Project Code/Version No SSET205 (Non Conf)

Low Carbon Networks Fund
Full Submission Pro-forma

Section 1: Project Summary

1.1 Project title

I²EV - Innovation-squared: managing unconstrained EV connections **NON-CONFIDENTIAL VERSION**

1.2 Funding DNO

Southern Electric Power Distribution

1.3 Project Summary

The I²EV project has been conceived by, and will be managed by, a non-DNO to deliver a low carbon solution to benefit customers and the network, creating a blueprint for the interaction of DNOs and third parties. The full bid content is endorsed by SSEPD, the project's participant DNO, but is written, developed and fronted by EA Technology. The project will deliver essential learning on managing the strain on the distribution network from anticipated increased uptake of electric vehicles (EVs). I²EV will deliver essential learning and a cost effective solution to DNOs, that reduces network reinforcement need, demonstrates a new project delivery framework by a third party project lead and will support EV market growth.

Innovation 1 (commercial): Novel commercial arrangement I²EV will be delivered by a third party innovation technology provider on a risk and reward basis, with the arrangement ensuring that the DNO meets the requirements of the LCN Fund and other obligations.

Innovation 2 (technical): New Technology trials EA Technology has independently developed a novel monitoring and control solution, 'Esprit' ('the Technology') to manage the supply of electricity to EVs connected to distribution networks. The Technology will be trialled on a range of real networks, with real customers and EVs.

1.4 Funding

Second Tier Funding request (£k)	4,137		
DNO extra contribution (k)	0	**External Funding (£k)**	4,908

1.5 List of Project Partners, External Funders and Project Supporters

Project partners: EA Technology: Third party technology innovation provider and I²EV project manager. Nissan: EV and EV charger manufacturer; supplier of EVs for project trials. Fleetdrive Electric: EV lease hire company. De Montfort University: Socio-economic modelling. Northern Powergrid: link with CLNR project. Charge Your Car: EV infrastructure support. Automotive Comms: EV specialist communications.
External funders: In-kind: Nissan, Northern Powergrid, Fleetdrive Electric, EA Technology, Charge Your Car. **Project supporters:** Bracknell Forest Council, Hyde District Climate Change Forum. Academic partners to be appointed September 2012 for independent project/solution verification and project evaluation.

1.6 Timescale

Project Start Date	7 January 2013	**Project End Date**	31 December 2015

1.7 Project Manager contact details

Contact name & Job title

Gill Nowell - Senior Consultant, EA Technology

Telephone Number

+44 (0) 151 347 2359 / +44 (0) 781 791 0889

Email Address

gill.nowell@eatechnology.com

Contact Address

EA Technology
Capenhurst Technology Park
Capenhurst
Cheshire
CH1 6ES

Section 2: Project Description

The I²EV project will be developed, project managed and delivered by EA Technology as a turnkey innovation technology provider. Focusing on one technical problem and one technical solution, the project will demonstrate how a non-network company can, through a novel commercial arrangement with a supporting DNO, access the LCNF Fund to deliver a low carbon solution.

2.1 Aims and objectives

1 Commercial

Problem: Ofgem has been looking at ways to open up innovation mechanisms to third parties under the RIIO (Revenue = Incentives + Innovation + Outputs) framework, as a potential vehicle to accelerate technology development and adoption. A key challenge in doing so is ensuring that that trials and risks are managed on real networks with real customers, and that knowledge is transferred to the DNO to secure buy-in and engagement to the project and its outputs. This project will demonstrate how non-DNOs can lead projects in a structured contractual framework to ensure development of adoptable solutions from third party providers, by developing a commercial structure for rapid solution deployment by a third party delivery body.
Solution to Problem: In order to provide access to the network, a blueprint commercial and operational framework will be developed between a DNO (SSEPD) and a non-network company (EA Technology). The blueprint will address issues and risks to both the DNO and third party delivery body while ensuring compliance with the relevant regulatory and LCNF governance requirements and obligations.
Method: Lead project management by non-DNO innovation technology provider: EA Technology will assume absolute responsibility for project management of I²EV, from project inception to delivery. The field trials will be designed by the third party, who will then work in partnership with SSEPD to conduct the field trials. Where possible the installation and commissioning of the Technology on electricity networks will be subcontracted to third parties.
Summary: LCN funding under Tier 2 is required to develop a blueprint commercial and operational framework for use between DNO and third party innovation technology provider development and roll-out to all GB DNOs. The development of this lies outside SSEPD's usual course of business and is timely given the projected launch of Network Innovation Competition funding in 2015.

2 Technical

Problem: Increased stresses on the network - overload due to market growth of EVs: by 2023, 1-3 million EVs are forecast to be on UK roads, 23 million by 2050 (Smart Grids Forum Work Stream 3). Peak energy demand from charging EVs could increase by 36%, resulting in 'a profound impact on the utilisation of generation and network capacity in the electricity system' (Advanced Smart Metering report, Imperial College/ENA, March 2010). Even at lower end forecasts, without the optimisation of demand side technology, this analysis indicates that this GB market growth is set to lead to local overloading of distribution networks. The I²EV project will provide DNOs with a cost effective intervention that avoids network reinforcement while at the same time supports the growth of EVs. Potential cost savings in terms of reducing stresses on the network due to EVs range are around £2 billion by 2030 (see section 4's calculation of net benefits for details). SSEPD has worked with EA Technology to select a project that addresses a single pertinent technical problem with a single technical solution - allowing focus on the structure as well as the technical aspects of the project. The I²EV project will be led by EA Technology who will be contracted by SSEPD to deliver the I²EV project from project start-up, through management and delivery.
Solution to Problem: The I²EV project facilitates the expedient connection of EV chargers to the DNO LV network as it avoids the possibility of the DNO becoming a barrier to multiple EV connections along a particular LV feeder. If successful, the solution will give GB DNOs a low cost, easy to implement, alternative to traditional network reinforcement when faced with networks overloading due to unconstrained connection of EV chargers. The Technology could also be used to control other major demand types, e.g. heat pumps.
Method: Modelling and trials of the Technology: Modelling and trials will aim to prove that the Technology works, with customer support, on a range of LV network types: cable, overhead line, mixed, heavily and lightly populated circuits. The technical aspects of the trials will consist of installing monitor-controllers (MC) at distribution substations, with active sockets (AS) installed in customer installations. The MC ensures that the load of all EV chargers does not take the load above the rating of the LV circuit. The initial proving trials will be conducted on cable LV networks that are located in the SSEPD area (Zero Carbon Homes, Chalvey) in September 2012. A key aspect to widespread deployment will be in understanding customers' attitude and behaviours to managed EV control; I²EV has enlisted the support of a social science academic partner. The trials will require the engagement of trial participants, both in 'clusters' (i.e. 10-25 people on one feeder).

2: Project Description cont.

The cluster trials, or 'technical trials' will aim to prove the Technology and mimic a 2030 network; these clusters will be in both residential situations (charging at home) and in business situations (fleet cars charging at work). The non-cluster 'social trial' EV users will be monitored for behavioural and socio-economic data, and will be largely fleet hire users (with the current exception of the North East Nissan employees under the LEAF hire scheme). Electricity customers lie at the heart of the I²EV project. The project will determine how best to manage a rapid uptake of EVs in given clusters, whilst developing a smart solution to make this a win-win solution for the community.

Summary: The Technology that forms the basis of the solution to the problem of increased stresses on the network (overload due to market growth of EVs) has not yet been released to the market. The solution is at the laboratory testing stage (TRL5), with plans to be ready for wide-scale in-situ testing on live networks (TRL7) by Q3-Q4 2012. Therefore the Technology will be beyond R&D stage at I²EV project commencement. I²EV will provide a large enough field trial to rigorously test the Technology on real LV networks, with real EVs and with real customers. LCN funding is required to undertake the trials and resultant GB-wide dissemination of results and learning to DNOs, which would not otherwise form part of SSEPD's usual course of business. The magnitude of the field trials required makes the project relevant to LCN Fund Second Tier funding. The Technology has not been trialled previously by SSEPD due to the nascent nature of EVs. The balance of risks makes it timely for the I²EV project to commence now given the projected acceleration of EV uptake and associated stresses on the existing network.

2.2 Technical description of the project

1 Commercial innovation

The commercial aims of the project are:

- To demonstrate delivery of a low carbon network project by a non-DNO on behalf of a DNO (see 'commercial innovation delivery framework' on page 10)
- To develop a novel commercial arrangement (see traditional and I²EV models on page 17)
- To enable all procurement related to the project activity to be managed by a non-DNO
- Evaluate the extent to which third party delivery accelerates deployment of low carbon network projects

The work is innovative as:

- It is delivered by a third party on behalf of a DNO
- It is project managed by a third party
- Will create a blueprint for future low carbon network projects to be delivered by a non-DNO

The commercial innovation is novel as it is the first project of its type under the Low Carbon Networks Fund.

2 Technical innovation

The technical aims of the project are:

- Learn customer driving and charging habits and the implications for control via the Technology.
- Develop and trial the equipment to ascertain its ease of installation.

Develop the integration of the Technology into the EV charging points including how existing intelligence and attributes in charging points can be harnessed to reduce the cost and improve the performance.

- Evaluate the range of networks where it can operate successfully and identify any type of networks that are inappropriate.
- Evaluate how often switch off routines are likely to be initiated from real life trials and extrapolation via modelling using the results.
- Evaluate the most appropriate length of time to switch off charging and how to cycle switches with references for battery management and customer preference and habits.
- From the results and extrapolation via modelling, estimate the typical and maximum thermal capacity gained.

The work is innovative as it:

- Is the first trial of equipment to directly control circuits within customers' premises using power line carrier (PLC) and without reference to a third party such as a supplier or aggregator.
- Takes into account customer behaviour, the needs of the network and the needs of battery management in developing a network control system.
- Integrates network control technology into a customer appliance (namely an EV charging point).
- Engages EV manufacturers to work with DNOs and those developing network control technology.
- It is a network trial led by a third party working with the DNO.
- Demonstrates the benefit of allow a DNO to directly limit or control elements of a customer's supply.
- Develop the principles of access to allow the management of multiple installations on one constrained network.

The trial design is from the perspective of both a technology developer and independent consultant. It aims to draw out the needs of a manufacturer, whilst ensuring technical rigour and trial validation satisfy the DNOs' requirements. See diagram on page 10 for an illustration of how the Technology works.

2: Project Description cont.

2.3 Description of design of trials

The tasks for the project are:

Task 0. Novel commercial agreement

Draft and agree a contract for a non-DNO entity to manage an LCNF Tier 2 project, including the obligations on each party and responsibility for different risks. This will detail the permissions and duties passed on or withheld by the DNO. At the end of the project the contract will be reviewed and improved if possible. This will be published for use by other DNOs.

Deliverables

i. Commercial agreement for the I²EV project
ii. Template for other LCNF projects led by a third party

Task 1. Initial background

Evaluation of the initial trial (September 2012) by an academic partner to improve the Technology and approach in the extensive trials planned. This will identify any improvements or additions in the logic developed to date for the Technology equipment to enhance the design. Other possibilities are additional monitoring capability, means to change control parameters or user interface in terms of lights or other means to indicate availability for charging. It will also investigate the most flexible and practical monitoring and means to inject communications signals to reduce interruptions to customers and installation time.
The academic partner will also carry out a literature survey of the estimates of the additional load that EVs will cause and the potential for load shifting. The academic partner will carry out a literature survey of existing knowledge of customer behaviour with regard to the use of EV and acceptance of direct control of appliances. This will highlight gaps in the knowledge and likely response and the best way to approach customers.

Deliverables

i. Assessment of the initial trial and recommendations on improvements to the design
ii. Technical literature survey of load shifting potential of EVs and heat pumps
iii. Social-economic literature survey of customer behaviour with EVS and acceptance of direct control of appliances

Task 2. Customer engagement

Key to the success of the project is the engagement of trial participants and the sourcing of EVs for trial participants to use. Clusters have been identified and engaged with in Hyde, New Forest and Leeds (letters of support in Appendix L). From the outset, and from learning derived from other Low Carbon Networks Fund projects, it has been recognised that the engagement of trial participants, not least those living in close proximity with one another, i.e. in clusters, presents a key challenge to the project. Through a clear and targeted pre-bid strategic approach, the Hyde and Leeds clusters are already primed to take part in the cluster trial programme, and other candidates have been contacted in Basingstoke and Whitchurch (see below).

At the same time, the project has engaged Nissan Europe's EV Steering Committee with the project. As a result, Nissan has brokered a deal with Fleetdrive Electric, an EV fleet hire company, to provide the project with 250 EVs at a subsidised rental per month for each trial participant, tailored to both the residential and business scenario. The Nissan offer is unique to the I²EV project, and demonstrates Nissan's commitment to placing the UK at the top of the EV agenda. This early work with Nissan and trial participants serve to de-risk the project, by addressing its two major challenges - supply of EVs and finding clusters of trial participants.

The project is further de-risked by working with SSEPD's New Thames Valley Vision's (NTVV) Consumer Consortium to identify EV fleet hire opportunities. There is a clear plan to engage Nissan with the Consortium and sign up major blue chip companies to the 'non-cluster' trial programme. This trial arm will provide valuable socio-economic data, together with data on charging habits, customer behaviour, charging times etc To further de-risk the project, I²EV has partnered with Northern Powergrid and Charge Your Car North Ltd. This will give access to an additional 200 Nissan employees on the Nissan LEAF hire scheme in the North East and the trial data from those EV users, ensuring linkage with Northern Powergrid's Customer-Led Network Revolution (CLNR) (LCN Funded project). Through the links with the NTVV Consumer Consortium and the CLNR projects, the I²EV demonstrates a pioneering approach to LCN Fund project planning and delivery; by working with two of the largest existing LCN Fund projects, crossing two DNO areas (Scottish and Southern Energy and Northern Powergrid), I²EV will reduce the risk of duplicating research, resources and crucially, will further lessen any disruption to the customer - whilst at the same time delivering added long term benefit to the customer by future proofing the network to manage increased

2: Project Description cont.

stresses due to uptake of EVs and other low carbon technologies. The initial sub task to Task 2 is the development of the customer engagement plan, which will be consulted upon and agreed with Ofgem. The outline knowledge dissemination plan, that will form the core of the customer engagement plan, is on page . This will be supported by a robust data protection strategy (outline in Appendix M).

Two groups of trials will take place:

1. Social trials - monitoring of existing EV owners and EV fleet hire users

During this process, EA Technology will engage with Nissan, Charge Your Car North Ltd and Fleetdrive to approach EV owners (wherever they are located) with the intention of monitoring and recording, with reference to location, their driving and charging habits, in a statistically significant numbers. The monitoring will be a basic power monitor to record the charging point load downloaded remotely (or from the charger itself if this is available) and a request to householders to record their mileage and time of journeys (possibly via a sat nav) with any additional charging away from home. De Montfort University will provide information as to the social economic data required. This will enable:

- A statistical comparison of the behaviour in the trials to be compared with a larger population to check that the customers within the trials are a true representation of the population as a whole.
- An understanding of the socio-economic situation of customers (do they represent a cross section of society or only higher social-economic sections) and the implications for EV customer behaviour in future.
- The results of the trials to be extrapolated to a larger population in the modelling work.

Pre-project progress in identifying existing EV owners

Charge Your Car North Ltd and Nissan have offered access to the Nissan Sunderland employees' LEAF hire scheme participants; 200 EV users' data will be shared with I^2EV. See Appendix L for letters of support. Through the New Thames Valley Vision Consumer Consortium, major blue chip companies such as Dell, GE, 3M, Honeywell and Waitrose will be approached with fleet hire options to lease an EV at a subsidised cost. Charging points will be installed, potentially free of charge, the Technology trialled and trial participants' behaviours, cycle and charging times etc. monitored.

Pre-project progress in identifying EV fleet hire customers

EA Technology with the support of Bracknell Forest Council (see letter of support in Appendix L) and SSE will facilitate a meeting with the New Thames Valley Consumer Consortium, Nissan and Fleetdrive Electric in October 2012.

2. Technical trials - trialling the Technology and monitoring using clusters (10-25 on one feeder) of EV charging points, with residential customers

To identify suitable communities and sign up customers for the trial, De Montfort University will provide input into the customer engagement to ensure that customers understand the social-economic information required. They will also review the engagement process to understand what was successful and what could be improved. Different means of engagement will be used. Project partners will provide in-kind contribution via support to identifying clusters and engaging trial customers/participants, i.e:

- Nissan's (LEAF EV manufacturer) EV ambassadors will be made available to facilitate evening briefing sessions to demonstrate / educate potential EV users of the benefits of using EVs.
- Fleetdrive Electric, an EV lease company will help to identify suitable trial clusters from its EV database.
- Charge Your Car North Ltd (CYC) will support with identifying clusters.

Clusters will not be limited geographically.

Pre-project progress in identifying clusters (see Appendix B for trial cluster summary):

The aim is to achieve clusters of around 20 EV connected to one feeder. 20 is a suitable number as it gives the scope to understand the likely variation in use of EVs and charging in any given location by different customers:

- Using data collated under the Smart Grids Forum Work Stream 3. An average feeder has around 40-60 connections, each with an After Diversity Maximum Demand of between 1-1.5kW or a peak demand of 40-90kW. 20 chargers, each with a demand of 3-4kW, gives an additional load of 60-80kW. Even with only half charging at one time, the additional load is 30-40kW which is a significant additional demand and a significant potentially shiftable load.
- Cycle charging points also require between two and eight switched off at any point and therefore 10 is a minimum number.

The challenge of managing multiple EVs in a given LV feeder is not a problem, but could pose a significant challenge as EV uptake figures increase. If there are insufficient clusters, with any combination of EVs or heat pumps, the results from the clusters available will be extrapolated using network modelling. Whilst the principle aim is for EV charging control, heat-pump users are another client base area and so further information will still provide information on the viability of the product. If after nine months there are insufficient clustered customers to trial an EV, a mitigation option is to utilise heat pumps; social landlords will be targeted as they often have clusters of housing stock where each home will have had a heat pump

2: Project Description cont.

installed. A mixture of EV clusters and heat pumps clusters may be used to achieve suitable 'cluster' sizes. Contact will be made via existing contacts from engagement in other LCNF projects, through information about social landlords who have participated in CESP or the Renewable Heat Premium Programme and therefore likely to have heat pumps installed in clusters. Examples of possible candidates are Southern Housing Group on the Isle of Wight, A2 Dominion, Hampshire Voluntary Housing Society, Hyde, Martlet, Swaythling Housing and Bracknell Forest Homes. In the case of heating, back-up heat or heat stores may need to be supplied to give comfort to households that they will not be cold. Reference will be made to DECC's research on heat pumps with heat stores. If there are insufficient clusters, with any combination of EVs or heat pumps, the results from the clusters available extrapolated using network modelling.
- Gated communities (1,000 in the UK; ideal cluster set-up) and cohousing associations have been identified and initial approaches been made through the UK Cohousing Network. This has led to in principle engagement with a cluster in Leeds. See Appendix L for a letter of support from LILAC.
- Hyde District Climate Change Forum has indicated in principle support for the I²EV project and interest in taking part in the trials. The I²EV project manager is presenting to the Forum on 22 August 2012. The village of Hyde is an ideal candidate community for a cluster trial, as the households off the same low voltage overhead feeder. See Appendix L for letter of support.
- Approaches have been made to potential clusters in Basingstoke and
- Nissan has been approached by a Scottish organisation, E-cosse, interested in accelerating the uptake of EVs; Nissan has offered to facilitate links with the I²EV project. Trials would be of particular interest in the Highlands and islands where the electricity network is weak and cost of transport fuel is high.
- Routes to contact sustainability community groups already established are the Low Carbon Communities Network and Transition Towns networks. Already key community groups have been identified to contact such as Low Carbon Oxford, Totnes and Hook Norton, remote Scottish island and highland communities such as Orkney, Eigg, Findhorn etc.
- Local Authorities that are known to champion low carbon initiatives such as Brighton, Bracknell, the highland and islands council, Oxford and Stroud. Bracknell Forest Council (NTVV partner) has indicated support for the I²EV project and interest in taking part in the trials, see Appendix L for letter of support.

Discussions that have taken place with Nissan, as referenced earlier, have resulted in the agreement to provide sufficient EVs to undertake the trials via Fleetdrive Electric car leasing company. The negotiated rates are appropriately low in order to make participation in the trial appealing to consumers. In the event of this agreement being unfulfilled, companies and government agencies will be approached to cover, as far as possible, the cost of leasing the vehicles for the duration of the trial. Discussions will be reinstated with other EV manufacturers and leasing companies to get the best deal possible for a leasing contract. Alternatively, purchasing new or second hand EVs and recouping some of the costs by selling them on at the conclusion of the trials can be considered. Candidate buyers could be local authorities or other agencies needing fleet cars. Ideally at least one cluster will be achieved on an island or remote location to demonstrate the potential on weak networks where upgrades are prohibitively expensive but the potential for renewable generation is high and transport fuel is expensive.

Project stage reviews

The key stage reviews are nine months when the number of EV clusters possible will be assessed, if insufficient, heat pumps will also be targeted. At 12 months the number of clusters (EVs or heat pumps) will be assessed. If insufficient clusters are available emphasis will be on monitoring multiple EV users.

Contingency

The risk of gaining sufficient numbers of users is significantly reduced following the agreement and accompanying letter of support from Nissan to provide EVs at a reduced rate for the trials. However, arranging suitable clusters of EV users is a significant threat for the project and for this reason, breakpoints to assess progress and the alternative of controlling heat pumps is written into the plan. Additionally, a range of funding options and potential participants will be contacted to increase the potential for signing up clusters. If few clusters of any type are found, monitoring individual EVs users will be used to extrapolate the results. The alternative plans should cost less than the priority option.

Deliverables

i. Customer engagement plan
ii. Social trials - 150 EV users engaged to participate in trials

2: Project Description cont.

iii. Technical trials - 100 customers signed up for the EV trial, in cluster groups of 10-25 EV users (heat pumps if necessary)
iv. Monitoring equipment installed to monitor an existing EV owner's behaviour

Task 3. Integration of the Technology with charging points
Alongside Task 2, EA Technology will engage with manufacturers of charging points to integrate the ability to accept Power Line Carrier (PLC) signals and the Technology logic into the charging point. Ideally, this will allow just a charging point (of any make) to be installed with the control capability included rather than two pieces of equipment. If this is not possible, the Technology logic will be installed in series with the charging points. Control of charging points may be one of many applications of the Technology and therefore the logic will be developed separately so that it can be used to control other appliances such as heat pumps.
Deliverables
i. Integration of the Technology into charging points or other loads.

