Planning Energy
for a Sustainable World

Ofgem LCNF Tier 2 Evaluations

I^{2}EV – Innovation-squared: managing unconstrained EV connections

SSEPD

Final Report

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Explanatory Note

This report, including the "traffic light" indicators that reflect issues of concern identified during the evaluation process, (other than Section 9) is based on:-

- the original full submissions that were received from the DNOs in August 2012;
- subsequent question responses through the formal written question process; and
- discussions held at meetings between the DNOs and the Expert Panel and/or PPA Energy.

In October 2012 the DNOs were given an opportunity to submit revised proposals. The traffic light indicators and the metrics shown in Sections 1 to 8 have not been changed to reflect any changes made by the DNOs in these revised submissions.

Section 9 of this report contains an addendum, which summarises changes made between the original and revised submissions, and the impact this has on the evaluation of the project against the criteria. Any significant changes to figures/metrics are noted in this addendum.

Project Summary

Full name:	I^2EV – Innovation-squared: managing unconstrained EV connections	Short name:	I^2EV
		Total cost:	£9.616 million
DNO group:	SSEPD	LCNF funding request:	£4.137 million

The Problem(s): (1) Commercial: How can innovation mechanisms for third parties (i.e. not DNO's) be opened up under RIIO as vehicles to accelerate technology development and adoption?

(2) Technical: How can increased stresses on networks - overloaded due to market growth of electric vehicles (EVs) – be cost effectively managed?

The Method(s): (1) Commercial: Lead project management by non-DNO innovation technology provider

(2) Technical: Modelling and trials of the technology ("Esprit", a monitoring and control solution to manage supply to EVs) aimed to prove that it works on a range of LV network types

The Trial(s): (1) Commercial:

Draft, agree and operate a contract for a non-DNO entity to manage a Low Carbon Network Fund tier 2 project, including establishing the obligations on each party and the responsibilities for different risks.

(2) Technical:

Socio trials – monitoring of the driving and charging behaviour of around 150 existing EV owners and EV fleet hire users

Technical trials – trialling and monitoring of the Esprit technology using clusters (10-25 on one feeder) of EV charging points, with residential customers. The aim is to have around 100 users in clusters of 10-25, using heat pump users as a fall-back if there is insufficient take-up of EV.

The Solution(s): (1) Commercial:

Use the experience of drafting, agreeing and operating a contract for a non-DNO entity to manage a Low Carbon Network Fund tier 2 project, to produce a contract template for future use by all DNOs.

(2) Technical:

Use the "Esprit" monitoring and control solution to manage supply to EVs to facilitate the expedient connection of EV chargers to the DNO low voltage network

Key strengths and weaknesses against the crtieria	Strengths: • This project is an opportunity to trial an innovative approach to the delivery of projects aimed at deploying new technology on distribution networks focused on encouraging low carbon solutions. • It is looking at a problem – distribution network stresses caused by growth in electricity demand resulting from EVs (or potentially other equipment i.e. heat pumps – which has been identified by the DNOs as a future area of significant difficulty. • The partners come from many of the most important stakeholders – an EV manufacturer, other parts of the EV supply chain, DNOs etc. Weaknesses: • There is considerable doubt about the rate of growth in the EV market. • Significant risk to the project arises from the need to recruit clusters of customers who are willing and able to participate. Whilst this has been recognised by the project and mitigating actions suggested in the event of not being able to achieve the required participation rate these seem undeveloped and substantially erode the potential benefits from the project. • It is understood that the IP in the Esprit technology which is generated during the project will be owned by EA Technology. This may conflict with the LCNF default IPR arrangements and requires full clarification. • In the event that this project is successful very significant benefits will result for Nissan, other EV manufacturers and other parts of the EV value chain. Whilst the other project partners are funding

a significant proportion of this project, it is proposed that nearly 50% of the funds are provided by the tier 2 LCNF mechanism. In view of the benefits that would accrue to other parties it is not clear that this is an equitable allocation of the costs and risks of this project.

- The project is intending to utilise an innovative approach with a non-DNO party leading the work and participants from multiple industries involved. It is not clear that the project management challenges of this have been recognised and an appropriate structure developed to deal with issues that may emerge.

1 Summary of Assessment against Evaluation Criteria

Criteria	Overall Assessment	
(a) Low carbon and benefits		Commercial Trial The benefits of the third parties leading Low Carbon Network projects are not convincingly expressed. It is not clear why this would reduce the total amount of resources (DNO and third party) required and project costs or the speed with which technology could be implemented – although the project proposers argue that the approach would allow more projects to be taken forward in parallel. Also it seems likely that many of the claimed benefits would also accrue to DNO-lead projects. Technical Trial It is recognised that the successful implementation of this technology may have the potential to ease the connection of EVs and other demand to the network. However there are doubts about the rate of growth of the EV market and the scale of the benefits of the technology (although it is recognised that the relatively low cost of deployment of the technology may mean that the overall resulting financial benefits are still positive). The project proposers indicate that the EV forecasts used have not been developed by themselves but have come from predictions used in Government reports. They recognise that the change from the medium to high scenario is an assumption but contend that it is reasonable based on the barriers that would be overcome and a number of other reasons.
(b) Value for money		Commercial Trial It is difficult to judge the costs that have been suggested here as no competitive process has been undertaken to assess them although it is

