

MY ELECTRIC AVENUE



Second Tier Reward Application

May 2018



The 'My Electric Avenue' project is the public identity [SR1] for the Low Carbon Networks Fund Tier 2 project "I²EV". The formal title "I²EV" is used for contractual and Ofgem reporting purposes.

Authored by



Executive Summary



The large-scale electrification of transport in Great Britain is one of our most important future challenges. Understanding how consumers will use this technology, and then designing the energy system to accommodate this new demand, is crucial. This project was the first to establish the link between Electric Vehicle connections, customer charging behaviour and the local electricity network. The project's impact has been far reaching. It has been used by multiple network operators, influenced governmental policy and shaped legislation. Estimated consumer benefits far exceed the original cost of the project.

My Electric Avenue was developed and delivered as a partnership Project by EA Technology and Scottish and Southern Electricity Networks. It was designed to understand the impact Electric Vehicles (EVs) would have on low voltage networks, trialling a new demand control technology, to manage this stress to avoid network overloads – saving cost and disruption to customers. It delivered one of the most ambitious customer recruitment programmes of any innovation project, namely, the engagement and sign-up of domestic consumers in multiple 'clusters' on LV networks up and down the country.

The project delivered exceptional learning by:

1. Providing detailed insight into how demand response services could be delivered from EVs without inconveniencing customers.
2. Communicating this evidence to HM Government's Office for Low Emission Vehicles (OLEV) to inform new legislation in the Automated and Electric Vehicle Bill.
3. Directly influencing changes to SSEN's approach to LV planning, stimulating the creation of a team specifically focussed on EV Strategy, and driving the industry to agree a standard for managing EV charging.
4. Providing insight on EV profiles, which have since been used by many, Office for Low Emission Vehicles DNOs, ICPs and the TSO.
5. Building confidence in the EV sector that the industry and its regulators are aware of and responding to the network challenge posed by large scale EV uptake.

It was the first innovation project to be led, in its entirety, by a non-DNO, with an SME taking responsibility for partner and supplier engagement, along with responsibility for project delivery. The commercial learning and contracts developed from My Electric Avenue have since been used in numerous projects.



Colin Nicol
Managing Director SSEN



Robert Davis
EA Technology CEO

My Electric Avenue was, and continues to be, a key project of its time. The datasets and output reports have been instrumental to our understanding and have helped inform our policy on grid issues. The evidence on customer charging behaviours and smart charging acceptance has helped give Government the confidence to push ahead with widescale electrification of cars and vans. The project has informed our thinking on legislation currently making its way through Parliament as the Automated and Electric Vehicle Bill. The project also led to the establishment of the EV Network Group, a much needed and relevant forum, which is now being directly supported by OLEV.

Nick Brooks, Head of Energy
Office of Low Emission Vehicles



My Electric Avenue cost the electricity consumer c£4.6m (£4.2m in costs, plus £416k returned via the Successful Delivery Reward), which was leveraged by over £5.6m from additional contributions by the broad range of project partners. Over £500m of benefits for consumers has been attributed, by successfully demonstrating that Demand Side Response (DSR) solutions can be used as an alternative to traditional network reinforcement to facilitate the mass roll out of EVs.

This was a complex and challenging project which was truly ground breaking by being the first to bring together stakeholders from the entire EV supply chain: from vehicle OEMs, charge point owners, EV retailers, DNOs and customers, many of whom have provided the testimonials included throughout this document. This project has benefitted immensely from the combined skills and expertise of SSEN and EA Technology to produce learning which has been instrumental in progressing the electrification of transport in GB. We believe that My Electric Avenue has delivered exceptional results and has proved to be excellent value for customer money, producing benefits which significantly exceed the initial investment. The project has provided learning which will ensure the industry is well prepared to deal the challenges ahead as the wide spread roll out of EVs continues, underpinning our low carbon transition.

1. Project Summary



Tier 2 Project name	Licensee	Project summary (2 sentences)	Tier 2 funding £k*	Licensee compulsory contribution £k*	Other contributions £k*	Link to Close-Down Report
I ² EV – Innovation-squared: managing unconstrained EV connections	SEPD	This project, explored two strands of innovation: a technical assessment of EV charging in clusters; and the commercial delivery of an innovation project by a non-DNO.	£4,175k	£475k	£5,620k	http://myelectricavenue.info/sites/default/files/documents/Close%20down%20report.pdf

Table 1: Summary of Tier 2 Project

*Nominal prices

1.1 Background

My Electric Avenue, (originally conceived and submitted as “I²EV – Innovation-squared: managing unconstrained EV connections”), was developed and delivered as a partnership project by EA Technology and Scottish and Southern Electricity Networks. The project was formulated and submitted to Ofgem’s Low Carbon Networks (LCN) Fund as a Tier 2 project in 2012. It started in January 2013 and was delivered over a three-year period, on time and under budget.

My Electric Avenue had the following principal objectives:

1. **Technical:** to assess the impact EVs and clustering have on the network, and to assess potential DSR solutions to:
 - Determine the extent to which DNO led DSR could facilitate the connection of EVs;
 - Identify what social factors (if any) impact the use of DSR technology; and
 - Establish the technical benefits and disadvantages of this DSR technology.
2. **Commercial:** to determine whether a third party can accelerate deployment of innovation on DNO networks:
 - The project was led by EA Technology with SSSEN acting as a ‘host’ network; and
 - Processes were developed and shared to allow other DNOs to use in similar innovation projects.

The project objectives were addressed through practical activities to deliver solid, experiential learning:

- The recruitment of c220 citizens to drive Nissan’s LEAF cars over an 18month period. The recruitment was split into two groups:
 - A ‘technical’ group of c100 customers grouped in 10 clusters (i.e. people who live on the same electricity feeder) to assess charging behaviour and to determine whether a new Demand Side Response (DSR) technology could effectively manage EV charging.
 - A ‘social’ group of c120 customers from across GB to scale the learning and generate statistically significant charging behaviour data.
- EA Technology, an SME, taking on the responsibility to deliver the project on behalf of the DNO.

“You guys have done such a fantastic piece of work with this project... it is fantastic as it is real... it is literally the best vehicle charging project in the UK, if not the world.”

Martin Hale, Head of Marketing and Sales, EV Charging Infrastructure, ABB

- **Management of a range of partners and suppliers** including a major automotive Original Equipment Manufacturers (OEMs), two academic institutions, one additional DNO, consultancies, PR agencies and one equipment manufacturer to deliver the project.
- **Taking on delivery responsibility and associated risks** to deliver the project as a 'turnkey' activity for SSEN.

1.2 Evidence of Critical Outcomes

Based on the industry and stakeholder feedback there is little doubt that My Electric Avenue delivered high quality outputs, which exceed the original project objectives. A brief summary of how the project complies with the key reward criteria are summarised below:

Reward Criterion A – Exceptional performance of a project against one or more of the Detailed Criteria:

The wide spread adoption of EVs will pose a range of new challenges for DNOs, particularly in the management of low voltage networks.

My Electric Avenue provided the industry with a robust understanding of the impact of EVs on the network and demonstrated how DSR can be used to mitigate that impact. The project was hugely successful, delivering exceptional outcomes and learning over and above its original intention. Highlights from the project include:

- **Delivering the Carbon Plan:** Being used by both BEIS and OLEV to inform policy development and lead to the inclusion of smart charging as part of the **Automated and Electric Vehicle Bill (2018)**.
- **Releasing Network Capacity:** Showing that if widely adopted, DNO-led DSR from EVs can free up **6GW** of capacity by 2050.
- **Benefits for Customers:** Demonstrating a net benefit of over **£500m** to consumers by 2050, as evaluated as part of an independent review of the benefits case by Frontier Economics to support this application.
- **Rollout to BaU:** Direct influence of changes to SSEN's and other DNOs approach to LV planning, stimulating the creation of a team specifically focused on EV Strategy. Informed policies outside of SSEN, supporting DNO planning tools and informing the development of **industry standards**.

- **Relevance and Timing:** A wide use of the outputs demonstrating the timely nature – helping policy makers and network operators facilitate the change to low emission vehicles.
- **Robustness and Readiness:** Independent auditor Ricardo, describing the projects outputs as solid, and the outputs statistically significant, with the project team described as "excellent".

Reward Criterion B – To invest the DNO's own money to enable the project to be successfully delivered

All innovation projects carry risk. The flexibility and approach demonstrated by the project team ensured the outputs were delivered on time and to budget, with no additional costs to customers.

- The project team secured £5.6m of additional financial contribution from a range of project partners to leverage the investment from the LCN Fund. The partner contribution was crucial to the success of the project, without which, the project would not have met its original objectives.
- Given the embryonic nature of the EV transition at the projects commencement, My Electric Avenue was highly innovative, requiring a wide-ranging team from across the EV supply chain to ensure its successful delivery.
- Of note was how the team responded and reacted to several significant challenges during the projects delivery phase. For example, customer recruitment challenges at the start of the project were overcome through increases in partner financial contributions and/or risk to ensure delivery and keep the project on track.

Reward Criterion C – Undertake exceptional effort to exceed delivery outcomes and disseminate

My Electric Avenue set a high benchmark for learning and dissemination. The project purposely sought ways to increase the learning and target non-distribution network audiences such as the automotive sector, broader energy supply chain, investors, and policy makers (including opportunities to speak at Select Committee hearings in the House of Commons) to get its message out to key stakeholders.

- The project team constantly sought ways to exceed the expectations of the bid by evolving and developing the scope as new learning became available. This allowed the project to deliver learning beyond that anticipated in the original submission.

- The project led to several critical follow-on activities to ensure Britain's electricity networks are EV-ready (Figure 1).
- Informing the development of DNO standards and procurement specifications

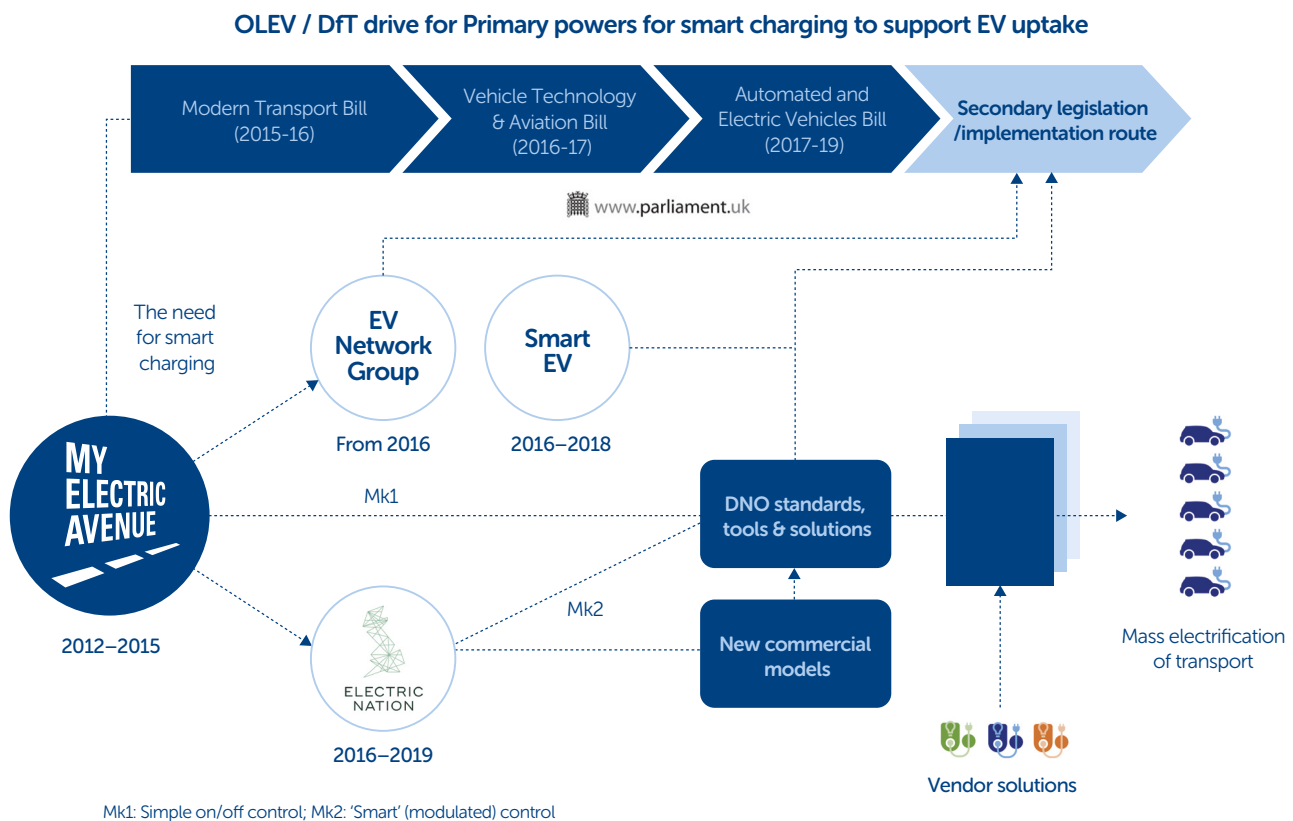


Figure 1: The journey from My Electric Avenue to support mass adoption of EVs on Britain's power networks