Task 4. Establishment of customer / cluster trials
The first cluster will be fully engaged by March 2013; the network will be assessed and the Technology installed together with charging points. It is planned to have a temporary circuit installed either on a spare way from the customer's meter or on the DNO side of the meter. Alternatively, a separate consumer unit may be installed for the additional circuit. Learning from this trial will improve further installations. As more clusters are found the Technology will be installed. It may be necessary to provide parking space for customers' conventional cars during the trial as they may not have space to park an additional vehicle. With DNO support, EA Technology will aim to find parking space for the existing vehicles. The NCP network will be approached to provide secure parking for the 'traditional' vehicles. It has been established that there is proven technology to bypass appliances that could block a PLC signal if necessary. There is a risk that the feeder itself is too noisy however the PLC technology has been successfully tested elsewhere on the UK (e.g. Hook Norton LCNF project and at Houghton, Slough under IFI). Therefore experience to date indicates that PLC could be applied to the majority of the LV network. If any of the trials show that PLC cannot be used, the character of these feeders will be useful learning as will using alternative communications. A temporary change in the connection agreement with the customers to cover the direct control of the EV charger will be agreed.
Deliverables
i. Charging points, the Technology and monitoring installed
ii. Likely number and length of switch-offs under different scenarios, incl. impact of higher capacity charging

Task 5. Monitoring first trial
The measurements to be taken each 10 minutes are:
- Feeder current
- Demand from each EV charging socket (or heat pump)
- Voltage at the customer premises
- PLC signals sent
- PLC signal received
- Number of switch offs each socket actuates
- Length of each switch off
- Time and length of each charge and total energy demand

The monitoring will be via the Technology and via power monitors on the charging point circuits. Data will be downloaded remotely using power line carrier (PLC) or mobile communications, should PLC not be available, as appropriate. EA Technology has used a number of data logging systems and will select the most cost effective means to communicate. The data monitor/controller will be able to log all the data that it and the Technology can measure, saving to a laptop or logger. This information will be downloaded from the substation by mobile phone, power line carrier or land line depending on the location. It is anticipated that the time and length of each charge and the energy used will be recorded by the charging point. If this is not possible a low cost power meter will be installed in series. The results from the other tasks and the first trials will feed back into the 'main' trials so that the control may be improved on an on-going basis. The first and each subsequent trial will last between 12 and 18 months. Due to the diversity of the network, and to ensure applicability to a GB-wide scenario, the limits on current may be set artificially low, and to different levels, to monitor successful operation, cycling of chargers etc. even when the feeders are not actually overloaded. There will be no adverse effect on the customer; only a small, and agreed (with the customer) interruption to supply to install the charging point. In the case of heat pumps, the internal temperature and coefficient of performance (COP) will be assessed to measure whether the performance has improved or degraded compared with operation without direct control.
Deliverables
i. Data collected monthly for duration of each trial; reported every six months to the steering group

2: Project Description cont.

Task 6. Trial participant interviews

The De Montfort University will hold pre, during and post-trial interviews with customers (trial participants) regarding:

- Driving and charging habits, concerns over charging being switched off, and any problem encountered as a result of the Technology

De Montfort University will develop a suitable interview 'pack'. The interviews will be conducted with a mixture of face to face where possible or, where this is not feasible, written or online surveys. The participation in feedback surveys will be written into participants' contracts for the trial to ensure that as much information as possible is gathered.

Contingency

A range of data gathering options, paper, online and face to face interviews will be used to provide participants with as much choice in how they respond to maximise data returned. Statistical analysis will be used to estimate data where there are gaps.

Deliverables

i. Interviews with customers held, social economic analysis carried out and recommendations made.

Task 7. Modelling

Using the results from the trials, an academic partner, with support from EA Technology, will model the actual test networks and other representative networks, using work carried out by Work Stream 3 of the Smart Grids Forum to establish the:

- % increase in thermal and voltage headroom and resulting cost savings in avoiding reinforcement compared with unmanaged installation of EV charging sockets (or heat pumps) including the impact of higher capacity charging
- Increased capacity and options for back-feeding and resulting cost savings
- Likely resulting increase in uptake of EVs (or heat pumps) and resulting savings in carbon emission using DECC published carbon intensity figures
- Any type of network that is unsuitable for the Technology

The results of monitoring the driving and charging habits of individual drivers in different locations will be used to verify that the habits seen in the trial clusters are representative and can be extrapolated to different types of network and locations. The results will be used to estimate the savings possible by using the Technology rather than reinforcing the network and the logic requirements of the Technology. If heat pumps are used, recommendations achieve the best COP whilst using the Technology will be made.

Deliverables

i. Network models of the impact of EV charging and the Technology

ii. Cost-benefit analysis (on a GB scale and DNO licence scale) for the network using the Technology. This will be based on the approach developed under Work Stream 3 of the Smart Grids Forum to help validate this work.

ii. Likely carbon savings of using the Technology

Task 8. Consultation with EV manufacturers - cycle times

With the results of the trials discuss with EV manufacturer the optimum switch off time and cycle time without adversely affecting battery management or lifetimes. This will also take into account customer and network requirements and which charger to switch off first.

Deliverables

i. Cycle times and logic for the Technology agreed.

Task 9. Project and regulatory recommendations and implementation

Make recommendations as to whether:

- Installation of the Technology (or similar) should become standard for large loads.
- There should be changes in the regulation to allow the DNO to directly control customers' supply.

Deliverables

i. Independent evaluation of project and the Technology.

ii. Regulatory recommendations, including integration into DNO business as usual.

iii. Technical and commercial framework recommendations.

Task 10. Dissemination

Dissemination - as much information as possible will be disseminated to other DNOs, manufacturers and the general public, without compromising the intellectual property or customer privacy of those involved, as described in the dissemination plan.

Deliverables

i. Dissemination plan developed and executed.

2: Project Description cont.

2.4 Changes since Initial Screening Submission

A number of significant activities have been undertaken since the submission of the 2012 ISP. Whilst the core of the project has not radically changed, the project now has a clearer focus, rationale and structure to maximise learning.

Increase in requested LCNF funding: This has increased from £2.5 million in the ISP to £4.1 million at full bid submission. This is accounted for by a number of key factors. At ISP stage costs for establishment of customer / cluster trials were under costed at £550,000. This has increased to around £1.8 million - with an in kind leverage of £5.8 million; no in kind leverage had been achieved at ISP stage. Management of the subsidised EV rental programme and other trial associated costs (collection/delivery of EVs, installation of charging points, finding trial participants) were either not accounted for or under costed. Management of the rental programme alone accounts for £225,875 and was not costed at ISP stage. Fleet management is not core to either EA Technology's or SSEPD's business; we have since engaged with an EV fleet hire partner who has worked with us to address and further refine costs for this element, in return for a high quality output that will de-risk the trial stages of the project - by providing the project with EVs and management of those EVs.

EV manufacturer engaged: The most significant development between submission of ISP and full bid is the committed engagement of Nissan to the project. Nissan is supplying, through a uniquely subsidised deal, 300 EVs to the trial programme, through an EV lease hire company, Fleetdrive Electric. Through Nissan's project partnership, I²EV will also have access to Nissan's Low Emissions Centre of Excellence in Sunderland which will support learning and technical need throughout the lifetime of the project. Two key learning areas from the trials will be social and technical, the former requiring EV drivers in different locales, the latter requiring clusters of 10-25 trial participants on one feeder (e.g. on one street, cohousing development or gated community). See Appendix L for letters of support from Nissan and Fleetdrive Electric.

Social trials - participants identified and secured in principle: Access to 200 EV drivers secured through partnering with Charge Your Car who manage the Nissan employees LEAF hire scheme in Sunderland. Progress made in engaging support of Bracknell Forest Council to provide direct links to SSEPD's NTVV's Consumer Consortium (blue chip companies) for fleet hire trials.

Technical trials - Clusters for trial identified and engaged: Successful trialling of the Technology depends upon identifying and engaging trial participants in clusters. Two potential clusters have already been engaged in Hyde, New Forest, and Leeds.

Review of all Tier 2 projects - collaboration with Northern Powergrid (CLNR) and link with NTVV: A comprehensive review of all Tier 2 projects has been undertaken to ensure the I²EV project effectively builds on the UK's LCNF portfolio. As a result, clear strategic links have been established with other LCN Fund projects - New Thames Valley Vision (NTTV) and the Customer-Led Network Revolution (CLNR) (both Tier 2). In recognition of the natural link between I²EV and CLNR, given both projects' involvement with EVs, Northern Powergrid has committed as a partner to the I²EV project.

Detailed costing and in-kind support: Detailed costing has been carried out following the re-focused project; partners' in kind support has been quantified and contractors costed.

GB DNO business as usual: Introduction of focused activity to bridge the gap into GB DNO business-as-usual including detailed technical evaluation of charging/derogation consideration, identification of the need for use-cases, policies, procedures and design tools to be developed in the project and the identification of the need to develop training material to educate the range of DNO stakeholders through the project.

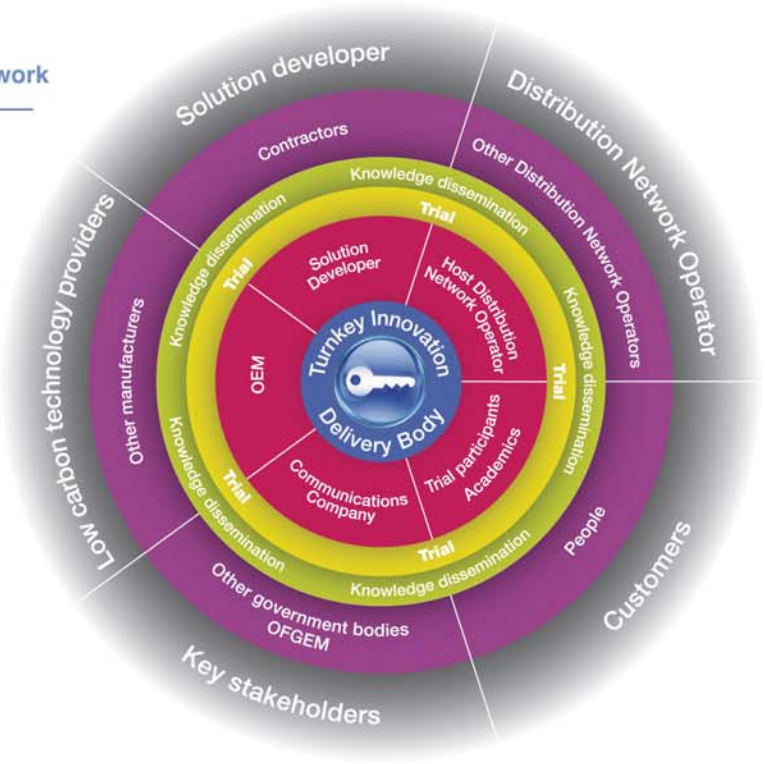
Improvements made to the project readiness:
- Governance: Project steering group and board established (see Appendix F for organogram)
- Commercial innovation: I²EV commercial model has been drawn up (see page 17)
- On-site trial of the Technology to de-risk the project - trial results will be available in September 2012
- Management of EVs for duration of the trials programme has been established with a trusted partner
- Letters of support have been provided by project partners and technical trial cluster groups (Appendix L)
- Social trials: Through Charge Your Car North, access to 200 EV drivers in the North East
- Technical trials: Two clusters have been identified and both have provided a letter of support
- Detailed project plan has been developed (Appendix G)
- Outline knowledge dissemination plan to inform the communications plan developed (see page 32)
- Outline data protection strategy to support customer engagement plan has been developed (Appendix M)

2: Project Description Images, Charts and tables.

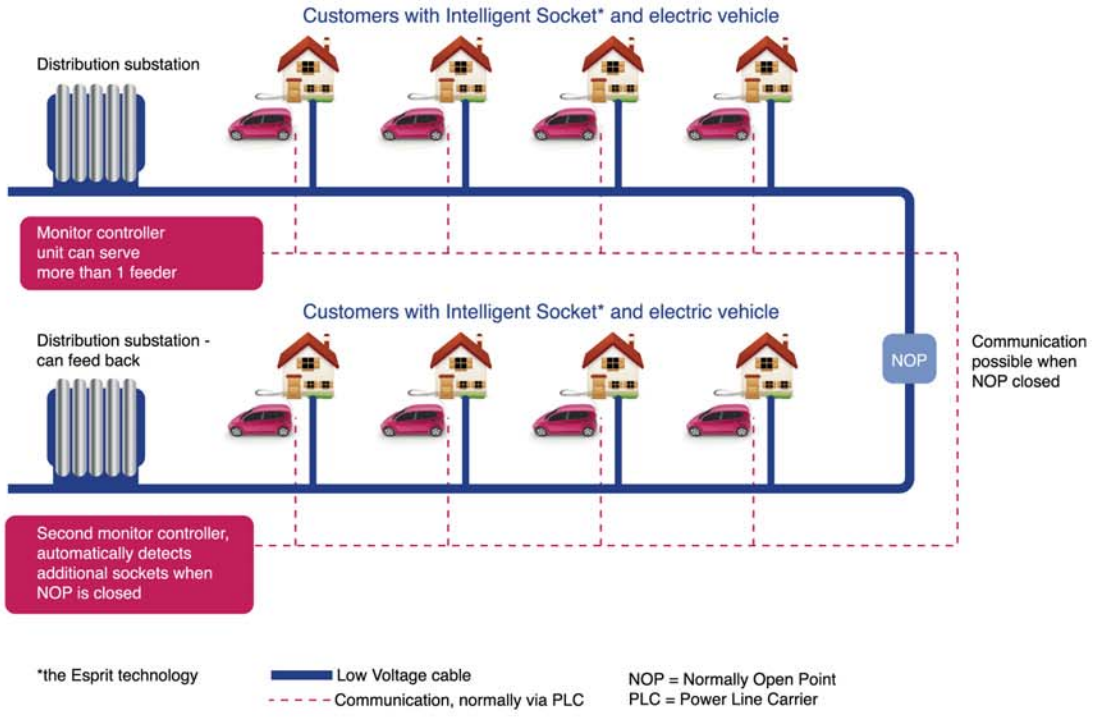
I²EV
Commercial innovation - delivery framework

This diagram illustrates the framework for a non-Distribution Network Operator (DNO) to deliver a low carbon network innovation project, from inception to delivery, on behalf of a DNO.

- i. The Turnkey Innovation Delivery Body (TIDB) develops, manages and delivers the low carbon network project on behalf of the DNO
- ii. These are the core parties with whom the TIDB partners in order to develop the project, leading to stage iii
- iii. Trials of the technology to support the low carbon network of the future
- iv. The knowledge and learning from the trials is disseminated to the partners in stages ii and v
- v. The key beneficiaries of learning from the project
- vi. The outer layer captures the main partner groups



I²EV
Technical innovation – how the Technology works



Project Description images

Section 3: Project Business Case

In this section, SSEPD supplied input is in italics.

3.1 I²EV in an SSEPD Context

I²EV is proposed by SSEPD, which is part of the Scottish and Southern Energy (SSE) group. SSE is involved in the generation, transmission, distribution and supply of electricity, the production, storage, distribution and supply of gas and in the provision of other energy-related services.

One of SSE's main priorities is to:
'Deliver upgraded electricity transmission networks and operational efficiency and innovation in electricity and gas distribution networks as they respond to the decarbonisation and decentralisation of energy.'

The learning from the LCNF projects such as the I²EV project continue to inform SSE's strategy to deliver on these priorities. Its role in informing efficient investment, the innovative application of technology and the support the project provides for decarbonised energy will be key to its success and the reason why SSEPD is submitting this bid to the Low Carbon Networks Fund.

SSEPD extends this to draw on the innovation of project partners and stakeholders, an approach which has reaped rewards both in SSEPD's Smart Grid projects Northern Isles New Energy Solutions (NINES) in Shetland and New Thames Valley Vision (NTVV) project in South England..

It is this disciplined yet supportive approach to innovation that gives colleagues and stakeholders the confidence to propose inspiring, challenging and novel projects like the I²EV.

In developing I²EV we, along with our lead partner, EATL, have taken the learning from an array of successfully delivered IFI and LCNF projects which have allowed us to gain a useful understanding of the challenges of the future and the tools both commercial and technical that we can utilise to resolve issues. Projects of note include:
- Orkney Registered Power Zone: the first network based operational Active Network Management system in the UK.
- Chalvey Zero Carbon homes: an SSE funded project in conjunction with Slough Borough council which has constructed 10 fully occupied zero carbon homes to demonstrate the most advanced home energy systems available for the new home market.
- Shetland battery: a six megawatt hour sodium sulphur (NaS) battery - Europe's biggest - installed adjacent to our power station on Shetland.
- Customer-Led Revolution - Northern Powergrid's LCNF project.

Integration with SSEPD's Business Plan

SSEPD's delivery priority is to deliver upgraded electricity transmission networks, operational efficiency and innovation in electricity distribution networks as they respond to the decarbonisation and decentralisation of energy.

The learning from the LCNF projects will assist our preparation for RIIO, and is absolutely in line with the values core to the operation of our business.

Converting innovation to business as usual

SSEPD's pragmatic approach to developing and implementing research projects and technology trials ensures the generation of outputs which are practical and effective. Conversion of these useful outputs to business as usual, for SSEPD and for the wider industry includes:
- the creation of new policies and procedures
– commercial precedents
– component specifications
– vocational and technical training courses
– management tutorials
- providing key data relating to this intervention (cost per intervention, risk, operational implications)

3: Project Business Case contd.

3.2 The I²EV Business Case

The business case for the I²EV project falls into two parts. Firstly there is a business case for the mode of operation and delivery of the project and secondly there is the benefit of the social, economic and technical deployment of the Technology and associated monitoring and engagement.

There is significant benefit to the DNOs of developing a framework in which third parties can trial new technology on one or more DNOs networks whilst still working closely with the DNO as the sponsor of the project.

The benefits are:

- Accelerating the development and deployment of new technology by allowing a third party to drive the trials forward. The aim is to trial the technology in three years, compared with five years often required under DNO led projects.

- Ensuring that the technology aligns with a DNOs needs and has DNO support to integrate it into normal working practice through DNO sponsorship of the project.

– Using a third party as the lead on the project enables one DNO to be the sponsor whilst allowing the Technology to be tested on other DNOs' networks ensures efficient management of the trials whilst ensuring testing on as wide a cross-section of networks as possible. Separate projects per DNO may increase costs by 50% as the project management and analytical costs would be remain at a similar and would not scale for two smaller projects.

– Developers working with DNOs engenders trust and understanding of risk that is beneficial for operating together in a `business as usual' context.

– Not only will the project help EA Technology grow as a developer of the technology, the project brings ANDTR, Fleetdrive Electric and Automotive Comms (all SMEs) into contact with the distribution system, supporting their growth and securing jobs.

– The project will also support the safeguarding of Nissan's jobs at Nissan's plant in Sunderland through enabling profile of the Nissan LEAF and potential new technological developments in integrating the Technology with the charging point.

– By ensuring that electric vehicle charging points can easily be connected to the network, the uptake of vehicles is likely to increase security of jobs in the electric vehicle industry. The automotive sector already accounts for 12% of the UK's manufacturing employment; low and ultra-low emission vehicles offer the potential to secure these jobs and build upon them ('Making the Connection - the Plug-In Vehicle Infrastructure Strategy', Office for Low Emission Vehicles, June 2011).

To achieve these aims, there are various contractual and working arrangements that will be trialled within the project. These frameworks will be made available to all DNOs and third parties so that this work does not have to be repeated. Thus, although over £200,000 has been allocated between SSEPD and EA Technology to develop the contracts and define scopes of work, much of the output can be used on other LCNF projects. Savings on future project will depend on their nature. However, if a modest £50,000 is saved on each future project, only four additional projects are required for there to be a cost saving.

From a technical point of view the technology will help mitigate the impact of low carbon technologies. Projections for the uptake levels of low carbon technologies (LCTs) across Great Britain have been determined as part of wide-ranging work within Government to provide forecast scenarios to meet the Carbon Plan. These scenarios, developed primarily by DECC, but with input from DfT regarding EVs, highlight the need for large-scale uptake of EVs, heat pumps and photovoltaic generation if the UK is to meet its carbon reduction targets without the need to purchase carbon credits. Detail on these scenarios has been published by Work Stream 1 of the Smart Grids Forum. With respect to EVs in particular, the "mid" scenario forecasts in excess of 6m EVs in Britain by 2030, with over 23m EVs by 2050.

3: Project Business Case contd.

Each of the LCTs described here poses a certain challenge for electricity distribution networks, which will need to be met in order to ensure that customers continue to enjoy a robust electricity supply. In the case of EVs, the challenges that will be faced include a potential exacerbation of peak demand if drivers plug in their vehicle upon returning home from work (therefore coinciding with the tradition network peak between 5 and 7pm). However, this is not the only issue, as simultaneous charging of multiple EVs along one LV feeder will also cause the voltage along that feeder to be depressed, potentially taking it outside statutory limits. The challenges associated with heat pumps are similar, as they are expected to form a significant drain on the thermal headroom of circuits, while similarly depressing voltage, particularly when starting on cold days (when load on the network is already likely to be at a high level).

While the uptake levels of EVs, heat pumps and other LCTs are heavily influenced by both market forces and by governmental policy (for example, the Feed-in Tariff mechanism leading to the significant increase in PV installations); the decarbonisation of transport (and heat) is recognised as being key to the UK achieving its carbon targets. Thus, even if the projections given here do not turn out to be absolutely reflective of the way in which LCTs appear, there will be a need for all network operators to consider the effects that these LCTs will have on their local distribution networks.

Work carried out under Work Stream 1 of the Smart Grids Forum predicts that if fast charging is possible that by 2023 (only 10 years after the start of the project) there could be between 1 and 3 million EVs on the road. Charging is a key factor in take up and allowing charging drawing up to 7-8kW at home will encourage low carbon vehicles. Given that the present after diversity maximum demand of a property is of the order of 1 - 2kW, the impact on the local electricity distribution infrastructure will be enormous; particularly given the possibility outlined above regarding customers charging at certain times of day that will lead to considerable increases in the peak demand level observed on the network. See page 28 for GB uptake scenarios for different forms of low carbon technology (Source: DECC, WS1).

For the calculations in this bid we have used 3kW per charger to represent an average slower charge possible today. It should be noted that this estimate may turn out to be on the conservative side, given that second generation EVs will have larger batteries and higher charging rates (with the same charger). This means that they will either need to draw more power to charge over the same period, or will need to charge at the 3kW for a longer period. This makes some demand side response solutions (e.g. Time of Use tariffs) less attractive, as the amount of demand that would need to be shifted to another time of day would be considerably larger (in terms of kWh). A means by which a DNO can have a direct control over EV charging loads to avoid reinforcement would remove potential barriers to chargers being installed. It should be noted that it is only under heavy loading, that charging may need to be curtailed, possibly only a few times a year that the customer may not notice at all. As well as reduced costs, the customer avoids the disruption of re-laying cables in return for a very small restriction on charging.

