

25 July 2017

To Whom It May Concern

Consultation on RIIO-ED1 Innovation Roll-out Mechanism Submissions
UK Power Networks - LV Network Visibility and Control

I am very pleased to have the opportunity to respond to the consultation on UK Power Networks' RIIO-ED1 Innovation Roll-out Mechanism Submission.

Imperial College London has completed extensive research and modelling in the area of the developing smart electricity networks, the role of networks in enabling the low carbon transition and the importance of the emerging Distribution System Operator. This research has provided evidence across the industry and government regarding the major challenges and opportunities for cost effective energy decarbonisation, including the Department of Business, Energy, and Industrial Strategy¹, the National Infrastructure Commission², and the Committee on Climate Change³.

<p>Question 1: <i>Do you consider that any of the proposed roll-out will facilitate the Government's Carbon Plan and/or deliver wider environmental benefits?</i></p>
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UK Power Networks' proactive deployment of LV network monitoring will accelerate the uptake of low-carbon technologies such as electric vehicles, heat pumps, microgeneration, and energy storage, by providing the data needed to better manage the network constraints that these technologies will cause. With the objective to reduce local emissions, London is the first city in the UK that requires that all new taxis in central London will be zero-emission from 2018 and the visibility of low voltage networks is essential for an informed and effective response. The same data will also provide fundamental insights into network losses and opportunities to reduce them, given that very significant proportion of losses are in LV networks.

¹ "Analysis of electricity system flexibility for Great Britain" (report for BEIS, 2016),

² "Delivering future-proof energy infrastructure" (Report for National Infrastructure Commission,

² "Delivering future-proof energy infrastructure" (Report for National Infrastructure Commission, 2016)

³ "Value of Flexibility in a Decarbonised Grid and System Externalities of Low-Carbon Generation Technologies" (report for Committee on Climate Change, 2015)

Question 2: *Do you consider that any of the proposed roll-outs will deliver long-term value for money to customers?*

I consider that UK Power Networks' proactive deployment of LV network monitoring is a least-regret solution, and will ultimately cost less than deploying the same solutions reactively in response to the low-carbon energy transition.

Question 3: *Do you consider that any of the roll-outs will allow the licensees to receive commercial benefits within the price control period, ie will the roll-out lead to cost savings and/or incentive rewards, greater than the cost of the roll-out within the price control period?*

UK Power Networks will achieve cost savings by avoiding network reinforcement, but the net effect of the roll-out will be to release more capacity for the same amount of investment, rather than release the same amount of capacity for less investment.

Question 4: *Do you consider that the technologies that SPEN and UKPN wish to roll-out fall within the definitions of a Proven Innovation or Ordinary Business Arrangement as defined in the IRM licence condition?*

The technologies that UKPN wishes to roll out have been trialled and demonstrated in innovation projects, including several projects where Imperial has been a project partner – for example FUN-LV, which demonstrated extensive use of LV network monitoring. These technologies could not be rolled out at the start of the RIIO-ED1 price control period because they were not yet technically and commercially feasible to be deployed at scale.

Question 5: *What are your views on the merits of any of the proposed technology roll-outs?*

- *To what extent are the proposed roll-outs relevant to current and future challenges in relation to the distribution network?*
- *What improvements, if any, do you consider that the proposed technology roll-outs offer compared to the current situation?*

The electrification of heat and transport will place significant challenges on the low-voltage part of the distribution network within the RIIO-ED1 price control period. UK Power Networks proposed rollout of LV network monitoring is very relevant to these challenges, as it will provide the data needed to manage these challenges in a proactive and cost-efficient way. At present, UK Power Networks (like other DNOs) have very limited visibility of their low voltage network, and would hence be restricted to responding reactively to the challenges of the low carbon transition.