- **Customer Recruitment** – the use of local 'champions' to aid customer recruitment, was not considered at bid stage, but was crucial to the recruitment process. This approach has been replicated on other successful innovation projects such as SSEN's New Thames Valley Vision and WPD's Electric Nation.
- **New Relationships** – From the start the project sought to engage stakeholders from across the entire EV value chain. The project has influenced and informed government thinking and evolving legislation. The relationships and knowledge developed in My Electric Avenue, were fundamental in the establishment of the EV Network Group which has forged a permanent link between the energy and automotive sectors.
- **Additional Learning** – Additional activities such as the performance of Power Line Communications (PLC) were investigated and shared to prevent wasted efforts from other DNOs on projects in these specific areas. This additional learning was delivered and disseminated within the original project budget.
- **Exceptional capture and dissemination** – 52 reports were generated, together with GB of data; learning has been shared across the sector and beyond. A broad range of tools were used, from specific discussions, to webinars, social media and interviews on the BBC and YouTube. It represents excellent value for money to electricity customers.

2. Compliance with Reward Criteria

2.1 Reward Criterion A

A1 Aspects of the Carbon Plan and/or Clean Growth Strategy that have been facilitated

My Electric Avenue was constructed to focus on supporting the mass electrification of transport, in line with the Carbon Plan – the outcomes of the project have been taken on board by BEIS, OLEV and even been used to support legislation around smart charging as part of the Automated and Electric Vehicle Bill.¹

Genesis and current context

- The technical element of My Electric Avenue was established to ascertain the true impact of EVs on GB's power distribution networks, particularly when they appear in clusters – i.e. several cars charging simultaneously on the same residential street.
- The network Problem:
 - UK electricity network design at Low Voltage has been largely unchanged since the 1960s – single-phase, and relatively modest connection capacity.
 - The principle of diversity has allowed highly efficient network design upstream of the house for decades. Across the UK, most households are considered to have an after diversity-maximum demand (ADMD) by the DNO and ICPs of 1-1.5kW.
 - In contrast, most EVs charge at between 3.5kW (equivalent to a kettle) and 7kW (equivalent to a power shower) in a domestic setting. In contrast to these examples, depending on the distance driven, and EV could be charging for many hours, increasing the demand of the home, and radically changing the underlying diversity.
 - Such a change increases the power flow of the upstream electricity network, ultimately causing it to operate outside of safe and reliable limits. The LV network will be the first place to feel the stress, and therefore the key place to focus attention.
- This issue remains directly linked to the Government's Carbon Plan as mass adoption of Ultra Low Emission Vehicles (electric) is necessary to reach the 2040 emission target of 0gCO₂/km.

- The Government's Fifth Carbon Budget identifies electric vehicles, (BEV / PHEV combined) to be 6% of new sales by 2020 and rising to 61% by 2030 in their central scenario.

Chart 16: Projected average new car and van emissions over the first three carbon budgets and illustrative ranges of average new car and van emissions in the fourth carbon budget period and to 2050

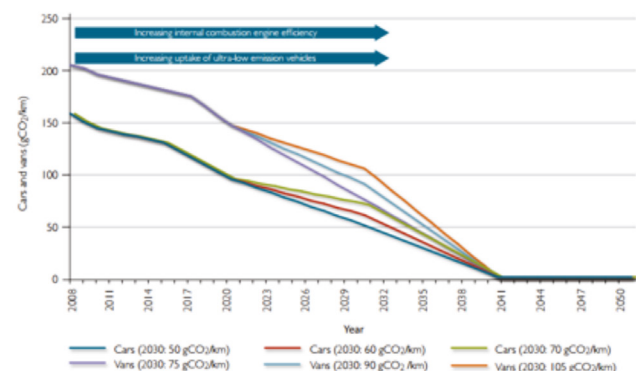


Figure 2: Vehicle emission targets from the Carbon Plan. NB. the 2040 target of 0gCO₂/km can only be achieved through a 100% switch from hydrocarbon-based fuel to another energy vector (source: The Carbon Plan: Delivering our Low Carbon Future, HM Govt, Dec 2011)

Figure 5.9: Key transport indicators under our Central scenario (2010-2030)

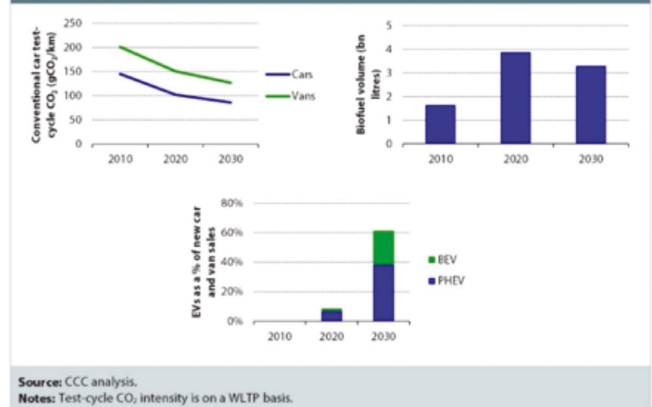


Figure 3: Carbon Budget key transport indicators (source: The Fifth Carbon Budget – The next step towards a low-carbon economy, Committee on Climate Change, Nov 2015)

1 Pages 26-27, Sections 4.2-4.3, My Electric Avenue Project Close-Down Report, March 2016

- Charging at home is expected to be prevalent, especially for those households who have off-street parking (as a proxy, the English Housing Survey, 2015 states that this covers 2/3 of all homes in England).
- The project came into being following desktop assessments to understand how policy projections from HM Govt, at the time DECC, Department for Transport and the Carbon Plan, might impact on the GB power system (source: Smart Grid Forum's Workstream 2 – A framework for the evaluation of smart grids, Frontier Economics, March 2012).
- Initial estimates suggested that charging patterns would exacerbate the evening peak seen on power networks, which if left unchecked, could damage electrical assets like cables and result in the need for significant reinforcement across the country.
- My Electric Avenue sought to quantify the desktop analysis, with experiential data from real customer charging behaviours, and to assess the ability of a simple demand side response tool 'Esprit' to defer or avoid the need for reinforcement.
- The project team sought to ensure that the DNO act as facilitator to the connection and charging of EVs, and not a blocker. This remains key in unlocking a critical element of the Carbon Plan, whilst simultaneously facilitating customer choice.
- When the project was put together in the spring of 2012, the volumes of EVs across the UK were very small. However, as was being seen with PV at the time, the uptake rates driven by support from FITs posed a challenge, as it was recognised that customer opinion can move faster than the typical investment timescales of an electricity network.
- The Government's policy agenda has since sharpened, with a recognition that EVs are a solution not just for the drive to low carbon, but also a means to improve air quality (air pollution in the UK's towns & cities is responsible for 40,000 premature deaths per annum). In 2017 HM Govt crystallised the aspirations of the Carbon Plan and announced that all new cars and vans would be zero emission by 2040, with tighter targets set for some regions, e.g. 2032 in Scotland, with some metro Mayors considering similar timescales.

- At time of writing, EV sales and overall volumes are progressing in line with the central trajectory outlined by DfT from 2011.
- Whilst there remains a divergent spread of EV uptake levels in the Carbon Plan, EVs are now seen as pivotal to meeting our carbon targets.

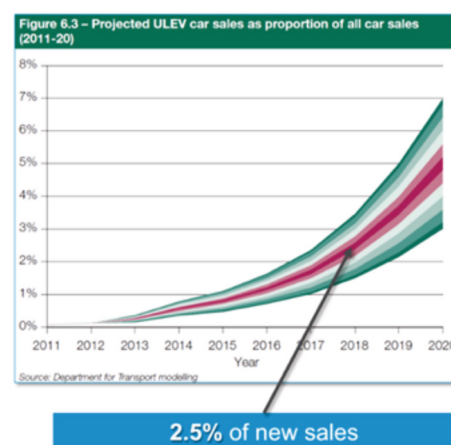


Figure 4: Actual and projected sales of BEV/PHEV in the UK (source: OLEV)

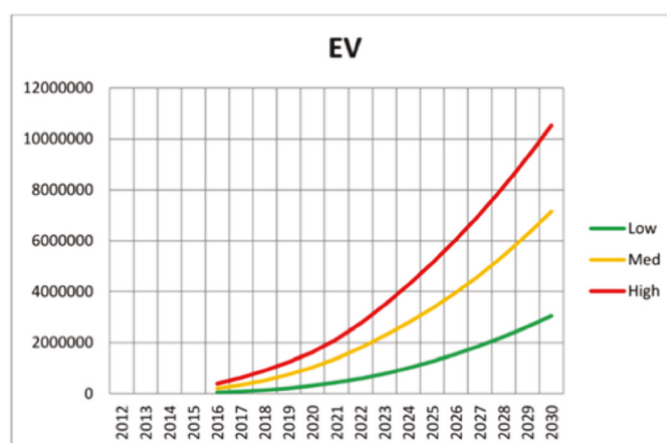


Figure 5: Actual and projected sales of BEV/PHEV in the UK (source: OLEV)

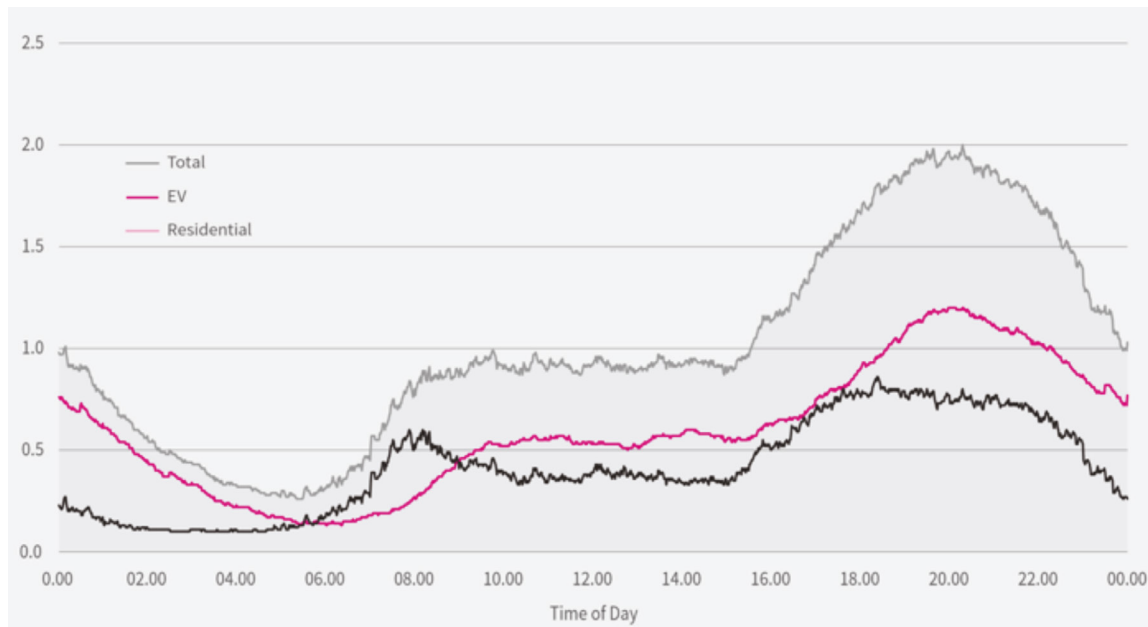


Figure 6: Revised domestic ADMD including EV charging (My Electric Avenue, Project Close-down Report, March 2016, page 27)