Alongside the technology itself, DNOs will gain greater understanding of:

- The habits of customers and their use of low carbon technologies and the impact on the network.
- Customers' acceptance of direct demand control by the DNO.

The additional data will help validate Smart Grids Forum network models.

The benefits of deploying the Technology are significant in terms of avoiding reinforcement. It is estimated that the savings of using the Technology rather than reinforcement will be £740 million across Great Britain or £53 million per licence area by 2040. The details of the assumption and estimation of the number of feeders where the Technology may be used are given in section 4. Whilst some the projections given above are extrapolations to 2040, the preparation to accommodate new LCTs will occur in the next 5 to 10 years. Clusters of EVs are likely to occur, particularly in urban environments or areas where they are being manufactured or promoted.

Thus DNOs will be taking action and using techniques such as the Technology in the near future. These solutions will then be rolled out as clusters appear elsewhere. Whilst SSEPD has expressed particular interest in the Technology and has sponsored the project, the Technology will be applicable to all DNOs. This is demonstrated by the fact the trials are expected to be on other networks as well as SSEPD's.

3: Project Business Case contd.

3.3 Carbon saving

Carbon savings from using the technology will be due to the facilitation of the uptake of EVs by allowing easy access to fast charging that is noted as a key to adoption of EVs in the UK's Carbon Plan. If facilitating fast charging helped move adoption from the medium to high scenario, 4 million additional cars would be on the road by 2030, about 2 million more in 2025 and 500,000 in 2020. The details of the estimate of the carbon savings attributable to the Technology is given in section 4 but estimated to be 33.5 million tonnes by 2030. Further savings may be possible due to facilitation of the connection of other LCTs such as heat pumps. Whilst the uptake of EVs and associated environmental benefits is not the prime driver for the project, the awareness raising and opportunity to try driving an EV should encourage the adoption of EVs. There is therefore an additional indirect benefit from the project.

3.4 Time savings and avoiding disruption

A key advantage of the Technology is that it can be deployed quickly; even as a stop gap and with minimal disruption. The Technology is expected to be very fast to install; a matter of a few hours to a day of time compared with months of planning and installation time for re-laying feeders. This will speed up the connection of LCTs and avoid disruption and inconvenience of installation to customers.

Leverage

The indirect benefits to the EV industry has meant that the project has attracted a number of in kind contributions. There is significant leverage from the LCNF demonstrating value for money to the customers.

3.5 Alternatives

Given that the options of continuing in a "business-as-usual" manner, adopting solutions such as laying additional cable to split existing feeders and hence reduce the load on each feeder has been demonstrated above as being very costly. This is both in terms of the amount of investment required from network operators, and also in terms of the societal cost in the level of disruption caused through excavating and laying thousands of km of LV cable, this is not regarded as a viable alternative.

DNO-supplier-customer demand management

Some form of "smart" solution is therefore required to facilitate the connection of EVs (and heat pumps) in the future. The most apparent alternative would be to make use of variable tariffs, instigated by suppliers that would incentivise customers to charge their vehicles at particular times of day. There are several potential drawbacks to this. Firstly, such a solution would depend upon a great deal of unknown quantities; not least of which would be the appetite of suppliers to offer such tariffs, and the appetite of the customer to accept them. There is also the issue of cost: how much would a supplier be willing to offer a customer to move demand from one time of day to another, and what is the minimum level of payment that a customer would be willing to accept? Analysis carried out using the Smart Grids Forum Work Stream 3 modelling work has shown that suppliers may look to shift demand fairly significantly at a cost of around 2p/kWh. However, it is unlikely a customer would accept such a low amount. A figure that seemed "reasonable" for customers to accept would be of the order of 20p/kWh, given that this is reflective of the sort of cost differential that exists between peak and off-peak tariffs at present. However, at this level of payment, the analysis showed that it was not cost-effective for suppliers to shift demand.

Another consideration is that suppliers' focus is broad, generally on a national level; while the needs of a DNO are inherently more local. The likelihood of being able to align these two drivers may well be low. Furthermore, the number of connections where Demand Side Management could be used to reduce load and relieve an LV cable is typically under 100 per feeder. The probability of sufficient voluntary load reduction via engaged customers through the use of tariffs on one feeder without automation is low.

There is also the issue that DNOs would look for a solution in which they could place a good deal of confidence and which could be applied uniformly across their network. Customers along any given feeder may have different energy suppliers and different tariff structures; and hence may respond to pricing signals differently. The Technology would ensure that the same solution could be applied across a range of networks (both in terms of feeder types and locations) and would not be contingent upon any third party being involved in the solution (unlike supplier-led Demand Side Response measures).

3: Project Business Case contd.

3.6 Conclusion

The business case is therefore in four parts. Firstly, it has the potential to reduce capital investment requirements for network operators consistent with the objectives of RIIO ED1 that will also be beneficial to customers. Secondly it facilitates the adoption of LCTs to reduce carbon emissions by reducing the cost, inconvenience and time of connection. Thirdly, it provides the data and technology to maximise the use of network capacity and fourthly provides a framework for a DNO to work with third parties who are leading network projects.

SSEPD commented that:

It is clear that the solutions that we are implementing in the I^2EV project do carry some uncertainty, in particular in relation to their ability to perform as planned, level of customer uptake and response and the sustainability of the technology. However, we consider waiting until the network is on the brink of overload would be an even higher risk and is not a realistic option.

Therefore, we have to look for solutions now and believe that the installation of the I^2EV technology will help avoid EVs causing excessive stress on electrical networks that would necessitate the replacement of a significant proportion of our low voltage network. We estimate that the replacement value of the SSEPD's assets across the two licences would be circa £3 billion.

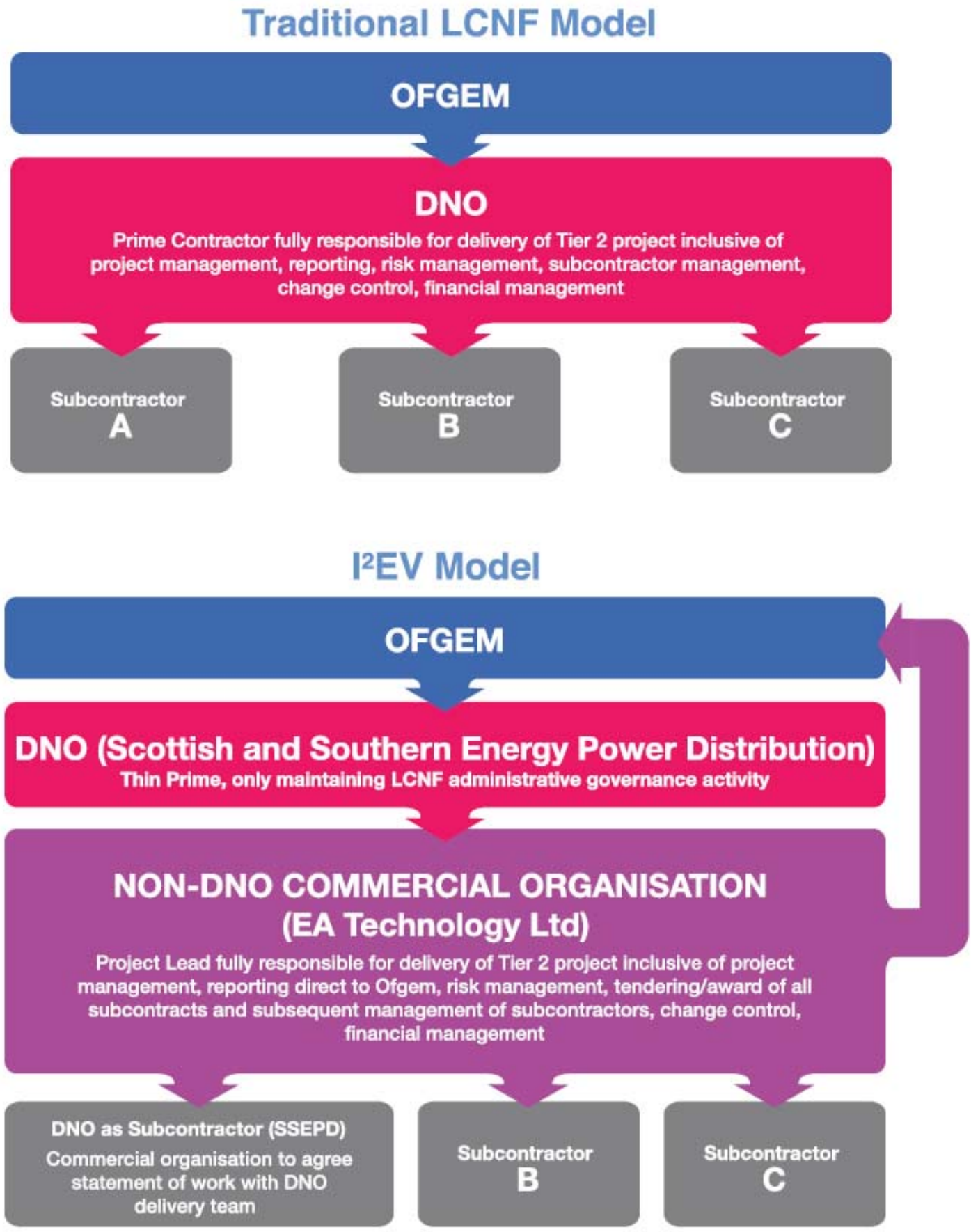
In addition, the disruption to public highways would be a significant consideration and would require the programme to be phased over tens of years, resulting in unacceptable delays to the connection of low carbon solutions. This is not compatible with our aim of providing the energy people need in a sustainable way and therefore is not an option.

In our opinion we need to do something new, now, and believe that the I^2EV technology will be a valuable tool for the DNOs to use in the future to manage their networks.

Project Code/Version No SSET205

3: Project Business Case contd.

3: Project Business Case images, charts and tables.



Project Business Case images

Section 4: Evaluation Criteria

4.1 Accelerates the development of a low carbon energy sector and has the potential to deliver net benefits to future and/or existing customers

The I²EV project facilitates the expedient connection of EV chargers to the DNO LV network as it avoids the possibility of the DNO becoming a barrier to multiple EV connections along a particular LV feeder. This could occur when multiple EVs wish to connect to a portion of network, but the local feeder may not be sufficiently rated to accommodate this load. In order to avoid overstressing the feeder and interrupting supplies to all customers fed via this circuit, the DNO would need to engage in reinforcement work, i.e. installing cables or overhead lines with higher rating. This would be time-consuming and result in the DNO forming a barrier to connection of a multiple EVs. However, spare capacity does exist in these feeders, but it is time dependent, i.e. there may not be any spare capacity (or "headroom") at times of peak demand; if some demand could be moved to other times of the day then this latent capacity could be utilised. Such profile changing may become possible through smart metering, but this is unlikely to be in effect until 2019, and will not be in widespread use before RIIO-ED2 in 2023. In the meantime, clustering of EVs is likely to occur in certain network areas, and not always as a result of an obvious reason (e.g. geography), but could be "irrational" (e.g. neighbours wishing to "keep up with the Jones'" by purchasing an EV). It is this sporadic clustering that may result in the biggest problems for DNOs. Even with smart metering it is unlikely that DNOs will have the confidence to rely on load shifting without direct control and will prefer a system over which they have control such as the Technology. The benefit will accrue to all customers in reduced reinforcement costs, costs, cleaner air and reduced carbon emissions.

Solution 1 - commercial

Carbon Plan: Low carbon transport is a priority under s.1.12 of the Carbon Plan. Section 2.79 and 2.86 illustrate the expected uptake of EV and plug in hybrids expected to fulfil the goal of decarbonising the transport system. The solution contributes to the Carbon Plan by allowing the expedient connection of EVs through an in depth understanding of how and where intelligent charging units could be used, thereby allowing the rapid deployment of techniques to manage the anticipated increase in penetration of low carbon technologies such as EVs. Deploying a third party who wishes to develop a technology help accelerate the deployment and facilitate the Carbon Plan.

Financial Benefits: The project will demonstrate the extent to which third party delivery of innovation projects could be more efficient than the projects being merely led by the host DNO. The savings will be via:

Using the expertise in third party project management to tightly mange time and budget -
Experience to date shows that DNOs are expert in project managing the maintenance and installation of assets but do not have a large pool of expertise in development of new technologies.
- Rather than seek to recruit new staff for this role, the project seeks to demonstrate that third party management is more effective, as knowledge and expertise can be drawn in as required.
- Enabling faster deployment using a third party rather than a DNO whose timescales for assets 40 years.
- Developing a solution that can be used outside the UK thus benefiting the UK export economy.

Solution 2 - technical

Carbon Plan: The Technology that forms the basis of the solution to the problem of increased stresses on the network - overload due to market growth of EVs, wholly aligns with the UK Government's Carbon Plan. Under s.1.12 in the Carbon Plan's 'Vision for 2050', low carbon transport, and in particular, EVs, are cited as being at the heart of the step change needed to reduce emissions. The UK is tasked to reduce emissions from transport around 17 $MtCO_2$ by 2020 ($325MtCO_2$) from 2010 ($342MtCO_2$) figures. The Carbon Plan also recognises that the grid will be faced with increased demands. The Technology solution under the I²EV project addresses the inevitable additional stress on the network from EVs. The Technology facilitates the connection of EVs without the need for excessive network reinforcement, thereby minimising costs. The project will also provide information on driving habits and customer response to LCTs that will help to promote them and achieve the Carbon Plan targets.

Alignment with other strategies: In addition to demonstrating alignment with the Carbon Plan, I²EV directly supports the Office for Low Emission Vehicles' (OLEV) 'Making the Connection - the Plug-In Vehicle Infrastructure Strategy' (June 2011). Ofgem's Low Carbon Networks Fund is cited in the executive summary (page 7) as being a conduit to support recharging at home through support of smart grid projects linked to Plugged-In Places (PIP) projects in London and the North East; Charge Your Car is the PIP programme for the North East and is a confirmed partner to I²EV (see letter of support in Appendix L).

4: Evaluation Criteria contd.

The clustering effect of low carbon technologies is recognised in OLEV's Strategy in relation to electric vehicles and that 'recharging in particular locations could lead to the need for local reinforcement' (page 33 of OLEV's strategy). This fully aligns with the I²EV trial programme and the need to engage with clusters to effectively demonstrate the Technology as a solution to the future problem of network overload on local distribution networks. The I²EV project has been presented to OLEV and and will benefit from their support in terms of strategic direction, identifying clusters and access to other synergistic data and projects - see Appendix L for letter.

4.1 Calculation of Net Benefits

Commercial solution

Cost Savings: The base case is that the project is led and coordinated by the DNO. This is estimated to require 2 full time staff (or equivalent) over 5 years at a total cost of £1 million. In contrast the commercial solution will cost £808,656 in developing a contractual framework and for the project management services of a third party. This delivers a net benefit of £191,344. For future projects it is assumed that having established the contractual framework, there will only be a cost equivalent of 25% of that allowed for developing the framework in this project. It is envisaged that in RIIO-ED1 period under Network Innovation Competition (NIC) that the number of projects adopting this framework will in crease rapidly. For RIIO-ED2 and beyond a modest number of projects are expected given the uncertainty around funding mechanisms. In total by 2040 there will be 40 projects using this commercial innovation delivering a net benefit of £13.99 million.

Time Savings: The key benefit to the commercial innovation is anticipated to be the accelerated deployment of a particular solution. For this project we envisage that the time to deployment will be 3 years (third party led) rather than 5 years (DNO led).

Headroom: No additional headroom is achieved, although the headroom gains associated with the technical solution could be achieved more quickly.

Rollout: It is envisaged that this commercial innovation could be applied to any large scale (LCNF or Network Innovation Competition) project anywhere in the country.

Technical Solution

Cost Savings: The only conventional alternative to the Technology is reinforcement of the LV network. For each of the trial sites, it is assumed that 300m of cable would have to be laid. The average costs to lay LV cable as agreed under DPCR 5 is £98.4/m. The cost for 10 feeders is therefore £295,200 (the base case). In contrast, the target costs for the substation installation for the Technology is £2,000 for the equipment and one day's work for two people to install it. This assumes that the cost will fall with bulk manufacturing. If staff cost £500 a day, this is £3,000 per substation. Note that this is a lower figure than that quoted by the Smart Grids Forum (SGF) Work Stream 3 (WS3) analysis as this included the cost of any installation at the customers' premises. It is known that for the proposed technology, the cost of the intelligent socket (the Technology) would be borne by the customer and should not increase the cost of the charging point noticeably. Therefore the cost to the DNO is lower than that quoted in the SGF WS3 documentation. The logic within the Technology should be maintenance free. The comparison gives a saving of £265,200 in I²EV project terms (i.e. across 10 substations with one feeder controlled at each). Scaling this up to a GB-wide scenario by the forecast number of substations where this will be deployed (source SGF WS3) in 2040 gives 27,920 installations. This would see cost savings across Britain of over £740 million by 2040 assuming an average benefit of £26,520 per site from the above net benefits calculations. One Technology installation in a substation could serve all the feeders and therefore comparing the cost with relaying one feeder length of cable is a pessimistic comparison of the savings that the Technology could offer.

Installation time savings: It is estimated that once planning has been carried out and permissions obtained, four months is the shortest time elapsed to relay a cable. In contrast, if the Technology is in stock, it could be installed in three weeks' time elapsed for time to book the necessary staff time and record the installation. If EV installations are already present, a monitor controller may already be available. Therefore the Technology could be implemented in 25% of the time required to relay cables across Great Britain. Installation time will be useful learning from the project.

4: Evaluation Criteria contd.

Headroom: The average load in a home during the night is less than 20% of peak loading and around 50-60% during the day. It is therefore estimated that by shifting EV charging, twice as many charging points could connect. That is, if 10 charging points can connect and charge during the peak, there should be headroom for 20 during the other 18 hours of the day. If on one feeder, on average 20 EV chargers can be installed rather than 10 without reinforcement using the Technology, this will provide about 30kW of additional headroom (assuming 3kW per charger). Extrapolated across the country, if used on 130,000 feeders envisaged under Smart Grids Forum Work Stream 3 work and freeing the same headroom, this would provide 390 MW of headroom overall.

Uptake: The rapid uptake of EVs is expected over the next 15-20 years. This timescale is longer than the likely roll out period for the technology. If the study in Work Stream 3 is correct, it is applicable to more than a third of all LV radial feeders supplying suburban streets, 32% of LV radial feeders in villages and 18% of LV radial feeders on terraced streets and in town centres. Note that many of the other feeders would not experience problems due to EV charging and therefore the applicability it is very widespread.

4.2 Provides value for money to distribution customers

As per the calculation of net benefits above, were the DNO to have to manage costly reinforcement measures to address the overload on local distribution networks due to the uptake of EVs and other low carbon technologies; this would have a severe impact on customers' electricity bills. The Technology will provide a solution to manage and alleviate this overload, thus having a positive effect on customers' bills as the costs of reinforcement are mitigated and the alternative saves 10% when rolled out across the UK. Further benefits to the distribution system are via the development of new commercial frameworks for rapid cost effective deployment of new technology.

Added to this there are the socio-economic benefits of facilitating EVs and avoiding the disruption of relaying cables. Throughout the document, the indirect benefits have been highlighted. Benefits associated with other factors other than the distribution system are:

- Encouraging uptake of EVs
- Supporting SMEs and other industry thus safeguarding jobs
- Reducing carbon emissions from transport
- A product suitable for export
- Raising awareness of energy

Competitive Tenders: Within the project, competitive tendering processes are being used to recruit organisations to provide 1. the socio-economic modelling, 2. technical modelling and 3. overall project evaluation. There was a robust assessment process including evaluation of value for money as well as experience and expertise.
Whilst Nissan and Fleetdrive Electric have been actively supporting the project and assisted during the development of this submission, and have signed up as project partners, other EV manufacturers and fleet hire companies may be engaged with through other project partners such as Charge Your Car North to the benefit of the project and its deliverables.

4.3 Generates knowledge that can be shared amongst DNOs

Two distinct elements of the project generate knowledge which can usefully be shared amongst all the DNOs to the benefit of the industry as a whole:

1. Commercial innovation

Successful partnership between SSEPD and a non-DNO third party creates an opportunity to generate a framework for contractual relationships of this nature. Deployment of this framework will facilitate future partnership-working between DNOs and non-DNO third parties by streamlining the process. That is, by providing a format and check list to organise the work, such as identifying in advance the key success criteria; potential risks and mitigating actions; essential processes and protocols; cultural issues, knowledge and skills gaps to be addressed. This framework will ensure that the advantages of third party commercial flexibility, delivery in tight timescales and innovation can be effectively married with the DNO experience and stability of supply. Sponsorship from a DNO helps ensure that the technology is practical and will be used as 'business as usual'.

4: Evaluation Criteria contd.

Utilising the additional capacity and capitalising on potential increased flexibility offered by partnerships with third parties will increase the scope for accessing the LCN Funding and enable more or larger scale energy-related projects to be delivered within the remaining timeframe of the LCN Fund. This can be continued for gas and electricity-related projects within the remit of the future Network Innovation Competition from 2015 onwards. This will allow commercial flexibility and innovation to be applied without risk to energy supply, while meeting LCN Fund requirements.

2. Technical innovation

Trialling the technology over a statistically significant number of participants and period will provide learning that will benefit all DNOs and related industry practitioners. This knowledge will include but is not limited to:

- Customer behaviours and attitudes i.e. current driving habits and how EV usage may change these, the extent to which customers are/are not willing to make lifestyle adjustments
- Charging habits and the impact on the network with greater EV usage;
- The impact that usage of the Technology will have in reducing the load on the network
- How much available network headroom through use of the Technology
- Cost savings to DNOs as a result of the Technology negating the requirement for network upgrades and the collateral impact on energy service companies and retail companies
- Time and materials required for installation

Learning from this project will also be relevant to and disseminated amongst other stakeholders including current and future EV manufacturers, EV charger manufacturers, local authorities and government policy makers, as well as the general car buying and car using public

4.4 Involvement of other partners and external funding

EA Technology has worked with SSE to pool experience and contacts to attract the right partners for the project. The potential project has been discussed with delegates at EV conferences and seminars.

- Contacts in the EV industry have been established through SSEPD's other LCNF projects (e.g. Charge Your Car who manages the EV trial for the CLNR project).
- A communications director with a track record in promoting LCT and particularly low carbon vehicles has been recruited.
- Identifying possible locations for the first clusters via various routes and contacting the relevant DNOs (letter of support from Northern Powergrid in Appendix L).
- Circulating invitations to tender to universities and other candidate organisations.
- Discussing the projects with relevant government agencies e.g. DECC, BIS and DfT through the Office for Low Emission Vehicles (OLEV) (letter of support in Appendix L).

