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

WPD_NIA_057

Project Progress

Project Title

Energy Planning Integrated with Councils

Project Reference

WPD_NIA_057

Funding Licensee(s)

WPD - Western Power Distribution (East Midlands) Plc

Project Start Date

February 2021

Project Duration

1 year and 11 months

Nominated Project Contact(s)

Jennifer Woodruff

Scope

The project will build on the existing process to build a DFES and analyse its impact which is currently used to create WPD's shaping sub-transmission reports which consider the 132kV and EHV networks. It will determine how to create a local energy plan and the impact this will have at LV and HV. The analysis of the networks and the generation of solutions and investment options will consider at least one primary substation in each of the selected trial areas.

The work will be delivered in the following work packages.

WP1 – Trial energy planning area selection
Working with WECA and local authorities the project will select three suitable strategic development areas to reflect the variations between local authorities within the WECA region, a mix of urban and rural geographies, a range of energy requirements including new developments, energy efficiency, energy generation, green gas, transport and opportunities for flexibility and energy storage. During this work package the project will also define the scope and boundaries of the strategic areas and identify key energy opportunities/challenges to be considered.

WP2 – Development of a local energy plan for each area. Including process design, trial design & support tool specification.
During this work package the project will examine the existing planning processes for the local authority, electricity and gas networks. This will involve bringing together DFES data and planning data and energy requirements from local authority and WECA decarbonisation action plans, net zero analysis and existing transport, new development, energy efficiency and heat strategies.

Using inputs from WECA and LA's the project will develop the process to create a Local Energy Plan in a format that can then be compared with, and incorporated into, network DFES forecasts. The process definition will including the data exchanges, timings, roles, methods of engagement, data gathering, forecasting assumptions etc. The Ofgem published Local Area Energy Plan methodology developed by CSE and the Energy System Catapult will be used as a basis.

This process will then be carried for the three trial areas, working with WECA and Local Authority teams, to create Local Energy Plans.

Alongside the development of a Local Energy Plan this element of the project will identify and define the requirements for new and enhanced support tools required for both local energy data exchange, network planning and investment appraisal. The way in which the different investment strategies will be modelled will be decided as will the range of sensitivity analysis required. These decisions will feed into the specifications for the various support tools including :

- New HV analysis tools – see WP4E
- Use of the NIFT toolset for the LV network
- Development of a Plan development support tool – See WP3
- Enhancements to existing gas network analysis tools – see WP4G

WP3 – Plan development support tool – detailed design, development, testing & documentation
This will develop a tool to compare planned investments from the local authority, electricity and gas networks to create an Integrated Investment Plan. The tool will support selecting between options using criteria that reflect the value more holistically, different investment strategies and will identify potential synergies that could be exploited by amending the planned investments. The project will first assess the potential to develop the Cost Benefit Analysis tool developed as part of the Open Networks project to provide the required functionality to avoid duplication of effort if possible.

WP4E – Electricity HV analysis tool detailed design, development & delivery
This work package will automate the process for analysing HV networks and will include the process by which the local energy plans are used to reflect the changes to future load / generation profiles.

WP4G – Gas network analysis tool development
This work package will develop new data assumptions to assist with modelling future gas supplies, storage and demands in general to assist with the creation of the local energy plan. The data areas in scope are:

- the optimum pressure/velocity values for 100% and blended hydrogen
- the capacity impacts of moving to hydrogen due to its lower calorific value
- other capacity impacts of moving to hydrogen due to e.g. different compressibility factors
- bio-methane and within grid compression

The outputs of this work package will be used as a set of analysis assumptions.

WP5G – Gas network Analysis for trial areas
This will use the support tool developed in WP4G to assist with the analysis of the impact of the Local Energy Plans on the gas network. Network investment options will be developed.

WP5E – Electricity network analysis for trial areas
This will use the tool developed in WP4E together with the NIFT to analyse electricity networks associated with at least one primary substation within each trial area and provision of investment options.

