



GE Response to DECC Consultation on Possible Models for a Capacity Mechanism

04 October 2011

Executive Summary:

1. The UK Government is proposing to introduce a traditional form of capacity mechanism; whereby the incentive is to ensure sufficient capacity is available at a 'day-ahead' stage and rely on the TSO to refine the STOR mechanism to address real-time issues.
2. GE views proposals for capacity payments as a welcome step that recognises the future role that flexible generation and demand side management will play. We support the introduction of a capacity mechanism targeted at capacity/demand response with the required flexible characteristics but where plant are free to despatch across all markets (day-ahead, balancing and ancillary services) leading to the most efficient overall energy system.
3. The Government's proposed 'strategic reserve' option is workable but will not provide the most efficient market for delivering peaking and flexibility in terms of cost and emissions. The design is also lacking in that it does not particularly suit demand response. We would prefer a capacity market that targets solutions with defined criteria, where the capacity price is sufficient to cover the additional capital costs of providing flexibility whilst allowing generators to contribute to capital and fixed costs through intra-marginal rents from operating across all the electricity markets.
4. The risks associated with considering capacity in separate markets is that transparency and liquidity is reduced. This could result in a less efficient and more expensive solutions to meeting the UK's energy goals.

1. Introduction

General Electric (GE) is pleased to provide its high-level views on the issues raised by the DECC consultation on possible models for a capacity mechanism which support the accompanying proforma response.

- GE Energy is one of the world's leading suppliers of power generation and energy delivery technologies.
- The businesses that comprise GE Energy - GE Power & Water, GE Energy Management and GE Oil & Gas - work together to provide a broad portfolio of product and service solutions in all areas of the energy industry including coal, oil, gas CCGT and nuclear energy; renewable resources such as water, wind, solar and biogas; and other alternative fuels. In the UK, GE's available installed technology meets up to 18% of UK electricity needs and we also supply digital energy solutions to 13 of the 14 transmissions & distribution networks in Great Britain.
- GE Energy is part of General Electric, a global infrastructure, finance and media company. GE is proud of its presence in the UK since the 1930s. We currently employ over 18,000 people across the UK and have invested over £14 billion in our UK-based businesses since 2002.

We view proposals for capacity payments as a welcome step that recognises the link between supply and demand and the growing role that flexible generation and demand side management will play in the future. Increasing deployment of intermittent wind and inflexible nuclear capacity will require a significant volume of complementary peaking generation as well as non-generation capacity. There will be a particular need for plant that can offer high efficiency and flexibility owing to the extreme hour-to-hour changes in net demand (demand less wind).

GE has conducted a wide range of renewable energy integration studies that have helped to increase insights into the most economically attractive options for providing flexibility under various scenarios. These consider electricity supply and demand, fuel and CO2 prices, renewable energy penetration levels and specific events or variations in renewable energy; while meeting environmental targets. We conclude that more variability and uncertainty in the net load introduced by renewables can be successfully managed with deployment of grid-friendly renewables along with flexible resources such as more mid-merit and peaking generation.

2. Modifying power market design to encourage operation and investment in flexible resources (Questions 1 & 24)

The UK is on an ambitious path to drive deployment of renewable energy and reduction of greenhouse gas emissions. The policy trajectory for 2020 and beyond is now increasingly clear, and further discussions and analysis are being undertaken to set goals for the energy sector for 2030 and 2050.

The UK Government has recognised a shortfall in the current power market structure and is consulting on a proposal to introduce a capacity-type mechanism to provide additional revenue sources to flexible generation. Two factors in the evolving electricity market design have influenced this growing interest in this policy mechanism:

- To fully decarbonise requires an increased use of inflexible baseload generation capacity will reduce the ability to turn power stations on and off to meet fluctuation in demand reasonably.
- An increased acknowledgement that as variable resources such as wind deployed on the system grow in future, a requirement for more capacity to be available will be needed to replace intermittent capacity when it is unavailable, potentially at a very short notice.

Investment is needed to meet future peak demand and flexibility requirements. Increasing deployment of intermittent wind and baseload nuclear capacity towards 2020 and beyond will require a significant volume of complementary peaking generation as well as non-generation flexible capacity. The current capacity margin enjoyed in the UK is sufficient but could also come under future pressure if existing fossil fuelled plant is closed prematurely.