		recognised that in view of the groundbreaking nature of the approach this may have been difficult. Again it is not clear why the approach would reduce the total amount of resources required and project costs or the speed with which technology could be implemented. Thus its value for money for distribution customers is questionable. <u>Technical Trial</u> A large £740 million benefit is claimed across GB in the event of the successful roll out of the technical solution. This may be somewhat – perhaps significantly – overstated although the project proposers continue to assert that, in fact, they may have been understated. In addition as previously mentioned even if the benefits are overstated the relatively low cost of deployment of the technology may mean that there is still an overall financial benefit. The request for Tier 2 funding amounts to over £4.1 million or 47% of the total cost of the project. In view of the possible allocation of the benefits from the project it is not clear that the distribution customer should be asked to fund such a high proportion of the work and thus shoulder a potentially disproportionate share of the risks. However the project proposers point out that the proportion of funding requested from the LCNF for this project is substantially less than the average proportion for such projects over the last two years.
(c) Generates knowledge		Initially the key point was the lack of clarity regarding the ownership of foreground IP in respect of Esprit. It has been indicated that this would be owned by EA Technology, which raised the question as to whether this approach may conflict with the principles of the default IP arrangements. Subsequently the project proposer has clarified that, in summary, the learning results following the addition of Esprit (or equivalent) technology to the network will be disseminated to all parties, but the internal

		workings of the Esprit Technology, how it operates both now, and following any future improvements, will remain the IP of EA Technology. The project is intended to include trials and modelling that will address a wide range of LV network types, including cables and overhead lines on circuits with a variety of loading levels. The dissemination of information will depend on effective management and control of the process by the non-DNO party.
(d) Partners and Funding		Whilst the grouping of partners seem to provide much of the expertise that this project would require there are some doubts about the process by which they have been selected.
(f) Relevance and timing		The project draws a clear connection between the number of electric vehicles predicted to be on the road by 2023 according to the work of the Smart Grid Forum and the key assumption that fast charging will be required. Charging load of 7-8kW is cited as a requirement for fast charging. However it is understood that, at present, batteries in EVs currently have a demand requirement of 3kW per vehicle. The project is highly relevant to the anticipated change in demand patterns that will arise with the increased penetration of EV. The timing is good in terms of the anticipated roll-out of EVs in the UK. However such forecasts are subject to considerable risk including, for example, the timing of the introduction of fast charging. The project proposer has commented that whilst the number of EVs in the UK is anticipated to rise significantly in the coming decade, it is accepted that their differing predictions in the rate of uptake of vehicles. The figures used were sourced from those generated as part of Government endorsed publications, and from prediction models designed in collaboration with all UK DNOs. The numbers resulting from this are of a size that some clustering can reasonably be expected. As the technical cluster trials will

		mimic a 2030 network it is questionable whether this project is required now although it is argued by the project proposers that the preparations to prepare for new LCTs will take place over the next 5-10 years.
(g) Methodology		There is a major risk that customers can be recruited to participate in the trial. Whilst some suggested mitigations are suggested these seem fairly undeveloped or to so reduce the value of the project as to make it questionable. The project is intending to utilise an innovative approach with a non-DNO party leading the work and participants from multiple industries involved. It is not clear that the project management challenges of this have been recognised or an appropriate structure developed to deal with issues that may emerge. The project proposes a single technical solution to a single problem - that of increased demand on the distribution networks from anticipated levels of EV penetration. The technical solution is based on EA Technology's "Esprit" solution, however there is little information provided in the application about this technology. It is stated that the technology is at TRL 5 planned to be at TRL7 by Q3/Q4 2012, however there is no evidence presented to support this claim. Insufficient detail is provided in the project plan to assess whether adequate consideration has been given to the impact of delays in key activities. The project proposer has responded that the "long duration tasks" depicted on the project plan are not intended to show individual sub-tasks as at the present time it is not known how many clusters will be participating in the trial, where they are located or on what dates they will be engaged, receive the EVs and begin trial participation. As such the project plan shows the maximum duration of the tasks affected by this. Information on the tasks that are required as part of the trial (but not including durations or dates) has also been provided. In

		the event that multiple clusters sign-up and require initialising in a short space of time many of these tasks will be undertaken in parallel for the different clusters with the whole process dynamically managed as more clusters are engaged.
Successful Delivery Reward Criteria		There are eight SDRCs - four of these relate to the commercial trial and four to the technical trial. This implies that SSEPD regard the two methods within the overall project as of equivalent importance. The criteria defined are, in some cases, too general and should be made more specific. For example whilst the number of existing EV drivers to be recruited to have their driving habits recorded is specified, the number of clusters of sufficient size (i.e. at least 10 users on a single feeder with equipment installed) established is not. Also the total number of EV users with equipment installed ins also not included as part of a SDRC.

The "traffic light" system used in the table above gives an indication of PPA Energy's assessment of the information provided by the DNO in support of the project in respect of its detail, alignment with the LCNF evaluation criteria, identification and management of project risks and other aspects for each of the criteria. This is not intended to suggest whether projects should be funded or not but to point out those areas which PPA Energy believes merit particular scrutiny or consideration. Thus:-

	• Seems to be generally in line with the objectives and requirements of the LCN Fund evaluation criteria, • Whilst there are some areas where additional information would be useful, that provided is generally comprehensive and provides no immediate cause for concern.
	• Some indication that the project is in line with the objectives and requirements of the LCN Fund evaluation criteria. However further scrutiny is required to ensure this, • There are some gaps in the information provided, • Further assurance is needed to confirm that the project is viable and that risks are appropriately managed.

	• Significantly more assurance is required that the project is in line with the objectives and requirements of the LCN Fund evaluation criteria, • There are some major gaps in the information provided, • Considerable scrutiny is needed to confirm that that the project is viable and that risks are appropriately managed, • Potential major risks to the viability of the project.

In the following evaluations against the criteria, if the project is addressing various problems and/or trialling several methods and solutions, separate analysis of metrics and sub-criteria will be provided, if appropriate, for relevant criteria.

