

EDFT2001 PROFORMA ADDENDUM

Proforma box number/ Spreadsheet	Where the latest information can be found
Box 2 Project Description	Response to EDFE 006 provides detailed explanation of the ways in which learning will be extrapolated to the whole of the UK.
Box 4 and Appendix 6 Derogations	Response to EDFE004 clarifies the position relating to derogations arising from ETR 130 guidance and ER P2/6 security
Box 4 and Appendix 6 Derogations	<p>Response to EDFE022 specifies an additional successful delivery reward criteria commitment to minimise CIs/CMLs subject to relief from IIS through the derogation (i.e. planned shutdowns to install monitoring devices).</p> <p>Response to EDFE022 also provides additional information relating to:</p> <ul style="list-style-type: none"> <li>• the estimated number of customers who might be affected if planned shutdowns are required to install monitoring at substations;</li> <li>• the potential duration of the outages; and</li> <li>• the potential IIS penalty that would be incurred.</li> </ul>
Box 4 and Appendix 6 Derogations	Response to EDFE024 provides further clarification in relation to temporary derogations which may be required by the trials.
Box 4 and Appendix 6 Derogations	Response to EDFE025 provides clarity on the proposed charging arrangements relating to the achievement of the licence condition objectives set out in SLC 13.3
Box 4 and Appendix 6 Derogations	Response to EDFE039 clarifies arrangements for compensating customers adversely impacted by the trials.
Box 7 Equipment Costs	Response to EDFE012 provides additional information relating to aggregator devices.
Box 7 Equipment Costs	Response to EDFE014 provides additional information relating to substation upgrades.
Box 10 Other Costs	<p>In response to EDFE007, the additional attachments provide further information on the Carbon Tools to be utilised by the project. The attachments are:</p> <p>EDFT2001 EDFE007 Carbon Tools'  'EDFT2001 EDFE007 ENXSuite-Overview'  'EDFT2001 EDFE007 ENXsuite Report Samples'  'EDFT2001 EDFE007 ENX Company-Overview-Aug-2010</p>
Box 10 Other Costs	Response to EDFE017 provides additional information relating to the Siemens Operational Data store
Box 10 Other Costs	Response to EDFE018 provides additional information relating to Imperial College involvement and the Learning Laboratory
Box 13 Successful Delivery Reward Criteria	<p>Response to EDFE023 provides clarification of the Successful Delivery Reward Criteria and the Learning Laboratory report structure.</p> <ul style="list-style-type: none"> <li>• In our response to consultation on Licence Condition CRC8 we committed to use all reasonable endeavours to ensure that the total level of (LPN) customer interruptions and (LPN) customer minutes lost as a result of planned shutdowns to install substation monitoring devices directly associated with the project</li> </ul>

	would not exceed, and where possible would be less than: 0.35CIs per 100 customers and 0.42CMLs per customer
Box 16 Impact on operation of the distribution system	Response to EDFE019 provides additional information on Low Carbon Technologies in the trial areas
Boxes 17,18 and 26	Response to EDFE027 provides clarity on the inter-relationships between learning outcomes of preceding trials and start-points of subsequent trials
Box 24 Relevance of project learning to DNOs	Response to EDFE021 provides clarity as to why the developments are "more likely to happen in London than elsewhere in the UK
Appendix A Full Submission Spreadsheet	Response to EDFE001 provides in spreadsheet titled "EDFE001 Response Attachment Rev D 14 Sept 10":  Tab titled "Final Bid Cost Breakdown" provides a Summary of UK Power Networks figures (by Partner/ Partner groups). This also details UK Power Networks Contribution.  Tab titled "Ofgem Costs by Year" provides a further breakdown of costs into category and by year. This also details calculation for inflationary costs and summary of extra Partner Contributions (column BE).  Tab entitled "Additional Partner EDF contribn" provides further details of each of the extra Partner Contributions that feed into the previous tab.
Appendix A Full Submission Spreadsheet	Response to EDFE003 includes: 1. a revised Appendix A spreadsheet as in the course of answering this question we noted that in copying data into the final Ofgem version our original submission omitted a number of benefits; 2. a recalculation of the costs of I&C customer contracted responsive demand allowing for a more gradual ramp-up to the theoretically available level of 8% (being a mid-point between 5 and 10% as suggested in Ofgem's Demand Side Response publication ref. 82/10). This impacts the overall calculation of NPV benefits.
Appendix 2	Response to EDFE029 provides a non-technical description of "wind twinning"

# Low Carbon Networks Fund Full Submission Pro-forma

**In completing this proforma DNOs should consider the regulation, governance and administrative processes set out in the LCN Fund Governance Document**

## Section A: Project details

### Project Summary

#### Box 1: Please provide details of the Project, the Method and Solution

DNOs must provide in this order a description of:

1. The problem(s) or challenge(s) the Project is seeking to address
2. The Solution to this problem or challenge which the Project seeks to demonstrate can be achieved using the Method
3. The Method(s) which is being trialled
4. The Project (trial) which is being undertaken.

**Low Carbon London – A Learning Journey** - an integrated, large-scale trial of the end-to-end electricity supply chain that could deliver substantial benefits if rolled out across Great Britain. For example (*see Appendix 3 assumptions*):

- Cumulative CO<sub>2</sub> savings of **0.6 billion tonnes** compared with business as usual (BAU) between 2011 and 2050, representing 17.5% of the cumulative savings needed to meet the Low Carbon Transition Plan 2050 target. In financial terms, the carbon benefits from a national rollout would give an NPV of **£29 billion** to 2050.
- **£12 billion** NPV of financial benefits for customers up to 2050.

A LCNF project can only deliver real long-term value by providing solutions that are robust on a national scale – which requires a series of interdependent trials across the whole supply chain. Low Carbon London is a large-scale, end-to-end project that can provide the level of analysis and learning needed to enable a national roll out.

**Problems & challenges** - London has the highest concentrations of electricity demand and CO<sub>2</sub> emissions in Great Britain, and the most demanding carbon reduction targets (60% reduction on 1990 levels by 2025). Its central area electricity networks are already very highly utilised and its urban environment means that reinforcement costs to meet new demand are high. London also has the greatest scope for distributed generation, micro-generation, and electric vehicles. All these factors make London **the ideal test-bed for a low carbon project**.

Major London agencies (partners in Low Carbon London) plan significant low carbon initiatives. The Mayor of London has committed to rolling out 25,000 electric vehicle (EV) charging points by 2015 to support 100,000 electric vehicles, while the London Spatial Development Strategy targets 25% of heat and power from local decentralised production by 2025. This creates unprecedented challenges and opportunities for electricity network management. We must find proven solutions now to ensure the electricity system remains secure, affordable and environmentally sustainable.

“The key to a cleaner, less polluted and more energy efficient city is clever new technologies. I want London to be a pioneer in the introduction of ingenious solutions to crack the environmental challenges we face. We are pleased to support EDF Energy Networks’ bid, which if successful, will deliver significant funds to help us accelerate smart ways to improve Londoners’ quality of life.” Mayor of London

**Solution** - Low Carbon London will develop a new approach to distribution network management to meet growing demand from emerging low carbon technologies such as electric vehicles, heat pumps and distributed generation. It will focus on carbon reduction targets and the need to reduce dependency on conventional reinforcement.

**Commercial** solution: includes multipartite contracts between EDF Energy Networks, National Grid, aggregators, suppliers, and industrial & commercial customers; energy efficiency consultation; contracts with distributed generation for network support; and Time of Use tariffs to support residential and SME peak demand management.

**Technical** solution: includes an active network management system with half hourly inputs from at least 5,000 smart meters, marshalled through a head end solution; and an operational data store (with complex event processing integrated with an existing network management system).

**Method** – Our project brings together a partnership of leading industry specialists to emulate the 2020 end-to-end electricity supply chain. It implements solutions to improve the overall efficiency of the distribution network. It maximises the capability of the network, and also the end-to-end electricity supply chain, to facilitate new low carbon initiatives such as wider use of decentralised generation and electricity for personal transport and home heating, and a higher contribution from centralised wind generation. It will do this by introducing, testing and proving:

- new commercial arrangements to maximise network utilisation/improve load factor
- new system design and planning practices that leverage the benefits of active network management and customer participation
- new operational practices such as active management of demand, generation and network configuration to optimise network power flows and minimise constraints.

The trials, via the Learning Laboratory at Imperial College London, will provide valuable knowledge for the industry throughout the project.

**Project (trials)** - Low Carbon London incorporates a co-ordinated suite of interdependent trials based on detailed Use Case Analyses (*see Appendix 2*), involving National Grid; suppliers; aggregators; residential and I&C customers; electric vehicles (and charging infrastructure); distributed and micro-generation; and the impact on the distribution network of intermittent centralised wind generation.

Supported by the Learning Laboratory, the trials will test these new low carbon generation technologies and applications to determine their impact at scale. This is crucial to evaluating solutions for future issues encountered at all stages of the network lifecycle - from strategic investment planning through to real-time operation.

The trials will explore the role of innovative commercial contracts, Time of Use tariffs supported by smart meters, and advanced active network management practices to optimise low carbon generation, and maximise both the utilisation of the distribution network and the overall efficiency of the end-to-end electricity system.

Our project will involve real customers. It will not only test the impact of new carbon technologies, but also how customers use these technologies and how willing they are to engage with new commercial incentives.

