

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.

Network Licensees must publish the required Project Progress information on the Smarter Networks Portal by 31st July 2014 and each year thereafter. The Network Licensee(s) must publish Project Progress information for each NIA Project that has developed new learning in the preceding relevant year.

NIA Project Annual Progress Report Document

Date of Submission

Jun 2022

Project Reference

NIA_WPD_065

Project Progress

Project Title

Demand Forecasting Encapsulating Domestic Efficiency Retrofits (DEFENDER)

Project Reference

NIA_WPD_065

Funding Licensee(s)

WPD - Western Power Distribution (South Wales) Plc

Project Start Date

March 2022

Project Duration

1 year and 1 month

Nominated Project Contact(s)

Nick Devine

Scope

Absent network monitoring on the HV and LV networks to provide measured load data, network loading is typically forecast using a profile class-based allocation method. Load growth due to LCT connections such as heat pumps is calculated from technology baselines and added to these profile classes. Traditional network connection costs are met by both the user and the DNO and its customers. As such, when connection assessments identify reinforcement needs, the costs to both increases. It is likely that current methods are overestimating these requirements by overstating the existing and future demand on these networks by not incorporating demand shifts due to energy efficiency retrofits.

Incorporating real pre- and post-retrofit energy demand data, into network modelling will provide a more realistic picture of the current and future demand of domestic buildings. It is expected that these profiles will lower the overall forecast demand, both in maximum demand and in representative daily profiles. This would allow for significant cost saving in new connection and general reinforcement expenditure by reducing the need for both. In the long term, these savings can be passed along to customers in DUOS charge reductions. Savings may also be passed along to connection applicants and customers by reducing or eliminating reinforcement charges.

Currently, within the R10-ED2 Business Plan it is projected in WPD's Best View that there will be an approximately increase in peak demand of more than 2GW, resulting in a primary and secondary reinforcement spend in ED2 of £635m, at a cost of approximately £318k per MW. Around 600k heat pumps are expected to be installed within the same period, increasing electrical demand from

heating by approximately 1.8GW under current modelling estimates. A 6% reduction in this demand due to energy efficiency retrofit, as per a 2020 Committee on Climate Change study on residential heat decarbonisation trajectories, could result in an estimated £38m in reinforcement savings in ED2 alone.

Objectives

Develop an understanding of the electricity demand profile of UK domestic building stock pre- and post-retrofits to building fabric.

Produce a methodology for integrating pre- and post-retrofit domestic demand profiles into network forecasting.

Assess the potential savings on network reinforcement and flexibility from accounting for energy efficiency in demand forecasting.

Perform an economic assessment of the potential benefits to networks from increased penetration of domestic retrofit interventions.

Success Criteria

A profiling tool will be delivered which is capable of generating archetype demand profiles for domestic buildings pre- and post-retrofit, including transference from gas to electric heating.

An investment appraisal tool will be delivered which is capable of supporting analysis of the business case for WPD investing or promoting energy efficiency as constraint management option.

The economic assessment will identify what, if any, are the most certain potential benefits to networks from energy efficiency.

The economic assessment will identify what, if any, are the opportunities to pursue these benefits within the existing regulatory and commercial landscape.

The profiling tool will be reusable and can be re-run with updated data.

The outputs of these tools can be integrated into distribution network forecasting and planning.

The methodology for the tools will be replicable across all distribution networks.

Performance Compared to the Original Project Aims, Objectives and Success Criteria

The Project kick-off meeting took place in the latter half of March and delivery plan was produced to solve the issues described in the NIA Project Registration Pro-forma:

Objectives:

- Develop an understanding of the electricity demand profile of UK domestic building stock pre- and post-retrofits to building fabric – in progress
 - o The plan for Workstream 1 work packages WP1.1 and 1.2 aims to meet this objective.
 - o Requirements for the tool that will produce this output are being defined in Workstream 0
- Produce a methodology for integrating pre- and post-retrofit domestic demand profiles into network forecasting – in progress
 - o The plan for Workstream 1 work packages WP1.4 aims to meet this objective.
 - o Workshops in Workstream 0 will start development of this methodology at high level.
- Assess the potential savings on network reinforcement and flexibility from accounting for energy efficiency in demand forecasting – not started
 - o The plan for Workstream 1 work packages WP1.4 and 1.5 aims to meet this objective.
- Perform an economic assessment of the potential benefits to networks from increased penetration of domestic retrofit interventions – in progress
 - o The plan for Workstream 2 aims to meet this objective.
 - o Requirements for the tools that will produce this output are being defined in Workstream 0.

Success criteria:

- A profiling tool will be delivered which is capable of generating archetype demand profiles for domestic buildings pre- and post-retrofit, including transference from gas to electric heating – in progress
 - o This is the planned output of Workstream 1 work package WP1.3.
 - o Requirements for the tool are being defined in Workstream 0.
- An investment appraisal tool will be delivered which is capable of supporting analysis of the business case for WPD investing or promoting energy efficiency as constraint management option – in progress
 - o This is the planned output of Workstream 2 work package WP2.1
 - o Requirements for the tool are being defined in Workstream 0.
- The economic assessment will identify what, if any, are the most certain potential benefits to networks from energy efficiency – not started
 - o This is the planned output for Workstream 2 work package WP2.2.
- The economic assessment will identify what, if any, are the opportunities to pursue these benefits within the existing regulatory and commercial landscape – not started
 - o This is the planned output for Workstream 2 work package WP2.2.
- The profiling tool will be reusable and can be re-run with updated data – not started
 - o This will be assessed in the user acceptance testing success criteria in Workstream 1 work package WP1.3.
- The outputs of these tools can be integrated into distribution network forecasting and planning – in progress
 - o This is the planned output for Workstream 1 work package WP1.4.
 - o Workshops in Workstream 0 will start development of this methodology at high level.

Required Modifications to the Planned Approach During the Course of the Project

There are no modifications to the planned approach required at this stage.

Lessons Learnt for Future Projects

Key learning from the project will be made available in the closedown report which will be published on the project web page: <https://www.westernpower.co.uk/innovation/projects/demand-forecasting-encapsulating-domestic-efficiency-retrofits-defender>
Findings from each work package will be summarised in the work package reports which will be published in the same location.

Note: The following sections are only required for those projects which have been completed since 1st April 2013, or since the previous Project Progress information was reported.

The Outcomes of the Project

Project outcomes are not known yet.

Data Access

No new data has yet been gathered in the course of this project.

It is anticipated that use will be made of existing tools and data within WPD's system. Information on WPD's long term network strategy can be found on the Network Strategy web page:

<https://www.westernpower.co.uk/our-network/network-plans-and-information>

Detailed network plans which will be used are available via our Data Portal, which can be found here:

<https://www.westernpower.co.uk/our-network/network-plans-and-information>

Foreground IPR

The Relevant Foreground IPR is:

- All summary reports and technical documentation produced for the work packages described in section 2.2.
- The demand profiling tool, the code for which will be made open source
- The investment appraisal tool

The Relevant Background IPR required to produce this is:

- Hildebrand's smart metering database
- The HTC algorithm learning from the SMETER project, as described in section 2.2
- Carbon Trust's Building Decarbonisation Options Appraisal tool, as described in section 2.2