

SUBMISSION FROM SP ENERGY NETWORKS

Executive Summary

Security of supply is a function both of the availability and flexibility of generation plant and the capability of the transmission system to support demand from the generation plant connected to it, but is not the only aspect crucial to an effective transmission system. Other issues are also significant, including system operability, which considers whether the network is able to deliver minimum voltage and frequency standards; and Black Start capability, necessary to effect an efficient and timely Black Start restoration and minimise the social and economic impact of such an event.

In addition there is a requirement to ensure there is sufficient transmission capacity available to the System Operator (SO) to allow reasonable and economic access for the Transmission Owners (TO) to undertake maintenance, refurbishment and construction works. We have considered each of these issues as follows:

- **Security of supply (ensuring that there is enough generation to meet demand).** Our view is that the risk of failing to meet winter peak electricity demand in Scotland remains low in the period to the end of the current decade, but it is increasing. Reliance on aging nuclear AGR generating stations contributes to the increased risk. Experience suggests the reliability of nuclear generation can be uncertain towards the end of life. Investment solutions that will deliver increases in south-north transmission capacity (England-Scotland and Central-Northern Scotland) are in construction and will improve the situation, but questions around the mix and availability of sufficient generation capacity and margins in a Great Britain (GB) context are of some concern.

In the period from 2020 to 2030, the prospective closure of the existing fleet of nuclear AGR generating stations across GB, and in particular the five AGR stations located in Scotland and the north of England, will be a major consideration and likely to present significant challenges on both a Scottish and GB wide basis.

- **System operation issues and voltage control (maintaining system voltages at levels that do not over-stress transmission equipment).** In response to anticipated changes in the availability of large synchronous generation plant in Scotland to the end of the current decade, transmission investment solutions are being progressed that will improve the situation by the 2017 summer period.
- **Black start (recovering from an event which results in loss of large parts or all of the GB transmission system).** Currently the operating regime and operational status of large thermal power stations is a determining factor in the speed with which any Black Start recovery can be effected. The continued decarbonisation of the electricity system will have a fundamental impact on the location and nature of electricity generation sources, and will lead to extended recovery profiles in some areas of the UK, including Scotland. The existing

Black Start recovery plan for central and southern Scotland will become invalid following closure of Longannet generating station.

About SP Energy Networks

SP Energy Networks own and manage the electricity transmission and distribution networks in central and southern Scotland, serving approximately 4 million people in this region. SP Energy Networks encompasses both of the licenced businesses SP Transmission plc (SPT) and SP Distribution plc (SPD).

Under the Electricity Act 1989, SPT is licensed to transmit electricity and required to fulfil the following obligations within its licence area: -

- To develop and maintain an efficient, co-ordinated and economical system for the transmission of electricity; and
- To facilitate competition in the supply and generation of electricity.

These statutory obligations are reflected in SPT's transmission licence. In addition, as owner of the transmission assets within its licence area, SPT has the following obligations pursuant to its licence conditions:-

- To plan and develop its transmission system in accordance with the National Electricity Transmission System Security and Quality of Supply Standard (SQSS); and
- To make offers to generators wishing to connect to the transmission system in SPT's licence area. In this regard, SPT is obliged to make its transmission system available for these purposes and to ensure that the system is fit for purpose.

In response to statutory and licence obligations placed upon it, SPT therefore provides connections for electricity generators and, where appropriate, reinforcements to increase transmission capacity both to accommodate the connection of new generation sources as well as the closure of existing generating capacity.

The three transmission licensees in GB¹ work closely to ensure co-ordinated planning of the transmission system and compliance with the SQSS. In accordance with The System Operator Transmission Owner Code, in planning and developing transmission infrastructure in central and southern Scotland, SPT is obliged to employ Planning Assumptions which are provided by National Grid and in practice are aligned with the National Grid UK Future Energy Scenarios.

In this response to this call for evidence, as a Networks business, we have focused on the following question:

¹ The three onshore Transmission Owners are: National Grid Electricity Transmission plc, SP Transmission plc and Scottish Hydro Electric Transmission plc. NGET also acts as the GB System Operator (SO).

“A number of new transmission network projects are currently under construction or being planned. What role will these have in securing electricity supplies, and where should future investment be directed? What role might the distribution network, and a single European electricity market play in securing supplies?”

RIIO-T1 Context and New Transmission Network Projects

Security of electricity supply in Scotland is function both of the availability and flexibility of ‘local’ generation plant located in Scotland and the capability of transmission infrastructure to support Scottish demand from ‘remote’ generation plant located in England and Wales. The availability and flexibility of ‘remote’ generation in England and Wales is also a highly relevant factor.

SP Energy Networks is presently delivering an investment plan in transmission infrastructure totalling £2.6 billion pounds over the 8-year RIIO-T1 price control period from April 2013 to March 2021. Along with the other GB onshore transmission licensees, this is the most significant investment in the transmission network in the last 70 years. The investment can be categorised in three broad areas:

- **Investing in existing assets to secure the performance of the transmission network by an extensive modernisation programme.** Replacing ageing infrastructure will ensure a high level of system reliability is maintained.

