

Nisha Doshi
Smarter Grids and Governance Team
Ofgem,
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21 May 2015

Dear Nisha,

Consultation on the Successful Delivery Reward Applications for Low Carbon Networks Fund: *Flexible Plug and Play Project*

Thank you for the opportunity to respond to the above open letter. This response is made on behalf of Imperial College London, and we very pleased that we had the opportunity and privilege to contribute to the Flexible Plug & Play, a leading-edge project which will stimulate and facilitate larger scale deployment of low carbon generation technologies in distribution networks.

The FPP project provided radically new insights regarding the cost effective integration of renewable generation in distribution networks through pioneering demonstration of a spectrum of novel technical and commercial solutions, including:

- Successful installation and application of the first 33kV Quadrature-booster in distribution networks;
- Deployment of novel coordinated Active Network Management scheme supported, for the first time, by a robust and scalable communication system;
- Successful application of remote terminal units, weather sensors, dynamic line rating technologies
- Pioneering application of advanced protection to enhance the reverse power flow capability the distribution substations and
- Development and implementation of the first smart commercial arrangement for connection of distributed generation.

The FPP project clearly demonstrated that these novel approaches could provide significantly lower cost solutions when compared to traditional network reinforcement, while not compromising on the carbon and security performance of the system. It is very clear that FPP has provided the industry with a step change in learning that will accelerate the deployment of renewable generation. The outputs of the FPP project

and actual savings already made clearly demonstrate exceptionally good value for the end consumers.

In the FPP project, Imperial College London led the development of a novel *Strategic Investment Model*, the tool can be used by UK Power Networks and other DNOs to investigate the economic and carbon benefits of strategic multi-year distribution network planning with smart technologies, active network management techniques and novel commercial arrangements that can facilitate efficient integration of renewable technologies in the existing distribution networks.

The rollout of FPP solutions is fundamentally transforming our distribution networks from passive to active. The paradigm shift towards active management of distribution networks enabled by the FPP project, will be essential for delivering efficient integration of renewable generation, as the traditional passive operation would result in either (a) much higher network reinforcement costs or (b) lower levels of renewable generation connected to distribution networks with adverse impact on system emission performance. Clearly, GB wide application of successfully trialled solutions in the FPP project will be essential for supporting cost efficient decarbonisation of the electricity system, particularly given growing interest in connecting renewable generation to distribution networks. The high quality of the project outcomes has gained very clear external recognition at both at national and international level.

Overall, the superiority of the FPP paradigm over traditional network operation and design practices has been very clearly demonstrated, and we strongly believe that the roll-out of the FPP concepts will be critical for facilitating cost effective evolution of the GB electricity system to a lower carbon future.

Imperial College London would be very pleased to discuss further any aspect of this response if this may be helpful.

Yours sincerely

A handwritten signature in black ink, appearing to read 'Goran Strbac', written in a cursive style.

Prof Goran Strbac