SCOTTISHPOWER

Rupert Steele OBE
Director of Regulation

Henry Shennan
National Infrastructure Commission
1 Horse Guards Road
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11 January 2016

Dear Henry,

NATIONAL INFRASTRUCTURE COMMISSION CALL FOR EVIDENCE

We welcome the opportunity to respond to this Call for Evidence. Balancing supply and demand cost effectively will be of the greatest importance as we transition to a low carbon electricity system. We therefore fully support the National Infrastructure Commission's work in this area, alongside that undertaken by DECC and Ofgem.

Our responses to the detailed questions in the Call for Evidence are provided in Annex A. We would, however, highlight the following issues in particular.

Independent System Operator (ISO)

We consider that recent policy changes have created increasingly deep conflicts of interest around the role of National Grid (NG) as the System Operator (SO). These turn on the fact that the SO is expected to hold the ring on policies such as transmission competition or the construction of interconnectors, while other parts of NG – as infrastructure investors – have significant interests in the outcome. By way of example, under the Ofgem process for determining the award of Cap and Floor support arrangements for interconnectors (which is an area in which National Grid Interconnector Holdings is a project developer), NG provides to Ofgem a quantitative assessment of the value of a range of systems services which interconnectors could provide.

The question of whether conflicts of interest can be managed through behavioural rules or whether ownership separation is required depends on how deep in practice the conflicts are. We consider that the conflicts cited above are sufficiently deep as to put the question of SO ownership (and the creation of an ISO) on the table.

Pumped Storage

We have the potential opportunity to expand our existing pumped storage site at Cruachan in Scotland. We believe that this would deliver good value for consumers for a storage technology at scale. However, the relatively high levels of capital, long investment lead times and future uncertainty result in significant barriers for investment.

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These are similar barriers to those which have affected the investment case for interconnectors.

We believe that these barriers could be overcome if a Cap and Floor mechanism (as used by Ofgem in respect of new interconnection projects) were available (subject to cost-benefit analysis) to transmission connected storage developments.

Interconnection

We are fully supportive in principle of the potential benefits arising from trade with Continental Europe through greater cost-effective interconnection. However, it is essential that this takes place based on a level playing field if the trading that ensues acts to create rather than destroy value. This is the principle benhind the efficient linking of markets to facilitate international trade.

In the case of the GB electricity market, we consider that there are number of dimensions of the charging and taxing regime, as well as the regulatory framework for interconnectors, that have the effect of distorting the market in a way that creates a fundamentally uneven playing field between domestic generation and foreign imported generation. Taken together, these various elements significantly disadvantage domestic generation in its competition with imported electricity from foreign generators – by around £11/MWh or over 25% of the wholesale price. These issues are further explored in the attached report from Oxera.

Capacity Market

Finally, whilst we believe that the market-wide Capacity Market (CM) is fundamentally the right mechanism for promoting investment and maintaining security of supply, we consider that there are a number of steps that the Government should take to ensure that the current CM Regulations and Rules provide a level-playing field for investment in all plant, including large-scale gas-fired power stations.

For example, embedded generation can currently benefit from Triad avoidance payments if it operates in the three highest demand half hours each year. This is, in effect, an additional capacity payment (equivalent to approximately £45/kW/year in 2019/20), which results in over-reward for embedded generation. We think that plants in receipt of CM payments should not be eligible for Triad benefits and have suggested to DECC how this could be achieved in the context of their consultation on possible reform of the CM.

If you have any questions regarding any aspect of this response, please do not hesitate to contact me.

Yours sincerely,

Rupert Steele
Director of Regulation

ANNEX A

NATIONAL INFRASTRUCTURE COMMISSION CALL FOR EVIDENCE

SCOTTISHPOWER RESPONSE

Question 1

What changes may need to be made to the electricity market to ensure that supply and demand are balanced, whilst minimising cost to consumers, over the long-term?

- What role can changes to the market framework play to incentivise this outcome:
  - Is there a need for an independent system operator (SO)? How could the incentives faced by the SO be set to minimise long-run balancing costs?
  - Is there a need to further reform the "balancing market" and which market participants are responsible for imbalances?
- To what extent can demand-side management measures and embedded generation be used to increase the flexibility of the electricity system?

Outlook

In her recent speech setting out a new direction for UK energy policy[1], the Secretary of State outlined the need for significant investment in new large-scale gas-fired power, as well the phasing out of coal by 2025, to ensure security of supply and decarbonise the energy system.