Through this process, ideas for finding clusters, deploying EVs at a low cost, analysing the technical results and engaging with customers have been received. These have been distilled into the project by considering:

- How they may help attract customer participation and make the project practical
- How they may reduce the risks to the project
- How they may enhance the rigour of the analysis and results
- How they enhance the learning and value of the project

It is important to note, that given a non-DNO organisation who is developing technology is delivering the project, the independent analysis from third parties is vital to ensure the results are independent and rigorous.

4: Evaluation Criteria contd.

Partners

SSEPD is the project sponsor with EA Technology consulting delivering the project. Through the following partners and support have been recruited:

Nissan: EV manufacturer and charging point manufacturer - will provide in kind support via a subsidised rental programme to trial participants, use of Nissan's EV ambassadors to engage trial participants, and will facilitate provision of free chargers to customers for the trials through the Plugged in Places programme and Chargemaster, in eligible areas (London East of England and Milton Keynes). Subsidised chargers and installation will be provided in the North East through Charge Your Car. Access to and use of Nissan's Zero Emissions Centre of Excellence will be made available to the project.
In kind value: £1,970,000

Charge Your Car North Ltd - EV infrastructure - will support in identifying clusters, use their EV infrastructure and media contacts in the North East as a means of engaging clusters, will deploy their EV sector and EV infrastructure knowledge and expertise on the project.
In kind value: £30,000

Northern Powergrid: DNO - support EV trials through the CLNR project - Northern Powergrid will supply access to substations and demographic information to support identification of trials participants / clusters.

Fleetdrive Electric: EV lease hire company - will supply EVs at subsidised lease hire rates to the project and will give use of their extensive database of EV drivers top the project to support in identifying clusters.
In kind value: £97,000

Automotive Comms: Low carbon vehicle sector communications expert - customer engagement and communications director.

Academic partner De Monfort University: socio-economic modelling, tender award subject to LCNF project approval.

Academic partner: independent network modelling and technical evaluation -tender to be awarded.

Academic partner: independent project evaluation - tender to be awarded.

Blah d Blah Ltd: (EA Technology's creative communications agency) Project Dissemination, quotation received.

EA Technology: programme manager and technology developer - EA Technology will contribute circa £636,000 in development, administration and communication costs.

4: Evaluation Criteria contd.

4.5 Relevance and timing

The Department of Energy and Climate Change provides predictions of the growth of EV ownership across the UK to 2030 (page 22 in the Smart Grid Forum's Work Stream 3 report to the Electricity Networks Association). It shows that if fast charging is possible, that by 2023 (only 10 years after the start of the project) there could be between 1 and 3 million EVs on the road. Charging is a key factor in take up; allowing charging drawing up to 7-8kW at home will encourage low carbon vehicles. The Technology facilitates the installation of such chargers in a cost effective manner.

The UK Government's Carbon Plan shows the forecast reductions in transport emissions to 2027, and expects 40% of vehicles sold by 2030 to be battery, battery with a range extender, or plug-in hybrid. Such an increase in EVs will require cost effective measures such as the Technology to manage the increased demand on the local distribution networks.

The development of EV charging infrastructure is nascent in GB, however the national roll-out of a UK-wide EV infrastructure programme has recently been announced through Elektromotive Limited, Europe's leading provider of electric vehicle (EV) charge points, and Charge Your Car. The aim is to create the UK's largest pay-as-you-go, `open source' network of public access charging stations for EVs, based upon the development of its proven pay-by-phone technology. The goal is to create a recharging network with 10,000 public access pay-as-you-go charge points located across the UK. This will encourage the purchase of EVs and the demand for home charging.

The project has confirmed engagement with Nissan, who aims to put the UK on the low vehicle emissions map. This is a critical partnership that will enable the project to supply EVs to trial participants. Nissan's support for the I^2EV in itself demonstrates that this is a timely and relevant project to benefit customers and to future proof the distribution network against prohibitively costly reinforcement measures.

Partner confidential information removed.

Nissan's forecasts provide supporting evidence on the rate of EV sector growth over the coming decade, and illustrate why delivering the I^2EV project over the period 2013 - 2015 is key in future proofing the GB distribution network by potentially offering a lower cost (to traditional reinforcement methods) of managing the network to deal with increased load due to increased numbers of EVs.

The graphs on page 28 illustrate the GB uptake scenarios for EVs, as forecast by the Department of Energy and Climate Change (DECC); around 1.7 million EVs are expected to be on UK roads by 2020, with over 10 million by 2030. The Nissan forecast figures corroborate this uptake scenario, as illustrated in the 'Nissan predictions for GB EVs - total and market share' graph on page 28.

See also Appendix K for Nissan EV sector growth forecast figures, compared with GB EV sector growth uptake projections.

4: Evaluation Criteria contd.

The interest from cluster groups from initial contacts show that there is an appetite for EVs from the public that the Technology will help to nurture. Hyde District Climate Change Forum has provided a letter of support, as has a cohousing development in Leeds.

All project partners are engaged and are in a position to commence work on the project in January 2013 pending project approval.

It is thought that if the Technology performs successfully, that it should be incorporated into business as usual working practices without significant training. Within SSE or other DNOs planning guidance would need to include use of the Technology either as standard when EV charging points are installed or as a solution to potential overloads. However, to ensure widespread roll out is possible, either receivers must be installed in homes or incorporated in to chargers. This may require changes to Engineering Recommendations (ERs) or similar. This project will provide the information and data for changes in ERs as well as internal working practices.

The regulation of the distribution network operators is in the process of being revised (RIIO-ED1) and this project demonstrates new ways of working and the involvement of third parties that could be incorporated.

Project Code/Version No SSET205

4: Evaluation Criteria contd.

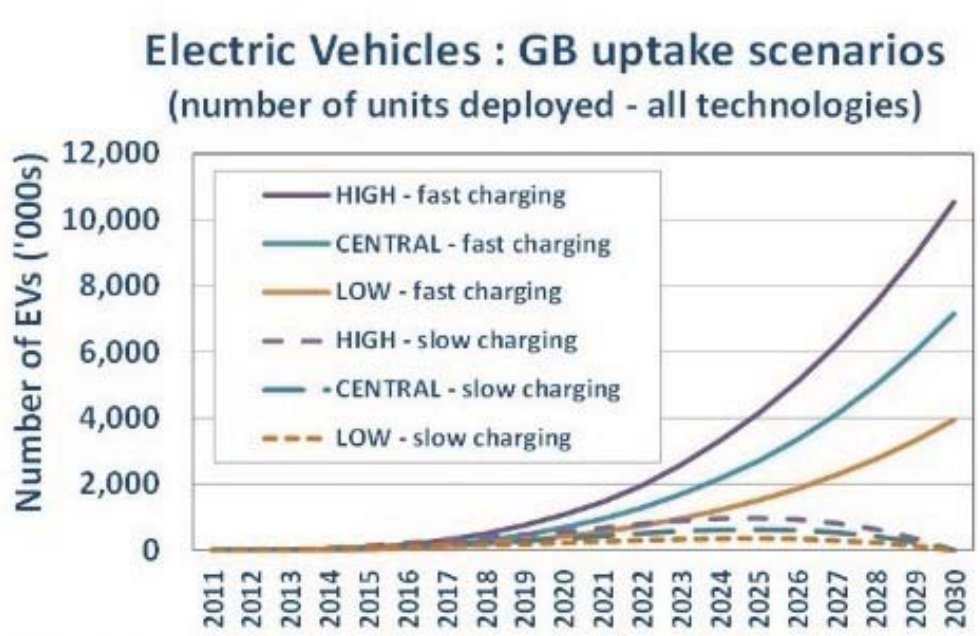
Project Code/Version No SSET205

4: Evaluation Criteria contd.

Project Code/Version No SSET205

4: Evaluation Criteria contd.

4: Evaluation Criteria images, charts and tables.



GB uptake scenarios for different forms of carbon technology (Source DECC, WS 1)

Evaluation Criteria Images

Section 5: Knowledge dissemination

☐ Put a cross in the box if the DNO does not intend to conform to the default IPR requirements

5.1 Learning dissemination

The I²EV project is unique in that although it has a transport focus, it deals with one particular customer behaviour; the learning has a wide impact and is of interest to a wide general audience including all vehicle owners and users, as well as DNOs. The learning dissemination will differentiate the project from other LCN Fund projects, as the learning will be actively disseminated not only to the DNOs and related interested parties, but to the general public as well. This dissemination will take place through a variety of media, as detailed in the communications plan to be developed under the project. The depth of communication will be phased across the lifetime of the project. There will be significant communication across a wide range of media at the outset of the project to raise general awareness across a wide spectrum of stakeholders and to facilitate the recruitment of trial participants. As the project progresses, steady but lower weight communication will continue to maintain interest and communicate progress. Communication will be accelerated to Government at the end of the project, notionally through a Parliamentary exhibition and reception, to disseminate the learning outcomes across all relevant stakeholders. A customer engagement plan will be drawn up at the start of Task 2; the knowledge dissemination plan that will form the core of the customer engagement plan is outlined on page 32. The customer engagement plan will be agreed with Ofgem. Its purpose will be to inform and enthuse people about the trials and ultimately engage them as trial participants. These participants will fall into separate user groups to allow us to study two distinct facets of the trials:

Social trials: Socio-economic impact of EV usage and deployment of the Technology. This category of individual users can be more geographically widespread, and therefore customer engagement activities will focus on communicating with fleet EV users within large commercial organisations.

Technical trials (the Technology): This will require clusters of residents whose households can be served by a single feeder. Customer engagement activities will therefore focus on approaching domestic users within specific geographic catchment areas.

Each user group will be communicated with using a variety of media deemed to be the most appropriate to reach and engage them. This is likely to include inter alia the use of social media, national and local press and radio, targeted mailshots and doordrops. This communication campaign will be overseen and directed by a dedicated specialist communications team member to ensure maximum effectiveness. The customer engagement plan will be supported by a robust data protection strategy (see outline in Appendix M), that will ensure that customers' privacy is protected at all times.

General information

It is important that, in addition to disseminating the specific learning outcomes, general information about the project is shared with as wide a range as possible of stakeholders throughout the course of the project. This will use a variety of communications techniques to make the information accessible for each respective audience throughout the course of the project. These techniques will aim to be appropriate for multiple audiences so that communication is as effective and cost-efficient as possible and will include but not limited to:

- a dedicated I²EV website which will act as a shop window for the trials with separate public and private sections intended for general and specialist audiences
- social media channels sharing the latest news and allowing direct two-way communication with trial participants
- national and local media coverage including press and radio
- printed and electronic documents including papers, newsletters and leaflets conveying information appropriate for either general or specialist audiences

5: Knowledge dissemination contd.

Particular Knowledge dissemination

The project will also generate three particular areas of knowledge which can be shared to benefit a range of stakeholders. It is intended to communicate these particular areas of knowledge as follows:

(1) Commercial innovation

Information: This successful partnership between SSE and non-DNO third party creates the opportunity to generate a standard framework for contractual working arrangements between a DNO and non-DNO third party deliverer including elements such as key success criteria, examples of best practice, requirements (legal, operational, knowledge) for each party, appropriate timeframes, etc. Utilising partnership-working rather than a DNO-led approach can be applied across other energy-related projects under the remit of the LCN Fund and the future Network Innovation Fund format.

It has the benefit of tapping into It has the benefit of tapping into the additional capacity, commercial flexibility and external innovation of a third party organisation while still meeting the LCN Fund requirements of DNO involvement.

Audience: The findings and potential blueprint framework for a successful contractual working arrangement will be shared with Ofgem, other DNOs, as well as any other third party organisations likely to be able to lead-manage a similar energy-related project.

Formats: As well as publicising the outcomes through a variety of relevant communications channels including the national and trade press, we propose to make available skeleton contractual documents on the dedicated I^2EV project website and publish a full written report on the learning outcomes to be shared with the relevant stakeholders. We also propose to hold a specific session sharing the learning within LCNF workshops and to offer both on- and off-line training sessions on successful partnership working.

(2) Technical innovation

Information: Trialling the Technology over a statistically significant number of participants and period will provide learning that will benefit all DNOs and related industry practitioners. This knowledge will include but not be limited to:

- The impact of the Technology on the impact on the network, how much the load can be shifted, what cost savings may be made, how much additional capacity is created when and where
- The success of the use of the power line carrier
- What issues for the control of EV charging may arise from the customer, manufacturer and network perspective
- The outcome of the project validation

Audience: This learning will be of interest to Ofgem and will benefit all DNOs and related industry practitioners such as manufacturers of EVs and EV chargers, as well as other stakeholders including local authorities and government policy makers, interest groups and housing developers. The outcomes will therefore be shared using a range of communication techniques that are appropriate for the specific audience.

Formats: We will publish the high-level outcomes on the dedicated I^2EV project website, and share specific highlights on social media channels, as well as utilising the national trade press to communicate with the relevant stakeholders as widely as possible. We propose to publish a formal written report of the learning outcomes and will share the results with other industry practitioners by holding a specific session within the LCNF workshops and across other industry events and seminars to reach a wider audience. The range of communications activities proposed is illustrated on page 32.

(3) Socio-economic learning

Information: The socio-economic implications of these trials represent the third area of original knowledge that this project will generate. While there may be other, hitherto unforeseen areas of learning about customer behaviour that may arise, we anticipate learning much more about customer EV driving habits and how these may change over the duration of the trials, the trial participants' degree of openness to change, and how they respond to the Technology itself.

5: Knowledge dissemination contd.

(2) Technical innovation

Information: Trialling the Technology over a statistically significant number of participants and period will provide learning that will benefit all DNOs and related industry practitioners. This knowledge will include but not be limited to:

- The impact of the Technology on the impact on the network, how much the load can be shifted, what cost savings may be made, how much additional capacity is created when and where
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- What issues for the control of EV charging may arise from the customer, manufacturer and network perspective
- The outcome of the project validation

Audience: This learning will be of interest to Ofgem and will benefit all DNOs and related industry practitioners such as manufacturers of EVs and EV chargers, as well as other stakeholders including local authorities and government policy makers, interest groups and housing developers. The outcomes will therefore be shared using a range of communication techniques appropriate to the specific audience.

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Audience: We anticipate this area of new knowledge being relevant to a particularly wide range of stakeholders including amongst others Ofgem, the DNOs, other energy industry practitioners, manufacturers of both EVs and standard cars, manufacturers of EV chargers, national government policy makers and local government authorities, special interest and trade groups, academia and the general public.

Formats: Given the wide range of stakeholders for communication, a variety of media will be used to ensure the relevant information is disseminated effectively. As well as wide-ranging media coverage on a national and trade basis, we will, amongst other communications activities, include the high-level outcomes on the dedicated I²EV website, feature the highlights on social media channels, publish a full written report on the learning outcomes and hold a session within LCNF workshops for industry stakeholders and other workshops where appropriate to reach a wider audience.

This multi-layered, multi-media approach will be the most efficient and cost-effective method of disseminating information to the various interested parties in the most accessible way for each of them. These multiple contact points will reinforce the learning outcomes rather than relying one single source to reach each stakeholder and will allow us to engage with each stakeholders at an expert or general level as appropriate them. It also provides the opportunity to inform policy and decision-makers in relevant areas of national and local government, manufacturing, energy transmission, distribution and retail, to the benefit of all in developing new low carbon technologies.

5.2 IPR

The IP will be managed in accordance with the default IPR requirements. The Foreground IP associated with demonstrating the performance, capability and deployment options of the Technology on live LV networks from I²EV will be actively shared to the DNO community.

The Technology is the Background IP of EA Technology Limited having been devised, designed, patented and developed without external funding.

5: Knowledge dissemination images, charts and tables.

I²EV Knowledge Dissemination Plan

Technical Innovation - Part 1

	Energy Industry						Car Industry					
	Ofgem	Project Partners	DNOs	TNOs?	PNOs?	Energy Service Companies	Business Fleet Managers	Business Fleet Suppliers	EV Mfrs	General Car Mfrs	EV Charger Mfrs	Mobility / Handicapped vehicle Manufacturers?
I2EV Website	*	*	*	*	*	*	*	*	*	*	*	*
LinkedIn, Twitter, Facebook	*	*	*	*	*	*	*	*	*	*	*	*
Evening drive sessions (customer engagement - Nissan EV ambassador support)							*	*				
Podcasts on specific issues (technical audience)	*	*	*	*	*	*			*	*	*	*
Podcasts on specific issues (laymans audience)	*						*	*				
Links to other websites	*	*	*	*	*	*	*	*	*	*	*	*
Industry Conferences	*	*	*	*		*			*	*	*	
PR events eg EV races, car show, Ideal Home Show, Parliament events	*	*	*	*	*	*	*	*	*	*	*	*
Partner events	*	*	*									
Ofgem reports	*											
Press releases	*	*	*	*	*	*	*	*	*	*	*	*
News bulletins	*	*	*	*	*	*	*	*	*	*	*	*
Interim reports	*	*	*	*	*	*			*			
Newsletters		*	*	*	*	*	*	*	*	*	*	*
VIP Visits to trial locations	*	*	*			*			*		*	
Doordrops												
Illustrated talks/speakers									*			
Roadshow												

Technical Innovation - Part 2

	Government		Housing Developers	Special Interest Groups	User Groups	Academia	Media			General Public			
	National	Local					National / regional / local media	Trade media	National / local radio & TV	Trial Participants	Local residents	EV drivers	General car drivers
I2EV Website	*	*	*	*	*	*	*	*	*	*	*	*	*
LinkedIn, Twitter, Facebook	*	*	*	*	*	*	*	*	*	*	*	*	*
Evening drive sessions (customer engagement - Nissan EV ambassador support)				*	*		*		*	*	*	*	*
Podcasts on specific issues (technical audience)				*	*	*		*					
Podcasts on specific issues (laymans audience)	*	*	*				*		*	*	*	*	*
Links to other websites	*	*	*	*	*	*	*	*	*	*	*	*	*
Industry Conferences	*	*		*	*	*		*					
PR events eg EV races, car show, Ideal Home Show, Parliament events	*	*	*	*	*	*	*	*	*	*	*	*	*
Partner events							*	*					
Ofgem reports													
Press releases	*	*	*	*	*	*	*	*	*	*	*	*	*
News bulletins	*	*	*	*	*	*	*	*	*	*	*	*	*
Interim reports	*					*		*					
Newsletters	*	*	*	*	*	*	*	*					
VIP Visits to trial locations	*	*	*	*	*	*	*	*	*				
Doordrops										*	*		
Illustrated talks/speakers		*		*	*	*					*		
Roadshow							*		*	*	*	*	*

Commercial Innovation

	Ofgem	Project Partners	DNOs	TNOs?	PNOs?	Energy Service Companies	National Govt	Local Authorities	National Media	Trade Media	Academia	Large Commercial Entitites	Business / trade associations
Workshop	*	*	*	*	*	*	*	*	*	*	*		
Conference (as part of wider LCNF event)	*	*	*	*	*	*	*	*	*	*	*		
White Papers	*	*	*	*	*	*	*	*	*	*	*		
Training Courses			*	*	*	*						*	*
e-learning Courses			*	*	*	*						*	*
Technical Articles	*	*	*	*	*	*	*	*	*	*	*		
Interim/final reports	*	*	*	*	*	*	*	*	*	*	*		
Press releases	*	*	*	*	*	*	*	*	*	*	*	*	*

Knowledge dissemination images

Section 6: Project readiness

Requested level of protection require against cost over-runs (%).	0%
Requested level of protection against Direct Benefits that they wish to apply for (%).	0%

6.1 Why the project can start in a timely manner

Governance: SSEPD and EA Technology through their engagement on the New Thames Valley Vision (NTVV) project already have a set of LCNF governance compliant terms and conditions agreed. These can be used as a foundation for I²EV enabling a swift lead into addressing the unique commercial set up of this work.

SSEPD will retain their prime contractor position as DNO but solely to maintain administrative compliance with current governance. So for example SSEPD will maintain the bank account containing I²EV funding but as part of the commercial innovation the acceptance of subcontractor deliverables and subsequent payment to such organisations shall be managed by EA Technology. The entire responsibility for delivery of the I²EV project shall reside with EA Technology which will be reflected in a pass through statement of work that SSEPD shall flow to EA Technology. SSEPD will then be another subcontractor for all purposes who will feed input up through to EA Technology. Please see flow charts on page 17 contrasting current commercial set up versus that proposed for I²EV.

As a measure of confidence in the project and to share the balance of risk, although, as the LNCF governance dictates, SSEPD will cover 10% of the overall project costs (to be reclaimed upon achievement of the Successful Delivery Reward Criteria), EA Technology and SSEPD will put in place a contract whereby the cost and therefore the risk is shared under independent agreement. In the case of the I²EV project, this balance is agreed at a ratio of 25% EA Technology (as an SME the financial risk is inherently greater on balance), and 75% SSEPD. These ratios would be expected to flex on future projects under this novel delivery framework, to recognise the commensurate size and nature of the parties involved.

Key appointments: The project team at EA Technology is ready to start project delivery in January 2013. The communications and dissemination team is in place through Automotive Comms, a low carbon vehicle sector specialist and communications expert with specific experience in recruiting trial participants for EV trials, and Blah d Blah design and communications company. De Montfort University has been engaged through a formal tendering process to conduct the socio-economic modelling work; a tender has been released for the independent technical verification work.

Project plan: A robust project plan has been developed to guide project task delivery (Appendix G) with stage gate reviews, monthly risk and project meetings, quarterly board meetings and monthly communications meetings embedded. This is a living document that will be continually updated as the project progresses.

Customer engagement plan: This will form part of an overarching communications plan. An outline of what will be included is in section 5; an overview of communication audiences and activities is on page 32.

Data protection strategy: The full data protection strategy will be developed in the first quarter of 2013; an outline of what will be included is in Appendix M.

Partner engagement: Key partners have been engaged pre-project, to enable the project to start effective delivery in January 2013. Nissan has committed to the project and will supply EVs and support with trial participant engagement and charging point infrastructure supply and installation; Fleetdrive Electric, an EV lease hire company, has come on board with the project to manage the subsidised lease deal brokered with Nissan and support with delivery and maintenance of the EVs; Charge Your Car North is engaged and will provide access to EV drivers in the North East, and provides a valuable link to Northern Powergrid and the Customer-Led Network Revolution project. Northern Powergrid is a partner to the I²EV project, demonstrating cross-DNO working and an innovative joint delivery approach to LCN Funded projects. All partners cited have provided or committed to provide letters of support.

6: Project readiness contd.

