Electricity Network Innovation Competition Screening Submission Pro-forma

Notes on completion
Before completing this form, please refer to the Electricity Network Innovation Competition (NIC) Governance Document. **Please use the default font (Verdana size 10) in your submission, the text entry areas are predetermined and should not be changed. The full-completed submission should not exceed 10 pages in total.** **Ofgem will publish all the information contained within the Screening Submission.**
Funding Licensee
Western Power Distribution on behalf of EA Technology
Network Licence Project Partners
None
Funding Licensee area
East Midlands, West Midlands, South West and Wales
Project title
OpenLV
Project Summary
The Licensee must provide an approximate Project start and end date.
The UK's strategy to become a low carbon economy (decarbonising transport & heating in particular) is creating a significant change to the traditional load profile of households and the corresponding power flows on low voltage electricity distribution networks. Significant investment will be required to reinforce LV networks, if they continue to be managed passively. **OpenLV** will deploy a low cost substation intelligence platform that will act as a hub for a range of complementary purposes, including: **- Network benefits:** provision of capacity uplift and enhanced flexibility through real time thermal ratings and automation, thereby avoiding costly network reinforcement; **- Customer and community benefits:** provision of network visibility to local communities and customers to allow them to align local action with network needs; **- Facilitation of non-traditional business models:** provision of a secure platform for third parties to open up network data to both identify problems and deploy solutions. **OpenLV** will demonstrate and quantify the benefits of substation intelligence and help to ensure low voltage networks are fit for the future and address the unprecedented changes in demand and power flows expected by 2030. As well as delivering more immediate, tangible benefits, the open and extensible nature of the platform will also enable customers to continue to realise value beyond the end of the project. **OpenLV** will run for a period of 36 months, commencing January 2017. **OpenLV** will be led by EA Technology.
Estimated Project funding
The Licensee must provide an approximate figure of the total cost of the project and the NIC funding it is applying for.

Total cost of Project	£5,157,500	**NIC funding requested**	£4,641,750
Cross Sector Projects only: requested funding from Gas NIC, NIA or second tier LCN Fund?	*If yes, please specify* N/A		

Problem

The Licensee must provide a narrative which explains the Problem(s) which the Project is seeking to address.

The UK Committee on Climate Change have set specific carbon budgets to ensure we meet our 2050 obligations. A critical enabler is the decarbonisation of electricity generation, which is very much in progress, and the decarbonisation of transport. In the latter targets of 60% of new cars and light vans being Ultra Low Emission Vehicles by 2030 are being set, with other countries going significantly beyond these targets. Global vehicle manufacturers are very much gearing for action, with all major companies bringing out full electric / hybrid vehicles into their fleets by 2020. In addition, there have been recent calls to reinstate the targets for zero carbon homes, and whilst there is some doubt about full electrification of heating, it is likely to have a dominant role into the future. (The Renewable Heat Incentive, for example, has been introduced and is influencing the uptake of heat pumps.)

The result of the above will be a significant change to the traditional load profile of households and the corresponding power flows on the low voltage electricity distribution networks.

The need to have real time information on the state of the network together with the potential benefits of actively managing the LV network are set to increase. However, different solutions will work in different situations and there is little advantage to having to deploy a suite of different hardware and controllers to substations. A flexible and open approach that can form the basis of an array of methods to manage the network would therefore be more attractive.

As an example, LV networks experience stresses during certain periods when there is a requirement to meet demands in excess of standard capacity. Rather than engage in expensive and time-consuming upgrades, it may prove more attractive to temporarily increase the network capacity via active network management. The same can be true for a suite of interventions, from intelligent voltage control to demand response.

At the same time, customers and third parties are becoming more engaged and increasingly want to become part of a 'smarter grid'. At present, there is no easy mechanism for information exchange regarding network loads, and how customers and third parties can help shape demands to avoid reinforcement.

Method(s)

The Licensee must describe the Method(s) which are being demonstrated or developed. It must also outline how the Method(s) could solve the Problem. The type of Method should be identified where possible eg technical, commercial etc.

