**School of Electronics, Electrical Engineering & Computer Science**

Queen's University Belfast
Ashby Building
Stranmillis Road
BELFAST, BT9 5AH

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Caspar Swales
Head of Economics and Efficiencies (Finance and Network Assets)
Utility Regulator
Queen's House
14 Queen Street
BELFAST
BT1 6ED

Dear Mr Swales,

**Re: NIE Networks Transmission and Distribution price control (RP6) draft determination**

We write in response to your invitation to comment on your draft determination in relation to NIE Networks Transmission and Distribution price control (RP6).

Queen's University Belfast (QUB) is a Russell Group university with a long history in Electrical Power Engineering. We have offered Electrical & Electronic Engineering courses accredited by the Institution of Engineering and Technology (IET) for over forty years continuously and are a founder member of both the IET's Power Academy and Power Networks Research Academy. We have a track record of having worked with all UK DNOs through EPSRC Supergen projects, and we have had a number of projects with GB DNOs funded under the Low Carbon Networks Fund (LCNF), the Network Innovation Allowance (NIA) and the Network Innovation Competition (NIC). Both the LCNF and NIC have provided the GB DNOs with significant resource for innovation and trial demonstrations and it is from our perspective a matter of great regret that such resource has hitherto not been available to NIE Networks.

While it is most pleasing to note that there is inclusion of funds to promote innovation and 'Investing for the Future' within the RP6 submission, it is concerning to note that this is significantly curtailed in the draft determination by the Utility Regulator and we would urge reconsideration before the determination is finalised.

While there is much that NIE Networks has, and can, learn from LCNF, NIA and NIC funded innovation, the rural nature of the NIE Network is very different from many of the GB DNOs. For

example there is a significant proportion of single phase 11 kV and a substantial capacity of wind generation connected at 33 kV and below. Indeed the installed capacity and instantaneous penetrations of wind generation would be completely unfamiliar to some of the other UK DNOs. This we believe provides unique challenges to NIE Networks for which solutions may not always be found in the existing output of the GB DNO innovation activities. Thus in some instances it will be necessary for NIE Networks to be a leader of innovation, rather than a fast follower of the innovation activities of other UK DNOs.

Furthermore the prerequisite constraints detailed in paragraph 4.46 of the draft determination are, in our view, a potential barrier to true innovation which is by its very nature speculative and for which outcomes are without guarantees of successful development and eventual deployment particularly within the current regulatory period. Indeed some of the most useful outcomes that have arisen from more speculative endeavours may not have been envisaged at the onset and as consequence, may take longer to mature. Consequently, while retaining the necessary checks and balances to ensure appropriate use of resource, we would urge a greater degree of flexibility perhaps making some allowance for longer term activities that may deliver outside the current regulatory period. Additionally, one of the lessons from the recent innovation projects in the GB DNOs is that non-network companies can have good ideas that are not taken forward because of the lack of a host DNO to work with. Given the significant number of SME and larger enterprises within the jurisdiction with expertise in appropriate areas, perhaps some consideration could be given to encourage such collaboration, similar to the CASE projects described below.

In relation to the five areas of innovation investment we would make the following comments:

Smart Asset Monitoring is an area where NIE Network and QUB have previously worked together to demonstrate through an academic study the potential of dynamic line rating (DLR) to significantly enhance (in some cases by 47%) line capacity over traditional rating methodologies [1]. With congestion in the 33 kV network increasingly likely to be due to the installation of wind turbines, there would be clear benefit moving forward with a deployment or demonstration project of such technology given the strong correlation between enhanced line ampacity and wind speed.

Demand Side Response (DSR) has been identified as a necessary step to facilitating a greater number of Low Carbon Technologies (LCT), and NIE Networks and QUB have just embarked in partnership (a CASE project funded by Invest Northern Ireland via their Competence Centre Programme) with Europe's largest manufacturer of DSR electrical heating appliances and an aggregator, to explore its potential to both DNO and TSO and also the practicality of deployment.

Active Network Management (ANM) is an area in which QUB has worked with a GB utility, particularly on the more rural aspect of their network to accommodate a large perforation of wind generation including many single-phase devices.

Voltage Management is an area where QUB are involved in the trials of a GB DNO who are currently trailing conservation voltage reduction (CVR) and methods of reactive power compensation. One observation that was not envisaged at the outset of this project was the potential of such technologies to enhance power quality and help mitigate the deterioration of power quality resulting from the adoption of other LCTs .

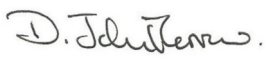
QUB believe the potential of Energy Storage Services covers a plethora of activities including peak reduction, energy arbitrage, and also has much to offer distribution networks in terms of DSR, ANM and power quality. Furthermore, their capabilities to provide aggregated response and services to the Transmission System Operator should not be overlooked. Indeed, through an Innovate UK funded project [2] and working in partnership with the TSO, AES Kilroot Power Limited and others, the potential of Battery Energy Storage System (BESS) to provide ancillary services, such as Fast Frequency Response (FFR) is enlightening. Furthermore, in other jurisdictions there is considerable investment in the area of clean and flexible energy storage, for example the UK's Industrial Strategy Challenge Fund (ISCF). Consequently the presently planned zero expenditure for this category in the draft determination is concerning.

Communications Infrastructure is of course the underlying facilitator for all low carbon and smart grid technologies. Our contention is that substantial future investment will be required to extend monitoring and control activities beyond the main and primary substations. At the secondary substation and below, the communications infrastructure is likely to be required to share bandwidth with other users whilst at the same time addressing issues such as scalability, security, latency and resilience.

Clearly QUB is already and would seek further involvement in, and therefore benefit from, such innovation activity through research projects and research studentships. However we would expect to see benefits to the other stakeholders as follows: NIE Networks through greater use of existing assets and deferral of CAPEX; electricity prosumers through optimisation of grid utilisation and greater facilitation of their low carbon technologies, societal benefits such as adoption of low carbon technologies and $CO_2$ reduction, and the training of highly skilled personnel required to achieve these goals.

Consequently and in conclusion, we would urge reflection of the draft determination to allow both greater funding and enhanced speculation in the nature of the innovation projects. Only with greater speculation in these endeavours are greater rewards in the outcomes likely to be realised.

Yours sincerely,



D John Morrow
Professor of Electrical Engineering

[1] Morrow, D.J., Fu, J., and Abdelkader, S.M.. An experimentally validated PLS model for dynamic line rating. IET Renewable Power Generation, Vol. 8, No.3, April 2014, pp. 260-268. (DOI: 10.1049/iet-rpg.2013.0097 )

[2] http://gtr.rcuk.ac.uk/projects?ref=102227