2 Criterion (a) Low Carbon and Benefits

Criterion:	Accelerates the development of the low carbon energy sector and has the potential to deliver net financial benefits to future and/or existing consumers
Overall assessment:	<u>Commercial Trial</u> The benefits of the third parties leading Low Carbon Network projects are not convincingly expressed. It is not clear why this would reduce the total amount of resources (DNO and third party) required and project costs or the speed with which technology could be implemented – although the project proposers argue that the approach would allow more projects to be taken forward in parallel. Also it seems likely that many of the claimed benefits would also accrue to DNO-lead projects. <u>Technical Trial</u> It is recognised that the successful implementation of this technology may have the potential to ease the connection of EVs and other demand to the network. However there are doubts about the rate of growth of the EV market and the scale of the benefits of the technology (although it is recognised that the relatively low cost of deployment of the technology may mean that the overall resulting financial benefits are still positive). The project proposers indicate that the EV forecasts used have not been developed by themselves but have come from predictions used in Government reports. They recognise that the change from the medium to high scenario is an assumption but contend that it is reasonable based on the barriers that would be overcome and a number of other reasons.

Metrics (as quoted by the project):

Net financial	Trial 1 – Commercial	£191,344	Network capacity	300 kW

benefit (£)[1]:	Trial 2 – Technical	£265,200	released (kW)[2]:	
	Total	£456,544		
Base case time to release capacity (months)[3]:	64		Method time to release capacity (months)[4]:	37
Potential for replication[5]:	High			

Sub-criteria	Assessment
Carbon claims (including quantitative, if provided)	<u>Commercial Trial</u> In regard to the Commercial trial it is argued that the use of a non-DNO project lead would accelerate the development and deployment of new technology (implicitly suggesting that this would lead to lower carbon emissions). It is stated that "the key benefit ... is anticipated to be the accelerated deployment of a particular solution. For this project we envisage that the time to deployment will be three years (third party led) rather than 5 years (DNO led)". In response to questioning it was subsequently explained that that this relates to the amount of DNO effort rather than the duration of the project and indicated that this would facilitate running multiple innovation projects in parallel. There is no clarity on the reasons for the size of this suggested resource reduction or recognition that seeking to

[1] The financial benefit of each method (at the trial scale) compared to the most efficient existing method; **Net financial benefit = Base case costs** (the lowest cost of delivering the Solution (on the scale outlined as part of the project) which has been proven on the GB Distribution Systems) **– Method costs** (the costs of replicating the method at the trial scale once it has been proven successful)

[2] The network capacity released by each method (the additional headroom released on the distribution system following implementation of the Method)

[3] The time it would take in months to deliver the capacity shown in "Network capacity released" under the Base Case

[4] The time it would take in months to deliver the capacity shown in "Network capacity released" using the replicated Method

[5] The estimated number of sites or % of the GB Distribution System where the method could be rolled out, up to 2040

	run such projects from outside the DNO would itself raise a number of new issues - such as the level of DNO involvement and response etc – that could have an opposing effect, thus partially or wholly negating the alleged benefits and thus carbon claims. The project proposers have explained that the reduction in DNO resources to project manage is relative to the volume of work being undertaken in a given timeframe and that as the approach has not yet been trialled it is based on a belief of the amount of work that would be offloaded by the DNO to a third party. They also acknowledge that involvement of a third party will present new challenges. <u>Technical Trial</u> For the technical trial there is a reference that the achievement of carbon claims are based on the estimated increased uptake of EVs as a result of minimising costs and difficulties of installing charger facilities. This seems to have been assessed based on a top-down assessment as follows:- “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 ... estimate of the carbon savings attributable to the Technology is ... estimated to be 33.5 million tonnes by 2030.” Forecasting the future growth of EV vehicles is clearly difficult and risky and many factors are likely to impact on it. However it is as least questionable whether such a change in the growth profile could be attributable to the use of this technology. Thus it is problematic to validate the scale of the planned benefit although the successful implementation of the technology would be likely to result in at least some carbon benefits. The project proposers indicate that the EV forecasts used have not been developed by themselves but have come from predictions used in Government reports. They recognise that the change from the medium to high scenario is an assumption but contend that it is reasonable based on the barriers that would be overcome and a number of other reasons.
Quantitative analysis	This is discussed in the previous section.

Robustness of financial benefits	<u>Commercial Trial</u> The net benefit of the suggested solution (were it be fully rolled out) is suggested to be nearly £14 million by 2040 based on its application to 40 projects. As previously mentioned there are significant doubts about the benefits (if any) that would arise from the approach and also about the number of projects. In response to questions the project proposers recognise that it is based on the extrapolation using a small pool of existing projects and also state that "a further reducing factor (has been) applied (to the number of projects) to ensure that a more reasonable level of applicability was considered". It is suggested that a further benefit of this approach allows technology to be tested on more than one DNO's network - as costs would increase if two projects undertaken separately. However other alternatives – such as several DNOs partnering on a project - are not considered. Indeed it could be argued that many of the claimed benefits are not exclusive to third-parties leading projects, which has been recognised by the project proposers. <u>Technical Trial</u> The benefits from this project are based on the assumptions that there are 10 trial sites at each of which 300m of cable would need to be laid at a total cost of £295,200 compared with a target cost for the Esprit technology of £3,000 per site (the costs at this stage are higher than this). This does not include the cost of the "intelligent socket" which, for full implementation, would be borne by the customer - note that for this proposal such costs are to be met by the project. It is then estimated that the total British savings should the technology be rolled out across relevant substations amounts to £740 million by 2040. This seems somewhat questionable as it is not clear that the Esprit technology, if successful, can wholly avoid the need for the reinforcement of the network or merely delay it. It seems likely that in reality a mix of situations will arise where there are varying periods for which the reinforcement is delayed suggesting a lower overall benefit. The project proposers argue that as it has been assumed that the Esprit technology is only applied to some substations (i.e. those where EV load has stressed the network) that the mix of avoidance or delay of