Project benefits in support of the Carbon Plan and Clean Growth Strategy

- The outputs of the project have been used to provide critical evidence of the impact of EVs on local power networks. For example:
 - Using the data from all trial participants the Project has generated a revised ADMD for non-electrically heated domestic properties, if each property hosts a single EV².
 - Figure 6 shows the currently used ADMD in comparison to the ADMD generated from the modelling of 1,000 EVs based on My Electric Avenue data.
 - Combining the two shows an increase of more than 100% to the total peak evening load, with the day time base load being higher and flatter than the previously considered morning peak. It is noted that for electrically heated properties, the 'Residential' and 'Total' loads would require revising upwards further to accommodate increased load.
- Across Britain, 32% of local electricity networks (312,000 circuits) will require intervention when 40% – 70% of customers have EVs due to the increased demand; new demand control technology could reduce the cost of managing this by over £500m up to 2050 (see A2) if the vast majority of customers accepted having their EV charging remotely controlled and cycled.
- As described in Section 2.3, the project team actively engaged with a broad range of stakeholders³, both during the project and immediately following, to support the Carbon Plan and provide insight on the practical experience of EV drivers, and of the potential solutions to support the network and minimise cost to GB citizens and electricity bill payers.

1 The calculations also assume that the EVs are equivalent to those used in the trials, i.e. battery capacity = 24kWh with a charging rate of 3.5kW.

3 Including: Government departments (BEIS, OLEV, InnovateUK); Ministers (industry & parliament trust, ministerial addresses); Ofgem; Automotive manufacturers (SMMT, LowCVP, Cenex LCV events, etc); Electricity Network operators and trade bodies (DNOs, National Grid, ENA); Other energy sector participants (National System Operator, Energy suppliers); House builders (inc. Barratt, Redrow); Charging manufacturers (Rolec, Chargemaster, Alfen (formerly ICU)); Investors; Other organisations: ETI, Energy Systems Catapult, academia, etc)

Electric vehicle infrastructure

The Bill provides government with the powers to:

- require that data on charge point location and availability is openly available
- set minimum technical specifications for charge point connectors
- oblige charge point network operators to allow interoperability between networks
- mandate provision of electric vehicle infrastructure at motorway service areas and large fuel retailers
- require that charge points are 'smart' and can interact with the electricity grid

Proposed ULEV measures for inclusion in the Modern Transport Bill

9 February 2017 Consultation outcome

"My government will work to attract investment in infrastructure to support economic growth. Legislation will be introduced to ensure the United Kingdom remains a world leader in new industries, including electric cars and commercial satellites [...]"

HM Queen Elizabeth II, 21 June 2017



Figure 7: The UK's Autonomous and Electric Vehicles Bill (2018) and it's predecessors (source: www.parliament.uk)

- Direct Carbon benefits from the project have been recalculated for this submission to be 186 Tonnes/CO₂.
- Project participants drove over 3million kilometres, saving an estimated 186 tonnes of direct CO₂ equivalent emissions based on the 2013/14 generation mix/carbon content for generation during the trial compared with an equivalent new internal combustion engine vehicle.
- In addition to the carbon benefits, the trial participants have also contributed to improvements in air quality with reductions in NO_x and SO_x emissions during the project.
- At the end of the project 58% of all participants responded that they were looking to either lease or buy an EV, following their positive experiences.
- Carbon emissions savings calculated in the project (SDRC 9.8) were assessed to be between 814 and 1,390 tonne CO₂e by 2050, dependent on technology uptake.

My Electric Avenue legacy to further support the Carbon Plan
My Electric Avenue, led to several critical follow-on activities to ensure the networks are EV-ready, these are shown in Figure 1 and described over.

- **Modern Transport Bill – Automated & Electric Vehicles Bill:** The strength of evidence provided from the project informed OLEV in their shaping of the Modern Transport Bill. Interactions between the project team and OLEV ultimately formed the basis for ‘Smart Charging’ to be included in this Bill as an ‘insurance’ measure to allow mass electrification of transport in harmony with Britain’s power networks.
 - Since 2015 the Modern Transport Bill has evolved into the Vehicle Technology & Aviation Bill (2016-17), followed by the Automated and Electric Vehicle Bill (2017-19). The clauses relating to Smart Charging have remained in all iterations of the Bill.
 - The Bill will give OLEV the powers to mandate Smart Charging in the UK. The detail of Smart Charging is not defined in the Bill, but will sit within other secondary legislation, and informed by the Smart EV project.
 - In June 2017, the Automated and Electric Vehicles Bills was mentioned in the Queen’s speech. At time of writing, the Bill has passed through the Commons and is currently at Committee Stage in the House of Lords following the second reading.
- **Smart EV:** The Automated and Electric Vehicles Bill will mandate smart functionality for electric vehicle charging points in the UK. The Smart EV project, led by SSEN and delivered by EA Technology is a direct successor to My Electric Avenue. It is developing technical specifications for both interim managed (smart) charging and longer-term managed charging technical architecture options.
 - The Office for Low Emission Vehicles (OLEV), the Government department behind the Automated and Electric Vehicles Bill, sits on the Smart EV Steering Group; the outcomes of the project will support Government policy in the area of smart, or managed, charging.
 - Both OLEV and BEIS have been instrumental in providing input into the proposed technical solutions under the Smart EV project.
- **EV Network Group:** EA Technology along with SSEN founded the EV-Network Group, to bring together the automotive and utilities sectors to support the increased uptake in EVs, for the benefit of customers and industry alike. The Group facilitates dialogue between the low carbon automotive and utilities sectors, acting as the conduit for information flow between those sectors and UK Government.
- **Electric Nation:** EA Technology established the Electric Nation project with Western Power Distribution (WPD) to further build on the learning from My Electric Avenue. Electric Nation is the customer-facing brand of CarConnect, a WPD and Network Innovation Allowance funded project. WPD’s collaboration partners in the project are EA Technology, DriveElectric, Lucy Electric Gridkey and TRL. The project started in April 2016 and will run for three and a half years.
- **DNO standards, tools and solutions:** Described in A2-A4, in concert with the above projects.

A2 Releasing network capacity

Mass deployment of DNO-led DSR from EVs, in line with the technical learning of the project would release 6MW of network capacity for GB by 2050.

- Back in 2012 the prevailing assumption was that all EVs would charge at peak time, with limited diversity. The project demonstrated that there is a degree of natural diversity between users, which will allow more EVs to connect before triggering reinforcement.
 - The project showed that peak demand for residential EV charging does coincide with the traditional residential evening peak, however there is some natural diversity between EV users. As a result, the after-diversity maximum demand for households with EV chargers was shown to rise from c1kW to approximately 2kW.
 - This increased penetration of EVs can cause both thermal and voltage problems on LV feeders. Thermal problems were shown to occur ahead of voltage problems.
 - The results of modelling in the project showed that 32% of LV feeders (312,000) circuits would require intervention at EV penetrations of between 40% and 70%. Susceptible networks are typically characterised by available capacity of less than 1.5 kW per customer.

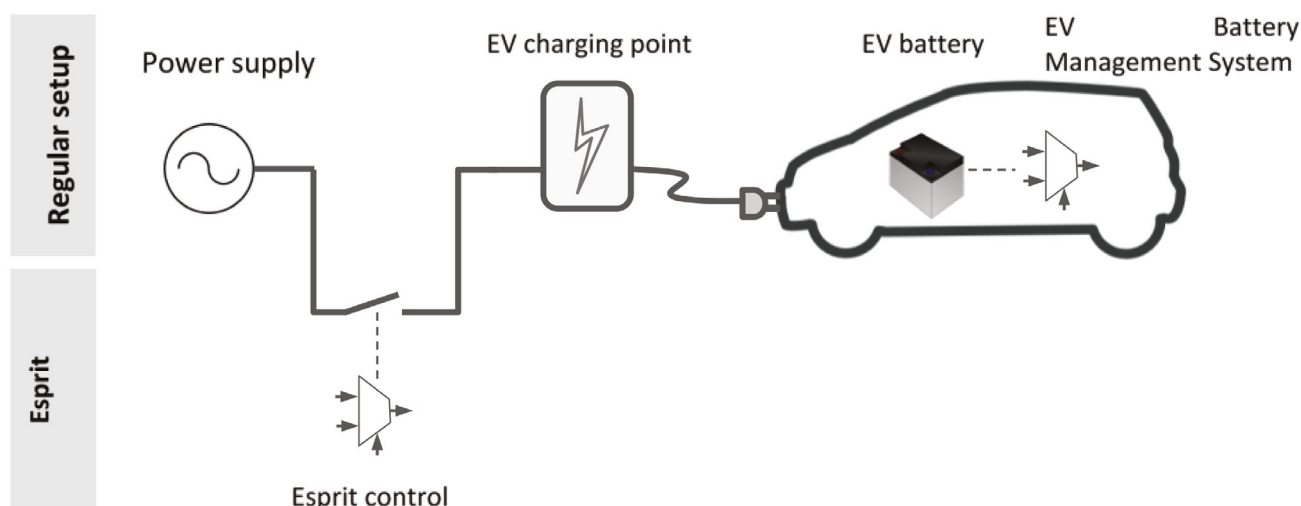


Figure 8: The Esprit solution in the context of the My Electric Avenue project

- Ability to monitor and manage load:
 - The trials of the DSR technology proved the concept of “DNO-led DSR” as sound. The system demonstrated its ability to monitor network conditions and trigger the curtailment and reinstatement of network load in response to changes to those conditions.
 - The modelling undertaken by the University of Manchester demonstrated that if DSR were enabled on every EV connected to ‘at-risk networks,’ the system would be capable of alleviating all problems caused by those EVs with appropriate control cycle and threshold settings. The example shown in Figure 8 show the potential improvements to network load at an EV penetration level of 100% (i.e. every property owning one EV, and the Esprit trigger thresholds set to 100% and 85% of the cable rating⁴)
- i) Esprit, as a form of smart charging and DSR, was shown to be capable of mitigating thermal constraints
 - in all types of residential networks, by using dynamic thresholds. Delivering thermal headroom of up to 46% at the highest levels of EV uptake.
- ii) Esprit also demonstrated additional voltage headroom equivalent to an additional 10% of customers connecting EV chargers. Furthermore, the number of non-compliant customers was reduced significantly, by up to 70% at the highest EV uptake considered. Delivery of greater voltage headroom is feasible but would require a more sophisticated control system responding to customer voltage measurements.
- Acceptability of the system
 - Interviews and focus groups delivered by De Montfort University found no statistically significant difference in opinion towards the ownership or use of EVs between the trial participants who experienced frequent and regular curtailment of their EV charging and those who experienced very little or infrequent curtailment.

⁴ Further, more detailed analysis of the effectiveness of Esprit for the purposes of network protection is available in the SDRC 9.8 document and reports produced by the University of Manchester, all are available on the project website.

