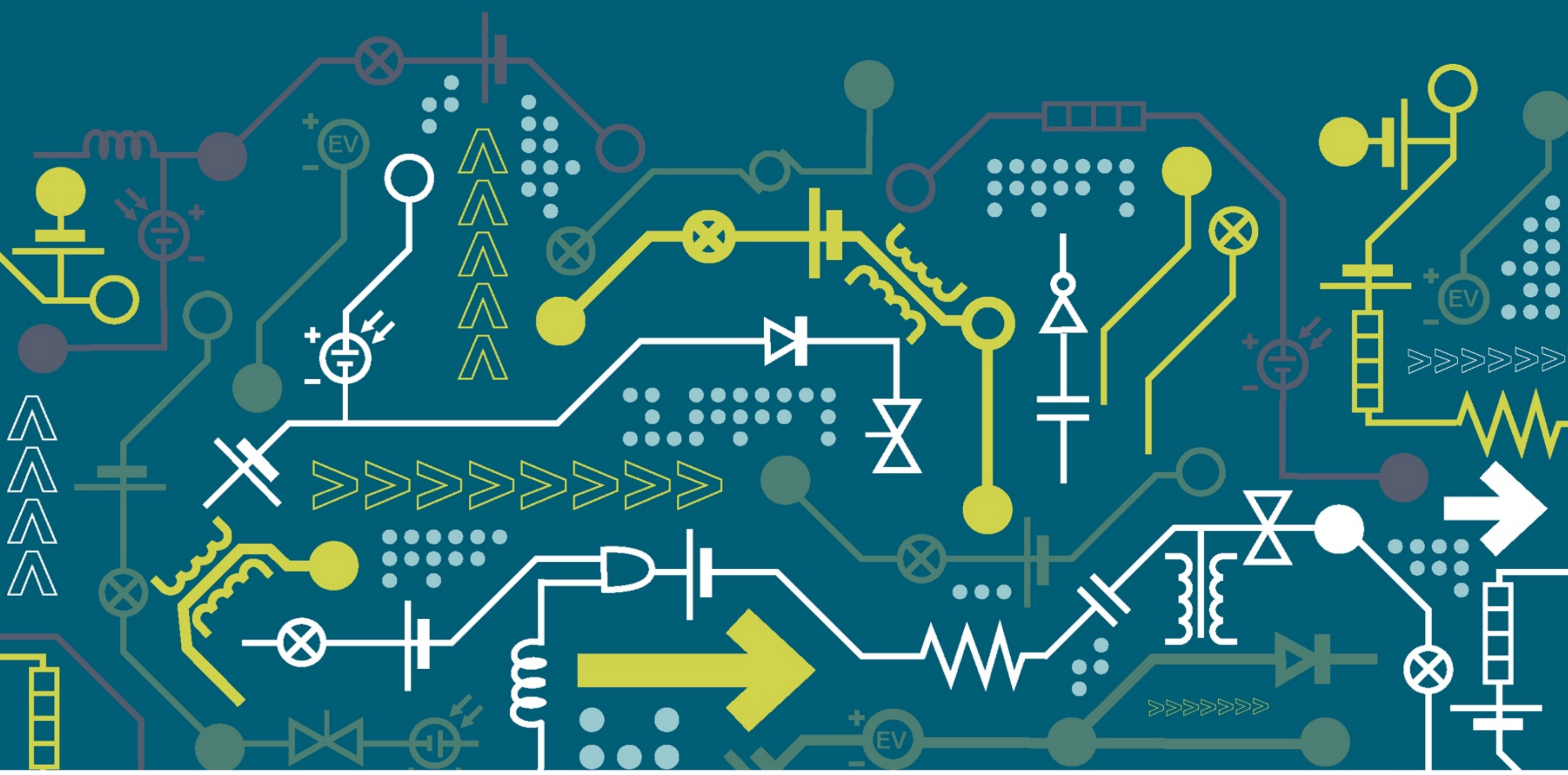
WPD INNOVATION

# Take Charge

## 6 Monthly Report

April 2020 – September 2020

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# Contents

# 1 Executive summary

Take Charge is a project funded through Ofgem's Network Innovation Allowance (NIA). The project was registered in April 2020 and is expected to be completed by December 2021.

The project will design, develop, construct and install a Compact Connection Solution (CCS) to provide a fast and cost effective solution to supply rapid Electric Vehicle (EV) charging facilities at Motorway Service Areas (MSAs). The design and build of the CCS will be led by Brush, a leading UK manufacturer of transformers and switchgear. Working closely alongside Brush we will focus on developing a solution with all the capabilities of a conventional substation but in a far more compact and low cost design. The CCS will be trialled at a site operated by the largest MSA operator in the UK, Moto. The CCS will be connected to existing 33kV and 11kV networks within the vicinity of the trial site and will provide supplies to existing and new EV charging infrastructure.

The demonstration of a new packaged substation on the live distribution network will provide the template for high capacity, low cost solutions to ensure rapid charging can be deployed efficiently to serve future numbers of EVs.

This report details project progress on Take Charge from April 2020 to September 2020.

## 1.1 Business case

The development and roll-out of rapid EV charging is becoming increasingly important as EV manufacturers aim to minimise the time and disruption associated with customers charging their vehicles.