	reinforcement has already been taken account of, and that because other loads, such as heat pumps, may also stress the network, in fact the benefits have been understated. Despite this explanation there remains some uncertainty that the approach will deliver the scale of benefits that are suggested although it is recognised that the relatively low cost of deployment may mean that the resulting overall financial benefits are still positive. It was not initially clear whether the underlying number of substations where it is assumed that the technology will be applied is limited to those where EV is the driver for its use or, in addition, to others where other potentially controllable loads may be utilised. However it has been subsequently explained that whilst the project intends to utilise EV as the primary loads in the tria,l other loads can be controlled in the same way.
Capacity released (and how quickly)	This is estimated to about 30 kW per feeder (on the assumption that 20 EV chargers can be installed rather than 10) or 390 MW over the 130,000 relevant feeders envisaged under the Smart Grids Forum work-stream 3 model. This thus depends on the effectiveness of the technology in spreading the demand of the chargers and the acceptability of this to customers. The project proposers have indicated that the evaluation of the effectiveness of the technology is part of the learning to be generated by the project
Replication (applicability of technology, dependence on specific network characteristics)	As part of their method, EA Technology want to evaluate the range of networks where their solution will be effective, and identify any areas where they think it will not be suitable.

3 Criterion (b) Value for Money

Criterion:	Provides value for money to distribution customers
Overall assessment:	Commercial Trial It is difficult to judge the costs that have been suggested here as no competitive process has been undertaken to assess them although it is recognised that in view of the groundbreaking nature of the approach this may have been difficult. Again it is not clear why the approach would reduce the total amount of resources required and project costs or the speed with which technology could be implemented. Thus its value for money for distribution customers is questionable. Technical Trial A large £740 million benefit is claimed across GB in the event of the successful roll out of the technical solution. This may be somewhat – perhaps significantly – overstated although the project proposers continue to assert that, in fact, they may have been understated. In addition as previously mentioned even if the benefits are overstated the relatively low cost of deployment of the technology may mean that there is still an overall financial benefit. The request for Tier 2 funding amounts to over £4.1 million or 47% of the total cost of the project. In view of the possible allocation of the benefits from the project it is not clear that the distribution customer should be asked to fund such a high proportion of the work and thus shoulder a potentially disproportionate share of the risks. However the project proposers point out that the proportion of funding requested from the LCNF for this project is substantially less than the average proportion for such projects over the last two years.
Metrics (as quoted by the project):	
Size of benefits to distribution system[6]	£740 million

[6] Size of benefits attributable or applicable to the Distribution System versus elsewhere

Sub-criteria	Assessment
Proportion of benefits attributable to distribution system (as opposed to elsewhere on supply chain)	Commercial Trial If the benefits that have been asserted actually arise from the commercial trial, these would accrue to the distribution business and its customers. Technical Trial As explained in the previous section in terms of avoided reinforcement in the distribution system, a £740 million benefit is claimed across GB in the event of the roll out of the technical solution. This may be somewhat – perhaps significantly – overstated although the project proposers continue to assert that, in fact, they may have been understated. In addition as previously mentioned even if the benefits are overstated the relatively low cost of deployment of the technology may mean that there is still an overall financial benefit. It could be argued that if the technology is successful very large benefits may accrue to Nissan (and other EV manufacturers), other parts of the EV value chain, and to EA Technology through the sale of the Esprit technology. No figures have been presented in the proposal to help to assess the level of benefits that may arise to other parties but potentially these could be very significant indeed.
How learning relates to the distribution system	The learning that is envisaged by the project relates to the distribution system.
Approach to ensuring best value for money in delivering projects	Commercial Trial No commercial process has been applied by SSEPD in selecting EA Technology as the lead for this project as a result of, it was stated, its groundbreaking nature. The project proposers argue that this is a reasonable approach at this stage. However SSEPD stated that it was intended for future such arrangements to be subject to such an approach. Other participating organisations have selected either

	competitively or because of their specialised resources or skills. <u>Technical Trial</u> Perhaps because of the nature of this project there appears to have been little competitive pressure regarding the cost estimates. Partners seem to have been attracted to it by EA Technology and SSEPD. In a number of cases significant external in-kind support has been provided - more than £2.6 million from Nissan and £675,000 from EA Technology. This means that the majority of the finance is provided by other than the Low Carbon Network Fund. However the request for Tier 2 funding still amounts to over £4.1 million or 47% of the total cost. In view of the possible allocation of the benefits from the project it is not clear that the distribution customer should be asked to fund such a high proportion of the work and thus shoulder a potentially disproportionate share of the risks. However the project proposers point out that the proportion of funding requested from the LCNF for this project is substantially less than the average proportion for such projects over the last two years.
Identify and review major cost items, examine justification for relevant costs, assess choice of discount rates	The largest components of the project for which Tier 2 funding is being sought are contractors and equipment (and there is also a significant contingency although the project proposers argue that it is reasonable for a research and development project substantially undertaken by an SME and that it will be returned to the fund if it is not spent). As previously mentioned the absence of a competitive process for some aspects of the project raises some concerns about these costs although other aspects raised above have greater importance.

4 Criterion (c) Generates Knowledge

Criterion:	Generates knowledge that can be shared amongst all DNOs
Overall assessment:	Initially the key point was the lack of clarity regarding the ownership of foreground IP in respect of Esprit. It has been indicated that this would be owned by EA Technology, which raised the question as to whether this approach may conflict with the principles of the default IP arrangements. Subsequently the project proposer has clarified that, in summary, the learning results following the addition of Esprit (or equivalent) technology to the network will be disseminated to all parties, but the internal workings of the Esprit Technology, how it operates both now, and following any future improvements, will remain the IP of EA Technology. The project is intended to include trails and modelling that will address a wide range of LV network types, including cables and overhead lines on circuits with a variety of loading levels. The dissemination of information will depend on effective management and control of the process by the non-DNO party.
Metrics (as quoted by the project):	
Conforming to default IPR arrangements:	It is stated that the project will be managed in accordance with the default IPR requirements. However please see further comments below.