Enabling Works: Working with WPD, install LV-Cap™ on 100 selected distribution substations - a low-cost hardware module (a remotely-managed, software-defined platform) developed by EA Technology in partnership with Nortech and the University of Manchester. LV-Cap™ is derived from proven technologies already used in datacentres and motorsport telemetry, developed under a £500k Innovate UK funded project. LV-Cap™ provides a secure/controlled platform for application developers to remotely deploy suitable applications (data gathering/ automation) to any substation, with data and information delivered securely back to network operator corporate systems. A key element of this work will be an independent evaluation and selection of communications channels for integrity and resilience against cyber attack

Method 1 – Network Capacity Uplift: Working with WPD, demonstrate the network related capabilities of LV-Cap™ through deployment of real time thermal rating application (Weathersense™), load management application (Loadsense™) and

Method(s) continued

automated linkbox switch (Linksense™) to provide LV capacity uplift through real time assessment of substation capacity and management of load via temporary network meshing.

Method 2 – Community Engagement: Exploit the flexible/open nature of LV-Cap™ platform by establishing a community engagement scheme to engage communities who want to be part of a smarter grid. Work with these communities to develop innovative algorithms and applications that could be deployed on LV-Cap™ to enable communities to better understand their electricity use (and generation). Thus enabling communities and to take action to, for example, reduce their impact on the environment, energy use and energy costs (possibly in partnership with Method 3 participants or third party funding, such as InnovateUK).

Method 3: OpenLV Extensibility: Exploit the flexible/open nature of LV-Cap™ platform to enable academics and companies (including non-energy companies) to develop innovative algorithms and applications that could be deployed on LV-Cap™ to both improve network performance and increase the visibility of LV networks; making data readily available for research by academics and opening opportunities for companies to develop innovative services for network operators or customers. An example of which could be providing control algorithms for existing network assets, such as LV storage devices on WPD's networks.

Funding commentary

The Licensee must provide a commentary on the accuracy of its funding estimate. If the Project has phases, the Licensee must identify the approximate cost of each phase. OFTOs should indicate potential bid costs expenses.

Costs assessed by EA Technology staff with expertise in the delivery of innovation projects; accuracy will be further refined prior to full submission.

Phase 1

Enabling works: Planning deployment, evaluate communications and security, specify, procure & deploy hardware, application development documentation & project closure: EATL: £1,180,000 WPD: £245,000, Other: £847,500, **Total: £2,272,500**

Phase 2

Method 1: Deploy applications & equipment to substations, monitor and evaluate performance of capacity uplift system, develop operating procedures EATL: £1,170,000, WPD: £40,000, Other: £250,000, **Total: £1,460,000**

Method 2: Community engagement process, support development/deployment of new applications, evaluate performance EATL: £820,000, WPD: £50,000, Other: £115,000, **Total: £985,000**

Method 3: Produce developer documentation, support development/deployment of new applications, evaluate performance EATL: £400,000, WPD: £5,000, Other £35,000 **Total: £440,000**

Total Project Cost £5,157,500

Specific Requirements (please tick which of the specific requirements this project fulfils)

A specific piece of new (ie unproven in GB) equipment (including control and/or communications systems and/or software)	✓
A specific novel arrangement or application of existing electricity transmission equipment (including control and communications systems software)	✓
A specific novel operational practice directly related to the operation of the electricity transmission system	✓
A specific novel commercial arrangement	

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

The Licensee must demonstrate that the Solution has the potential to accelerate the development of the low carbon energy sector in GB and/or deliver wider environmental benefits to GB customers. The Licensee must demonstrate the potential to deliver net financial benefits to existing and/or future customers.

The inflexibility of the existing low voltage network is a barrier to the adoption of low-carbon devices onto the electricity system. Currently, the only way to accommodate such additional stress in a passive network is to install additional capacity at significant expense.

At the same time, there is considerable uncertainty about the likely uptake of such low-carbon devices, meaning that there are significant risks involved in either investing ahead of need (leading to wasted expenditure) or delayed investment (leading to damage / poor network performance). These additional costs are passed on to consumers, creating a further barrier to adoption of low-carbon devices.

The methods used in this project will accelerate the development of the low carbon energy sector and deliver net financial benefits to existing and future customers by:

- Method 1 of OpenLV will increase the flexibility of distribution networks, effectively enabling the available headroom on the system to respond to the prevailing load and phase imbalance. This method will improve knowledge of prevailing levels of load growth, enabling greater uptake of low carbon loads and at lower cost.