Trial progress: The project has already embarked upon identifying and engaging with EV users and clusters of trial participants. Through Charge Your Car North and Nissan's involvement in the project, we have direct access to 200 EV drivers in the North East for socio-economic modelling purposes. Through early engagement with Bracknell Forest Council, we have access to the New Thames Valley Vision's Consumer Consortium and major blue chip companies who are a target audience for EV fleet hire purposes. Clusters of trial participants have been actively engaged with in Hyde, New Forest and in Leeds. Letters of support for these two clusters are in Appendix L. Further approaches have been made in Basingstoke, Mold and Whitchurch.

6.2 How the costs and estimates have been estimated

A breakdown of the costs are given below. Phasing over the years is estimated from the likelihood of when clusters will be established and when data will be available. Contingency costs have been estimated by estimating the cost impact and the likelihood that it will occur (or that all the additional cost will be incurred) and multiplying these figures together.

The cost of each task has been budgeted by estimating the days for EA Technology and partners time and the materials, travel and accommodation required. Where possible fixed price contracts have been arranged. The contingencies were calculated by multiplying the costs for mitigating the risk by the probability of the risk occurring. The breakdown of costs per task is as follows NB. All costs are in gross real terms (i.e. the partner / customer contribution(s) have not been shown, and the figures are uninflated):

Novel commercial agreement	**£211k**
Initial background - evaluation of initial trial	**£24k**
Customer engagement	**£194k**
Integration of the Technology with charging points	**£357k**
Establishment of Customer / Cluster trials	**£5,545k**
Monitoring the trials	**£122k**
Trial participant interviews	**£177k**
Network Modelling	**£162k**
Consultation with EV manufacturers - cycle times	**£30k**
Project recommendations and implementation	**£264k**
Dissemination	**£322k**
Programme Management	**£848k**
Project Contingency	**£395k**

The calculation methods for the benefits are given in sections 3 and 4.

The costs overview is in Appendix A2; all prices are expressed in 2012 real terms. Please see full cost spreadsheet delivered as part of the full bid submission for further information and detailed costings. For the avoidance of doubt, all costs in the cost spreadsheet are provided in Nominal terms.

EA Technology have requested a contingency of £400k (nominal terms) against the funding request of £4.137m. This equates to 9.7% of the LCNF request. The scale of this contingency request is a function of the size of EA Technology. In FY12 EA Technology's revenue was £22m (a record for the organisation since being employee-owned in 2004), so this scale of project and level of risk involved is significant against the size of the organisation. The contingency has been developed bottom-up against each of the identified risks, as shown in Appendix B, and will be managed as part of the project governance as the project is deployed.

Clearly, there is an intention that contingency funds will not be needed - any unspent monies would be provided back to customers at the end of the project. The exact nature of this financial transaction will need to be agreed as part of the commercial discussions under Stage 0.

6: Project readiness contd.

6.3 Measures to minimise possibility of cost runs or shortfalls in Direct benefits

The following are used to minimise cost over runs:

Project management

Project management will use the following techniques to keep to time and budget and identify problems as early as possible; a monthly report for each party and task detailing:

- On schedule
- On budget
- Milestones achieved
- Activities in the next month
- Risks / issues / mitigation / contingency
- Lessons learned
- Actions required of others

The reports will allow a comparison of spend against budget, identification of any problems or risks in next few months and mitigating actions. This should identify any areas that are likely to go over budget and allow time to take mitigating action. The Gantt chart will be updated each month to track progress and monthly project team meeting will be held face to face or by phone. This should aid identifying any short fall in resources as soon as possible. Formal meetings with SSEPD management will be held on a six monthly basis.

The breakpoints in the project plan will minimise spend as the project can be reduced in scope or halted.

EA Technology will allocate a project manager and project director. If problems cannot be solved on a day to day basis they will be escalated.

There will be one I^2EV programme manager at EA Technology to coordinate different parties involved. This will:

- Prevent duplication of work
- Help coordinate tasks
- Identify factors in different tasks that together may cause budget overspend and take mitigating action

An EA Technology resource will be located part-time at SSEPD's Reading office. This will provide a direct link between the two contracting parties and facilitate project delivery, as well as acting as a link for the trial programme and SSEPD commitment around practical delivery e.g. installation of monitoring equipment at substations.

An initial project risk and mitigation register (Appendix H), and risk and contingency register (Appendix I) has been prepared, and this will be maintained following bid submission. Risk mitigation has been agreed with SSEPD. The responsibility of the safe running of the distribution network resides with SSE but project risks are the responsibility of EA Technology. There is an overlap between the two roles and a clear interface is needed.

To ensure that all risks due to the project are acceptable and managed well, for each action on the network EA Technology will:

- Provide the method statements from the contractor
- List potential risks
- List how the risks will be mitigated
- Allocate contingency to risks and mitigation where appropriate

SSE will:

- Confirm that the method statement is in accordance with their policies and procedures
- Confirm that the contractor is authorised and/or supervised as appropriate
- That the risk and mitigation is acceptable
- They give permission for the work to be carried out
- They take on the residual risk

This will be signed off by Stewart Reid, Future Networks and Policy.

The project does not envisage any direct benefits to the DNO, in that the clusters will be artificially created; the project is not targeting any areas of the network previously requiring reinforcement.

6: Project readiness contd.

6.4 Verification of all information in the proposal

The information in this proposal has been developed in conjunction with all project partners and has been subject to checks and analysis to ensure its validity. Contact details for all project partners and suppliers to the project is in Appendix E - project partner register and project supplier register tables.

Project partner profiles are in Appendix J.

On-site proving trial of the Technology in advance of I²EV project commencement

Carrying out an initial small scale trial before the start of the Tier 2 project will help streamline installation, and allow any problems with the technology to be solved on a small scale. Using a PLC system that has already been trialled on SSEPD's network has demonstrated its performance and practicality for use on the UK LV system reduces the risk of delays from problems with the PLC. The company providing the PLC has also already demonstrated their good service and proactive attitude to solving any issues.

Verification

Costs

SEPD and Northern Powergrid's costs

The costs to SEPD and Northern Powergrid's were estimated by SSE and EA Technology by breaking down their role in the project, days and personnel required. DNO involvement is lower than previous projects given EA Technology's lead role.

SSEC's costs

Installation of the equipment in substations must be carried out by authorised staff. SSEC were asked to quote for a `unit price' per substation as an estimate (as the locations are unknown and costs could vary). This was multiplied by 20 (the maximum number of clusters).

Modelling and evaluation contracts

The modelling and evaluation tasks were out to competitive tender. The invitation to tender for the socioeconomic tasks was sent to:
[- Parties removed for this non-confidential version]

The invitation to tender for the network modelling tasks was sent to:
[- Parties removed for this non-confidential version]

The invitation to tender for the project evaluation was sent to:
[- Parties removed for this non-confidential version]

The tenders were or will be marked by three members of staff against ability to meet the brief, experience and cost. De Montfort University won the tender for social-economic tasks. The other two tenders will be awarded by mid-September.

In kind Contributions

The costs to Fleet-drive, Charge your Car and Nissan were estimated by the respective companies.
- Fleetdrive Electric provided a breakdown of costs and their in-kind contribution.
- Nissan provided confirmation of subsidised vehicle hire and staff to promote the project.
- Charge your Car provided confirmation of the costs they would incur and those available in kind.

Subcontractors' costs

The activities for other partners were discussed and either day rates or quotes received from:
- Automotive Comms
- ANDTR
- Blah d Blah
- SSEC (for network installations)

6: Project readiness contd.

EA Technology Costs

These were divided into three categories:
(1) Consulting - technical analysis and management. Consulting costs are based on day rates from experience of the time required for tasks and include travel and accommodation. Internal governance administration will be provided in kind.
(2) Project management - overall coordination. Project management costs are based on experience of other large projects and LCNF.
(3) Technology development - development of the solution. EA Technology will provide the technology development costs in kind, this includes also some of the publicity costs.

Capital costs

Charge Your Car, Nissan, ANDTr and Fleetdrive provided information on the costs of charging points, leasing and installation.
Costs for monitoring and downloading data were estimated by EA Technology from experience on other projects.

Other Data

Data on the growth of the use of electric vehicles is based on the latest data from work within the Smart Grids Forum, Technology Strategy Board, Government's Carbon Plan and OLEV's Plug-In Vehicle Infrastructure Strategy. Technical information on charging points and electric vehicles were provided by the manufacturers.

6.5 How project would still deliver learning if take-up in trial area of low carbon technologies lower than anticipated

The Project plan demonstrates EA Technology's understanding of the magnitude of challenge in engaging with participants to use EVs as part of the I^2EV trial; learning has been taken from the Customer-Led Network Revolution LCN Fund Tier 2 project, which has found customer engagement in trials to be a major challenge. In recognition of this learning, the I^2EV project trials are broken down into two groups:

1. Social trials - monitoring existing EV users and new EV users

2. Technical trials - trialling the Technology with clusters of EV charging points

This approach will de-risk the project by limiting the cost to the customer and ensuring that the appetite for technical trial participation exists in the number and density of clusters needed to deliver a successful technical trial programme. In parallel and to run concurrently with the technical trial programme, the social trial programme will run. The activity and learning from the social trials, which is irrespective of take-up in technical trial areas (i.e. clusters), will be:

- Evaluation of the initial on-site trial of the Technology by a University to improve the Technology and approach. This will identify any improvements or additions in the logic developed to date for the Technology equipment to enhance the design. This may be additional monitoring capability, means to change control parameters or user interface in terms of lights or other means to indicate availability for charging. It will also investigate the most flexible and practical CTs for monitoring and means to inject PLC signals to reduce interruptions to customers and installation time. The University will also carry out a literature survey of the estimates of the additional load that EVs will cause and the potential for load shifting. They will also survey work with respect to the additional load from heat pumps and potential for shifting heating load.

- A literature survey of existing knowledge of customer behaviour with regard to use of EV and acceptance of direct control of appliances will be carried out. This will highlight gaps in the knowledge and likely response and the best way to approach customers.

- Analysis of the data collected from the social trials including driving habits compared to location and demographics. This will be compared with data from the literature survey.

6: Project readiness contd.

6.6 Processes in place to identify circumstances where the most appropriate course of action will be to suspend the project, pending permission from Ofgem that it can be halted

Breakpoints will be key times when the viability of the project will be review and if necessary it can be reduced in scope or closed. The project plan is in Appendix G.

Risk identification will be the responsibility of all partners to the project. Changes and additional risks will be managed by the project manager and reviewed on a monthly basis. Should any risk materialise and be insurmountable or become too great, then the project will be reviewed and possibly closed.

Project Code/Version No SSET205

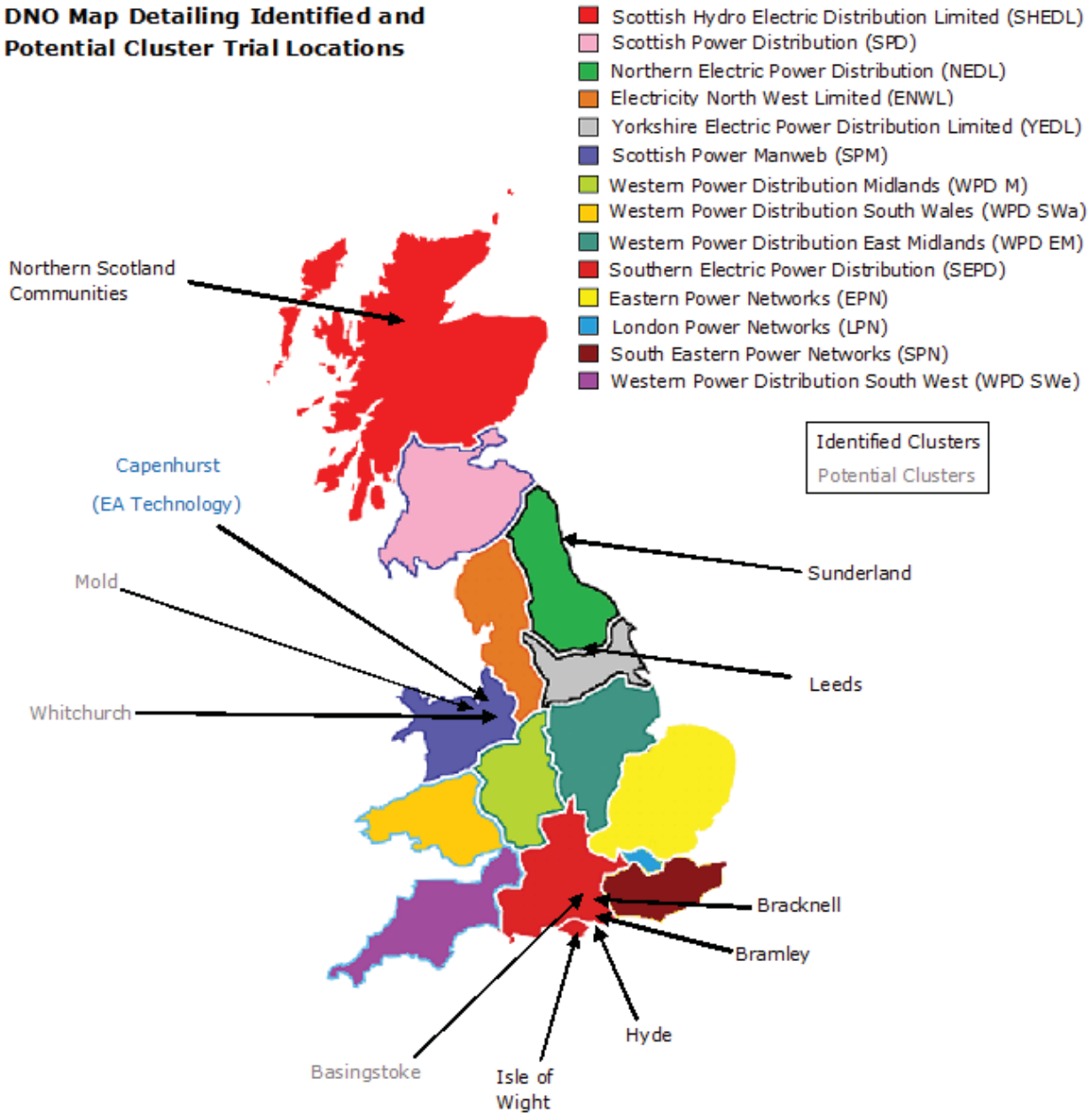
6: Project readiness contd.

6: Project readiness images

I²EV Partners

I²EV Suppliers

DNO Map Detailing Identified and Potential Cluster Trial Locations



Project readiness Images

Section 7: Regulatory issues

☐ Put a cross in the box if the Project may require any derogations, consents or changes to the regulatory arrangements.

The project will provide the DNO direct control over the customer supply and can limit a circuit under certain circumstances. This is different to most previous load controls as the control does not go through a third party of a supplier or aggregator who has a contract with the customer. It should be noted that the ability to limit the supply only applies to the significant load on a separate circuit, specific to the trials of EVs, and does not apply to the rest of the household supply. The supply is not de-energised.

The only direct control of appliances is switching storage heaters by Teleswitching Agreement. This is controlled by the suppliers and operated by DNOs on their behalf. However, SSE does control teleswitching to maintain the power system and has initiated load management areas in locations where changing switching times could overload the network. (Southern Electric Power Distribution PLC, Miscellaneous Charging Services Statement, Effective from April 2012 http://www.ssepd.co.uk/uploadedFiles/Controls/Lists/Resources/SEPD_2012_-_2013_Charging_statements/SEPD_MiscellaneousServicesStatementApril2012.pdf). This is a precedent for SSE developing direct control of Electric Vehicles charging points to maintain the power system.

The two contractual agreements that may be affected by the DNO have direct control is the DCUSA and the Distribution Code.

DCUSA states that a supply must be informed of any change or variation from the standard Connection Terms that will affect use of system charges, but direct control will not affect these charges (page 121).

On p121 There is an obligation on the DNO to convey electricity to each Exit point subject to an agreements made by the connectee and the DNO. Therefore non-standard arrangements are allowable.

Within DCUSA the National Connection terms on p264 states that:

'Network constraints. Our obligations [the DNO] under this agreement are subject to the maximum capacity and any other design feature of the connection. You must contact us in advance if you propose to make any significant change to the connection or to the electric lines or electrical equipment at the premises, or if you propose to do anything else that could affect our network or if you require alterations to the connection.'

Installation of an Electric Vehicle charger that is capable of delivering 7-9kW of power could be regarded as a significant change. This is also stipulated in DPC 5.2.1 on page 49 of the distribution code:

'and

Agreeing other connection terms. You and we may each, at any time, ask the other to enter into an alternative connection agreement in respect of the connection if you or we believe an alternative agreement is needed because of the nature of the connection.'

Provides provision to agree other connection terms.

On page 371, DCUSA provides the right of DNOs to designate Load Management Areas to control the switching of loads to prevent co-incident switching over loading the network. However, it is unclear whether the switching must be carried out by the suppliers.

DPC 5.3.2 provides for the DNO to agree methods to minimise the impact of disturbing loads. An EV charger could be regarded as a disturbing load.

DPC 6.7.1 provides for communications to be established between the customer and the DNO where it is required for the control of the network and included in a connection agreement.

DPC6.7.4. stipulates that the communications required within the customer's premises should be maintained by the customer. In the Technology's case, the maintenance is minimal.

7: Regulatory issues contd.

Conclusion

It would be appropriate to agree a temporary change to the connection agreement with the customer to cover the direct control of the EV charger. This does not require a derogation from the regulations.

7: Regulatory issues images, charts and tables

Regulatory issues images

Regulatory issues images

Section 8: Customer impacts

8.1 Customers impacts in a learning outcome context

The learning outcomes to be delivered by the project are shown in Appendix C:

Commercial

Learning outcome C1: To what extent does a DNO enabling a third party delivery of innovation accelerate deployment?

Expedient delivery of the innovative technology to be trialled under I^2EV, if successful, will future proof local distribution networks. Lights will stay on, household electrical appliances will continue to operate even at peak times of EV charging. This is a potentially beneficial customer impact of the Technology that is applicable to all electricity users, not just those that drive EVs.

Technical

Learning outcome T1: To what extent can DNO direct demand control facilitate the connection of low carbon technology?

Long term sustainability of the electricity network to the benefit of all customers, again regardless of EV or other low carbon technology (LCT) ownership, will be the result of successful trialling of the Technology, which will demonstrate how a DNO can use direct demand control to connect any LCT.

The learning outcomes are linked to the Successful Delivery Reward Criteria (SDRC) in section 9. The SDRC register and illustration of how they are mapped to the learning outcomes is in Appendix D.

8.2 Monitoring Existing EV owners (the social trials)

Monitoring the behaviour of existing EV owners; via Nissan and Charge Your Car, existing EV owner will be approached to see if they are willing to have their EV use and charging habits recorded. A brief explanation of the project and how the data will be used and its benefits will be provided.

Much of the information may be available via the charging units and permission to use the data is all that is required. In other cases a power monitor and GSM communications will be required. Customers will have to allow entry and installation to take place. However, this work will be inside the customers' premises and not on the DNO's network. This may require a brief disconnection of the circuit feeding the EV charger. Customers will also be asked to record their journey times and lengths and some socio-economic data on an anonymous basis.

The tariffs and contractual arrangements for supply of electricity with the customer will remain the same. Apart from some minor intrusion, the only other impact for the customer will be visibility of their charging habits. They may be able to identify a better tariff for their electricity use as a result. Much of this data will be made available through the Nissan employee LEAF hire scheme, managed by Charge Your Car.

Monitoring the behaviour of new EV users. Via Nissan and Fleetdrive Electric, fleet hire users will be approached through the New Thames Valley Consumer Consortium.

Customers who do not use an EV will benefit from additional knowledge about LV networks and avoidance of reinforcement costs. It will also prevent EV charging potential absorbing all the available headroom providing DNOs more flexibility in serving all their customers. Indirect benefits will be improved air quality nad reduced carbon emission and traffic noise.

The regulation of the distribution industry uses a "socialised cost" model in that customers are already required to cover the cost of supplying additional load (unless it is a `disturbing load'), The commercial and technical solution proposed should provide the lowest cost approach to managing the supply of additional load.

8: Customer impacts contd.

8.3 Clusters of EV Charging Points (the technical trials)

The project will recruit about 150 customers to lease an EV for 12-18 months. These will be approached via EV manufacturers (Nissan), Fleetdrive Electric and Charge your Car in collaboration with EA Technology. A full explanation of the project and how the data will be used and its benefits will be provided. Nissan will provide the use of their EV ambassadors to support recruitment, to run evening community engagement sessions, where a Nissan LEAF (EV) will be available to test drive.

Routes to customer engagement are illustrated on page 48, as proposed under Fleetdrive Electric's plans to engage customers for the project trial programme.

The lease will be at subsidised cost and the charger will be installed temporarily. There will be car parking space provided for customers own vehicles during the trial if necessary. Customers will be asked to fill in surveys during the trial.

An explanation of the contract for the car, costs and what is expected in terms of monitoring and feedback will be provided.

The tariffs and contractual arrangements for supply of electricity with the customer will remain the same. There should be no impact on the availability of the EVs for the customers however if the trial is not successful, customers will still have previous transport options available to them.

To install the EV charger, there is likely to be a short interruption to the supply to the customer's premises as would be expected during a standard installation. It is expected that the PLC monitor control can be installed live, using approved live working procedures. However, the local population will be given notice of a brief interruption of supply, one interruption per substation, in accordance with the regulations.

The Technology will only switch off the circuit supplying the EV charger (that will not be supplying other loads). The supply to the existing loads will be unaffected by the Technology. The only load that is controlled is the EV that is provided on a conditional basis.

A key aspect to the trial will ensure that the chargers can be cycled on and off without causing large voltage step changes or flicker.

Should heat pumps be used it is expected that the level of interruptions would be very similar during installation. It is assumed that the heat pump is connected to a dedicated circuit within the premises.