Sub-criteria	**Assessment**
Potential for new/incremental learning to be generated by the project	The application splits knowledge generation into that which is associated with commercial innovation (through the use of a non-DNO party to deliver the project) and technical innovation. The latter includes insight into changing customer behaviours and attitudes, the impact of the technology in reducing feeder load and learning around the installation of the necessary equipment. The knowledge base that is expected to be expanded is therefore fairly broad. The claims that the project is going to generate significant new

	learning in relation to the contractual arrangements around running a project with a third party responsible for overall delivery seem somewhat overstated, given the range of outsourcing that DNOs typically undertake today although the project proposer argues that there are significant differences in the approach suggested here compared with other outsourcing arrangements. The technical learning that is identified, in the areas of the impact of the control technology on the network, the use of power line carrier communications in potentially "noisy" control environments, the range of technical and behavioural issues arising for manufacturers and consumers, and overall project validation, have reasonable potential to add value.
Applicability of learning to other DNOs	The consortium now includes collaboration with Northern Powergrid to build on the links that could exist between the I^2EV and Customer Led Network Revolution projects. It is claimed that the trials are going to be implemented on more than one DNO network. Whilst it was not initially clear which other networks were to be involved the project proposer has now clarified that Northern Powergrid (NP) is a project partner and it is the intention that some clusters will be located within its area. It has also been stated that if insufficient clusters are identified within the areas operated by SSE and NP but potential clusters exist elsewhere then the relevant DNO will be contacted. The applicability of learning is likely to be highest for those DNOs with large densities of residential consumers where high penetration of EVs may be expected in a small geographical area.
Proposed IP management and any deviations from default IP principles	It is stated that this project does not propose to deviate from the default IP principles and that the Foreground IP will be actively shared with DNOs. The Technology that is to be initially utilised is the background IP of EA Technology – who have indicated that a non-exclusive licence to use it will be granted to the other participants in the project solely for the purposes of the project during its term. At the meeting between the I^2EV project team and Ofgem's consultants on 4 September it was stated that IP in respect of Esprit developed during the I^2EV project would be owned by

	EA Technology. This raised the question as to whether the approach may conflict with the principles of the default IP arrangements. The project proposer has subsequently indicated that during the the I²EV project, two streams of IP will be developed in relation to the Esprit Technology as follows:- 1. Technical Applicability - IP relating to the use of the Esprit (or equivalent) Technology on the UK network, including perceived and actual impacts to end consumers, operation of connected devices such as EVs and Heat-Pumps, and data transmission problems on specific local networks. This will be provided to all project partners, the LCNF and GB Licence Holders in line with the default LCNF IP Terms. 2. Technical Development: The IP relating to further research, development and technical improvements to the Technology will be undertaken by EA Technology, at its own cost. As such, IP generated in relation to the technical improvements will not be made available beyond the limited 'non-exclusive licence' to the relevant background IPR to other participants.
Credibility of proposed methodology for capturing learning from the trial and plans for disseminating	The project aims to include dissemination of learning to a wide range of potential users of the technology beyond the DNO community. This includes a significant campaign to achieve customer engagement and encourage participation in the trials. A communications specialist has been engaged for the project to achieve this outcome. Use of a project specific website, social media, national and local press/radio and specific publications/leaflets is proposed.

5 Criterion (d) Partners and Funding

Criterion:	Involvement of other partners and external funding		
Overall assessment:	Whilst the grouping of partners seem to provide much of the expertise that this project would require there are some doubts about the process by which they have been selected.		
Metrics (as quoted by the project):			
Total cost of project (£):	£9.616 million	LCNF support (£)[7]:	£4.137 million
Costs met by DNO (£):	£0.471 million	Costs met by others (£):	£4.908 million
LCNF support (% of total cost)[8]:	43.02%	Costs met by DNO (% of total cost):	4.90%
Costs met by others (% of total cost):	51.04%	Number of consortium members:	8 project partners; 3 project supporters (including academic partners)

Sub-criteria	**Assessment**
Appropriateness of collaborators (including experience, expertise and robustness of commitments)	The academic partners are yet to be finalised (Project Evaluation (University 1) and Technical Modelling (University 2)). Nissan brings in significant experience in EV car making and involvement in previous LCNF and IFI projects. The innovative structure proposed for this project means that the DNO's role as a thin administrator is somewhat unclear and, although the project proposer has drawn attention to a short

[7] This represents the funding provided by the LCNF at the beginning of the project and does not take account of the assumed working capital/interest benefits that accrue from the DNO holding these funds until they are gradually spent over the lifetime of the project

[8] Based on the funding provided by the LCNF at the beginning of the project

	description of the intended approach in the bid document and an organisational chart provided in response to a question, there is still some residual doubt about the depth to which the operating arrangements have yet been developed. However it is recognised that the development of the contract between the DNO and the third party service provider will be a further opportunity for this to be deepened and strengthened.
Level of external funding (presented on a comparable basis with other Projects)	A significant external funding has been offered amounting to more than half of the total costs.
Effectiveness of process for seeking and identifying new project partners and ideas	Whilst SSEPD stated that a quantitative tender process is being used to choose the (as yet unselected) academic partners to carry out socio economic and technical modelling, there is no indication of the same being done for the other partners. This includes Nissan, EA Technology, Fleet Drive, Charge Your Car North etc. Thus questions exist regarding the effectiveness of the process for choosing all project partners. There are also questions around why academic partners are considered appropriate for independent network modelling and technical evaluation rather than parties with more practical experience of project implementation. The project proposer has indicated that a number of academic institutions have been invited to tender for involvement in the project in the areas of socio-economic modelling, network modelling, and independent project verification. This was done as the benefits brought to the project by the academic institutions were significant in regard to their depth of knowledge, expertise in undertaking and evaluation projects and lack of bias..

