LCN Fund Full Submission

Supplementary Answer Form

Tick if this answer is Confidential: ☐

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Project code:	Smarter Network Storage	Question Number	UKPN024
Question date	6 September 2012	Answer date	10 September 2012
Submission section question relates to			
Topic	Commercial		
Question	Please explain the background to the calculations of income from STOR and Frequency Response in sections 1.1.4 and 1.1.5 of Appendix G, including the frequency and duration of utilisation of the batteries that is assumed, the volume of each service that is delivered, the duration over which the analysis of incomes is assessed and the assumed prices paid for the services. Please also explain to what extent it is considered likely that the project will be competitive alongside existing providers of the services.		
Notes on question			
Answer	For the purposes of the business case we conservatively accounted only for the potential revenues from participation in two current ancillary services of STOR and Frequency Response. The background to these calculations is described below. The period of analysis was 10 years, with a discount rate of 7.2%. STOR and Frequency Response are services procured by the GB TSO from market participants. Contract terms are available and are published by National Grid. At the outset, it should be noted that these ancillary services are under a constant state of review by National Grid, in order to ensure value for money, and to meet their changing requirements for balancing services. Accordingly, a detailed analysis of expected income from these services carries a significant degree of uncertainty and our expectation of income has been formulated with this in mind. It should be noted that as the purpose of the LCNF is to test innovations which may or may not be viable now, but are expected to become required in the future and to demonstrate economic feasibility later, attempting to balance costs and income now is not necessarily appropriate. The objective		

of the commercial operation of the battery in this project is to understand different approaches, and to trial alternative commercial strategies and business models.

Project participants have direct experience of negotiating bilateral contract terms for ancillary services as well as a detailed understanding of the tendering arrangements for services such as STOR. In addition, our early discussions with National Grid's designated account manager, indicate that our expectations are reasonable.

Estimating benefits from STOR

The starting point for consideration of income from STOR is to examine the historic and current prices that have been tendered for this service. Tenderers are able to offer a combination of availability payment and utilisation payment which they believe suits their own technical requirements and in addition will be attractive to National Grid. National Grid will choose a selection of tenderers in order to have a range of providers, covering a range of power outputs, location, speed of response and certainty of provision. There is therefore no unique combination of availability and utilisation payment that determines acceptability in the market place, although under bidding other providers to ensure tender acceptance would be potentially a financial loss. The tender process is now very competitive, due to the presence of high carbon providers of reserve who have saturated the market. However, the technical characteristics of the battery are considered to be superior to those of a typical diesel genset, and so a higher availability fee, coupled with a lower utilisation payment would seem to be appropriate. Tender periods for STOR vary from year to year, depending on National Grid's forecasts, and the exact utilisation will depend on actual conditions on the day. (Indeed a fast acting provider will reduce the need for additional plant to be dispatched, and this will be a key benefit of the project).

For the purposes of the business case, with regards to STOR, we have used a very conservative estimate and assumed that the batteries are paid availability payments for a range between 1000 and 1600 hours in a year at £9/MW/hr (the average for last complete year was £9.08). In addition, we have assumed that the batteries are utilised between 10 to 20 hours a year at £220/MWh (which is a lower than average payment of £251.70 / MWh for this service). This therefore reflects the requirements on large scale OCGTs and CCGTs in a future world of high wind intermittency.

Over the 10 year period, discounted at 7.2% this equates to approximately £520k from STOR.

STOR is not a service that requires a 24 hour contract liability, and therefore the battery would be expected to participate in other markets during its non-contracted period. While it would be ideal for the plant to be guaranteed a full dispatch during every day, the nature of STOR does not make this a certainty, and experience will need to be gained as to how the plant may be used during non STOR hours – for example, to capitalise on possible negative prices.

Frequency Response

Assessing income from frequency response services is also complex, depending in this instance on a bilateral discussion with National Grid in order to form a contract. The battery can operate in both the dynamic and static modes, and both of these are of interest to the TSO and to ourselves. In both instances, volume will depend critically on the circumstances of the day. For the static service, the TSO may prefer a wide tolerance on the frequency set points, meaning that the battery would be dispatched less, but as the service is provided on an availability basis, this will not have a significant effect on income. Income will be made up from availability payments, which can be related to published information from National Grid. There are separate value streams for both positive and negative response, and this combination is therefore attractive to National Grid. An additional value stream can be attributed to the positioning payment which is made to other providers, but is not directly required in this case.

