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

Oct 2020

Project Reference Number

NIA_UKPN0065

Project Registration

Project Title

Cleaner Engines

Project Reference Number

NIA_UKPN0065

Project Licensee(s)

UK Power Networks

Project Start

October 2020

Project Duration

2 years and 6 months

Nominated Project Contact(s)

John Field

Project Budget

£433,000.00

Summary

Following the work carried out by Scottish and Southern Electricity Networks (SSEN) deploying single phase hybrid generators using diesel fuel, as part of UK Power Networks' Green Action Plan this project seeks to further identify opportunities to reduce the use of diesel as a fuel. As alternative fuels get introduced, UK Power Networks needs to understand the supply chain, e.g. availability and how they should be safely stored and handled, current legislation, etc.

It is possible the use of diesel fuelled generators will be banned in Central London.

The project will allow all DNOs to understand what measures need to be put in place to reduce their dependency on diesel.

Nominated Contact Email Address(es)

innovation@ukpowernetworks.co.uk

Problem Being Solved

Following the work carried out by Scottish and Southern Electricity Networks (SSEN) deploying single phase hybrid generators using diesel fuel, as part of UK Power Networks' Green Action Plan this project seeks to further identify opportunities to reduce the use of diesel as a fuel. As alternative fuels get introduced, UK Power Networks needs to understand the supply chain, e.g. availability and how they should be safely stored and handled, current legislation, etc.

It is possible the use of diesel fuelled generators will be banned in Central London.

The project will allow all DNOs to understand what measures need to be put in place to reduce their dependency on diesel.

Method(s)

October 2022 Update:

This change request is for approval of a five-month extension to the project (taking the project end date to 31 March 2023) as a result of supply chain delays. Initially, parts for the generators were delayed by the COVID 19 pandemic. More recently, alternate fuel availability has been impacted by conflict in Ukraine. There is no impact on the project budget.

The lessons learned from SSEN showing hybrid generators run efficiently and reduce noise especially at night will be extended to explore the use of alternative fuels such as Biofuel e.g. Hydrotreated Vegetable Oil (HVO), Liquefied Petroleum Gas (LPG) and glycerine. The project will work with identified suppliers to design and demonstrate a number of different hybrid generators using alternative fuels. This will include: converting small 6kW diesel powered mobile generators into a 10kVA hybrid running on biofuel; designing a LPG fuelled hybrid generator and managing LPG as a fuel; and designing a glycerine fuelled three-phase hybrid generator based on the technology developed for Formula E racing to avoid recharging race-cars using a diesel-fuelled generator.

Storage and handling of glycerine, LPG and other fuels will be an integral part of the success to Net Zero. The use of a dedicated bowser and intermediate bulk containers will need procedures developed for safe handling of fuels.

Each unit will be deployed whenever a mobile generator is required and comparisons on performance, efficiency, reliability, customer responses, CO2 and NOx emissions to help UK Power Networks make the right decisions in reducing our carbon footprint down the Net Zero path.

Scope

Using the functional specification for alternative temporary power solutions, i.e. hybrid unit, the project will demonstrate a number of alternative fuelled options:

- Convert two 6kW diesel powered mobile generator into a 10kVA hybrid running on biofuel;
- Design and operate two LPG fuelled hybrid generator and two three-phase glycerine fuelled hybrid generators; and
- Compare and contrast the performance, efficiency, reliability, customer responses, CO2 and NOx emissions to help UK Power networks make the right decisions in reducing our carbon footprint down the net zero path.

The project will also develop the storage and handling procedures for large volumes of these alternative fuels. These procedures will be demonstrated in a depot hosting the alternative fuelled hybrid generators.

This project will inform customer acceptance of non-fossil fuelled hybrid generators, especially customers who have invested in Low Carbon Technologies .

Objective(s)

The project will:

- design, build and operate a number of alternative fuelled hybrid generators to deliver part of our CO2 and NOx emission reduction targets;
- monitor the hybrid generators and analyse the results to determine which options deliver optimum benefits;
- publish storage and handling procedures for large volumes of these alternative fuels; and
- inform the Green Action Plan to facilitate UK Power Networks strategy to reduce the dependency on diesel.