WP5 – Network analysis for trial areas
This covers the network analysis for the electricity and gas network in the three trial areas. On the electricity side HV and LV network analysis will be conducted for at least one selected primary substations within each of the trial areas. The analysis will identify the network issues that are encountered in different timeframes and the investments required to ensure the network complies with standards. This will include non-network solutions where possible.

WP6 - Integrated plan development with stakeholders
The Plan development support tool that was created in WP3 will then be used with the data from the network analysis trial areas to create an Integrated Investment Plans for each area.

WP7 - Evaluation & Learning report
The various elements of the project will be evaluated, such as the degree of added value from the Integrated Investment Plan compared to the original separate plans, the sensitivity of the analysis to particular factors, whether the results suggest any shortcuts that could be made in future iterations etc.

WP8 – Dissemination & Closedown
The results of the project will be shared via webinars and reports.

Running alongside the EPIC project, and taking input from the EPIC work package 2, Regen have been commissioned by WECA to complete an Infrastructure Requirements Plan for the South West Bristol strategic area. This high level infrastructure plan will feed into the Infrastructure Master Planning that WECA is currently undertaking for the SW Bristol area. Owing to the timing of the Infrastructure Master Plan (which will be completed by May 2021) this parallel workstream will provide a relatively high level view of the infrastructure requirements of the strategic area which will not involve detailed network planning. Input and benchmark guidance from WPD and WWU network planning teams will however be provided.

This work package is not part of the EPIC NIA budget and will be funded by separate arrangement between WECA and Regen. The EPIC project partners are however happy to support the work to ensure that the EPIC outputs from work package 2 can feed into the SW Bristol study.

Objectives

The objective of the project are to;

- Develop a standardized process that can be used with different local authorities to create a local energy plan.
- To create energy plans for the three trial areas
- To determine how to reflect the local energy plans in the DFES used for network planning purposes
- To disaggregate the DFES data to support LV and HV planning
- To develop a tool to support automated analysis of HV networks and suggest network remedies
- To analyse the HV and LV networks associated with at least one primary substation in the trial areas and provide a view of the network and non-network solutions under different investment strategies
- To develop a tool to allow the investment plans for electricity networks, gas networks and the local authorities to be compared to identify potential synergies
- To use the tool to create an Integrated Investment Plan in the trial areas.
- To refine the processes to reflect the learning gained during the project.

Success Criteria

The project will be judged successful if the following criteria are met.

- The process to create investment plans jointly between electricity and gas utilities and the local authority will have been developed.
- The process will include flexibility and other non-network solutions as options to alleviate network constraints.
- The process will have been applied to develop joint plans for at least three trial areas.
- The process will have been refined to reflect learning from the real-world use.
- The process will have been assessed in relation to the LAEP method document and/or subsequent guidance from Ofgem regarding Local Authority Energy Planning
- A plan development support tool will have been developed to assist with the appraisal of investment options and to provide the evaluations necessary to improve plans e.g. by changing investment combinations, scale, timing etc.
- An HV network analysis automation tool will have been developed so that real network issues can be identified for the energy scenarios and variants.
- The support tools will have been refined to reflect learning from the real-world use.
- The impact of different investment strategies i)“just in time” at point of need investment, ii) “One touch” future proof investment and iii) anticipatory or strategic investment will have been assessed.
- The benefits from the jointly created plans compared to the individually created plans will have been assessed.
- The learning from the project will have been collated into a report and disseminated.

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

The project is in its early stages, only having started in February. Therefore it is too early in the project for objectives to have been achieved, however progress towards these objectives is described below.

- To develop a standardized process that can be used with different local authorities to create a local energy plan - Complete
o A standardized six stage process has been developed and this has been used during the project.
- To create energy plans for the three trial areas - Complete
o Energy plans have been created for the three trial areas which used disaggregated DFES data which was further refined following workshops with the local authorities relevant to each trial area.

- To determine how to reflect the local energy plans in the DFES used for network planning purposes - Complete
o The DFES building blocks to be used for network planning have been agreed including which items should be disaggregated to distribution substation or HV feeder level. The method to include dummy substation to model HV feeder disaggregated items has also been developed.

