

Socrates Mokkas  
Energy Market Research and Economics  
Ofgem  
9 Millbank  
London  
SW1P 3GE

7 December 2011

Dear Socrates,

### **Electricity Capacity Assessment: Measuring and modelling the risk of supply shortfalls**

EDF Energy is one of the UK's largest energy companies with activities throughout the energy chain. We provide 50% of the UK's low carbon generation. Our interests include nuclear, coal and gas-fired electricity generation, renewables, combined heat and power plants, and energy supply to end users. We have over five million electricity and gas customer accounts in the UK, including both residential and business users.

EDF Energy plans, with its partner Centrica, to build up to four new nuclear reactors, the first two being at Hinkley Point. We are also actively developing our portfolio of renewable generation assets and completing construction of a 1300MW CCGT. Our final investment decisions for new nuclear generation are reliant on receiving the necessary consents and on a robust investment framework being in place.

EDF Energy believes that without capacity payments, the economics of new peaking capacity will depend on very infrequent occasions of very high prices. The uncertainties over the magnitude of these peak prices, their frequency, and their acceptability leads us to believe that, if a capacity mechanism is not introduced, the market would reach equilibrium with a lower standard of security of supply than we currently have. This problem is unlikely to materialise until at least 2016, maybe later. However, we believe it is important to address this issue now, as part of a holistic Electricity Market Reform package, to remove an uncertainty that will increase the risk associated with investment decisions in all forms of generation.

Our preference is for a capacity market in which the value of capacity would remain separate from the energy market and transmission access products. In particular, we see a capacity market operating independently from the balancing market, and believe there is a distinct difference between the value of "balancing energy" and "peak energy" / capacity adequacy. In such a capacity market, the total need for capacity would be set centrally, with a price set through annual auctions that would determine the value of capacity for all plant at least four years in advance.

A realistic timetable for the introduction of a capacity market would require clarity on the details of the capacity mechanism in the early part of 2012 (to meet the deadlines for decisions required in April 2012 in choosing compliance options available under the IED and the end of 2013 for decisions on limited life derogations from the IED), with the first capacity auctions ideally in 2013, or 2014 at the latest. By 2014, auctions could be held

covering the years 2016/17/18, with the auction covering 2019 taking place in 2015, thus putting the Capacity Market into operation by 2016. Although capacity prices may be low in 2016, we would expect them to rise by 2019/2020.

We believe introducing such a capacity market on the timetable above would give greater certainty for investments by providing an efficient capacity price signal, whilst the use of a "trigger" for the introduction of a capacity market would not help to reduce investment uncertainties.

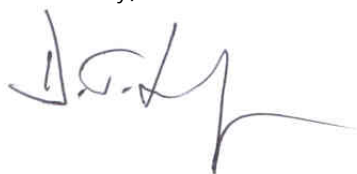
Therefore, our response, as detailed below, is made on the basis that the capacity mechanism will be introduced as soon as practicable and that the capacity assessment report will provide information on the future capacity position of the GB market and will not be used as a means to assess whether the introduction of a capacity mechanism should be "triggered". With this in mind, it is our belief that the capacity assessment report should provide a detailed forecast for each year at least until the year of the next auction.

We also note Ofgem's proposal to delegate construction and updating of the model for capacity assessment to National Grid Electricity Transmission plc (NGET). We recognise that NGET is well placed to carry out the modelling on Ofgem's behalf. However, we wish to highlight the need for transparency and clear data use guidelines in light of NGET's potential conflict of interests with respect to their roles as transmission owner (e.g. the possible impact on transmission investments of the two region model results and assumptions made on the size and location of new wind generation installations) and System Operator (e.g. purchaser of STOR and possible purchaser of Strategic Reserve in the future). As the regulator of energy markets, Ofgem will play an important role in ensuring that the capacity assessment activities performed by NGET are ring-fenced from the conflicting areas of their business. Clearly defined rules governing the provision and use of data would help to ensure that the detailed modelling and assumptions are well understood, transparent and appropriate. Modelling and assumptions workshops involving NGET, Ofgem and market participants would also be very helpful.

Much of the data provided for this exercise will be subject to considerable uncertainties, and market participants will not have fixed plans for capacity availability four or more years ahead. Therefore, the information provided for this exercise should not be regarded as commitment to specific actions. Market participants should be asked to identify the most significant risks that may lead to changes in their plans.

Our detailed responses are set out in the attachment to this letter. Should you wish to discuss any of the issues raised in our response or have any queries please contact my colleague Ravi Baga on 020 7752 2143, or myself.

Yours sincerely,

A handwritten signature in black ink, appearing to read "D. Linford".

**Denis Linford**  
**Corporate Policy and Regulation Director**

## Attachment

### Electricity Capacity Assessment: Measuring and modelling the risk of supply shortfalls

#### EDF Energy's response to your questions

##### **Question 1: Do you agree that the de-rated capacity margin is a good indicator of future capacity adequacy?**

EDF Energy agrees that de-rated capacity margin is an appropriate indicator of future capacity adequacy. As more and more intermittent plant is added to the system, the "simple" capacity margin defined as the excess of installed generation over demand is no longer a reliable measure of system security.