### **Partnership & collaborators**



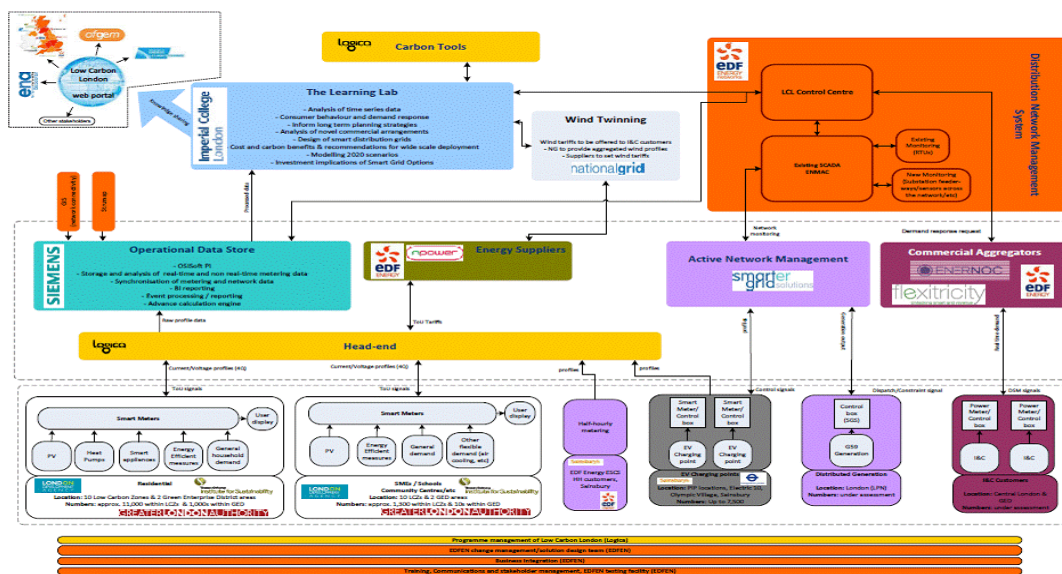
Low Carbon London is based on strong strategic partnerships between EDF Energy Networks and its collaborators. These collaborators bring a deep and broad level of relevant expertise and experience to the project –

and ensure real London customers remain at the heart of the project.

## Box 2: Please provide a description of the Project

**Description of the project** - The project centres on the London 'LPN' licensed distribution network – characterised by very high load densities in the central area; very high utilisation levels; high levels of load growth; high fault levels; very high levels of supply quality (which must be maintained to meet existing customers' expectations, including high profile customers critical to London's economy); and very high reinforcement costs due to severe limitations on availability of service routes and substation sites. London's decentralised energy strategy targets 25% of electricity and heat from local generation by 2025 to help reduce CO<sub>2</sub> emissions by 60% by 2025. By 2020, there will be 68MW of photovoltaic generation will have been installed in London along with 6MW of micro-wind electricity generation, while 168MWth of heat demand will be supplied by ground or air sourced heat pumps.

Appendix B2 (see thumbnail below) provides a high level overview of the solution and the main roles played by each of the project collaborators.



The main activities (also outlined in Boxes 13 and 16) are:

- EDF Energy Networks – Lead partner, providing distribution network management, solution design, change management, business integration, training, stakeholder management and communications
- Siemens – operational data store and support of solution design
- Imperial College – learning laboratory and data analysis
- Logica – programme management, carbon consultancy and tools, and smart meter head end (interfaces)
- Smarter Grid Solutions – active network management
- NPower (tbc), EDF Energy – customer relationships, smart meters, energy tariffs
- EnerNOC, Flexitricity, EDF Energy – commercial aggregators, running demand side management contracts with National Grid/industrial & commercial customers
- Greater London Authority/London Development Agency – residential, SMEs, schools, community centres, etc. in Low Carbon Zones & Green Enterprise District
- Transport for London – electric vehicle (EV) charging project ('Plugged in Places')
- National Grid – system residual balancing and wind generation forecasts
- We will use our 'G83' database to track clusters of micro-generation and identify needs for more advanced automatic voltage control

- 14,000 existing residential homes across the 10 designated boroughs (see Appendix B3) will be our focus in accessing data from smart meters to measure the network impact of changing customer demand patterns
- We will explore EV options to manage charging patterns with Transport for London ('Plugged in Places'), which will deliver 7,500 EV charging posts by 2013 with a total of 25,000 charging posts serving 100,000 electric vehicles by 2015
- We will explore through innovative contractual / tariff arrangements with customers and producers, the scope for optimising demand and generation profiles to maximise network capacity & utilisation and low carbon generation production
- We will work with the Institute for Sustainability and developers to support new low carbon developments and understand their impacts on the network within the LDA's Green Enterprise District

**Geographical location** - *Appendix B1* provides a map of the 10 London Low Carbon Zones. The project also covers the LDA's Green Enterprise District and Central London. Significant clusters of electric vehicle charging facilities, micro-generation, or heat pumps outside of these defined areas will also be incorporated where appropriate – e.g. data from the Olympic Park and Village will reinforce the analysis.

**Network diagrams** - *Appendix B4* provides network diagrams of the existing network and proposed works for the Archway zone (as an example). Network diagrams for all other zones are available on request.

**Number of customers & impact** - *Appendix B3* gives details of customers engaged / potentially impacted by the project, by the relevant trial areas. We will include at least 5,000 residential customers and 60 Industrial & Commercial customers (with their consent) through efficiency measures, TOU tariffs, and responsive demand contracts. Distributed generation operators will be impacted (with their consent) where opportunities for active network management of dispatchable distributed generation and/or network capacity support services (e.g. ER P2/6 DG contribution) can be made available.

**Contractual relationships with customers and network users** – We envisage a number of new contractual relationships including:

- Contracts facilitated by Aggregators to provide demand response services through industrial and commercial customers to defer ER P2/6 driven network reinforcement, including those already participating via demand aggregators in the balancing market. Such contracts will leverage the full value of responsive demand in providing services both to EDF Energy Networks and National Grid (e.g. for Fast Reserve or STOR)
- New contracts with demand customers with on-site or standby generation, who are currently export inhibited, to provide net demand reduction capacity services when called upon due to temporary network constraints and outages
- New contracts with distributed generation in relation to grid connections for controllable export and/or network security support
- Changes to both Energy and Distribution Use of System charging tariffs to reward customers who manage discretionary demand to avoid peak periods – through either direct control or Time of Use (ToU) Use of System tariffs
- New tariffs implemented in conjunction with energy supply businesses for Electric Vehicle charging
- New 'wind' tariffs implemented in conjunction with energy suppliers to incentivise demand to follow wind generation as far as practicable

**Box 3: Please outline the changes which you have made to the Project since the Initial Screening Process**

**Does the high level Solution being demonstrated and the high level Method being trialled in the Project remain the same as that contained in your Screening Submission? Yes/No**

DNOs must outline any changes they have made since their Screening Submission; for example

- the scale of the Project, funding required, other partners or External Collaborators involved in the Project
- the IPR arrangements proposed for the Project

The project scope has not changed since our Screening Submission but:

- Our funding request has reduced from £39 million to £24.26 million since our Screening Submission as we now plan to stage the project in two standalone phases. This will reduce the risk of asset stranding, minimise impact on customers, and give sufficient time to understand the implications of early learning from our trials. Phase two will be a standalone bid to the LCNF next year. It will use learning from the decentralised trials and associated network solutions and services in phase one to define requirements for wider and more centralised control of low carbon networks.
- We have reviewed our risks to reflect this phasing of the project and have consequently reduced the contingency for this bid to an overall 10%.
- Our external collaborator contributions are now £6.17 million.
- We have confirmed a further external collaborator: EDF Energy Customers Plc, plus intent to collaborate from npower, Sainsbury's and EDF R&D.
- There have been no changes to the IPR arrangements.

**Project Costs**

**These should be the same amounts as detailed in the Full Submission Spreadsheet tab entitled 'Second Tier Funding Request' included as Appendix A**

<b>Total Project Cost</b>	£36.06 million (supporting financial assumptions in <i>Appendix 3</i> )
<b>External Funding</b>	£ 6.17 million
<b>DNO Extra Contribution</b>	£ 1.60 million
<b>DNO Compulsory Contribution</b>	£ 3.00 million
<b>Second Tier Funding Request</b>	£24.26 million
<b>Project Completion date</b>	06/2014

## Derogations or exemptions

**If awarded funding, will you require a derogation, licence consent or exemption, or any change to the regulatory arrangements in order to undertake the Project or cater for contingencies? Yes/No**

**Box 4: If Yes, DNOs must provide a summary of the details of the derogation, licence consent or exemption, or change to the regulatory arrangements required**

Demand side management (DSM) contractual arrangements with major business customers will enable some deferment of load related reinforcement. However, contracted DSM services may provide less security than conventional network reinforcement. We will use a probabilistic approach to determine the likelihood of an unplanned network outage coinciding with both an annual peak demand period and non-availability of responsive demand leading to a capacity shortfall.

EDF Energy Networks would apply for derogation from ER P2/6 for a defined section of the network (typically a primary substation) if the security level determined on this basis gives an acceptable risk when weighed against the NPV of avoided network investment.

We may need more flexible DUoS tariffs to give sufficient incentive to customers on responsive demand. In this case EDF Energy Networks may seek temporary derogation under SLC 13A.18 for relief of obligations under SLC 13A.1 to 13A.4 (obligation to comply with CDCM) for customers within defined trial areas. EDF Energy Networks would continue compliance with SLC13 (Charging Methodologies) and would submit (under SLC 13.10 to 13.13) a revised temporary charging methodology to apply in the trial areas during the project.

We may seek minor relief from IIS for planned shutdowns to install network monitoring devices at some distribution substations. Each site would be subject to a risk assessment to determine if live installation is possible.

We will make quantitative assessments of security of supply, competition, and/or customer impact according to Ofgem's guidance on licence derogation requests.

