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

Aug 2018

Project Reference Number

NIA_WWU_051

Project Registration

Project Title

Green City Vision

Project Reference Number

NIA_WWU_051

Project Licensee(s)

Wales & West Utilities

Project Start

August 2018

Project Duration

1 year and 0 months

Nominated Project Contact(s)

Wales & West Utilities – Bethan Winter UK Power Networks – Timothy Staniford Scottish & Southern Electricity Networks – Kate L Jones

Project Budget

£150,918.66

Summary

The project will utilise Wales and West Utilities' Pathfinder Simulator to assess low-cost, technically feasible solutions to produce a 2050 city scenario. The project will encompass a system approach, taking into account heating, electricity and transport, and assess a reference city against defined technology scenarios to inform investment strategies for both the gas and electricity network

Nominated Contact Email Address(es)

innovation@wwutilities.co.uk

Problem Being Solved

A range of solutions are being researched and trialled which offer decarbonisation options for heat, light, power and transport through the use of renewable generation and green gases, along with new technologies. Much of the work to date has focussed on technologies and solutions in isolation and / or on achieving an annual balance. In order to ensure a reliable supply even at peak demand levels, as well as understanding how renewable generation would be constrained / stored at lower demands, it is necessary to understand balancing at least an hourly level. In addition, the increasing interaction between the networks from gas peaking power plant, hybrid heating systems and power to gas means that it is increasingly important to assess energy flows in both vectors in a more holistic approach. This will enable us to invest efficiently across gas and electricity networks to ensure security of supply can be maintained when demand is at its highest.

Method(s)

The project will take a collaborative approach involving a range of stakeholders who will be engaged to provide input in the development of scenarios for a selected city.

The WWU Pathfinder 2050 model, which is a simple, user-friendly, and flexible energy model which can be used to allow assessment

of energy demands across a specific area on an hourly basis, will be used to assess these scenarios to measure effectiveness against decarbonisation, reliability of supply and cost.

The method will include the following steps.

Project Definition Workshop
Produce 'Common' Model inputs
Scenario workshop
Produce Scenario Specific Inputs
Local City Stakeholder Workshop
Review scenarios and simulate using WWU Pathfinder 2050 model
Final scenario workshop
Report writing
Dissemination and presentation

Scope

- Location: As part of the project we will identify and select an appropriate city based on it being representative of other cities in the UK. This will ensure replicability of the learning in other geographical areas. Key requirements for the selected city would include: being on the WWU and Scottish & Southern Electricity Networks (SSEN) network; and that it would be capable of implementing a range of technologies.
- This area should therefore be slightly ahead in terms of the technologies already available, and local stakeholders should already have a good level of understanding of the issues that will be discussed as part of the project.
- A range of new customer types / behaviours to be considered including: electric and gas vehicles; green gas for entry; use of electric and hybrid heating; and heat networks.
- Considering the potential for whole system thinking to address constraints, for example:
    - The potential for storing excess renewable generation by converting to hydrogen and injecting into the gas grid; and
    - The poential of heat storage to minimise the impact of electrification of heat on the electricity network.
- A range of new technologies to be considered including hydrogen storage.
- Use of existing as well as new/alternative WWU models.
- Report on implications of findings, presentation and recommendation for future developments.

Objective(s)

The objective is to assess a city, combining all the energy demands (excluding any very large industry that will have a bespoke plan) now and in the future and matching that against low or zero carbon sources. The aim will be to design a 2050 optimised energy solution for the city that minimises the cost to the consumer. The design/designs will be costed at a feasibility level to assess solutions for this goal.

The main outcome of the work will assist stakeholders as follows:

Wales & West Utilities – understand how the gas network will be used in the selected city to indicate the most effective investment strategy for both current and future gas consumers. If representative, this could be replicated across the GB network.

Electricity Distribution Network Operators – understand how differing solutions may impact on the electricity network, inform their ED2 investment planning and potentially consider a more joined up strategy for energy overall.