It is critical, therefore, that there is an effective framework for investment in new capacity to replace the retiring capacity, particularly given the uncertainties around the timing of replacing the ageing nuclear fleet. Accordingly, we welcome the Government's commitment to reviewing the design of the Capacity Market (CM), the primary mechanism for achieving this objective.

Whilst we believe that the market-wide CM is fundamentally the right mechanism for promoting investment and maintaining security of supply, we consider that there are a number of steps that the Government should take to ensure that the current CM Regulations and Rules provide a level-playing field for investment in all plant, including large-scale gas-fired power stations. For example, embedded generation can currently benefit from Triad avoidance payments if it operates in the three highest demand half hours each year. This is, in effect, an additional capacity payment (equivalent to approximately £45/kW/year in 2019/20), which results in over-reward for embedded generation. We think that plants in receipt of CM payments should not be eligible for Triad benefits and have suggested to DECC how this could be achieved in the context of their consultation on possible reform of the CM.

Given long-term decarbonisation, it is clear that the electricity system will need to adapt over time. However, it is hard to predict precisely what the future system will look like. Among other things, this will depend on the pace and nature of change. Whilst it is possible that generation may become more distributed and more variable (though recent changes to the

[1] *Amber Rudd's speech on a new direction for UK energy policy,* 18 November 2015

small scale Feed-In-Tariff (FIT) scheme will have affected the rate of change), it is key that the appropriate infrastructure investments are made at a system level, as well as at a local level. This approach should ensure that the high levels of security of supply within the UK are maintained regardless of the nature and pace of future change.

Independent System Operator (ISO)

We consider that recent policy changes have created increasingly deep conflicts of interest around the role of National Grid (NG) as the System Operator (SO). These turn on the fact that the SO is expected to hold the ring on policies such as transmission competition or the construction of interconnectors, while other parts of NG – as infrastructure investors – have significant interests in the outcome. By way of example, under the Ofgem process for determining the award of Cap and Floor support arrangements for interconnectors (which is an area in which National Grid Interconnector Holdings is a project developer), NG provides to Ofgem a quantitative assessment of the value of a range of systems services which interconnectors could provide.

The question of whether conflicts of interest can be managed through behavioural rules or whether ownership separation is required depends on how deep in practice the conflicts are. For example, Ofgem and the EU commission found that the conflicts around ScottishPower's ownership of SP Transmission were minor and effectively mitigated by NG acting as SO. However, in the case of NG, we consider that the conflicts cited above are sufficiently deep as to put the question of SO ownership (and the creation of an ISO) on the table.

By way of example, under the Ofgem process for determining the award of Cap and Floor support arrangements for interconnectors (which is an area in which National Grid Interconnector Holdings (NGIH) is a project developer), NG provides to Ofgem a quantitative assessment of the value of a range of systems services which interconnectors could provide. While the information provided was interesting, it is very difficult to determine whether the analysis is robust and if the reported benefits are realistic. Also, we consider that the analysis should have weighed up the system benefits that the interconnectors deliver against the cost of foregoing the system benefits that could be delivered by a thermal plant that the interconnectors displace.[2] There is, therefore, a serious question about how appropriate it is for NG, as a developer, to be the central provider of the modelling on which Ofgem relies for its assessment.

Similar issues arise under Ofgem's ITPR proposals where NG as SO is meant to be preparing projects for tender, while NG's transmission business can be both a bidder and /or the host TO. NG's interests as TO are much bigger than their interests as SO and therefore there will always be a suspicion (whether true or not) that the SO may tend to act in the interests of its owner.

An independently owned SO could address these concerns. But it would clearly have issues of its own. It would need sufficient technical expertise and either it would need sufficient financial strength for Ofgem's current incentive process to be reasonable, or those incentives would need to be adjusted. We believe that the Government (working with Ofgem) is well-placed to consider these questions, including carefully weighing up any risks and timing questions. If the current arrangements are to endure, DECC and Ofgem will need to ensure that regulation provides for adequate business separation and transparency.

[2] We would also note that, for some of the interconnector projects assessed by National Grid, a large proportion of the benefits arise from system operation impacts. In two of the projects where National Grid Interconnector Holdings is a joint developer (IFA2 and Viking Link), the assessment of system operation impacts appear critical, accounting for 113% and 87% of total benefits respectively.