- To disaggregate the DFES data to support LV and HV planning - Complete
o The appropriate level of disaggregation of the DFES building blocks has been determined and metrics for disaggregation to HV feeder level have been provided.

- To develop a tool to support automated analysis of HV networks and suggest network remedies - Complete
o The (HV NAT) HV Network Assessment Tool has been developed, tested and refined for use on the project.

- To analyse the HV and LV networks associated with at least one primary substation in the trial areas and provide a view of the network and non-network solutions under different investment strategies - Complete
o The LV networks have been assessed using the NIFT (Network Investment Forecasting Tool) this has included the selected primary substation for each of the three trial areas but has also included other areas where the results have been compared to determine how consistent results are in different areas.

- To develop a tool to allow the investment plans for electricity networks, gas networks and the local authorities to be compared to identify potential synergies - Complete
o The Cost Benefit Analysis (CBA) tool developed by the ENA as part of the work for the Open Networks project has been adapted for use by the project and formats for input data files have been agreed so that the NIFT and HV NAT can provide the agreed data in the appropriate format. A set of standard comparison charts has been produced to reduce the effort required to analyse the different use cases.

- To use the tool to create an Integrated Investment Plan in the trial areas - In Progress
o In progress – the CBA tool is currently being used to compare results for the different analysis runs and to draw conclusions.

- To refine the processes to reflect the learning gained during the project - In Progress
o In progress – the learning from earlier stages in the process is being collated but the work to refine the process in light of all the learning will take place later in the project.

The progress against the success criteria given below also reflects the very early stage of this project.

- The process to create investment plans jointly between electricity and gas utilities and the local authority will have been developed - Achieved
o A Six stage process has been developed and has been used within the project.

- The process will include flexibility and other non-network solutions as options to alleviate network constraints - Achieved
o The modelling within the HV NAT has included flexibility as a solution and the NIFT includes a set of other non-network solutions. The NIFT does not include flexibility as a solution , however as distribution transformer upgrades are modelled in the HV NAT for top down analysis this provides a useful insight. At the moment the modelling of flexibility services to resolve constraints on distribution transformers is somewhat speculative as at present the cost and effort required to transfer flexibility services to this level is prohibitive.

- The process will have been applied to develop joint plans for at least three trial areas - Achieved and In Progress
o Energy Plans have been produced for all three trial areas and workshops to support the development of investment plans are underway.

- The process will have been refined to reflect learning from the real-world use.
o This will take place later in the project

- The process will have been assessed in relation to the LAEP method document and/or subsequent guidance from Ofgem regarding Local Authority Energy Planning - Achieved

o The LAEP method document has been used to assist designing the process and to suggest sensitivity analysis requirements. Since then the learning and experience from EPIC has been fed into the various workshops held by Energy Systems Catapult looking at Local Area Energy Planning.

- A Plan Development Support Tool will have been developed to assist with the appraisal of investment options and to provide the evaluations necessary to improve plans e.g. by changing investment combinations, scale, timing etc - Achieved

o The Cost Benefit Analysis tool provided via the Open Networks project has been investigated and the functionality developed will be adapted to the needs of the EPIC project.

- An HV network analysis automation tool will have been developed so that real network issues can be identified for the energy scenarios and variants.

o The HV NAT has been developed and used to analyse the networks in the test areas.

- The support tools will have been refined to reflect learning from the real-world use - Achieved

o The CBA tool has been adapted to include standardised charts and to include standard file imports.

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The impact of different investment strategies e.g. i)"just in time" at point of need investment, ii) "One touch" future proof investment and iii) anticipatory or strategic investment will have been assessed - In Progress

o The network analysis is complete but the work to compare the results in the CBA tool is ongoing.

- The benefits from the jointly created plans compared to the individually created plans will have been assessed.

o This will take place later in the project after the final plans have been determined with the local authorities.

- The learning from the project will have been collated into a report and disseminated.

o This will take place at the end of the project after the results have been evaluated.