Excellent progress has been made in the delivery of the plan in its first two years. The modernisation programme for overhead lines is ahead of plan, but there remain challenges to overcome. Replacing assets designed and built in the 1960s requires careful planning to ensure both that supplies are maintained during the construction works and that access to the transmission system for generators is maximised. However, it is inevitable that some generator access restrictions will be necessary while these works are ongoing. In accordance with its licence obligations, SPT develops the most economic, efficient and co-ordinated solutions, recognising the balance between capital cost and operational costs during construction, including generator constraint costs. We have identified a number of major modernisation schemes where building assets ‘off-line’ would result in an incrementally higher capital cost but achieve significantly greater savings in constraint costs. We are presently working with the other onshore transmission licensees and Ofgem to introduce a mechanism to ensure these schemes are implemented in a timely manner.

- **Providing connections to new sources of low carbon energy.** The transmission system is being extended to provide connections to new generators, most of which are on-shore wind.

As part of our RIIO-T1 business plan submission to Ofgem, we forecasted the connection of an additional 2503MW of new renewable generation to the transmission network in the period to March 2021. We presently have contracts

with NGET for 6924MW to connect during this price control period and beyond. In part, this has been influenced by the 'Connect and Manage' framework, which permits generators to connect to the network in advance of the completion of required wider reinforcement works. The generators' output is then managed to ensure that the network remains operated within its capability. In some cases, this is leading to significant difficulty in securing the outages to complete the necessary transmission reinforcement works, in part due to the associated generator constraints.

- **Reinforcing the transmission network.** This provides capacity to meet renewable energy targets, address local capacity issues and secure the network for the closure of existing generation capacity.

System reinforcement works have focused on the necessary increases in transmission capability to permit the bulk transfer of low carbon energy internal to Scotland and from Scotland to England and Wales. Due consideration has also been given throughout the investment planning process to the capability of the Scottish networks to import power from England and Wales. The Western HVDC link, a joint project with National Grid currently under construction, will have a bi-directional power transfer capability of up to 2250MW. The onshore reinforcements in our RIIO-T1 business plan will also provide incremental benefits for import to Scotland.

What role will these Projects have in securing electricity supplies, and where should future investment be directed? Over the last year, we have worked together with National Grid and SHE Transmission, in carrying out specific analysis with regard to these issues in Scotland, including a review of the capability of the transmission system to support power flow from England and Wales to Scotland, and from south to north across the Scottish transmission system.

- **Security of Supply** - The existing transmission system can support a secured² transfer in the winter months of approximately 2.65GW from England and Wales to Scotland. This represents almost 50% of the approximate 5.5GW winter maximum demand for electricity in Scotland. To serve this maximum demand at times of low wind generation output, around 2.85GW of generation output will therefore be required across Scotland. While due consideration must be given to unforeseen plant breakdown and unavailability, this requirement can presently be met from a combination of generating stations.

Completion of the Western HVDC Link is expected to enhance the capability of the transmission system from winter 2017/18 and enable transfers from England and Wales to Scotland of up to 3.9GW in the period to the end of the decade. This represents 70% of the prevailing 5.5GW maximum demand.

In the period from 2020 to 2030, the prospective closure of the existing fleet of nuclear AGR generating stations across GB, and in particular the five AGR

² Transmission capabilities have been assessed in accordance with the National Electricity Transmission System Security and Quality of Supply Standard (SQSS).

stations located in Scotland and the north of England, will be a primary consideration. Against a background of continued change in the wider generation portfolio, this will present significant and unprecedented challenges on both a Scottish and GB wide basis. In view of the potential timeframe required to develop and implement mitigating measures, there is an increasing risk that the rapid pace and direction of change, as evidenced by recent events, may outstrip the capability of the industry to deliver the necessary infrastructure in good time.

- **System Operability** - In addition to the above security considerations at time of winter peak demand, at times of low demand coincident with periods of low wind generation output, voltage control is becoming increasingly challenging and high voltage issues are more frequent and widespread in operational timescales. These are being driven in part by significant changes in the electrical characteristics of the demand served by the transmission system, and are exacerbated with low / reduced availability of large synchronous generation plant. SPT and SHE Transmission have identified a requirement to install an additional 720MVAR of transmission based voltage control equipment in Scotland. Design and engineering work is underway to deliver this additional equipment in advance of summer 2017. This will ensure the effective management of transmission voltages across Scotland following the reduced availability of large synchronous generation plant to the end of the decade. In the interim, we anticipate National Grid will need to manage high system voltages and may routinely need to switch out of service several lightly loaded transmission circuits, which will potentially have an adverse impact on system resilience.
- **Black Start** - At present SPT has authority delegated to it under the Emergency Black Start Plan to manage restoration of the system within its licence area from local thermal generation. The future operating regime and operational status of large thermal power stations will be a determining factor in the speed with which any Black Start recovery can be effected. The continued de-carbonisation of the electricity system will have a fundamental impact on the location and nature of electricity generation sources, and will lead to extended recovery profiles in some areas of the UK, including Scotland. The current and long standing SPT area Black Start plan will become invalid following closure of Longannet generating station. SPT will be unable to recover the transmission system in central and southern Scotland as all the potential options require re-energisation from outside SPT licence area. Such actions must be directed by National Grid.

