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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\_049

## Project Progress

### Project Title

Electric Nation - PoweredUp

### Project Reference

NIA\_WPD\_049

### Funding Licensee(s)

WPD - Western Power Distribution (East Midlands) Plc

### Project Start Date

January 2020

### Project Duration

2 years and 7 months

### Nominated Project Contact(s)

Ricky Duke

## Scope

The scope of the project is to engage and recruit between 90-110 participants to install V2G charging and control equipment in domestic properties across WPD's four licence areas. The chargers will be split into various groups of similar size and assigned to the on-board energy suppliers (up to 5). Each supplier will then use their group of chargers to test their various energy services utilising Crowd Charge's demand management charger platform which provides optimised charging sessions, whilst keeping within the DNO network limits. The effect of these services on the LV network will be modelled and reported on, including the use of this real world V2G data in a network assessment tool.

## Objectives

The aims of the project are as follows:

1. Explore and report on the impact of V2G charging on the LV network utilising end-user trial charging data and analysis.
2. Demonstrate, via modelling, to what extent V2G can assist with management of LV network demand.
3. Examine how sophisticated dynamic bi-directional energy services based on vehicle battery storage, from a variety of energy suppliers, may impact the LV infrastructure.
4. Provide recommendations for policy and commercial frameworks on V2G services.

## Success Criteria

The success of the Electric Nation V2G project will be based on:

1. Presentation of the final report, data analysis and project's findings to WPD and key industry stakeholders at the dissemination event, held in the first quarter of 2022.
2. Recommendations/suggestions to WPD's V2G services policy and commercial frameworks.
3. Specify and provide a standard dataset that can be used by a network modelling tool to evaluate impact of V2G charging on LV networks.
4. Using a network modelling tool to forecast the effects of V2G charging at varying levels of uptake; this will be based on a mix of dynamic bi-directional energy services.

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

### Aims & Objectives

- Explore and report on the impact of V2G charging on the LV network utilising end-user trial charging data and analysis -Ongoing  
-This objective is part of the main trial which began in June 2021, we are currently monitoring trial participants utilising their assigned energy proposition. A report on initial findings has been submitted for review with a final report due in July 2022.
- Demonstrate, via modelling, to what extent V2G can assist with management of LV network demand - Ongoing  
- This work package is being carried out by EA technology (EATL), it will utilise trial data to determine and validate V2G profiles and model the LV network utilising the LV planning tool developed in Electric Nation.
- Examine how sophisticated dynamic bi-directional energy services based on vehicle battery storage, from a variety of energy suppliers, may impact the LV infrastructure - Ongoing  
- Trial participants who are signed up to four different energy suppliers with each supplier providing a different energy proposition are being monitored. The most interesting learning point so far is that V2G services reduce diversity of charging demand but is also heavily influenced by suppliers tariffs. The DNO, supplier and customer relationship will be instrumental in providing flexibility.
- Provide recommendations for policy and commercial frameworks on V2G services - Ongoing  
-This objective is part of the main trial which began in June 2021, all learning from the main trials will be used to provide recommendations for policy and commercial frameworks on V2G services

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

- Presentation of the final report, data analysis and project's findings to WPD and key industry stakeholders at the dissemination event, held in the first quarter of 2022 – Ongoing  
- The main dissemination event has been postponed due to the final report being delayed, this is a result of the impact that COVID-19 has had on the project installations delaying the trial,. All other aspects, including trial data and deliverables have been on time and this has had no financial impact on the project. The project team will be holding webinars in June 2022 and exploring dissemination at the CENEX LCV event in September 2022.
- Recommendations/suggestions to WPD's V2G services policy and commercial framework -Ongoing --The Business Requirements workshop took place on the 10th of March 2020 in Avonbank, Bristol. This workshop included WPD District Planning staff and members of the WPD Planning Policy and Network Strategy teams, further improvements will be recommended/suggested as the project continues.
- Specify and provide a standard dataset that can be used by a network modelling tool to evaluate impact of V2G charging on LV networks - Ongoing  
- EATL to deliver new load profiles that can be used within Connect/LV planning tool and CrowdCharge submitted standard datasets within the DNO group analysis report which is currently under review.
- Using a network modelling tool to forecast the effects of V2G charging at varying levels of uptake; this will be based on a mix of dynamic bi-directional energy services -Ongoing  
-WPD began implementing the network assessment tool within our business as 'Connect/LV', the V2G profiles and data from the main trials will feed into this tool and enable better assessments of local networks. Standardised load profiles to be provided to network strategy for better forecasting of V2G and V2H features.

## Lessons Learnt for Future Projects

From monitoring trial data and customer behaviour, it is obvious that there is less diversity in charging when using a V2G system, this is because any diversity as a result of a customer's driving habits is replaced by exporting any additional charge to the grid, therefore requiring any diversity to be replaced..

These charging habits are however impacted almost always by supplier's tariffs. There does remain the issue if every EV owner was on one particular tariff there would be no diversity at all. It highlights the need for more tariffs that incentivise export and import and at different times, these tariffs would create that diversity of export and demand.

The relationship between DNO and supplier needs to be strengthened and possible network constraints used to inform better time of use tariffs, this could incentivise customers to import or export based on constraint signals at a local level rather than being guided by generation and demand at a national level.

There seems to be a lot of looped services on our network in particular, and although we would unloop free of charge, this impacted the installation phase of the project.