EDF Energy therefore believes that the de-rated capacity margin, taking into account expectations of plant availability (e.g. planned and forced outages, intermittency of renewable generation, etc.), is the correct approach to measuring system security. However, we believe that transparency is required on the assumptions and modelling that are used to determine the value of the de-rated capacity margin.

In addition, although we agree it is the correct technical approach to assess available generation capacity against demand-net-of-wind-generation, we believe total demand and the expected contribution of wind generation to the capacity margin should also be published alongside any assessment of capacity margins. This will help provide sufficient transparency on the contribution of wind generation to security of supply.

We also agree with Ofgem's suggestion to measure the de-rated capacity margin throughout the year modelled. This will help to identify times when the system could be under stress at non-peak demand times, such as in summer when maintenance outages are scheduled, and to measure the frequency and duration of energy unserved events that cause increased difficulties for end users. We believe that a measure, such as the one outlined in our response to question 2, is an important additional measure of risk that should be reported.

##### **Question 2: Are there any measures of risk other than LOLE and EEU that we should report and what are their comparative advantages?**

EDF Energy agrees that Loss of Load Expectation (LOLE) and Expected Energy Unserved (EEU) are both appropriate for assessing the risk of supply shortfalls and should be measured throughout the years modelled. However, we believe that additional measures are needed to consider the frequency and duration of energy unserved events. These measures would recognise the increased difficulties faced by end users when energy unserved events occur a number of times during a short period of time and/or last for extended length of times. To enable the frequency and duration measures to be assessed, the analysis should consider the load-duration curve and also consider specific modelled events over time (e.g. very low wind availability during x consecutive hours of high demand).

**Question 3: Are there any additional key input assumptions that we should consider in the modelling?**

EDF Energy believes that “volume constraints” (e.g. LCPD opt-out plant, IED implications for gas and coal plant, hydro-generation, storage, demand side response, embedded generation, emission performance standards, etc.) should be considered in the model. This will allow the de-rated capacity margin, LOLE and EEU correctly measured throughout the year and the frequency and duration of the energy unserved event to be assessed.

Furthermore, we believe that the transmission system capacity should also include agreed future investments.

**Question 4: Do you agree that the use of stochastics (probability distributions) to model short-term variation of key input variables is the best available method? Do you agree with the use of scenarios and stress tests for capturing long term uncertainty in key input variables?**

EDF Energy agrees with Ofgem that the use of stochastics is the appropriate methodology for modelling many of the short term variations affecting the UK market. However, care must be taken on the choice of scenarios as wide fluctuations (e.g. interconnection flows) could negate the benefits of stochastic modelling of variables such as demand and wind availability.

**Question 5: Do you agree with the proposed approach to modelling wind availability?**

EDF Energy considers that the proposed second option, where wind speed is converted to power output based on wind turbine specifications, would be the most appropriate. However, we recommend that there should be an additional check against how the original technical specifications of existing wind turbines have performed against their actual power output, with divergences between projected and actual performance used to improve future projections of wind availability.

**Question 6: Do you agree with the proposed use of NGET's existing data and assumptions, regarding, in particular, commissioning and decommissioning dates and embedded generation?**

EDF Energy broadly agrees with Ofgem’s proposed use of NGET’s existing data, which is likely to be a good source of information for transmission connected assets. Market participants will be aware of their existing obligations to provide data such as OC2 data (as for generation). Nevertheless, data used in modelling should be the most accurate and up to date as possible and a review of the existing data on transmission connected generation should be undertaken to confirm whether it is fit for the purpose of capacity assessment.

We believe that NGET’s assumptions need to be reviewed in more detail during a modelling and assumptions workshop involving NGET, Ofgem and market participants to ensure that the detailed modelling and assumptions are well understood, transparent and appropriate. Due to the uncertainties surrounding start dates and capacities of new plant

(both under construction and planned), it is our recommendation that a “no investment case”, based on existing plant only, should be considered for the base case scenario rather than one based on TEC register capacities and start dates.

On demand side response and embedded generation, it is our understanding that NGET has access to much less information than on the transmission connected generation side. Therefore, there should be a review of what data is potentially available from customers, suppliers, embedded generators, demand side response aggregators and DNOs.

Data used in modelling should be provided in a transparent manner from all parties.

**Question 7: Do you believe that Ofgem should require industry stakeholders to submit up-to-date data with regard to commissioning and decommissioning dates and embedded generation? Which industry process will ensure the confidentiality of information provided?**

EDF Energy agrees with Ofgem that industry stakeholders should, for the purposes of capacity assessment, submit up-to-date plans for commissioning and decommissioning dates and embedded generation data. A review of the existing data on generation should be undertaken to confirm whether it is appropriate for the purpose of capacity assessment. Plans for continued operations and closure of existing plants and opening of new plants are subject to a number of uncertainties such as legal and regulatory developments, market conditions, transmission access, commercial negotiations, construction risk and operational risk. Therefore, market participants will not have fixed plans for capacity availability four or more years ahead and the information provided for this exercise should not be regarded as commitment to specific actions. Market participants should be asked to identify the most significant risks that may lead to changes in their plans.

