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NIA Project Registration and PEA Document

Date of Submission

Jan 2020

Project Reference Number

NIA_WPD_051

Project Registration

Project Title

Net Zero South Wales – Cross Vector Scenarios

Project Reference Number

NIA_WPD_051

Project Licensee(s)

National Grid Electricity Distribution

Project Start

February 2020

Project Duration

0 years and 5 months

Nominated Project Contact(s)

Sam Rossi Ashton, Bethan Winter

Project Budget

£152,354.00

Summary

Although the future will be increasingly multi-vector, there is no defined or inherent process for cross-vector network planning at licence area and local level. For example, network and geographical areas used in single vector planning do not currently align as they are conceived to address specific network infrastructure and operation in gas and electricity. There is currently no detailed understanding of the net zero implications on energy networks at a licence area and distribution network level, including understanding the uncertainties and interaction between multi-vector technologies (such as hydrogen)

This project will develop a process and methodology by which both gas and electricity network operators can conduct local level joint scenario planning in a region or licence area and improve understanding of the impacts of a set of net zero carbon pathways on the distribution network, within a single licence area.

Third Party Collaborators

Regen

Problem Being Solved

The UK energy system is going through a significant transition as it moves towards a more decentralised and net-zero carbon energy system. Renewable and other low-carbon technologies are expected to dominate the future system, which will also feature widespread “smarter” new technologies.

Already the growth of decentralised electricity generation has led to local and regional network constraints, meaning electricity network operators have needed to become more proactive and sophisticated in how they plan for, and manage, future network connections.

In 2019, the UK government legislated to commit to achieving net zero carbon emissions by 2050. This landmark legislation is a significant increase from the 80% commitment made in the original Climate Change Act. It will require a far faster and deeper transformation than previously anticipated, and has implications for how distribution scenario processes are conducted, increasing the need for cross-vector planning and solutions.

Although the future will be increasingly multi-vector, there is no defined or inherent process for cross-vector network planning at licence area and local level. For example, network and geographical areas used in single vector planning do not currently align as they are

conceived to address specific network infrastructure and operation in gas and electricity. There is currently no detailed understanding of the net zero implications on energy networks at a licence area and distribution network level, including understanding the uncertainties and interaction between multi-vector technologies (such as hydrogen).

Method(s)

The project comprises of five stages:

Stage 1 -Project clarification and baseline/pipeline data collation.

Stage 2 - Extend and harmonise South Wales projection models.

Stage 3 - Frame a high-level UK net-zero 2050 scenario.

Stage 4 - Model net zero outcomes in South Wales to 2050.

Stage 5 - Distribute net-zero sensitivity pathways geographically.

Scope

Undertaking this assessment will:

- Provide WPD and WWU with a shared view of bottom-up and evidenced-based forecasts to inform their long-term investment planning.
- Enhance WPD and WWU's ability to identify likely future hotspots and pinch points within their networks, thus highlighting their key areas for network investment.
- Provide a basis to analyse the impact of changes in demand and supply on both the gas and electricity networks at a more granular level.
- Enable a better shared understanding of the likely impact of cross-vector disruptive technologies and sources of supply, including electric vehicles, alternative heating supply technologies (e.g. heat pumps), hydrogen blending/networks and biomethane.
- Provide evidence that WPD and WWU's network forecasting and investment planning are aligned with:
 - o Different net zero pathways, and adaptive to the impacts of decarbonisation.
 - o South Wales regional and local development and infrastructure priorities, specifically regional and local city region authorities and LEPs.
 - o Welsh Government's objectives and policy priorities around energy supply, domestic and commercial energy use and decarbonisation.

The methodology and learning in this analysis will also influence and improve future energy scenarios produced for other distribution networks, and lead to better investment outcomes for consumers.

Objective(s)

1. Develop a process and methodology by which both gas and electricity network operators can conduct local level joint scenario planning in a region or licence area. This would include identifying shared definitions and building shared operational understanding, geographical areas, approaches to assessing the evolution of energy generation and supply, along with changes in demand and flexibility.
2. Understand the impacts of a set of net zero carbon pathways on the distribution network, within a single licence area.

Consumer Vulnerability Impact Assessment (RIIO-2 Projects Only)

n/a

Success Criteria

The project will be successful if:

- It produces learning about the operation and network impact of cross-vector technologies. This will be evidenced through a net-zero cross vector methodology that will be developed through the project and disseminated to other GDNs and DNOs; and
- The results of the analysis, the dataset and companion report, are used to inform National Grid's transmission and distribution study in South Wales.