- Method 2 of OpenLV will enable communities to take action in their desire to become part of a lower carbon or smarter network. The increased visibility will facilitate community action to be used as a lower cost alternative to traditional reinforcement.

- Method 3 of OpenLV will facilitate the creation of a new market in the deployment of innovative applications onto existing LV networks. By also exploring innovative commercial arrangements for the deployment of these applications, OpenLV will establish not only the technical platform but also facilitate the development of non-traditional business models in which such innovations can thrive. This is similar to the platforms used by smartphone providers in supporting the buoyant and competitive app market.

Such outcomes will significantly reduce the ongoing cost and risk of providing the required network flexibility over conventional solutions, lowering the cost to customers and therefore enabling greater uptake of low-carbon devices.

Delivers value for money for electricity customers

The Licensee must demonstrate that the Method(s) being trialled can derive benefits and resulting learning that can be attributed to or are applicable to the electricity transmission system.

The upgrading or replacement of an existing LV substation and/or feeders requires significant expenditure. With over 50,000 ground mounted substations under WPD ownership, the management of these assets represents a major expenditure: these costs can be significant where LV substations and associated feeders require upgrades owing to perceived lack of capacity. Upgrade works also incur additional social costs of disruption to customers.

By embedding low-cost intelligence and flexibility into distribution substations using the LV-Cap™ platform, this upgrade expenditure can be substantially reduced while maintaining long-term reliability and efficiency. The target deployment cost of the complete system is well below LV substation and feeder upgrade costs. Initial modelling suggests that OpenLV Method 1 would provide adequate capacity in approximately half of investment cases for substation and LV network upgrades, potentially providing substantial savings to network operators.

In addition to this immediate saving through temporary capacity uplift, the LV-Cap™ platform will remain in place, enabling significantly improved understanding of the real-time utilisation and performance of the LV network for OpenLV Methods 2 and 3. Additional intelligence (such as cable fault location, load forecasting, incipient fault detection and storage management) can then be deployed, providing permanent flexibility throughout the life of the substation.

Once widely deployed, OpenLV will therefore return considerable value to electricity

Demonstrates the Project generates knowledge that can be shared amongst all Network Licensees

The Licensee must explain the learning which it expects the Method(s) it is trialling to deliver. The Licensee must demonstrate that it has a robust methodology in place to capture the learning from the Trial(s).

The project will generate the following knowledge that can be shared amongst all Network Licensees:

- The functional specification and design of the low cost hardware platform
- The design and security of the chosen last mile communications technology
- The specification of a 'standard container' and framework for the deployment of software algorithms to substations
- An understanding of the potential capacity uplift from the deployment of real time thermal ratings and automation on the LV network
- An understanding of the appetite for communities to engage with DNOs to reduce network costs, and the ways by which this could occur
- An understanding of the appetite for third parties to engage with DNOs to commercialise innovative applications
- Provide a framework and mechanisms for IPR exploitation for third parties within the confines of the Default IPR provision of NIC/NIA
- Provide a platform for national roll out of distribution substation intelligence, with a life well beyond the project.

Please tick if the project conforms to the default IPR arrangements set out in the NIC Governance Document?	✓

If the Licensee wishes to deviate from the default requirement for IPR then it must demonstrate how the learning will be disseminated to other Licensees and how value for money will be ensured. The Licensee must also outline the proposed alternative arrangements and justify why the arrangements are more suitable than the default arrangements.

N/A

How is the project innovative and with an unproven business case where the innovation risk warrants a limited Development or Demonstration Project to demonstrate its effectiveness?

Demonstrate why the Licensee has not previously used this Solution (including where the Solution involves commercial arrangements) and why NIC funding is required to undertake it. This must include why the Licensee would not run the trial as part of its normal course of business and why the Solution is not Research.

Although many of the components for successful deployment either already exist or are in active development, these components have not yet been packaged together into a single low-cost, high-value solution. Furthermore, there are some components (hardware module, secure communications, operational algorithms, procedures and training) that this project would develop and share across all Methods.

Method 1 will reduce uncertainty over the amount of additional headroom available from real time thermal ratings and automation. This will reduce the risk associated with such techniques and qualify them to be deployed on a purely commercial basis.

Method 2 will determine the appetite for and effectiveness of community engagement in reducing network costs, as well as developing a mechanism for such engagement.

