WESTERN POWER DISTRIBUTION

INNOVATION

NEXT GENERATION NETWORKS

Electric Nation (CarConnect)

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NIA MAJOR PROJECT PROGRESS REPORT

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Contents

Glossary

Term	Definition
BAU	Business as usual
BEV	Battery Electric Vehicle
CRM	Customer Relationship Management
DE	Drive Electric
DG	Distributed Generation
DNO	Distribution Network Operator
EATL	EA Technology Ltd
GB	Great Britain
HV	High Voltage
IPR	Intellectual Property Register
LCT	Low Carbon Technologies
LEGK	Lucy Electric GridKey
LV	Low Voltage
NAT	Network Assessment Tool
NIA	Network Innovation Allowance
PHEV	Plug in Hybrid Electric Vehicle
PIV	Plug in Vehicle
PIVDCS	PIV Demand Control Services (or Demand Management Services) The ability to control the charge rate and/or the charge time of a vehicle remotely
PR	Public Relations (activities)
TRL	Transport Research Laboratory
TTP	The Technology Partnership
ULEV	Ultra-Low Emission Vehicle
V2G	Vehicle to Grid – The ability for vehicle batteries to export their stored energy onto the LV grid
WPD	Western Power Distribution

1 Executive Summary

Electric Nation (the customer facing brand of CarConnect) is funded through Ofgem's Network Innovation Allowance (NIA). Electric Nation was registered in April 2016 and is expected to be complete by October 2019.

Electric Nation aims to enable DNOs to identify which parts of their network are likely to be affected by Plug-in Vehicle (PIV) uptake and domestic charging, and whether PIV domestic charging demand management services are a cost effective solution to avoiding or deferring reinforcement on vulnerable parts of their networks, using three methods:

- Network modelling to identify network that may be affected by domestic PIV charging in the future;
- Development of an algorithm to allow retrospective analysis of previously captured substation monitoring data to assess the impact of installed PIV charging on a LV network; and
- Development and operation of a trial that adapts and deploys smart domestic PIV chargers to private individuals to assess the viability of domestic PIV charging demand control (potentially to include V2G) and associated arrangements/services to mitigate the need for network reinforcement.

This report details progress of the project, focusing on the first ten months of the project, May 2016 to March 2017.

1.1 Business Case

As groups of neighbours acquire PIVs, localised clustering of demand is likely to cause problems for electricity networks, as demonstrated through the (Low Carbon Networks Fund) My Electric Avenue (MEA) project. MEA showed that approximately 30% of GB low voltage networks will need reinforcement by 2050, if adoption of PIVs (and domestic charging) is widespread (i.e. meeting DECC's High EV Market Growth Forecast). This represents a present day cost of £2.2bn to UK customers, using EATL's Transform Model® analysis, based on UK Government forecasts of nearly 40 million PIVs on UK roads by that time. The UK Government is committed to the electrification of transport, as illustrated by its recent investment into ultra-low emission vehicles (ULEV) such as its extension of grants for PIV chargers, PIV car subsidies and the Go Ultra Low Cities Scheme.

Which parts of distribution networks will be affected by PIV market growth is not understood – the MEA analysis used idealised network types. There is no tool available for assessing real LV networks to identify those at risk from high penetration of domestic PIV charging, and to identify the technical efficacy and economic viability of smart solutions (domestic charging demand control and V2G) against traditional network reinforcement. Through this project, a tool will be developed that will allow the assessment of real LV networks for the susceptibility to high demand from domestic PIV charging.

In recent years, "smart" chargers have been developed for domestic and public charging use, which are controllable for access and billing purposes. Alongside these public smart chargers, control services have been developed and deployed to carry out the access control and billing services. These smart chargers also give the option to modulate the power taken by PIVs, giving a more refined set of demand control options than trialled in MEA. It is thought that these technologies could be adapted for domestic charger control to provide demand control services to DNOs across LV areas (rather than just single feeders). However, it is not known whether the application of these technologies to customers charging PIVs at home is technically viable and acceptable to customers. The technical challenges include: ensuring secure and reliable communications between the charger and control services; providing customers with information about the charging of their PIV; allowing the customer to state preference as to when they are charged (ensuring the control is as "fair" as possible to all); and investigating what, if any, compensation or incentives customers require to participate in PIV demand control. Also, the PIV market has and will continue to diversify with a range of battery sizes fitted to PIVs and nominal charge rates growing (from 3kW to 7kW+), making possible peak loads higher and adding complexity to the challenge of PIV demand control. Therefore, this project will investigate to what extent it might be possible to utilise domestic PIV charging demand control to defer or avoid some of the £2.2bn cost to UK customers, calculated in the MEA project.

In addition, vehicle to grid (V2G) services and associated technologies are being developed in the UK and abroad. The impact of mass V2G services on LV networks needs to be understood, especially as some V2G services (such as transmission frequency services) may adversely affect distribution network operations, in a similar way to solar PV generation. V2G could be a solution as much as a problem for LV network congestion, in that export mode could be used to address peak PIV demands - but as V2G has not been developed sufficiently at this time this is a poorly understood option. Furthermore, adapting the

domestic PIV charging demand control services to utilise V2G export mode to address PIV charging induced peak loads has not been proven. This project aims to explore the technical readiness of V2G technology for domestic use and assess its potential economic feasibility.

1.2 Project Progress

This is the first major progress report. It covers progress from initial registration in April 2016 to the end of March 2017.

The majority of project activities in this period have focussed on project mobilisation to reach the goal of starting recruitment of customers into the customer trial in early 2017:

- Establishment of project monitoring and reporting processes
- Establishment of customer Data Protection and Privacy policies and procedures
- Establishment of project marketing and PR campaigns and collateral
- Contracting key project suppliers and procurement of equipment and services to the project
- Design and construction of a smart charger test system at EA Technology (EATL), Capenhurst, to enable testing of the PIV Demand Control Services (PIVDCS) to be deployed into the trial
- Testing of PIVDCS to ensure they are fit for purpose in readiness for the customer trial
- Initialisation of cyber security review of PIVDCS systems
- Ten pilot installations of smart chargers - to prepare for the trial roll-out
- Market research to establish viable supply of V2G chargers to bring into the customer trial
- Definition of a trial plan and establishment of customer research activities for the customer trial
- Customer recruitment programme initiated
- First customers recruited into trial and equipped with smart chargers
- In addition, EA Technology & WPD have explored network data availability to scope and specify the Network Assessment tool and development of the NAT has begun.

1.3 Project Delivery Structure

1.3.1 Project Review Group

The Electric Nation 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.

1.3.2 Project Resource

Western Power Distribution (WPD)

Project Manager: Initially Ben Godfrey followed by Mark Dale from September 2016.

Project Support: Emily Green

Marketing and Data Provision support as required.

EA Technology (EATL)

EA Technology's primary roles in the project are:

- Project management
- Management of project supporting activities, such as marketing and PR for customer recruitment, and customer research
- Development of the Network Assessment Tool
- Development of the customer trial programme
- Management of the PIV DCS suppliers and their input to the trial
- Development of the PIVDCS algorithm(s)
- Management of V2G trial
- Production and dissemination of the project deliverables, reports and learning outcomes

DriveElectric (DE)

Drive Electric's primary roles in the project are:

- Recruitment of customer trial volunteers
- All practical aspects of operating the customer trial
- Customer relationship management (including data protection)
- Supply of PIVs to some of the customers volunteering for the trial (not funded by this project)
- Supply and installation of "smart" chargers, through sub-contractor organisations

- Customer communications and retention in the trial
- Supply of vehicle related trial data
- Supply of V2G chargers

TRL

TRL's primary roles in the project are:

- Overarching project overseeing role for all three methods, providing WPD deeper insight into how the project is performing from both a Project Management and Technical perspective
- Provision of feedback, expert advice, technical review and reporting of project approach and milestones
- Maintaining the project RAID log, Action Log and Key Outputs and Milestones log, alongside EATL and DE
- Monthly meeting coordination and reporting
- Monthly and 6 monthly reporting to WPD
- Escalation of significant issues to WPD
- Independent validation of milestones

Lucy Electric Gridkey (LEGK)

Lucy Electric Gridkey's primary roles in the project are:

- Supply of monitoring equipment
- Development of a monitoring algorithm (TTP supporting LEGK)
- Production of a functional specification for a monitoring algorithm to detect EV charging

1.4 Procurement

The following table details the current status of procurement for this project.

