WESTERN POWER DISTRIBUTION
Serving the Midlands, South West and Wales

Date of Submission

NIA Project Registration and PEA Document

Notes on Completion: Please refer to the **NIA Governance Document** to assist in the completion of this form. Please use the default font (Calibri font size 10) in your submission. Please ensure all content is contained within the boundaries of the text areas. The full-completed submission should not exceed 7 pages in total.

Project Registration

Project Title		**Project Reference**
Net Zero South Wales – Cross Vector Scenarios		**WPD_NIA_051**
Funding Licensee(s)	**Project Start Date**	**Project Duration**
Western Power Distribution (South Wales) Wales & West Utilities Ltd	February 2020	Years: 0 / Months: 4
Nominated Project Contact(s)		**Project Budget**
Sam Rossi Ashton, Bethan Winter		£152,354

Contact Email Address

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Lead Sector

Electricity Distribution	☒	**Gas Transmission**	☐
Electricity Transmission	☐	**Gas Distribution**	☐

Other Sectors

Electricity Distribution	☐	**Gas Transmission**	☐
Electricity Transmission	☐	**Gas Distribution**	☒

Research Area

Network improvements and system operability	☐
Transition to low carbon future	☒
New technologies and commercial evolution	☐
Customer and stakeholder focus	☐
Safety, health and environment	☐

Problem(s)

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:
    - Different net zero pathways, and adaptive to the impacts of decarbonisation
    - South Wales regional and local development and infrastructure priorities, specifically regional and local city region authorities and LEPs
    - 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.

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 GDNOs 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.

Technology Readiness Level at Start	Technology Readiness Level at Completion
2	4

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.

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 in the RIIO Settlement

N/A

Indicative Total NIA Project Expenditure

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

Project Eligibility Assessment

Specific Requirements 1

1a. A 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 systems and 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	☐

Specific Requirements 2

2a. Has the Potential to Develop Learning That Can be Applied by all Relevant Network Licensees ☐

Please answer one of the following:

i) Please explain how the learning that will be generated could be used by relevant Network Licenses.

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.

ii) Please describe what specific challenge identified in the Network Licensee's innovation strategy that is being addressed by the Project.

N/A

Is the default IPR position being applied?

Yes	☒
No	☐

If no, please answer i, ii, iii before continuing:

i) Demonstrate how the learning from the Project can be successfully disseminated to Network Licensees and other interested parties

ii) Describe how any potential constraints or costs caused, or resulting from, the imposed IPR arrangements

iii) Justify why the proposed IPR arrangements provide value for money for customers

2b. Has the Potential to Deliver Net Financial Benefits to Customers ☒

Please provide an estimate of the saving if the Problem is solved.

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 financial benefits of a Development or Demonstration Project (not required for Research Projects). (Base Cost – Method Cost, Against Agreed Baseline).

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 in terms of the number of sites, the sort of site the Method could be applied to, or the percentage of the Network Licensees system where it could be rolled-out.

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.

2c. Does Not Lead to Unnecessary Duplication ☐

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 Requirements

Please identify that the project is innovative (i.e. not business as usual) and has an unproven business case where the risk warrants a limited Research, Development or Demonstration Project to demonstrate its effectiveness ☒

i) 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).

ii) Please identify why the Network Licensee will not fund such a Project as part of its business as 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.

iii) 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.

Additional Registration Questions

These are required for summary section of registration; some areas can be copied from sections above.

Technologies (select all that apply)

☒ Active Network Management	☐ Environmental	☐ Network Monitoring
☐ Asset Management	☐ Fault Current	☐ Overhead Lines
☒ Carbon emission Reduction Technologies	☐ Fault Level	☐ Photovoltaics
☐ Commercial	☐ Fault Management	☐ Protection
☐ Condition Monitoring	☐ Harmonics	☐ Resilience
☒ Community Schemes	☐ Health & Safety	☐ Stakeholder Engagement
☐ Comms & IT	☒ Heat Pumps	☐ Substation Monitoring
☐ Conductors	☐ High Voltage Technology	☐ Substations
☐ Control Systems	☐ HVDC	☒ System security
☐ Cyber Security	☒ Low Carbon Generation	☐ Transformers
☐ Demand Response	☐ LV & 11Kv Networks	☐ Voltage Control
☒ Demand Side Management	☐ Maintenance & Inspection	☒ Gas Distribution
☒ Distributed Generation	☐ Measurement	☐ Gas Transmission
☒ Electric Vehicles	☐ Meshed Networks	☒ Electricity Distribution
☒ Energy Storage	☐ Networks Automation	☐ Electricity Transmission

Project Short Name

Net Zero South Wales

Project Introduction

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.

Project Benefits

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.

PEA Version	**1**		
	Name and Title	**Signature**	**Date**
Prepared by			
Approved by			