

Role of batteries and fuel cells in achieving Net Zero

Written Evidence

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energy sector, including for the carbon price ⁶. In April 2013, the UK --

- 6 Anuta, O. H., Taylor, P., Jones, D., McEntee, T. & Wade, N. An international review of the implications of regulatory and electricity market structures on the emergence of grid scale electricity storage. *Renewable and Sustainable Energy Reviews* **38**, 489-508, (2014).
- 7 N2EX day ahead auction prices. (NORDPOOL, [Online]. Available: <https://www.nordpoolgroup.com/Market-data1/GB/Auction-prices/UK/Hourly/?view=table>).
- 8 Battery promoting policies in selected member states. (N° ENER C2/2015-410, European Commission. June 2018 [Online]. Available: https://ec.europa.eu/energy/sites/ener/files/policy_analysis_-_battery_promoting_policies_in_selected_member_states.pdf).

9 Green Deal: energy saving for your home. (Gov.UK. [Online]. Available: <https://www.gov.uk/green-deal-energy-saving-measures>).

10 Li, X., Chalvatzis, K. & Stephanides, P. Innovative Energy Islands: Life-cycle cost-benefit analy(b)-10.7 (://w)o nu ant (ef)9 (4 (n)-10.6

AS is an European power exchange and is responsible for delivering power trading across Europe⁴. The wholesale price increases with electricity demand.

9.4. National Grid (grid services):

- *Firm Frequency Response (FFR)*: FFR complements other categories of frequency response (e.g., primary response) and provides firm availability. FFR can be from generators, energy storage, and aggregated demand response¹⁴.
- *Short Term Operating Reserve (STOR)*: The provider gives a contracted level of power when called by National Grid to achieve energy reserve requirement¹⁵. STOR provider must provide a minimum of 3 MW of steady demand reduction or generation for two hours minimum.
- *Fast Reserve (FR)*: FR provides rapid active power by reducing the demand or increasing the generation, as requested by the National Grid Electricity System Operator¹³, to participate in controlling frequency variations. FR provider needs to give power consistently for a minimum of 15 minutes.

9.5. Distribution network operators: Super Red Credits (SRCs): Distribution network operators provide SRC payments to non-intermittent generators for providing energy during peak demand times (i.e., super red periods). These generators allow the distribution network to defer the reinforcement or grid upgrade. To receive these credits, generators must be connected to the extra high voltage grid. *Participation in SRC payments is possible for renewable sources with batteries and enhanced as the need for providing dispatchable power*¹⁴.

9.6. Electricity Market Reform: Capacity Market (CM) aims to create enough reliable capacity (both supply and demand-side) for secure electricity supplies, in particular during

14 Firm frequency response (FFR). (National Grid ESO. [Online]. Available: <https://www.nationalgrideso.com/balancing-services/frequency-response-services>).

15 Short term operating reserve (STOR). (nationalgridESO, [Online]. Available: <https://www.nationalgrideso.com/balancing-services/reserve-services/short-term-operating-reserve-stor>).

16 Fast reserve. (nationalgridESO, [Online]. Available: <https://www.nationalgrideso.com/balancing-services/reserve-services/fast-reserve>).

17 Distribution connection and use of system agreement (DCUSA) DCP108- Availability of the non-intermittent generator tariff. (Office of Gas and Electricity Markets, April 2012. [Online]. Available: <https://www.ofgem.gov.uk/ofgem-publications/62523/dcp108d-pdf>).

critical periods for the system (e.g., poor weather conditions)¹⁸. CM allows the market to determine a price for competitive capacity. Capci8

- 18 G17 - Capacity provider payments EMRS guidance. (EMR Settlement Limited, Electricity Settlements Company, March 2018. [Online]. Available: <https://www.emrsettlement.co.uk/documentstore/guidance/g17-capacity-provider-payments.pdf>).
- 19 Lai, C. S., Locatelli, G., Pimm, A., Wu, X. & Lai, L. L. A review on long-term electrical power system modeling with energy storage. *Journal of Cleaner Production* **280**, 124298, (2021).