Despite relatively low forecast demand growth over the medium-term, significant amounts of intermittent wind capacity (around 20GW) is expected to be connected to the system by 2020, with the closure of a similar amount of fossil and nuclear plant (up to 25GW) expected to occur over the same period. In addition, the availability of existing flexible plant is also expected to reduce over the next decade; as plant complies with environmental legislation.

However, the need for plant that can offer high efficiency and flexibility will increase because by 2020, the extreme hour-to-hour changes in demand (net of wind output) could be as much as 17GW, which is a significant increase from the maximum variation of 5GW in 2009. In these circumstances, it is important that market mechanisms recognise the importance of highly efficient flexible generation capacity in real time. This hourly variation will also not be completely predictable which will also require generation which can respond and ramp up/down very quickly.

To cost-effectively integrate renewable power into electricity networks around the world on a large scale, GE has developed FlexEfficiency*50, a first-of-its-kind combined cycle power plant engineered to deliver an unprecedented combination of flexibility and efficiency. While power plants can provide flexibility or high efficiency, this power plant will deliver an unprecedented combination of both. The plant will deliver enough energy to power more than 600,000 homes and is the result of an investment of more than \$500 million in R&D, drawing from the company's jet engine expertise. It represents a key part of GE's on-going work to create and manufacture technologies around the world that deliver cleaner, more efficient energy. (*trademark of the General Electric Company)

3. GE main recommendations for the implementation of a capacity payment

GE is pleased to provide its high-level views on the following aspects of the capacity mechanism:

- i. Capacity mechanism model and criteria
- ii. Market transparency and the need for real-time signals
- iii. Functional arrangements - The need for a long-term certainty and central co-ordination
- iv. Form of despatch
- v. Demand Side Response

i. Capacity mechanism model and criteria (Question 1)

The UK Government is proposing to introduce a traditional form of capacity mechanism whereby the incentive is to ensure sufficient capacity is available at a 'day-ahead' stage and rely on National Grid to refine the STOR mechanism to address real-time issues.

GE believes that EMR provides a wider opportunity to consider the market as a whole and to ensure the most efficient (and low carbon emitting) capacity is deployed to meet the needs at both a day-ahead and real time basis. The danger in considering capacity separately in these markets is that transparency and liquidity is reduced which could in-turn result in a less efficient and more expensive overall system solution.

Whilst all parties that can contribute to security should be incentivised to do so, the GB market requires some form of system in place to ensure that best flexible capacity comes on line as opposed to simply rewarding existing capacity. GE supports the introduction of a capacity mechanism targeted at capacity/demand response but where the plant are free to despatch across all markets (day-ahead, balancing and ancillary services) so that we end up with the most efficient total system.

Whatever the final proposed design of the capacity mechanism, it should support defined flexible characteristics. This should target high efficiency and flexible generation based on parameters that

include efficiency of ramping, ramp rates, carbon emissions, start costs. This should enable new generation to provide peak demand and flexibility services but ensure the most effective investment from a technological whilst helping the UK to meet its emissions targets in an affordable manner.

We would suggest that the Department of Energy & Climate Change (DECC) should consider undertaking further analysis and modelling in order to determine the desired characteristics of flexible generation and demand response solutions required to maintain security of supply under the EMR. This analysis might explore how the overall system would be required to respond, given the deployment of low carbon generation envisaged, to variations in expected wind generation at real time.

ii) Market transparency and the need for real-time signals (Question 3)

A capacity mechanism will need to address flexible resource requirements to better deal with grid operation uncertainty resulting from increasing deployment of variable renewable energy. As such the system should be underpinned by a need for transparency, competition and efficiency.

The system will require a reliable (real-time) power system operation and signals for investments in generation, transmission and demand side options to ensure power system reliability in the future. In principle the reference market should be 'within day' and as close to real time as possible. Intra-day balancing markets are in most countries still not mature and auctions for system services tend to not provide sufficient investment signal.

