5th Floor
The Athenaeum
8 Nelson Mandela Place
Glasgow
G2 1BT

Tel: +44 (0)141 3415400

fnc.co.uk

011857/96863L

8 February 2022

Deputy Director, Electricity Distribution
Ofgem
10 South Colonnade,
Canary Wharf,
London,
E14 4PU

Dear Deputy Director

RIIO-ED2 - SCOTTISH POWER ENERGY NETWORKS ED2 SUBMISSION

Frazer-Nash Consultancy is happy to provide the following response to Ofgem on the Innovation aspects of Scottish Power Energy Network's (SPEN) RIIO ED2 submission. We understand that it will be used to help Ofgem form an understanding of stakeholder views and will form part of the evidence base for SPEN's plan. We are content for it to be used for this purpose.

Frazer-Nash is a leading systems, engineering and technology company. We help organisations deliver innovative engineering and technology solutions to make lives safe, secure, sustainable, and affordable. We provide technical services across the UK power transmission and distribution sector, with a particular focus on innovation. Our people apply their expertise to develop, enhance and protect our clients' critical assets, systems and processes. This expertise and our consultancy role provide us the insights into the policy, approach and challenges of electricity network innovation which we have use to develop our response.

In 2019 and 2020 Frazer-Nash Consultancy supported an Independent Panel of experts, established by BEIS and Ofgem, reviewing the role of Electrical Engineering Standards in the future energy system. This work provided insight into the key whole system challenges that the industry faces and role that Distribution Network Operators (DNO) can play in the efficient transition to a Net Zero energy system. Whilst this work was focussed on the role that standards play in driving network costs and constraints, its findings[1] also identified several opportunities for cost reduction within the current standards framework. The comments in the sections below on aspects of SPEN's ED2 business plan are made reflection on the findings and recommendations of that Electrical Engineering Standards review. Our comments may also be applicable to other DNOs' plans however we have focused our response on SPEN's plans due to the time constraints associated with this consultation.

The comments below reference sections in Scottish Power Energy Network's Innovation Strategy, which is Annex 2a to their RIIO-ED2 Business Plan, accessed at:
https://www.spenergynetworks.co.uk/pages/chapter_2_annexes.aspx

[1] Electrical engineering standards: independent review - GOV.UK (www.gov.uk)

1 Comment 1 – Enhanced Voltage Control

Related section: Annex 2a: Innovation strategy, sections 4.7 and 6.2.3.

Enhanced voltage control has a number of potential network benefits. These include:

- The accommodation of additional demand (without causing voltage to fall below statutory limits)
- Additional headroom for distributed generation; and
- Potential energy saving through voltage optimisation.

These benefits have the potential to contribute to a faster uptake of low carbon technologies (LCT), in both demand and generation, with reduced network impacts and reduced customer energy bills. The increased penetration of LCTs causes particular challenges due to the wider voltage range an individual circuit may see; i.e. high photovoltaic (PV) penetration may increase voltage during the day, and high electric vehicle (EV) and heat pump load will further reduce voltage during evening peaks.

Conventional secondary substation equipment connecting to low voltage networks does not typically have voltage control functionality, leading to the need for DNOs to set conservatively high voltage set points and to the potential determent of customers.

We note that SPEN plan to increase the roll out of technologies such as On-load Tap Changers (OLTCs), which provide the capability to change voltage throughout the day and should (where targeted appropriately) provide customer and environment benefits. These solutions can be used in place of more costly network reinforcements. We also note more innovative technologies, such as the power electronic enhanced transformers, are part of ongoing innovation projects and may provide additional voltage optimisation and harmonic reduction benefits.

Relating to the claim on customer electricity bill reduction (section 6.2.4), we note that there is limited discussion quantification as to what types of electrical loads would see an energy reduction from the voltage reduction/optimisation. Power electronic interfaced loads such as EV chargers tend to operate on a constant power basis, and as such the increased use of such loads over time may see the ‘energy reduction’ benefit diminish. Studies which are inclusive of the future demand mixes could be an area for future innovation projects.

2 Comment 2 – LV Network Visibility

Related section: Annex 2a: Innovation strategy and Annex 4A.21

The visibility of the low voltage (LV) network continues to be a challenge for DNOs. It can lead to non-optimal network planning, operation and monitoring of outages. Significant improvement is particularly required to enable future smart system and flexibility functions.

The roll-out of network monitors is one key component of this. It is noted that SPEN intend to install a number of network monitors at targeted locations in their network. These monitors, combined with the more granular ENZ connectivity model should support SPEN more efficiently managing load on their network.

As well as targeted ‘retrofitting’ of monitors, installing monitoring as default on all (or at least the majority) of new secondary substations would likely lead to more efficient deployment of these in future. SPEN’s position on such an approach is not apparent from our review.

We recognise there is a number of initiatives ongoing around open data and facilitating data sharing to move towards the real-time delivery of flexibility functions. Realising commitments to open data and coordinating with national programmes such as Modernising Energy Data will be critical to enabling future smart home and network benefits.

3 Comment 3 – DC Distribution

Related section: Annex 2a: Innovation strategy section 6.2.3

The use of direct current (DC) network distribution has a number of potential efficiency and capacity advantages at multiple voltage levels. However, for medium voltage direct current (MVDC) and medium voltage direct current (LVDC) applications standardisation around aspects such as voltage level, earthing system design and protection remains immature. Non-technical issues also present key barriers. These include that industry professionals are unfamiliar with DC and the market for DC devices and components is currently small. This is a particular issue for Great Britain with very limited experience compared to the USA and parts of Europe.

SPEN Innovation Projects such as Angle DC and LV Engine support greater understanding of how DC can be used effectively on the UK network. We would encourage further innovation projects in this area to increase understanding and capability of using DC networks, and ultimately benefit customers through reduced network costs.

4 Comment 4 – Network Resilience

Related section: Annex 2a: Innovation strategy section 4.6 and Annex 4 A.7: Climate Resilience strategy

Through our increasing dependence on electricity, the resilience of the electrical system is becoming increasingly important over time. Whilst resilience is primarily an issue for National Grid ESO to manage through the operation of the transmission system, the role of distribution networks will be increasingly vital given the growth of distributed generation (including an exponential growth of energy storage).

NIC projects such as Distributed Restart are a start to understanding how distributed assets may be used for system restoration functions.

We believe this should remain a key area of research for network companies considering aspects such as:

- How distribution networks can effectively support the operation and defence of low inertia networks.
- The potential for microgrid or islanded operation as a means of system defence or to manage outages in more rural communities.

Developing a network which will be resilient to climate change will be vital, and this should continue to be a key focus in future.

5 Closing Thoughts

As engineering consultants, Frazer-Nash staff use our skills and talents to ensure a sustainable future for society. Our work helps deliver a safe and secure world, where natural resources are conserved, and clean energy is available to all. And we focus on actions to reduce climate change;

supporting rapid and far-reaching transformations in the delivery of energy, security, industry, and transport.

We believe that the innovation strategy that SPEN have committed to is aligned with these objectives and look forward to continuing to support their innovation development through our consultancy role.

Yours sincerely,
FRAZER-NASH CONSULTANCY LIMITED

David McNaught
Group Leader
Technology Management