Further details are provided in *Appendix 6* (derogations)

## Section B: Project Management

**DNOs must provide an organogram outlining roles and responsibilities in the Project and the organisational structure. This must be included as Appendix C.**

**Contact details of DNO Principle Project Manager:**

<b>Name and Title:</b>	Steve Barnsley, Programme Director – Low Carbon London
<b>Telephone:</b>	07875 115 544 (mobile)
<b>Email:</b>	<a href="mailto:stephen.barnsley@edfenergy.com">stephen.barnsley@edfenergy.com</a>
<b>Address:</b>	Ground Floor, 21 Skylines Lime Harbour Back of Marsh Wall London E14 9TS



**Box 5: Please provide details of your Project plan**

DNOs should outline up to ten key milestones associated with their Project.

<b>Date</b>	<b>Milestone</b>
04/01/2011	Project start (based on Ofgem awarding the contract in December 2010).
04/04/2011	First industrial & commercial contract in place.
08/07/2011	Learning Laboratory set up complete and ready to start trials analysis work.
05/09/2011	Smart meter set up and initial installation complete (including set up of head end system and installation of initial batch of 500 smart meters).
16/02/2012	Technical solution implementation complete.
13/06/2012	Conclusion of measurement phase in Learning Laboratory.
15/08/2012	Smart meter set up and installation complete.
30/12/2013	Conclusion of monitoring phase in Learning Laboratory.
30/06/2014	Conclusion of high-level learning phase in Learning Laboratory (to produce final learning reports for industry and Ofgem).
30/06/2014	All project trials and project close down complete (and close down report produced for Ofgem).

**A full Project plan, presented as a Gantt chart, must be provided as Appendix D:** DNOs must include a month by month breakdown of the activities associated with a Project; milestones, delivery of outputs and deliverables, dependencies, critical path, responsibilities, phases and key decision points. *(see Appendix D for full project plan)*

## Project Budget

**DNOs must complete the Full Submission Spreadsheet tab entitled 'Second Tier Funding Request' and include it within Appendix A.** *(see Appendix A for Full Submission Spreadsheet)*

**Box 6: Please provide a breakdown of your total employment costs for the total Project which you are project managing and highlight where these are funded by, or provided by others**

Total employment costs should include all the costs used for labour, including pensions but excluding Contractors (whose costs are detailed separately). Personnel with the same role can be grouped together

Staff type	Total Costs	Person days	Funding
<b>Change management/solution design:</b> Programme Director (1No)	£512,050	770	EDF Energy Networks intends to fund all direct staffing costs as part of the compulsory and extra DNO contribution
<b>Change management/solution design:</b> PMO (1No)	£310,310	770	Ditto
<b>Change management/solution design:</b> Communications Manager (1No) Commercial Manager (1No)	£468,468	770 308	Ditto

Staff type	Total Costs	Person days	Funding
<b>Change management/solution design:</b> Administrative Support (1No)	£154,000	770	Ditto
<b>Business implementation:</b> Technical Lead (3No)	£630,000	2310	Ditto
<b>Business implementation:</b> Network Operations staff (12No)	£2,520,000	9240	Ditto

**Box 7: Please outline the main Equipment costs required for the total Project which you are project managing**

Item description & No. of units	Function in Project	Cost per unit	Total Cost	Funding	Direct Benefit
Active network management (ANM) scheme to manage thermal & voltage technical constraints comprising a max number of constraint locations & controllable devices within each ANM scheme. Each ANM scheme implemented at a primary substation to remove network congestion in that area. Localised constraints managed zonally (3No)	Collecting data from field devices (either directly from dual-port RTUs or via an alternative data source) & controlling distributed energy resources directly to manage real-time grid constraints.	£168,750	£506,250	Funded by LCN Fund (product discounts provided as partner contribution)	0
ANM scheme to manage thermal & voltage technical constraints comprising a maximum number of constraint locations & controllable devices within each ANM scheme. Each ANM scheme implemented at a primary substation to remove network congestion within that area. Localised constraints managed zonally (2No)	Collecting data from field devices and controlling distributed energy resources directly to manage real-time grid constraints.	£168,750	£337,500	Funded by LCN Fund (product discounts provided as partner contribution)	0

Item description & No. of units	Function in Project	Cost per unit	Total Cost	Funding	Direct Benefit
Various aggregator equipment/ devices (40No)	Enabling sites to participate in direct response	£16,250	£650,000	Funded by LCN Fund	£1.8 million
Logica smart metering		£	£693,000	Funded by LCN Fund	0
EDF Energy Networks contribution to 'Plugged in Places'	Contribution to charging post functionality	£150.00	£1,125,000	Funded by LCN Fund	0
EDF Energy Networks substation works	Primary site upgrades, secondary feeders, interface and adaptors	£	£1,328,000	Funded by LCN Fund	0
		£	£		

**Box 8: Please outline the Contractor costs required for the total Project which you are project managing**

Contractor	Role in Project	Funding	Expected length of contract	Total Cost
<p>EDF Energy does not intend to use contractors for the delivery of this project, other than through our partners/collaborators</p>				
				£
				£
				£

**Box 9: Payments to users or Customers**

**Please outline the details of any payments you wish to make to users or Customers as part of the Project.**

<b>Type of user or Customer</b>	<b>Payment per User</b>	<b>Total Payment</b>	<b>Funding</b>
Aggregator payments to industrial & commercial (I&C) customers	Payments are customer specific depending on capacity and utilisation	£2,440,000	Funded by LCN Fund





## Cost over-runs & Unrealised benefit

**Box 11: Please detail any cost over-run you anticipate requiring for the Project and express this as a percentage of the funding you are requesting**

DNOs must outline (as a percentage of the Second Tier Funding Request<sup>1</sup>) the level of protection they require against cost over-runs

0 %

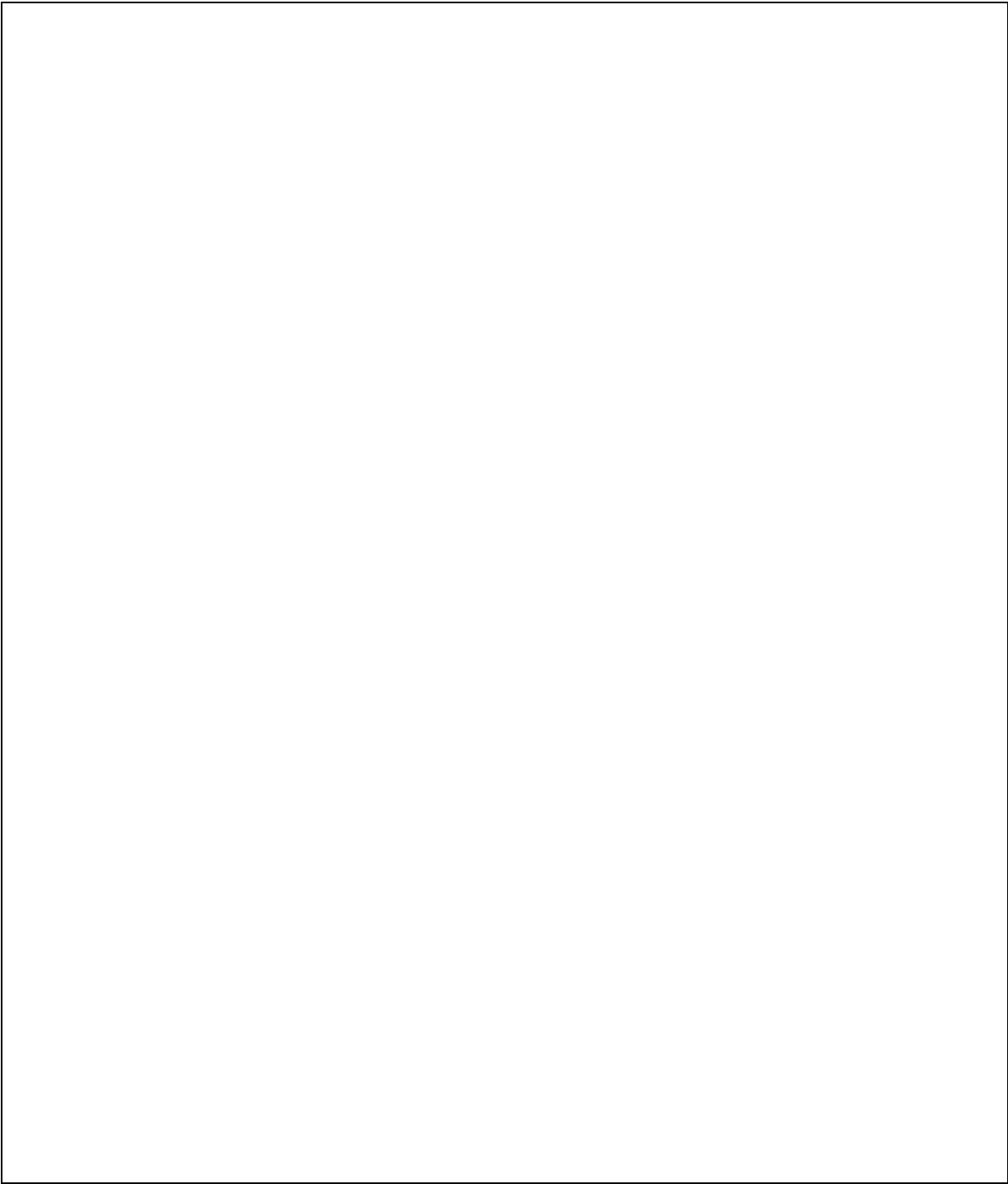
If a DNO states that they would like protection against a cost over-run the default position is that the maximum amount that can be requested is 5% of the Second Tier Funding Request. If the level of protection you are requesting is not the default then please justify.