Provider	Services/goods	Area of project applicable to	Anticipated Delivery Dates
CrowdCharge	PIVDCS services	Test System Pilot Installations Customer Trial	August 2016-December 2018
Greenflux	PIVDCS services	Test System Pilot Installations Customer Trial	August 2016-December 2018
ICU Charging Solutions	Smart Chargers	Test System Pilot Installations Customer Trial	August 2016-December 2018
APT	Smart Chargers	Test System Pilot Installations Customer Trial	August 2016-December 2018
The Tech Factory	Systems Integration (smart charger communications) equipment, services and support	Test System Pilot Installations Customer Trial	August 2016-December 2018
NCC	Cyber Security Assessment of PIVDCS systems	Customer Trial & Functional Specification	Summer 2019
EV Charging Solutions Stratford Energy Solutions Actemium UK The Phoenix Works	Smart Charger Installation services	Pilot Installations and Customer Trial	November 2016-Spring 2018
Impact Utilities	Customer research services	Customer Trial	December 2016 – January 2019
AutomotiveComms	Marketing & PR services	Project	July 2016-October 2019
TTP	Algorithm development for LEGK	Monitoring	End of project

Table 1-1: Procurement Details

1.5 Project Risks

A proactive role is taken to ensure effective risk management for the CarConnect | Electric Nation project. A RAID (Risks, Assumptions, Issues, Dependencies) log is maintained, examined and updated by TRL, EATL, and DE. This activity ensures that risks are frequently reviewed, examining: whether risks still exist, whether new risks have arisen, whether the likelihood and impact of risks have changed, for reporting of significant changes that will affect risk priorities, and to deliver assurance of the effectiveness of control.

Risks are reported to WPD within each monthly report. At each monthly meeting, the RAID log is reviewed and updated by the project delivery team, TRL and WPD. TRL provides a critical overseeing role within the meeting to ensure that all risks are being effectively captured and managed.

Contained within Section 7.1 of this report are the current top risks associated with successfully delivering Electric Nation as captured in the RAID log. Section 7.2 provides an update on the most prominent risks identified at the project bid phase.

1.6 Project Learning and Dissemination

A Project Learning Log is maintained. Project lessons learned and what worked well are captured throughout the project lifecycle. These are captured through a series of on-going reviews with stakeholders and project team members, and will be shared in lessons learned workshops at the end of the project. These are reported in Section 5 of this report.

Project Dissemination Activities during this period

- The project customer facing brand “Electric Nation” was officially launched at the Cenex LCV conference and exhibition, held at Millbrook, on 14th September 2016.
- EA Technology held its 50th anniversary celebrations on the 16th September 2016 where the project test rig and a range of plug in vehicles was exhibited to visiting EA Technology customers, dignitaries and company pensioners.
- The project exhibited at the LCNI Conference held on 11th-13th October 2016, exhibiting on WPD’s stand at this event.
- Over 50,000 views of Robert Llewellyn’s Fully Charged video on Electric Nation, featuring WPD’s Roger Hey & Ben Godfrey, and EA Technology’s Gill Nowell, launched October 2016: http://www.electricnation.org.uk/2016/10/11/robert-llewellyns-fully-charged-video-about-electric-nation-goes-live/
- The project presented at a V2G Workshop on 14th December 2016 organised by CENEX and the Level project (Low Emission Vehicle Enterprise & Learning), Gill Nowell and Ben Godfrey, WPD, attended.
- The project presented at REA Partner Event - Energy Storage and Connected Systems on 7th February 2017.
- The project attended a Cenex inspired V2G workshop at Warwick Manufacturing Group on 3rd March 2017.
- The project and WPD participated in the Smart Energy Marketplace 28th March 2017, hosted by Regen SW, to promote the project in the South West region.
- EA Technology presented the project at the New Energy Forum, London 2nd March 2017, to senior business leaders.

2 Project Manager's Report

2.1 Project Background

Electric Nation aims to enable DNOs to identify which parts of their network are likely to be affected by Plug-in Vehicle (PIV) uptake and domestic charging, and whether PIV domestic charging demand management services are a cost effective solution to avoiding or deferring reinforcement on vulnerable parts of their networks, using three methods.

Method 1: Modelling

This project will provide DNOs with an assessment tool to predict where PIV market penetration may cause network problems through increased demand for domestic PIV charging. This tool will, firstly, enable assessment of all (non-meshed) LV networks in a DNO's license areas to identify those most likely to be affected by increased penetration of domestic PIV charging. Secondly, the tool will enable more detailed assessment of those LV networks to identify the level of domestic PIV charging penetration that would present a problem and potentially trigger reinforcement. These identified networks might then be candidates for Method 3 Mitigations (see below).

Method 2: Monitoring

This project will develop an algorithm deployable on an existing substation monitoring facility that will enable the effect of charging PIVs on a LV network to be retrospectively analysed and allow the measureable impact to be compared against the modelling tool output.

Method 3: Mitigation

This project will adapt existing smart charger technology, potentially including V2G chargers if state of technology development is sufficiently advanced during the project timeframe, and existing commercial charger management services to deploy these in a mass-market customer trial. The aim of the trial is to prove the technical/economic viability of domestic PIV charging demand control and V2G services, to avoid or defer network reinforcement and to prove that such systems are acceptable to customers. The customer trial will include a wide range of PIVs, with a range of battery sizes and charging rates to assess to what extent such systems can be deployed in a future with a diverse PIV market.

2.2 Project Progress

2.2.1 Method 1: Modelling

Progress within this reporting period

Activity on development of the Network Assessment Tool in this period has focussed on identification of suitable data held by WPD that can be used in the NAT.

- Discussions regarding suitability of WPD's improved mapping project outputs concluded that the timescales of WPD's project and this project did not coincide and that there would be very limited data available for inclusion in the NAT.
- However, the NAT will be developed in such a way that inclusion of improved mapping data can be incorporated in the future (beyond the lifetime of this project).
- Further discussion regarding use of two existing WPD data sources:
  - Cable and overhead lines database (held by WPD's Mapping Centre); &
  - Crown database (including, substation and connections data - held by Asset Management) concluded that combining these two sets of data could be used in the NAT, recognising that these data have limitations and therefore confidence in the accuracy of the outputs from the NAT will vary.
- The reasons for this variation in confidence in the outputs include:
  - Cable and overhead line data is of variable quality
    - There are several sets of data, some legacy data is not as good as more recent data
    - Joint and pole data is partial
    - More critically
      - Cable and overhead line data only provides coordinates for start and finish, no data is available for actual route taken – which leads to potential inaccuracies relating customer connections (defined by MPAN data) to individual cables/lines
      - There is no connectivity data, relating the end of one cable/line to another to define a set of cables/lines that would make up a feeder.
  - Crown data provides some information regarding customer connections relationship to a feeder number, but it has been noted that this can be erroneous in many cases. In addition, feeder number is not used in the cable and overhead line data set.
- All this being said, using these data sets EA Technology believes it can produce a model of LV networks across whole license areas, with indications of confidence in each LV feeder being generated based on the quality of the data available – a model which does not exist at this time.
- The outcome of all these discussions has been an agreed outline specification for the NAT LV network modelling module
- WPD have provided sample data sets which EA Technology are now in the process of assessing in order to combine the two separate data sets to enable development of a LV network models.