6 Criterion (f) Relevance and Timing

Criterion:	Relevance and timing
Overall assessment:	The project draws a clear connection between the number of electric vehicles predicted to be on the road by 2023 according to the work of the Smart Grid Forum and the key assumption that fast charging will be required. Charging load of 7-8kW is cited as a requirement for fast charging. However it is understood that, at present, batteries in EV's currently have a demand requirement of 3kW per vehicle. The project is highly relevant to the anticipated change in demand patterns that will arise with the increased penetration of EV. The timing is good in terms of the anticipated roll-out of EV in the UK. However such forecasts are subject to considerable risk including, for example, the timing of the introduction of fast charging. The project proposer has commented that whilst the number of EVs in the UK is anticipated to rise significantly in the coming decade, it is accepted that their differing predictions in the rate of uptake of vehicles. The figures used were sourced from those generated as part of Government endorsed publications, and from prediction models designed in collaboration with all UK DNOs. The numbers resulting from this are of a size that some clustering can reasonably be expected. As the technical cluster trials will mimic a 2030 network it is questionable whether this project is required now although it is argued by the project proposers that the preparations for new LCTs will take place over the next 5-10 years.

Metrics (as quoted by the project):			
Start date:	07/01/2013	Elapsed time of project:	36 months

Sub-criteria	Assessment
Significance in the project in: (a) overcoming current obstacles to	Overloading of LV circuits in the presence of increased penetration of EVs,heat pumps or other such loads is a recognised problem. The costs and physical challenges of achieving all the necessary network reinforcements potentially may be reduced using the Esprit technology, subject to greater clarity as to the material impact of the technology in enabling

a low carbon future	clusters of charging (or fast charging load at the level of 7-8kW) to be accommodated. The Smart Grids Forum Work Stream 3 report (2011) lists "Intelligent integration of EV" as one of their Smart Grids "Use Cases" for around 2020. The business need is: "Intelligent charging of electric vehicles using data link between vehicle and local network". The numbers given (in terms of EV by 2023 / 2050) agree with the report although such forecasting is likely to be hazardous. The project proposer has commented that whilst the number of EVs in the UK is anticipated to rise significantly in the coming decade, it is accepted that their differing predictions in the rate of uptake of vehicles. The figures used were sourced from those generated as part of Government endorsed publications, and from prediction models designed in collaboration with all UK DNOs. The numbers resulting from this are of a size that some clustering can reasonably be expected. The project aims to prevent DNOs becoming a barrier to the uptake of EVs.
(b) trialling new technologies that could have a major low carbon impact	The technology proposed in the project consists of controlling the circuits to which charging and fast charging installations are connected in order to minimise the additional demand on LV feeders that this presents at time of system peak. This would enable larger quantities of EV to be charged from existing circuit capacity, assuming that: a) the Esprit technology is effective in controlling charging load, and b) the pattern of charging that results is acceptable to vehicle users. These are fundamental technical points that can be assessed from studies ahead of the trials; there is insufficient information available at present to confirm the likely effectiveness of the project.
(c) demonstrating new system approaches that could have widespread	The basic premise of the project, that loading on LV feeders is going to become higher and require significant management as EV and/or heat pump penetration increases, is a reasonable one. The proposed approach to direct control of connected loads offers the potential for widespread application, subject to

application	proving the acceptability of frequent switching of supplies to charging loads, and the reliability of PLC communications to effect the switching (although the project proposer argues that direct control of the technology is an important but not vital part of the Esprit technology).
Applicability of the project to future business plans, regardless of uptake of Low Carbon Technologies (LCTs)	The applicability of this project in a scenario of minimal uptake of LCTs would be lower, since the requirement for load shifting (and the practicality of doing it for loads other than those that can be placed on separate circuits) will be lower if demand growth is not affected by the high penetration of low carbon loads. However the project proposer contends that even in these circumstances naturally occurring clusters would cause difficulties to DNOs. Whilst this may be true it is unlikely that the scale of this would be very great.

7 Criterion (g) Methodology

Criterion:	Demonstration of a robust methodology and that the project is ready to implement
Overall assessment:	There is a major risk that customers can be recruited to participate in the trial. Whilst some mitigations are suggested these seem fairly undeveloped or to so reduce the value of the project as to make it questionable. The project is intending to utilise an innovative approach with a non-DNO party leading the work and participants from multiple industries involved. It is not clear that the project management challenges of this have been recognised and an appropriate structure developed to deal with issues that may emerge. The project proposes a single technical solution to a single problem - that of increased demand on the distribution networks from anticipated levels of EV penetration. There is continuing development of the technology with an associated technology risk. The technical solution is based on EA Technology's "Esprit" solution. However there is little information provided in the application about this technology. It is stated that the technology is at TRL 5 and planned to progress to TRL7 by Q3/Q4 2012. However there is little evidence presented to support this claim although during discussions EA Technology indicated that they were confident that this could be achieved. Insufficient detail is provided in the project plan to assess whether adequate consideration has been given to the impact of delays in key activities. The project proposer has responded that the "long duration tasks" depicted on the project plan are not intended to show individual sub-tasks as at the present time it is not known how many clusters will be participating in the trial, where they are located or on what dates they will be engaged, receive the EVs and begin trial participation. As such the project plan shows the maximum duration of the tasks affected by this. Information on the tasks that are required as part of the trial (but not including durations or dates) has also been provided. In the event that multiple clusters sign-up and require initialising in a short space of time many of these tasks will be undertaken in parallel for the different clusters with the

	whole process dynamically managed as more clusters are engaged.		
Metrics (as quoted by the project):			
Requested level of protection against cost over runs (default 5%) (%):	0%	Requested level of protection against direct benefits (default 50%) (%):	0%