'Within-day' markets maximise the amount of capacity able to participate and are becoming more critical to support the growing penetration of wind on the system. To-date, power markets have been predominantly 'day-ahead'. Consequently in the UK, it will be particularly important to ensure that sufficient capacity is available on the real-time balancing market, so as to support the increased deployment of intermittent wind generation.

iii) Functional arrangements - The need for a long-term certainty and central co-ordination (Question 10)

Current policies do not set sufficiently clear long-term volume targets in the wholesale electricity markets and a long-term signal is needed to drive new investments currently reliant on market price spikes. For the electricity market to be attractive to the full range of investors, it is therefore necessary to ensure that there is a clear and credible long term sales volume opportunity against which potential investments can be assessed.

A capacity mechanism should be underpinned by clear investment signals either set by a central body. It requires an assessment of the appropriate level of capacity and an incentive to deliver this desired level of capacity. Ultimately the desired level of security must be determined by the Government. As such grid operators are by dint of their remit often (but not always) the best placed entities to assess capacity requirements to deal with increasing grid operation uncertainty. Setting the level of capacity should not undermine delivery of outcomes which should be left to the competitive market.

iv) Despatch (Question 6)

There are two main proposals to determine how resource could be despatched: 'last-resort despatch' whereby the resource is only used after all other resource has been exhausted; and an 'economic despatch' when the market price reaches a certain level and sold into the market at this price.

A 'last-resort' despatch runs the risk of distorting the market such that peaking generation is provided by low capital cost inefficient plant with high emissions. This is likely to result in less efficient generation and higher carbon emitting generation on the system. Competition should provide the most efficient and cost effective solution to incentivising investment in plant to meet both extreme peak demand and hour-to-hour variation in intermittent generation output.

As outlined above, GE supports the introduction of a capacity mechanism that drives capacity/demand response with the required flexible characteristics but where plant are free to despatch across all markets (day-ahead, balancing and ancillary services) so that we end up with the most efficient total system.

The level of capacity payment used needs to be set to ensure plants act competitively in the energy markets. It should also be set sufficiently to cover the additional capital costs of providing this flexibility but allow generators to contribute to capital and fixed costs through intra-marginal rents from operating across all the electricity markets.

v) Demand-side response (Question 5)

Whilst incentivising flexible peaking plant, EMR provides an important opportunity is to get a clear and credible long term price signal into the market price so that consumers or providers of other capacity (storage, DG) can enjoy the same value if providing capacity at appropriate times.

GE's overriding concern with the proposed targeted mechanism is that it is only designed to encourage additional peaking capacity not investments in new flexible capacity and demand response. The latter are not economically viable under the proposed mechanism but would be under a market-wide design whereby flexibility is rewarded through an additional capacity payment. This type of plant should be able to operate freely in the day-ahead, balancing and ancillary services market to ensure the system operates in the most efficient manner.

There is a concern that storage and interconnector capacity in particular might not be able to participate in a strategic reserve as they are only likely to be despatched infrequently.

4. Wider efforts to encourage capacity – the role of transparent and liquid markets

To support the design of a capacity mechanism, wider consideration should be given to enhance market liquidity and grid reliability, most notably:

- Improving the operation of the wholesale electricity and balancing market
- Wider energy market reform with the EU and other member states

As reflected by current work by the Regulator (Ofgem), there is a need for reform to the wholesale electricity and balancing market if the Government is to achieve its decarbonisation targets. Liquid, competitive wholesale markets are fundamental to promoting investment in flexible generation by both independent incumbents and new entrants.

Except in the short-term, current markets offer insufficient liquidity, competition and contracting. Inadequate levels of medium-term liquidity have a detrimental effect on the development of price signals, which, in-turn, diminishes investor confidence in the GB wholesale electricity market.

At the same time that the UK Government is considering electricity market reform, the European Commission also has a role to encourage Governments elsewhere in Europe to review their electricity markets to ensure the market reform process in the UK is more coherently aligned. The costs of meeting UK Government objectives are likely to be significantly reduced over the longer term if policy objectives are more integrated with the single European market.

Liberalised electricity markets open up new opportunities and revenue streams for market participants who invest in technologies that drive a better overall system. For example, well-functioning intra-day cross-border trading could increase options for utilities and generators in other member states to reap operational efficiencies that result in more balancing options.