Next steps

- Development of data import and validation routines (underway)
- Development of LV network model algorithm/heuristic using available data
- Review by WPD and improvement of algorithm/heuristics

2.2.2 Method 2: Monitoring

Progress within this reporting period

Thirty GridKey units have been available for substation monitoring for the CarConnect | Electric Nation project. The location for twenty-one of these units has been identified by WPD and deployment to these locations is underway.

Through a separate project, LEGK has also installed GridKey units at Millbrook and has begun to examine the signatures and patterns of EV charging where the background demand can be excluded.

Next steps

The remaining nine GridKey units will be available for locations where increased demand for domestic PIV charging is identified through the project.

Results of monitoring using the GridKey units will be fed back to the project team and WPD in order to ascertain whether the signatures and patterns of EV charging can be identified at a substation level against background demand.

2.2.3 Method 3: Mitigation

Progress within this reporting period

Delivered by EA Technology:

- **Project monitoring and reporting procedures established with WPD and TRL**

- **Project Data Protection and Privacy policies and procedures developed**
  - Data Protection Policy submitted and approved by Ofgem, 13th September 2016.
  - Data Protection Policy and procedures reviewed and modified as necessary as project proceeds
  - An updated version of the Data Protection Policy is due for submission to Ofgem in April, following minor clarifications of project partner and suppliers' roles and processes
- **Procurement of subcontractors undertaken in two phases**

  Phase 1 (EA Technology)

  - Contracting with CrowdCharge and Greenflux for provision of PIVDCS services to the project.

- Specification, selection and procurement of smart chargers for the test system and pilot installations, with a view to using these in the customer trial – contracts awarded to ICU (compatible with Greenflux system) and APT(compatible with CrowdCharge system).
- Procurement, under competitive ITT, of AutomotiveComms to provide Marketing and PR services to the project.
- Procurement, under competitive ITT, of Impact Utilities to provide customer research services to the project.
- Procurement, under competitive ITT, of The Tech Factory to provide systems integration equipment, services and support to the test system, pilot installations and ultimately the customer trial
- Procurement of NCC to undertake a cyber security review of the ICU/Greenflux and APT/CrowdCharge systems to identify system weaknesses and threat modelling.

Phase 2 (DriveElectric)

- Procurement of ICU and APT chargers for the customer trial deployment
- Procurement of charger installation services for charger deployment into the trial, contracts have been awarded to
  - EV Charging Solutions
  - The Phoenix Works
  - Stratford Energy Solutions
  - Actemium UK
- Procurement of vehicle telematics services to provide PIV state of charge data to a selection of vehicles in the customer trial

- **Marketing and PR**
  - Project marketing strategy developed
  - Project customer facing brand developed – "Electric Nation"
  - Marketing collateral specified, developed and supplied, including
    - Website: http://www.electricnation.org.uk/
    - Facebook: https://en-gb.facebook.com/ElectricNationProject/
    - Twitter: electricnation_
    - Interactive display model for use at exhibitions and trial recruitment events designed and built
    - Exhibition stand and banners stands
    - Posters and leaflets for recruitment partners (vehicle sales)
    - Branded giveaways (pens and USB memory sticks) for recruitment events
    - Recruitment brochure – explaining the trial to potential recruits
    - Customer welcome pack – for customers entering the trial
    - Photography for this marketing collateral
    - Videos explaining the project for the website and social media campaigns
  - Delivery of project marketing activities
    - Updating website, news and events
    - Delivering a social media campaign promoting the project through Twitter and Facebook – primarily aimed at customer trial recruitment
    - Exhibitions, conferences and workshops attendance to promote the project
    - Press releases and articles for selected publications developed and published
    - Planning for 2017 events – exhibitions, conference, etc

- **Customer research**

  The customer research activities of the project aim to provide qualitative evidence of customer driving and PIV charging behaviours and acceptance of PIV charging demand management during the customer trial. This will be measured through a series of questionnaires that customers involved in the trial will be asked to complete (electronically, over the phone and in some cases, face to face).

  - Baseline questionnaire – post-recruitment, pre-installation of smart charger – developed and deployed to customers as they are recruited into the trail. This is aimed at gathering recruit socio-economic data and vehicle usage data
  - Post installation questionnaire developed. This is aimed at gathering data on attitudes to charging their PIV after a few months, in some cases before they experience demand management in some cases where demand management is imposed on their charger from the day they join the trial.

- **Test System design and Build**

  The project test system, built and operated at EA Technology's offices in Capenhurst, Chester has served and continues to serve several purposes for the project:

  a) To provide a test environment for the smart chargers selected for the customer trial – to ensure they have the required functionality for PIVDCS and data reporting (complete).
  b) To provide a test environment for the system integration components and services required to ensure secure and reliable communications between the smart chargers and PIVDCS servers (complete)
  c) To test the Greenflux and CrowdCharge PIVDCS configurations prior to deployment into the customer trial – and provide an ongoing test environment for further configuration improvements as the customer trial produces results that highlight need for improvement (ongoing).
  d) To provide a facility for investigating equipment and PIVDCS performance issues and failures arising in the customer trial (ongoing).
  e) To enable testing of PIV charging performance under demand management conditions (ongoing).

  Activities delivered in this period

  - Design of test system, including independent monitoring equipment to validate smart charger performance and data returns
  - Successful application for landlord's permission to build the test system
  - Procurement of materials, equipment and services required to build the test system
  - Test system construction
  - Test system commissioning

  The test system is now fully operational.

- **PIVDCS Configuration Testing and Improvement (Algorithm Development)**
  - EA Technology has worked with both PIVDCS providers, CrowdCharge and Greenflux to test and improve their system configurations in order to ensure the PIVDCS are fit for purpose for the customer trial. This has entailed numerous tests of each PIVDCS:
    - With a variety of PIVs: numbers, types (e.g. BEVs and PHEVs) and models.
    - Under steady state and varying capacity limits

  - To date both PIVDCS have been tested sufficiently with individual vehicles, confirming that their initial configurations are fit for purpose in the customer trial; both providing PIVDCS under varying capacity limits and capable of providing data for performance evaluation. The test system will be used throughout the trial to further improve PIVDCS configurations, depending on need, based on performance in the customer trial and customer research findings.

  - EA Technology has also worked with both PIVDCS providers to define data requirements from their systems to enable PIVDCS performance evaluation in the customer trial. This has been used to specify and develop a database that will be used to carry out this analysis and reporting.

  - EA Technology has worked with WPD to define a PIVDCS control regime, based on HV feeder demand control. These are 11kV feeders supplying a number of LV (distribution) transformers in an area. WPD has provided sample HV feeder data that has been used by EA Technology to develop model feeder demand profiles for use in the initial stages of the customer trial by the PIVDCS.

  - EA Technology has worked with WPD, DriveElectric, Greenflux, CrowdCharge and Impact Utilities to develop a customer trial specification. This is necessarily adaptive owing to the complexity of the trial population and the uncertainty of the ultimate make-up of the trial population.
    - The trial population is complex owing to the variety of models (manufacturers), types (BEV and PHEV), battery sizes and nominal charging rates of vehicles that may be involved in the customer trial, as well as demographic-based vehicle usage (e.g. the difference between commuter use, stay at home parents, retired people and other types of vehicle use) that complicates the population further.
    - While the project has specified target proportions of type, battery size and charging rates, the actual proportions of each actually recruited will be defined by customer willingness to participate in the trial, customer vehicle preference and the rapidly evolving PIV market (the range of models of PIVs and the rise in battery sizes in new models changes month by month). This gives rise to uncertainty in the actual mix of population the project will ultimately achieve.

    The initial phase of the trial is designed to accommodate the gradual growth in trial participants from January 2017:

    - Trial participants entering the trial will be equally assigned to each PIVDCS

- Initially customers entering the trial will be assigned to a control group of PIV owners who can charge at will, i.e. not subjected to PIV demand management.
- Subsequently, customers entering the trial will be subjected to PIV demand management as soon as they enter the trial.
- As soon as possible, depending on growth in the trial population, PIVDCS performance and customer research data will be used to identify the significant factors affecting charging behaviour, such as PIV type, battery size, charging rate, vehicle usage and so on. This analysis will be used to determine population splits further into the trial, at least in the second year of the trial in 2018.