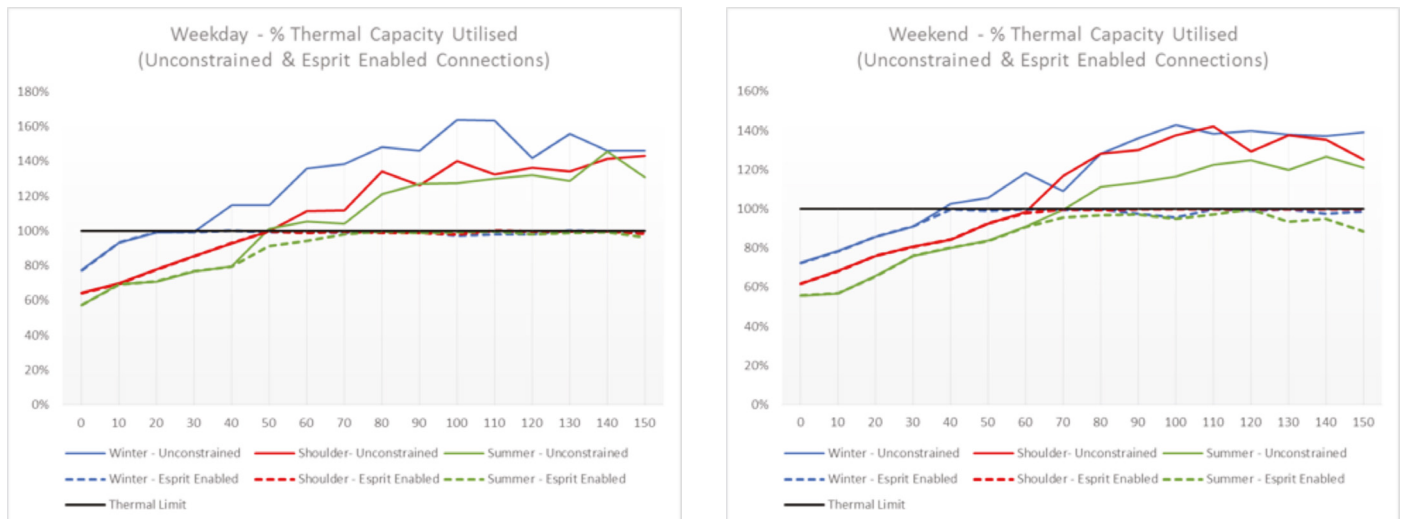


Figure 9: Unconstrained & Esprit enabled network impacts at increasing penetration levels⁵

- The Esprit DSR solution was technically capable of supporting significant numbers of additional EV connections on commercial networks. However, the on-off nature of the control was found to be unacceptable for workplace charging as the flatter load profile of these networks resulted in long period of curtailment during which minimal capacity is available to share across customers.
- When considering these outcomes together, the project concluded that whilst EVs pose a valid risk to GB LV networks, the trials had demonstrated that the Esprit Technology can provide a viable solution, acceptable to both the DNO and the customer.
- Analysis undertaken to support the financial benefits assessment for A3, using the learning from the project, shows a benefit of 5.1GW in the Central and 6GW in the High case by 2050. By way of context, 6GW of demand response would equate to c1million of the 40million vehicles at 2050 (2.5%), assuming 7kW charging with on/off control or 2million vehicles (5% of the EV fleet) if the power is ramped to half charge.
- Technical/commercial barriers
 - In addition to tactical technical refinements (comms resilience, etc) that would be applicable to any equipment manufacturer the project identified⁶ the following as necessary to realise the above benefits:
 - i) Integrate the technology with charging points. This would allow the communication and computing functionality of the charging point to continue operating (presently the technology cuts power to the charging point), maintaining user satisfaction and minimizing disruption to charging point technology. Action required by: technology provider; EV charging point manufacturers.

Capacity released from the trial and scale up to GB

- Whilst demand was successfully shifted over several thousand events during the project, there was no network capacity released in the trials. The settings were purposely set below the rating of the cables to mimic a cable operating close to capacity. This rigorously tested both the technology and the customer experience, allowing the learning to be scaled, without exposing customers to risk of network failure.

⁵ Pages 28-30 Sections 4.3, My Electric Avenue Project Close-Down Report, March 2016

⁶ Intelligent Management of EV Charging – A White Paper by EA Technology, My Electric Avenue, Feb 2016

ii) Agreement of a standard protocol for communicating with charging points. This would greatly improve the operability and adoptability of the solution. Action required by: DNOs; technology provider; EV charging point manufacturers; EV manufacturers; policy makers.”

- Both above points have been addressed via the Automated and Electric Vehicles Bill (2018) and the Smart EV project to derive a national standard for embedding in charging points, as described in A1 above. Neither would have happened without evidence provided by My Electric Avenue.

A3 Delivering Financial Benefits

An independent review of the benefits case by Frontier Economics, yields a net benefit of at least £500m by 2050 in the Central case.

Benefits calculated from the technical trial

- Whilst the Esprit solution, demonstrated in My Electric Avenue, has been superseded by other manufacturers products with more sophistication, the principles and functional requirements of the solution remain valid.
- The CBA undertaken in the project⁷ yielded a c£2.2bn of benefit out to 2050 for three of the four modelled scenarios (Figure 10: Extract from p119 of SDRC 9.8, Vol 1, My Electric Avenue).
- The benefits assessment has been revisited as part of this application in line with Ofgems guidance. Supporting information available via a report on the My Electric Avenue website⁸. This builds on the analysis carried out in the project and combines it with the latest public sources of national scenarios and independent advice from Frontier Economics⁹. Following this approach, the net benefits of our Central case have been revised down to £503m by 2050 (Table 3).

SCENARIO	ED1 (TO 2023)	ED2 (TO 2031)	ED3 (TO 2039)	ED4 (TO 2047)	TOTAL TO END OF ED4
1 (High Heat)	0	1,030	885	310	2,225
2 (High Transport)	0	652	1,362	228	2,242
3 (High Heat & Transport)	14	813	880	508	2,215
4 (Low)	0	0	75	122	197

Figure 10: Benefits case extracted from SDRC 9.8 v1, My Electric Avenue

	Counterfactual Costs (i.e. no Smart Chargers / EV control)	With Solution Costs (i.e. includes Solution without Smart Charger delta)	Benefit (Without Charger Cost)	Additional Cost of Smart Chargers	Net Benefit
Central	£17,185m	£15,802m	£1,383m	£880m	£503m

Table 3: Summary of Transform Model outputs – Present value of costs to 2050

7 Page 47, Sections 8.0, My Electric Avenue Project Close-Down Report, March 2016

8 “Annex to My Electric Avenue’s Second Tier Reward Submission: Remodelling the financial benefits of DNO-led DSR from Electric Vehicles”, EA Technology, 2nd May 2018

9 “My electric Avenue Benefits Case – Peer Review by Frontier Economics”, Frontier Economics, 1st May 2018

Where:

- **Counterfactual Costs:** This is the total cost to GB out to 2050 to accommodate the modelled scenarios using all conventional and smart solutions except our DNO-led DSR¹⁰, in present value terms
- **With Solution Cost:** This is the same as the Counterfactual, but now includes the DNO-led DSR solution for EV managed charging, incorporating benefits as derived from My Electric Avenue and costs from the above assumptions.
- **Benefit:** This is the benefit of the Solution (Counterfactual Costs – Solution Costs)
- **Additional Cost of Smart Chargers:** This is the cost delta of smart chargers as compared to dumb chargers, multiplied by the total number of EVs in the scenario.
- **Net Benefit:** This is the resultant benefit (Benefit – Additional Costs of Smart Chargers)
- £503m is a conservative estimate and the benefits will rise if the additional cost to make the chargers 'smart' are borne by either the EV customer or actors wanting to use / aggregate the EVs in other energy markets.
- The £503m benefit, comes through from 2040-2050. However, this should not be considered a future problem with a wait-and-see approach. The results of the CBA are highly dependent on the EV scenarios.
- OLEV has not released detailed scenarios since c2012, well before Government's 2017 announcement to ban the sale of diesel and petrol cars and vans from 2040.
- From the 2012 data only the High scenario seems compatible with the 2015 Fifth Carbon Budget, which targets of a growth in new ULEV sales from 6% to 61% over the 2020 to 2030 period as their central case.

Cumulative Figures (including Previous Years), Central					
	Counterfactual Cost (i.e. no Smart Chargers / EV control)	With Solution Costs (i.e. includes Solution without Smart Charger delta)	Benefit (Without Charger Cost)	Additional Cost of Smart Chargers	Net Benefit
To 2020	£348m	£348m	£-	0	£-
To 2030	£2,630m	£2,588m	£42m	£402m	-£360m
To 2040	£10,050m	£10,142m	-£91m	£715m	-£806m
To 2050	£17,185m	£15,802m	£1,383m	£880m	£503m

Table 4: Net benefits by decade (central uptake scenario)

Cumulative Figures (Including Previous Years), High					
	Counterfactual Cost (i.e. no Smart Chargers / EV control)	With Solution Costs (i.e. includes Solution without Smart Charger delta)	Benefit (Without Charger Cost)	Additional Cost of Smart Chargers	Net Benefit
To 2020	£357m	£357m	£-	£-	£-
To 2030	£3,293m	£2,961m	£332m	£590m	-£259m
To 2040	£13,691m	£11,182m	£2,509m	£969m	£1,540m
To 2050	£20,017m	£17,484m	£2,533m	£1,222m	£1,311m

Table 5: Net benefits by decade (high uptake scenario)

¹⁰ Identified as "Local smart EV charging infrastructure_Intelligent control devices" in the Transform Model®

- In our High scenario, the net benefits rise to £1.3bn by 2050, with deployment coming through from the 2020s, and an acceleration from 2030 to 2040.
- In addition, many of the capabilities and details of DSR are currently being “baked in” to the design of the DSO, Smart metering infrastructure and Smart Charger design. The wide scale use of DSR needs infrastructure and systems and as a result early sight of the value of DSR in relation to network constraint management is invaluable at this early stage.
- Our modelling approach is comprehensive and considers a raft of smart solutions alongside conventional reinforcement options to avoid double-counting benefits. Removal of other smart solutions yields a net benefit of £3.9bn by 2050.
- Overall the benefit outweighs the project cost by a significant margin.

Additional benefits from the commercial trial

- The business case for the use of a third-party provider to deliver innovation projects has also been successfully verified. The Project was delivered for less than budgeted, leveraging the value of Innovation funding over what a DNO in isolation could achieve. This was achieved despite the increased complexity and associated costs relating to parallel recruitment and deployment of the equipment (see Section B of this report).
- Further use of this approach to deliver innovation projects can greatly assist the industry in trialling more technologies that have the potential to further improve reliability, reduce costs and improve service to customers.
- In 2016 Ofgem changed the innovation governance arrangement to now put an obligation on DNOs to put their innovation projects out to third parties to deliver.

A4 Rollout across the DNO’s system and across GB

The learning from My Electric Avenue has been widely shared with all DNOs. The statistical significance of My Electric Avenue has allowed some DNOs to make changes to their policies and develop projects to close off new issues identified by the project.

The role played by EA Technology in leading the project has opened the door to other non-DNO entities delivering innovation projects.

A4a: Technical aspect: Impact of EVs on power networks and suitable mitigation

- The use of My Electric Avenue’s technical outcomes by SSEN
- The **Smart EV NIA** project (described in A1) was created following a review of the project’s findings on the risk to LV networks. It was initiated to move EV charge management towards Business as Usual. SSEN plan to use the specification informed by the project to tender for a solution to manage EV charging and avoid network overload issues.
- In addition, the business created an **EV Readiness Manager**, with responsibility to develop the strategy, processes and documentation to help prepare SSEN for the necessary technical, commercial and process changes that will allow it to manage the step change in demand resulting from EV uptake. The strategy was informed by stakeholder feedback and has been signed off by the SSEN Board.
- A change to the philosophy of **planning and operating the LV network** – SSEN’s Planning Standards for Low Voltage Distribution Network (TG-NET-NPL-001, revision 2.00) was updated to reflect the findings in relation to doubling of peak demand in typical domestic properties and reduction in diversity when considering ADMDs (Page 22, Section 11.10), with suggestions on how to incorporate these impacts into planning for new or additional connections (Page 26, Section 11.28).

