



HUGHVIEW POWER STORAGE

## **Response to the consultation on possible models for a capacity mechanism**

The growing share of intermittent renewable generation in the generation mix is already creating supply and demand mismatches. Increasingly regular constraint payments would suggest that the scale and pace of government's subsidy-driven push for wind has outstripped National Grid's ability to integrate this uncontrollable source of energy at tolerable cost. Diesel and Gas turbines as reserve might keep the lights on but are not an energy efficient or carbon reduction solution.

Overlaying the closure of large fossil fuel plants, and an increase in electrical demand due to the electrification of heat and transport will create an even greater challenge for the network to balance supply and demand efficiently, economically and environmentally. The Electricity Market Reform Whitepaper has set out the government's plans to restructure the electricity market in order to ensure security of supply and meet decarbonisation targets affordably and sustainably.

There are now a substantial number of independent reports, both generated from the UK and overseas which state that electricity storage is part of the solution to future system balancing. Reports such as Energy Research Partnership's statement on the Future of Electricity Storage leave no doubt that this key technology is a vital part of our future electrical infrastructure

While Emission Performance Standard (EPS), carbon price floor, and FIT with CfD are supposed to ensure further investment in the low carbon generation technologies and hence contribute to decarbonisation targets, the two models of capacity mechanism proposed in the white paper, strategic reserve and/or capacity market, are believed to be the right mechanisms to guarantee reliable and secure delivery of power to the end consumers. However we believe that the package proposed in the whitepaper does not sufficiently maintain the coherence between the three fundamental objectives of the EMR, since the targeted capacity mechanism is more inclined towards supporting CCGT/OCGTs for balancing and security of supply purposes; this we believe is not in line with a low carbon economy.

The role of energy storage as an enabling technology rather than merely a generation asset is not recognised in the UK electricity market. Based on where on the network the system is installed and used, energy storage is capable of enhancing the utilisation of all network assets: generation, transmission and distribution. Both centralized and decentralized applications can be fulfilled by storage infrastructure.

- Centrally located (transmission connected) storage facilities are designed to buffer large fluctuations in generation and demand at a system level. Operation and control of a large scale, high energy storage facility is significantly easier than trying to manage large imbalances using scattered demand response from various sources such as EVs and heat pumps. (storage as a transmission level asset)
- Decentralized storage defers the requirement to reinforce the distribution network and also reduces the grid capacity requirement because the demand fluctuations are managed near the origin. (storage at a distribution level)
- More frequent fluctuations in generation supply due to higher penetration of intermittent sources into the grid can be efficiently managed by storage facilities and hence the need to ramp down the conventional power plants or throttle the renewable generation is minimised. (storage to stabilize generation assets)

The classic view of energy storage as a technology for pure price arbitraging has prevented the industry from truly recognizing the system-wide value of storage. This has also put off the government from assessing energy storage as an asset with benefits for a wider range of stakeholders and therefore incentivising its development and deployment.

There are currently proven new energy storage technologies, such as Highview's CES operating at a demonstration level on the national grid hosted by SSE, with different capacity and energy capabilities that can be used for energy balancing (large-scale, long duration reserve as well as frequency regulation) and enhancing network asset utilisation with lower levels of CO2 emissions. The challenge though, as with all nascent technologies, is the need for further system capital cost reduction so they can economically compete with already established high emission but inexpensive fossil fuelled plants. Cost-down, as with wind or solar or carbon-capture or EVs, will be driven by deployment; government, not private sector, subsidy is necessarily required.

While we recognize the role of interconnectors, demand side management, and fast response gas generation in delivering security of supply, we believe that energy storage should also be recognized, supported and incentivised as an important part of the mix of enabling future technologies. Capacity mechanism is seen as the right support mechanism that if strategically designed and implemented can facilitate deployment of storage through ensuring secure revenue streams for the life of the system. On the other hand it should also be recognized that apart from the revenue certainty, storage needs support and incentives for research and development to make its capital cost competitive compared to other technologies and more appealing for investors.

## HIGHVIEW POWER STORAGE – long duration, large scale energy storage

Highview technology, which uses liquid air as the medium, can be scaled up to 100MWs of power output and GWhs of storage, but is not geologically or geographically constrained as with pumped hydro or CAES. It is also far more energy dense than water, so requires far less space than pumped hydro.

Critically, our system is also not theoretical:-

- (i) We have a pilot plant connected to the grid and operational at Slough Trading Estate (in fact housed by Scottish & Southern Energy and part funded by DECC);
- (ii) The components for large scale plants are from mature supply chains so do not need big technical advances or investment in manufacturing/factories.