Sub-criteria	Assessment
Feasibility of project proposal	The overall project proposal is well thought through in terms of the need for participation from EV users. The aspiration of the project is to connect clusters of around 20 EV (in the range 10-25) per LV feeder and to work with a sample of 10 feeders. Whilst the project has recognised the difficulties of the recruitment of sufficient customers to participate and is making efforts to identifying methods of doing so, there is a major danger that they may not be able to do so. Users must be, among other things:- • Willing to use an EV • Located as part of a cluster of users on one of 10 single feeders • Have the ability to install a charging point at a convenient location • Able to have installed an additional circuit and monitoring equipment • Able to accept any risks of less battery power in the EV than they are expecting • Able to accept (if necessary) the location of any other vehicles that they may own at a separate location for the duration of the trial This seems very challenging and to lead to a significant project risk that sufficient customers who are willing, able and

	appropriately located cannot be identified. The project proposer acknowledges that there is a "reasonable" element of risk inherent in the plan to engage sufficient clusters of users for project participation but contends that project partners have already been independently contacted by multiple parties, enquiring about how to be participants in the trial and that the proposed monthly cost for each EV is sufficiently low as to make it an extremely attractive opportunity. The project proposer has stated that in the resubmitted proposal a stage gated approach will be introduced under which funds related to the implementation of a cluster would only be released when a cluster is identified Also more funds will be allocated to the process of contacting potential groups about clusters.
All risks, including customer impact, exceeding forecast costs and missing delivery date	Consideration has been given to the range of mitigating measures needed if insufficient EV take-up is achieved in the proposed clusters to enable statistically significant trials to proceed, in terms of the range of measures proposed to publicise the trials and to encourage customer participation. Reference is also made at various places in the application to the Technology being applicable to heat pump installations as well, and candidate social housing schemes have been identified. Overall however there remains considerable doubt that these customer related issues can be overcome. Further work is required on the project risk register. In particular:- • the completeness and adequacy of the range of risks that have been identified needs to be verified • there is a lack of information as to the potential effectiveness of the proposed mitigation strategies. (All of the risks appear to have the same likelihood/severity post-mitigation as pre-mitigation. The project proposer recognises that this resulted from the version of the risk register presented in the bid and has provided an alternative "pre-mitigation" version. In addition it is stated that the risk register is a live document which will evolve through the life of the project).

Whether items within project budget provide value for money	See Criterion (b) and in particular Sub-Criterion "Identify and review major cost items..."
Project methodology (including depth and robustness of project management plan)	A project plan has been provided although the level of detail is relatively low with a number of long period tasks that need to be broken into more detail. The project proposer has responded that the "long duration tasks" depicted on the project plan are not intended to show individual sub-tasks as at the present time it is not known how many clusters will be participating in the trial, where they are located or on what dates they will be engaged, receive the EVs and begin trial participation. As such the project plan shows the maximum duration of the tasks affected by this. Information on the tasks that are required as part of the trial (but not including durations or dates) has also been provided. In the event that multiple clusters sign-up and require initialising in a short space of time many of these tasks will be undertaken in parallel for the different clusters with the whole process dynamically managed as more clusters are engaged. A brief description of the approach to project management has been given. However in view of the innovative nature of the delivery mechanism that is being used a more detailed explanation of this would have been helpful. An "organogram" was also included within the proposal but this mainly showed the organisations within the project rather than a project management structure. It is not clear that the parties have fully addressed the issues associated with managing a project of this nature using the innovative model that they have selected. A more comprehensive diagram was subsequently provided. There are a number of aspects of the Technology installation that are dependent on charger manufacturers being prepared to implement switching logic in their devices (which may not be relevant at this stage as Esprit may be deployed as a separate device) or on site-specific installation issues. Resolving these will be essential to the timely deployment of the trial. It is claimed that a technology trial within 3 years will be possible, using a third party management body, compared with 5 years under a DNO led project. Given the dependence on the DNO for the actual implementation of the trial, this claim seems hard to justify. The efficiency of delivering the trials

	will be highly dependent on the DNO/contractor relationship. It is noted that EA Technology and SSEPD appear to have entered into a risk sharing arrangement in relation to the 10% contribution that the DNO is making to the project.
Appropriateness of Successful Delivery Award Criteria (SDRC)	See Section 8

8 Successful Delivery Reward Criteria

Criterion:	Appropriateness of the SDRC definitions and timing and adequacy of links to key project milestones.
Overall assessment:	There are eight SDRCs - four of these relate to the commercial trial and four to the technical trial. This implies that SSEPD regard the two methods within the overall project as of equivalent importance. The criteria defined are, in some cases, too general and should be made more specific. For example whilst the number of existing EV drivers to be recruited to have their driving habits recorded is specified, the number of clusters of sufficient size (i.e. at least 10 users on a single feeder with equipment installed) established is not. Also the total number of EV users with equipment installed is also not included as part of a SDRC.
Review:	There are eight SDRCs - four of these relate to the commercial trial and four to the technical trial. This implies that SSEPD regard the two methods within the overall project as of equivalent importance. The criteria defined are, in some cases, too general and should be made more specific. In regard to the commercial trial, two SDRCs refer to experience of having a third party producing the Tier 2 bid, the contractual arrangements between the third party and the DNO, and the learning experience of programme management. The delivery of a template contract is one piece of evidence suggested and this would be a useful legacy document demonstrating the progress made. However other aspects are reports on the experience and learning. It is not clear that these would be sufficiently independent and comprehensive. The project proposer has commented that as these reports will be produced by all of the project partners, the diversity of views will ensure appropriate insights into the success of the project. In Criterion 9.4 there is a reference to 6 monthly independent reviews. This could be helpful but again only if truly independent. Perhaps the best way to test effectiveness of the approach is the

	success of the technical part of the trial. Hence these SDRCs should be as specific as possible. Whilst this has to some extent been achieved further improvement should be possible. For example whilst the number of existing EV drivers to be recruited to have their driving habits recorded is specified, the number of clusters of sufficient size (i.e. at least 10 users on a single feeder with equipment installed) established is not. Also the total number of EV users with equipment installed is also not included as part of a SDRC.