We are confident we can deliver the project to specification, time and cost, and will not be seeking protection against cost overruns because we have:

- detailed use cases (*Appendix 2*)
- integrated solution design (*Appendix B2*)
- clearly defined roles and partner responsibilities (*Appendix C*)
- schedule of trials (*included in Appendix 2*)
- comprehensive project plan with project deliverables and milestones (*Appendix D*)
- prudent level of contingency in line with project management best practice, and an active RAID log.

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<sup>1</sup> In the LCN Fund Governance Document the term Approved Amount is used since the description relates to the implemented Project.



**Box 12: Please detail the level of protection required against Direct Benefits in excess of the DNO Compulsory Contribution**

DNOs must outline the level of protection against Direct Benefits that they wish to apply for

0 %

The default position for protection against Direct Benefits is 50% of Direct Benefits in excess of the DNO Compulsory Contribution. If the level of protection you are requesting is not the default then please justify

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0% because the level of anticipated direct benefits is lower than the DNO Compulsory Contribution.

## Successful Delivery Reward Criteria

### Box 13: Please set out your proposed Successful Delivery Reward Criteria

Successful Delivery Reward criterion	Evidence
<p><b><u>Build phase</u></b></p> <ul style="list-style-type: none"> <li>• Preparation of solution implementation complete: Logica smart metering head end solution and Learning Laboratory commissioned</li> <li>• Preparation for at least 5,000 smart meter roll out complete, including address selection, acceptance surveys, privacy and security measures (working with GLA and consumer representatives) – Q3 2011</li> </ul>	<p><b><u>Outputs and learning</u></b></p> <ul style="list-style-type: none"> <li>• Demonstration of the Learning Laboratory facilities at Imperial College with documented schedule of trials</li> <li>• Results of customer smart meter acceptance surveys</li> <li>• Documented privacy and security strategy</li> <li>• Statistical analysis of smart meter trial sample size</li> <li>• Demonstration of initial functionality of head end</li> </ul>
<ul style="list-style-type: none"> <li>• 1<sup>st</sup> stage of solution implementation complete: operational data store and interface to Logica head end commissioned, smart meter installation underway and 'carbon impact tools' delivered</li> <li>• Implementation of initial trials based on data from the initial smart meters and half hourly industrial &amp; commercial (I&amp;C) customer meters with analysed results – Q1 2012.</li> </ul>	<ul style="list-style-type: none"> <li>• Functioning operational data store and head end accessing/processing smart meter information</li> <li>• Multipartite demand side management (DSM) contracts between National Grid, aggregators, I&amp;C customers and EDF Energy Networks</li> <li>• DSM risk assessment for ER P2/6 and ETR 130</li> <li>• Initial CO<sub>2</sub> impact assessments</li> </ul>
<p><b><u>Trial phase:</u></b></p> <ul style="list-style-type: none"> <li>• Conclusion of "Using Smart Meters and Substation Sensors to Facilitate Smart Grids" trials – Q2 2012               <ul style="list-style-type: none"> <li>○ Understanding customer behaviour and potential network impact</li> <li>○ Use of smart meter information to support distribution network planning and design</li> <li>○ Use of smart meter data to support network operations</li> </ul> </li> </ul>	<p>Learning reports Q2 2012:</p> <ul style="list-style-type: none"> <li>• 1-1 Accessibility and validity of smart meter data</li> <li>• 2-1 Network state estimation and optimal sensor placement</li> <li>• 2-2 Accessibility and validity of substation sensor data</li> </ul>
<p>Conclusion of "Enabling and Integrating Distributed Generation" trials – Q2 2013</p> <ul style="list-style-type: none"> <li>○ Facilitating connections to low voltage and high voltage distribution networks</li> <li>○ Active management of distributed generation to address security of supply concerns and postpone network reinforcement</li> </ul>	<p>Learning reports Q2 2013:</p> <ul style="list-style-type: none"> <li>• 3-1 Impact of LV connected DER on power quality</li> <li>• 7-1 Opportunities for DG in the distribution network</li> </ul>

Successful Delivery Reward criterion	Evidence
<ul style="list-style-type: none"> <li>• Conclusion of “Enabling Electrification of Heat and Transport” trials – Q3 2013               <ul style="list-style-type: none"> <li>○ Exploring impact of electric vehicle charging</li> <li>○ Exploring the impact of heat pump demand</li> </ul> </li> </ul>	<p>Learning reports:</p> <ul style="list-style-type: none"> <li>• 5-1 Impact of opportunities for wide-scale electric vehicle deployment (Q3 2013)</li> <li>• 4-2 Impact of energy efficient technologies on network utilisation (Q4 2013)</li> </ul>
<ul style="list-style-type: none"> <li>• Conclusion of “Demand Side Management” trials – Q1 2014               <ul style="list-style-type: none"> <li>○ Demand side management with residential and SME customers</li> <li>○ Demand side management with industrial &amp; commercial customers</li> <li>○ Demand side management conflicts and synergies</li> </ul> </li> </ul>	<p>Learning reports Q4 2013:</p> <ul style="list-style-type: none"> <li>• 8-1 Demand response of I&amp;C customers</li> <li>• 6-1 Consumer attitudes to flexible tariff rates</li> <li>• 6-2 Residential and SME responsiveness to TOU rates</li> <li>• 6-4 Smart appliances for residential demand response</li> <li>• 4-1 Impact of energy efficiency on energy consumption</li> <li>• 9-1 Real time control of active networks using DER</li> </ul>
<ul style="list-style-type: none"> <li>• Conclusion of “Wind Twinning” trials – Q1 2014               <ul style="list-style-type: none"> <li>○ Wind twinning through TOU tariffs with suppliers</li> <li>○ Wind twinning through responsive demand contracts with commercial aggregators</li> </ul> </li> </ul>	<p>Learning reports Q1 2014:</p> <ul style="list-style-type: none"> <li>• 10-1 Wind twinning on the distribution network</li> <li>• 12-1 Novel commercial arrangements and the smart distribution grid</li> </ul>
<ul style="list-style-type: none"> <li>• Conclusion of trials – Q2 2014 – for:               <ul style="list-style-type: none"> <li>○ “New Network Design and Operational Practices”</li> <li>○ “Network Planning and Operational Tools”</li> </ul> </li> </ul>	<p>Learning reports Q2 2014:</p> <ul style="list-style-type: none"> <li>• 11-1 Design of smart distribution grids</li> <li>• 11-2 Resilience performance of smart distribution grids</li> <li>• 14-2 Impact of carbon reduction policies</li> <li>• 14-3 Overall summary report</li> </ul>

## Section C – Evaluation Criteria

### Accelerates the development of a low carbon energy sector

#### Box 14: Outline how the Solution accelerates the development of a low carbon energy sector

- outline how the Solution associated with the Project makes a contribution to the UK Low Carbon Transition Plan, as published by the Department of Energy & Climate Change (DECC), as may be amended from time to time. For the avoidance of doubt this is the contribution of the Solution if rolled out nationwide
- ensure that the sources they have used to support this outline are clearly referenced and provided in full Appendix E
- detail the NPV of carbon benefits associated with the Solution within the 'net benefits' tab in the Full Submission Spreadsheet included as Appendix A

**Contribution to UK Low Carbon Transition Plan (UK LCTP) :** A national rollout of the Low Carbon London solution would produce cumulative CO<sub>2</sub> savings of **0.6 billion tonnes** compared with business as usual (BAU) over the period 2011 to 2050. (BAU is taken as the Ofgem LENS Report 'Big T&D' scenario.) The LCTP target is to reduce CO<sub>2</sub> emissions by 80% by 2050. Our project represents **17.5% of the cumulative savings** needed to meet this target.

A national rollout would reduce carbon emissions by: enabling distributed generation to connect and export; twinning demand with renewable generation; and incentivising the inherent flexibility of electric vehicles and heat pumps to minimise investment in additional network and generation capacity.

The project will stimulate significant reductions in CO<sub>2</sub> emissions compared with the LENS (BAU) scenario 'Big T&D' scenario. The 17.5% breaks down as:

- **35%** through electrification of heat replacing higher emission heating sources and through new build adopting low carbon technology
- **34%** from **twinning** demand with renewable energy generation – reducing need for CO<sub>2</sub> emitting generation to supply demand at times of low wind generation
- **20%** from demand side management at end user level, dynamic network management and network losses reduction - due to flattening demand curves and reducing the need for peaking plant to supply peak (I<sup>2</sup>R) losses
- **11%** from decarbonisation of transport by ensuring efficient electric vehicle charging

The LCTP is also about achieving a sustainable future and driving a transition to low carbon economic growth while safeguarding access to affordable and dependable sources of energy. Low Carbon London will demonstrate the economic benefits of an integrated solution to this carbon challenge. It will teach us how advanced distribution network management can reduce costs and CO<sub>2</sub> emissions along the whole electricity supply chain, while also allowing high penetrations of sustainable low carbon generation, electric heat applications and electric vehicles. It will also deliver new learning to enable the UK to compete in an international low carbon economy.

**NPV of carbon benefits** to 2050 from the UK wide rollout of our solution is **£29 billion** due to the sources of CO<sub>2</sub> saving summarised above.

**Assumptions and data sources:** We performed a detailed study modelling the potential CO<sub>2</sub> emissions savings enabled by a national rollout of the Low Carbon London solution and then compared it to the Ofgem LENS 'Big T&D' scenario. This shows a **total CO<sub>2</sub> saving of 0.6 billion tonnes** from a UK wide rollout of our solution. *Appendix E* gives full details of the assumptions and data sources used for our study.