Discussions between the Scottish transmission companies and National Grid in its capacity as System Operator with regard to a review of Black Start procedures are being pursued to determine an acceptable recovery plan. It must be understood that the absence of sufficient suitable thermal generation plant in Scotland following closure of Longannet will significantly increase the time taken to recover supplies to customers in central and southern Scotland. Alternative strategies which are yet to be agreed, are likely to involve re-

energising elements of the transmission system in Scotland from England and Wales as quickly as is practicable under the prevailing conditions, this will support any available renewable generation in Scotland to play a role in the recovery of the wider GB system. Recovery of the transmission system in central and southern Scotland will become wholly dependent on National Grid, whose organisational focus and operational priorities will be determined under the prevailing GB wide Black Start scenario and on the overall availability of generation plant within the UK mainland.

It must also be understood that under Black Start conditions, the Western HVDC Link will not be able to operate at its full capacity until sufficient local generation is connected to support operation of the HVDC Link.

What role might the distribution network, and a single European electricity market play in securing supplies?"

Potential Role of the Distribution Network

Nearly 2 million customers (approximately 4 million people) are connected to our distribution system in the South of Scotland area, representing a maximum demand of approximately 3.8GW. We are experiencing increasing levels of embedded generation (generation connected directly to the distribution system) connecting to our network. This smaller generation is typically beyond the control of National Grid as transmission system operator (TSO) who see its impact as an overall reduction in demand. The volume of this type of generation and the limitation of communication and control mechanisms requires an alternative approach.

Innovation is an essential part of all our future plans for our transmission and distribution networks and we have been very proactive over recent years in maximising the benefits from innovation. As a Distribution Network Operator (DNO) we can provide potential solutions by developing a distribution system operator (DSO) function, which manages demand and generation on the distribution system in response to system conditions on either the transmission and distribution networks. For example, we have developed an innovation project "Accelerating Renewable Connections" (ARC) that was successful in Ofgem's Network Innovation Competition receiving funding of £8.4m. This project allows embedded generation to connect in certain areas ahead of the transmission works being completed. Significantly this involves generators contracting with us as a DNO to allow us to manage their output in response to changing system conditions.

We are building on our ARC project by submitting a bid to the 2015 Network Innovation Competition (NIC) for an Innovation project "Project EVOLUTION". By investing £6.8m over 4 years Project EVOLUTION will implement local system balancing through innovative commercial and technical mechanisms under a Grid Supply Point (GSP) i.e. on the distribution system. EVOLUTION will explore the wider issues around market coordination, and the effect upon national system balancing and settlements, leading to a pilot DSO model. We are engaging with National Grid in this project, because of its potential to mitigate some of the system security issues which are emerging.

Potential Role of a Single European Market

The development of a single European market has to consider fundamental issues including system stability, system operability, interconnection, capacity and congestion management. These considerations are being addressed in the suite of European network codes, which are gradually progressing towards completion, which existing GB legislation will need to be compliant with. The various companies in the electricity industry, working with DECC and Ofgem (and supported by National Grid and ourselves and the other Transmission System Operators (TSO's) in GB), are influencing the content of these codes and considering how we will implement them in GB. The intention of these codes is to provide the possibility of managing and mitigating local system security and operability issues by the establishment of a single market. For example, The Requirements for Generators (RfG) Code states:

“The swift completion of a fully functioning and interconnected internal energy market is crucial to maintaining security of energy supply, increasing competitiveness and ensuring that all consumers can purchase energy at affordable prices....

And seeks to achieve...

“Harmonised rules on grid connection for power generating modules should be set out in order to provide a clear legal framework for grid connections, facilitate Union-wide trade in electricity, ensure system security, facilitate the integration of renewable electricity sources, allow more efficient use of the network and resources, and increase competition, for the benefit of consumers.”

Similar narrative introduces the other network codes and it is clear from this that a single European market is intended to improve system security issues and recognises the potential of a single market to provide solutions and is seeking to develop the conditions in terms of harmonisation and standardisation by which this may be achieved.

Conclusions

We are making a significant contribution to Scottish Energy Policy by delivering our £2.6billion Investment Plan to increase the capacity of the transmission system, connect new renewable generation and replace aging assets. Our view is that the risk of failing to meet winter peak electricity demand in Scotland remains low in the period to the end of the current decade, but it is increasing. The anticipated shift in the generation mix in Scotland represents a fundamental change. Scottish supply security will soon become totally reliant on being part of the wider generation mix across the UK.

We do not believe current investment levels in the short term in the UK for large synchronous generation are sufficient to mitigate these risks in the medium term and we are engaging with the Regulator, National Grid as the system operator, and other

industry partners to jointly identify and deliver a range of measures to protect the interests of current and future consumers.