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

Minor changes to the delivery of early components within the project have been agreed which do not impact the delivery of later components. This was due to some initial difficulties in acquiring required information. Our original expectation was that local authorities would have specific plans that would result in specific investments that could be individually included or excluded but this was not the case. As such the investment plans are likely to reflect selected policy decisions reflecting the results of the EPIC analysis of the various use cases rather than a set of individually selected investments.

There has been a change in approach for the modelling of the Gas network. Preliminary analysis showed that while there were local areas where demand was increasing for new developments, the overall picture for all scenarios was of declining gas usage as boilers were replaced by heat pumps. This resulted in gas networks that did not require upgrades and therefore there were no gas related investment options to be included in the investment plans. Therefore, to still provide learning on the analysis methods required on the gas side an additional scenario including hydrogen network deployment was created.

Originally the network analysis and investment options were seen as separate stages of analysis. While this still holds true for the LV

NIFT, this was not feasible for the HV Network Assessment Tool which integrates upgrades to the network with the process to analyse the network in different years. This is a beneficial change as it only requires one process rather than two.

The expectations of what will be produced within investment plans has changed. Originally it was anticipated that there would be a small number of significant investment options from the local authority, gas and electricity network operators and that choices to select between the options could be made jointly to form an optimal investment plan. However, there are few investment options put forward by the local authorities and no real investment options from the gas analysis so selecting combinations that exploit trade-offs is not really possible Therefore the investment plan production is expected to focus more on selecting between policy options e.g. should we install more or fewer high speed charging hubs rather than including or excluding individual investment options e.g. should we install a high speed charging hub at location A or location B. This is still a useful part of the process and recent workshops by Energy Systems Catapult into Local Area Energy Planning also concluded that this type of process would be more likely to provide a general steer.

Where changes were significant these were subject to a standardised change request procedure as part of the normal project governance arrangements.

Lessons Learnt for Future Projects

The Trial Area Selection work package generated the following learning;

- Careful consideration of the Strategic Planning Area[1] (SPA) boundary is critical and will be influenced by a variety of factors including location of significant new developments and the boundaries of the Electricity Supply Areas (ESA), which is the area supplied by a primary substation, and the boundary of the Gas Supply Area (GSA) the smallest area of the gas network that can be modelled in isolation.
- As part of the process to define the SPA boundary, several datasets will need to be examined and it will be useful for future users of the process to request these from the networks upfront.
- Effective stakeholder engagement will be a cornerstone of the success of any project using the EPIC process and a stakeholder map and engagement plan is likely to be very useful.

The Local Authority engagement that took place as part of the work to create the local energy plan gave rise to further learning, including that regular and ongoing engagement with local authority stakeholders was vital to the success of the workshops. In the EPIC project, we worked extensively with all the Local Authorities prior to the workshops to provide the background, context and progress-to-date of the project to enable the workshops to focus on the modifications to the baseline DFES data in line with local policies. This early engagement identified a number of additional stakeholders within the Local Authorities whose input would be required for the workshops and who were then invited.

For the EPIC project, and likely for future users of the EPIC process, staff capacity conflicts and resource constraints did cause, and likely will cause, some scheduling issues. In the EPIC project, we tried to mitigate these by:

- Having the ‘right people in the room’ was critical to the success of the workshops. Of course, this was not always possible and some additional stakeholder contacts were identified by the Local Authorities in the first workshops for further engagement on particular topics.
- Although one of the objectives of the first workshops was to agree the quantitative updates to the baseline DFES data, this, again, was not always possible. Often Local Authorities needed to refer to published (or draft) policies after the workshops which took additional time and resource.
- In addition to having the ‘right people in the room’, crucial to a good output is for stakeholders to have had to the capacity to think about and engage in the project.
- Therefore, it may be useful for future iterations of the EPIC process to allow more time between workshops to allow for further stakeholder engagement and information gathering for all parties.

The development of the HV NAT highlighted a number of issues with the underlying data and processing times.

- It had been assumed that the “gaps” between the bottom up and top down analysis, due to distribution substations that could not be modelled within the NIFT and HV connected customers, would be simple to fill but this process ended up being very time consuming. This highlights a general point of requiring good quality data to support automated analysis processes.
- Similarly the SINCAL network model that was used did not support network analysis one feeder at a time as parts of the model HV

feeder attribution[2] were missing.