5. Conclusion (Questions 11 & 27)

As outlined above, GE views proposals for capacity payments as a welcome step in recognising the link between supply and demand and the growing role that flexible generation and demand side management will play in the future.

We support the introduction of a capacity mechanism targeted at capacity/demand response with the required flexible characteristics but where the plant are free to despatch across all markets (day-ahead, balancing and ancillary services) so that we end up with the most efficient total system. GE believes that EMR provides a wider opportunity to consider the market as a whole and to ensure the most efficient (and low carbon emitting) capacity is deployed to meet the needs at both a day-ahead and real time basis.

The proposed strategic reserve market is 'workable' but GE has concerns that it will not provide the most efficient market for delivering peaking and flexibility in terms of cost and emissions. The design is also lacking in that it does not particularly suit demand response. GE would prefer a capacity market, targeted at solutions with defined criteria, where the capacity price is sufficient to cover the additional capital costs of providing this flexibility but generators also contribute to capital and fixed costs through intra-marginal rents from operating across all the electricity markets.

The risk with considering capacity separately in these markets is that transparency and liquidity is reduced. This could result in a less efficient and more expensive solutions to meeting the UK's energy goals.

-end-

Consultation on Possible Models for a Capacity Mechanism

Response form

Responses are welcome by email or post. You may find this document helpful for structuring your response, but can reply in a separate document if you prefer. If replying in a separate document please make clear which questions you are answering.

Respondent Details	
Name	[REDACTED], Head of UK Policy
Organisation	GE Energy
Address	2 The Arena, Downshire Way
Town/ City	Bracknell
Postcode	RG12 1PU
Telephone	[REDACTED]
E-mail	[REDACTED]
Fax	

Tick this box if you are requesting non-disclosure of your response. ☐

Please return by 30 September 2011 to:

Department of Energy & Climate Change,
Electricity Market Design – Security of Supply
4th Floor, Area D
3 Whitehall Place,
London, SW1A 2AW

You can also submit this form by email to:
DECC.capacity.mechanism@decc.gsi.gov.uk

Consultation questions

Note: the references in square brackets refer to page and figure numbers in the consultation document where more information can be found, and the questions are set out in context. The consultation document is Annex C of the Electricity Market Reform White Paper, and is available here:

http://www.decc.gov.uk/en/content/cms/consultations/cap_mech/cap_mech.aspx

Targeted mechanism

Consultation question [page 167]	
1	Does this table [see Figure C3] capture all of your major concerns with a targeted Capacity Mechanism? Do you think the mitigation approach described will be effective?
Response	GE's overriding concern with the proposed targeted mechanism is that it is only designed to encourage additional peaking capacity not investments in new flexible capacity and demand response. The latter are not economically viable under the proposed mechanism but would be under a market-wide design whereby flexibility is rewarded through an additional capacity payment. This type of plant should be able to operate freely in the day-ahead, balancing and ancillary services market to ensure the system operates in the most efficient manner.

Consultation question [page 168]	
2	How long should the lead time for Strategic Reserve capacity procurement be and why?
Response	Procurement lead times should be sufficient to allow for construction of new capacity but not too far forward so as to undermine the need for new capacity. Lead times may also need to vary in order to address the need for different types of technologies.

Consultation question [page 168]	
3	Should the length and nature of contracts procured by the Strategic Reserve procurement function be constrained in any way?
Response	For the electricity market to be attractive to the full range of investors it is necessary to ensure there is a clear and credible long-term signal against which potential investments can be assessed. Contracts must be sufficient for an acceptable return to be made over an economical life time. Conversely, contract length should not be such that it distorts the market and deters the deployment of newer more efficient generation in the future.

Consultation question [page 169]	
4	Which criteria should providers of Strategic Reserve be required to

	meet?
Response	The criteria should depend on exactly what type of reserve is needed. Parameters might include efficiency of ramping, ramp rates, carbon emissions, start costs and cost.