Motorway Service Areas (MSAs) have been identified as a specific location where rapid EV charging would need to be deployed on a large scale to allow simultaneous charging by multiple customers when undertaking long journeys. MSAs are currently supplied either directly via the local Low Voltage (LV) networks or via a distribution substation connected to the 11kV network. However, the deployment of rapid EV charging at MSAs is likely to require a power supply capacity of up to 20MVA to ensure that customers can simultaneously charge their vehicles at peak times.

Providing this level of capacity using traditional solutions would require the installation of a new 33/11kV substation with associated transformers, compound, switchroom, switchgear and auxiliary equipment. The delivery of this solution would be expensive, time consuming and often far too complex for the needs of the customer.

The Government's Road to Zero strategy sets the ambition that by 2050 almost every car and van will be zero emission, and has since moved its planned date for ending the sale of petrol and diesel vehicles from 2040 to 2035. It is therefore highly likely that large scale rollout of rapid EV chargers at all major MSAs will be required to meet future demand from EV customers. In GB there are three main MSA site owners. The following list indicates the number of MSA sites attributed to each owner:

- Moto – 44 sites
- Welcome Break – 26 sites
- Roadchef – 21 sites

There is a total of 91 sites where the solution could be installed. The post-trial method cost of the solution has been estimated as:

- £470k - (A).

The base case is the scenario that a traditional primary substation is constructed to supply the rapid charging demand for each MSA site.

The average cost of a 33/11kV primary substation is:

£960k - (B)

Therefore the solution offers a saving of:

£490k per site - (B – A) = (C)

We anticipate that 68 MSA sites (75% x 91) will require the packaged substation solution. The total saving across the GB roll-out is therefore £33.3m (68 x C).

## 1.2 Project progress

This progress report covers progress during the period April 2020 to September 2020. This is the first six monthly progress report since Take Charge was successfully registered on the Smarter Networks Portal in April 2020.

During this reporting period the progress has included setting up the project, both in WPD internal systems and those of the lead consultant appointed to manage the delivery of the project, GHD.

Following establishment of the project, a combined project team was mobilised to provide appropriate resource to deliver the outcomes according to the agreed plan set out in the Project Eligibility Assessment (PEA) document. As part of this mobilisation, detailed logs of actions and Risks, Assumptions, Issues and Dependencies (RAID) were prepared to be updated during the course of the project as part of the monthly reporting.

Engagement with project stakeholders has taken place in the form of kick-off meetings with Ecotricity, Moto and Brush. Follow-up discussions have been held with each party, and a further meeting has taken place with Moto to discuss the substation location at the preferred site.

Work has concluded on Work Package 1 (System Capacity Optimisation), with the completion of the Site Selection Report and System Capacity Optimisation Report. These reports present the results of the work carried out:

- To evaluate 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; and
- To assess the predicted level of EV rapid charging demand up to 2050 to ascertain the optimised required system capacity to inform the device design.

In addition, work has commenced on Work Package 2 (Develop and Design the Connection Solution), with the completion of the Functional Specification document to define a solution that meets the requirements identified in Work Package 1 and to satisfy other design requirements identified as part of this work. A contract with Brush is under preparation for them to prepare the detailed design under Work Package 2 and proceed to build and install the connection solution as part of Work Package 3.

## 1.3 Project delivery structure

The Take Charge Project Review Group meets on a bi-annual basis. The role of the Project Review Group is to:

- Ensure the project is aligned with organisational strategy;
- Ensure the project makes good use of assets;
- Assist with resolving strategic level issues and risks;
- Approve or reject changes to the project with a high impact on timelines and budget;
- Assess project progress and report on project to senior management and higher authorities;
- Provide advice and guidance on business issues facing the project;
- Use influence and authority to assist the project in achieving its outcomes;
- Review and approve final project deliverables; and
- Perform reviews at agreed stage boundaries.

## 1.4 Project resource

Table 1-1 provides an overview of the project resources for the project.

**Table 1-1 Project resources**

| Project Partner | Name | Role |
|---|---|---|
| WPD | Yiango Mavrocostanti | Innovation Team Manager |
| | Paul Jewell | DSO Development Manager |
| | Stephen Hennell | Policy Engineer (Switchgear) |
| | Andy Reynolds | Policy Engineer (Transformers) |
| | Peter White | DSO Development Engineer |
| GHD | Neil Murdoch | Project Manager |
| | Daniel Hardman | Technical Lead |
| | David Thorn | Strategic Consultant |
| Brush | Kevin King | Brush Lead |
| | Bill Carlyle | Senior Engineer |
| Moto | Paul Comer | Moto Lead |
| Ecotricity | Andrew Hibberd | Ecotricity Lead |

## 1.5 Procurement

Table 1-2 provides a summary of the current status of the procurement activities for the project.

**Table 1-2 Procurement status**

| Provider | Services/Goods | Project Area | Status/Due Date |
|---|---|---|---|
| Brush | CCS Detailed Design | Design | Scheduled to begin in October 2020 |
| Brush | CCS Build | Build | Scheduled to begin in November 2020 |
| Brush | FAT | Testing | Scheduled to begin in March 2021 |
| Brush | CCS Installation | Installation | Scheduled to begin in March 2021 |
| Siemens | 33kV switchgear | Installation | Scheduled to be procured in November 2020 |
| TBD | RTU | Installation | Scheduled to be procured in November 2020 |
| TBD | AC/DC auxiliary equipment | Installation | Scheduled to be procured in November 2020 |
| TBD | 33/11kV cabling | Installation | Scheduled to be procured in February 2021 |

It can be seen that the procurement activities are all currently on schedule based on the Brush design and build contract being finalised by early October 2020.