Method 3 will provide shared data on typical asset performance and utilisation together with a common platform for solution deployment. This will be extremely valuable to third parties, reducing uncertainty and risk associated with developing new innovative commercial products.

The flexible and open nature of the LV-Cap™ platform would mean that the functionality and intelligence of the distribution substation can continue to be enhanced beyond the lifetime of the project – either using components developed by Network Licensees or sourced from 3rd parties. By creating an open, competitive market for substation intelligence components, this is expected to drive significant innovation while avoiding any risk of "lock-in" to a single vendor.

Project Partners and external resourcing/funding

The Licensee must provide evidence of how Project Partners have been identified and selected, including details of the process that has been followed and the rationale for selecting participants and ideas for the project.

The Licensee should provide details of any Project Partners who will be actively involved in the Project and are prepared to devote time, resources and/or funding to the Project. If the Licensee has not identified any specific Project Partners, it should provide details of the type of Project Partners it wishes to attract to the Project.

A competition was carried out by Western Power Distribution to find third party applicants for this year's NIC process. The process provided 32 applicants of which eight were taken through to the next stage before being down selected to a final two. This proforma is the work of EA Technology. The statements in this application do not necessarily reflect the views of Western Power Distribution.

This project will be led by EA Technology, along similar lines to the successful My Electric Avenue (I²EV) LCN Fund Tier 2 project.

The project will make use of existing relationships to provide the core technology, together with competitive tender for the new Methods outlined in this bid. In doing so, it provides a solid technology foundation whilst ensuring value for money where this can be most effectively provided by the market.

These parties include a manufacturer to ensure the hardware platform is ready for large-scale deployment, a cyber-security expert to test the resilience of the system, and while there will be a communications partner for integration with the DNO systems (backhaul), a separate process will be undertaken to select a communications provider for the 'last-mile' communications (from the substation along the LV feeder).

The necessary suppliers and partners will all be in place in time for the full submission of the project bid. These will be appointed by competitive tender during the bid process, or at the outset of the project as appropriate.

Derogations or exemptions

The Licensee should outline if it considers that the Project will require any derogations, exemptions or changes to the regulatory arrangements.

None anticipated

Customer impact

The Licensee should outline any planned interaction with customers or customers' premises as part of the Project, and any other direct customer impact (such as amended contractual or charging arrangements, or supply interruptions).

There will be no Planned outages as part of the project's activities.

A Customer Engagement Plan will be produced for the community engagement element of the project. All community/customer engagement with the project will be on a voluntary basis.

General disruption through the delivery of the project will be handled using the standard WPD process.

No in home works will take place as part of this project.

Details of cross sector aspects

The Licensee should complete this box only if this Project forms part of a larger cross sector Project that is seeking funding from multiple competitions (Electricity NIC, Gas NIC or LCN Fund). The Licensee must explain about the Project it will be collaborating with, how it all fits together, and must also add a justification for the funding split.

N/A

Any further detail the Licensee feels may support its submission
This project builds on work previously funded by InnovateUK and partners under their "Energy Catalyst Mid stage round 1". 'Common Application Platform for LV Network Management' is a £500k project led by EA Technology and delivered in collaboration with Nortech Management Ltd and University of Manchester. The purpose is to develop a novel, common, low cost, robust monitoring and management system for the low voltage network (LV-Cap™). The work is aimed at lowering the cost of connecting low carbon technologies with a focus on producing a demonstration at TRL 5. Further details can be found at: http://www.eatechnology.com/news-and-resources/news/ea-technology-news-substation-intelligence In support of Method 1, ongoing academic research has identified the potential that can be realised when these two approaches are combined. Working together, automation and real time thermal rating appear to provide a significant capacity increase (~10-30%) in many scenarios. However, this work remains largely theoretical and has not yet been proven on real networks. It is effectively at TRL 4. Open LV combines the above components into a single, integrated platform running on a number of WPD substations to deliver an LV capacity uplift solution at TRL 8. Method 2 will then enable a number of existing innovations, and develop them to the point where they can then be deployed as a cost-effective solution across the GB network in order to reach TRL 9. The project also supports and complements the aims of InnovateUK's "Energy game changer" competition. This competition seeks to find innovative solutions to long-standing challenges faced by the energy sector, by engaging with non-traditional innovative SMEs, to attract fresh thinking to the industry.

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