Consultation question [page 169]	
5	How can a Strategic Reserve be designed to encourage the cost-effective participation of DSR, storage and other forms of non-generation technologies and approaches?
Response	<p>Please refer back to Q1 & 3 relating to our view on the design of the market. The key is to achieve a clear and credible long-term signal into the market price so that consumers or providers of other capacity (storage, DG) can enjoy the same value if providing capacity at appropriate times.</p> <p>There is a concern that DSR might not be able to participate in a strategic reserve as they are only likely to be despatched infrequently.</p>

Consultation question [page 175]	
6	Government prefers the form of economic despatch described here. Which of the proposed despatch models do you prefer and why?
Response	<p>A 'last resort' despatch runs the risk of distorting the market such that peaking generation is provided by low capital cost inefficient plant with high emissions. As outlined in Q1 GE supports the introduction of a capacity mechanism targeted at capacity/demand response with the required flexible characteristics but where plant are free to despatch across all markets (day-ahead, balancing and ancillary services) so that we end up with the most efficient total system.</p>

Consultation question [page 175]	
7	How would the Strategic Reserve methodology and despatch price best be kept independent from short-term pressures?
Response	<p>The despatch price should be market-driven and open to market pressure. The current proposed fixed price would not encourage generators to invest in more efficient flexible and peaking plant and as such could lead to higher than necessary peak prices and emissions.</p>

Consultation question [page 175]	
8	Do you agree that a Strategic Reserve should be periodically reviewed? If so, who would be best placed to carry out the review and how often should it be reviewed?

Response	Yes. The Strategic Reserve can be reviewed to take account of developments in technology.
-----------------	---

Consultation question [page 176]	
9	Into which market should Strategic Reserve be sold and why?
Response	It should be sold into the balancing mechanism.

Consultation question [page 178]	
10	Do you have any comments on the functional arrangements proposed for managing a Strategic Reserve?
Response	No

Consultation question [page 179]	
11	Given the design proposed here and your answers to the above questions, do you think a Strategic Reserve is a workable model of Capacity Mechanism for the GB market?
Response	The proposed strategic reserve market is 'workable' but GE has concerns that it will not provide the most efficient market for delivering peaking and flexibility in terms of cost and emissions. The design is also lacking in that it does not particularly suit demand response. We would prefer a capacity market, targeted at solutions with defined criteria (as in Q4), where the capacity price is sufficient to cover additional capital costs of providing this flexibility but whereby generators can also contribute to capital and fixed costs through intra-marginal rents from operating across all the electricity markets.

Market-wide mechanism

Consultation question [page 182]	
12	How and by whom should capacity in a GB market be bought and why?
Response	Energy Suppliers

Consultation question [page 183]	
13	What contract durations would you recommend for a Capacity Market?
Response	The contract should be long-term and for the economic life of the plant. Distinctions may need to be made in regards to capital cost pay-back periods and later years where only fixed costs should be covered.

Consultation question [page 184]	
14	How long should the lead time for capacity procurement be? Should there be special arrangements for plant with long construction times?
Response	The longer the lead time, the more project risks are reduced (including construction risks for new plants being built) and investment incentivised. Longer lead times will therefore provide a greater potential role for new entrants which should reduce the overall costs of providing capacity. On the other hand, the further in advance capacity is sold, the greater the potential margin for error in projections of future peak demand.

Consultation question [page 185]	
15	Should there be a secondary market for capacity? Should there be any restrictions on participants or products traded?
Response	Secondary trading supports a competitive market assuming sufficient market liquidity.

Consultation question [page 186]	
16	What are the advantages and disadvantages of making a central, administrative determination of (i) the capacity that can be offered into the market by each generator; (ii) the criteria for being available; and (iii) the penalties for non-availability? In outline, how would you suggest making these determinations?
Response	A capacity mechanism requires an assessment of the appropriate level of capacity and an incentive to deliver this desired level of capacity. As such a central body (in some cases, but not all, the TSO) can best assess capacity requirements to deal with increasing grid operation uncertainty.

Consultation question [page 191]	
17	How should the reference market for reliability contracts be determined and what would be an appropriate reference market if it is set by the regulator? How could any adverse effects of choosing a particular option be mitigated?