- **Pilot Installations**

  To prepare for the customer trial roll-out of smart chargers a small scale pilot installation (10 pilot installations in total) has been undertaken. This involved:

  - Developing a technical specification for the systems to be installed in homes – in particular, ensuring compliance with safety related regulations.
  - Developing draft detailed installation instructions for installers – focussing on elements of the installation that would be unfamiliar to them, such as the communications equipment
  - Developing H&S risk assessments for use in the installations – ensuring compliance with CDM regulations.
  - Procuring equipment required and the services of installers, selected by DriveElectric, to carry out the pilot installations
  - Installing five of each of the ICU and APT smart chargers in volunteers' homes
  - Refining the installation instructions based on actual experience of installers
  - Troubleshooting issues with the pilot installations – These included faults on chargers themselves and communication equipment issues. Using this learning to refine the installations instructions and to develop troubleshooting guidance for the project for use in the customer trial.
  - Developing and delivering a training course for the installers who will be delivering the customer trial installations.
  - Handover of installer instructions, H&S/CDM, etc systems to DriveElectric for the customer trial delivery.

- **Systems Integration**

  Secure, reliable and cost effective smart charger communications are essential for delivery of PIVDCS systems. To meet this requirement the project has engaged a specialist internet communications company to work with both ICU/Greenflux and APT/Crowdcharge to provide equipment and services throughout the project. This work included:

  - Specification of systems to support home broadband internet communications as a priority communications method – this will in the long term be much cheaper than mobile data methods.

- Utilising mobile data as a back-up in case of poor broadband services or in cases of failure of the broadband internet service or system equipment.
- Deploying equipment into the test system at Capenhurst to test the communications solutions work.
- Deploying these solutions into the pilot installations, troubleshooting issues and advising on improvements to the installation instructions for installers regarding commissioning and troubleshooting.
- Supplying equipment, services and support for the customer trial installations
- Troubleshooting customer trial installations through this support service.

- **Cyber Security**
  - Effective cyber security in the future deployment of PIVDCS is essential as "internet of things" type devices have already proved to be gateways to subversive internet attacks; smart chargers are by the fact that they require internet connectivity are "internet of things" devices. Weaknesses in smart charger communications could provide threats to PIVDCS systems that could be used to disrupt electricity demand (e.g. rapid simultaneous switching of active charger could cause faults or disrupt frequency locally or even wider afield). It is likely, in future, that real time demand control may be required, where connectivity between Distribution Network Operator systems and PIVDCS is required. In which case, PIVDCS systems could even act as a gateway to Distribution Network Operator data/control systems and provide more avenues to electricity distribution, transmission and generation systems.

  - While it is recognised that the PIVDCS systems deployed in this project are likely to be obsolete within a few years, replaced by evolving/new technologies, the principles of effective cyber security and learning from this project could and should be used in the procurement of future PIVDCS.

  - As there is no physical connectivity between WPD systems and the project's PIVDCS, and the fact that the number of smart chargers deployed in the customer trial is relatively small (in terms of maximum electricity load that can be disrupted in comparison to GB wide electricity loads) the consequences of disruption of the project's systems are extremely small. So, cyber security threat analysis of the PIVDCS is not an immediate issue and is not a risk to the project.

  - This project has procured the services of NCC to undertake cyber security threat modelling of both the Greenflux/ICU and CrowdCharge/APT PIVDCS systems to identify immediate threats to the customer trial (that the suppliers will be required to address within the lifetime of the project, if the consequences to the success of the project are significant) and less urgent threats that should be considered within the functional specification of PIVDCS that will be produced as an output of the project. This functional specification being developed for future Distribution Network Operator procurement of PIVDCS into the 2020s.

- To date NCC has undertaken a preliminary scoping of the PIVDCS and requested detailed information from the suppliers of the components/services involved in the PIVDCS. Most suppliers have provided this information, information from one supplier is outstanding. Once this information is provided NCC can develop a threat model for the PIVDCS and make recommendations for testing these threats.

- **V2G Market Research**
  - The project has an aim to bring household scale vehicle to grid systems into the customer trial – that is single phase, G83 compliant V2G system – in order to assess whether V2G, alongside smart charging/PIVDCS can be used to meet the project aims of providing mitigation to PIV charging growth. V2G chargers could be switched to export mode at times of peak electricity demand to support local PIV charging when required, supporting local voltage and reducing LV substation loads.
  - Almost all V2G charging systems that the project has identified to date are three phase systems designed for commercial charging scenarios (e.g. offices/car parks).
  - Furthermore, most of these systems are bespoke or pre-production systems.
  - One (albeit three phase) V2G charger that is apparently commercially available has to date proved impossible to purchase or even to get a quote for costs. The team continues to engage with the supplier.
  - Cenex has recently announced deployment of a single single-phase V2G charger in GB, but this is a bespoke built unit. The project is investigating whether it might be possible to purchase these units for the customer trial.
  - However, the project has identified a potentially viable single-phase V2G charger manufacturer, with good pedigree. If the supplier can bring their technology to the project within the CarConnect | Electric Nation project timeframe then this may enable the project to incorporate V2G in the customer trial. At this time, we need to preserve commercial confidence and cannot disclose more details.

Next steps

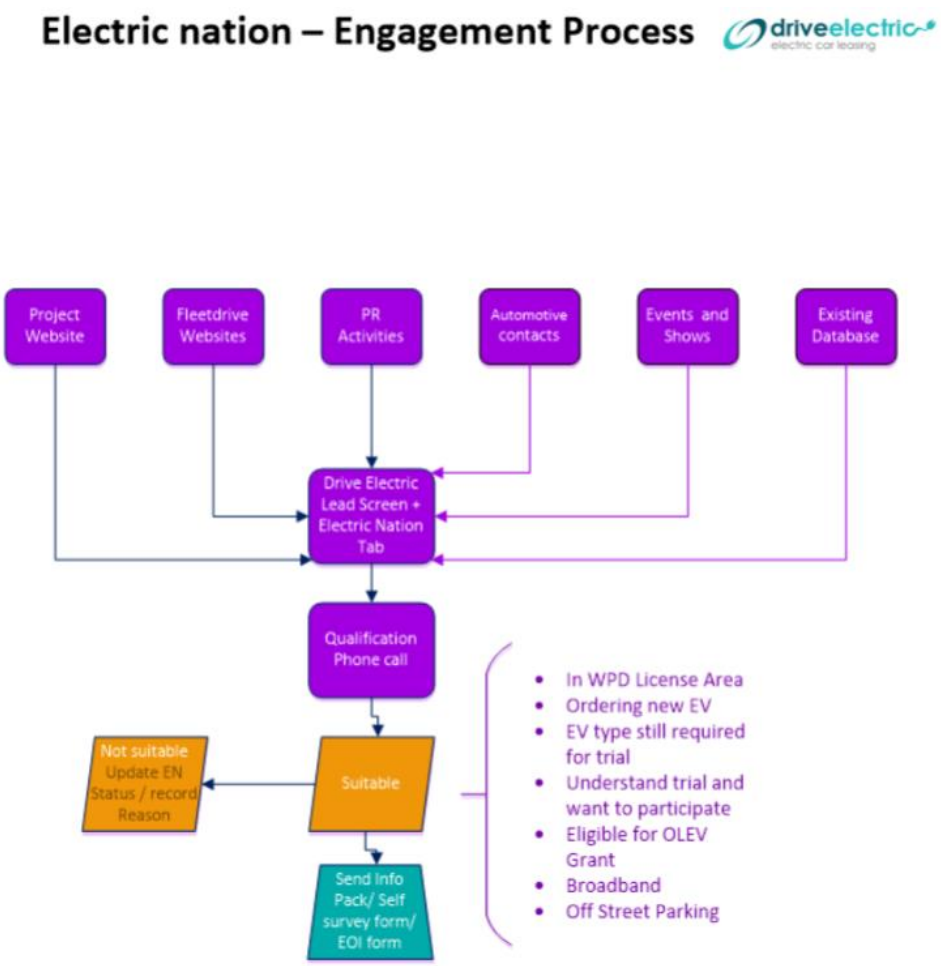
- Systems Integration supply of equipment for Customer Trial installations – ongoing.
- Work with Systems Integration provider, charger manufacturers and PIVDCS suppliers to support to installers and DriveElectric trial support team to ensure maximum communications uptime of chargers in trial – ongoing.
- Identify and implement successful resolutions to the currently identified faults with pilot and customer installations.
- Continue development of trial data database, incorporating data returns from Greenflux/Crowdcharge/Impact Utilities and developing queries and reports for analysis and project reporting purposes – ongoing.
- Use Greenflux/CrowdCharge data returns to watch out for potential early issues with PIVDCS implementation in the customer trial – e.g. overly severe demand management actions or customers left with inactive chargers at the outset of the trial could lead to unnecessary customer dissatisfaction – April/May onwards.
- Continue progressing Cyber Security analysis – ongoing.
- Continue raising awareness of project through dissemination activities and support DriveElectric customer recruitment programme – ongoing.