- SSEN realised the value that **LV substation monitoring** would provide in being able to determine the load profile on a given feeder and/or substation and understand what challenges were being posed by EV charging. The business took the decision to stimulate the market into developing lower cost substation monitoring equipment and undertook an NIA project (Low Cost Substation Monitoring) to challenge suppliers to meet the requirements, allowing monitoring to be deployed more readily/ across greater areas. Whilst the project is still in flight, the business has agreed to tender for the deployment of LV substation monitoring in late 2018 starting with the monitoring of an initial ~1750 at risk feeders to support the EV Strategy, LV Strategy and inform future investment decisions.
- A change programme for the Connections business within SSEN was agreed to increase efficiency and customer service experience as EV uptake ramps up, with implications from the project findings informing the ability to maintain compliance with Ofgem Commitments, regulatory obligations and Guaranteed Standards.
- SSEN have **linked data** from the IET's Code of Practice on Electric Vehicle Charging Equipment Installation, whereby installers notify each DNO of charge point connections, with OLEV data to inform network capacity. This information allows for the identification of networks that are at risk of overload from EV charging demand. Members of the project team and engineers from SSEN's Thames Valley Vision Tier 2 LCN Fund project used data and calculations from both projects to do this and in effect develop an EV impact forecasting tool. This allows for the prioritisation of LV network monitoring, with data further supporting risk management evaluation, and the timescales involved.
- The use of My Electric Avenue's technical outcomes by other DNOs.
 - The broader **electricity sector** (all DNOs, BEIS, Ofgem, etc) are behind the principals of Smart EV, which seeks a long-term deployment for smart charging – based on evidence collated in My Electric Avenue.¹¹
- Almost nothing was known about EV charging patterns until this project. The outputs of the project have been much referenced by DNOs, and the datasets are trusted.
- **Western Power Distribution** have built upon some of the gaps identified in My Electric Avenue with their Electric Nation project (registered as CarConnect through the NIA in 2016). The LV focussed 'Network Assessment Tool' within this project uses insight from My Electric Avenue on EV demand profiles.
- **Northern Powergrid** were a partner of the My Electric Avenue project, hosting several of the technical clusters within their Northern licence area. NPg have since launched a strategic partnership with Nissan – building on relationships developed in the project; they also have submitted the AutoConnect NIA project relating to managing connection planning to support the EV uptake.
- **UK Power Networks** have used some of the learning relating to customer clustering from My Electric Avenue to inform their Black Cab Green NIA project. In addition they are developing the Optimise Prime NIC project in 2018 which will build on the findings by looking at fleets of EVs and smart charging.
- **Scottish Power Energy Networks** directly quote My Electric Avenue as a source for EV charging profiles as part of their EV2032 modelling of towns in the SPD network with high penetration of EVs. SPEN have also developed Refuelling Tomorrow a NIC project for the 2018 competition, which again references My Electric Avenue
- **Northern Ireland Electricity Networks** took the outputs from My Electric Avenue (demand profiles and DSR headroom gains) into their Transform Modelling which was used to inform their RP6 submission. The project was also used to inform Board discussions on NIEN's strategy.
- **National Grid** used the raw data for charging occurrences from the project to create a plug in profile by year, month, working day and non-working day. This allowed them to determine when domestic EV users would charge their cars, building the foundation for several of the models in their Future Energy Scenarios (FES) papers; a key publication in the energy industry, shaping discussions on whole system developments / requirements.

11 Bullet 4, Page 53, Section 11.2, My Electric Avenue Project Close-Down Report, March 2016

- **Energy Network Association (ENA)** has used My Electric Avenue outputs in several forums. It was used to inform the ENA's Electric Vehicles Working Group which ultimately led to the IET's Code of Practice on Electric Vehicle Charging Equipment Installation, whereby installers notify each DNO of charge point connections. In 2017 it was a critical evidence point in forming their updated LCT Working Group, created by the ENA and chaired by SSEN. This Group is focussed on the creation of a consistent message, approach and strategy for LCTs with EV connections being a key focus.

"The insight gained from My Electric Avenue has been invaluable in helping us develop our view on the impact of EVs and smart charging. The project outputs have been used, and continue to be used by National Grid System Operator to help determine the national impact of domestic EV charging at peak times as part of our Future Energy System (FES) analysis."

Marcus Stewart, Head of Energy Insight
SO Strategy, System Operator, National Grid

- The delivery success was a contributory factor in Ofgem's governance change to mandate the RIIO network companies issue a call for ideas from third parties each year¹².
- The use of My Electric Avenue's commercial outcomes by SSEN
 - Recruitment of partners – Transition will follow the contractual approach developed in My Electric Avenue
 - SSEN (together with ENWL) have tendered for project partners for both the 2017 and 2018 NIC programme. The resulting projects are likely to follow similar commercial structure and delivery model to that developed from this project.
- The use of My Electric Avenue's commercial outcomes by other DNOs.
 - **Western Power Distribution's** Electric Nation NIA and OpenLV NIC projects use contract structure and Governance mechanisms developed in My Electric Avenue.

A5 Value for money for Customers

The project was delivered at a cost of £4.6m to the GB electricity customer, which was further levered up to c£10m through contributions from industry and EV leaseholders.¹³

- Our approach to **minimising the cost** of resources used or required
- My Electric Avenue was conceived by EA Technology and SSEN in February 2012. It was developed on the basis that the project would be delivered by EA Technology, with SSEN providing access to its network and governance to allow it use of LCN Fund monies, as a third-party delivery body.

A4b: Commercial aspect: Use of a third party to deliver an innovation project

- The use of My Electric Avenue's commercial outcomes by Ofgem
- My Electric Avenue was the first innovation project to be led, in its entirety by a third party. The project demonstrated the value of bringing in other parties to deliver innovation.

¹² The network innovation review: our policy decision, Ofgem, 31 March 2017

¹³ Page 46, Sections 7.0, My Electric Avenue Project Close-Down Report, March 2016

- It was recognised that a range of partners and suppliers would be needed to supplement the skills of EA Technology, and procurement processes were initiated by EA Technology post ISP submission. All Partners and Suppliers named in the bid submission provided fixed price quotations for the work detailed in the bid.
- Where the Project required bespoke expertise or a particular product with limited supplier options, fixed price contract values were negotiated, and shared with Ofgem as part of the bid development process. Where expertise could be procured from multiple potential companies, a competitive tender approach was followed.
- Fixed price contracts:

- **EA Technology:** EA Technology priced the whole project in the development of the Full Bid submission. This was converted to a fixed price contract with SSEN following their signing of the Project Direction. This meant that the delivery, reputational and financial risk of the whole project sat with EA Technology for the duration of My Electric Avenue.
- **Nissan:** The Nissan LEAF was the only pure electric vehicle available for deployment in sufficient numbers to meet the purpose of the Project and consequently, very few leasing companies were offering EVs in any form. Nissan offered significant in-kind support through reduced leasing arrangements at bid stage. They contracted with EA Technology on a fixed price basis.
- **Fleetdrive** had recently established an EV focussed area of the business (Fleetdrive Electric, now 'Drive Electric') and were already working with Nissan to offer the LEAF to individual customers, not just to companies. They contracted with EA Technology on a fixed price basis.
- **Zero Carbon Futures (ZCF¹⁴),** were initially approached for assistance following their previous work with Nissan, providing charging point expertise at Nissan's Sunderland manufacturing plant. ZCF subsequently joined the team of Project Partners during the bid process – contracting with EA Technology on a fixed price basis.

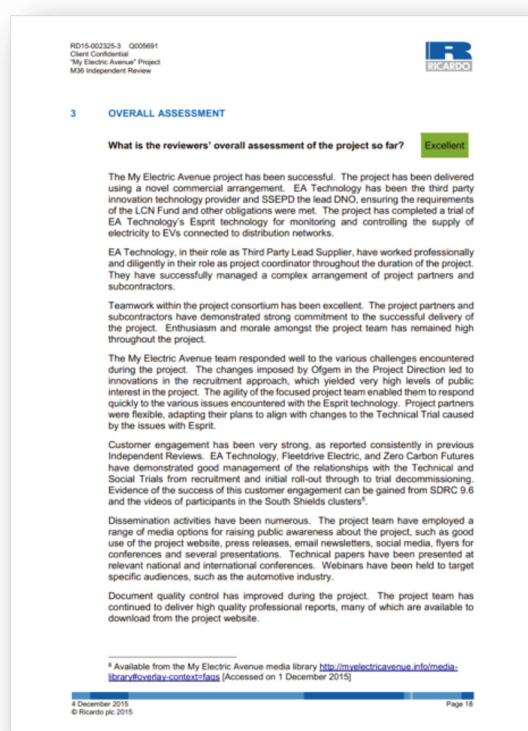
"I am impressed by the clear strategy that EA Technology had for the venture My Electric Avenue, it was a natural fit for Nissan to partner on this pioneering trial project. The 'bottom up' approach to customer engagement is reaping great results. EA Technology's combination of project management, technical and 'people' expertise make it a company worth doing business with."

Olivier Paturet, Head of Zero Emissions Strategy, Nissan Europe SA
(quote taken in 2015)

- **Tendered activity:** Post Project award, Ricardo and SSE Contracting were awarded Supplier roles via competitive tender. Ricardo were contracted directly to the Project via EA Technology to provide the Independent Review whereas SSE Contracting were contracted to ZCF to provide installation capabilities for the trial equipment.
- ii) Our approach to the **efficient use of funding** (the relationship between the stated project outputs and the funding needed)
 - The project was delivered within the stated budget.
 - The My Electric Avenue Project delivered its planned outcomes in a cost-effective manner for the customer despite the increased scope introduced through additional clauses in the Project Direction.
 - Project partners and suppliers were managed tightly in line with their contracts, to ensure full and effective delivery of the project. Monthly meetings were typical with some partners involved in weekly meetings at critical stages of the project, e.g. customer recruitment.
 - An explicit project contingency was declared in the bid, for issues that were unforeseen in the bid stage. A tight governance process was structured around this contingency with applications only approved if granted by Senior Managers of both EA Technology and SSEN.

14 The network innovation review: our policy decision, Ofgem, 31 March 2017

- Additional in-kind contributions agreed as part of the Change Request, were determined to have raised the total value of the Project to approximately £10.12 million, an increase from £9.66 million, with no increase to the funding provided by the LCN Fund (detailed in Section B2).
- In total, the unused budget equated to £86k, achieved in spite of increased scope requirements being accomplished within the original budget and timescales.



- iii) Our approach to the **effective use of funding** (the relationship between the intended and actual results of funding)
- In recognition that EA Technology developed Esprit, managed the project and intended to test it, it was determined that a third party was to be engaged to conduct regular independent reviews of the Project.
- The reports detailing the findings and recommendations at six monthly intervals were published in SDRC 9.4. The independent reviewing company, Ricardo, gave the Project an overall rating of 'Excellent' determining that both the commercial and technical areas of innovation have added value to the industry and that the complex project was managed successfully and professionally.
- Ricardo also noted the value of additional learning delivered by the Project, beyond that anticipated during the bid development phase, for future DSR projects. The extensive dataset gathered by the Project is also anticipated to provide valuable input to many future academic and innovative research projects in the UK and beyond.
- Ofgem's assessment as part of the SDR criteria:
 - *We consider SSEN to have demonstrated through the SDR application for My Electric Avenue that it delivered against its SDRC to an acceptable quality and on time. This was also confirmed by the independent reviewer, Ricardo – appointed by SSEN as part of meeting its final SDRC.*
 - *We consider SSEN demonstrated that it has delivered against its SDRC to a satisfactory quality and on time. We are satisfied that the SDRC were delivered at an effective cost to consumers. It has shown management of risk, with an ability to adapt recruitment approaches to meet targets. Further, consultation responses supported the value of Project outputs and management of the Project. We consider that this warrants a substantial reward under the SDR of £416k (against a total of £475k)¹⁵.*

- Ofgem's assessment as part of the SDR criteria: SSEN delivered the Project within the budget set out in the Project Direction, which was updated in the final year of the Project, following a change request. This underspend will be returned to customers. During the Project partners made significant in-kind contributions which meant that the overall delivery cost of the Project increased. The additional contributions from Project partners helped enable it to deliver its objectives without the need for additional money from customers¹⁵.

