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_052

Project Progress

Project Title

Take Charge

Project Reference

NIA_WPD_052

Funding Licensee(s)

WPD - Western Power Distribution (East Midlands) Plc

Project Start Date

April 2020

Project Duration

2 years and 4 months

Nominated Project Contact(s)

Yiango Mavrocostanti

Scope

The duration of the project is expected to be 20 months and will be split across four work packages:

Work Package 1 – System Capacity Optimisation
The first work package will involve assessing the predicted level of demand for all Moto MSA sites within our licence areas to ascertain the optimised capacity to inform the device design. The assessment will utilise data made available through OLEV's Project Rapid, forecast data provided by charging point installers and EV charging data that has been made available from other innovation projects.

This work package will also determine the most appropriate site to trial the new solution. Using the demand data already captured, we will work closely with Moto to assess each potential site against a set of criteria to ensure that the selected site offers the best value in terms of costs and benefits for the trial.

Work Package 2 – Develop and Design the Connection Solution
The second work package will use the information gathered in the first work package and produce the design requirements and detailed functional specification for the new package solution. The design will be focused on developing a solution with most of the capabilities of a conventional substation but in a far more compact and low cost solution. Another key element will be complete off-site assembly and testing, ensuring a standard design to minimise on site construction activities, reducing cost and time to connect.

The design will be developed in conjunction with Brush, who will be building the new solution and have a wealth of experience in the

design and installation of switchgear and transformers.

Work Package 3 – Build and Install the Connection Solution
In the third work package we will coordinate with Moto to install and integrate the innovative new solution at the chosen trial site determined in work package 1. The new solution will be connected to our existing 33kV network and will integrate with the 11kV network that currently supplies the trial site. The solution will therefore supply existing EV charging infrastructure and the new charging infrastructure planned by Moto. The new solution will also be connected to our Network Management System (NMS) to provide our engineers with the necessary levels of control and visibility of monitoring information.

Work Package 4 – Trial and Evaluation
The last work package involves a six month trial period to evaluate the performance of the new solution and capture the associated learning following connection to the live network. Working alongside Moto, we will assess how the new solution performs against the original aims of the project and verify the benefits that have been generated.

Information on the technical performance of the solution will be regularly reported both internally within WPD and externally to the wider industry via number of dissemination events. The results of the project will also be captured in a report produced by the project partners.

Objectives

The project objectives are as follows:

- Determine the optimal capacity for the new solution
- Select an appropriate site to install the new solution
- Produce a standardised design for large capacity, compact substations at MSAs
- Manufacture, install and energise the new solution at the trial site
- Measure and demonstrate the effectiveness of the new solution on the live network
- Analyse the findings from the trial and collate results that can be shared and disseminated across the industry
- Minimise disruption to Moto's business operation during the trials

Success Criteria

The project success criteria are as follows:

- Analysis of information and data to inform the design of the new solution
- Selection of a suitable trial site for the installation
- Development of a design for the new package solution
- Installation and integration of the new package solution at the trial site
- Monitor and analyse information and data during the trial phase
- Dissemination of key results, findings and learning to internal and external stakeholders

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

The performance compared to the original objectives is detailed as follows:

1. Determine the optimal capacity for the new solution - Completed

This objective has now been fulfilled as part of the Work Package 1 activities. Following the selection of the trial site, a detailed study was carried out to establish the capacity requirements for the Compact Connection Solution (CCS). The chosen capacity for the trial site was calculated to be 12 MVA and further details can be found in the System Capacity Optimisation report which is available on the project webpage.

2. Select an appropriate site to install the new solution - Completed

The trial site was chosen in August 2020 following a detailed analysis of 13 shortlisted sites across all four WPD licence areas. The chosen trial site is Exeter MSA in our South West licence area, adjacent to the M5 motorway. Therefore, this objective is now complete and further details can be found in the Site Selection Methodology report which is available on the project webpage.

3. Produce a standardised design for large capacity, compact substations at MSAs - Completed

The first stage of the design was completed in late 2020 and the detailed functional specification for the CCS is available on the project website. The full detailed design of the CCS was completed in Summer 2021, including the designs required for the site installation at Exeter MSA.

4. Manufacture, install and energise the new solution at the trial site - Completed

All the equipment for the CCS was manufactured by October 2021. The equipment comprised of a 33/ 11kV transformer and switchroom containing 33 kV switchgear, 11 kV switchgear, protection equipment and auxiliary equipment. The equipment was installed on site in April 2022 and work is currently underway to connect the equipment to the live network. It is anticipated that the CCS will be energised in June 2022.