## 1.6 Project risks

A proactive role has been taken to effectively manage risk in the delivery of the Take Charge project. Processes have been put in place to review the applicability of existing risks; identify and record new risks that have arisen; and update the impact, likelihood and proximity of risks that have developed.

A summary of the most significant risks is provided in Section 7.2.

## 1.7 Project learning and dissemination

The project learning is captured throughout the project lifecycle by monthly reporting and is available on the Take Charge project website.

No official events or dissemination activities have been undertaken to date. However, an abstract for CIRED 2021 has been submitted. The abstract submission is currently in the stages of review by CIRED and an update on the success of the submission is expected in November 2020.

# 2 Project Manager's report

## 2.1 Project background

The development and roll-out of rapid EV charging is becoming increasingly important as EV manufacturers aim to minimise the time and disruption associated with customers charging their vehicles.

The project will develop, construct and install a compact packaged 33/11kV substation with a capacity expected to be in the range of 10-20MVA. Construction will be undertaken at a Motorway Service Area (MSA), based on applicability and the expected number of Electric Vehicle (EV) customers. The new packaged substation will be connected to existing 33kV and 11kV networks within the vicinity of the trial site and will provide supplies to existing and new EV charging infrastructure.

## 2.2 Project progress in the last six months

The NIA Project Registration and Project Eligibility Assessment (PEA) document for Take Charge were submitted to the ENA and the project was successfully registered in April 2020.

Table 2-1 provides an overview of the work packages that were detailed within the PEA and the progress that has been made to date.

**Table 2-1 Take Charge work packages**

| Ref | Work Package Description | Status |
|---|---|---|
| 1 | Kick-Off and Data Gathering | Completed |
| 2 | System Capacity Optimisation | Completed |
| 3 | Design of the Solution | In Progress |
| 4 | Build of the Solution | Not started |
| 5 | Site Installation | Not started |
| 6 | Complete Trials | Not started |
| 7 | Closedown Report | Not started |

The kick-off and data gathering work package was completed in May 2020 following discussions with Moto, Ecotricity, Brush and internal stakeholders at WPD. Data was gathered for a number of different subject areas including potential trial sites, vehicle charging information, vehicle movements, equipment standards and supporting documentation from other innovation projects.

Work began on the System Capacity Optimisation Work Package following completion of the kick-off and data gathering in May 2020. This work package was focussed on selecting a suitable trial site for the CCS and determining the required power supply capacity for CCS at the chosen trial site. Both these deliverables have now been completed and further details on these are provided in section 2.2.1 and 2.2.2.

The design activities in Work Package 3 are currently in progress and we are working closely with Brush to finalise the design and build contract for the CCS. A Functional Specification has been produced for the CCS and will be used as part of the design and build contract. Further details of the design of the CCS can be found in section 2.2.3.

In addition to the Work Packages listed in Table 2-1, we have also produced an abstract for the CIRED 2021 conference. If successful, the proposed paper will discuss the process that was implemented for the site selection and system capacity activities.

### 2.2.1 Site selection

In order to identify a suitable MSA to trial the new substation solution, a desktop study was carried out to assess each MSA against a set of criteria. The range of criteria was prepared to assess the technical suitability of each site, and to evaluate each site against the objectives to minimise costs, time and disruption associated with conducting the trial. In addition, the criteria also sought to maximise the learning from the trial in order to provide the best value to GB customers.

There are 13 MSAs operated by Moto within WPD's distribution licence area and each was evaluated against the criterion shown in Table 2-2.

**Table 2-2 Scoring criterion for MSAs**

| | Criteria | Description |
|---|---|---|
|  | **Proximity to PoC** | The proximity of the existing network at 33kV/132kV minimised the time and cost of connection. This distance was obtained using Electronic Mapping Utilisation (EMU). |
|  | **Access to PoC** | The access from the MSA to the nearest PoC was considered, based on this criterion, an MSA with few obstacles would be preferable, since this would reduce costs and time whilst also causing less disruption to the local community. |
|  | **Network Capacity** | The trial required up to 20MVA of capacity to meet the rating of the compact substation solution. As such, the PoC was assessed to ensure that the upstream network could facilitate this demand, ideally without system reinforcements. |
|  | **PoC Configuration** | The type of connection to the PoC for the MSA was rated, ensuring the connection to the network was as simple as possible and therefore, avoiding expensive extensions to the BSP and complex integration of circuits on existing OHL and cable networks. |
|  | **MSA Space** | The available space at the MSA was crucial to the success of the installation of new EV charging units, as a section of parking spaces would need to be converted into EV charging spaces. Additionally, an area of approximately 150m$^2$ was needed for the installation of the compact substation solution. This space was required to not encroach a detrimental impact on the number of people that use the MSA due to the disruption caused through site modification. |
|  | **Visitor Usage** | The annual footfall of the MSA was a considered factor, as increased visitor numbers would indicate greater potential for EV drivers to participate in the trial. It was noted that the configuration of the MSA had an important influence on footfall, for example the general road location and distribution of space. |

The sites were scored against each criteria and were then weighted in accordance to their relevance and impact. The MSA with the highest score was Exeter and an overview of the site is provided in Figure 2-1.