## Has the potential to deliver net benefits to existing and/or future customers

**DNOs must complete the spreadsheet tab 'Net benefits' within the Full Submission Spreadsheet and include as Appendix A.**

**Box 15: Please provide a qualitative account of the net benefits which the Solution has the potential to deliver if rolled out across GB.**

Low Carbon London will demonstrate how to develop electricity networks that enable a low carbon world and, at the same time, offer customers informed choice about their electricity consumption.

The results of the trials will clearly indicate the potential for new approaches to network management to deliver real savings to customers as we move towards a low carbon economy. These approaches will be valid and meaningful for customers across Great Britain.

Some of the more important qualitative benefits for customers of a national rollout of the innovative practices trialled and proven by Low Carbon London include:

- Avoided network reinforcement investment will be reflected in DNOs' business plan submissions and will benefit customers in terms of lower DUoS charges (this represents the main component of the financial savings shown in *Appendix A*).
- Improved visibility of network demand profiles will improve quality of supply due to avoided network overloads.
- Greater control of demand profiles will also enable higher penetrations of electric vehicles and heat pumps, enabling customers to more easily take advantage of these new low carbon alternatives for personal transport and domestic space/water heating.
- A further benefit of improved visibility of network demand profiles is that it will enable faster and more competitive quotations for new connections.
- Leveraging opportunities from smart metering and Time of Use tariffs will facilitate reductions in energy bills and DUoS charges by allowing customers to take personal control of their energy consumption, including by use of smart appliances.
- Customers will be able to participate in the electricity market and take advantage of direct incentives such as Feed in tariffs and the renewable heat incentive.
- Industrial and commercial customers, with flexible demand such as air cooling and refrigeration or standby generation, will be able to take advantage of responsive demand contracts through commercial aggregators leveraging both short-term operating reserve and network constraint relief ancillary service opportunities.
- Active network management will benefit customers by minimising constraints, increasing load factor, minimising losses, and reducing our dependency on expensive and high carbon generation peaking plant to supply peak losses.
- By understanding how to develop an integrated approach to managing the distribution system (for example leveraging the potential synergies surrounding responsive demand) and involving all the key players, we will also understand how to manage the end-to-end electricity supply chain to enable customers to benefit from reduced energy, transmission and distribution charges.

## Direct Impact on the operation of the Distribution System

### Box 16: Explain the way in which the Project/Solution has a Direct Impact on the Distribution System

- outline the extent to which the Project will be expected to provide learning and benefits relating to the planning, development and operation of an efficient distribution system
- detail the size of the net benefits calculated in the 'net benefits' tab of the Full Submission Spreadsheet Appendix A that can be attributed to the Distribution System as a proportion of the level of funding requested

The Low Carbon Transition Plan will lead to higher levels of intermittent and distributed generation, and increased use of electricity for transport and heat. Many studies predict that this 'low carbon economy' will have a major impact on electricity distribution systems but few quantify that impact – and none are based on real experience.

Low Carbon London will, through real trials on real networks at scale, create new learning to fill this 'knowledge gap' and help all network operators to plan, develop and operate an efficient distribution system. London has a highly utilised distribution network, and many existing and planned initiatives to accelerate decentralised generation, electric vehicles and heat pumps – enhancing Low Carbon London's potential to evaluate the impact of the transition to a low carbon economy.

**Learning and benefits:** Low Carbon London will use advanced active network management techniques, innovative commercial mechanisms and smart meters to demonstrate the scope for, and benefits of, more active network, generation and demand management. This will pave the way for all network operators to transform how they plan, design, develop and operate their distribution systems in order to radically improve overall system efficiency. For example Low Carbon London's comprehensive trials will demonstrate the impact of:

- micro-generation (especially photovoltaic solar panels) on LV voltage regulation
- electric vehicles on daily load shape, and especially impact on peak demand (and how controlled charging or price signals can reduce this impact)
- heat pumps where installed at scale – eg. new build in Green Enterprise District
- energy efficiency measures on energy consumption levels and load shape
- smart meters - improving visibility of low voltage (LV) load shapes and voltage regulation to assess LV network capacity headroom more precisely
- TOU tariffs for residential and SME customers in terms of reducing peak demand
- aggregators accessing flexible demand to provide STOR ancillary services to National Grid (expected to become more prolific with higher levels of intermittent generation)
- transmission connected wind generation on spot prices and hence demand
- responsive demand contracts with industrial & commercial customers and the extent to which these provide a viable alternative to ER P/6 driven network reinforcement
- active management of dispatchable generation to manage network constraints (eg. fault level) and provide ER P2/6 support (testing assumptions underpinning ETR 130)

The trials will also demonstrate how to operate distribution systems more efficiently through active coordination of distributed energy resources and real-time network reconfiguration to maximise low carbon generation, optimise power flows and voltage levels, manage constraints and improve load factor (and hence reduce losses).

**Size of benefits:** Over DPCR5, the solution should produce £1.8 million of direct benefits to the London Power Network (LPN) in avoided network investment. This is 9.9% of the level of funding requested. However, in the longer term, the combined impact on distributions systems of decentralised generation and electrification of heat and transport will be far greater. **If implemented nationally, the NPV benefit of the solution over the period to 2050 is £12 billion.**



**Generates new knowledge that can be shared amongst all DNOs**  
**Answers to this section should be detailed in boxes 17 to 19**

**Box 17: Explain the new learning which will result from a successful Project**

The project will generate new learning in the following areas:

- how customers respond to energy efficiency measures, and to commercial and technological innovation
- how embracing commercial and technological innovation will impact the network operators and their processes
- how best to integrate demand response, distributed generation and emerging technologies into the development and operation of future distribution networks.

**Level of incremental learning expected**

- How best to optimise a distribution network
  - Understand and model demand response technologies and capabilities
  - Understand alternative ways to deploy control equipment and systems
- How to maximise benefits for consumers
  - Understand consumer acceptance and engagement
  - Provide analysis and design of innovative commercial arrangements
- Understand & model distributed generation technologies and their flexibility
- Examine alternative operational planning and real time network control strategies
  - Effectiveness and robustness of real time decision making process
  - Ability to: optimise demand and generation response for achieving different network objectives and provide system services
  - Predict demand response under various conditions
  - Coordinate between distributed / automatic control and centralised control
  - Coordinate between preventive and corrective network control
- Examine alternative network design strategies
- Develop recommendations for wide-scale industry deployment, including learning on how to monitor, manage and minimise risks

**How new learning applies to other DNOs**

- Project will test a wide spectrum of new network management techniques (based both on direct control and innovative commercial arrangements) relevant to all DNOs
- DNOs will also benefit from the learning regarding alternative methodologies deployed and alternative communication strategies used
- Shared learning on avoiding network investment

**How the project will capture learning**

- 'Learning Laboratory' will systematically document and store detailed design of experiments that test how novel technologies and commercial arrangements can exercise network control
- Systematically store measurements, control commands and pricing signals exercised within specific network experiments so that we can replay events.
- Systematically analyse and document network experiments
- Analyse outcomes to enable further design and fine tuning of trials
- Design specific trials to investigate appropriateness, functionality and quality of network management tools (eg. state estimator, demand and generation forecasting tools, tools for system management etc.) and alternative pricing strategies

**Extrapolation**

- To ensure technically & statistically robust trials, the project will carry out multiple experiments using statistically valid samples to quantify consistency of response
- Project includes verification of outcomes by Imperial College London
- The project will extrapolate the results to larger systems using Imperial's simulators and models for smart appliances

## Box 18: Outline the arrangements for disseminating learning from the Project

detail how any learning from the Project will be disseminated to other DNOs and other parties. For the avoidance of doubt this will detail the method of dissemination and outline any novel ways in which the DNO plans to do this

A dedicated 'Learning Laboratory' using the Maurice Hancock Laboratory facilities (part sponsored by EDF Energy) at Imperial College London will create an interactive learning experience around how to plan, develop and operate an efficient low carbon distribution system. Other DNOs and parties seeking will have access to this experience throughout the project. We will also seek to incorporate the experiences of the other DNO projects:



The Learning Laboratory will produce a selection of reports including:

L1-1 Accessibility and validity of smart meter data	L6-4 Smart appliances for residential response
L2-1 Network state estimation and sensor placement	L7-1 Opportunities for DG in the distribution network
L2-2 Validation of data from network sensors	L8-1 Demand response of I&C customers
L3-1 Impact of LV DER on power quality	L9-1 Real time network control including use of DER
L4-1 Impact of energy efficiency programmes	L10-1 Wind Twinning and the distribution network
L4-2 Impact of energy efficiency on network UF	L11-1 Design of smart distribution grids
L5-1 Impact of wide-scale EV deployment	L11-2 Smart distribution grid resilience performance
L6-1 Consumer attitudes to flexible energy rates	L12-1 Novel commercial arrangements
L6-2 Consumer / SME responsiveness to TOU rates	L14-2 Impact of carbon reduction policies
L6-3*Public participation in supply demand matching	L14-3 Final overall perspective report

\*Note: All except L6-3 are reports; L6-3 is a workshop

We will also **distribute and embed the learning internally** to underpin how we develop and evolve our business. The learning will inform our 2020 Vision and Route Map (see *Appendix 4*) to ensure we operate effectively within a low carbon environment.

**Box 19: Outline the arrangements for Intellectual Property Rights (IPR)**

**Does the Project conform to the default arrangements for IPR? ~~Yes/No~~**

DNOs must describe the Relevant Foreground and Background IPR. If this IPR does not conform to the default arrangements, DNOs must identify these differences and must:

- demonstrate how the learning from the Project can be disseminated to network operators and interested parties
- take into account any potential constraints or costs caused, or resulting from, the proposed IPR arrangements
- justify why the proposed IPR arrangements provide value for money for consumers

Yes, our bid conforms to Ofgem's overarching principles for disseminating learning from the Project. We may, however, require some further clarification and discussion with Ofgem about some of the more recent specific requirements published in Governance Document V3 on 22 July 2010.