Response	In principle the reference market should be 'within day' and as close to real time as possible. Within day markets will maximise the amount of capacity able to participate and are becoming more critical to support the growing penetration of wind on the system. Power markets are predominantly day-ahead with variability of renewable energy to be managed within a few hours before delivery. Intra-day balancing markets are (in most countries) still not mature and auctions for system services tend to not provide sufficient investment signal. Consequently in future it will be increasingly important to ensure intra-day cross-border trading functions properly, as the variability of wind and solar will need to be managed within a few hours before actual delivery.
-----------------	---

Consultation question [page 192]	
18	For a Reliability Market, how should the strike price be determined? If using an indexed strike price, which index should be used?
Response	The level of capacity payment used needs to be set to ensure plants act competitively in the energy markets. It should also be set sufficiently to cover the additional capital costs of providing this flexibility but allow generators to contribute to capital and fixed costs through intra-marginal rents from operating across all the electricity markets.

Consultation question [page 193]	
19	For a Reliability Market, what level of physical back up (if any) should be required for reliability contracts and how should it be monitored?
Response	-

Consultation question [page 194]	
20	Do you agree that a vertically integrated market potentially raises issues for the effectiveness of a Reliability Market? If so, how should these issues be addressed?
Response	One of the primary goals of EMR to ensure the EMR design promotes liquidity, transparency, and flexibility. Variability introduced by higher levels of renewable energy will increase the need for updated operating rules for flexible resources and modified power market offerings to remunerate operation of flexible resources.

Consultation question [page 195]	
21	What could we do to mitigate interactions between a Capacity Market (especially if a Reliability Market) and Feed-in Tariff with Contract for Difference without diluting the effectiveness of either?

Response	Generation could be prohibited from participating in the Capacity Market. Alternatively contracts for differences (CFDs) could take account of an expected achievable level of capacity market income accorded to each type of generation.
-----------------	--

Consultation question [page 196]

22	How can a Capacity Market be designed to encourage the cost-effective participation of DSR, storage and other non-generation technologies and approaches?
Response	The main objective is to incorporate elements of the payments into a reference price that is visible to all potential participants.

Consultation question [page 199]

23	Do you have any comments on the functional arrangements proposed for managing a Capacity Market?
Response	A tender for targeted resource needs to be administered by a central and independent organisation or agency.

Consultation question [page 199]

24	Do you think that a trigger should be set for the introduction of a Capacity Market? If so, how do you think the trigger should be established, and how should it be activated?
Response	It could be established as soon as other elements EMR-related arrangements go live or when certain capacity margins are reached.

Consultation question [page 199]

25	What is the most appropriate design of Capacity Market for GB and why?
Response	Please refer to Q1. A centrally determined, dominant market price that can be seen by all parties and includes an element in the price related to the value of capacity is required. Generators and suppliers can then freely trade financial instruments around this price. The establishment of such a price would boost market liquidity as well as facilitating the greatest participation of demand and other non-generation resources.

Consultation question

[page 210]

26	What are your views on the costs and benefits of a Capacity Mechanism to industry and consumers?
Response	Fundamentally a capacity mechanism should promote overall 'system efficiency' by replacing a spiky price-stream by a 'smoother' one that in principle provides the same long term average price but makes it easier to invest in low load factor plant.

Consultation question

[page 211]

27	Which Capacity Mechanism should the Government choose for the GB market and why?
Response	Please see Q11. GE would support the development of a capacity market that is targeted at solutions with defined criteria. The capacity price should be sufficient to cover the capital costs of providing additional flexibility but allow generators to contribute to capital and fixed costs through intra-marginal rents from operating across all the electricity markets.

Please select the category below which best describes who you are responding on behalf of.

- ☐ Business representative organisation/trade body
- ☐ Central Government
- ☐ Charity or social enterprise
- ☐ Individual
- ☒ Large business (over 250 staff)
- ☐ Legal representative
- ☐ Local Government
- ☐ Medium business (50 to 250 staff)
- ☐ Small business (10 to 49 staff)
- ☐ Micro business (up to 9 staff)
- ☐ Trade union or staff association
- ☐ Other (please describe):

Thank you for taking the time to let us have your views.

The Government does not intend to acknowledge receipt of individual responses unless you tick this box. ☐