**Exeter MSA**

**Overview:**

Exeter MSA is located at Junction 30 of the M5 motorway, approximately 6.5km away from Exeter in Devon, England. The MSA can be accessed from both sides of the motorway and it is located near an industrial area. The MSA is located approximately 1.1km from the nearest BSP, Sowton 132/33kV. There are a number of 33kV circuits in close proximity to the MSA (<0.4km), however, the PoC has been chosen to be Sowton BSP as it is only a short distance away and would simplify the connection. There are no major obstacles to provide the 33kV connection to the MSA from the BSP.

**Licence area: South West**

**Location:**


| Criteria Item | Answer | Score |
|---|---|---|
| Proximity to PoC (km) | 1.1 | 3 |
| Access to PoC | No Obstacles | 3 |
| Network capacity (MVA) | >20 | 3 |
| PoC configuration | BSP Expansion | 2 |
| MSAs space (m²) | ~75,576 | 3 |
| Visitor usage (Million ppl/yr) | 4.2 | 3 |
| **Weighted Total** | | **2.85** |

**Figure 2-1 Exeter MSA score**

Important learning was generated during the process of selection of the preferred trial location, including building a range of criteria to consider as part of the methodology and review of system data. Further details of this can be found in the Site Selection Report.

### 2.2.2 System capacity optimisation

As part of work on this activity in the first work package, a methodology was developed for the assessment of the required system capacity for rapid EV charging at MSA locations up to 2050. This comprised assessment of a number of factors that determine the required system capacity. The range of factors that were considered is summarised below:

- EV uptake as a proportion of vehicles on the road;
- Traffic (historic count of vehicle flow past Exeter MSA; and regional and national projections of total vehicle journey miles);
- Customer behaviour (vehicle turn-ins at Exeter MSA; dwell time of vehicles stopped; proportion of vehicles that stop to refuel);
- Charging demand/profile (comparison of approximate EV rapid charging demand profile with Exeter MSA demand to assess level of complementarity);
- Network demand (comparison of approximate EV rapid charging demand profile with local network demand profile to assess level of complementarity);
- MSA infrastructure (numbers of existing conventional fuel pumps, EV fast charging units and car parking spaces); and
- Hardware (EV rapid charging units, 33/11kV transformer sizes, and potential for sharing of electrical equipment between EV rapid charging and solar PV and/or battery storage technologies).

The nature and relevance of each of the factors has been explained in the report, along with quantitative assumptions identified for application in the assessment of the required system capacity. The assessment used data made available through OLEV's Project Rapid, forecast data provided by charging point operators and EV charging data available from other innovation projects. Relevant assumptions corresponding to projections for the identified factors were applied using two approaches for assessment of the required capacity. These approaches provide projections based on the existing numbers of EV rapid charging points and conventional refuelling pumps, respectively. Results have been obtained for the required system capacity from each approach, as well as validation of them and a record of future considerations.

The approaches to the assessment are illustrated in Figure 2-2.