Low Carbon London will deploy (at scale) a number of COTS (Commercial-Off-The-Shelf) products that have never been integrated before. This is aligned with the Ofgem's stated governance of undertaking trials of technology already at 'Technology Readiness Levels seven to nine'. Given the COTS nature of the products, we do not expect the project to generate any substantial Foreground Intellectual Property requiring any form of Intellectual Property protection.

Any product development will be undertaken and funded by project partners (external collaborators) separate to the trials. We expect to generate new learning in understanding how to integrate these COTS products to deliver business functional requirements and implement new commercial frameworks. We will disseminate this learning in line with the stated IPR arrangements.

Our intended approach allows this project to take advantage of IPR without charging development costs to the project. Our bid submission therefore includes no costs relating to IPR, providing best value to Ofgem and consumers alike.

## **Involvement of External Collaborators and external funding**

**Does the Project involve External Collaborators and/or external funding?** Yes/No

**Box 20: If you have been unsuccessful in attracting External Collaborators and/or external funding to the Project, please detail your endeavours to do so**

DNOs should detail:

- the reasonable endeavours it has made to attract External Collaborators and/or to obtain external funding. This could include an explanation of why potential partners did not chose to invest in the Project

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We have been very successful in attracting external collaborators to Low Carbon London. The respective contributions of our partners highlight the importance they attach to the project.

EDF Energy Networks will pursue additional funding from the EU Smart Cities Fund and the JESSICA Fund when they call for proposals in 2011.

**Box 21: Where funding is provided by a third party that is not an External Collaborator, DNOs should provide details of the funder. If there is more than one External Funder, details of others can be included as an appendix:**

<b>Organisation name</b>	Lower Lea Valley Smart Buildings Project
<b>Type of organisation</b>	Private and public-sector consortium
<b>Amount of funding</b>	Between £5 million and £10 million
<b>Funding arrangements</b>	Majority private sector funding plus contributions from the public sector. The project will encompass smart appliances, controls and communications in order to evaluate the impact of smart electricity supply on consumption, headroom etc.
<b>When funds will be provided</b>	Between April 2011 and December 2012
<b>Conditions of funding</b>	Subject to negotiation regarding dissemination of results, commercially sensitive data etc.
<b>Risks/uncertainties</b>	Project as currently proposed is dependent on delivery of the Low Carbon London project.
<b>Details of contract or agreement</b>	Commitment in principle from private sector organisations. Unlikely to be a contract between private sector companies and EDF Energy Networks. The Institute for Sustainability, who lead the consortium and are a collaborator in Low Carbon London (see <i>Box 22</i> ), will negotiate with contributors and manage their engagement with the Low Carbon London project.

### Box 22: Details of External Collaborators

DNOs should provide details of the 6 main parties who are collaborating with them on a Project. Details of any further External Collaborators should be included as an appendix. (see Appendix 1 for details of 6 further external collaborators).

<b>Organisation Name</b>	<b>Greater London Authority (GLA)</b>
<b>Relationship to DNO (if any)</b>	None
<b>Type of Organisation</b>	The GLA's remit is to design a better future for the capital, and support the Mayor to develop and deliver strategies for London, including transport and energy & climate change.
<b>Role in Project</b>	The GLA will provide links to London communities and businesses, existing building stock, local authorities and local energy services, and building retrofit projects, offering opportunities to test 'smart' technologies and innovative demand management solutions. The Mayor's Low Carbon Zones programme, provides 10 diverse London neighbourhoods already working with Mayoral and local authority funding to 'showcase' carbon saving and local environmental sustainability. Together, they provide a potential test bed of over 14,000 homes, 1000+ local businesses, plus schools, hospitals and community buildings.
<b>Prior experience brought to Project</b>	The GLA has been working with a range of strategic and local partners since 2000 to support London's ambition to be a world leading low carbon city and a hub for the low carbon economy [see website for details <a href="http://www.london.gov.uk">www.london.gov.uk</a> ]. Along with the policies and programmes that the GLA has developed, it provides the gateway to a broad range of projects delivered by its functional bodies, including <b>Transport for London</b> (also see Box 22) and the <b>London Development Agency</b> (see Appendix 1) – both external collaborators in Low Carbon London.
<b>Funding</b>	£1,275,000 including £1,075,000 of direct investment in energy efficiency/renewable measures in the Low Carbon Zones in 2010-12, projected to save c.5200tonnes of CO <sub>2</sub> emissions.
<b>Contractual relationship</b>	<b>Will the DNO have a contract in place which ensures the External Collaborator complies with the LCN Fund Governance Document?</b> Yes/ <del>No</del> Current status - signed collaboration agreement (see Appendix 5) and proposed delivery contract
<b>External collaborator benefits from Project</b>	Developing an electricity distribution system fit for purpose for 2020 will help to deliver sustainable energy services to London. The 10 Low Carbon Zones include: installing low carbon retrofit; energy efficiency and renewable measures in homes, public buildings and local businesses; and community engagement and behaviour change initiatives. Low Carbon London's smart meter, smart grid and electricity demand management solutions will complement these initiatives to help deliver projected carbon emission savings of c.33,000 tonnes by 2013. The collaboration could also result in savings of up to £200 per household in reduced energy bills, particularly significant as many Low Carbon Zone households are low income.

<b>Organisation Name</b>	<b>Transport for London</b>
<b>Relationship to DNO (if any)</b>	None
<b>Type of Organisation</b>	Transport for London (TfL) is a statutory corporation governed by the Greater London Authority (GLA) Act. Its main roles are to implement the Mayor's transport strategy and manage transport services across London. These services include, London's buses, London Underground, Docklands Light Railway, London Overground, Tramlink, and London River Services
<b>Role in Project</b>	TfL is implementing the Mayor's Electric Vehicle Delivery Plan (EVD), which aims for 100,000 electric vehicles (EVs) in London as soon as possible. The plan calls for 25,000 recharging points across London by 2015 (the 'Plugged in Places' scheme), plus 1,000 EVs operating in GLA vehicle fleets (e.g. Met Police, TfL and the Fire Brigade). The EVD will support and add value to the Low Carbon London project. Working with 'Plugged in Places' partners and charge point suppliers, the project will have access to EV charging and usage data in order to analyse London's public charge point network usage and energy consumption. TfL will support businesses to install workplace EV charging, creating further opportunities to gain data, as well as to trial demand side management techniques.
<b>Prior experience brought to Project</b>	TfL has substantial experience in delivering high-profile projects and managing multi-million pound programmes to improve London, including: <ul style="list-style-type: none"> <li>• Congestion Charging and Low Emission Zone</li> <li>• Maintaining main roads and London's traffic lights</li> <li>• Regulating London's taxis and private hire trade</li> <li>• Promoting a range of walking and cycling initiatives.</li> </ul> <p>TfL's EVD project is managed by the Congestion Charging &amp; Traffic Enforcement directorate, which incorporates a centre of excellence for project &amp; programme management.</p>
<b>Funding</b>	TfL will contribute £1 million to the project in return for the data and analysis that the project will provide. This includes providing all resources to the project at no cost.
<b>Contractual relationship</b>	<b>Will the DNO have a contract in place which ensures the External Collaborator complies with the LCN Fund Governance Document?</b> Yes/No Current status - signed collaboration agreement ( <i>see Appendix 5</i> ) and proposed delivery contract
<b>External collaborator benefits from Project</b>	Marketing and consumer information forms a key part of the Mayor's Electric Vehicle Delivery Plan, and learning and data from Low Carbon London will help to improve the information and resources on electric vehicles that TfL can offer private consumers and businesses. In addition, Low Carbon London will help inform TfL's electric vehicle infrastructure strategy, including where to concentrate future resources.

<b>Organisation Name</b>	<b>Siemens</b>
<b>Relationship to DNO (if any)</b>	None
<b>Type of Organisation</b>	Siemens has almost 5,000 staff in the energy sector. It provides innovative technology & engineering solutions across the energy landscape, from oil and gas production through to power generation, transmission, distribution, metering & retail services. In 2009, Siemens generated revenue of €23 billion with from its environmental portfolio - the largest in the world.
<b>Role in Project</b>	Siemens has worked with EDF Energy Networks for over six months to develop a 2020 vision for energy distribution extending from strategic network planning through to ahead-of-time and real-time operation. Siemens will provide the operational data store for all time series data.
<b>Prior experience brought to Project</b>	<p>Knowledge and products around innovative grid management, especially in metering, meter data management, efficient building automation, microgrid management, distribution automation systems and integration of electric vehicles. Experience in smart grids from other global projects eg.</p> <ul style="list-style-type: none"> <li>• N-Ergie AG Vienna - a multi-phase smart metering project using AMIS technology and distribution automation integration, integrated smart metering, load switching and power quality monitoring.</li> <li>• ONCOR - a US project on smart distribution grid automation and management.</li> </ul>
<b>Funding</b>	£600,000
<b>Contractual relationship</b>	<p><b>Will the DNO have a contract in place which ensures the External Collaborator complies with the LCN Fund Governance Document?</b> Yes/No</p> <p>Current status - signed collaboration agreement (<i>see Appendix 5</i>) and proposed delivery contract.</p>
<b>External collaborator benefits from Project</b>	<ul style="list-style-type: none"> <li>• Association with a globally-regarded, low carbon initiative</li> <li>• Working with other collaborators will help understanding of how best to combine respective strengths to deliver high value solutions to the energy industry</li> <li>• Opportunity to trial solutions in an innovative multi-vendor environment, combining them with the products and services of other vendors</li> </ul> <p>Siemens' investment of resources to work with EDF Energy Networks and the other collaborators to scope, define and plan the LCL project reflects the significance of these benefits.</p>



