Electricity Capacity Assessment 2014: Consultation on methodology

Response by Nick Eyre

Summary of Main Points

1. Ofgem's duty with respect to consumers is a good starting point for the analysis, but it could usefully be mentioned that this implies a judgement about how to offset low probability risks of security of supply against additional generation capacity costs.
2. Given the objectives and timescales, I agree with the general methodology and, in particular that the use of a time collapsed model is sufficient.
3. Experience from earlier years indicates that, despite Ofgem's best efforts, outputs of the analysis are misrepresented. Careful consideration should therefore be given to presentation of results. De-rated capacity margin is recognised in the 2013 report as a relatively poor metric of supply security, and therefore arguably should not feature so prominently. LOLE is a key metric, but also problematic if misinterpreted as a metric of customer loss of supply. Greater emphasis should therefore be given to the risk of customer disconnection, which is the main risk for both consumers and policymakers.
4. There are key uncertainties that cannot reasonably be assigned probabilities. These are, in the main, identified and handled appropriately as sensitivities.
5. The level of demand is not handled in as much detail as supply. Use of National Grid's 'Gone Green' scenario numbers is broadly appropriate, but consideration could usefully be given to some additional sensitivities in efficiency and DSR policy.
6. The methodology for future supply sensitivities is appropriate, but more attention might be paid to different approaches to assessing conventional generation load factors.
7. In the approach to interconnector flows, the Reference case is justifiable, but a more radical sensitivity to full use of interconnectors could usefully be considered.
8. Ofgem will need to consider the impacts for this methodology of more recent proposals for new balancing services (BSR and DSBR).
9. There are some areas where better data and analysis is desirable, but which may not be possible on the timescales of this assessment. These include the load factor of wind energy at ACS winter peak, interconnector behaviour, conventional generation strategic outages and policy related demand sensitivities. In these cases, it would be useful for Ofgem to consider, and to be explicit about, what research might be undertaken to improve analysis in future.

More detailed response

Context

The opening paragraph sets out Ofgem's principal duty to protect consumers, and, quite properly, mentions that this includes security of supply and environmental considerations. It may be obvious to better informed readers that it also includes consideration of efficient levels of investment and efficient system operation, but this could usefully be made explicit. In essence, any capacity assessment involves a trade-off between some metric of security and the costs of additional capacity. This involves a judgement about how low probability risks of disconnection should be set against additional generation costs. Whilst it is not Ofgem's role to make that assessment, it is the underlying reason for the assessment.

General Methodology

Question 1: Do you agree that the general methodology used for the 2013 report is still valid to analyse GB's generation adequacy in the next five winters from 2014/15 to 2018/19? If not, please explain why and make some specific suggestions for the methodology and their comparative advantages.

In general terms, yes. Given the absence of better analytical tools and the limited time horizon of the assessment, the dominant risks are those of not meeting demand at times of high demand, which broadly correlate with cold, dark weather. In the longer term, with higher levels of renewable generation on the GB system, it is possible that there will also be significant risks at times of lower demand, associated with periods of low generation capacity availability, i.e. low load factors for wind and solar generators. These would correlate with times of widespread low wind speed and, in this context, the extent to which the drivers of stress from the demand and supply side are correlated will be important. This issue is considered further under Question 3 below. However, I agree this is likely to prove important only after 2018.

Ofgem also needs to consider the implications for this methodology of its consultation on new balancing services, Supplementary Balancing Reserve (SBR) and Demand Side Balancing Reserve (DSBR), which post-dates this consultation. The primary issue raised is that both SBR and DSBR look to provide new products that increase the range of options for the System Operator in periods of stress. To the extent they are successful, they will decrease the risk of disconnection for any given level of LOLE. This should be reflected in the calculation of risk of disconnection. As the indicative capacities for BSR and DSBR used by NGET (2GW and 1GW respectively) are comparable with the size of existing balancing services set out in the 2013 report (2.75 GW), the effect is potentially significant. It could be included in the Reference case or considered as a sensitivity.

DSBR raises a secondary (purely definitional) issue relating to whether loss of load undertaken by a customer to secure DSBR payment constitutes 'controlled disconnection'. I would suggest it is excluded, as DSBR is a voluntary activity undertaken in return for

payment, and therefore is not a system security failure any more than is DSR undertaken within the (non-balancing) market.