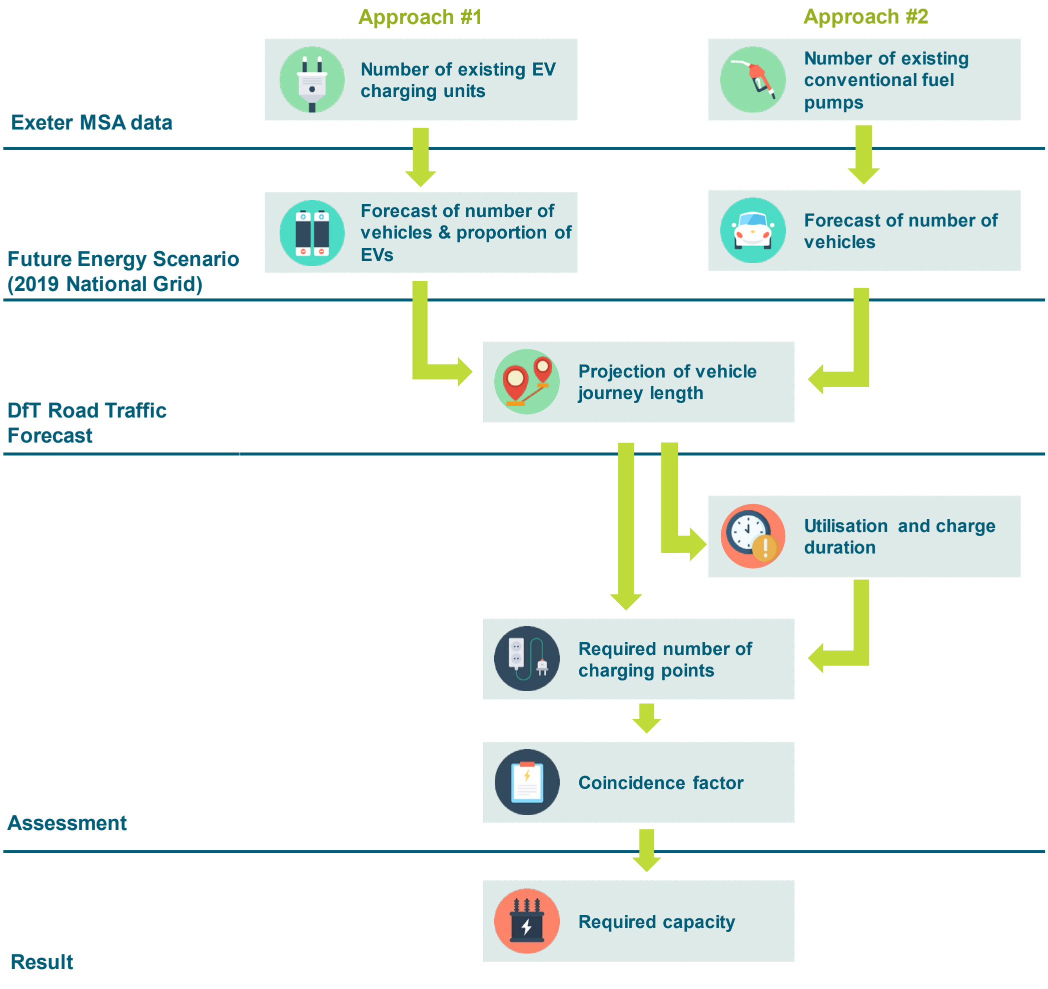


**Figure 2-2 Approaches used for System Capacity Assessment**

In approach 1, the factor with the greatest impact on the assessment of the required system capacity is the proportion of EV uptake. The quantitative assumptions for this parameter were taken from the National Grid Future Energy Scenarios (FES) document. The FES 2019 document forecast the proportion of EVs on the road to increase from 0.5% in 2019 to 88.3% in 2050, i.e. a factor increase of 172. Due to a re-baselining of data and updates to the projections in FES 2020, the proportion of EV uptake was revised to increase from 0.3% in 2019 to 92.5% in 2050, i.e. a factor increase of 310.

Due to the limitations resulting from the large proportional increase in EV uptake (primarily due to the low starting point), approach 2 was deemed to be more accurate. As such, the changes implemented by National Grid between FES 2019 and FES 2020 do not impact the conclusions made about the required system capacity that have been carried forward to the subsequent project activities.

### 2.2.3 CCS design and build

The CCS will be connected to our existing 33kV network and will integrate with the existing HV network that currently supplies the Exeter MSA. The CCS will therefore supply existing EV charging infrastructure and the new charging infrastructure planned by Moto.

The main aim of the CCS is to produce a “plug and play” solution that can provide large capacity for rapid EV charging at a low cost. To achieve this we are working closely with Brush, a leading UK manufacturer in switchgear and transformers to design and build the CCS. Since the project was registered we have had several design discussions with Brush and have developed a Functional Specification for the CCS that is incorporated within the design, build and installation contract. The Functional Specification builds upon our existing standards and policies and outlines the basic requirements for CCS across a number of topics as detailed below:

- General Requirements – including service conditions, nominal ratings, spares, reliability, documentation etc.
- Transformer – detailing the construction, connection types, tap-changer, losses and testing.
- Switchgear – details of the 11kV switchgear including the ratings, configuration, protection requirements and testing.
- Enclosure – outlines the requirements for the switchgear and ancillary equipment housing including access/egress, climate management, small power, lighting and transportation.

Extracts from the Functional Specification are shown below in Figure 2-3 and Figure 2-4.

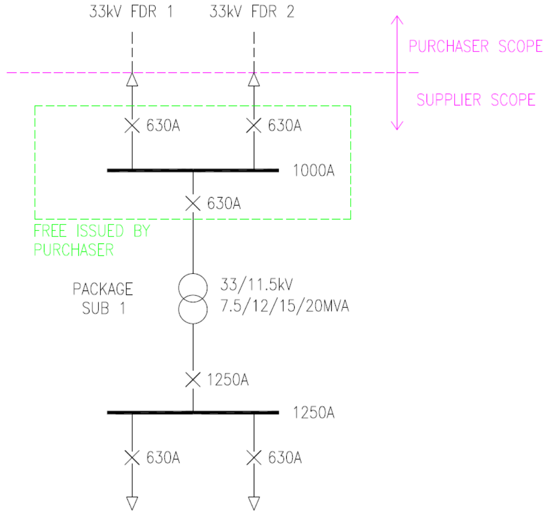


**Figure 2-3 Outline CCS SLD**

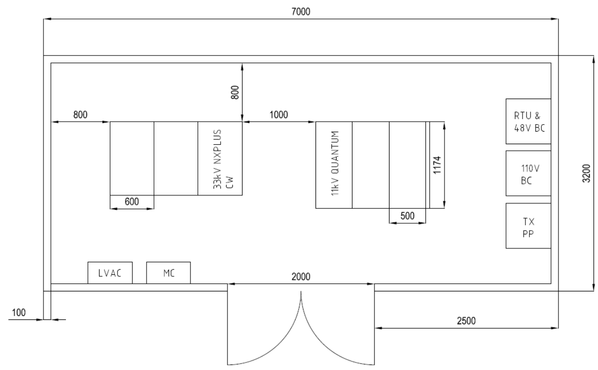


**Figure 2-4 Outline CCS switchroom layout**

Brush will build upon the Functional Specification during the design stage which is programmed to begin in October 2020 following the signature of the contract. After initial discussions with Brush it was apparent that a number of components for the CCS should be free-issued by WPD due to our existing procurement contracts that would offer financial savings to the project. These components include the 33kV switchgear, transformer and protection panel, Remote Terminal Unit (RTU) and 110V/48V auxiliary systems. The design and integration of these components will be discussed and approved between WPD and Brush.