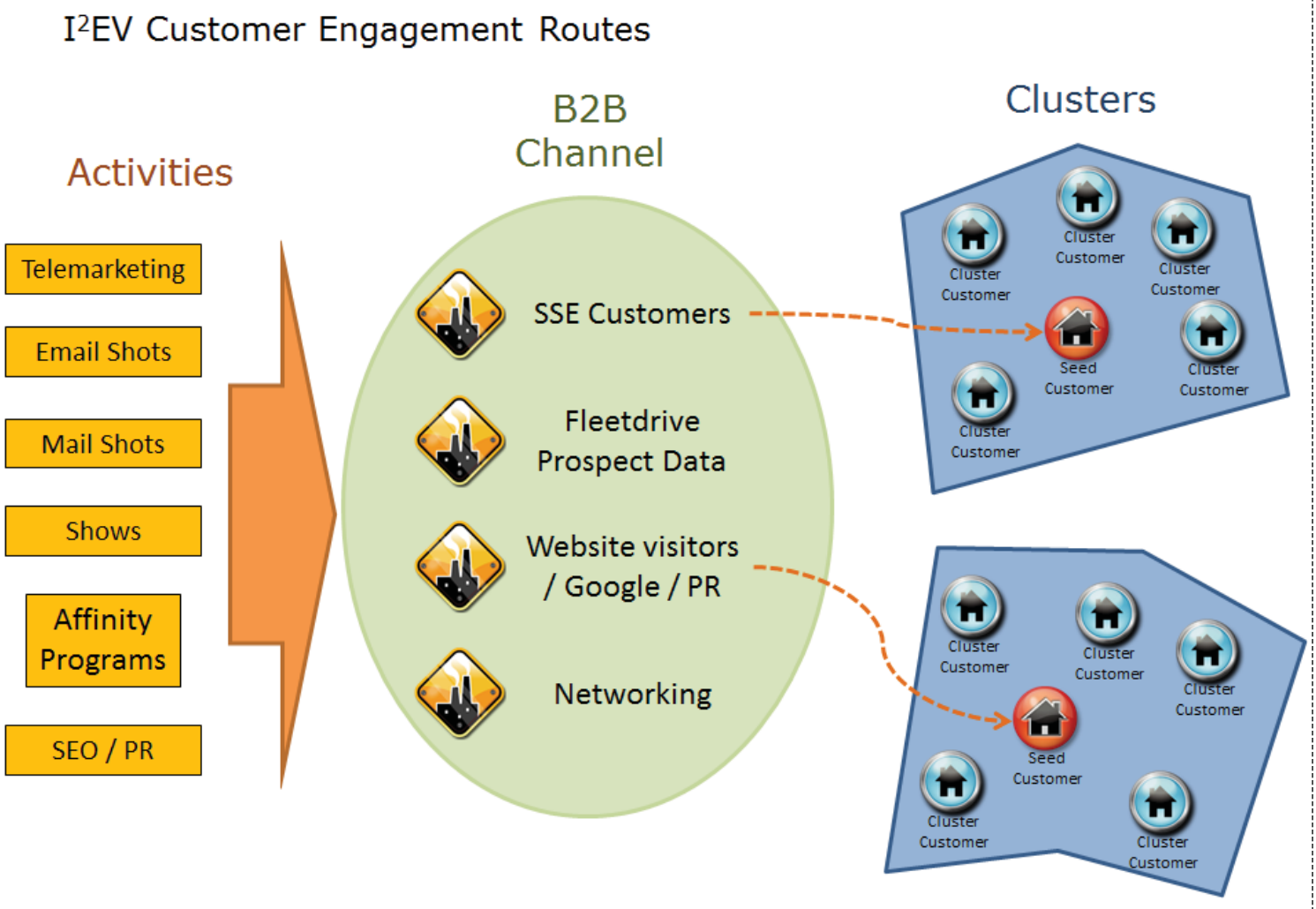
It is anticipated that protection is required from the Interruption Incentive Scheme for a maximum of 10 brief interruptions.

Project Code/Version No SSET205

8: Customer impacts contd.

8: Customer impacts contd.

8: Customer impacts images, charts and tables



Customer Impacts images

Section 9: Succesful Delivery Reward Criteria

Criterion (9.1)

Focus: Commercial
Learning and recommendations from the experience of third party leading and writing a Tier 2 bid.

Related learning:
Learning outcome C1.2.1 - what learning has come out of the bid process?
Related Task: 0 - Novel commercial agreement
Related commercial aims: Under 2.2 the commercial aims are to:
-To demonstrate delivery of a low carbon network project by a non-DNO on behalf of a DNO (see 'commercial innovation delivery framework' on page 10)

Evidence (9.1)

9.1.1 Report of the learning and recommendations published for DNOs and third parties.

(a) Prepare documentation on learning and recommendations
(b) Commission and deliver a report to Ofgem
(b) Disseminate report to DNOs

Achieved by month 2.

Criterion (9.2)

Focus: Commercial
Learning about the contractual arrangements and programme management of the third party leading an LCNF Tier 2 project.

Related learning:
Learning outcome C1.2.2 - what form are the contracts?
Learning outcome C1.2.3 - how are the risks managed with the DNO?
Learning outcome C1.2.4 - what form does the programme management take?
Related Task: O - Novel commercial agreement
Related commercial aims: Under 2.2 the commercial aims are to:
- To develop a novel commercial arrangement (see traditional and I^2EV models on page 17)
- To enable all procurement related to the project activity to be managed by a non-DNO

Evidence (9.2)

9.2.1 Draft template contract
(a) Consultation exercise with all DNOs through a workshop

9.2.2 Report of the learning and recommendations
(a) Learning and recommendations report published
(b) Report disseminated to DNOs

9.2.3 Final template contract
(a) Template contract published and made available on I^2EV website

Achieved by month 36.

9: Succesful delivery reward criteria contd.

Criterion (9.3)

Focus: Commercial
Successful engagement and collaborative working.

Related learning:
Learning outcome C1.1.1 - what is the management and interface process with the DNO?
Learning outcome C1.1.2 - what form are the contracts?
Learning outcome C1.1.4 - how does learning become business as usual when project is non-DNO led?
Learning outcome C1.3.1 - how is expedient deployment achieved - benefits/other over DNO-led approach?
Learning outcome C1.3.2 - how are the project and its results validated?
Related Task: 0 - Novel commercial agreement
Related commercial aims: Under 2.2 the commercial aims are to:
-To demonstrate delivery of a low carbon network project by a non-DNO on behalf of a DNO (see 'commercial innovation delivery framework' on page 10)

Evidence (9.3)

9.3.1 Involvement of two DNOs in a third party led project
(a) Produce minutes from steering group meetings

9.3.2 Highlight the benefits and disadvantages of third party led projects
(a) Facilitate a dissemination seminar to debate benefits and disadvantages
(b) Produce event report that makes recommendations as to future DNO collaboration with third party-led projects

Achieved by month 34.

Criterion (9.4)

Focus: Commercial
Third party independent project evaluation.

Related learning:
Learning outcome C1.3.2 - how are the project and results validated?
Related Task: 9 - Project recommendations and implementation
Related commercial aims: Under 2.2 the commercial aims are to:
-To demonstrate delivery of a low carbon network project by a non-DNO on behalf of a DNO (see 'commercial innovation delivery framework' on page 10)

Evidence (9.4)

9.4.1 Programme manager's response to 6 monthly independent reviews of the project and technology.
(a) Produce 6 monthly report to be tabled at steering group meetings
(b) Produce discussion document on each review to be tabled at each steering group meeting
(c) Produce decision papers as appropriate in response to each discussion document for agreement by steering group members at next meeting

Achieved by months 7,13,19,25,31,and 36.

9: Succesful delivery reward criteria contd.

Criterion (9.5)

Focus: Technical
Sign up and monitoring of sufficient customers to thoroughly test the technology.

Related learning:
Learning outcome T1.1.2 - will customers accept direct control and under what circumstances?
Related Tasks:
Task 4 - Establishment of customer / cluster trials
Task 5 - Monitoring the trials
Related Technical aims: Under 2.2 the technical aims are to:
- Learn customer driving and charging habits and the implications for control via the Technology.
- Evaluate the range of networks where it can operate successfully and identify any type of networks that are inappropriate

Evidence (9.5)

9.5.1 Minimum of 150 existing EV drivers customers signed up to have their driving habits recorded.
(a) Reports presented to the monthly project meetings to capture and log progress in signing up customers to the EV trials
(b) Six monthly reports to steering group on trial engagement progress

9.5.2 First cluster operational and monitored.
(a) First signed agreement documentation to Ofgem
(b) Prepare and present first report on level of customer engagement and learning
(c) Work with partners to maximise learning and publicity

Achieved by month 18.

Criterion (9.6)

Focus: Technical
Modelling to understanding additional headroom available/other network benefits from using he Technology.

Related learning:
T1.2.1 - how much headroom is released?
T1.2.3 - on what type of networks can the technology be used?
T1.2.4 - how do the needs of the EV charging (or other loads) affect the settings?
Related tasks: 5 - Monitoring the trials
Related Technical aims: Under 2.2 the technical aims are to:
- Evaluate how often switch off routines are likely to be initiated from real life trials and extrapolation via modelling using the results.
- From the results and extrapolation via modelling, estimate the typical and maximum thermal capacity gained.

Evidence (9.6)

9.6.1 Models developed and % thermal and voltage headroom estimates produced. Potential cost savings and carbon emission savings using DECC published carbon intensity figures. If technology is unsuccessful, reasons why will be stated.
(a) Consultation of model with DNOs
(b) Production of model and launch at relevant event

Achieved by month 30.

9: Succesful delivery reward criteria contd.

Criterion (9.7)

Focus: Technical
Socio-economic analysis complete.

Related learning:
T.1.1.1 - how does a trial encourage the uptake of low carbon technology?
T.1.1.2 - what social factors have an impact on the use of the Technology?
T.1.1.3 - how can a trial be used to educate customers about the electricity network and low carbon technologies?
Related Task: 6 - Trial participant interviews
Related Technical aims: Under 2.2 the technical aims are to:
- Learn customer driving and charging habits and the implications for control via the Technology.

Evidence (9.7)

9.7.1 Data collected and recommendations made.
(a) Present data and report to six monthly steering group meetings on progress
(b) Prepare and present report to DNOs and wider stakeholders

Achieved by month 34.

Criterion (9.8)

Focus: Technical
Establish the most appropriate integration of the Technology for different applications and suitable cycling times or reasons why this is not possible if the trials are not successful.

Related learning:
T.1.1.2 - will customers accept direct control and under what circumstances?
T.1.2.4 - how do the needs of EV charging (or other loads) affect the settings?
Related Task: 3 - Integration of the Technology with charging points
Related Technical aims: Under 2.2 the technical aims are to:
- Develop and trial the equipment to ascertain its ease of installation. -
- Develop the integration of the Technology into the EV charging points including how existing intelligence and attributes in charging points can be harnessed to reduce the cost and improve the performance.

Evidence (9.8)

9.8.1 Recommendations of suitable cycle times for one or more low carbon technologies for demand side management or why demand side management is not feasible.
(a) Report produced
(b) Present report and learnings DNOs through a workshop or relevant event

Achieved by month 34.

Section 10: List of Appendices

Appendix A – Cost Overview (All prices are expressed in 2012 [real] terms).

Please see full costs spreadsheet delivered as part of bid submission for further information.

Table 1: I2EV Project Costs Overview

TOTAL COSTS (£)			EA Technology (Desk based consultancy)		EA Technology (Project Management)		EA Technology (Equip & development)		SEPD		Nissan		Fleetdrive		SEC (installation)		De Montford Uni		Uni 2 (Technical review)		Uni 3 (Project review)		Charge Your Car		EATL contracting out - Supplier TBC		Northern PowerGrid		Customer input	
Description	Task	Project Workstream	Funded	In-Kind	Funded	In-Kind	Funded	In-Kind	Funded	In-Kind	Funded	In-Kind	Funded	In-Kind	Funded	In-Kind	Funded	In-Kind	Funded	In-Kind	Funded	In-Kind	Funded	In-Kind	Funded	In-Kind	Funded	In-Kind	Funded (Incentives)	In-Kind (payments)
Novel commercial agreement	0																													
Establish the 3rd party delivery commercial framework (yr 1)		0.1	£ 96,640	£ 5,000					£ 19,635																£ 48,800					
Review the commercial framework and recommend changes (yr 3)		0.2	£ 24,160						£ 4,909																£ 12,200					
Initial background - evaluation of initial trial	1																													
Evaluation of initial on-site trial		1.1			£ 9,360																									
Literature survey - additional load		1.2			£ 2,340																									
Literature survey - customer behaviour		1.3			£ 2,340																									
Customer engagement	2																													
Customer engagement plan		2.1	£ 25,450						£ 1,227																£ 5,000					
Social trials		2.2	£ 26,450																						£ 18,000					
Technical trials		2.3	£ 98,800																						£ 20,000					
Integration of the Technology with charging points	3																													
Technology development of Epsrit		3.1	£ -	£ 15,000			£ -	£ 80,000																						
Ongoing development of Esprit during project		3.2	£ -				£ -	£ 30,000																						
Engage with charging point manufacturers		3.3	£ -				£ -	£ 50,470				£ 130,000																		
Integrate technology with charging points		3.4	£ -				£ -	£ 11,720															£ 40,000							
Establishment of Customer / Cluster trials	4																													
Managing subsidised rental programme for fleet users		4.1	£ -		£ 21,096								£ 52,000	£ 20,000																
Managing collection and delivery of cars		4.2	£ -											£ 15,000																
Finding trial (fleet) participants and providing funding / risk of funding		4.3	£ -										£ 173,875	£ 53,000																
EV leasing costs (fleet)		4.4	£ -									£ 1,800,000																	£ -	£ 900,000
Engage with local network cluster(s)		4.5	£ 24,024									£ 450,000											£ 100,000						£ 270,000	£ 180,000
Assess network(s)		4.6	£ 19,219																											
Install technology and charging points		4.7	£ 90,132				£ 286,000	£ 286,000	£ 22,091					£ 9,000	£ 161,385								£ 315,000		£ 203,000		£ 22,091			
Removal of charging points at end of trial		4.8													£ 43,080								£ 27,000							
Monitoring the trials	5																													
Monitor and download data		5.1	£ 47,792						£ 12,272																£ 5,000		£ 12,272			
Report on data (6 monthly)		5.2	£ 9,610																											
Uninstall monitoring at end of trial		5.3	£ 35,310																											
Trial participant interviews	6																£ 170,000													
Develop interview pack		6.1			£ 3,844				£ 1,227																					
Pre trial interviews		6.2			£ 2,000																									
During trial interviews		6.3			£ 2,000																									
Post trial interviews		6.4			£ 2,000																									
Socio-economic modelling		6.5			£ 2,000																									
Make recommendations and report		6.6			£ 3,844																									
Network Modelling	7																													
Network modelling and analysis contract		7.1			£ -														£ 150,000											
Model the test network		7.2			£ 1,922																									
Extrapolate to different network types and locations		7.3			£ 2,883																									
Compare the results with existing work identified in literature survey		7.4			£ 2,883																									
Estimate savings through the use of the Solution		7.5			£ 3,844																									
Consultation with EV manufacturers - cycle times	8																													
Agree the cycle times for the Technology with OEMs		8.1	£ 30,400																											
Project recommendations and implemenation	9																													
Independent evaluation (Project and Solution)		9.2			£ 17,280																£ 150,000									
How might the solutions be used by DNO planners as part of BAU		9.3	£ 39,200						£ 6,131																		£ 6,131			
Technical framework recommendations		9.4	£ 20,049						£ 1,841																		£ 1,841			
Commercial framework recommendations		9.5	£ 20,049						£ 1,841																					
Dissemination	10																													
Develop dissemination / comms plan		10.1	£ 9,610									£ 10,000													£ 15,000					
Implement communications plan		10.2		£ 10,000	£ 45,938			£ 20,000	£ 44,181			£ 30,000													£ 100,000		£ 8,404			
Reporting of SDRC outputs		10.3	£ 29,000																											
Programme Management	11																													
Programme management to deliver the project		11.1			£ 471,717				£ 88,362		£ 50,000																£ 22,091			
Project governance and support		11.2				£ 127,970			£ 29,454				£ 5,000											£ 30,000						
DNO project review and results		11.3							£ 18,408																		£ 4,602			
Project Contingency	12																													
RI 001		12.1			£ 25,000																									
RI 002		12.2			£ 7,500																									
RI 003		12.3			£ 5,000																									
RI 006		12.4			£ 7,500																									
RI 007		12.5			£ 10,000																									
RI 010		12.6			£ 18,000																									
RI 011		12.7			£ 2,500																									
RI 012		12.8			£ 7,500																									
RI 013		12.9			£ 25,000																									
RI 015		12.10			£ 55,000																									
RI 020		12.11			£ 25,000																									
RI 021		12.12			£ 25,000																									
RI 022		12.13			£ 25,000																									
RI 023		12.14			£ 157,500																									
Total		£ 8,653,217	£ 645,895	£ 30,000	£ 992,811	£ 127,970	£ 286,000	£ 478,190	£ 251,579	£ -	£ 50,000	£ 2,420,000	£ 225,875	£ 102,000	£ 206,465	£ -	£ 170,000	£ -	£ 150,000	£ -	£ 150,000	£ -	£ 482,000	£ 30,000	£ 427,000	£ -	£ 77,432	£ -	£ 270,000	£ 1,080,000
LCN Fund Total		£ 4,385,057	£ 645,895		£ 992,811		£ 286,000		£ 251,579		£ 50,000		£ 225,875		£ 206,465		£ 170,000		£ 150,000		£ 150,000		£ 482,000		£ 427,000		£ 77,432		£ 270,000	

Appendix B – Trial Activity Summary

Table 2: Trial Activity Summary

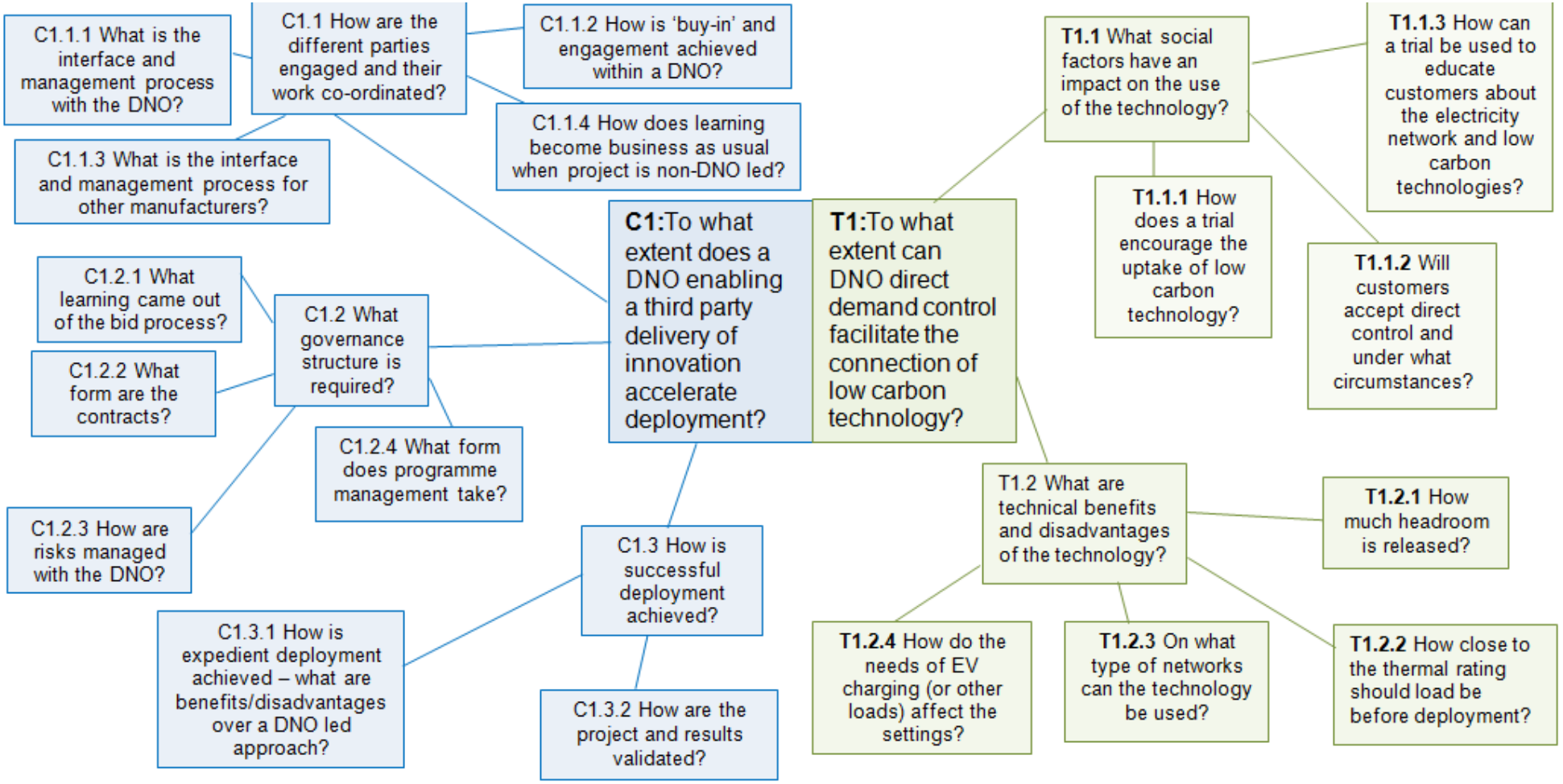
Trial	Activity	Source of EVs	Quantity
Socio-Economic	Monitor driving and charging behaviour and record social profile and locations.	Existing owners in Plugged in Places areas (or otherwise contactable).	(1,000+)
		Nissan employees.	(~200)
		Drivers of Fleet cars – new EVs provided by Nissan through Fleetdrive Electric. Leads through Bracknell Forest Council and SSEPD's New Thames Valley Vision's Consumer Consortium.	~150
Technical	Testing the technology with customer surveys.	EVs from Fleetdrive Electric.	100-200

		Locations of potential clusters:
		• In SSE licence areas:
		  ○ Hyde, New Forest
		  ○ Thames Valley Vision area
		  ○ North of Scotland
		  ○ Medstead, Basingstoke
		  ○ Bramley, Hampshire
		• In NPG licence areas:
		  ○ Leeds
		  ○ Sunderland
		• Other, out of area, options:
		  ○ Whitchurch, Shropshire
		  ○ Mold, North East Wales
		  ○ Capenhurst, Nr Chester	

Figures in brackets are links forged to other Electric Vehicle trials, and will not be funded outside of the I²EV project.

Whilst the trial will focus on community clusters in the SSE and Northern Powergrid licenced areas, the project team will seek to engage the support of other DNOs if other suitable trial sites/locations are identified during the project.