Additionally, the system can be integrated with the existing industrial gasses industry and nationwide infrastructure thereby providing an economic and fast-track solution to large scale (GWhs) of capacity or strategic reserve within the right market and regulatory environment.

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

Please return by 4 October 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: <a href="mailto:DECC.capacity.mechanism@decc.gsi.gov.uk">DECC.capacity.mechanism@decc.gsi.gov.uk</a>

## 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](http://www.decc.gov.uk/en/content/cms/consultations/cap_mech/cap_mech.aspx)

### Targeted mechanism

Consultation question [page 167]	
1	<b>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?</b>
Response	<ul style="list-style-type: none"> <li>- While the major concerns indicated here seem to be the potential distortion in the wholesale market, dispatch price calculation and the possibility of regulator's interference, it is not clear whether there is any appreciation of low carbon technologies against the classic high emission inexpensive gas / diesel plants in providing strategic reserve. Environmental issues are not addressed.</li> <li>- Since it is assumed that the strategic reserve would not be available to the electricity market, and perhaps prevented from providing other services such as ancillary services, it is important to clearly design the payment mechanism (fixed or variable) so the service provider's fixed and variable costs are fully compensated.</li> <li>- If there is no technology discrimination in the assessment process, and the providers are picked solely on the basis of competitive costs and pricing, it becomes almost impossible for new technologies (new storage technologies in this case) to compete with gas plants.</li> </ul>

Consultation question [page 168]	
2	<b>How long should the lead time for Strategic Reserve capacity procurement be and why?</b>
Response	Based on the forecasts of long-term demand and the generation capacity on the system, the forecast accuracy, and considering different lead times to build new plants, the system/market operator can design different types of contracts. For example there could be multiple procurement rounds starting from a few years ahead of the delivery year up to a few months ahead of the delivery year.

Consultation question [page 168]	
3	<b>Should the length and nature of contracts procured by the Strategic Reserve procurement function be constrained in any way?</b>
Response	Different contract lengths can be designed to reflect the difference between the already established inexpensive technologies and the new technologies that need support and certainty over future revenue streams. The contracts can also vary

	according to the capacity and energy each unit can provide and the CO2 emission levels of the unit.
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Consultation question <span style="float: right;">[page 169]</span>	
<b>4</b>	<b>Which criteria should providers of Strategic Reserve be required to meet?</b>
<b>Response</b>	The capacity and the amount of energy each technology is capable of offering to the market could be the basis for classifying them as short-term (low energy) or long-term (high energy) service providers. This enables the DSR, interconnection and storage to be regarded as short term reserve providers whereas longer term requirements can be fulfilled by gas peaking plants.

Consultation question <span style="float: right;">[page 169]</span>	
<b>5</b>	<b>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?</b>
<b>Response</b>	<p>The technical capabilities (power capacity and energy) of each technology already available in the market should be considered in designing the contracts and so in the tender process. DSR could be used for shorter term energy requirements whereas different storage technologies based on their power rating and response duration capabilities could be classified in different groups and hence priced differently.</p> <p>If the strategic reserve providers are supposed to be kept away from the energy market and only utilised at times when energy market or ancillary services are short of providing enough capacity to meet demand, then designing a suitable pricing methodology that can compensate all participating technologies (low cost but high carbon emission, or high cost and low carbon) becomes extremely important.</p>

Consultation question <span style="float: right;">[page 175]</span>	
<b>6</b>	<b>Government prefers the form of economic despatch described here. Which of the proposed despatch models do you prefer and why?</b>
<b>Response</b>	Economic despatch may seem to provide more economic value to customers but last resort despatch is more compatible with the definition of strategic reserve, which is the resource ready to dispatch when the market is not capable of responding to the demand. The energy market dynamics would therefore be not violated by a last resort dispatch approach.

Consultation question [page 175]	
7	<b>How would the Strategic Reserve methodology and despatch price best be kept independent from short-term pressures?</b>
Response	Strategic Reserve is procured to fulfil the demand requirements when there is no other resource available. Therefore it should inherently follow a last resort dispatch; this could safeguard it from short-term political/regulatory pressure.

Consultation question [page 175]	
8	<b>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?</b>
Response	Strategic Reserve should be reviewed periodically by an independent body and feedback should be sought from the market participants. The review process however should not aim for periodically changing/modifying the fundamentals of the strategic reserve (such as nature of the existing contracts) on which the investments are based. Ofgem for example could be a good candidate for carrying out the periodical reviews.

Consultation question [page 176]	
9	<b>Into which market should Strategic Reserve be sold and why?</b>
Response	The existing reserve mechanism operated and managed by National Grid could be a good potential market for the strategic reserve procurement. It is important though that the tenders are open to all providers and some level of support is designed to incentivise investment in new technologies for the procurement of this service.