During this reporting period we have explored various different innovative solutions that could be incorporated within the CCS to meet the overall design aims. For example, we will aim to reduce the wiring and associated commissioning requirements by implementing new connectors between equipment. We also aim to design a hermetically sealed transformer that will reduce maintenance requirements and costs. We are also in discussions with WPD Telecoms to understand the suitability of new RTU technologies that could be incorporated within the design to provide enhanced levels of control and visibility at a lower cost than traditional methods.

In the coming months we will enter the detailed design phase for the CCS and, once approved, we will start the build phase and ordering of free-issue materials.

### 2.2.4 Future activities

Completing the CCS design and beginning the build stage will be the main focus during the next reporting period. The first activity will involve Brush completing the detailed design for the CCS which will be reviewed and approved by WPD. As the base outline design for the CCS has already been prepared we expect that the detailed design should take around 4-6 weeks.

Following completion of the detailed design, the CCS will move into the build stage. The key item for the build stage will be the 33/11kV transformer as this will be a fully bespoke design for the CCS. Completion of the detailed CCS design will also allow us to finalise the site design for Exeter MSA with equipment dimensions, weights and orientation confirmed. We have already begun discussions with Moto regarding possible locations for the CCS at Exeter and these will continue as the design develops.

We will also work with Brush to start the preparation of draft versions of the manual and testing documentation for the CCS during the next reporting period. These documents will be crucial to ensure that the CCS is ready for connection to the live network and will inform our own policy documentation.

### 2.2.5 COVID-19 impact

The COVID-19 pandemic has not had a significant impact on the Take Charge project at the current stage. However, the situation is being monitored and the possible future risks with the design, build and installation stages have been identified and rated.

Table 2-3 presents a summary of the possible impact to the project and the mitigation action plans in order to reduce these risks.

**Table 2-3 Summary of COVID-19 impact**

| Risk | Risk Rating | Mitigation Action Plan | Progress |
|---|---|---|---|
| The Covid-19 pandemic causes delays to site visits | Moderate | Regular engagement with Moto and local site teams. Continually monitor government, WPD and Moto guidelines. Conduct as much investigation using desktop techniques. | Situation still being monitored. |
| The Covid-19 pandemic causes delays to the installation of the equipment on the 33kV & 11kV network (i.e. difficult to plan outages) | Moderate | Early engagement to understand the restrictions on site staff and continual monitoring of the situation | No updates on progress – installation not until 2021. Keep monitoring |
| Covid-19 delays the testing of new Brush equipment | Moderate | Early engagement with Brush to understand if there are social distancing working arrangements that can be implemented. | No updates on progress – testing not until 2021. Keep monitoring |

# 3 Progress against budget

Table 3-1 summarises the details of the progress that has been made with respect to the project budget.

**Table 3-1 Project finances**

| Budget Item No. | Budget Item | Budget (£k) | Expected Spend to Date (£k) | Actual Spend to date (£k) | Variance to Expected (£k) | Variance to Expected (%) |
|---|---|---|---|---|---|---|
| **1** | Project Management and Design | 350.0 | 48.0 | 48.0 | 0.0 | 0% |
| **2** | Brush CCS | TBC* | 0.0 | 0.0 | 0.0 | 0% |
| **3** | Free-issue equipment and installation | TBC* | 0.0 | 0.0 | 0.0 | 0% |
| **4** | Internal Project Review and Controls | 70.0 | 0.0 | 0.0 | 0.0 | 0% |
| **-** | **Totals** | **1,380.0** | | | | |

*Contract for Brush still under preparation and final equipment to be determined. Budgets will be available in the next six monthly progress report.

### *Comments around variance*

Take Charge is currently progressing to schedule with actual spend to date matching the expected spend to date. This will continue to be monitored as the project moves into the design and build stage. There is a possibility that delays could be incurred due to the impact of COVID-19 as presented in section 2.2.5.

# 4 Progress towards success criteria

Table 4-1 presents the progress towards the success criteria documented in the Take Charge Project Registration and PEA document.

**Table 4-1 Progress towards success criteria**

| Criterion No. | Success Criterion | Progress |
|---|---|---|
| 1 | Analysis of information and data to inform the design of the new solution | Completed – all data gathered from internal sources, Moto, Ecotricity and Brush. |
| 2 | Selection of a suitable trial site for the installation | Completed – Exeter MSA selected as the trial site for the installation. Site Selection report details the methodology and other shortlisted sites. |
| 3 | Development of a design for the new package solution | In progress – Functional Specification for the CCS has been prepared and design and build contract being finalised with Brush. |
| 4 | Installation and integration of the new package solution at the trial site | Not started – installation and integration of the CCS will begin after Item 3 |
| 5 | Monitor and analyse information and data during the trial phase | Not started – monitoring and analysis of data will begin after Item 4 |
| 6 | Dissemination of key results, findings and learning to internal and external stakeholders | In progress – Site Selection Report and System Capacity Optimisation Report completed. CIRED abstract prepared for 2021 conference. |