Question 6: *What are your views on the timing of the proposed roll-outs?*

- *What would happen if any of the proposed roll-outs didn't occur until the next distribution price control starting in 2023?*
- *Does the timing of any of the proposed roll-outs have a significant effect on the expected level of benefits?*

This very much depends on which of the future energy scenarios eventuates during RIIO-ED1, but in three of the four scenarios (Two Degrees, Consumer Power, Slow Progression), there will be significant uptake of low-voltage-connected low-carbon technologies by 2023. Without visibility of the low voltage network, UK Power Networks (and other DNOs) will be restricted to responding reactively to the impacts of these technologies, and at higher cost.

Question 7: *To what extent will the proposed roll-out facilitate the Carbon Plan?*

- *Please explain what aspects of the Carbon Plan you consider the proposed roll-out will facilitate.*
- *What is your view of the claims made by the licensees regarding the contribution the proposed roll-out will make to these aspects of the Carbon Plan?*
- *Will any of the proposed roll-outs deliver benefits more quickly than the business as usual methods used across Great Britain (GB)?*

UK Power Networks' proposed rollout of LV network monitoring will enable quicker and more efficient connections for several low-carbon technologies that comprise the Carbon Plan: low-carbon heating (heat pumps), low-carbon transport (electric vehicles), and low-carbon electricity (microgeneration). These technologies will largely connect to and impact the low voltage network. The rollout will provide real-time and historical data that will enable UK Power Networks to make quicker and more informed decisions on LCT connection applications, operate the LV network closer to its limits, and make smarter interventions when the limits are reached.

Question 8: *To what extent will the proposed roll-out deliver wider environmental benefits?*

- *Please explain what, if any, environmental benefits you consider the proposed roll-outs will deliver.*
- *What is your view of the claims made by the licensees regarding the environmental benefits their projects will deliver?*
- *Will any of the proposed roll-outs deliver benefits more quickly than the business as usual methods used across GB?*

Transport for London has significant interests in electrifying transport sector in order to reduce local emissions. London is the first city in the UK to impose emission restrictions on taxis: from 1 January 2018, all new taxis in central London will be zero-emission capable (i.e. plug-in vehicles). In this context, UKPN's networks will be amongst the first GB DNO networks required to accommodate residential clusters with high concentrations of plug-in Taxis (and private EVs), according to the analysis of TfL and the London Taxi Company. Clearly, the visibility of LV networks will be

critical for assessing the impact of charging of Taxis on the LV networks and will facilitate proactive network control and planning and facilitate the investigation of the opportunities for smart charging.

Furthermore, the LV network data will provide better insight into network losses and opportunities to reduce them. Reducing network losses will clearly provide a further mechanism for environmental benefits in the future.

Question 9: *To what extent will any of the proposed roll-outs deliver value for money to consumers?*

- *Please explain whether you consider the cost and scale of any of the proposed roll-outs is justified in relation to the benefits each will deliver.*
- *What proportion of the potential benefits from the proposed roll-outs do you consider will accrue to the network compared to other elements in the energy supply chain?*

UK Power Networks rollout of LV network monitoring is targeting the 7% of substations where uncertainty about LCT uptake and load growth is most likely to result in either unnecessary reinforcement, or constraints on LCT uptake. As such I believe that the roll-out is a good least-regret solution to deal with this uncertainty that will ultimately cost significantly less than the “do nothing” option.

I expect that a significant proportion of the benefits will accrue directly to customers via reduced connection costs for customers adopting LCTs. Technology vendors will obviously also benefit via increased sales of their products, but I believe that a roll-out of this scale will stimulate significant competition to keep the rollout cost as low as possible.

Question 10: *With reference to the IRM licence condition, do you have any significant concerns about funding any of the proposed roll-outs under the IRM? For example, do you consider it is reasonable to expect the licensee to carry out the work anyway as part of business as usual?*

I do not think it is reasonable to expect UK Power Networks to fund the rollout as part of business as usual.

Kind regards,



Prof Goran Strbac