Local Government – to assist with decarbonisation strategies for their city.

Consumer Vulnerability Impact Assessment (RIIO-2 Projects Only)

n/a

Success Criteria

Wales & West Utilities – understand how the gas network will be used in a typical city in the UK to indicate the most effective investment strategy for both current and future gas consumers. If representative, this could be replicated across wider parts of Wales and the SW of England.

Electricity Distribution Network Operators (UK Power Networks and SSEN) – understand how differing solutions may impact on the electricity network and to potentially see a more joined up strategy for energy overall. This will allow the Distribution Networks Operators to refresh our position on electrification of heat based on the latest industry development and inform their RIIO-ED2 investment planning.

Local Government – to assist with decarbonisation strategies for their city

Project Partners and External Funding

This project will be led by WWU with Progressive Energy, in collaboration with UK Power Networks and SSEN

Potential for New Learning

• Provide clear evidence based understanding of the impact of decarbonisation on networks and other stakeholders
• The Pathfinder 2050 model has been made available by WWU for general use which will enable others to adopt the learning and undertake similar analysis in other areas

Scale of Project

This project is done at the relevant scale which is a desk top study

Technology Readiness at Start

TRL2 Invention and Research

Technology Readiness at End

TRL3 Proof of Concept

Geographical Area

A city on the WWU and SSEN network that can be representative of other cities in the UK (in order to ensure replicability of the learning in other geographical areas) and capable of implementing a range of technologies.

Revenue Allowed for the RIIO Settlement

None

Indicative Total NIA Project Expenditure

Indicative external & internal costs

WWU: £58,666.66
UK Power Networks: £53,034
SSEN: £39,218

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)

This research project will provide long term savings to GB customers by providing better long term planning decisions. Optimising capacity management and network design through use of improved understanding has the potential to reduce the risk of unnecessary investment. This project will help us to identify the optimal investment to facilitate the decarbonisation of heat across different energy networks.

Please provide a calculation of the expected benefits the Solution

Research Project

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

The chosen city will be a typical UK city and the outputs from the project should be able to be replicated in any city in the UK.

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

On completion of the project dissemination will take place to inform networks of the work completed, including a speaker slot at the the Low Carbon Networks & Innovation Conference. This will enable effective investment efficiently across gas and electricity networks to ensure security of supply can be maintained when demand is at its highest.

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

Gas and electricity planning processes are currently independent with each sector devising its own forecasts and systems. This project will promote a joint approach including the use of Wales & West's Pathfinder model which provides hourly forecasts of both electricity and gas demand based on integrated modelling. This together with other future research studies will provide energy networks with a holistic view and impact assessment allowing them to better predict future requirements and plan investment wisely. This work will support the UK's strategic aim to use smart technologies to help decarbonise energy over the next 40 years and to ensure an integrated energy system across different vectors is introduced to support a green energy future in the UK. It is anticipated that additional benefits will arise from working together and sharing knowledge and best practice which may inform the development of planning processes.

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 WWU Pathfinder 2050 model is the only model we are aware of that specifically addresses the interactions of gas and electricity usage on an hourly basis ensuring that both peak, and seasonal requirements are considered. This will be the first time that both gas and electricity networks have worked together to use this approach to develop and understand the impact of optimal scenarios.

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

Previously studies have focused on the use of renewables in isolation; however this project will provide a holistic view and give an actual scenario for a chosen City, considering all innovative sources of heat, light and power.

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

This is a feasibility study to understand the energy mix to create a decarbonised City. As the outputs are unknown this is a risk to Wales & West Utilities.

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 is undertaking research which will benefit a range of stakeholders including gas and electricity networks and other planners e.g. local authorities. The aim will be to show how a city's energy use can be decarbonised in the best way taking into account a range of metrics including costs, reliability and disruption. Given the benefits are not only to existing gas consumers (bill payers) it is appropriate that funding is sought from outside our normal business as usual arrangements.

This project has been approved by a senior member of staff

☑ Yes