¹⁵ Decision on 2016 Low Carbon Networks Fund Successful Delivery Reward applications, Ofgem, 29/07/2016

Since the completion of the project, numerous external organisations, including national and regional Government(s), have used the outputs from My Electric Avenue to inform their strategies, approaches and practices. The extent of this demonstrates the value others place on this project and the excellent value for money to customers.

A6 Relevance and timing of project

Timing for the project was perfect: initiated in 2012 when EV penetration was de minimus¹⁶, and scepticism was dominant, it has since grown to be significant, with multiple vehicle manufacturers releasing new vehicles and models of battery electric vehicles and plug-in hybrids.

The project outputs have informed numerous follow on projects from DNOs / Governmental departments and even supported legislation.

The project was conceived with a clear eye to the likely ramp rates that were being envisaged by the Department for Transport on the mass electrification of transport. Forecasts predicted rapid uptake in the 2020s, which was modelled to pose a threat to GB electricity networks, with the lack of capacity acting as a real blocker to this cornerstone of Government low carbon policy. This, and the degree of uncertainty around EV charging behaviour and cost-effective solutions fed into the design of the project. During the project, the team adapted practices and approaches to ensure it delivered, whilst also going out of it's way to support the long list of stakeholders interested in the project and its outputs. As the testimonials in this report prove, the outputs have been critical to so many organisations (Government, DNOs, vehicle OEMs and the broader energy sector), a strong indicator of both their relevance and timing.

- The project was initiated having identified the governments aspirations and scenarios (from DfT et al) in 2011 for the mass electrification of transport. We foresaw real issues to power networks by the mid/late 2020s if the volumes appeared as projected but needed evidence to support our hypothesis.

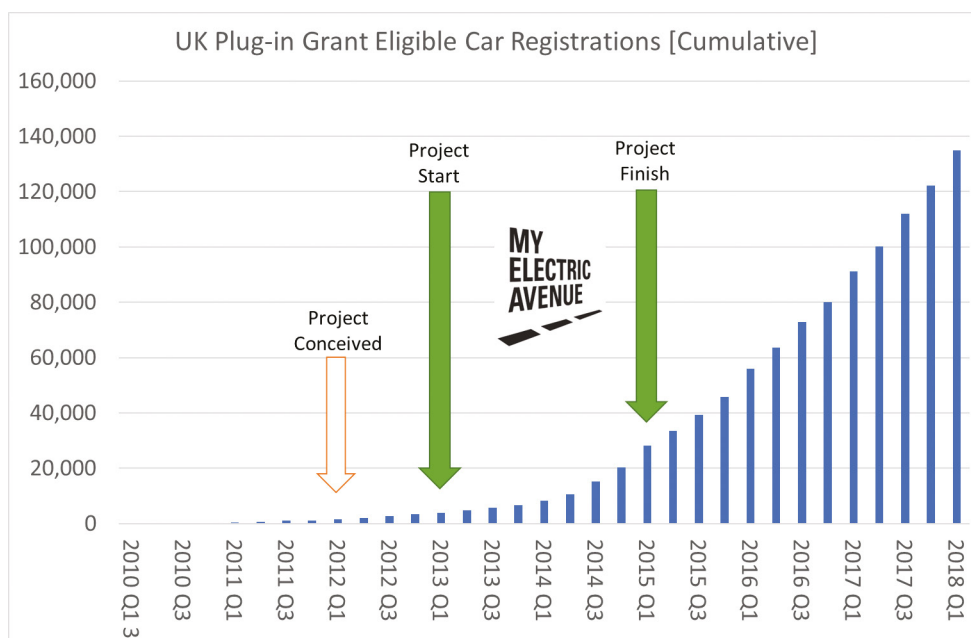


Figure 11: EV adoption across the UK showing the timing of My Electric Avenue

16 Figure 1, Page 9 Sections 1.0, My Electric Avenue Project Close-Down Report, March 2016

- When the project was conceived in spring 2012, there were minimal numbers of EV/PHEV on the road and limited makes and models of vehicle on the market. Indeed, there was some debate at bid stage with the Expert Panel as to whether we would be able to meet the projects' ambitious recruitment forecasts given the status of the EV market, and the poor experience of other projects' in their customer engagement. As a result, additional funding conditions (as described in Section C2) were placed on the project in order to ensure that it met its recruitment objectives and to protect customers money.
- With careful navigation, we successfully rode the media 'wave' of real interest in EVs to promote the project, and combined this with incentives from Nissan, monies from the LCN Fund and a unique customer recruitment campaign from project partners. As a result, the project successfully recruited all customers in areas required to derive real learning.
- When the project completed its recruitment, c1.3% of all EVs registered in the whole of the UK were part of My Electric Avenue.
- Since the project started, vehicle registrations continue to accelerate. The vehicle OEMs are responding strongly, with battery prices continuing to fall and the number of manufacturers selling vehicles increasing significantly. When the project was put together in 2012, there were five models of BEV/PHEV available on the market in the UK; by the end 2017, this had risen to over 60.
- At time of writing, the project still represents the most comprehensive set of trial results from real people, operating real cars, on real networks. This is exemplified by the numbers of key organisations who have downloaded, and continue to download, data or taken the results from project to inform their policies and strategy.

The My Electric Avenue project was a timely addition to the sector's understanding of the grid impact of EVs, and how non-network solutions like demand response could be used as an alternative to conventional reinforcement. The learning has informed work undertaken in the Energy Systems Catapult and continues to be a valuable source of information and insight.

The Catapult has drawn on this work in its Future Power System Architecture project, in the development of a number of collaborative bids, in cross-Catapult EV initiatives and in the ongoing development of its capability to support achieving its innovation objectives.

Eric Brown, Director of Innovation,
Energy Systems Catapult

A7 Methodology robustness and project readiness

"We tried a numerous options , some worked, some didn't. We adapted, we delivered."¹⁷

The approach was solid, with statistically significant outputs. Described by the project's independent reviewer, Ricardo, as 'Excellent', the team delivered the project with professionalism, despite challenging contractual and budgetary conditions.

- Our safeguards to ensure the **project's methodology exceeded that specified** in the Full Submission

A variety of techniques used to derive statistically significant results from the project, and to ensure it was technically robust. These are broken into key parts of the project:

17 Pages 17-25, Section 3.0, My Electric Avenue Project Close-Down Report, March 2016



Technical (clustered) Trials

Key Milestones	
3 clusters	Sept 2013
5 clusters	Dec 2013
7 clusters	Mar 2014
100 EVs	Mar 2014



Social Trials

Figure 12: My Electric Avenue Customer recruitment successes

- Project design
 - The project was designed to combine 10 geographical 'clusters' (each cluster on the same LV feeder) for what was called the Technical Trial, with a larger 'control' group of customers located throughout GB as part of our Social Trial. The Social Trial was put in place to establish strong data, and statistical significance on charging patterns. Customers were expected to fund the vehicle leasing for 18 months, although discounts were offered from both Nissan (all vehicles) and the LCN Fund (technical trial only).
 - The project team (both SSEN and EA Technology) identified the need for an independent reviewer to ensure the outputs were objective. Ricardo fulfilled this role following competitive tender and helped maintain the link between the Full Bid and what was delivered. The role of an independent assessor is now a feature of many Network Innovation projects.
- Trial design
 - We sought to achieve a strong blend of customers, covering a range of customer demographics (e.g. ages, genders, social classes). We wanted a range of electricity networks (dense urban, suburban, rural), with charging both at home and at work locations.
- Customer recruitment
 - In 2012, when the bid was developed and submitted, customer engagement to network trials had been poor. The recruitment of 200+ residential customers was viewed as, ambitious, particularly the development of local clusters, and led to several restrictions in the project budget.
 - The funding conditions were highlighted at the time as being significant, ramping up the risk on the deliverability of the project, and the impact on customers: real people leasing real cars, when funding was restricted until ALL customer had been recruited and signed financial contracts.
 - Nevertheless, the project team launched into the project with determination. Ofgem was kept informed of project progress, and several of the project partners stepped in with further financial support / contributions to keep the project on track (described briefly below and in Section B of this report).
 - The recruitment was completed ahead of schedule and in line with the project needs.

- Data collection and review
 - Technical data was gathered throughout the project trial. We had a strong focus on collecting the right data, and ensuring that the dataset was of sufficient quality to be useful after the project.
 - At several points, Nissan informed us that the project was pulling more data from their CARWINGS telematics system based in Japan, than any other global user!
 - Our project participants drove over 3 million kilometres, and had their car charging curtailed more than 7,000 occasions in support of the distribution network.
 - Customer surveys were used to gain softer 'user experience' data to support the technical datasets.
 - Two academic organisations (University of Manchester and De Montfort University) reviewed the datasets and ensured rigour in the analysis.
- Project management
 - The third-party led approach had never been tried before. It had never been delivered in this way by EA Technology, SSEN, or any other organisation for projects in the LCN Fund. Therefore, the project management structure was very responsive to change and allowed working arrangements to adapt as the project developed
 - The nature of projects from LCN Fund is complete transparency; the process and results were visible to other organisations (both collaborators and competitors to the project partners) – the project team was open in sharing both the successes and the challenges of the project.
 - A robust project Governance arrangement was developed between SSEN and EA Technology, and has since been used for other projects as mentioned in Section A4.
 - My Electric Avenue had more partners and suppliers than many other projects from the LCN Fund. New processes were developed to support engagement and drive the delivery.
 - Budget challenges resulting from both errors in the bid spreadsheet and restrictions between category were met with the submission of three Change Requests at specific points in the project timeline. The Change Request process was lengthy and put a further burden on both the project and EA Technology in their role as delivery lead, despite this the project was successfully delivered.
 - All project SDRCs were delivered on or ahead of schedule.
 - Our Customer recruitment completed early. We started with a conventional 'shotgun approach', with recruitment events held to cultivate interest – it didn't work. We switched to the use of local 'champions', engaged members of the community who sought to obtain support with their neighbours. This approach was pioneering and is now a technique now used by other DNOs for innovation projects, and by SSEN in storm situations.
 - As described in Section B2, financial risk was taken by EA Technology from Jan-Mar 2014 to support the delivery of the project at the time when vehicles were being deployed.

"My Electric Avenue has brought our community together under a common purpose – and it's been great fun finding people to take part in our cluster. I've been out dropping leaflets through doors, talking to people in the shops to get them on board... and then driving a Nissan LEAF at the test drive event really sealed the deal for us. It makes sense in so many ways – environmentally, financially – and I've even learnt a bit about the local electricity network."