# 5 Learning outcomes

The following sections list some of the key learning outcomes that resulted from activities during this reporting period:

## 5.1 Site Selection

Whilst developing and implementing the site selection process for the most suitable MSA for the Take Charge trials, a number of learning outcomes were noted:

- Initial discussions with Ecotricity revealed that existing charging patterns for EVs will not be reflective in future rapid charging. This is because most EV users charge their vehicles at home before embarking on a journey and hence do not use public chargers on the motorway network that frequently. In addition, user behaviours at MSAs may change as rapid charging will allow them to charge their vehicles in a fraction of the time compared with standard chargers. This could mean that users are more inclined to charge their vehicles whilst they use the facilities at MSAs.
- The layout and positioning of MSA sites was found to have a major impact on their ability for selection. Sites surrounded by major obstacles, such as heavily built up areas, railways, bridges or areas with difficult environmental conditions for example would result in significant engineering challenges. A number of the sites had MSAs split across a motorway. Having evaluated the data for these sites it was confirmed that the footfall and space were reduced compared to sites that are accessible from both sides of the motorway. Choosing an MSA located with access to both sides of a motorway (and near to large town or city) will provide more space and footfall that should result in greater participation in the trial (i.e. more EVs).

These learning outcomes adjusted the approach of the methodology for site selection and will be points of considerations for further installations of the CCS in the future.

## 5.2 System capacity optimisation

The System Capacity Optimisation task involved research into a number of different areas to establish the capacity required for the CCS and a number of learning points were captured as detailed below:

- The review of EV charging profiles in MSAs, as part of the assessment of required system capacity, showed that MSA profiles generally follow the same trend as general “public” EV charging profiles. These profiles also align with traffic visiting MSAs and, therefore, can be used as the basis to calculate the capacity required for EV charging requirements in the future.
- The review of hardware requirements showed that the configuration of rapid charging infrastructure on site is limited by interfacing with existing WPD standard assets (such as distribution transformers). For example, 350kW rapid chargers are currently connected at LV and, therefore, only a maximum of two can be connected at one standard distribution substation (1 MVA) without any limits being applied. There are possibilities to connect more, however, control systems would be required to limit the output from chargers at peak times.
- There are a number of different approaches for calculating system capacity and the result can vary significantly depending upon the method used. The uncertainty of EV uptake projections has a significant impact on the assessment of the rapid charging capacity required at MSAs up to 2050. Therefore, having a “modular” approach to adding capacity is preferred and also allows for greater security of supply in the future.
- The System Capacity Optimisation work was based on EV uptake determined from the 2019 FES. Following release of the FES 2020 document a check was performed to see if there were any substantial changes that would need to be reflected in our work. We found that the FES 2020 EV uptake was forecast to be slightly “faster” between 2020 and 2045 and the factor increase from

2019 to 2050 was considerably more due to a re-baselining of the data. However, the ultimate number of vehicles was the same in 2050 and, therefore, no changes to the calculations were required in Approach 2. Approach 2 was deemed to be more accurate prior to the update of the FES, and taken as the basis for work on subsequent activities.

## 5.3 Design

In developing the Functional Specification, a number of key points were 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:

- The configuration of the enclosure for the CCS will need to be limited to 3.4m wide to allow for transportation without the need for special permits. With this in mind, the layout of the enclosure will need to provide space all around the switchgear to ensure that operatives can easily exit in an emergency.
- In some instances the CCS may be connected to the local 11kV network to provide additional security of supply. In order to provide this facility, an 11kV busbar VT is required on the CCS switchboard to provide a voltage reference.
- The CCS will be equipped with 2 no. 11kV outgoing feeders to distribute the load to the EV charge points. The standard 11kV feeder circuit breaker rating of 630A will be used in the design as the alternative, 1250A, would require cables larger than $3x300mm^2$ to distribute the current. Cables larger than this size, however, cannot be terminated into a standard distribution RMU and therefore cannot be used.

# 6 Intellectual property rights

There is no current IPR to date. However this situation is being monitored and updated as we enter the design stage and contract negotiations with Brush finalised.

# 7 Risk management

## 7.1 General

Our risk management objectives are to:

- Ensure that risk management is clearly and consistently integrated into the project management activities and evidenced through the project documentation;
- Comply with WPDs risk management processes and any governance requirements as specified by Ofgem; and
- Anticipate and respond to changing project requirements.

These objectives will be achieved by:

- Defining the roles, responsibilities and reporting lines within the project delivery;
- Team for risk management;
- Including risk management issues when writing reports and considering decisions;
- Maintaining a risk register;
- Communicating risks and ensuring suitable training and supervision is provided;
- Preparing mitigation action plans;
- Preparing contingency action plans; and
- Monitoring and updating of risks and the risk controls.

## 7.2 Current risks

Table 7-1 details the top five current risks by category. For each of these risks, a mitigation action plan has been identified and the progress of these are tracked and reported.