Balancing Market

As a package, we are broadly supportive of the recent cash-out reforms and the current balancing market. We believe that the current arrangements provide appropriate incentives for companies to balance as efficiently as possible. However, we do not underestimate the new financial risks now faced by our business during times of system stress.

For the EU's Internal Electricity Market to be successful, the fragmented national balancing markets across Europe will need to be better aligned. It is important that GB remains fully engaged in the process of producing the European Electricity Balancing Network Code which is set to be introduced in 2-3 years. As part of this process, it is vital to demonstrate that any harmonisation of European markets is in the interest of consumers.

Demand-side Management Measures and Embedded Generation

When considering the delivery of flexibility we think it is important not to be technology-specific, but rather develop functional specifications that can be met using various technologies. For example, 'flexibility' is about the rate of response and the magnitude and duration of response, rather than specific technologies such as energy storage, demand-side management or embedded generation. We also believe, when creating 'functional specifications', that it is important to consider likely additional future system requirements above and beyond flexibility; amongst others, this will include system inertia.[3]

Wind and solar PV have much lower inertia than conventional generation. Interconnectors also displace generation when importing, but are not currently configured to provide inertia. Therefore, frequency will deviate more quickly from the target value in times of unexpected imbalance. In this context, we welcome National Grid's work around its relatively new System Operability Framework. This work has begun to set out the future system requirements and may be used by the industry to better identify possible future demand for services.

It is also important that industry continues to share their understanding of the impacts that embedded distributed generation (DG) can have on the wider system and, where possible, identify solutions to mitigate these (as has been happening through the DECC/Ofgem Smart Grid Forum[4]).

The importance of Distribution Network Operators (DNOs) managing their networks more flexibly is likely to increase over time (though it is difficult to forecast the pace and nature of the changes). We will continue to support work on engaging with consumers to procure flexibility, and on clarifying the future relationship between the System Operator and a possible future Distribution System Operator (DSO) with greater involvement in local balancing.

[3] System inertia is proportional to the sum of stored energy in the rotating masses of machines (generators and motors) which are directly connected the electricity grid. (National Grid, *System Operability Framework,* November 2015.)

[4] https://www.ofgem.gov.uk/electricity/distribution-networks/forums-seminars-and-working-groups/decc-and-ofgem-smart-grid-forum

Question 2

What are the barriers to the deployment of energy storage capacity?

- Are there specific market failures/barriers that prevent investment in energy storage that are not faced by other 'balancing' technologies? How might these be overcome?
- What is the most appropriate scale for future energy storage technologies in the UK? (i.e. transmission network scale, the distributed network or the domestic scale.)

There seems to be growing recognition that as the UK electricity system decarbonises, building more power stations and cables to meet demand when renewable sources are unavailable may not always be the most efficient approach towards managing whole system challenges. In this context, it appears to be increasingly recognised that electricity storage has an important role to play in balancing the system, alongside other sources of flexibility such as interconnection and demand side response.

We consider below the potential for storage at three different scales (domestic, transmission connected and distributed) along with the potential barriers to uptake at these different scales.

Domestic Scale Storage

To ensure that potential future system benefits are not missed we are actively engaging in domestic storage trials. However, while domestic storage combined with solar PV may help alleviate localised problems with excess generation at summer lunchtimes, it may contribute to summer night excesses of generation and it is unlikely to make a useful contribution in the winter. We will use the data from our trials to calculate the average value from charging the battery during theoretically 'cheap' time periods and discharging during more expensive periods, and to inform a wider assessment of opportunities in this area.

Transmission Connected Storage

We have the potential opportunity to expand significantly our existing (440MW) pumped storage site at Cruachan in Scotland. We have applied for inclusion in the 2016 European Ten Year Network Development Plan (TYNDP) in order to leave open the opportunity to pursue status as a priority European project (Project of Common European Interest, PCI) should this be considered appropriate.

We consider that the further development of this storage technology at scale would deliver good value for consumers. We believe that pumped storage can facilitate the effective delivery of decarbonisation in an efficient and environmentally friendly manner.

However, the relatively high levels of capital, long investment lead times and future uncertainty result in significant barriers for investment. These are similar barriers to those which have affected the investment case for interconnectors.

We believe that these barriers could be overcome if a Cap and Floor mechanism (as used by Ofgem in respect of new interconnection projects) were available (subject to cost-benefit analysis) to transmission connected storage developments. The current approach to assessing Cap and Floor support based on a cost-benefit analysis should ensure that only cost effective projects are progressed.