- Continue management of Customer Research supplier and liaison with DriveElectric to ensure customer research activities cover expected growth in trial population (demographic of participants and vehicle mix).
- Continue pursuit of favourable V2G options for the project with a view to reporting conclusions to WPD by June 2017.
- Continued development of the NAT.

Delivered by DriveElectric

- **Trial Recruitment and Customer Support Team Recruitment**
  - Sales/Engagement Manager recruited May 2016
  - Draft qualification process developed (see Figure 1)

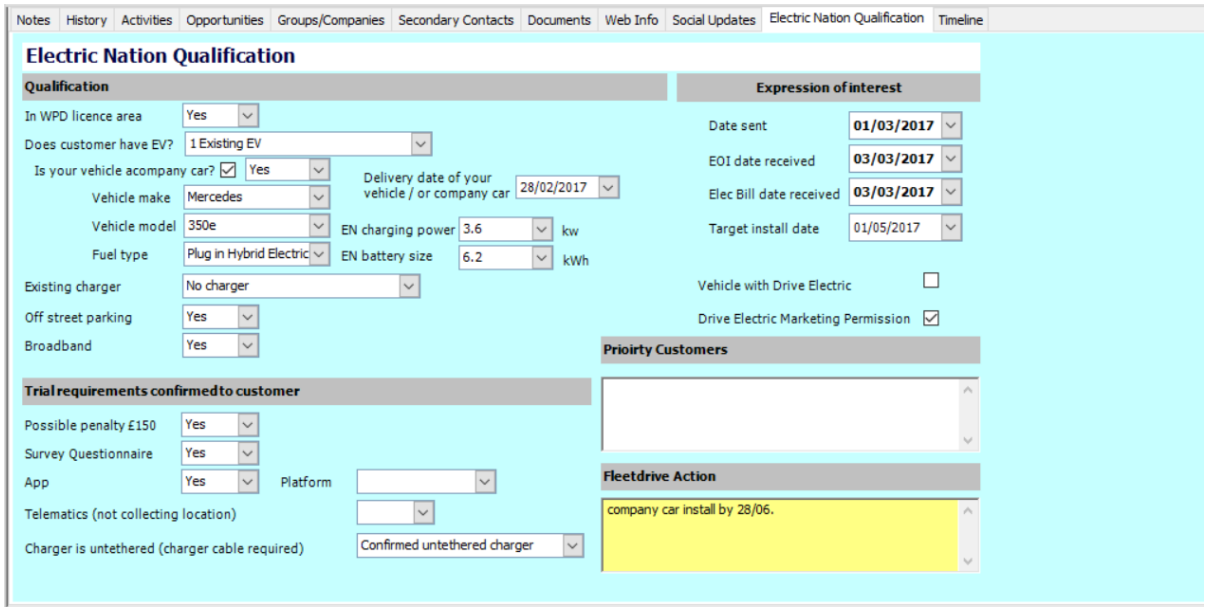
Figure 1 - qualification process



- Data Protection and Customer Engagement plan completed July 16
- The make-up of the engagement team has evolved to reduce field staff to more office based staff. The project team is mix of existing and recruited staff.

- **Customer Relationship Management (CRM) system development**
  From the start of engagement process the call handling screen has been developed. The current iteration of this is shown in Figure 2.

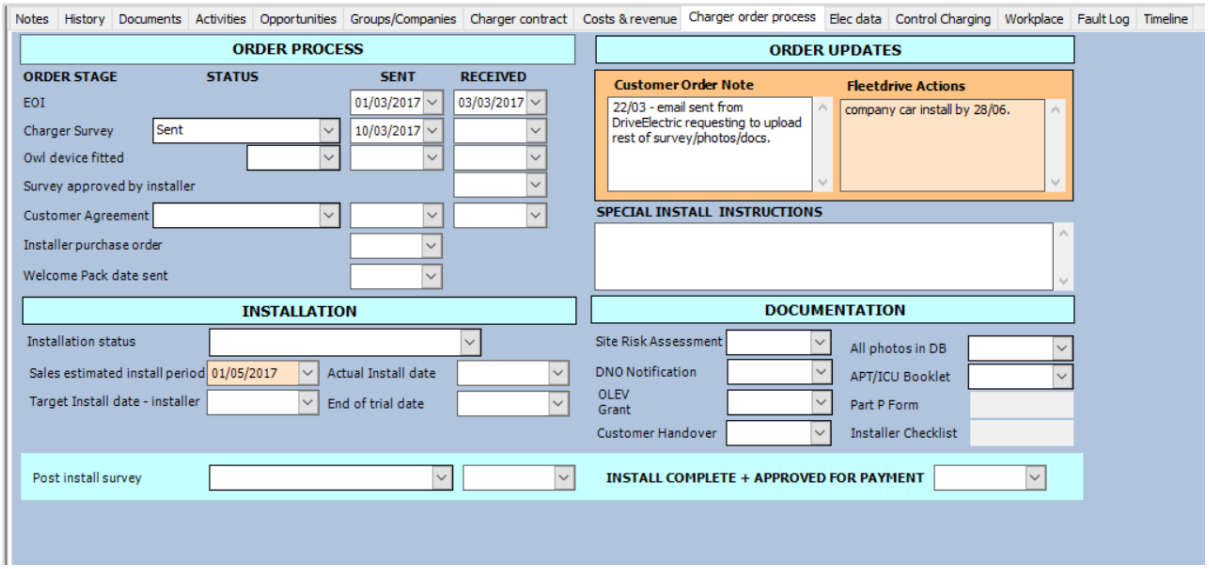
Figure 2- Call handling screen from CRM system



Iterations have included:

- Company car has become important as rules for company cars are different for the Office for Low Emission Vehicles (OLEV) grant rules.
- Battery size and power has been amended to make it definite figure as opposed to groups of sub 30kWh etc.
- Broadband provider has been added to keep check for comms faults.
- Tethered charger (charge lead permanently connected to the charger) option has been added, as it was initially expected that all chargers would be socket type, as this allows for future flexibility, however some participants have a preference for tethered.
- In light of many free charge point offers appearing over the summer/autumn 2016, the £150 up front refundable fee was amended to a payment of £150 if participants leave the trial early.
- Questions around trial terms such as willing to participate in questionnaires etc. were added.
- The CRM system has also been developed to administer the installation of chargers and deal with the helpdesk function. (screen shown in Figure 3)

Figure 3 - Charger installation screen from CRM system



The charger installation screen has been updated through the development of the install process. The main updates have been:

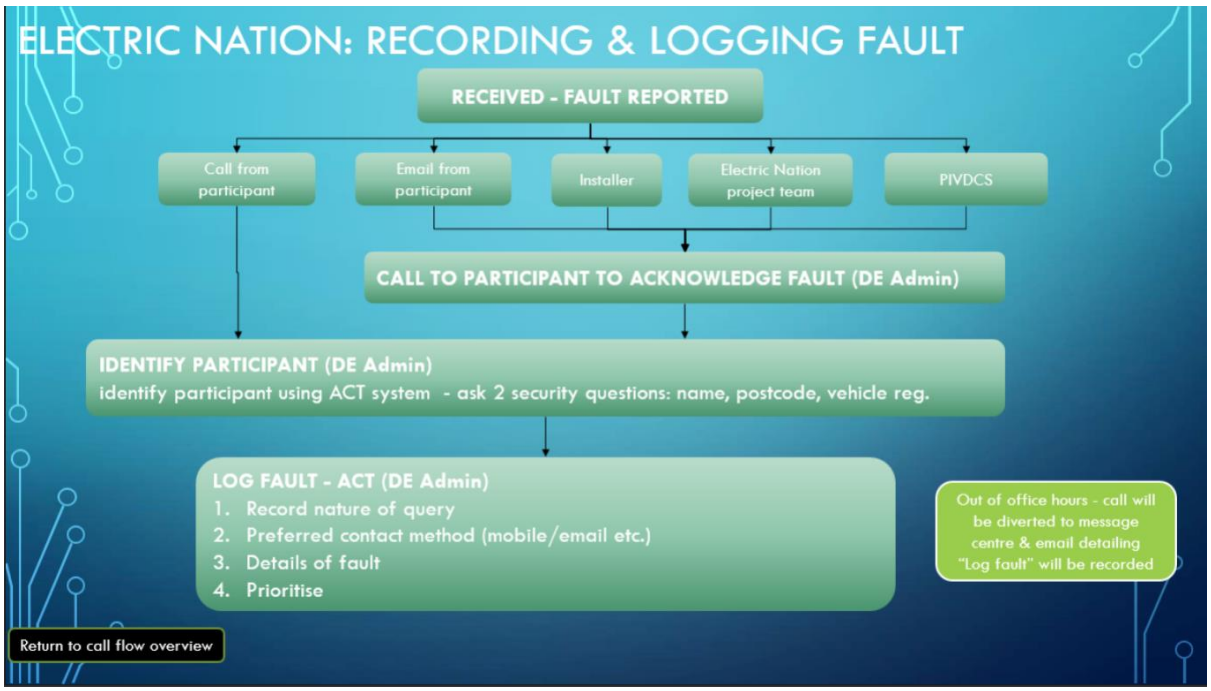
- Addition of dates for all documents
- Addition of DNO notification, Part P Form, Risk assessment

Systems outside of the CRM system have been developed to ensure data protection policy is adhered to including:

- Installer online report to update install dates etc.
- PIVDCS report to act as checklist of chargers entering the system.
- Charger OEM reporting to give a heads up for delivery of chargers.
- All the above have been communicated using Dropbox spreadsheets (anonymised apart from Installers) to provide secure access.
- Fault report spreadsheet – for review with all stakeholders. This process is being refined.

- **Customer Support System Development & Delivery**
  - Customer helpline establish on specific number which includes 24 / 7 answering with simple triage questioning
  - Initial helpline process developed and subsequently refined several times as relationship with PIVDCS, Charger installers and Charger OEM's developed.
  - The process for initial faults is shown in Figure 4.

Figure 4 - Fault recording and logging



Further details of the fault recording and logging process:

- A customer initial fault diagnosis guide has been included in the welcome pack.
- All faults are being reported on a fault log each week.
- There have been 3 x faults whereby chargers are tripping protection devices. It is not clear if these are connected however it would seem that BMW i3 could be a factor here. One benefit of the PIVDCS system has been the ability to impose a current limit on these installations to provide a short term fix and allow unfettered charging to take place.

- **Trial Recruitment Activities**
  - Trial recruitment began in Sept 2016 with a launch event at Cenex along with associated PR activities.
  - An initial surge of applicants proved to be largely ineligible. In the main part C.45% due to location being out of WPD area and C 35% due to not being eligible for OLEV Grant. The location aspect of this has continued through the process so far.
  - The strategy was adjusted to concentrate on informing new PIV drivers about the project as close to point of sale as possible. Therefore further canvassing activity was focussed on Dealers, Manufacturers and online referrals to engage with the right types of prospect.
  - Overall supply of leads has steadily built and this has been solidly over 50 a week for the last 6 weeks. With a target of 13 completed installations a week to be on target the conversion rate of C20%.
  - The April 2017target for installations has been exceeded. The end-April 2017 milestone for approved surveys is close to being met. This would bring installations and approved surveys one month ahead of target.
  - Overall DE has now spoken to over 1200 potential participants to get to an expected 140 installs (once they have worked through the system). The expected success rate

was 10% so this is a little above target and is expect this to improve and marketing and bringing participants into the trial continues to improve.

- At the end of March 2017, the numbers of participants at different stages in the process was:

Total responses	1175
Total EOI Received*	254
Total Surveys sent	249
Total Approved	118
Total Installed	55
WPD Participants	6

* EOI = Expression of Interest

- **Smart Charger Installation services**
  - A training package and training day have been held to bring installers up to date on the processes and chargers specific to this CarConnect | Electric Nation project.
  - Installers have been given access to PIVDCS systems to check on communications however this does not help with diagnosing faults on install.
  - Pilot installs were carried out to develop the install process and to train new installers.
  - DE is looking to recruit alternative suppliers for install at right price.
  - Assessment of overall load for a property has also been an issue for some properties. It has been necessary to issue "OWL" type clamp meters to homes where the overall load is thought to be a problem. It is felt there is a need for more guidance for installers in the situations where more than one PIV charger is requested.
  - The Risk Assessment process has been embedded in the installation process and this is working well. Additional qualified electrician resource is being sourced through EA Technology to provide additional assurance for the role of Principal Contractor and to aid fault resolution.

- **PIV Telematics Selection, Procurement and Delivery**
  - The telematics supplier originally used for quoting raised the price significantly once the project was finally started. There was a gap of over 12 months in between and changes in currency exchange rates have had an effect.
  - To maintain project budget, the strategy was changed increase mixture of OEM telematics and procurement of a third party solution form a UK supplier at a lower price.
  - Both OEM and third party solutions are taking time to develop and complete an overall solution.
  - The third party solution is still more expensive than OEM and to date has not fully delivered on the requirements for data to be collected.

- **Customer communications**
  - Documentation has been developed for various stages of the engagement process:
    - Expression of Interest – This has been modified in line with adjustments for qualification process e.g. inclusion to confirm if company car etc.
    - Home survey document – This is completed by the customer and checked by the installer to ensure safe and within budget installation. In general, this has worked well.
    - Customer order updates – Once in the process for engagement all participants are sent a weekly update that repeats the arrangements made for them including most importantly the target date for installation.
    - Customer agreement – this confirms the terms of participating in the project, and importantly, outlines the work to be carried out and any additional costs.
    - Installation checklist – The installer completes all the steps of installation including discussion of safety with customer, customer acceptance signature etc.
    - Aside from the project learning, some additional quality checks have been carried out in the first survey. The first 10 participants have also been independently contacted and initial feedback has been positive.

Next steps

The milestones for the next two quarters for DriveElectric are:

Milestone Description	Due Date	Status
DriveElectric - 100 recruit orders	30/04/2017	Complete
DriveElectric - 40 customers in trial	30/04/2017	Complete
DriveElectric - Customer Communications & engagement report	30/04/2017	In progress
DriveElectric - 140 recruit orders	31/07/2017	In progress
DriveElectric - 100 customers in trial	31/07/2017	In progress
DriveElectric - Customer Communications & engagement report	31/07/2017	Not yet started

Next steps:

- Finalise recruitment of all installers.
- Finalise and implement a fully functioning telematics solution that delivers on the required data from all trial vehicles.
- Test and confirm ability to collect comparable telematics data from across a selection of OEM and third party solutions implemented in the project.