The three remaining objectives relate to the trial and dissemination stages which are expected to commence once the CCS is energised in June this year:

5. Measure and demonstrate the effectiveness of the new solution on the live network – Not Started

This will commence once the new solution is connected to the live network. The effectiveness of the new solution will be compared against more traditional approaches and any learning points will be captured and disseminated with the wider DNO community.

6. Analyse the findings from the trial and collate results that can be shared and disseminated across the industry – Not Started

Following completion of the trial the project team will collate all the relevant documentation, findings and learning points and share this with the wider DNO community and other interested stakeholders. The project learning will be disseminated at various industry events and conferences.

7. Minimise disruption to Moto's business operation during the trials – In Progress

Any disruption to Moto and their operations needs to be minimised to ensure that they can continue provide the same levels of service to the customers. The design of the new solution has meant that there was no disruption during the installation phases and it is expected that the trials will be conducted without any issues.

The performance compared to the success criteria is detailed as follows:

1. Analysis of information and data to inform the design of the new solution - Completed

This criterion was met as part of the activities in Work Packages 1 and 2. The functional specification for the CCS was developed and published following completion of the System Capacity Optimisation report (available on the project webpage) and various discussions and meetings with internal and external project stakeholders. The functional specification sets out all the design parameters required to build and install the CCS, and is available on the project webpage.

2. Selection of a suitable trial site for the installation - Completed

The selection of the trial site was completed as part of Work Package 1 and involved a detailed assessment of all available sites in conjunction with Moto. Exeter MSA was determined to be the most suitable site due to location, number of customers and proximity to a suitable 33 kV Point of Connection (PoC). Details can be found in the Site Selection Methodology report, which is available on the project webpage.

3. Development of a design for the new package solution - Completed

The full design for the CCS has now been completed with all components manufactured, tested and delivered to site. The functional specification for the CCS is available on the innovation website as mentioned above and further information shall be disseminated on the design during the project closedown phase.

4. Installation and integration of the new package solution at the trial site – Completed

This criterion was met as part of the activities in Work Package 3 which is now complete. The 33 kV circuits to the CCS have been installed and all equipment has been delivered and installed at the trial site. Work is underway to energise the CCS on the live network which will allow the main project trial to begin.

The last two success criteria relate to the CCS project trials and dissemination of the project outcomes and learning. These success criteria are scheduled to be completed in the coming months:

5. Monitor and analyse information and data during the trial phase – Not Started

This success criteria will be evaluated once the new solution is connected to the live network. The data, information and feedback from the trial will be captured and any learning points will be disseminated with the wider DNO community.

6. Dissemination of key results, findings and learning to internal and external stakeholders – Ongoing.

This progress against this success criterion is ongoing. As discussed in Section 7, we have disseminated various project documentation on the project website and have presented at various events on the progress and learning to date.

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

A modification to the planned approach for Take Charge was implemented during this annual reporting period relating to the project budget and timescale.

As reported in our six monthly progress report for April to September 2021, there were a number of delays to obtaining Planning Permission for the new CCS. However, permission was eventually granted and conditions were met allowing work to begin on site in late January 2022. The delays to the start of the civil installation required a change request to extend the project end date to July 2022. In addition, the cost of materials and labour for the installation of the 33 kV cables and new CCS have increased significantly since the project budget was initially prepared.

These changes to the planned budget and timescales prompted a change request process which was managed using our standard project governance procedure. The first step involved reviewing and updating the original business case to confirm that the project would still deliver value for money. The revised business case demonstrated that, despite the increase in costs, the project would still deliver substantial value for money compared with the traditional solution. Following approval of the change request for increased funds and new end date, an updated PEA was registered on the ENA Smarter Networks Portal and the project was able to progress into the installation phase.

With the trials about to commence on the project, no further modifications to the planned approach are expected and we intend to finalise the project in July 2022.

