommunications are an essential enabling technology for smart grid and represent a significant investment in their own right. The cost nationally could be of a similar order to the communications infrastructure for smart metering which cost £2.1bn. By trialling a hybrid approach to telecommunications this project will help to inform licensees on the most cost efficient methodologies for smart grid communications with potential financial benefits of £100m to £200m nationally.

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

All UK DNO's are faced with the same challenge around accessing a cost effective, fit for purpose communications system. The successful outcomes and learning from this project would be beneficial to all UK DNOs as they could adopt the same approach to satisfy their telecommunications requirements to enable the transition to DSO model.

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

Unable to be specific, will dependent on systems that others use

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

☐ 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

All UK DNO's are faced with the same challenge around accessing a cost effective, fit for purpose communications system which will support their aspirations to increase the use of renewable energy, large scale battery storage, electric vehicle adoption, extend asset life and improve performance overall. The successful outcomes and learning from this project would be beneficial to all UK DNOs as they could adopt the same approach to satisfy their telecommunications requirements. Additionally, if more UK DNOs adopt the same approach – thereby increasing the size of the UK equipment market, then global hardware vendors are more likely to produce suitable hardware and minimize any risks of vendor lock-in which are often associated with more proprietary systems.

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.

As far as we can determine, this project will not duplicate any innovation projects undertaken by other licensees. It will build upon output of previous innovation projects such as WPD's Falcon & Nexus and UKPN's 'Flexible plug and play' which focussed on a single technology solution or were desktop only exercises.

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

Some of the specific technical elements of the project that have not been tried before include the trial new spectrum proposed for release by Ofcom and MOD with high capacity scanning telemetry, and private LTE technology, both co-located in the spectrum. The overall objective of trialling a hybrid solution in a real world environment is innovative, building on the recommendations of previous desktop exercises.

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

Revenue is not allowed for in the RIIO settlement to fund this trial.

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 project can only be undertaken with the support of NIA due to the technical and operational risks involved. The technical risks are associated with the innovations outlined above which have not been trialled in a real world environment and we can not be certain that the propagation characteristics and immunity to interference etc. will meet modelled expectations until a trial is carried out. The operational risks are associated with the performance of the systems are in relation to aspects such as: - throughput, reliability, latency, cyber security, black start resilience, etc. which will be evaluated during the trial.

This project has been approved by a senior member of staff

☑ Yes