- In order to improve processing times, hourly rather than half hourly analysis was used and comparison of the results showed that this improved running times without detrimentally affecting the results.

The work to specify and develop the Cost Benefit Analysis tool provided learning around metrics and data integration as follows;

- For user-defined financial metrics (e.g. WACC, capitalisation rate etc.), it's important to ensure the most up-to-date and accurate values are used as these will change with time.
- To ensure compatibility with the Whole Systems CBA tool, it would be useful to pre-define a live "EPIC CBA inputs" workbook where the outputs of the three network analysis tools can be stored for effective data integration with the CBA tool. This would minimise the data manipulation required by the 'EPIC energy planner' and would be the most efficient way to collect and input the required data into the CBA tool.
- Future users of the EPIC process may want to align an approach to reference and locate network demand in the gas and electricity network analysis models. Although a postcode approach was used in project EPIC, a database based on UPRN (Unique Property Reference Numbers) or a combination of gas and electricity meter numbers could ensure more effective, common language that is relevant and meaningful for both the gas and electricity networks.
- For technologies that impact both the gas and electricity networks, it is essential that the same forecasting methodology is used for these technologies by both networks and early agreement on an appropriate forecasting approach will be useful.
- While it was intended to reflect the network benefit from reinforcement work that created spare capacity, it was very hard to specify a metric for this that could be applied consistently across the LV and HV networks and that did not have a value so large as to overwhelm the other benefits and costs in the network analysis. This was overcome by relating the metric to the change in capacity rather than reflecting the entire network capacity.

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

The project has delivered the trial area selection report that outlines the trial areas that have been selected and their key characteristics. As part of the work to develop a combined planning process, working documents have been produced outlining the data model, the approach to disaggregation, the options for sensitivity analysis and how energy efficiency impact can be modelled.

The local energy plans have been created with the input of the local authorities which has involved a great deal of data preparation, disaggregation and the creation of dummy substations to support modelling.

The NIFT tool has been adapted to allow for modelling of energy efficiency and to upgrade the analysis engine from WinDebut to Connect LV before being used to analyse the trial areas and generate results in a suitable format for the CBA tool.

The HV NAT tool has been specified, developed, tested and used to analyse the networks in the trial areas. It has generated results in a suitable format for the CBA tool.

The process to analyse the gas networks, determine the appropriate costs to be used and create suitable output files has been trialled.

The project has highlighted some key areas where data quality is insufficient and would be problematic if the process were to be adopted at scale.

The CBA tool has been configured with appropriate costs and metrics for benefits. The configuration allows for the analysis of multiple use cases and for output files from multiple network analysis tools. The CBA tool has also been enhanced by the inclusion of standard charts.

The learning from EPIC to date has been fed into the workshops held by Energy Systems Catapult in February 2022 in relation to Local Area Energy Planning.

The ongoing analysis will quantify the benefits of different strategies and use cases. The analysis will provide information to understand the impact of different investment strategies, least regret options and the degree to which extended engagement with local authorities and between the gas and electricity network operators results in improved investment plans that will deliver wider benefits.

Data Access

The new data that will be created during the project will include the disaggregated DFES building blocks for each trial area reflecting the local authority estimates and, where these are not available, the network utilities estimates disaggregated to the level required to support the analysis. This will be provided via the published local energy plans. Data will also be embedded within the analysis tools that are developed to reflect the profiles associated with additional heat pumps, electric vehicles etc. These will be based on data provided by previous projects rather than being captured by EPIC, but will be included in the shared learning. The investment plans for the trial areas will also be published.

Foreground IPR

New foreground IPR has been created by PSC in the development of the HV NAT. This tool will be available to third parties however, but they will need to obtain suitable SINCAL licensing to use it.

Additional foreground IPR has been created by Regen in the enhancements that have been applied to the CBA tool developed by the ENA. The upgraded version of the tool will be provided to the ENA for use by interested parties.