Lessons Learnt for Future Projects

A number of lessons have been learnt on the project over the last year. These are summarised as follows:

Design

The design phase has seen several key points captured through discussions and dialogue between internal WPD policy engineers and Brush. The learning points listed below are valuable to ensure the CCS is fit for purpose:

· WPD's standard policy for neutral earthing requires a reactor. However, as the CCS is designed to be low maintenance and compact, a resistor is a more suitable option for this application. The NER for the project is based on the standard Engineering Equipment (EE) specification. However, as the CCS is designed as a package substation it might be possible to reduce the size of the NER by refining the design. This would help to reduce the footprint of the next iteration of the CCS;

· The route feasibility study revealed all the important services along the route of the 33 kV cable. It was discovered that there is a 1.35m diameter storm drain across the front of the entrance to the connection point of the CCS, Sowton Bulk Supply Point (BSP). This, along with congested services, meant that we pursued a more risk averse approach by using directional drill techniques at the other side of the Sowton BSP to avoid any potential conflicts;

· The cable contractors engaged for the project have proposed the use of a vacuum excavator to remove soil and material from around trees protected by TPOs. The use of this technique helps to protect tree roots and prevents the need to remove or disturb trees;

· The fit-out of the switchroom container took longer than originally planned. This was due to long-lead time materials and issues with the interpretation of the design. For future installations we would recommend that the following items should be considered:

o Changing the current Steel-Wire Armoured (SWA) multicore cables to those with standard insulation and encapsulated within metal trunking to provide mechanical protection. This would allow installation to be improved.

o Minor repositioning of equipment, including the RTU, to allow to shorter lengths of interconnecting cables.

o Reducing the size of the marshalling cabinet to minimise the volume of wiring.

· The new substation was designed with a simple bund to contain the transformer ester insulating fluid in the event of catastrophic failure. The ester-fluid used is environmentally friendly and whilst there is no need to bund the transformer, it was decided that any spills should be contained. Following further discussions, there was a requirement for an interceptor and associated equipment to be installed on this trial unit. For future units it will be worth considering the need for this and how best to optimise the bund solution; and

· The initial results of the surveys at the new site indicated that the ground at Exeter Moto had a poor load bearing capacity. Further investigations were carried out following mobilisation of the civil engineering contractor and, although the ground conditions were sub-optimal, only minor work was required to remedy the situation. For future projects, we would recommend that further intrusive surveys are completed in advance for sites with poor load bearing capacity.

Planning and delivery

The planning and delivery of the project has generated various key learning points. These points would be applicable to any project that is looking to establish new infrastructure and have been shared within our teams:

· As part of the planning process we decided to engage early with the local council. Following initial discussions with Exeter City Council we discovered that all trees around the Motorway Service Area are subject to Tree Protection Orders (TPOs). The trees are not a species of particular interest; however, it was apparent that the council wants to retain as much green space as possible. In future for such sites we would look to carry out a search of TPOs before starting with the design;

· The TPO areas around the MSA site have resulted in additional work and delays which were not foreseen at the start of the project. Although a tree survey was completed and submitted as part of the planning application, the local authority requested further details and included these as conditions in the planning award. For future installations, we would recommend that a detailed Tree Protection Plan (TPP) and Arboricultural Method Statement are prepared in advance of the planning application and submitted along with other relevant documentation. This will help to avoid unnecessary delays; and

· There have been numerous activities relating to additional surveys and searches for wayleave purposes. These have included further ecological surveys and land owner searches along the route of the 33 kV cable. These items have arisen as the project has progressed with only minimal notice. For future projects, any new asset installations should consider all these aspects at the very start of the project.

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 is currently transitioning into the trial phase and several key outcomes have already been captured and published on the project website.

The following list gives a summary of the project's outcomes since the last reporting period:

· Engagement with customers who will connect to the new CCS

· Planning permission obtained for the new CCS

· All civil work completed for the new CCS despite challenging conditions

· All major components now manufactured, tested and delivered to site

· 33 kV circuits installed between the source substation and the CCS

· Technical paper presented at the CIRED 2021 conference

The outcomes of the project have also been disseminated to the wider DNO community and the public during presentations at the CIRED 2021 (virtual event on 20-23 September 2021) and the Energy Networks Innovation Conference (12-15 October 2021). A

number of learning documents have also been published on the innovation website as follows:

- Site selection methodology
- System capacity optimisation
- Functional specification
- Regular progress reports (Apr-Sep 2020, Oct 2020-Mar 2021 and Apr-Sep 2021).

Data Access

The up-to-date outputs from the project can be found on the dedicated project website. The website contains the relevant reports and information that has been generated by the project team along with the latest progress summary.

Further details can be requested by contacting the WPD's Innovation Team (wpdinnovation@westernpower.co.uk).

Foreground IPR

No foreground IPR has been generated.