<b>Organisation Name</b>	<b>Logica</b>
<b>Relationship to DNO (if any)</b>	None
<b>Type of Organisation</b>	Logica - a company of 39,000 people and 2009 revenues of £3.7billion - provides business consulting, systems integration and outsourcing services. Logica UK is a leading provider to the utilities industries (particularly electricity), with a strong track record in complex solutions e.g. NETA and the competitive electricity market, national electricity settlement systems and as a major provider of IT support services for several DNOs
<b>Role in Project</b>	<p><b>Programme management</b> - Logica's experience in delivering complex programmes in a complex stakeholder environment within the electricity industry significantly reduces the delivery risks, and provides access to specialist systems integration skills where required.</p> <p><b>Smart metering</b> - Logica is a recognised leading participant in smart environment development across Europe, and brings expertise in smart metering and associated interfacing, technology and business process areas.</p> <p><b>Carbon management</b> - Logica is providing resources, expertise and systems to provide a range of carbon management services and monitoring.</p>
<b>Prior experience brought to Project</b>	<ul style="list-style-type: none"> <li>• Successfully implementing complex programmes within the electricity industry</li> <li>• Profound industry knowledge including cross-industry expertise with supply businesses</li> <li>• Implementing smart grids in Portugal</li> </ul> <p>Logica also brings considerable experience as EDF Energy's IT support service provider, which helps to minimise the implementation risk associated with the project.</p>
<b>Funding</b>	£533,000
<b>Contractual relationship</b>	<p><b>Will the DNO have a contract in place which ensures the External Collaborator complies with the LCN Fund Governance Document?</b> Yes/No</p> <p>Current status - signed collaboration agreement (see Appendix 5) and proposed delivery contract.</p>
<b>External collaborator benefits from Project</b>	Logica has a legacy of delivering innovation in the UK energy market and has actively built skills based on supporting new operating models to support change. Logica has been involved in smart metering from the beginning and has already gathered significant learning and experience, all of which it will share with the project. Learning how smart meters will benefit the DNOs, and including DNOs in the end-to-end operating model, will allow Logica to further develop its understanding and so continue to support energy market change.

<b>Organisation Name</b>	<b>EDF Energy Customers plc (known as ESCS)</b>
<b>Relationship to DNO (if any)</b>	EDF Energy Networks and EDF Energy Customers plc are wholly owned subsidiaries of EDF Energy.
<b>Type of Organisation</b>	Energy Sourcing and Customer Supply (ESCS) is responsible for maximising the long-term value of EDF Energy’s residential and business customers, using our generation assets and access to energy markets.
<b>Role in Project</b>	<p>ESCS will join the project in two key areas:</p> <p>Business to Business (B2B) will collaborate on demand side management as an aggregator</p> <p>Business to Customer (B2C) will:</p> <ul style="list-style-type: none"> <li>• deploy up to 5,000 smart meters</li> <li>• provide access to charging data from private residential EV charging posts</li> </ul>
<b>Prior experience brought to Project</b>	<ul style="list-style-type: none"> <li>• ESCS B2B is actively involved in developing the Feed in Tariffs market and will be invaluable in identifying distributed generation potential and in developing solutions to support the increase in distributed generation.</li> <li>• ESCS B2C has been running a number of smart meter trials over five years and has more than 3,000 smart meters installed across the UK. The most recent trials work has been in conjunction with energy display units, heating controllers and Time of Use tariffs.</li> </ul>
<b>Funding</b>	ESCS will fund the deployment of up to 5,000 smart meters in the areas covered by the project.
<b>Contractual relationship</b>	<p><b>Will the DNO have a contract in place which ensures the External Collaborator complies with the LCN Fund Governance Document?</b>    Yes/No</p> <p>Current status - signed collaboration agreement (<i>see Appendix 5</i>) and proposed delivery contract.</p>
<b>External collaborator benefits from Project</b>	<p>ESCS will gain valuable learning relating to:</p> <ul style="list-style-type: none"> <li>• Time of Use tariffs</li> <li>• Feed in tariffs</li> <li>• consumer response to smart meters deployed in greater density than previously</li> <li>• the impact of smart meters on customer behaviours.</li> </ul>

<b>Organisation Name</b>	<b>National Grid</b>
<b>Relationship to DNO (if any)</b>	None
<b>Type of Organisation</b>	National Grid owns and operates the high voltage electricity transmission system in England and Wales and, as National Electricity Transmission System Operator (NETSO), operates the Scottish high voltage transmission system. In addition to its UK electricity and gas operations, National Grid owns and operates substantial electricity and gas assets in the USA.
<b>Role in Project</b>	<p>National Grid brings significant experience and expertise in the field of network operation and control - in particular system balancing services, demand management services, potential distribution system operator functionalities and constructing the future energy environment.</p> <p>National Grid will enable the project to deliver a more robust and efficient solution covering the whole supply chain. It will do this by providing direct access to information and experience such as, data on demand profiles, market behaviour patterns, effective market self-balancing/residual balancing, demand response and impacts of embedded generation.</p>
<b>Prior experience brought to Project</b>	<p>National Grid will be able to both contribute to and learn from the Low Carbon London project.</p> <ul style="list-style-type: none"> <li>• Forecasting demand profiles and market behaviour patterns</li> <li>• Effective market self-balancing and its impact on the scale of the residual balancing role</li> <li>• Access to and competition for Demand Response;</li> <li>• Control arrangements and the impact of embedded generation</li> <li>• DNO to DSO</li> <li>• Data exchange on operational and planning data</li> </ul>
<b>Funding</b>	National Grid will provide resources to the project at no cost.
<b>Contractual relationship</b>	<p><b>Will the DNO have a contract in place which ensures the External Collaborator complies with the LCN Fund Governance Document?</b>    Yes/No</p> <p>Current status - signed collaboration agreement (<i>see Appendix 5</i>) and proposed delivery contract.</p>
<b>External collaborator benefits from Project</b>	National Grid will gain important knowledge on implementing smart distribution systems eg. learning about embedded and intermittent generation connection, and consumer response to new tariff arrangements. Knowledge may also include: improved forecasting and understanding customer behaviour; using smart meter data for post-event management; additional services enabled from industrial & commercial customers and electric vehicles, including fleet management; active network management; new forms of energy and system balancing services; and post-event management.

### **Box 23: Other partners**

DNOs can choose to use this space to provide details of other partners involved in the Project but who have not committed funding or resources and who do not have a contractual relationship with the DNO

EDF Energy Networks has secured the involvement of the following partners, who are still in the process of agreeing and signing the Collaboration Agreement:

#### **npower**

npower has expressed a strong interest in Low Carbon London due to the valuable learning it believes it will achieve through being involved in such a holistic project which focuses on customers and developing commercial innovation as essential components of future advanced network management.

npower has a significant customer base across London and anticipates being actively involved and contributing to the project by installing smart meters and making available the data to support the objectives of the project. As a further key energy supplier (in addition to EDF Energy Customers Plc – see Box 22), the project will gain considerably from their expertise and customer engagement skills.

#### **Sainsbury's**

Sainsbury's is London's largest greengrocer. Sainsbury's is also a very advanced consumer; it is developing 'smart' energy efficient stores and is already actively involved in the electricity market as an ancillary service provider – leveraging the embedded storage inherent in their electricity profile to provide short-term operating reserve services to National Grid.

Sainsbury's has expressed a very strong interest in being involved in our project. It will make available metering information from its stores (which are already half-hourly metered) together with information from its comprehensive sub-metering which records electricity usage across various store functions such as air cooling, refrigeration, bakery, etc. We see considerable potential for Sainsbury's to extend its responsive demand ancillary services, for example to also provide network capacity support.

Sainsbury's is also a member of 'The Electric 10' group of companies who are actively supporting the Mayor in developing electric vehicles and charging point infrastructure. Sainsbury's already operates a fleet of electric delivery vehicles; information from these and their at-store charging points (including charging points for their customers' use) will add a further valuable input to the Low Carbon London trials.

As a provider of essential goods (such as food) to customers served by London's electricity network, it is in customers' interests that Sainsbury's is actively involved in discovering how to maximise its own efficient use of electricity, and potential ancillary services, to reduce its energy related net costs and hence reflect those savings in its product prices. We see a strong mutual objective in pursuing this goal.

#### **EDF R&D**

EDF Energy Networks has enjoyed a long association with EDF R&D based in France - in particular in our joint participation in the Energy Technologies Institute (ETI), major EU Funded R&D projects such as FENIX and ADDRESS, and numerous smaller IFI projects.

We are therefore pleased that EDF R&D will be supporting our project by committing expertise as well as a source of reference for comparing and validating the results of Low Carbon London trials with those from major projects in France also pursuing low carbon trials at scale. This arrangement would continue after the proposed separation of EDF Energy Networks from the EDF Group.

## Relevance & Timing of Project

### Box 24: Please outline why the learning from the Project is relevant to Network Operators

#### **Relevance to the most likely Low Carbon Economy developments**

The most likely low carbon economy developments are associated with the Government's Renewable Energy Strategy and incentives such as Feed in Tariffs, Renewable Heat Incentives, and electric vehicle subsidies. Such developments are more likely to happen in London than elsewhere in the UK. They are also likely to happen more quickly due to local government initiatives including the London Development Agency's 'Green Enterprise District', the Greater London Authority's 'Low Carbon Zones', and Transport for London's partnership with Siemens, Sainsbury's and others (which has received £17m to deliver the UK's largest electric vehicle charge point network). Such initiatives underpin ambitious sustainable energy targets set out in the Mayor of London's spatial development strategy - 'The London Plan' - and 'London's Electric Vehicle Infrastructure Strategy' (eg. 25% of heat and power from decentralised sources by 2025 and 25,000 electric vehicle charging points supporting 100,000 vehicles by 2015). London's network is already highly utilised, so these new targets make it essential to understand the characteristics of low carbon developments, how they will impact the network, and how technological and commercial innovation can mitigate or even capitalise on this impact.