Julie Skevington,
Trial Participant South Shields

- ii) Our efforts to ensure the **project's readiness exceeded those specified** in the Full Submission

Innovation projects, by definition, involve risk. The project team delivered the project fully in line with the timescales and funding set out in the bid, despite additional conditions set into the Project Direction. This was only achieved through exceptional efforts made by the full project team: EA Technology, SSEN and all of the project partners, as detailed below:

- Network support
 - Assessments were taken for each of the LV networks prior to customer recruitment to ensure 'no harm' done. The recruitment approach resulting from restrictions in the Project Direction meant that this was a significantly larger task than originally planned (planned c50 feeders, actual c500).
 - Alerts were setup within the project team to monitor the performance of live clusters. Concern of the impact of charging over Christmas 2014 (not previously witnessed) led to a 'standby' arrangement with members of EA Technology's team dialling into clusters throughout the holiday period to ensure the networks operated within limits.
- Issues from technology in the trial
 - Issues were experienced with the Power Line Carrier (PLC) communications, as described in Section C2. The project team sought ways to overcome the issues with repeater units on the network, whilst also sharing results so that others' could benefit.
 - Recall and reinstallation of equipment: an issue was found on one of the Intelligent Control Boxes (ICBs) in a customer's home with a wiring fault affecting the communications with the substation located Monitor Controller. The issue was dealt with in a timely and effective manner including inspections of the faulty unit and bypassing of all devices being used within 3 weeks - the speed of response was applauded by SSSEN. Following a redesign and testing by the manufacturer, the project team then arranged for the units to be replaced prior to the units being needed in autumn 2014.
 - As the project entered its decommissioning stage, an issue was noted with one manufacturer's charger type. At the time, the charger was one of the main units deployed through the Government's charging point incentive – the learning was shared with OLEV on a confidential basis. (point to be redacted in published version)
 - My Electric Avenue identified areas which required further innovation, these were shared as part of the project outputs and have since formed the basis of projects by DNOs and/or further analysis by key stakeholders. As shown in Figure 1, it was not an isolated project.

A8 Other Benefits

The project has helped inform the work of the Energy Systems Catapult, technology calls from InnovateUK, as well as provide information to investors and other parts of the energy sector.

- My Electric Avenue's commercial learning has helped shape the way third parties are viewed in delivering innovation projects by
 - Raising profile of potential issues within the Smart Grid Forum, BEIS, OLEV, etc
 - Engagement with other solution providers;
 - Learning from the Bid: Highlighted concerns (IP, cost of engagement, complexity / timescales / costs of bid process, etc);
 - Contacts and governance mechanisms developed for My Electric Avenue are now a feature of several live DNO projects;
 - As mentioned in A4b, My Electric Avenue has been used to shape Ofgem and the industry's approach regarding the use and engagement of third parties in bidding for innovation work
- It has informed innovation activities beyond the LCN Fund
 - My Electric Avenue has fed into the strategic direction of the Energy Systems Catapult's work on the Future Power System Architecture
 - The project has helped shape InnovateUK's recent V2G call.
- The project has helped inform investors of opportunities and challenges associated with deployment of EV charging infrastructure / network capacity limits in the UK
- It has created positive press coverage for the industry.
- The media have generally taken the outputs of the project and presented them in a positive light helping to build confidence in the preparedness of the industry, its regulator and government in relation to the home charging of Electric Vehicles.

My Electric Avenue is the project that established the impact of EVs on the local grid. It has given UK plc the evidence base it needs to innovate further in this space, from smart charging technologies to vehicle to grid.

I regularly cite My Electric Avenue learning in presentations to Government and industry, along with the fact that EV drivers became confident and relaxed with charging deferral into the night. It is great to see that the project has directly led to other initiatives such as the EV Network Group and Smart EV project.

Mark Thompson, Head of Energy
at Innovate UK

2.2 Reward Criterion B – To invest the DNO’s own money to enable the project to be successfully delivered

The project did not require any additional contribution from the DNO or its customers. Multiple project partners increased their in-kind contributions or accepted additional risks during the project to ensure delivery was kept on track¹⁸. As project lead, EA Technology took on unprecedented financial risk to deploy vehicles to customers at a time when budgets were still subject to onerous contractual restrictions. These decisions were taken to ensure the project delivered, despite issues outside of the control of the project team.

B1 Details and significance of DNOs additional contribution

Despite contractual challenges which hampered the recruitment process, the project met all its original objectives and was ultimately delivered on time and within budget. No additional funds were required from the DNO or its customers.

B2 Issues that justified the additional contribution

Whilst there were no additional funds provided by SSEN over and above their share of the 10% DNO compulsory

contribution, there were several critical actions taken between SSEN and EA Technology as lead parties that were essential to the delivery of the project: In particular, it is worth noting that any expenditure prior to the customer recruitment conditions being satisfied could have been disallowed, this represented a significant risk to both EA Technology and SSEN. However, we were convinced that the project would succeed and through careful management this risk was avoided.

- Before project
 - In 2012 an estimate of £100k for bid development costs was put forward from EA Technology to SSEN (Source: SDRC 9.1 – Learning from Bid Process). EA Technology agreed to split this with 50% funded by the DNO, 50% funded through in-kind support. The full costs of bidding exceeded the £100k budget, with all increased costs funded by EA Technology.
 - SSEN and EA Technology agreed to split the 10% DNO Compulsory Contribution on a 7.5%:2.5% share (respectively). £118k investment was therefore put into the project bank account by EA Technology. At the time, none of the LCN Fund projects had completed, and so it was not clear how, or even if, monies would be awarded through this mechanism.
 - In addition, a well-documented, but unintentional error in the finance spreadsheet led to a £120k shortfall in the funding request in the Final Bid. This was covered by EA Technology to ensure the project could still be delivered in line with the plan, and with no impact on the budgets to partners or suppliers.
- During project
 - The Project Direction was a back-to-back commercial arrangement from Ofgem to SSEN and SSEN to EA Technology.
 - Restrictions in the project budget, as set in the Project Direction, resulted in pressure being applied to EA Technology in their role as the principal contractor.
 - Unprecedented financial risk, was taken by EA Technology to support the project with roll out of vehicles, to manage customer expectations and ensure delivery of the project in line with onerous restrictions outlined in the Project Direction.
 - i) This decision was taken to manage customer expectations and keep the project alive – but meant that EA Technology underwrote the project at its most critical stage.

18 Page 46, Section 6.0, My Electric Avenue Project Close-Down Report, March 2016

ii) The level of financial risk, £1.2m, was a Board level decision (at the time EA Technology was a £18m turnover SME), which could have liquidated the company had it been realised.

- A short-term loan was made available to EA Technology by SSEN to support cashflow challenges during the rollout of vehicles.
- The above decisions were taken with full consideration of the customer impact: both those specific customers directly involved in the project, and for all customers who would benefit from the learning generated from the project.
- We note that Ofgem were looking for ways to engage SMEs in these sorts of project; but risk taken by EA Technology (an SME) was significant, necessitating the support of the DNO to enable delivery.
- It is noted that EA Technology and SSEN have a 50:50 share in any monies won as part of the Exceptional Reward. EA Technology are supporting this application entirely through in-kind contributions; again, an untested path.

In addition to the above, several Project partners made significant in-kind contributions which increased the effective delivery cost of the Project. The additional contributions helped deliver the objectives without the need for additional money from customers.

- At the point of bid submission, the total in-kind contribution for the Project was anticipated to be c£4,908,000; with the addition of the further in-kind contributions, this increased to c£5,620,000.
- Changes to in kind contribution from project partners
 - Fleetdrive Electric (now Drive Electric) increased their in-kind contribution by approximately £60,000 by incurring significant additional costs whilst successfully recruiting trial participants and not passing all of the costs on to the Project. This increased the in-kind contribution provided by Fleetdrive Electric to approximately £158,000.
 - At the end of the Project, Nissan elected to further increase their in-kind contribution to the Project by not invoicing for their element of staff support. This further in-kind contribution of £50,000 was provided in addition to the preferential lease rates of the Nissan LEAF provided to the Project.

- EA Technology reduced the staff rates quoted during the bid submission phase, allowing more resource effort to be provided over the course of the Project for the same cost. EA Technology also increased the subsidy on the Esprit equipment and associated support, providing in total approximately £1,000,000 in-kind contribution, £400,000 above the contribution planned during the bid).

One significant area of concern which must be addressed for future innovation projects with a novel commercial arrangement, is the high level of risk imposed on EA Technology [...] via the restrictions outlined in the Project Direction.

Following the early recruitment success of trial participants, EA Technology wisely decided to accelerate the establishment of the initial clusters for the Technical Trial, and to begin the roll-out of electric vehicles to Technical and Social Trial participants. This ensured the continued participation of customers who successfully met the trial criteria. Whilst this demonstrated the commitment of the Third-Party Lead Supplier to the success of the project, it placed EA Technology at severe financial risk, especially considering their company size and annual turnover. This was exasperated by the debate regarding interpretation of cluster establishment. Such an approach [...] is likely to deter other SMEs from pursuing the role of Third Party Lead Supplier for future LCN Fund projects.

Ricardo, My Electric Avenue - MONTH 36,
INDEPENDENT REVIEW REPORT,
December 2015

B3 Demonstrable benefits to customers

No additional funding was sought from the DNO or its customers. The contributions mentioned in B2 were made by project partners to ensure the project continued, allowing it to generate the outputs as outlined in this report.

2.3 Reward Criterion C – Undertake exceptional effort to deliver and disseminate

C1 Demonstrate where the project has delivered more learning than was expected

The project delivered far more learning than was envisaged when the bid was submitted.

Whilst there was an expectation of some learning around EV charging behaviours, use of DSR and even the approach taken by EA Technology as a third-party lead, the extent to which the project has influenced and informed government thinking, DNO projects and forged a link between the power and automotive sector was beyond anticipation¹⁹.

- Discussed in Figure 1 and Section A (e.g. Figure 5 (A1) and A4), My Electric Avenue has been key in supporting the electrification of transport in the UK.
 - Used by OLEV and BEIS in shaping policy and legislation announced in the 2017 Queen's speech
 - Used by all DNOs as key evidence of EV impact / mitigation and formed the basis for multiple follow on projects
 - Used by National Grid as a part of their Future Energy Scenarios (FES)
 - Used by the Energy Systems Catapult and InnovateUK to inform strategy and shape funding calls
 - Established the EV Network Group as a liaison body between the network operators and the automotive community
- It was the first project of the LCN Fund to be led, in its entirety, by a non-DNO
 - Risk was taken, but the project was delivered in its entirety
 - It involved more delivery partners than many other projects, covering a range of organisations types: from multinational OEM, to academia, to sole traders, coordinated by a SME

- It was one of the first of the competitive innovation projects to involve more than one DNO (SEN and Northern Powergrid)
- Now a governance change for network operators to engage with third parties for the delivery of innovation (e.g. NIC)

"Through the 'My Electric Avenue' Project a significant 'bridge' between the Energy and Automotive industries has been created via EA Technology and LowCVP. The vital importance of these two industries collaborating over the challenges and opportunities presented by large scale adoption of Electric Vehicles has now been grasped by UK central Government initially under the EV Network Group banner (led by LowCVP with significant support from EA Technology) and will be taken forward as a key initiative within the DfT's imminent 'zero emission vehicle strategy' One of the first tasks of this group will be to identify secondary legislation under the Automated and Electric Vehicles Bill, to establish standards for Smarter Charging methods clearly reflecting the original My Electric Avenue project and its impact in stimulating this sector"

Andy Eastlake, Managing Director,
Low Carbon Vehicle Partnership

C2 Additional learning as a result of exceptional effort of the DNO

The customer recruitment approach using local 'champions'²⁰ was not considered at bid stage but was critical to the success of the project; it has since been recognised to have been industry leading, and has been used in other similar projects. Side activities such as the performance of Power Line Communications (PLC)²¹ were investigated and shared to prevent wasted efforts from DNOs on projects in these specific areas.

¹⁹ Page 57, Cross sector liaison, My Electric Avenue Project Close-Down Report, March 2016

²⁰ Pages 30-31, Sections 4.4; Page , My Electric Avenue Project Close-Down Report, March 2016

²¹ Page 48, Sections 9.1.2, My Electric Avenue Project Close-Down Report, March 2016

The above examples were completed within the project, and with no change to the project budget.