Consultation question [page 178]	
10	<b>Do you have any comments on the functional arrangements proposed for managing a Strategic Reserve?</b>
Response	Strategic reserve should be managed by an independent body preferably National Grid which already contracts and manages similar resources for ancillary services. Technical and operational differences between technologies, fixed and operational costs, and perhaps their location (close to the origin of demand or proximity to constrained areas) should also be considered in designing the contracts and pricing and payment methodology.

Consultation question		[page 179]
11	<b>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?</b>	
Response	<p>From the system operation point of view, Strategic Reserve could potentially be a better option than capacity market, because it is easier to implement, managed and controlled, and fundamental changes to the market structure are not required. However if principally the providers of this service are not permitted to provide other services or participate in the energy market then the design of the payment structure becomes very crucial so that all technologies are included and can compete on a fair basis.</p> <p>We believe that a capacity market has more potential to attract investment in additional capacity and could facilitate participation of new technologies in the market.</p>	

### *Market-wide mechanism*

Consultation question		[page 182]
12	<b>How and by whom should capacity in a GB market be bought and why?</b>	
Response	<p>Capacity market can be a pool market operated by a central buyer. Unlike strategic reserve, capacity market requires the creation of a new market which may result in additional complexities. A pool market with a central buyer offers a smoother implementation and is more open to accept and accommodate capacity offered by new technologies.</p>	

Consultation question		[page 183]
13	<b>What contract durations would you recommend for a Capacity Market?</b>	
Response	<p>Contracts can have different durations. Longer term contracts should be designed to ensure investment in new technologies and facilitate the new systems capital cost reduction.</p>	

Consultation question		[page 184]
14	<b>How long should the lead time for capacity procurement be? Should there be special arrangements for plant with long construction times?</b>	
Response	<p>The capacity can be procured through different rounds of auctions in an exchange. There could be auctions to procure capacity years ahead of the delivery year, so to allow for long construction times, and there could also be capacity auctions nearer to the delivery time, when demand projections are more accurate; the existing plants would be the best options for these later auctions rounds.</p>	



Consultation question [page 185]	
15	Should there be a secondary market for capacity? Should there be any restrictions on participants or products traded?
Response	N/A

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 central buyer can effectively, based on the supply and demand forecasts, available capacity, energy and price offered by different technologies, locational constraints and environmental impacts of each generation unit, determine the capacity providers and market price for capacity. In this process it is extremely important that new low carbon technologies are not left out of the stack merely due to their higher capital cost.

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	We believe that reliability contracts are more in favour of the existing technologies and add more complexity to the current complicated market. Hence we do not support the proposal for reliability contracts.

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	See the question 17.

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?

<b>Response</b>	See question 17.
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<b>Consultation question</b>		<b>[page 194]</b>
<b>20</b>	<b>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?</b>	
<b>Response</b>	N/A	

<b>Consultation question</b>		<b>[page 195]</b>
<b>21</b>	<b>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?</b>	
<b>Response</b>	The technologies which are paid Feed-In Tariff should not participate in the capacity market.	

<b>Consultation question</b>		<b>[page 196]</b>
<b>22</b>	<b>How can a Capacity Market be designed to encourage the cost-effective participation of DSR, storage and other non-generation technologies and approaches?</b>	
<b>Response</b>	A capacity market with a central buyer and administrator can pave the way for the new technologies into the market. The specific characteristic of the technologies should be recognized and determined in the tender process. In the case of storage, the ability to generate as well as absorb wrong time renewable generation should be recognized and valued.	

<b>Consultation question</b>		<b>[page 199]</b>
<b>23</b>	<b>Do you have any comments on the functional arrangements proposed for managing a Capacity Market?</b>	
<b>Response</b>	N/A	

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	N/A

Consultation question [page 199]	
25	What is the most appropriate design of Capacity Market for GB and why?
Response	<p>We believe that between the two mechanisms proposed, capacity market could be a better option to procure capacity on a fair basis and different types of technologies based on their characteristics can participate. A central buyer can facilitate new storage technologies entrance into the market and appraise the low carbon nature of these technologies against the mature alternatives such as Diesel and CCGTs.</p> <p>A simple market design and administration regulated by an independent body with simple and transparent tender rules would bring more certainty for investors and help new technologies and developers to reduce capital costs.</p>

### *Capacity mechanism Assessment*

Consultation question [page 210]	
26	What are your views on the costs and benefits of a Capacity Mechanism to industry and consumers?
Response	N/A

Consultation question [page 211]	
27	Which Capacity Mechanism should the Government choose for the GB market and why?
Response	We prefer a capacity market with a central buyer.

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. ☐