Appendix C – I²EV Project Learning Outcomes



Appendix D – SDRC Register

Table 3: SDRCs and their mapping to the Project Learning Outcomes

No.	Type	Criterion	Evidence	Achieved by month	Inclusion in other contracts	Learning Outcome
1	Commercial	Learning and recommendations from the experience of third party leading and writing a Tier 2 bid.	Report of the learning and recommendations published for DNOs and third parties.	2		C 1.2.1
2	Commercial	Learning about the contractual arrangements and programme management of the third party learn LCNF Tier 2 project.	Draft template contract	8		C 1.2.2 C 1.2.3
			Report of the learning and recommendations published for DNOs and third parties.	34		C 1.2.2 C 1.2.3 C 1.2.4
			Final template contract	36		C 1.2.2 C 1.2.3
3	Commercial	Successful engagement and collaborative working	Involvement of 2 DNOs in a third party led project	24		C 1.3.1 C 1.3.2 C 1.1.1 C 1.1.2 C 1.1.4
			Dissemination seminar highlighting the benefits and disadvantages of third party led projects	34	3rd party project evaluation contract must stipulate information must be provided on time	
4	Commercial	Third party independent project evaluation	Programme manager's response to 6 monthly independent reviews of the project and technology	7,13,19, 25,31,36	3rd party project evaluation contract must stipulate information must be provided on time	
5	Technical	Sign up and monitoring of sufficient customer to thoroughly test the technology.	Minimum of 150 existing EV drivers customers signed up to have their driving habits recorded First cluster operational and monitored.	18	Timely installation by SEC written into the contract	T 1.1.2

No.	Type	Criterion	Evidence	Achieved by month	Inclusion in other contracts	Learning Outcome
6	Technical	Modelling to understanding additional headroom available and other network benefits from using The Technology.	Models developed and % thermal and voltage headroom estimates produced. Potential cost savings and carbon emission savings using DECC published carbon intensity figures. If technology is unsuccessful, reasons why will be stated.	30	Network modelling contract must stipulate outputs to be provided on time	T 1.2.1 T 1.2.3 T 1.2.4
7	Technical	Analysis of socio-economic complete	Data collected and recommendations made.	34	Socio-economic analysis contract must stipulate outputs to be provided on time	T 1.1.2 T 1.1.1 T 1.1.3
8	Technical	Establish the most appropriate integration of the Technology for different applications and suitable cycling times or reasons why this is not possible if the trials are not successful.	Recommendations of suitable cycle times for one or more low carbon technologies for demand side management or why demand side management is not feasible.	34	Network modelling contract must stipulate outputs to be provided on time	T 1.2.4 T 1.1.2

Appendix E – Contact Registers

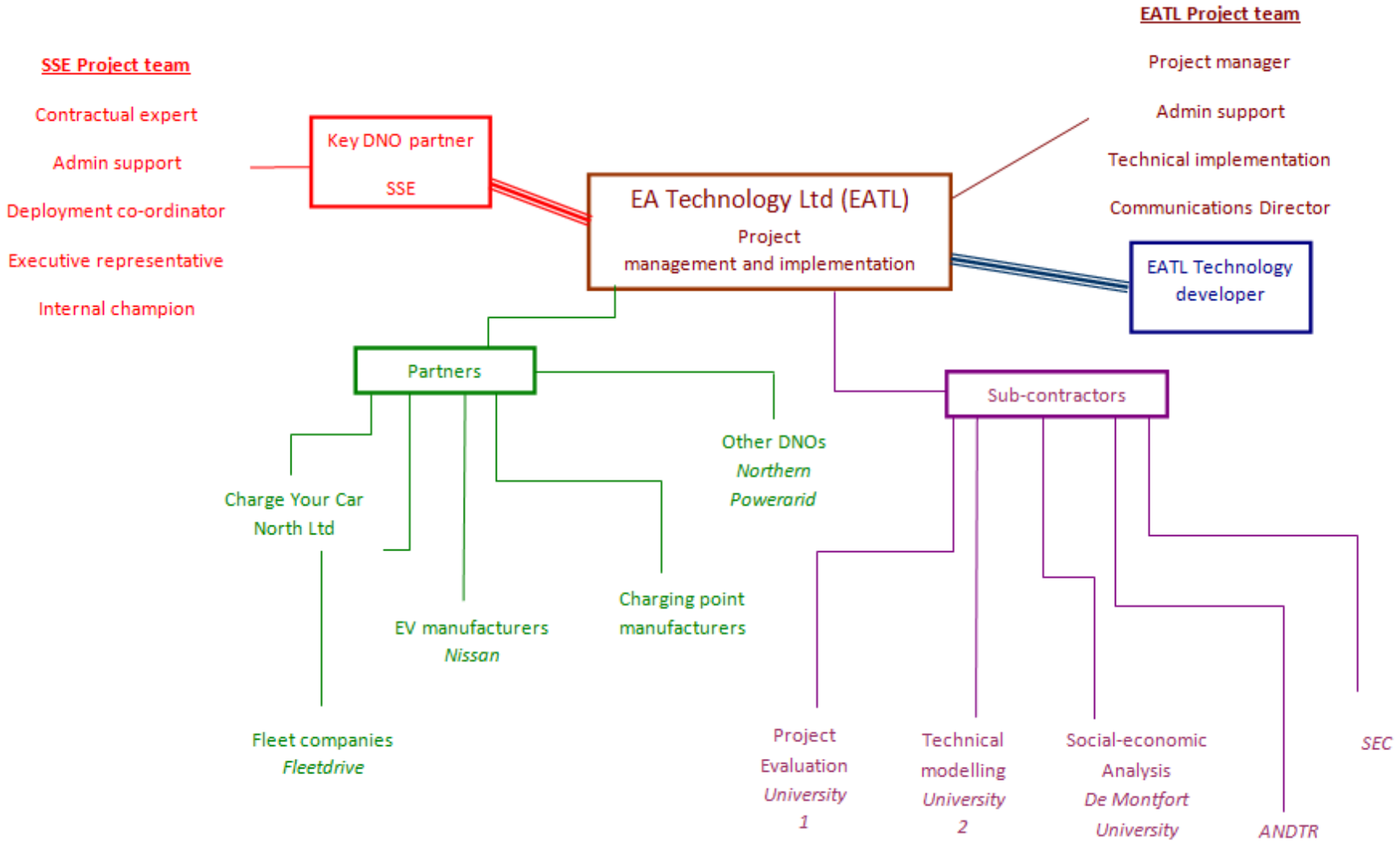
Table 4: Project Partner Register

Project Partner	Contact	e-mail
SSEPD	Brian Shewan	brian.shewan@sse.com
EA Technology	Gill Nowell	gill.nowell@eatechnology.com
Nissan	Olivier Paturet	opaturet@nissan-europe.com
Fleetdrive Electric	Mike Potter	mikep@fleetdrive.co.uk
Charge Your Car North Ltd	Josey Wardle	josey.wardle@gateshead.ac.uk
Northern Powergrid	Andrew Spencer	andrew.spencer@northernpowergrid.com

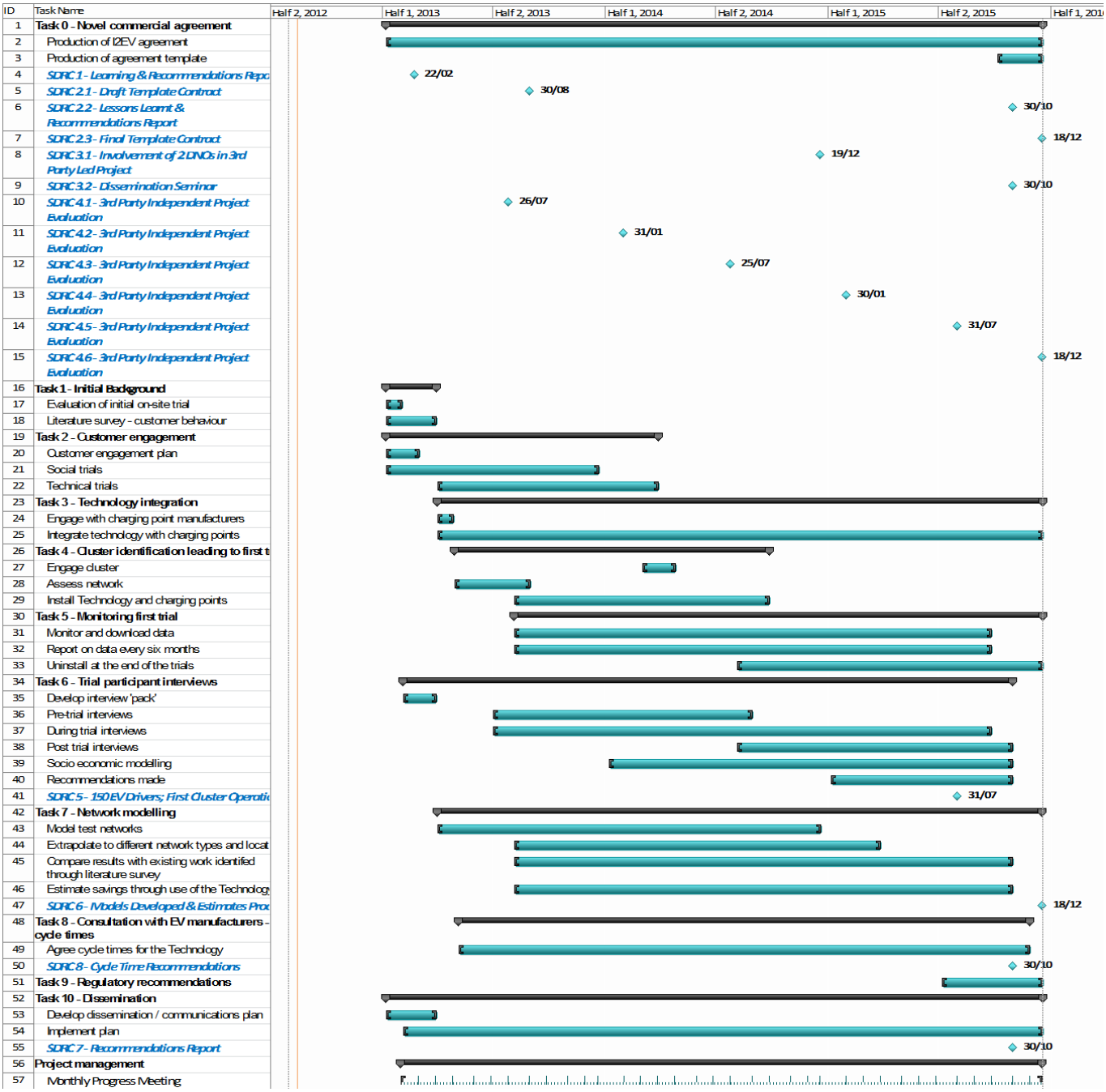
Table 5: Project Supplier Register

Project Supplier	Contact	e-mail
Automotive Comms	Paul Clarke	paul.clarke@automotivecomms.co.uk
De Montford University	Nadia Omar	nomar@dmu.ac.uk
AND Technology Research	Steve Kear	steven.kear@andtr.com
blahdblah	Neil Rylance	neil@blahdblah.com

Appendix F – Organogram



Appendix G – Project Plan



Appendix H – Risks & Mitigations Register

Table 6: Risks & Mitigations Part 1

Risk Identification	Risk Category	Risk Details	Pre-Mitigation		Post-Mitigation					
			Likelihood	Severity	Mitigation Measure	Cost of Mitigation	Mitigation Applied	Owner	Likelihood	Severity
023	Business (All)	Due to the nature of the project (research trials into new, experimental technology) it is reasonable to assume that risks that have not been specifically forseen will occur. This line allows for the impact of currently unforseen risks.	Almost Certain	High	Ensure regular updates meetings/teleconferences held between all parties to discuss adherance to the project plan and identify risks and blockers to progress of the project.	£ -	No	All parties	Almost Certain	High
015	Technical	Equipment (cars/chargers/data monitors etc.) is more expensive.	Possible	Moderate	Discussions undertaken with all parties on-board in order to allow utilise costs that are as accurate as possible.	£ -	Yes	EA Technology	Possible	Moderate
001	Technical	Limited results (insuffucient data gathered) from the trial project make it more difficult to determine technical and commercial viability and hence justification to continue with the project.	Possible	Severe	Esprit trial will provide indication of expected results and guide measurements required. 6 monthly reviews of data being gathered to determine useability and highlight additional data requirements where applicable.	£ -	No	EA Technology	Possible	Severe
013	Technical	Temporary charging point installations cannot be fitted in homes	Possible	Moderate	No mitigation possible. Dependant on houses to be involved in the trial.	£ -	No	EA Technology Nissan CYC	Possible	Moderate
020	Business (Contractor/Supplier)	No access to network/utilisation data due to resource shortages within the DNOs participating in the trials.	Possible	High	Ensure regular updates meetings/teleconferences held between all parties to discuss adherance to the project plan and ensure resources are planned to be available when required. Resourcing concerns to be raised as soon as practicable and evaluated for impact to the project plan.	£ -	No	All parties	Possible	High
021	Business (Internal)	EATL unable to provide sufficient resources in the timescales necessary to deliver the project.	Possible	High	Active recruitment of additional staff is currently underway. Planning of the project to allow for anticipated resource availability as far as is reasonably practicable.	£ -	No	EA Technology	Possible	High
022	Business (Internal)	EATL spend more time project managing due to the risk above occuring.	Possible	Moderate	Ensure regular updates meetings/teleconferences held between all parties to discuss adherance to the project plan and identify risks and blockers to progress of the project.			EA Technology	Possible	Moderate
010	Business (Contractor/Supplier)	EV Supplier does not engage with project resulting in inability to test proposed system with EV vehicles.	**Continuation Requirement**	Severe	- Nissan have already provided a letter of support for the project so risk unlikely to occur.	£ -	Yes	EA Technology	Possible	Severe
007	Business (All)	Availability or loss of key resources.	Possible	Moderate	Consider succession strategies; identify and ensure suitable knowledge transfer and training to potential replacements.	£ -	No	All parties	Possible	Moderate
002	Technical	Esprit trials fail due to unforseen issues cause delay to the overall programme and loss of confidence in product.	Unlikely	Moderate	Laboratory testing to date gives no reason to expect problems with the system trials.	£ -	Yes	EA Technology	Unlikely	Moderate
006	Business (Contractor/Supplier)	Lack of buy-in from project partners.	Possible	Moderate	Unlikely as letters of support already received and companies already investing staff time in the project. Shared risks and benefits/profits agreed where applicable and long term benefits identified for all parties.	£ -	Yes	EA Technology	Unlikely	Moderate
012	Technical	PLC cannot be fitted in substations or communication medium fails	Unlikely	Moderate	Esprit system is capable of using other communication methods (such as GSM) if necessary.	£ -	Yes	EA Technology ANDTr	Unlikely	Moderate

Table 7: Risks & Mitigations Part 2

Risk Identification	Risk Category	Risk Details	Pre-Mitigation		Post-Mitigation					
			Likelihood	Severity	Mitigation Measure	Cost of Mitigation	Mitigation Applied	Owner	Likelihood	Severity
003	Technical	User clusters prove unsuitable to trial product effectively resulting in insufficient data being gathered from loading scenario.	Probable	Moderate	Liaise with as many partner and supporting agencies as possible to maximise exposure and contact to target audience groups. Significant discussion already undertaken with Fleetdrive, Nissan and County Councils.	£ -	Yes	EA Technology	Possible	Moderate
011	Business (Contractor/Supplier)	EV Supplier fails to delivers Evs and associated chargers to test site locations resulting in dellays to the trials and loss of credibility with trial participants.	Possible	Moderate	Strong workinging relationship being developed with Nissan and FleetDrive to ensure smooth delivery.	£ -	Yes	EA Technology	Unlikely	Moderate
004	General Public	Lack of buy-in from customers for trial participation prevents sufficient numbers of EVs being utilised to provide adequate data. This limits results and hence available, useful data or causes the trial to be extended resulting in delays and additional costs.	Possible	Moderate	Early discussions with Nissan & FleetDrive have resulted in sufficients quanitites of EVs promised at sufficiently low monthly costs to provide good incentives to customer participation. FleetDrive's business is also to identify, target and engage customers.	£ -	Yes	FleetDrive Nissan EA Technology	Possible	Moderate
005	Technical	Networks issues/data gathered during the trials, indicate that installation on anything other than laboratory or small scale testing require major alterations to existing networks.	Unlikely	Severe	Initial tests and domain knowledge give no indication that this will be an issue but planned Esprit trial will determine viability in the context of wider network applicability beyond the already undertaken laboratory testing.	£ -	No	FleetDrive Nissan EA Technology	Unlikely	Severe
008	General Public	Failure to identify/engage suitable clusters (10 - 20 EV drivers per feeder) potentially leading to delays in trial instigation, reduction in cluster sizes (and hence useful data). Net impact of reduction in confidence of results.	Probable	Moderate	Identify as many potential sites as possible to maximise chances of sufficient cluster sizes and begin liaison with community groups and local councils to gain their support.	£ -	Yes	EA Technology	Probable	Moderate
009	Business (Internal)	Failure of project to adequate cover lease hire costs so customer uptake insufficient preventing reasonable data gathering from trial.	Possible	Moderate	Negotiated significant reduction in normal rates for lease of Nissan Leaf EV.	£ -	Yes	EA Technology	Possible	Moderate
014	Technical	Cycling of chargers is not possible or switching off all chargers is required to meet thermal limits of a feeder.	Possible	Moderate	Undertaken desktop studies to determine effectiveness of the cycling of chargers. Indications are that shifting charging will provide significant head-room for feeders.	£ -	Yes	EA Technology	Unlikely	Moderate
016	Technical	Results from other related projects (EV) having less positive results than anticipated.	Possible	High	Ensure a good working knowledge of the national picture and similar projects. Once Esprit trial is underway expectations of results and changes to result in more appropriate tesing can be undertaken.	£ -	Yes	All parties	Possible	High
017	Technical	Other forms of transport becoming increasingly attractive, reduced rail fares, lower petrol costs etc.	Unlikely	High	No mitigation possible. Changes to current transport policies unlikely. Prices of fuel and public travel costs unlikely to reduce.	£ -	No	All parties	Unlikely	High
018	Technical	Impact of external factors economic, regulatory, environmental. I.e. EV uptake is slow and not enough are available to trial.	Unlikely	Moderate	Nissan already agreed to work as part of the trial team.	£ -	Yes	EA Technology	Unlikely	Moderate
019	Technical	Technology only works with Nissan EVs & associated charging methodology.	Possible	Severe	Engage with other EV manufacturers to ensure that the Technology with be compatible with their current and planned products.	£ 40,000.00	No	EA Technology	Unlikely	Severe

Appendix I – Risks & Contingencies Register

Table 8: Risks & Contingencies Part 1

Risk Identification	Risk Category	Risk Details	Pre-Mitigation		Contingency Action in Event Risk is Realised	Contingency Requirements			Notes
			Likelihood	Severity		Risk Closed	Cost Impact	Contingency Required	
023	Business (All)	Due to the nature of the project (research trials into new, experimental technology) it is reasonable to assume that risks that have not been specifically forseen will occur. This line allows for the impact of currently unforseen risks.	Almost Certain	High	Contingency plans to be developed as specific risks and/or blockers are identified/realised.	No	£ 175,000.00	£ 157,500.00	
015	Technical	Equipment (cars/chargers/data monitors etc.) is more expensive.	Possible	Moderate	Contingency funds allocated to allow for reasonable increase in costs due to inflation or similar. If costs rise excessively, review viability of project continuation.	No	£ 110,000.00	£ 55,000.00	
001	Technical	Limited results (insuffucient data gathered) from the trial project make it more difficult to determine technical and commercial viability and hence justification to continue with the project.	Possible	Severe	Adapt data gathering on Esprit trial and planned data capturing for main I²EV trial to maximise useful data capture.	No	£ 50,000.00	£ 25,000.00	
013	Technical	Temporary charging point installations cannot be fitted in homes	Possible	Moderate	A permanent circuit can be utilised if necessary.	No	£ 50,000.00	£ 25,000.00	Assumption of 100 of the planned 200 homes require £1k worth of additional effort/equipment to establish operation.
020	Business (Contractor/Supplier)	No access to network/utilisation data due to resource shortages within the DNOs participating in the trials.	Possible	High	EATL will recruit additonal staff to work on the DNO side of the interface to support DNO staff.	No	£ 50,000.00	£ 25,000.00	
021	Business (Internal)	EATL unable to provide sufficient resources in the timescales necessary to deliver the project.	Possible	High	Other projects will be delayed if there is insufficient resource and new recruits are not employed in time. If necessary freelance contractors will be used to supplement the internal resources.	No	£ 50,000.00	£ 25,000.00	
022	Business (Internal)	EATL spend more time project managing due to the risk above occuring.	Possible	Moderate	Project management processes will aim to resolve problems at the earliest possible time to limt costs.	No	£ 50,000.00	£ 25,000.00	
010	Business (Contractor/Supplier)	EV Supplier does not engage with project resulting in inability to test proposed system with EV vehicles.	Continuation Requirement	Severe	Discussions with other EV manufacturers will be restarted/instigated in the event of the current agreement collapsing. Project programme will be updated to reflect new delivery dates if alternative EVs manufactures join the project.	No	£ 36,000.00	£ 18,000.00	
007	Business (All)	Availability or loss of key resources.	Possible	Moderate	Provide support to 'new' resources to bring them 'up-to-speed' as quickly as reasonably practicable.	No	£ 20,000.00	£ 10,000.00	
002	Technical	Esprit trials fail due to unforseen issues cause delay to the overall programme and loss of confidence in product.	Unlikely	Moderate	- Identify cause of failure. - Undertake solution to problem if viable. - Incororate lesssons learnt from Esprit into I²EV project.	No	£ 30,000.00	£ 7,500.00	
006	Business (Contractor/Supplier)	Lack of buy-in from project partners.	Possible	Moderate	Instigate contact with other companies in the same market areas as those who have pulled out of the project.	No	£ 30,000.00	£ 7,500.00	
012	Technical	PLC cannot be fitted in substations or communication medium fails	Unlikely	Moderate	Transfer communication protocols to GSM methods.	No	£ 30,000.00	£ 7,500.00	

Table 9: Risks & Contingencies Part 2

Risk Identification	Risk Category	Risk Details	Pre-Mitigation		Contingency Action in Event Risk is Realised	Contingency Requirements			Notes
			Likelihood	Severity		Risk Closed	Cost Impact	Contingency Required	
003	Technical	User clusters prove unsuitable to trial product effectively resulting in insufficient data being gathered from loading scenario.	Probable	Moderate	Expand trial to control heat-pumps to be incorporated in clusters.	No	£ 10,000.00	£ 5,000.00	Use of heat-pumps deermined to be cost neutral in comparison to use of EVs; some costs required for additional PM (searching for customers and negotiation effort).
011	Business (Contractor/Supplier)	EV Supplier fails to delivers Evs and associated chargers to test site locations resulting in dellays to the trials and loss of credibility with trial participants.	Possible	Moderate	Instigate contact with other companies in the same market areas as those who have pulled out of the project.	No	£ 10,000.00	£ 2,500.00	
004	General Public	Lack of buy-in from customers for trial participation prevents sufficient numbers of EVs being utilised to provide adequate data. This limits results and hence available, useful data or causes the trial to be extended resulting in delays and additional costs.	Possible	Moderate	Expand trial to control heat-pumps to be incorporated in clusters.	No	£ -	£ -	
005	Technical	Networks issues/data gathered during the trials, indicate that installation on anything other than laboratory or small scale testing require major alterations to existing networks.	Unlikely	Severe	Changes to product design or trial timescales can be incorporated as required.	No	£ -	£ -	This would result in closure of the project unless system/product could be readily adapted to overcome the experienced problems.
008	General Public	Failure to identify/engage suitable clusters (10 - 20 EV drivers per feeder) potentially leading to delays in trial instigation, reduction in cluster sizes (and hence useful data). Net impact of reduction in confidence of results.	Probable	Moderate	Utilisation of heat-pumps to replace EV loading on feeders. Intention being to contact landlords who are likely to own/operate multiple properties in close proximity that may already, or could be supported in the use of heat-pumps.	No	£ -	£ -	
009	Business (Internal)	Failure of project to adequate cover lease hire costs so customer uptake insufficient preventing reasonable data gathering from trial.	Possible	Moderate	Utilisation of heat-pumps to replace EV loading on feeders. Intention being to contact landlords who are likely to own/operate multiple properties in close proximity that may already, or could be supported in the use of heat-pumps.	No	£ -	£ -	
014	Technical	Cycling of chargers is not possible or switching off all chargers is required to meet thermal limits of a feeder.	Possible	Moderate	Evaluate viability of project continuation.	No	£ -	£ -	
016	Technical	Results from other related projects (EV) having less positive results than anticipated.	Possible	High	Changes to product design or trial timescales can be incorporated as required.	No	£ -	£ -	
017	Technical	Other forms of transport becoming increasingly attractive, reduced rail fares, lower petrol costs etc.	Unlikely	High	Evaluate viability of project continuation.	No	£ -	£ -	
018	Technical	Impact of external factors economic, regulatory, environmental. I.e. EV uptake is slow and not enough are available to trial.	Unlikely	Moderate	Instigate contact with other companies in the same market areas as Nissan, potentially providing a wider range of EV trial data by using more than one type of EV.	No	£ -	£ -	
019	Technical	Technology only works with Nissan EVs & associated charging methodology.	Possible	Severe	Investigate the required changes, if possible, that would be required to enable to Technology to be utilised universally across all EV manufacturers.	No	£ -	£ -	Risk is held entirely by EA Technology as inventors & developers of the Technology.

