SUBMISSION FROM FLEXITRICITY LIMITED

Principles

We suggest that a few principles are borne in mind when considering these questions:

1. Scotland is electrically integrated with England and Wales, in the way that Denmark is with Sweden, Norway and Germany, or that Northern Ireland and the Republic of Ireland are with one another. Regardless of devolution, independence or any other political changes that may occur, this integration will remain central to Scotland's energy future, and Scotland should take best advantage of that fact.

2. It is incorrect to state, as some have done, that the intermittency of renewables necessitates the constant running of an equal volume of fossil plant. This confuses capacity (megawatt capability) with production (megawatt-hours of electricity sent through meters). It also ignores the success which has been seen in improving forecasts of renewable output, and the options for trans-national balancing which interconnectors bring.

3. The vast majority of power cuts which most people have experienced are the result of distribution faults. GB has run out of electricity only twice in the last ten years, but power lines are damaged in every major storm. We have assumed that distribution network reliability is not in scope in this consultation. In the present context, supply security has been excellent for many years.

The importance of diversity

Resolving the energy trilemma – security, affordability and sustainability – requires diversity. This has emerged, in a mixed fashion, over the past two decades. Diversity must take into account the following factors:

- Large thermal generators supply not only energy: they can also provide essential power quality management services such as voltage support and inertia. On the other hand, fossil generators are exposed to fuel price risks and, increasingly, carbon taxes. Nuclear generators suffer from poor economics, as the difficulties suffered by Hinkley C have shown. While carbon taxes are imposed politically, the importance and scope of the objectives associated with those are such that they can be taken as an input quantity in the present context.

- "Ambient" or "intermittent" renewables are strengthened by diversity. The complementary output profiles of wind and solar photovoltaic generation benefit supply security, both in terms of capacity (in the past, GB has experienced capacity crises in both hot summers and winter storms) and in terms of fuel availability (wind and solar now make a significant difference to GB's overall fuel bill). Adding further resource types to this mix will add to this diversity and to the supply security benefit that results. We therefore very much regret the difficulties which have recently been experienced by wave and tidal power companies, and would encourage the Scottish Government to consider these sectors to be of strategic importance. We also regret the aggressive degression of feed-in tariffs that is affecting new small hydro developments, and the complete failure of Contracts for Difference to support any large hydro investments.

- Interconnection with other markets (for example, the Moyle link to Northern Ireland, or the proposed Icelink connector to Iceland) are powerful tools for adding diversity, increasing security, enhancing the value of domestic renewable generation, and reducing the cost to customers. Internal transmission upgrades are equally important: upgrades presently underway within Scotland will improve England's access to Scotland's enormous renewable resources.

- With the exception of two pumped-storage plants in Scotland and two in Wales, both built generations ago, investment in energy storage in GB is minimal. However, energy stores, properly deployed, are key elements of a diverse and secure electricity system.

- Combined heat and power, trigeneration and anaerobic digestion are examples of where the fundamentally integrated nature of energy processes can be exploited. Combined with local energy production, such schemes can enhance diversity and security, as well has having other economic benefits. In Denmark, for example, multiple, local CHP plant regularly turn down generation, or turn on electric heaters, in order to use high wind output, and ramp up generation to fill the gap when wind drops. These plant compete on level terms with large power stations such as Avedøre. Skagen in Western Denmark hosts a perfect example of a locally-owned CHP which adds flexibility and diversity to a market stretching from the Arctic Circle into Germany. Such approaches are very rare in GB, but are the norm elsewhere.

- Finally, demand response is the ultimate "diversity technology", as it replaces the traditional electricity equation (supply must equal demand) with its converse (demand must equal supply). Industrial and commercial consumers have been providing positive reserve to deal with power station failures and system peaks through aggregation since 2008. Negative reserve – to help absorb excess wind – is being launched now, also through aggregated demand response. With the right environment, domestic demand response can also emerge, and it is through this route that heat pumps and electric vehicles may become enhancers rather than depleters of network security.

None of the above technologies or approaches can alone secure electricity supplies. Acting together, it is clear that they can do so affordably and with ever lower carbon emissions. It is for this reason that we consider diversity to be the keystone of a secure, affordable and clean electricity system. Diversity enables, and indeed makes heavy use of, Scotland's unique renewable resource; it makes customers active and opens the door to microgrids and local ownership; and given adequate treatment of externalities, it allows the market to find the best resource to meet each need as it emerges.

Historically, most utilities have had little to gain from diversity. Ultimately, diversity creates competition for large power stations. National Grid and, more recently, the Distribution Network Operators have developed diversity as a tool for system security, often under the category of "smart grid". These organisations are held apart from generation concerns. In contrast, the engagement of vertically integrated suppliers with demand response, local energy resources, active customers and open energy markets has been very weak.

Generation adequacy

We acknowledged above the important role of thermal generators in managing power quality. Although recent focus has been on Longannet, most of Scotland's large power stations are reaching the end of their lifespans. Peterhead currently has no Capacity Agreement; its recent success in National Grid's voltage management tender appears to be its only long-term commitment. Hunterston and Torness are contracted in the Capacity Market to 2021; while Torness should have a longer future it is likely that Hunterston will cease by 2023.

In the meantime, National Grid is working with a number of organisations including Scottish-based Flexitricity, Psymetrix and Strathclyde University to develop alternative approaches to power quality management. The £10m Smart Frequency Response project seeks to develop inertia services to replace those lost along with thermal power stations, using a combination of demand response, small CHP generators, wind farm control systems, energy storage and other technologies. Technologies for voltage management in the absence of large power stations are already well established. Interconnectors currently being installed will further back-fill traditional power station roles.

