

LCN Fund Full Submission
Supplementary Answer Form

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Project code:	Smarter Network Storage	Question Number	UKPN012
Question date	04 September 2012	Answer date	07 September 2012
Submission section question relates to	Section 2		
Topic	Project Description		
Question	Please explain, quantitatively, how the energy and power ratings of the store have been optimised to address the future network constraint.		
Notes on question			
Answer	<p>This answer involves a description of how infrastructure planners prioritise network investment. Their basic tool is the load forecast known as the Planning Load Estimate (PLE) that takes account of historical observed peak demands, load growth/decay trends, planning proposals from the planning authority for that substation. Demand growth assumes a normal running arrangement and considers weather conditions to determine a normalised maximum demand (MD).</p> <p>Planners also take into account the amount of transfer capacity and the likelihood of an n-1 event being coincident with the winter evening peak.</p> <p>In our answer to question UKPN007 the daily load curve at Leighton Buzzard shows two extremely cold nights in 2010. On these occasions, the peak shortfall was 3.8MVA, with 10MVAh of energy at risk for the loss of one of the 33kV feeder circuits. This provides the theoretical minimum level of power and energy required without any margin for future growth if transfer capacity is excluded.</p> <p>Power Capacity</p> <p>The Maximum Demand for the two most recent years reduced, but is expected to grow by an average of 2% over the next ten years. The magnitude and timing of growth is very much dependent on the economic</p>		

recovery, new connections and penetrations of low carbon technologies that are installed.

The energy storage device comprises three modular 2 MW / 5 MWh units, combinations of which represent economically optimal configurations. Each unit's power requirement is limited by the power conversion system rated at 2 MW. As Leighton Buzzard's additional demand power requirement of 3.8 MVA is already close to the capability of 2 units and given the uncertainty in the growth of demand due to low carbon technologies, three units (equating to 6MW) have been proposed as optimally addressing future network support requirements. Space has also been provided for further expansion to prevent stranded assets and provide additional options to Base Case reinforcement in future RIIO periods.

Energy Duration

The Smarter Network Storage project is the first time that an energy storage device has been trialled in GB to optimise multiple services including network support. Energy consumption is not normally considered, as power capacity is what drives traditional investment prioritisation. Clearly, energy storage does have the limitation that if the battery has been completely discharged it cannot provide further support until it has been recharged.

The shape of the load curve has a large impact on the future usefulness of the storage device. As the afternoon demand begins to exceed the site's firm rating, the energy requirement and time duration becomes the dominant consideration over the 6 MW power capacity.

The nature of change in demand profiles due to low carbon technologies creates some uncertainty as to the point at which energy requirements are exceeded. However, comparing demand growth trends, and assuming the shape of demand curve at Leighton Buzzard remains the same, as the overall magnitude increases and should an n-1 event should occur, a storage capacity of 15 MWh is expected to provide optimum energy capacity through to approximately 2020/21.

Operationally a control engineer will make a judgement that for the loss of one circuit whether to utilise the traditional 11 kV transfer capacity or rely on the energy storage device to support the demand during that evening peak. Using the transfer capacity will increase the time that the energy storage device is able to support the demand and defer reinforcement.

It should be noted that a key benefit of storage is the ability to optimally size (and expand) power or capacity in this way to meet the required duty, and unlike some conventional assets can be relocated if it ceases to be required. The proposed approach therefore represents the optimum available means of achieving the required capacity increase at Leighton Buzzard.

Attachments

Verbal Clarifications (Consultants)	
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