Consumer Vulnerability Impact Assessment (RIIO-2 Projects Only)

n/a

Success Criteria

We will measure success using the following metrics:

1. Different designs of alternative fuelled hybrids will be operated by Network Operations when planned or fault restoration work takes place; and

2. The CBA shows that in spite of the higher capital cost the lifetime cost of operating alternative fuelled hybrids is economic.

Project Partners and External Funding

We plan to purchase alternative fuelled hybrid generators from Aquafuel Research Ltd and Energy Solutions (UK) Ltd.

Potential for New Learning

The project is expected to develop new learning such as:

· sharing the Equipment Specification used to procure the hybrid generators and whole life cost comparisons with diesel equivalents will be made available upon request: and

· developing the storage and handling procedures for large volumes of alternative fuels as well as the operational performance of the hybrid generators.

Scale of Project

The project is limited to two of each type of alternative fuelled hybrid, each has different CO2 and NOx emissions. The operational analysis will illustrate the availability, efficiency and benefits realisation.

Technology Readiness at Start

TRL6 Large Scale

Technology Readiness at End

TRL8 Active Commissioning

Geographical Area

The hybrid generators will operate out of our Ashford, Kent depot.

Revenue Allowed for the RIIO Settlement

None

Indicative Total NIA Project Expenditure

The total expenditure that UKPN expects to incur for this project is £433,000 of which 90% will be recovered from NIA.

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)

The annual savings are based on reduced fuel consumption, reduced CO2 emissions, improved customer service through reduction of noise compliants and greater periods between routine maintenance.

Assuming 50 generators are replaced with a mixture of alternative fuelled hybrid generators the annual saving is calculated to be

NPV : Base Cost – (Method Cost – Method Benefits) up to the end of RIIO-ED2

Base cost	£1,394.30k
Method cost	£1,882.91k
Method Benefits	£1,116.87k
NPV	£628.26k

Please provide a calculation of the expected benefits the Solution

Six alternative fuelled hybrid generators will be trialled in the project.

Base cost	£167.3k
Method cost	£280.5k
Method Benefits	£159.0k
NPV	£46.1k up to the end of RIIO-ED2

Benefits
Avoided responses to noise complaints one per month per area per annum taking one FTE to resolve. £5k
Fuel costs are reduced as hybrids run efficiently compared to an equivalent 30kVA diesel fuelled generator.

Reduced fuel consumption - 80% reduction based on 52 days pa.

Reduced maintenance - 75% reduction saving £1.75k pa
Reduced noise - 80% Unit runs 3 – 4 hours per 24 h day.
CO2 benefits as per CBA spreadsheets about £100 per annum. LPG still produces CO2.

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

If each Network licensee owns and operates mobile generation and their usage to restore supplies is similar to UK Power Networks then the costs and benefits will be similar. SSEN already operates a fleet of small single phase diesel fuelled hybrid generators and could be converted to biofuel.

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

Hybrid generators are still in their infancy. Both SSEN and NPg have trialled battery solutions. Using alternative fuelled generators will be gradual investment influenced by local authorities. A fleet of 10 glycerine fuelled hybrids is likely to cost £560k. If each Network licensee replaces 10 units each year during RIIO-ED2 then the estimate costs of rolling out the Method across GB would be £3m per licensee.

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 learning from this project will be about understanding the storage and handling procedures for large volumes of alternative fuels as well as the operational performance of the hybrid generators.
Whole life cost comparisons with diesel equivalents will be available to justify the necessary investment.

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.

Both SSEN (Hybrid Generator, IFI 2011_14) and NPg (Silent Night NIA_NPG_016) have trialled hybrid battery solutions. The SSEN hybrids are diesel fuelled or charged in the depot. A glycerine fuelled generator has not been trialled in GB. Converting diesel generators to run on biofuel has been carried out, but not in mobile generation. LPG has not been used with mobile generation.

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

Hybrid generators are few in number and currently use diesel as a fuel. This project will develop three differently fuelled and kVA outputs, including a three phase device. The performance and reliability of hybrids and the impact of these units is not clearly understood.

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

There is a significant risk that the alternative fuels are not as available as diesel. The supply chains for glycerine have not been developed. The storage and handling procedures are not fully understood.

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

Hybrid generators are expensive and changing the fuel that they run on increases the risk that operational teams face when restoring electricity supplies to customers especially the vulnerable.

This project has been approved by a senior member of staff

☑ Yes