3 Progress against Budget

Spend Area	Budget (£k)	Expected Spend to Date (£k)	Actual Spend to Date (£k)	Variance to expected (£k)	Variance to expected %
WPD Project Management	96,008	20,550	41,479	20,929 overspend	102% overspend (1)
EATL	3,094,358.75	922,984.64	922,985	0	0
TRL	226,802	90,722	90,722	0	0
Drive Electric	2,129,374.67	401,096	326,096	75,000 underspend	19% (2) underspend
Lucy GridKey	255,480	156,000	71,400	84,600 underspend	54% (3) underspend
TOTAL	**5,802,023.42**	**1,591,352.64**	**1,452,682**		**9% underspend**

Comments around variance

1. WPD project management costs include time for depot charging point installations that were not in original budget, and associated internal policy work.
2. DriveElectric £75k enablement fee not invoiced in Dec 2016. will be corrected in next report
3. Lucy Grid Key installation training completed in early April. Not invoiced yet.

4 Progress towards Success Criteria

The success criteria of the project are defined as:

1. An LV Network Assessment Tool for DNOs (an add-on to the widely used WinDEBUT LV design tool) that:
   a. Analyses and quantifies PIV related stress issues on LV networks (to LV area scale), including:
      i. Heuristics enabling rapid assessment of PIVs on LV networks through "topological" modelling of LV networks
      ii. Ability to include known PIV charger installations
      iii. Ability to forecast future PIV charger installations based on PIV market growth and forecasts
      iv. Flexibility allowing for future charger rating and PIV battery size developments
   b. Identifies best economic PIV solution: Demand Control/V2G/Reinforcement.

   Project Activity has been slowed by necessary discussions with WPD regarding data availability. However, this delay in starting development of the tool is not perceived as a threat to ultimate delivery and meeting this success criterion.

2. A functional specification for a technique to monitor and understand the effects of electric vehicle charging on LV networks across different levels of penetration (to be delivered by others)

   Outputs from the Lucy Electric GridKey units will be used to report upon this success criterion in future 6 monthly reports.

3. A functional specification and commercial framework for future procurement and deployment of PIV/V2G Demand/Export Control Services by DNOs to delay or avoid network reinforcement in cases where PIV installation numbers create network stress.

   Progress on establishing the test system, pilot installations and customer trial are on schedule with good progress made toward this criterion.

5 Learning Outcomes

All project learning to date has arisen from Method 3: Mitigation:

1. Marketing & PR activities – in developing a customer facing brand it is worth the cost and effort to trademark the brand to avoid potential conflict with another party that might develop a very similar brand at the same time.

   In this project: an automotive OEM coincidentally developed a social media campaign with the name "Electric Nation" at the same time this project did, neither party was aware of each other's branding until this project launched the project in September 2016, just days ahead of the other party's planned launch. Our launch gave us a priority claim on the brand name and the OEM rebranded their campaign. This might have been avoided if the project branding had been registered through a trademark application at the earliest opportunity.

2. Pilot installations
   a) Homeowners may not have a direct relationship with their internet service provider, if their internet is provided by their employer for example.

      Problems with one pilot installation communications not working were caused, in part by a very old broadband router model and its set up. This proved impossible to resolve by changing the router settings as the householder did not have any credentials for logging on their system and their employer's contractor was incapable of providing them either.

      This problem was resolved by reconfiguring the project's communications equipment to get round the problem and adopting this as a standard for all APT/CrowdCharge systems for the project.

b) A physical fault on an APT charger was repaired by an APT field engineer, who was unaware that the charger had a special configuration programmed in for project purposes. The field engineer reprogrammed the charger with standard settings making the charger unusable for project purposes.

This led to a decision to get both charger manufacturers to programme the chargers to the project's specification at the factory and to issue the configuration as a one of their own suite of configurations to avoid future instances.

c) The project has concentrated on testing and proving what were rightly viewed as "critical" equipment - the chargers and communications equipment. Ancillary equipment such as power switches and USB power supplies were viewed as "low risk" items as they are in market items and used commonly with very low failure rates. In particular, charger installer advice and guidance was followed to specify the electrical protection equipment required for the smart charger installations.

Some of the pilot installations and early customer trial installations have highlighted potential issues with this equipment:

- RCBO "nuisance" tripping – this is a safety critical device on the power supply to the charger, in layman's terms an "earth leakage" device that protects people from electric shocks in case of damage or tampering with equipment.
  Investigations have revealed that this is a technical problem with using this type of protection device with power inverters, as used by PIV on-board chargers. There is no easy fix, devices that would be less sensitive to inverter "noise" would provide insufficient protection against electric shock risks to people.

  Swapping out RCBO's, in the hope of finding a less sensitive unit may resolve some of these nuisance trip issues, but the likelihood is that nuisance tripping will, for the foreseeable future, be a problem PIV owners may have to put up with – until the electrical protection industry and regulators devise a solution.

- MCB nuisance tripping is an altogether different issue relating to electrical loads drawn by PIVs. An MCB acts like a fuse and protects wiring and electrical appliances from short circuit faults that have a potential to cause fires.

  One of the pilot installations has suffered numerous MCB trips during charging events – investigation highlighted a problem with the charger installer practice of rating charger power supply MCBs at the charger rating, i.e. 32A for a 7kW charger. The issue is that this rating is normally specified at 30^{o}C, as PIVs charge, the current going through an MCB warms the device, as the device gets warmer its tripping current reduces, so at 40^{o}C to less than 30A and at 50^{o}C around 28A. Furthermore, MCBs are known to

"wear with age", the longer they are installed and subjected to loads that warm the device the more likely they are to trip at lower currents.

It would appear that PIVs that charge at the full 32A current (not all do) may trip MCBs over extended charging periods and may prematurely age them.

The solution to this problem is to rate the MCB and power supply wiring to chargers at 40A, giving some leeway for chargers that are run at highest possible loads of 32A. This change to the technical specification for trial installations has been implemented

The real learning from all of this is not to assume that custom and practice in electrical installations is correct and low risk. Testing of ancillary equipment before the pilot installations may have identified the RCBO and MCB issues earlier and allowed us to warn the pilot volunteers and early entrants to the customer trial about the RCBO issue and change the MCB specification before the trial installations began (some of which may need to be retrofitted with 40A MCBs)

d) The installer training post pilot installations was very useful in terms of ensuring installers understand procedures and processes, clarifying procedures and processes based on installer feedback and reinforcing practical aspects of communications commissioning and troubleshooting.

Similar training/communication events to all similar projects would be recommended where contractors or employees separated from a core project team are asked to carry out remote installation, maintenance, etc. works for the project to ensure consistent high quality service from these suppliers.

6 Intellectual Property Rights

A complete list of all background IPR from all project partners has been compiled. The IP register is reviewed on a quarterly basis.

As the project is just entering the customer trial phase no foreground IP has been identified to date.

7 Risk Management

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, during monthly meetings and considering decisions;
- ✓ Maintaining a comprehensive Risks, Assumptions, Issues and Dependencies (RAID) register which is monitored and evaluated by TRL on behalf of WPD and discussed and reported at monthly meetings ;
- ✓ 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.

7.1 Current Risks

The Electric Nation risk register is a live document and is updated regularly. There are currently 31 live project related risks. Mitigation action plans are identified when raising a risk and the appropriate steps then taken to ensure risks do not become issues wherever possible. In Table 7-1, we give details of our 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.