Project Partners and External Funding

The project will be delivered by the Regen project team with review and input by collaboration partners WPD and WWU at key stages including project. This will include a dedicated workshop in late January/early February and a webinar in early March.

No external funding will be used for this project.

Potential for New Learning

The methodology developed in this analysis will help improve the development and use of future net-zero cross vector energy scenarios produced for WPD, WWU and other networks. This will lead to more effective planning process for future network investment. Specifically, this process will support:

- Decarbonisation and planning for net-zero for distribution networks – it will in particular support improved network planning for technologies with a cross vector impact such as hybrid heat pumps.
- Efficient and effective scenario processes – a key impact would be to update the methodologies currently used for distribution scenario processes, to allow the outputs from these studies to be utilised by other stakeholders in addition to gas and electricity networks.

Scale of Project

South Wales is the area identified for the study. This is for a number of reasons: firstly, because the gas and electricity network distribution licence areas are well aligned in this area; secondly, there is also a significant level of existing data and insight about this licence area, through Regen completing South Wales DFES studies for both WWU in 2019 and WPD in 2018. Thirdly, the results of this study will input into a National Grid transmission and distribution study in South Wales.

Technology Readiness at Start

TRL2 Invention and Research

Technology Readiness at End

TRL4 Bench Scale Research

Geographical Area

The project will cover the combined WWU and WPD South Wales licence area. This area has a diverse geography including rural, urban and industrial areas. It also has a significant level of distributed generation, which means the licence area is currently ahead of other parts of the UK in terms of decentralisation. The area also has high potential for industrial hydrogen networks. As a result, it presents a useful case study area that will highlight key cross-vector technology issues which are likely to be crucial to achieving net-zero in licence areas across GB.

Revenue Allowed for the RIIO Settlement

N/A

Indicative Total NIA Project Expenditure

Total budget	£152,354
WPD funding	£7,618
WWU funding	£7,618
NIA funding	£137,119

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)

Enabling network operators to better identify where gas and electricity usage interaction could improve flexibility and resilience of the energy system. As an example the Freedom trial of the impact of hybrid-heat pumps was estimated to create a £40 benefit per household through offsetting DNO reinforcement costs.

Please provide a calculation of the expected benefits the Solution

There are approximately 1mn domestic connections in South Wales, if the project could facilitate 1% of them fully realising the benefits of hybrid heating as a consequence of this project learning, then the gross financial benefit would equate to £400k from a project spend of £152k.

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

Cross vector solutions can be utilised at every gas-connected dwelling within the UK. As such, the project method is highly replicable.

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

There is no perceptible cost for additional network operators to adopt the cross-vector network planning solutions developed during this project

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 project output will provide other network licenses with:

- A methodology and assumptions technical companion report. This would detail the process and key assumptions and outputs made in the project by factor and technology.
- An innovation learning report for dissemination. This report would synthesise the learnings and make recommendations on processes and approach to cross-vector modelling methodology at distribution network level.

These outputs would be disseminated to other organisations to support new cross-vector studies, as well as apply to updating methodologies used for single energy vector analyses.

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.

This is a unique scenarios partnership project between WPD and WWU covering a shared distribution licence area.

It will be developing a new methodology that will build consistency between how DNOs and GDO's model potential decarbonisation pathways up to 2050 and understand the impact of cross-vector technologies on both distribution networks.

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

There is currently: - No defined or inherent process for cross-vector network planning at licence area and local level. For example, network and geographical areas used in single vector planning do not currently align as they are conceived to address specific network infrastructure and operation in gas and electricity; and - No detailed understanding of the net zero implications on energy networks at a licence area and distribution network level, including understanding the uncertainties and interaction between multi-vector technologies (such as hydrogen).

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 project could not proceed without innovation funding due to the technical and commercial risks associated. This includes the risk that pursuing the wrong mix of cross-vector solutions would incur higher network costs than the status quo.

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 looks to investigate the least cost route to net zero whilst coordinating both gas and electricity. Due to the commercial risk (potential for cross-vector solutions to be more expensive than the status quo) as well as the technical risk (going on to trial solutions not yet proven in the UK) the NIA is the best route to support the project.

This project has been approved by a senior member of staff

Yes