There are some important issues related to the choice of metrics. The 2013 Capacity Assessment states explicitly (paragraph 1.13) that: "It would not be appropriate to use the controlled disconnection of customers as the main metric of the risk to security of supply." This is a judgment and it is supported in the following sentences with respect to the impact of mitigation actions on quality of service and power plant lifetimes. These are clearly important issues and I agree they should be considered within the assessment. However, I do **not** agree that they are of such over-riding importance to reject the use of disconnection as the main metric of system security. From the point of view of both customers and policy makers, the major risk **is** disconnection, and I believe this should be reported as the main metric, with appropriate sensitivity charts. LOLE and EEU should also be reported, but as subsidiary metrics. I believe this would help in avoiding the misreporting of LOLE as customer loss of supply, which has been an unhelpful outcome of media reporting of the assessment in previous years. De-rated capacity margin is recognised in the 2013 report as a relatively poor metric of supply security, and therefore should not feature so prominently, for example in the Executive Summary.

Question 2: Do you agree with using a qualitative approach to assess the impact of interconnector flows on LOLE and EEU in our Reference Scenario and sensitivities? If you disagree, please provide justification and suggestions for alternative approaches.

I assume that "a qualitative approach" here means the use of scenarios with non-quantified probabilities for interconnector behaviour at times of high LOLE. In this case, I agree that this is appropriate, as there is no available, valid and quantified, approach to model interconnector behaviour. However, it is a little misleading to describe this as "a qualitative approach", as the outcomes of particular scenarios are quantified in terms of LOLE, EEU etc. "A semi-qualitative approach" might be a more accurate description. More comments on the interconnector sensitivities are given in response to question 6.

There is an important presentational issue associated with this decision. The proposed methodology uses a relatively cautious approach to interconnector flows in the Reference scenario and then treats more optimistic scenarios as sensitivities. I do not have the expertise on interconnectors to make a judgment about the relative likelihood of different interconnector behaviours at time of stress, and I agree that Ofgem should not attempt this with inadequate information. I therefore agree that showing scenarios that span a broad range of plausible interconnector behaviour is appropriate. Strictly speaking, the choice of reference case does not matter if readers interpret the analysis, as intended, as plausible scenarios with no assigned probabilities. However, experience shows that less well-informed media commentators tends to privilege the Reference scenario. It should be considered how this might be avoided by different presentation of results. This is another area where Ofgem could usefully consider what research is needed to improve future assessment methodologies.

Question 3: Do you agree with our proposed approach to capture the uncertainties of a potential relationship between wind availability and high-demand on the level of risk? Please justify and provide suggestions for alternative options and their comparative advantages.

This is clearly a very important question for the longer term future, with higher levels of renewable generation on the GB electricity system. In this case, it is quite possible that there will be significant stress periods associated with periods of low generation outputs from variable generators, i.e. when there are low load factors for wind and solar generators. These would correlate with times at which it is dark and there is widespread low wind speed.

The correlation of the two drivers of stress (high demand and low supply) is an important question, and increasingly so as the capacity of variable renewables increases. The analysis presented in the 2013 report (Figure 18) indicates there is a risk of a positive correlation between high demand and low wind speed, but also shows that the current data is insufficient to quantify this with much confidence. In these circumstances, I agree that it is not appropriate to change the methodology for the 2014 assessment. I also agree that using the chosen de-rated capacity margin for wind is reasonable. It is not an ideal situation, but Ofgem clearly recognises this.

However, given the longer term importance of the issue, any progress which can be made in developing relevant datasets and analysis would be very useful. The consultation document focuses on the correlation between peak demand and the output of wind generation connected to the GB system. Clearly this would provide ideal dataset and I agree it is not currently available. This is largely because the relatively short time period within which there has been significant wind generation in the UK. However, it is not the only conceivable approach. It is possible that a better understanding of the correlation of peak demand and wind generation output could be achieved using cold weather (i.e. the principal driver of peak demand) as a proxy for peak demand. There may well be meteorological datasets correlating wind speeds and temperature, gathered over longer timeframes, which could then be used. This would clearly then require some additional assumptions to use for the purposes of this type of assessment. I am not a meteorological expert, so will not speculate on the likelihood of such an approach being useful. However, given the long term importance of the problem, Ofgem should investigate this option and consider the timescales on which it might be used in this type of analysis.

Question 4: Do you agree with the use of sensitivities to represent the main uncertainties facing the electricity security of supply outlook at the moment? If not, please provide specific reasons and alternatives.