For the purposes of the business case, we undertook a simple estimate of the potential income from Frequency Response based on the assumption that the availability payments are provided for approximately 2660 hours and that the type of response provided is commercial Frequency Response. The initial availability payment is £21.5/MWh. We have also assumed that the batteries will be used over the same number of hours and attract an assumed energy payment of £1.26/MWh.

Over the 10 year period, discounted at 7.2% this equates to approximately £3.3m.

The exact durations for the provision of these services during the test period is not known with certainty, as it will depend on the exact dates for tender rounds and contract commitments. For example, it would be appropriate to tender for more than one STOR tender round, as well as ensuring that the plant is available for providing frequency services during periods of high system stress, such as high wind generation, low thermal generation and low demand.

Our estimates may be considered low, as additional value can be gained from a fast acting service, that can be held in dispatch for longer periods: that is a service which bridges the gap across frequency response into STOR. Discussion with National Grid indicates the attractiveness of such a service, which would be novel in the GB market.

Growth in Service Value

For both the STOR and FR services, within the above calculations we assumed an increase in market prices of 30% over the 10 year period from the above, based on an assessment of historic market price and future trends in requirements.

There are a number of factors that are likely to drive increasing requirements and value for these types of services in the future including:

- The Large Combustion Plant Directive (LCPD) and the Industrial Emissions Directive (IED) are two pieces of legislation which have led and will further lead to closures of old OCGTs, CCGTs and coal plant, thus reducing the level of conventional capacity available for reserve purposes;

	• Increased unpredictability and variability to the system from increased levels of renewable generation, increasing frequency response and reserve requirements; • From a total GB coal generation fleet of roughly 31000MW, approximately 12000MW has opted-in under the ELV route, 8000MW is operating within a NERP. 11000MW has opted-out and will close by the end of 2015, the vast majority of which operate in the STOR market increasing the need for reserve. With the loss of large scale power plants in the future and the increase in renewable investment, we believe that the requirement for Frequency Response and reserve will increase significantly in the future. With a decrease in the number of flexible generating plants that are able to provide this service, we therefore believe that this future price track is credible. **Competitiveness alongside existing providers** The existing providers of these services include: **Frequency response**: conventional thermal (CCGT, coal and oil plant), hydro and pumped hydro. Static frequency is provided by some demand side participants. **STOR:** reciprocating diesel gensets, open cycle gas turbines and some demand customers and aggregators. It is expected that the battery system would be competitive against these providers, as the raw energy cost for the battery system is taken as off peak electricity, rather than primary fuel. Conventional generation plant offers frequency services on a cost plus basis, only seeking scarcity rent when the system is stressed. Many STOR providers are established themselves specifically to offer the service, and have no other effective contractual income stream. Loss of their STOR contracts either means withdrawal from the market, or participation as a peak provider in the energy market or balancing mechanism. In a market environment, it is not certain how other participants will respond to new entrants, and price reductions may occur. This of course, would have a direct impact on total system operating costs, which would in any case feedback to all customers through the socialisation of the costs of balancing services. However it should be stressed that the battery system is not dependent on securing a particular contract: it can freely move in the open market between ancillary services, energy market trading and constraint management. While maximising income may be seen as a commercial priority, finding the optimum running strategy for the longer term is a key commercial learning point for this project. The technical characteristics of the battery are also considered to be superior to those of a typical diesel genset or gas turbine, and so a higher availability fee, coupled with a lower utilisation payment would seem to be appropriate. Indeed a fast acting provider will reduce the need for additional plant to be dispatched, and this will be a key benefit of the project. Other competitive advantages offered by advanced energy storage technologies include ease of siting and location, fast speed of construction and commissioning, low operation and maintenance costs and high

	availability and reliability.
Attachments	
Verbal Clarifications (Consultants)	