**Table 7-1 Top five current project risks (by rating)**

| Risk | Risk Rating | Mitigation Action Plan | Progress |
|---|---|---|---|
| Protection for the rapid charging connection solution does not meet WPD policy requirements | Major | Review protection requirements with WPD policy engineer and build these into the functional specification | Review of protection requirements has been undertaken and will be re-visited during the detailed design stage |
| Unable to agree land rights or lease for the new substation at Exeter MSA | Major | Engage with in-house wayleave personnel and begin discussions with the land owner | Discussions underway with Moto and wayleave personnel |
| Trial site location has to be changed during the project | Major | Confirm suitability of selected trial site with Moto. Also have back up sites prepared and discussed in case the site has to be changed | Site selection methodology has been prepared and all sites have been shortlisted. |
| 33kV connection for the CCS is delayed | Major | Monitor the progress on the 33kV connection and identify if there any major issues with the proposed works | 33kV connection design is underway and no major issues identified to date |
| CCS enclosure design does not comply with HSE regulations | Major | Work with Brush to ensure that the design and layout of the enclosure complies with HSE requirements and WPD requirements | Outline layout discussed with Brush and WPD Policy engineers. Will be monitored during the detailed design stage. |

Figure 7-1 provides a graphical summary of the project risk register to give an ongoing understanding of the project risks.

| | | | | | | |
|---|---|---|---|---|---|---|
| Likelihood = Probability x Proximity | Certain/Imminent (21-25) | 0 | 0 | 0 | 0 | 0 |
| | More likely to occur than not/Likely to be near future (16-20) | 0 | 0 | 0 | 0 | 0 |
| | 50/50 chance of occuring/ Mid to short term (11-15) | 0 | 1 | 0 | 0 | 0 |
| | Less likely to occur/Mid to long term (6-10) | 0 | 2 | 5 | 7 | 2 |
| | Very unlikely to occur/Far in the future (1-5) | 0 | 2 | 5 | 4 | 0 |
| | | 1. Insignificant changes, re-planning may be required | 2. Small Delay, small increased cost but absorbable | 3. Delay, increased cost in excess of tolerance | 4. Substantial Delay, key deliverables not met, significant increase in time/cost | 5. Inability to deliver, business case/objective not viable |
| | | **Impact** | | | | |

| | Minor | Moderate | Major | Severe | |
|---|---|---|---|---|---|
| **Legend** | 9 | 10 | 9 | 0 | **No of instances** |
| **Total** | 28 | | | | No of live risks |

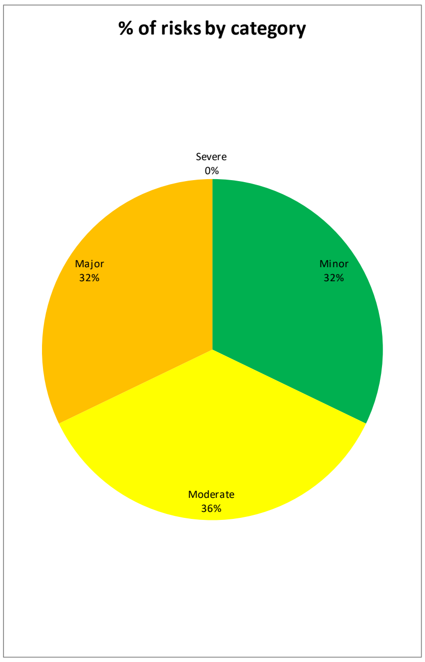


**Figure 7-1 Graphical view of project risks**

## 7.3 Update for risks previously identified

As this is the first six monthly report of the Take Charge project, no update on previous identified risks are currently available.

# 8 Consistency with project registration document

The project is being carried out according to the Project Registration and PEA document, and no inconsistencies or required changes have been identified relating to completed or future work on the project.

# 9 Accuracy assurance statement

This report has been prepared by the Take Charge Project Manager (Neil Murdoch), reviewed and approved by the Innovation Team Manager (Yiango Mavrocostanti).

All efforts have been made to ensure that the information contained within this report is accurate. WPD confirms that this report has been produced, reviewed and approved following our quality assurance process for external documents and reports.

# Glossary

| Acronym | Definition |
|---|---|
| AC | Alternating Current |
| BSP | Bulk Supply Point |
| CCS | Compact Connection Solution |
| COVID | Coronavirus Disease 2019 |
| CIRED | International Conference on Electricity Distribution |
| DC | Direct Current |
| DNO | Distribution Network Operator |
| EMU | Electronic Mapping Utilisation |
| ENA | Energy Networks Association |
| EV | Electric Vehicle |
| FES | Future Energy Scenarios |
| FAT | Factory Acceptance Testing |
| GB | Great Britain |
| GHD | Gutteridge Haskins and Davey Ltd |
| HSE | Health and Safety Executive |
| IPR | Intellectual Property Rights |
| kV | Kilovolts |
| LV | Low Voltage |
| HV | High Voltage |
| MSA | Motorway Service Areas |
| MVA | Mega Volt-Amperes |
| NIA | Network Innovation Allowance |
| OHL | Over Head Line |
| OLEV | Office for Low Emission Vehicles |
| PoC | Point of Connection |
| PV | Photovoltaic |
| PEA | Project Eligibility Assessment |
| RAID | Risks, Assumptions, Issues and Dependencies |
| RMU | Ring Main Unit |
| RTU | Remote Terminal Unit |
| TBC | To Be Confirmed |
| VT | Voltage Transformer |
| WPD | Western Power Distribution |

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