I agree with the use of sensitivities to address the main uncertainties. For the main uncertainties discussed below, it is not realistic to develop quantified representations of uncertainty. However, in each case it is realistic to assess a range of plausible quantified

futures for the timescales of this assessment, and therefore sensitivity analysis is a viable methodology.

Question 5: Do you agree that our proposed sensitivities around interconnector flows, generation capacity, and peak demand capture the uncertainties that have the most significant impact on the level of risk? If not, what other sensitivities should we consider and why?

Given the discussion above, about the limited role of variable generation in the timescales of this assessment, the major uncertainties relate to three factors: peak demand, available capacity (at times of peak demand) and interconnector flows (at times of peak demand).

Each of these three main drivers is itself potentially complex to model, as it is dependent upon a number of factors – related to future investment in individual elements of the system, their technical performance, their economics and management (particularly at times of system stress) and any relevant policy and system operational changes over the period. These are issues addressed in more detail in responses to the following two questions with reference to the approach used in the 2013 Capacity Assessment.

Question 6: Do you agree that the Reference Scenario and associated sensitivities provide a sufficient range of possibilities for the electricity security of supply outlook? Please provide suggestions for alternative options and their comparative advantages.

Capacity available at times of peak demand depends on both the total installed capacity and its availability at peak demand (the de-rated capacity).

For installed capacity, I agree it is appropriate to use the National Grid scenarios, as National Grid has a unique insight into the current, and near term future, connection of capacity and has consulted widely. Previous assessments have used the Gone Green scenario as the Reference case. This choice needs to be kept under consideration, as there are increasing signs that it does not reflect current investment plans. However, it has the advantage of representing the scenario that is closest to DECC's view of the outcome of current policy goals. I therefore believe it is appropriate to retain this choice for this assessment, provided that it is clear it is only a Reference case, rather than an "expected" or "central" case. This necessarily implies the use of sensitivities, as proposed.

The 2013 report "low supply" and "high supply" sensitivities represent a reasonable view of the future range of installed capacity investment and closure. I agree that this broad approach should be continued, updated with the best available market intelligence.

The calculation of de-rated capacities uses load factors from recent winters. Ofgem will be aware that this approach has been criticised by well-informed analysts, on the grounds that the load factors are lower than technical assessments of unscheduled outages, i.e. lower than an engineering analysis of technical availability. The 2013 report sets out that it is prudent to

use a load factor that includes commercial ("strategic outages") as well as technical outages, and, on these grounds, the proposed approach to the Reference case is justifiable. However, it is clearly arguable that, in periods of system stress, and therefore high prices, conventional generator availability should approach the technical limit. Any other assumption involves significant "strategic outages" at times of system stress, which implies a prima facie case of market manipulation. I therefore suggest that the 'high availability' sensitivity, at least, should be revisited and, if necessary, revised (in either direction) to reflect an informed expectation of technical performance. And, given the implications of possible strategic behaviour by generators that is contrary to consumer interests, this is an area where further research might be useful.

The approach to wind capacity has been considered above in response to Q3.

For the reasons set out in response to Q2, I agree that it is appropriate to use sensitivity analysis with respect to interconnector flows. The specific choices are clearly more problematic and Ofgem will be aware that some choices made in the 2013 assessment were controversial. In particular, some analysts consider that the Reference case assumption (that continental connectors are in balance and the Irish interconnector remains fully exporting) is unrealistically pessimistic for times of very high GB demand. This view is underpinned by the insight that GB consumers might be prepared to pay up to the value of loss of load for electricity at times of system stress, and, under these conditions, basic economic analysis would indicate that full imports would be the likely outcome. The criticism is somewhat weakened by the extensive potential for use of interconnector services as a System Operator intervention in periods of system stress. Nevertheless, the insight clearly has some merit, in that 'normal market' operation might be expected to produce full use of interconnectors without System Operator action.

However, on balance, I have some sympathy with Ofgem's previous approach of not choosing to adopt this approach as the Reference case. First, it seems quite possible that interconnected systems might be in stress at the same time as the GB system, and therefore also facing high prices. Secondly, and perhaps more importantly, there is no guarantee that basic textbook economics will adequately describe the performance of the interconnectors. Their operation is subject to complex contractual requirements. I have no detailed knowledge of these, but it is clear from analysis of actual flows that they do not correspond in any simple way to relative prices in the interconnected markets. I therefore agree that a more conservative scenario remains acceptable as the Reference case. However, the 'maximum use of interconnection' is a reasonable scenario, and therefore might usefully be included as a sensitivity. Of course, doing this will reduce SO emergency options, and therefore is likely to affect LOLE and EEU more than risk of customer disconnection.