On demand side response and embedded generation, there should be a review of what data is potentially available from customers, suppliers, embedded generators and DNOs. The data used in modelling should be provided in a transparent manner from all parties using and amending existing processes if and where appropriate.

**Question 8: What are your views on how best to model LCPD opt-out plants' restricted running regimes?**

EDF Energy believes three scenarios could be used to model the restricted running regimes of LCPD opt-out plants:

- All plant using hours as quickly as possible
- Plant run in line with current running patterns
- Some plant conserve hours to 2015

In addition to LCPD opt-out plants, we recommend that the restricting running regimes of plants covered by the Industrial Emissions Directive (IED) should be considered. The IED comes into force in 2016 and will cover all large combustion plants in existence before 2013. By April 2012, gas and coal plant operators will need to decide whether to opt for the Transitional National Plan approach and by the end of 2013, they will need to make the final decision between the three options available under IED (installation of

appropriate abatement equipment, limited hours derogation of 17,500 hours with an end date of 31 December 2023 and the Transitional National Plan of 4.5 years to 30 June 2020). Therefore, we believe that the impact of the IED on plant running patterns (e.g. NO<sub>x</sub>, SO<sub>x</sub> and particulates limits) should be assessed.

**Question 9: Which of the two approaches for modelling electricity interconnection flows will provide the most realistic flows? If you favour the scenario based approach, what are your views on reasonable scenarios to run?**

For the purposes of capacity assessment, it is important that the modelling of interconnection flows allows the risks to be correctly assessed and for tail risks to be understood. EDF Energy believes that neither of the proposed options are ideal. In the first option, the scenario approach could negate the benefits of using stochastic modelling in other areas. A comprehensive approach to the second option of modelling flows based on price would require significant model development to cover neighbouring markets without necessarily providing additional benefits. For these reasons, EDF Energy believes a simpler probabilistic approach should be investigated. If it is not possible to find such an approach, then the scenario approach would be preferable, but great care must be taken with the design of the scenarios to ensure that they do not undermine the benefits of stochastic modelling in other areas and which recognise the ultimate objective of ensuring the required standard of security of supply for the UK.

**Question 10: Under what conditions would users respond by curtailing their demand and how would you go about modelling this? Is it worth Ofgem requesting data from DNOs on self-interruption and interruptible contracts?**

Users curtail demand if price signals (i.e. energy and capacity) are sufficiently high to justify required investment and operational switching of energy supply or the turning down of demand.

EDF Energy believes that a review should be undertaken to assess what data is available from customers, aggregators, suppliers, embedded generators and DNOs. It will also be important to determine what basis the information will be provided (e.g. on a "reasonable endeavours" basis).

We believe that that demand-side response activity should be open to competition, and that more transparency is required on self-interruption/interruptible contracts, demand-side response potential and end user price reactivity.

**Question 11: Is historical data of scheduled outages a good indicator of future patterns of scheduled maintenance timings?**

EDF Energy believes that Ofgem's second option, based on historical data of scheduled outages, is the most appropriate for modelling future patterns of maintenance outages as it will provide a good level of accuracy in predicting the scheduled maintenance timings. This is in contrast to the first option which would require significant model development and would not necessarily provide a corresponding improvement in the accuracy of predicting scheduled maintenance timings.

**Question 12: Will treating half-hour periods independently have significant effects on our estimates of the de-rated capacity margin and risk of supply shortfalls and how should the model take into account half-hourly cross-correlations?**

Although modelling half-hours independently has some merits, EDF Energy believes that the frequency and duration of energy unserved events are important measures to assess the risk of supply shortfalls. These measures recognise the increased difficulties faced by end users when energy unserved events occur a number of times during a short period of time and/or last for extended length of times. To enable the frequency and duration measures to be assessed, the analysis should not treat half-hour periods independently. Half-hourly cross-correlations of demand, wind availability and generation availability are required to correctly assess difficulties of end-users arising from the frequency and duration of energy unserved events.

**Question 13: Are there any boundaries other than Cheviot that may significantly affect the risk of supply shortfalls?**

Constructing a capacity assessment model consisting of two or more regions starts to consider the impact of transmission infrastructure on the risk of supply shortfall. Given its bank of existing data, NGET is well placed to provide information on whether a multi region model is required. However, as previously highlighted, we wish to emphasise the need for transparency and clear data use guidelines on the issue of modelling transmission constraints in light of NGET's potential conflict of interests from their role as transmission owner. Therefore, we believe that the decision to develop and use a multi-region model for the capacity assessment report should form part of the discussions during the modelling and assumptions workshop involving NGET, Ofgem and market participants that we have suggested earlier in our response.

**EDF Energy**  
**December 2011**