Details of the Risk	Risk Rating	Mitigation Action Plan	Progress
R046 Customers switch off chargers resulting in spurious loss of communications events - wasting project team time investigating; and potential loss of data if customer does not restart system correctly to get communications working again.	Major	Customers are being instructed to not switch chargers off as part of trial participation instructions. Customers have also been given detailed instructions to allow them to reset their charger system after a loss of communications (or power failure/charger switched off event)	This is a recently added risk, following initial participants into the trial. The effectiveness of the information provided to participants will be monitored.
R006 During Trial the data captured from the vehicles is incomplete or of poor quality due to insufficient data resolution of the vehicle's on-board telematics systems or poor signal quality	Major	Liaison with OEMs regarding use of their telematics systems is ongoing. Alongside this, third party providers of	Both OEM and third party solutions are taking time to develop and complete an overall solution. The third party solution

Details of the Risk	Risk Rating	Mitigation Action Plan	Progress
preventing data transmission.		telematics systems are providing and adapting telematics systems for vehicles for which an OEM solution is not available.	is still more expensive than OEM. This risk is ongoing and a repot will be provided by DriveElectric for the next monthly project meeting.
R007 prior to Trial the vehicle data capture systems/technology may not be ready in time for vehicle delivery.	Major		
R016 EA Technology or DriveElectric poor delivery may occur	Major	- Selection of experienced sub-contractors, with potential for overlapping scope. - Regular update / progress meetings will be conducted to identify issues early. - Contract cover will be appropriate for all areas of work.	TRL provides an overseeing role on behalf of WPD, reporting on progress, risks, monthly reporting to and meetings with WPD. The high score of this risk is due to a high impact rather than high probability.
R012 during Trial there may be interface issues with the vehicles (e.g. vehicles do not respond to requests for information)	Moderate	An alternative data capture system has been identified that is independent of manufacturer and vehicle type, this is planned for use with some vehicles and could be used as an alternative when OEM systems fail to provide data	See above response in relation to R006 and R007. This is an ongoing risk to parts of the project and a repot will be provided by DriveElectric for the next monthly project meeting.

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

Table 7-2 provides a snapshot of the risk register, detailed graphically, to provide an on-going understanding of the projects' 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	0	2	0	0
	Less likely to occur/Mid to long term (6-10)	1	3	9	2	1
	Very unlikely to occur/Far in the future (1-5)	2	2	7	2	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	15	11	5	0	**No of instances**
Total	31				No of live risks

Table 7-2: Graphical view of Risk Register

Table 7-3 provides an overview of the risks by category, minor, moderate, major and severe. This information is used to understand the complete risk level of the project.

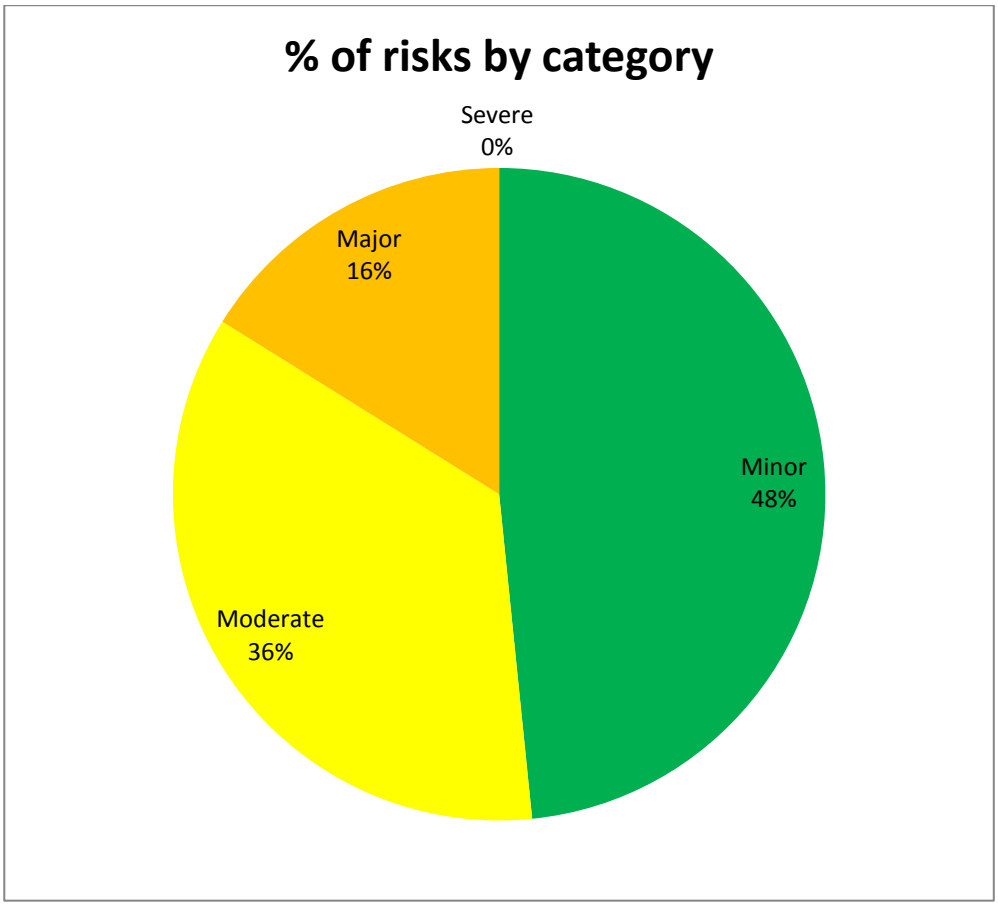


Table 7-3: Percentage of Risk by category

7.2 Update for risks previously identified

This is the first report of this type and therefore output from a previous report is not available at this time; the risks in Table 7-4 are therefore taken from the Outline Document. The partial completion of information populated in Table 7-4 is based on that available from the Outline Document.

Details of the Risk	Previous Risk Rating	Current Risk Rating	Mitigation Action Plan	Progress
The network data provided by WPD is not suitable / sufficiently robust for modelling purposes (R003)	N/A	Closed	No longer relevant	

Details of the Risk	Previous Risk Rating	Current Risk Rating	Mitigation Action Plan	Progress
There may be conflict between multiple technology suppliers preventing successful integration of the technology (R004)	N/A	Closed	No longer relevant	
Securing permission to install the test system may take longer than anticipated (R005)	N/A	Closed	No longer relevant	
The project may fail to recruit sufficient customer numbers across the range of vehicle types (R009)	N/A	Minor	The Project will agree metrics for each vehicle type and provide this clarity to Partners.	
Issues relating to unforeseen technical complexities, (beyond those risks already identified) may occur (R035 and R036)	N/A	Minor	**R035** - Charger communications and demand control services will be monitored by Greenflux to identify potential reliability issues, this data will be evaluated by EATL - Collaboration (already established) with Greenflux, ICU and The Tech Factory to	Technical complexities have been managed successfully to-date by EA Technology and Drive Electric. Further reporting on the resolution of chargepoint problems has been requested by TRL and WPD.

Details of the Risk	Previous Risk Rating	Current Risk Rating	Mitigation Action Plan	Progress
			understand and overcome identified issues - solutions will be deployed and tested on test system and relevant pilot installations before deploying into trial - Clear scopes of work will be agreed that do not transfer risk onto EA Technology or WPD. **R036** - Charger communications will be monitored by CrowdCharge to identify potential reliability issues, this data will be evaluated by EATL - Collaboration (already established) with CrowdCharge, APT and The tech Factory to understand and overcome identified issues - solutions will be deployed and tested on test system and relevant pilot installations before deploying into trial - Clear scopes of work will be agreed that do not transfer risk onto EA Technology or WPD.	

Table 7-4: Risks identified in the previous progress report

8 Consistency with Project Registration Document

The scale, cost and timeframe of the project has remained consistent with the registration document, a copy of which can be found here: https://www.westernpowerinnovation.co.uk/Projects/Current-Projects/CarConnect.aspx#FAQLink142;javascript:void(0);

9 Accuracy Assurance Statement

This report has been written and compiled by the CarConnect | Electric Nation Project Manager from TRL (Andy Wells) with input from the Project Managers from EA Technology Limited (Nick Storer) and DriveElectric (Mike Potter). This report has reviewed by Mark Dale and approved by the Future Networks Manager (Roger Hey).

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.