In this context, it is concerning that Ofgem appears to have insufficient information and analysis to make more detailed analyses of interconnector performance. A large part of the value of interconnectors relates to their role in improving system security, and this will increase as markets on both sides of interconnectors rely on higher levels of variable

generation. It will be difficult to judge the investment case for future interconnection without a reliable analysis of the probability that they will be used in an economically rationale way. This is another area where Ofgem (and/or DECC) should consider the need for increased information and analysis.

My response on the demand reference case and sensitivities are given in reply to Q7 below.

Question 7: Do you agree that the different demand projections presented in the report provide a sufficient range of possible demand outcomes? If not, please suggest alternatives and their comparative advantage.

The basic approach uses the National Grid "Gone Green" scenario demand projections, and this is appropriate, as it is consistent with the supply side approach.

The sensitivities used reflect variations in economic assumptions, which are an important sensitivity, but not the only one. The 2013 report acknowledges that energy efficiency policy is an important driver of demand, but does not further consider this insight quantitatively, claiming that it is "very difficult to anticipate the impact of energy efficiency policies on energy use". To the extent that future policies are uncertain there are clearly relevant uncertainties, but the impact of known or planned policies on demand **is** relatively easy to assess, and therefore this should be considered.

The scale of the energy efficiency programmes undertaken by energy suppliers, has been reduced very substantially in the last year in the changeover from CERT to ECO, in particular with respect to electricity saving. This will place upward pressure on demand, and therefore all metrics of security. To the best of my knowledge, this impact has not been assessed. It would therefore be prudent to understand the impact of electricity efficiency policy on security metrics.

Ofgem (through E-Serve) has unique expertise in the energy efficiency programmes undertaken by energy suppliers. There are published analyses on other policy drivers of electricity demand elsewhere. DECC has developed an analysis of electricity saving potential across the economy. Defra's Market Transformation Programme has developed alternative scenarios for individual product categories. And National Grid scenarios explore different rates of technology adoption at a higher level of aggregation. Together these could, in principle, be used to assess the impact of policy on electricity demand. Undertaking this for every category of electricity use might be too difficult in a single year, but should be possible over a longer period. In the short term, it might be appropriate to focus on one or two areas, which make a major contribution to peak demand. For example, lighting could be addressed using the data from the Slow Progress scenario from National Grid as a sensitivity case.

Similar issues apply to the potential impacts of feed-in tariff changes for small scale generation (which appears as negative demand in the National Grid model). However, this

predominantly affects solar PV, which makes a negligible contribution at ACS winter peak, and therefore can be neglected in the context of this analysis.

The proposed approach to DSR is relatively straightforward, but basically sound, in using the Gone Green scenario assumptions as the Reference case. However, this scenario has some radically different assumptions from those in the Slow Progress scenario with respect to the speed of smart meter roll out, and therefore DSR implementation. Even by 2018, this could be a significant effect. Again, the Slow Progress assumptions could be used as a sensitivity case.

Question 8: What sensitivities do you think would be most appropriate to include in our main summary graphs (e.g. Executive Summary), and why?

De-rated margin should not be a priority for inclusion in the summary analysis for the reasons set out above, which reflect Ofgem's own concerns about its value a metric of system security. Excluding this metric from the summary would allow more analysis and charts on other metrics. I agree that the impact of key sensitivities on LOLE should be retained. However, this should be accompanied by more focus, including charts, on the effect of key sensitivities on customer disconnection, as this is the most meaningful metric and the one of most interest to stakeholders outside the electricity sector.

The key sensitivities summarised should cover all of the three main areas: demand, capacity and interconnector behaviour. The last of these would be an addition to those in the 2013 report. The demand and supply sensitivities could helpfully be in each direction from the Reference case, unlike the 2013 report, which included only the more pessimistic options. (Whilst high risk scenarios are, inevitably, of greater public interest it is important for balance that low risk scenarios are given equal weight in the summary.)

It is probably impractical to include a large number of interconnector sensitivities in the summary, so one simple option that would be easy to understand would be to use the existing (rather conservative) Reference case assumptions and a single sensitivity reflecting optimum use (full import) of the interconnectors.