- Recruitment approach using local customer 'champions' (ref. section My Electric Avenue SDR application)
 - The Project had planned a route of sequential recruitment and deployment, enabling recruitment effort to be focussed in a small geographic area. Following recruitment of a cluster, equipment would be deployed and cars issued as soon as practicable.
 - This approach was intended to maximise data gathered, enabling any problems identified with the equipment installed or data capture processes to be corrected before further clusters were established and equipment deployed. Furthermore, the bid team hoped to capitalise on media interest for the first 'electric vehicle streets' and use the resulting publicity boost to more quickly recruit further clusters.
 - With the need to meet all recruitment targets before release of funding for the deployment of vehicles and equipment, a fundamental change in strategy was required. Recruiting multiple clusters in parallel enabled the use of generic marketing campaigns but required significant effort to coordinate cluster suitability checks and test drive events.
 - It was necessary to verify the suitability of LV networks proposed for inclusion to the Project by volunteering residents. During creation of the bid submission, it was expected that the Project would need to liaise with between 30 and 50 potential clusters in a sequential manner to identify and establish ten suitable clusters for the trials. As a consequence of the parallel recruitment requirements, over 370 clusters were liaised with to support cluster champions in the recruitment of their neighbours.
- Learning / outcomes used by SSEN over and above the original business case in the bid
 - The ability to use champions to ensure information is spread throughout a community was noted by SSEN, and adopted as an additional means of getting messages through before/during storms. Customer & Community Advisors were embedded within Regional teams and would engage community champions (typically Parish Councillors and other volunteers) who would help disseminate key information to their communities. This practice is still in effect today.
- The Project made use of opportunities to extend planned

learning, where Project difficulties were experienced, notably in response to technical communications failures.

- In an age where DNOs were considering a range of comms systems, the learning from My Electric Avenue on the performance of PLC (Evaluation of Power Line Carrier communication for direct control of electric vehicle charging, 17 Nov 2015) allowed DNOs to assess the validity of this technique without having to run separate Innovation projects at the cost to the consumer.

"The My Electric Avenue project has helped improve the Scottish Government's awareness of the potential impact of electric vehicles on our distribution networks. The underlying data set has given us greater insights into charging behaviour in a domestic context, with the project as a whole improving our understanding of the potential network costs associated with electrification of transport."

David Richie, Dept Director of Energy Industries, Scottish Government

C3 Exceptional capture and dissemination of learning

My Electric Avenue set a high benchmark for learning and dissemination²².

As well as the 'usual suspects', it purposely targeted non-distribution network audiences such as the automotive sector, broader energy supply chain, investors, Parliamentary Select Committees and key policy makers.

A wide range of tools were used, from specific 121 discussions, to cross sector webinars, to the use of social media and customer focussed interviews on the BBC and YouTube (Robert Llewelyn's Fully Charged).

- Project learning was shared using multiple methods throughout the three years of the Project and beyond. The project team recognised the importance and timely nature of this work and were keen to brief a broader range

22 Pages 55-58, Section 12.0 Dissemination of Learning, My Electric Avenue Project Close-Down Report, March 2016

of stakeholders than was necessary.

- An array of communications approaches was used, to share information to different audiences:
 - **Technical.** To convey detailed results, both during and after. For example, external dissemination of the SDRCs follows a planned schedule of email dissemination to a 500-strong list of relevant sector stakeholders – spanning both the utility and automotive sectors, using a combination of traditional and Social Media engagement routes.
 - **Non-Technical.** The project strove to develop and share materials that were accessible and understandable to lay audiences, boosting awareness and publicity around the project, and to engage customers and other stakeholders. When communicating beyond the DNO sector, the project team actively sought to highlight the benefits of both the project, and the LCN Fund in general.

"I was excited to be involved in My Electric Avenue in its early days, to support its trial recruitment. The Fully Charged episode we did on the project was brilliantly received and reached a wide audience. My Electric Avenue stood out as being pioneering in its day, and I can easily believe that it has paved the way for further development of smart charging and innovation in the electric vehicle space and wider energy industry"

Robert Llewellyn, Actor,
Broadcaster Fully Charged

- As described below, we categorise these stakeholders into:
 - **The DNO sector.** Electricity Network operators and trade bodies including all UK DNOs (GB and NIE Networks), National Grid, ENA, ICPs
 - **National UK Government / Regulators.** Parliamentary meetings (types of sessions, who met, etc); OLEV (number of meetings, workshops); Government departments (e.g. BEIS, OLEV, InnovateUK); Ministers; Local councils; Regulators (Ofgem),

- **The broader energy industry.** National System Operator, Energy suppliers
- **The automotive community.** OEMs and the motor sector (SMMT, Nissan, LowCVP, Cenex LCV events, etc); Charging manufacturers (Rolec, Chargemaster, Alfen (formerly ICU));
- **Other relevant stakeholders.** Investors; ETI, Energy Systems Catapult, academia, House builders (inc. Barratt, Redrow); etc, etc
- **Trial participants.** Those people involved in the project – initially from a recruitment perspective, then latterly those driving vehicles and having their charging demand monitored
- **The public.** Lay audiences / the public who have an interest in the subject, but who may not be expert in the specifics

The following are specific examples of exceptional stakeholder engagement for each of the above audiences, over and above the base dissemination carried out by the project:

- Examples of engagement with the **DNO sector**
 - **DNO trans-departmental learning events:** The project learning was shared amongst all interested DNOs through a series of workshops (a one to one between the project team and each DNO), with content tailored to respond to key questions or areas of interest raised in advance by the respective attendees. This approach also informed the content of the Close-Down Report, shaping it to cover specific areas, whilst also enabling each DNO equal opportunity to apply project learning to the direct benefit of its customers.
 - **Transform Model:** The charging profiles, and performance of an Esprit style of DSR solution were submitted to the Smart Grids Forum for inclusion to the GB dataset of the Transform Model®.
 - **LCNI Conferences:** Several presentations were given at events in Brighton, Aberdeen and Manchester covering both the technical and commercial learning from the project. Whilst all projects are required to disseminate via this route, the project team received feedback praising the honesty and openness of learning, particularly of the commercial aspects of My Electric Avenue.
- Examples of engagement with **National UK Government / Regulators**

- **OLEV dissemination workshops:** Several workshops were held along with numerous 121 meetings with the Office for Low Emission Vehicles (OLEV) during the course of My Electric Avenue to explain the concepts of and learning from the project. These events helped educate OLEV on the potential issues, and pool data and insight from this project with their datasets.
- **Industry and Parliament Trust (IPT):** EA Technology (a member of IPT) raised the project and the need to consider the network impacts at EV related dinner for MPs and peers at the House of Lords.
- **Ministerial stakeholder briefing:** SSEN held an event at Portcullis House, Westminster chaired by Transport Minister John Hayes on 20th March 2017. The purpose of the session was to share the learning from the project with ministers and their staff, and to highlight the Smart EV project as a direct follow on activity.
- **Commons Select Committee:** Data from the MEA project was presented as part of a verbal and written submissions to the Business, Energy and Industrial Select Committee in 2017/18. Evidence was also presented in 2016 in the Energy and Climate Change committee looking at 2020 renewable heat and transport targets.
- Examples of engagement with the **broader energy industry**
 - **National Grid FES:** The project team met with National Grid's Future Energy Scenarios (FES) team.
 - **Charging point manufacturers:** The project team met with BEAMA's EV and infrastructure working group on several occasions to share the learning, and address any concerns from their membership.
 - **National Working Groups:** Presentations were given at the Smart Grid Forum in the concluding phase of the project on the role of a third party and the experience of EA Technology in leading the My Electric Avenue project.
 - **Conference papers:** Project partners De Montfort University and University of Manchester, as well as EA Technology, presented papers at national and international events such as CIRED and HEVC. Academics from the project are now sharing their experiences and working as far afield as Costa Rica and Australia.
- Examples of engagement with the **automotive community**
 - **Cross sector liaison:** My Electric Avenue may be unique amongst LCNI projects in that it has engaged directly and deeply with the automotive sector and others, gaining traction in reputation as an authority on the issue that EVs pose to electricity networks. The project is still seen as the 'go to' source of learning in the utility-automotive sector overlap.
 - i) During the project meetings were held with SMMT, LowCVP, OLEV, BEAMA, Northwest Automotive Alliance, Nissan, Tesla, Institution of Mechanical Engineers, amongst others.
 - ii) It was the first project from the LCN Fund portfolio to have a presence at the annual Cenex LCV event in Millbrook (the major annual conference for BEV/PHEV industry). The project team presented every year at this event from 2013-2015.
 - iii) Two presentations were given to the EV group of the Society of Motor Manufacturers & Traders (SMMT) during the project. SMMT referenced My Electric Avenue in their 2016 Ultra Low Emission Vehicles Guide (17 March 2016).
 - **Webinars²³:** The project has hosted a series of webinars focusing on both the network and automotive perspectives. One of the automotive sessions provides an insight into EV charging and driving behaviours, perceptions of EVs and of controlled charging. The prior research into this webinar included a survey of the automotive sector and supply chain (charging point manufacturers etc.) for their views on remote control of EV charging. These views were then fed back to the DNO and automotive community through the webinar.
- Examples of engagement with **other relevant stakeholders**
 - **Energy Systems Catapult (ESC):** The project team have been engaged with the ESC from 2015. In 2016 members of the project team met with both ESC and the government's EV 'tsar' (Richard Perry-Jones) to share learning and insight.
 - The project was the only of the network innovation portfolio to feature in Sustainability First's New Pin

23 <http://myelectricavenue.info/media-library#overlay-context=faqs>

7 Workshop Paper titled “Innovation in energy and water: What is an appropriate role for Government and regulators in delivering desired long-term public interest outcomes?”

- **Top Ten Tips Series²⁴:** This series, covering topics from customer engagement, novel commercial arrangements and trial installations, to data monitoring and data management, was lauded by Ricardo, the project’s independent reviewer, as an exceptional output for the project. Accessible and readily transferable across project portfolios and sectors, these ‘how to’ snapshots enable uptake in learning and are testament to My Electric Avenue’s pioneering approach to learning dissemination.
- **Examples of engagement with trial participants**
 - **Videos:** A series of EV test drive videos, using real customers, galvanised recruitment at the start of the project.
 - **Customer liaison:** Tailored newsletters have been sent to clustered customers on the trial programme on a monthly basis, informing customers of project progress, learning, and inviting feedback. A dedicated video for customers was produced in November 2015, to thank them for participation and reveal the final project learning and results. The cluster champions were invited to the project’s finale event on 3 December 2015.
 - **Newsletters to triallists:** The project has engaged extensively with its customer triallists to invite feedback on the customer experience through technology installation, vehicle deliveries, and decommissioning. Any feedback has been passed on to relevant project partners or contractors to support continual improvement in process and design of pertinent project stage.
- **Examples of engagement with the public**
 - **Key media** including the BBC, Independent, Guardian, energy and automotive press have attended press briefings for key project events such as the launch in 2013, and a dedicated press briefing in advance of the project’s finale event in December 2015. Press coverage was achieved in over 300 media, covering sector, trade (engineering, automotive, energy), national and international press. Press releases are sent out through Newspress (5,000 recipients) and utility / energy sector press contacts list of c.50.
 - **Social Media:** The project was one of the first of the LCN Fund to actively use Social Media as a tool for engagement and recruitment. We started using Facebook, Twitter and LinkedIn; ultimately landing on the latter two. The platforms are still used, at time of writing the @MyElectricAve Twitter account still has over 2500 followers covering an international audience.
 - **Filmed interviews:** These have included Robert Llewellyn interviewing project lead EA Technology and partners for an edition of Fully Charged, Energy News Live’s coverage of the final EV cluster, and at Cenex LCV2015. These films support ready access to project learning cross-sectorally, and with electricity network customers on a global scale. The Fully Charged episode on the project has been viewed almost 15,000 times.
 - **The project website** (www.myelectricavenue.info) was, and still is, a key tool
 - i) Total site visitors since website creation 38,553.
 - ii) Visitors that actually browsed the page 20,209.
 - iii) Even 2 years after the project has completed, 427 individuals visited the website in March 2018.
 - iv) Whilst the majority of visits are from the UK, we continue to see a global interest.

24 <http://myelectricavenue.info/top-tips>



Email myelectricavenue@eatechnology.com
 Go to www.myelectricavenue.info
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Project leads

Project partners



My Electric Avenue has received support from Ofgem through the Low Carbon Networks (LCN) Fund.