#### **How the learning will inform future business plan submissions – inc. DPCR6**

Our solution emulates a 2020 energy scenario at scale. It explores how to:

- match demand to low carbon generation while maximising network load factor and capacity utilisation
- use new technologies and commercial instruments to leverage responsive demand and distributed energy resources
- actively manage network constraints.

If we are successful, our business planning will shift radically from 'business as usual' to 'smart' network management strategies, and commercial and technological innovation will increasingly displace more costly conventional network investment. This will materially impact our submissions in future price controls, including DPCR6 which will cover the period up to and beyond 2020.

#### **Timeliness and synergies with industry developments and anticipated changes**

Our project coincides with 'The London Plan' and the 'Electric Vehicle Infrastructure Strategy'. These will have a catalytic impact on take up rates and penetration levels of cogeneration, micro-generation, electric vehicles and heat pumps. Low Carbon London is also timely due to the 2020 centralised intermittent wind generation targets in the Government's Renewable Energy Strategy. These targets call for higher levels of responsive demand to deal with wind output variation and minimise the need for fossil fuel generation at times of low wind output or peak demand. Such responsive demand will impact on the daily load profiles of distribution networks but could also reduce the need for network reinforcement.

The proposed national smart meter programme makes it timely to trial the potential benefits of encouraging customers to take advantage of new more flexible Time of Use tariffs. Low Carbon London will install at least 5,000 smart meters and explore uncharted territory in terms of information communication technology, active network management and commercial innovation to prepare for the growth in low carbon technologies.

Our project will demonstrate how radical changes in distribution system management will reduce energy-related CO<sub>2</sub> emissions and benefit customers by minimising the energy-related costs of transition to a low carbon economy. We have brought together industry and stakeholder partners with the expertise and input to emulate a 2020 energy scenario at scale. This means there is a huge momentum to deliver this project now.

## Demonstration of a robust methodology and that the Project is ready to implement (answers should be detailed in boxes 25 to 27)

### Box 25: Please demonstrate that the Project has a robust methodology and can start in a timely manner

DNOs must:

- demonstrate that the Project can start in a timely manner
- explain why the costs and benefits of the Project have been reasonably estimated and identify any uncertainties in those estimates

#### Project can start in a timely manner

The project can start directly after the funding award by Ofgem because we have:

- produced a detailed analysis of project objectives and requirements, together with in-depth use cases (*see Appendix 2*). These detail both the trials to be performed and their learning objectives. The use cases also help define the technical solution requirements to enable the trial
- carried out a detailed planning exercise, driven by the use cases and solution requirements. Appendix D is a detailed project plan outlining activities, deliverables, resources and dependencies for delivering the entire project
- ring fenced key resources (many of whom are involved in the bid phase) to ensure they are available at the beginning of the project.

Project delivery and risk management risk will use the industry leading and proven EDF Energy EEPW project delivery methodology (based on Prince 2) and governance.

EDF Energy Networks and Logica have extensive experience and capability in successfully managing and delivering large and complex projects eg.

- EDF Energy projects: **Allenby / Connaught** – Land Army infrastructure project, value of £400 million over 35 years. **Heathrow Terminal 5** – transport infrastructure project, value of £75 million.
- Logica projects: **BT performance improvement** – complex business process outsource and transformation programme. **Elaxon** – a £50m central services solution and £100 million 10-year service programme.

#### Costs & Benefits estimation, and uncertainties

Our estimates are based on:

- **benchmarking** collaborator costs where possible
- adding **contingency** to the costs based on key risks to avoid needing additional funds to complete project
- basing financial and carbon benefits on **demand forecasts** available from public sources and on **results of trials** conducted in the UK and USA
- basing reinforcement avoidance - a key benefit both in the trial period and in the long term - on the belief that various **DSM measures and commercial relationships** with aggregators will successfully impact residential, industrial & commercial and SME demand.

We have identified the following **key uncertainties** for the costs and benefits estimates:

- Availability of key infrastructure required to perform trials.
- Carbon benefits are based on flat electricity consumption profiles in order to reflect the impact the project will bring to a business as usual scenario.

## Box 26: Please provide details of the risks associated with the Project

DNOs must:

- include the key risks associated with delivery of the Project
- detail how the identification of these risks have fed into their risk management and contingency plans.

RISK DESCRIPTION	MITIGATION ACTIONS	STATUS (Probability)
<b>SMART METERS</b>		
There may not be sufficient energy efficiency measures in place in the smart meter locations	Energy efficiency measures are being rolled out in the Green Enterprise District and the Low Carbon Zones and the project will explore with our Partners deployment of CESP / CERT funding	M
Installation issues relating to the installation of Smart Meters: a. Accessibility to sites; b. Functionality; c. Data confidentiality.	a) & c) Project will work with GLA and Consumer Focus will include address selection, acceptance surveys and privacy and security measures, b) Meters to be installed by Supply Partners will comply with full industry specification	L
The take up of Time of Use tariffs may be low	Ongoing discussion with suppliers to incentivise take up	M
<b>DISTRIBUTED GENERATION</b>		
Insufficient levels of Distributed Generation available	Ongoing discussion with suppliers to incentivise take up, and working closely with LDA and Institute for Sustainability to track and influence developments in the Green Enterprise District.	M
<b>INDUSTRIAL &amp; COMMERCIAL</b>		
Aggregators are unable to attract sufficient load for the project's requirements	Aggregators have already made approaches to potential customers and are confident of being able to meet the requirements	L
<b>ELECTRIC VEHICLES</b>		
Insufficient numbers of electric vehicles in the trial area	There are currently 500 vehicles in the GLA fleet which will be available to the project. There will also be collaboration with the ETI and EDF ESCS EV projects and possible future collaboration along with TfL with vehicle manufacturers.	M
The project is unable to add monitoring software to electric vehicle charging posts or control the use of the posts.	Collaboration with TfL will provide access to usage data, etc.	L
The majority of charging posts are privately owned and cannot be monitored	ESCS project is looking at data acquisition from privately owned charging posts. Ongoing discussions with potential additional collaborators who have private charging posts, e.g. retailers	M
<b>PROJECT</b>		
Installation of measurement equipment in LV substations may require derogations.	Potential derogations have been raised in the bid submission	L
The collaborative nature of the project may lead to infringement of the Competition Act.	The Programme Director will hold regular briefing sessions with the Director Of Company Shared Services, the Compliance Officer, the Head of ESCS Legal and the Head of Networks Legal to ensure the early identification and avoidance of any potential breaches.	L
A Partner may withdraw from the project	A collaboration agreement has been signed by all Partners, and a Delivery Contract will be negotiated between September and November to be ready to sign if funding is awarded.	L

### Risks feeding into risk management and contingency plans

Identification of these risks

- was a key factor in project planning and solution design
- was a main determinant in the scale of the contingency contained within the overall project budget
- allowed the prioritisation of risk based on the impact and probability of occurrence
- ensured that appropriate mitigation measures have been planned.

We will continue to examine and validate risks throughout the project lifecycle in order to minimise their impact and to inform the project change process.

**Box 27: Please provide details of the risk monitoring procedures you will put in place for the Project**

DNOs must:

- outline the project monitoring procedures and processes in place to anticipate issues with the Project, react to these or determine when it may be appropriate to suspend a Project or flag to Ofgem that it may have to apply for a cost over-run.

Project governance will be by regular Project Board and Partner Advisory Group Board meetings. We will invite Ofgem to these meetings.

- Project run under full EEPW governance (based on Prince 2)
- Mandatory monthly reporting to the EDF Energy Networks Portfolio Board
- Regular risk reviews by the Programme Director with results reported to the Project Board and Partner Advisory Group Board, included in mandatory reporting, and fed directly into the risk planning process
- Strict financial control through mandatory monthly reporting – including Project Sponsor oversight to highlight potential overspends before they occur and use of specified tolerances in projected spend
- Ongoing assessment of project delivery risk to ensure a successful outcome
- Assurance approaches include:
  - 'Set Up For Success', to ensure that all necessary project disciplines are in place and adhered to
  - Strategic project reviews to ensure project meets its objectives
  - Peer project reviews where an independent senior project manager reviews the project to provide quality assurance and to ensure accurate project reporting etc.

A Senior Business User will provide quality assurance through regular monitoring of progress against plan and achievement of key deliverables.



## Section D: Appendices

Please list all the appendices you have attached to this pro-forma and outline the information which they provide. Where these appendices support any information provided in the pro-forma, that information should be adequately referenced

<b>Appendix A</b>	<b>Full Submission Spreadsheet</b>
<b>Appendix B</b>	<b>Maps and network diagrams (B1, B2, B3, B4)</b>
<b>Appendix C</b>	<b>Organogram</b>
<b>Appendix D</b>	<b>Project plan</b>
<b>Appendix E</b>	<b>Information sources referenced in Box 15</b>
<b>Summary</b>	Executive summary of optional appendices included
<b>Appendix 1</b>	<a href="#">Additional external collaborators</a>
<b>Appendix 2</b>	<a href="#">Use cases</a>
<b>Appendix 3</b>	<a href="#">Assumptions</a>
<b>Appendix 4</b>	<a href="#">2020 Vision &amp; Roadmap / Future Networks organisation (4A, 4B)</a>
<b>Appendix 5</b>	<a href="#">Collaboration agreement</a>
<b>Appendix 6</b>	<a href="#">Derogations</a>
<b>Appendix 7</b>	