If it is accepted (as we argue) that Scotland's energy future is an interconnected one, then it is possible to achieve electricity security with far less thermal generation than Scotland presently possesses. Nevertheless, there are two reasons why a wholesale "no big generators" policy may not be attractive. Firstly, when interconnectors fail, they do so abruptly; Flexitricity has responded on a number of occasions to failures of the France-England interconnector. Without thermal power stations, the volume of demand response required in Scotland would be driven by the size of the largest interconnector bipole, and this could be a large number. Secondly, there may be strategic reasons why Scotland wishes to remain involved in thermal generation technology; the most obvious one at present is carbon capture and storage.

More importantly, the question of generation adequacy is an incomplete one. The focus must also be on demand elasticity.

Demand peaks and demand response

Two mechanisms for reducing peak demand have met with remarkable success over recent years. National Grid's "triad" system concentrates transmission charges for business energy users on the three winter half-hour periods of peak demand, which are determined ex-post subject to a highly-effective spreading rule. The triad system operates as a game; there is no guarantee of success so customers must manage peaks in real time to gain maximum benefit. While this does not make life easy for industrial consumers, it is crucial to the scheme's success. National Grid has estimated that at least 1.4GW of industrial and commercial demand response acts during winter peaks across GB; we suspect that the figure may now be closer to 2GW.

Without the triad system, and the gigawatts of demand response which it activates, GB would have endured several blackouts over winter peak during the past ten years. It has had none. Managing peak demand increases security of supply.

Since 2010, distribution network operators have applied charges on a pre-set "red/amber/green" (RAG) basis. This reduces peaks by encouraging embedded generation to schedule run hours into the expensive "red" periods. Compared to triads, this is not as effective as a means of reducing peaks: business consumers that can only tolerate a modest number of shutdown hours per year gain no advantage from RAG systems, while they do from triads. Additionally, red periods are fixed and are not affected by weather or actual demand, which introduces inefficiency. Nevertheless, Flexitricity works with at least 100MW of CHP plant which schedules generation into red periods, thus reducing the peak.

The cost recovery mechanism for the Capacity Market is similar to the RAG system, but has a significant flaw. Sufficient incentive for calendar- and clock-based scheduling is already present in the DNOs' RAG system for all despatchable embedded generators apart from standby diesels. However, the Capacity Market raises the incentive to a level which will make regular diesel running economic. This is a case of a peak-reduction mechanism which has gone too far: from 2018 onwards, diesels are likely to run for around 260 hours in every winter, regardless of need. If the Capacity Market were to adopt the triad mechanism instead, it would increase useful peak reduction and avoid inefficient, polluting actions in low-stress days when no action is required.

There is a further, very simple flaw in the peak reduction mechanisms presently available: they do not reach domestic consumers. Half-hourly settlement for domestic customers is a necessary but insufficient step for domestic consumers to begin participating in peak reduction. Innovation by licensed suppliers is also necessary. For this to occur, Ofgem's current package of reforms (the Electricity Balancing Significant Code Review) is necessary. Through this, we hope that liquidity in day-ahead and within-day markets will emerge. Additionally, licensed generators must be unbundled from licensed suppliers – active, peak-reducing customers compete with a traditional generation portfolio, whereas innovative suppliers whose interests are fully aligned with their customers will give those customers access to prompt markets. Finally, politically-expedient transient measures, such as restricting the number of tariffs which suppliers can offer, can block innovation.

Flexitricity's business consists entirely of aggregated, industrial and commercial demand response, operated principally for National Grid and DNOs. From a tentative operational launch in 2008, Flexitricity has grown its portfolio by two orders of magnitude. It is now able to field a power-station scale of capability, able to act in minutes (or, in some cases, less than one second). This has been achieved in the teeth of a deep recession and an adverse market: despite media reports, GB is presently oversupplied with reserve capacity, and prices are at historic lows.

In a more favourable market, demand response would grow by a further order of magnitude. This can be achieved if the measures discussed here are adopted. In summary, these are:

- An end to vertical integration, and continual attention to the competitiveness of electricity markets.
- Full implementation of Ofgem's Electricity Balancing Significant Code Review.
- Capacity Market cost recovery to shift to the triad system.
- Half-hourly settlement for all electricity users.

Transmission, interconnection and EU harmonisation; regulation and the Capacity Market

Most of our views on these matters are covered above. We have a small number of further observations to add.

First, the bitter experience of the development of the Capacity Market is that detail lost in haste is very hard to recover, and such errors can turn a beneficial policy into a positive barrier to innovative approaches to energy security. The Capacity Market gave far more contracts to low-capital merchant generators such as diesel farms than to demand response. Indeed, only one new-build CCGT was funded by the first auction. Since the core goal of the Capacity Mechanism was to fill the power station investment gap, it could be argued that it has failed.

On the other hand, Ofgem's Low Carbon Networks Fund demonstrated technologies including demand response and storage that can simultaneously address local and wider-scale supply security. These technologies were then adopted as business as usual in the latest distribution price control review, known as RIIO-ED-1. This is an example of good regulation breaking barriers and creating benefits to customers.

In the various activities associated with the EU Target Model, we see a variety of positive signs. Demand response is taken seriously; competitive barriers to demand response are being noticed at an early stage; market liquidity is recognised as vital. However, in developing the detail for these complex policies, there is considerable risk of errors and unintended consequences. If policy developers recognise these dangers and act appropriately, the EU Target Model should benefit customers across Europe by supporting innovation, competition, renewables, and diversity.