9 Addendum: Changes made in resubmission

9.1 Summary of Changes

SSE submitted a revised project proposal in mid October 2012 following meetings and discussions with the Expert Panel and PPA Energy, and after receiving and responding to written questions.

SSE made numerous minor editorial changes which, they explained, were aimed at improving the clarity of their explanations together with the alignment of referencing for appendices and section diagrams. Whilst useful in ensuring understanding of the proposal, these changes have not had a material impact on it.

In addition there were a number of cases where SSE has provided additional material often following discussion at the Expert Panel or consultants meetings or the submission of a written question. Again, SSE explained that these were intended to expand the clarity of the case or to provide some additional evidence regarding the particular point being made. Whilst useful these have had only a limited impact on the issues raised earlier in this report. The topics covered included:-

- A more detailed explanation of the assumed drivers for the expected numbers of EVs and further information on expected EV releases
- Further clarification of the expected carbon benefits from use of the Technology
- A more detailed description of the claimed benefits of third party leadership of DNO LCNF projects and explanation of their calculation
- Further information about the technical trial design
- Further information on the regulatory issues related to the implementation of the Technology
- Further details of customer impacts
- Refinement of the SDRCs
- An updated risk register

There were a number of areas where some rather more significant changes have occurred or information clarified or provided. These are discussed below.

9.1.1 <u>LCNF Tier 2 Funding Request</u>

The amount of funding requested for the project from the LCNF has increased in the resubmitted proposal from £4.137 million to £4.175 million – or by just under £38,000. This seems to have arisen from some costs changes resulting from the completion of a tender process. Whilst this is clearly a small financial change it is surprising that SSE have felt the need to make such an amendment at such a late stage of the project review process and in view of the significant contingencies that are included.

In addition there appears to have been a change in the mix of expenditure between the original and revised submissions. The original submission indicated that equipment costs would amount to £1.353 million and contractors’ costs to £3.222 million whereas in the resubmission these costs were forecast to be £0.641 million and £3.973 million respectively. No explanation for these changes has been identified

9.1.2 Project Stage Gating and Additional Information on Clusters

Further information has been provided on pre-project activity to generate customer clusters (of more than 10 participants on a single feeder). It is also stated that “an additional incentive will be a further subsidy from the project to cluster participants. This should encourage those interested to sign up their neighbours”.

In addition additional information has been provided on the role of Automotive Comms in engaging customers for the project.

In the resubmission SSE have introduced a process by which the approach and progress in establishing trials of customer clusters will be independently evaluated at various points in the project lifetime. A diagram of the process was also provided. It is stated that funds for installing clusters will only be released as they are established. However there is no clear statement of how the amount of money to be released at each stage will be calculated. It is also stated that the maximum amount of LCNF funding that would be required if no clusters were established would amount to £1.75 million.

9.1.3 IPR

A far more detailed explanation of the treatment of IPR has been provided. This states “in summary, the learning results following the addition of Esprit (or equivalent) technology to the network will be disseminated to all parties, but the internal workings of the Esprit Technology, how it operates both now, and following any future improvements, will remain the IP of EA Technology”.

9.2 Impact on LCNF Funding Request

In this section the impact of the additional material provided during the project review process and the changes made by SSE to the proposal are considered for each criterion.

9.2.1 Criterion (a) Low Carbon and Benefits

A number of concerns are expressed earlier in the report regarding this criterion. More information has been provided and although this has substantially mitigated those concerns they have not been fully addressed. It may be that in regard to the “commercial” trial of using a third party to deliver the project, its innovative nature means it is not possible to fully allay the concerns without undertaking the project i.e. it is part of the learning.

9.2.2 Criterion (b) Value for Money

It is recognised that this project funding request from the LCNF is comparatively low and a high proportion of the project costs are being met by other parties. There remain concerns about the claimed benefits of both the commercial and technical elements of the trial but, in respect of the former, as previously, more information on this should emerge as part of the learning from the project; and regarding the latter, even though there remain doubts about the level of claimed benefits, the comparatively low cost of the Technology would suggest that, if successful, benefits may still arise.

9.2.3 Criterion (c) Generates Knowledge

The key concern here was the lack of clarity regarding the ownership of foreground IP in respect of Esprit. This has been addressed in the resubmitted proposal and this concern has been allayed

9.2.4 Criterion (d) Partners and Funding

It is recognised that tendering processes to select suitable partners for aspects of the project have progressed during the assessment process and that SSE have stated that should the delivery approach being trialled here be successful that other, perhaps tender type processes may be appropriate for selecting more of the partners.

9.2.5 Criterion (f) Relevance and Timing

It is accepted that the relevance and timing of the project has been broadly demonstrated.

9.2.6 Criterion (g) Methodology

Major concerns were identified in regard to the recruitment of suitable customer clusters to undertake this project. In response to these, in the resubmission a project stage gating approach has been introduced such that funds for installing clusters will only be released as they are established and verified by an independent assessor. This represents a major step in allaying these concerns. However the details of the method by which the scale of the funds to be released is calculated has still not been provided. Thus there are residual concerns about the role of the independent assessor. For example, there is little clarity about the approach that the independent assessor will use to assess the robustness and sustainability of the clusters that are proposed; as already mentioned, the detailed method by which the scale of the funds to be released will be calculated has not been provided, and no arrangements have been proposed that demonstrate and ensure the independence of the assessor.

9.2.7 Successful Delivery Reward Criteria

These have been refined and improved in the resubmission.