Appendix J – Partner Profiles

Table 10: Partner Profile - EA Technology

Organisation name	EA Technology Ltd
Relationship to DNO	None
Type of organisation	An employee-owned SME, offering end-to-end technical services and products to meet the needs of operators of power networks around the world. Established in the 1960s to focus on electricity distribution and use, today they work with clients in the electricity, utilities, infrastructure and associated sectors, delivering responses to the challenges they face. EA Technology's strategy for sustainable growth is centred on contributing real value to customers, shareholders and wider society.
Role in project	Project Management, Technical Leadership & Product Development
Prior experience brought to the project	**Commercial innovation and project delivery:** EA Technology was part of the LCN Fund bid team for Northern Powergrid's 2010 Customer Led Network Revolution (CLNR) and SSEPD's 2011 New Thames Valley Vision (NTVV) Tier 2 projects. Since early 2011, the organisation has acted as 'client engineer' for the CLNR project, and is leading activity in both CLNR and NTVV project to integrate the outputs in the DNO's Business-As-Usual activity. EA Technology has successfully managed a number of multi-party collaborative projects including the Strategic Technology Programme (STP), and, more recently, the Smart Grids Forum WS3 Phase 2 activity. EA Technology was approached by SSEPD in February 2012 to spearhead this novel commercial arrangement, having been recognised as a trusted delivery body. **Technical innovation:** EA Technology has extensive knowledge of distribution networks, associated technological solutions as well as domestic low carbon technologies such as heat pumps and microgeneration. It has a rich history of involvement with electric vehicles and today poses broad experience including: integration of system studies and power quality measurements, communicating, policy writing, provision of training. The Esprit product has been developed and patented by EA Technology having recognised the potential challenges multiple EVs could pose, globally, to existing distribution networks.
Funding	EA Technology is providing in kind of £636,000 to the I²EV project; this includes technology development, product discounts and resource for programme management.
Contractual relationship	In principal, high level heads of terms / terms and conditions of contract have been agreed with SSEPD. This ensures that there will be no delay in the start of the project.
External collaborator benefits from the project	EA Technology have designed and developed the system/product being trialled and hence their gained benefit from the project is the data gathered from testing and verification of the product design.
Website	www.eatechnology.com

Table 11: Partner Profile - Nissan

Organisation name	Nissan
Relationship to DNO	None
Type of organisation	Automobile manufacturer
Role in project	Manufacturer and supplier of electric vehicles for the trials
Prior experience brought to the project	Nissan is one of the world's top car developer and manufacturing companies being one of the first to successfully bring to market EVs for use by the general public. Nissan has agreed, via a letter of intent to provide sufficient EVs to enable the necessary trials to take place. They have extensive experience in researching, identifying and marketing electric vehicles to differing demographics in the population and so provide highly valuable expertise in 'selling' the benefits of the trial and associated vehicles to the targeted trial participants.
Funding	The project will benefit from 200 – 300 vehicles and the customer contact expertise provided by Nissan, with an in kind value of ca. £1.97million.
Contractual relationship	Confidentiality agreement will be signed. In principal, high level heads of terms / terms and conditions of contract have been agreed with EA Technology. This ensures that there will be no delay in the start of the project.
External collaborator benefits from the project	Involvement in the project is primarily in the provision of in kind equipment and support; secondary benefits will be the potential identification of new market opportunities in the low carbon vehicles sector, building of new relationships, positive marketing due to the project involvement and exposure of their EVs to a large volume of potential new clients. Nissan will dedicate a resource to the project for two days per month for the duration of the project; this will cement their commitment and facilitate delivery of mutual benefits.
Website	http://www.nissan.co.uk/

Table 12: Partner Profile - Fleetdrive Electric

Organisation name	Fleetdrive Electric
Relationship to DNO	None
Type of organisation	Business vehicle leasing company
Role in project	Delivery and management of the electric vehicles
Prior experience brought to the project	Fleetdrive specialises in providing businesses with lease hire vehicles on the basis of both fleets and individual vehicles. They bring 20 years' experience in identifying, targeting and engaging customers for lease hire purposes. Fleetdrive also operates a specific division, dedicated to sourcing, providing and operating electric vehicles giving them a wide base of knowledge and experience on the current technical issues. Additionally, having been involved in early EV trials in 2008, they have prior knowledge and hence can provide advice backed with experience in the specific market sector.
Funding	The project will benefit from over 20 years' experience in sourcing, leasing and maintaining both traditional and electric vehicles for customers. Additionally, the intellectual and practical contribution of the Fleetdrive team, with an 'in-kind' value of ca. £97,000.
Contractual relationship	Confidentiality agreement will be signed. In principal, high level heads of terms / terms and conditions of contract have been agreed with EA technology. This ensures that there will be no delay in the start of the project.
External collaborator benefits from the project	Fleetdrive will develop a close working relationship with Nissan as well as gaining direct access to new potential customers for future targeted marketing and sale purposes. Additionally, experience gained in the use and applicability of the technology being trialled will enable them to more rapidly incorporate it into their future electric vehicle leases and sales.
Website	http://www.fleetdrive.co.uk/ and http://www.fleetdrive-electric.com

Table 13: Partner Profile - Charge Your Car North Ltd.

Organisation name	Charge Your Car North Ltd
Relationship to DNO	None
Type of organisation	Electric vehicle infrastructure specialist
Role in project	Provider and installer of EV charging points for trial participants
Prior experience brought to the project	Charge your Car is the North East's Plugged in Places project funded by One North East, OLEV, public and private partners. Over 60 partners in the North East including all twelve Local Authorities, private businesses, transport providers, academia, NHS, retailers, business park operators, fleet operators and electricity distributors/suppliers are already signed up to host chargers. Plugged in Places is a national programme run by the Office for Low Emission Vehicles (OLEV).
Funding	The project will benefit from over 2 years' experience in installing, maintaining and operating EV charging points for customers. Additionally, the intellectual and practical contribution of the Charge Your Car team, with an in kind value of c£30k.
Contractual relationship	Confidentiality agreement will be signed. In principal, high level heads of terms / terms and conditions of contract have been agreed with EA Technology. This ensures that there will be no delay in the start of the project. A letter of support for the I^2EV project has been received.
External collaborator benefits from the project	Charge Your Car will continue to develop their close working relationship with Nissan and OLEV, as well as gaining direct access to new potential customers for future targeted marketing and sale purposes. Additionally, experience gained in the use and applicability of the technology being trialled will enable them to more rapidly incorporate it into their future marketing plans.
Website	http://www.chargeyourcar.org.uk

Table 14: Partner Profile - Northern Powergrid

Organisation name	Northern Powergrid
Relationship to DNO	None
Type of organisation	Northern Powergrid is an electricity distribution business, delivering electricity on behalf of suppliers from the national transmission system to 3.8 million domestic and business customers. Covering an area of 25,000 square kilometres, Northern Powergrid's network extends from north Northumberland, south to the Humber and northern Lincolnshire, and from the east coast to the Pennines. The network consists of more than 31,000 substations and around 91,000 kilometres of overhead line and underground cables.
Role in project	Provision of additional network areas for Technology testing, allowing more areas of cluster grouping outside of SSE controlled areas.
Prior experience brought to the project	Lead partner in Low Carbon Networks Fund Tier 2 Customer-Led Network Revolution (CLNR) project. Knowledge of design and operation of distribution networks, including the installation of micro-generation technologies. Experience in trialling experimental technology on distribution networks, monitoring the use and Extensive knowledge of distribution networks, micro-generation, heat pumps and demand-side management. It has broad experience of practical trials and experience including: facilitation and co-ordination of technology trials, demand side management, integration of system studies, provision of monitoring, communicating, policy writing, provision of training.
Funding	Northern Powergrid will be paid by the project if clusters are identified within the network they operate.
Contractual relationship	Confidentiality agreement will be signed. In principal, high level heads of terms / terms and conditions of contract have been agreed with EA Technology. This ensures that there will be no delay in the start of the project.
External collaborator benefits from the project	Northern Powergrid will benefit from direct involvement in the trials, giving them an advantage in understanding and implementing the lessons learnt that will be disseminated to all DNOs on completion of the trials. This will support the EV trials under the CLNR project. They will also have the opportunity to build good working relationships with all other partners, making later installations of all utilised products easier for all concerned and gain direct experience of working with the Technology.
Website	http://www.northernpowergrid.com

Appendix K – removed for partner confidentiality

Appendix L – Letters of Support

Figure 1: Letter of Support - Nissan

The Office of Gas and Electricity Markets

9 Millbank

London

SW19 3GE

02 August 2012

Dear Sir / Madam,

I²EV Low Carbon Networks Fund Tier 2 bid – letter of support

Nissan welcomes the opportunity to support the I²EV project, which has a duration of three years, from January 2013 to December 2015. The project aligns wholly with Nissan's vision to place the UK at the forefront of the electric vehicle movement. The technical solution proposed and to be trialled by the project has clear synergy with Nissan's mission to ensure that customers are delighted and prioritised throughout their electric vehicle experience. Nissan appreciates the need to work in partnership to enable an informed and accelerated transition to the Zero Emission vehicle as a major mode of transport in 2020 and beyond. The learning and data that will come from the project will provide valuable evidence to ensure that customers' behaviours and needs are paramount in informing the development of the electric vehicle sector and its infrastructure going forward.

Nissan Europe supports the I2EV project; talks are underway with Nissan GB and a fleet hire company to secure electric vehicles at a subsidised monthly rental. Nissan's engagement with the I2EV project will support the provision of around 200 electric vehicles to the project for trial purposes. The project will cover for the operating expense (monthly leasing terms) linked with the vehicle usage for the duration of the project. Nissan offers the use of Nissan electric vehicle 'ambassadors' to aid with trial participant engagement; supply of quick charging points and infrastructure support is also an in principle offer to the project.

Nissan notes that the I2EV project is also partnering with Charge Your Car North Ltd, and applauds this joined up approach in terms of infrastructure support and the link with the Nissan employees' LEAF hire scheme, from which socio-economic data can be shared. Nissan welcomes this strategic partnership approach.

Nissan looks forward to maintaining momentum and working with EA Technology, SSE and partners to deliver an exciting and visionary project.

Yours faithfully,

Olivier Paturet

GM, Zero Emision Strategy

Nissan Europe SAS

Figure 2: Letter of Support - De Montfort University

DE MONTFORT UNIVERSITY LEICESTER

The Office of Gas and Electricity Markets
9 Millbank
London
SW19 3GE

9th August 2012

Dear Sir / Madam,

Letter of support to Ofgem for the Low Carbon Networks Fund Tier 2 I2EV project proposal

On behalf of De Montfort Expertise Ltd (trading arm of De Montfort University), I am confirming the organisation's agreement to take part in the proposed I2EV project, aimed at collecting and analysing the behaviour and feedback from the 200 participating households in the trial programme. Although rising fuel and energy costs represent a significant challenge to consumers in general, it is not known whether attitudes to energy companies controlling power supply to charging units will be positive or not.

Our team would like to conduct the qualitative and quantitative research into the behavioural piece behind the project. We will provide important support to a key sector in our area and help to achieve our country's targeted CO2 reductions.

There will be many valuable lessons to be learned and shared about consumer engagement, energy management and the successful adoption of renewable energy technologies.

We look forward to working with EA Technology, SSE and partners, and hope that this much needed project is funded.

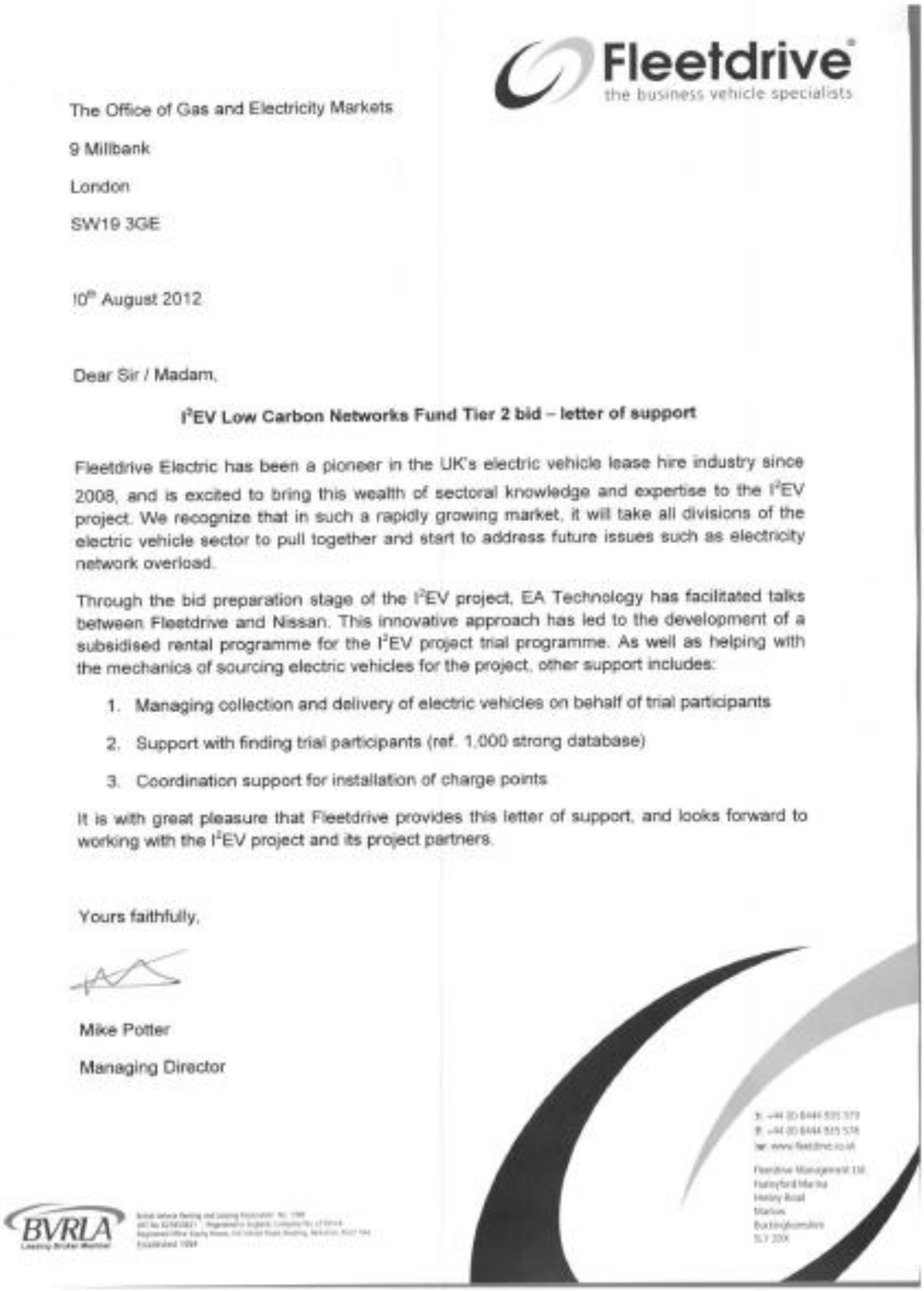
Yours sincerely

Andrew Collop

Professor Andy Collop
Pro Vice-Chancellor

De Montfort University, The Gateway, Leicester LE1 9BH
T: +44 (0)116 257 7092 **F:** +44 (0)116 250 6092 **E:** acollop@dmu.ac.uk

Figure 3: Letter of Support - Fleetdrive



Fleetdrive
the business vehicle specialists

The Office of Gas and Electricity Markets

9 Millbank

London

SW19 3GE

10th August 2012

Dear Sir / Madam,

I²EV Low Carbon Networks Fund Tier 2 bid – letter of support

Fleetdrive Electric has been a pioneer in the UK's electric vehicle lease hire industry since 2008, and is excited to bring this wealth of sectoral knowledge and expertise to the I²EV project. We recognize that in such a rapidly growing market, it will take all divisions of the electric vehicle sector to pull together and start to address future issues such as electricity network overload.

Through the bid preparation stage of the I²EV project, EA Technology has facilitated talks between Fleetdrive and Nissan. This innovative approach has led to the development of a subsidised rental programme for the I²EV project trial programme. As well as helping with the mechanics of sourcing electric vehicles for the project, other support includes:

1. Managing collection and delivery of electric vehicles on behalf of trial participants
2. Support with finding trial participants (ref. 1,000 strong database)
3. Coordination support for installation of charge points

It is with great pleasure that Fleetdrive provides this letter of support, and looks forward to working with the I²EV project and its project partners.

Yours faithfully,

Mike Potter

Managing Director

BVRLA

Figure 4: Letter of Support - Northern Powergrid

NORTHERN POWERGRID

98 Aketon Road
Castleford
WF10 5DS
jim.cardwell@northernpowergrid.com

The Office Of Gas and Electricity Markets
9 Millbank
London
SW1P 3GE

10 August 2012

Dear Sir / Madam,

I2EV Low Carbon Networks Fund Tier 2 bid - letter of support

Northern Powergrid recognises the challenge that the uptake of low carbon technologies will present to local distribution networks and welcomes the opportunity to engage with the I2EV project and to support the project's delivery and trial programme. There is a good fit between the SSEPD supported I2EV project and Northern Powergrid's own innovation strategy. Specifically, we favour working with regional leaders in the low carbon technologies space such as Nissan. We are also keen to build on our existing work and deliver synergistic benefits with our own Customer-Led Network Revolution (CLNR) learning through the existing range of partners such as EA Technology and Charge Your Car.

The Northeast of England is a pioneer in terms of electric vehicle technology and infrastructure and is a natural fit with the I2EV project in terms of working collaboratively to utilise existing electric vehicle facilities to support the trials, and to share knowledge and learning with the CLNR project.

Through linking up with the CLNR project, both the CLNR and I2EV projects will maximise benefits to customers, minimise duplication of effort and cost, and boost the learning outcomes from both projects that may be shared amongst the DNO community.

Yours faithfully,

Jim Cardwell
Head of Regulation & Strategy

Figure 5: Letter of Support - DfT & OLEV

Office for Low Emission Vehicles

Department for Transport

Dr Eamonn Beirne
Head of Infrastructure Delivery
Office for Low Emission Vehicles
1/31 Great Minster House
33 Horseferry Road
London
SW1P 4DR

14th August 2012

Dear Gill,

Thank you for meeting me last week to present the I²E project to which you are seeking Low Carbon Network Funds from Ofgem.

It is expected that in the short-term emissions reductions from road transport will be driven largely by improvements in conventional technology, but in the medium and longer-term an increased penetration of ultra-low emission vehicles (ULEVs) will be vital to meet our environmental goals. The Office for Low Emission Vehicles (OLEV) is spearheading the drive to increase the uptake of ULEVs in the UK, and is working with colleagues at the Department for Energy and Climate Change in understanding and providing for the future energy requirements to support the expected uptake of plug-in vehicles.

As we decarbonise the electricity system, the environmental benefits of plug-in vehicles will increase and it is possible they could provide a use for lower carbon night-time electricity generation or, through smart management, we could shift plug-in vehicle recharging according to when it is best for the energy system as a whole.

It is essential to understand how to manage the additional load plug-in vehicles will place on local distribution networks, and I would hope that projects like I²E will help inform the energy and the transport industries as they work together in meeting this challenge.

I wish you success in bidding for the Second Tier LCNF and you keep me and my colleague Ben Davison (Head of Energy Issues, OLEV) abreast of progress on the I²E project and any other related workstreams.

Yours sincerely,

E. Beirne

Eamonn Beirne
Head of Infrastructure Delivery

Appendix M – Outline Data Protection Strategy

Introduction

The data protection strategy for the I²EV project will cover key questions surrounding how the project will handle customer data for customer engagements. A full data protection strategy will follow to cover the entire project. The full document will also reiterate the engagement methods covered for continuity.

What the data protection strategy will cover

The data protection strategy will cover the following areas:

- Who we are engaging with and why?
- How will engagement be targeted?
- What personal data will be collected for the purposes of the Project
- How this personal data will be used
- How consent for use of the personal data will be obtained
- What information will be provided to the Customer prior to consent being sought
- If Priority Services Register Customers are included in the Project, how their personal data will be obtained
- Who owns the personal data
- How long the personal data will be retained
- How this personal data will be managed (which should be based on a "privacy by design" approach, as advocated by the Information Commissioner's Office).

Data storage

Initial customer contacts will be managed using a paper-based filing system. All customer consents and contact information will be stored on EA Technology premises and located in locked, fire-proof, filing cabinets.

Data handling

Data will only be handled by EA Technology staff who: Have been vetted in accordance with EA Technology employment practices (credit and address checks); are working on the I²EV project; and are therefore approved to handle personal data for EA Technology.