G99 applications appear to be one significant barrier to installations. There is no standardised method for completing the application process and it depends heavily on a correct load assessment being carried out. Some installers and customers have added up their main circuit breaker ratings and come up with a load of 152A for an 80A supply and then would add an additional 32A EV charger. The average customer would struggle to complete an accurate load assessment and they would need to know how to apply diversity to their load as per IET regulations. Inevitably the correspondence between installers/customers and DNO planners is quite extensive, this is because the DNO needs to do the study based on the information provided and this inevitably ends up with a quote for reinforcement. This process needs to be made easier for customers and especially those who cannot afford an electrician to carry it out for them.

Building the Energy Supplier relationship with new energy supplier contacts took longer than CrowdCharge anticipated. This affected the time required to create their end-user energy proposition. In future we should allow contingency in time to create, discuss and collaborate on energy service ideas and incentives for customers. In addition working with large organisations can take considerably longer as the decision-making process tends to be more complex. This contributed to a delay in CrowdCharge and the largest supplier in the project agreeing signing the agreement, and issuing their Energy Proposition to applicants on the trial, which in turn has delayed the total approvals for 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**

### Functionality testing report

During January and February 2021, CrowdCharge instructed four pilot sites to carry out some testing, utilising their Wallbox App to prove the app was functioning correctly and the data received to the CrowdCharge platform was consistent with what the participant was seeing at site. Some results in the first round of testing were unsuccessful, as two vehicles were unable to discharge their EV using the app, or the site experienced a communication fault. The former was important to discover as this led CrowdCharge to further understand the operational limits of the charger after discussion with Wallbox's technical department. This operational constraint of the charger not being able to discharge if the State of Charge (SoC) is 97% or above is critical to understand in designing the one-year customer trial charging/discharging optimisation algorithms.

The second round of pilot testing produced successful test results with the communication fault resolved and each pilot site instructed to only discharge if the vehicle SoC was 94% or below.

Generally speaking, testing has been successful in that all sites are able to operate their app and instruct their Quasar to charge their EV without any issues. As some faults have occurred with discharging operation, further Quasars are required to be installed in

domestic customer's properties to increase the volume of charger operation and charge cycle data on CrowdCharge. Therefore, CrowdCharge recommend proceeding with main trial installation of c.10-15 units. As each charger installed, CrowdCharge monitored the operation and checked the Quasar and Apps operation/faults (if any) from customers to understand if there were further instances of discharging faults/auto pausing. A decision was then made whether we can proceed with main trial installs. CrowdCharge continued to monitor the pilot sites, and new installs, to understand if these tested faults were consistent.

#### The CrowdCharge Atom App

This is a project specific process which has been developed and allows the onsite installer to take photos of the completed install, complete post installation safety checks and the app allows the installer to commission the charger to the CrowdCharge platform via the CrowdCharge commissioning team.

This software process was designed during November 2020 and implemented across the following two months by a subcontractor – Jumptech. During January 2021, the app was released for initial pilot testing and integration development work with CrowdCharge CRM. The pilot test with installers using this app was successful.

#### V2G Charging Optimisation Platform (COP)

During winter 2020, CrowdCharge re-developed and re-designed their V2G COP and structure. This has been tailored to be able to accommodate the charging, and discharging, parameters and control required to operate the one-year customer trial.

A new operational portal has been developed and created in January 2021. The portal displays each asset installed as well as displaying the charger cycle data for that particular asset. This operational port will prove useful during the trial lifecycle as it can be used to help diagnose faults and issues with the Chargers and/or Controllers. This operational interface allows CrowdCharge to easily view charge cycle data for any of the chargers installed.

#### Progressive Web-App (PWA)

For the purpose of operating the customer trial, CrowdCharge have designed and developed a PWA. This will be shared with all participants during the first stage of the trial to allow them to select to either 'Optimise' their charging/discharging, to provide their EV with the cheapest and green electricity possible, or the 'Charge Now' option which immediately charges their EV to the battery maximum SoC, irrespective of the charge cost and carbon intensity. This will be implemented in the Fixed Schedule with local control stage of the trial (from June 2021 to August 2021).

#### Group Control Analysis Report

This report contains results and commentary on the historical charging data captured between June 2021 and December 2021 on the Electric Nation PoweredUp project, and a simulation-based analysis of what the impact of group limits would have been on these charging events. Key observations are:

- V2G smart charging is largely driven by tariffs with charging typically being moved to overnight cheap periods and discharging to the traditional evening peak period.
- Combining users on different types of tariffs leads to a diversity of behaviour that inherently reduces peaks in demand so much so that constraining maximum power demand to 30% has a limited impact on charging behaviour.
- V2G behaviour results in an increase in both charging and discharge activity, as additional charging is required to compensate for the energy lost during discharge.
- As export tariffs are rarer and lack diversity, it is more likely that those using them end up with co-ordinated discharge operation. This co-ordinated behaviour led to the greatest absolute power peak during discharge. However, this effect is largely driven by existing tariffs that may evolve over time as the concept of traditional evening peak erodes. In addition, when combined with larger numbers of users without export tariffs, this impact is diluted.

## Data Access

To request access to project data, please visit: [www.westernpower.co.uk/Innovation/Contact-us-and-more/Project-Data.aspx](http://www.westernpower.co.uk/Innovation/Contact-us-and-more/Project-Data.aspx)

## Foreground IPR

Functionality testing report      CrowdCharge/WPD

The CrowdCharge Atom App      CrowdCharge

V2G Charging Optimisation Platform (COP)      CrowdCharge

Progressive Web-App (PWA)      CrowdCharge

Group Control Analysis Report      CrowdCharge/WPD