Distributed Network Storage

The debate around the current classification of storage assets and whether this creates a barrier to entry is not new. Whilst we believe that bulk storage assets which deliver energy on a comparable basis to conventional generation can operate under the 'generation[5]' classification, we can also envisage instances where it may be more problematic for smaller scale resources[6].

In this context, we are supportive of the remarks made by the Council of European Regulators[7] noting that 'storage is considered, in principle, a market activity and therefore the role of DSO in storage should be limited to the use of specific grid-oriented services. However, energy storage cannot be used as a substitute for fully available distribution lines, but could be used to solve network constraints on a temporary basis. DSOs can use storage services, provided this technical solution is justified as the most cost-effective option and is sourced in a non-discriminatory manner'.

If any regulatory classification changes are to be made, then contestability and promotion of competition will, as always, be key. Any changes to the distribution licence should continue to encourage competitive and third party progression of storage wherever possible. Only in instances where third parties do not come forward on a competitive basis should DNOs be able to make capital investments themselves. In short DNOs should only be able to take on a 'provider of last resort' role.

To justify storage as the most cost-effective option to solve network issues, there is likely to be a need to demonstrate additional revenue streams over and above its application for network support. For this type of storage to be considered both successful and profitable, smart commercial agreements and services must be developed in such a way as to not distort existing competition. Such arrangements are explored in more detail in the recent work carried out as part of the Smarter Network Storage (SNS)[8] project - the aims of this project were to carry out a range of technical and commercial innovations to tackle the challenges and facilitate more efficient and economic adoption of storage.

For both domestic and grid distributed storage, the level of automated control, and availability readings may prove to be key if the storage is to be relied on, and full system benefits are to be realised. The control and operation of storage may, however, become complex where the storage has been deployed to solve network constraints, and is also used in other markets/applications.

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[5] Electricity storage is not explicitly recognised under EU legal frameworks; storage is treated as a type of generation asset. It is not believed that this was a deliberate design choice.

[6] Classification of storage as a type of generation limits the involvement of DNO. DNOs can only participate in storage via the licence exemption route for smaller generation and the associated de minimis. However, even this approach is limited by the de minimis business restrictions placed on DNOs under their licence conditions (Standard Condition 29 places limitations on non-distribution activities. It restricts: total turnover from non-distribution activities to 2.5% of the DNO's distribution business revenue; and total investments in all non-distribution activities to 2.5% of the licensees share capital in issue, its share premium and its consolidated reserves.

[7] 'The Future Role of DSOs – A CEER Public Consultation Paper', CEER, 16 December 2014.

[8] http://innovation.ukpowernetworks.co.uk/innovation/en/Projects/tier-2-projects/Smarter-Network-Storage-(SNS)/Project-Documents/SNS4.6_SDRC+9.3+-+CA+for+IU+of+Flexibility_v1.0.pdf

Question 3

What level of electricity interconnection is likely to be in the best interests of consumers?

- Is there a case for building interconnection out to a greater capacity or more rapidly than the current 'cap and floor' regime would allow beyond 2020? If so, why do you think the current arrangements are not sufficient to incentivise this investment?
- Are there specific market failures/barriers that prevent investment in electricity interconnetion that are not faced by other 'balancing' technologies? How might these be overcome?

We are fully supportive in principle of the potential benefits arising from trade with Continental Europe through greater cost-effective interconnection. However, it is essential that this takes place based on a level playing field if the trading that ensues acts to create rather than destroy value. This is the principle benhind the efficient linking of markets to facilitate international trade.

In the case of the GB electricity market, we consider that there are number of dimensions of the charging and taxing regime, as well as the regulatory framework for interconnectors, that have the effect of distorting the market in a way that creates a fundamentally uneven playing field between domestic generation and foreign imported generation. Taken together, these various elements significantly disadvantage domestic generation in its competition with imported electricity from foreign generators – by around £11/MWh or over 25% of the wholesale price. These issues are further explored in the attached report from Oxera.

A key aspect of this is the unilateral Carbon Price Floor in the GB (implemented through the Carbon Price Support mechanism), which is supplementary to the EU ETS regime. This in effect acts as a carbon tax applied to GB thermal generation but not to foreign generators who are supplying electricity to the GB market across the interconnectors. The effects of this tax are exacerbated by a system charging regime applying to GB generators (transmission, balancing and losses) that significantly deepens the overall market distortion. This is because the charging regime that applies to generators in most Continental EU countries is much less onerous than the one that applies to GB generators. Lastly, we would note that the potential costs associated with Ofgem's current Cap and Floor support regime for new build interconnectors is an additional cost burden that GB generators will have to bear.

Taken together, these various elements significantly disadvantage domestic generation in its competition with imported electricity from foreign generators. Whilst the level of distortion varies from country to country, depending on alternative tariff arrangements, the Table below provides an indication of the scale of this problem. In particular, the Table demonstrates the level of distortion between GB and countries that levy no or very limited system charges on generators, such as France and Germany.[9]

[9] Oxera, Impact of an uneven playing field for power generation in Great Britain and connected markets (research for ScottishPower), 17 December 2015

Additional costs faced by a typical GB CCGT as compared to equivalent plants in France, Germany and the Netherlands	£/MWh	% of 2016 Forward Wholesale Market Price (c.£40/MWh)
UK Carbon Tax (Carbon Price Support) (additional import support based on the additional value that feeds through to GB wholesale power price when compared to other EU countries)	6.4	16.0%
Higher liability for transmission network tariffs, balancing tariffs and transmission losses	4.5	11.3%
Total (approx)	**11**	**27%**

Moreover, the significance of this lack of a level playing field is not simply the unfair and distortionary impacts on existing GB thermal generators but, importantly, the fact that it creates a highly negative outlook for potential investors in new build gas generation in the GB market. This is particularly damaging for UK investment prospects given that the future projections for spark spreads, as is widely recognised, already make the environment for investing in new build generation a very difficult one. We consider that this is a critical issue taking into account the future challenges around security of supply, as well as the Government's stated ambition to develop a higher degree of energy autonomy by producing our own energy at home wherever we can do so cost-effectively.

Given the absence of a level playing field, we believe that the current regulatory framework could result in a higher level of interconnection than is economically optimal. Accordingly, we consider that the current discussions at an EU level around a possible 15% target should be focussed on an aspirational aim rather than a hard target. Moreover, it should be clearly recognised that a 'one-size-fits-all' target for interconnection does not suit all Member States, particularly island States.

Question 4

What can the UK learn from international best practice in terms of dealing with changes in energy technology when planning to balance supply and demand?

The Energy Storage Operator Forum's (ESOF) work[10], which was supported by DECC, summarises some international policy developments that are being used to drive the uptake of electricity storage. It is noted that some of these policy developments have emerged to support reliability, grid operation and renewables integration in the context of the Government's decarbonisation ambitions as legislated for under the Climate Change Act 2008.

Whilst in Japan and Germany, subsidies are being made available to individuals and, in the case of Japan, businesses wishing to install energy storage, we consider that for larger scale assets which deliver energy on a comparable basis to conventional generation (and which can operate under the 'generation' banner), risk mitigating schemes, such as a Cap and Floor mechanism, would be more appropriate. Such a mechanism is already offered by

[10] http://www.eatechnology.com/products-and-services/create-smarter-grids/electrical-energy-storage/energy-storage-operators-forum/esof-good-practice-guide

Ofgem to a competing technology (interconnectors), and a Cap and Floor mechanism is a tool that could be used to procure additional system storage requirements on a competitive basis. A Cap and Floor mechanism could be designed to limit market distortions and unintended consequences whilst minimising complexity. In particular, it allows decisions on when to pump and when to generate to be determined by market signals (especially if the cap and floor are constructed so as to allow some remaining incentive when either the cap or floor is reached). This should ensure that the plant is deployed when most useful to the system.

In addition, whilst storage targets have been established in California[11], we consider that bottom-up delivery through properly designed and regulated markets should provide a better outcome for consumers in this country rather than top-down targets. If a Cap and Floor mechanism were to be introduced in the UK, we do not think that a storage target would be necessary. In this con text, the current approach of assessing Cap and Floor support based on cost-benefit analysis would be key in ensuring that only the most cost-effective projects are built to meet the UK's demand for future bulk storage.

Lastly, when considering distributed storage and generation, it is important to consider whether the economics are distorted by hidden subsidies. Where these exist, some developments that appear economic may in fact be negative in welfare terms. We therefore support the removal of hidden subsidies so that the most economically beneficial solutions, large or small, are deployed.

ScottishPower
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[11] In California the target level is set to be procured by 2020, with installation operational no later than 2024.