

Long duration electricity storage in GB

March 2024

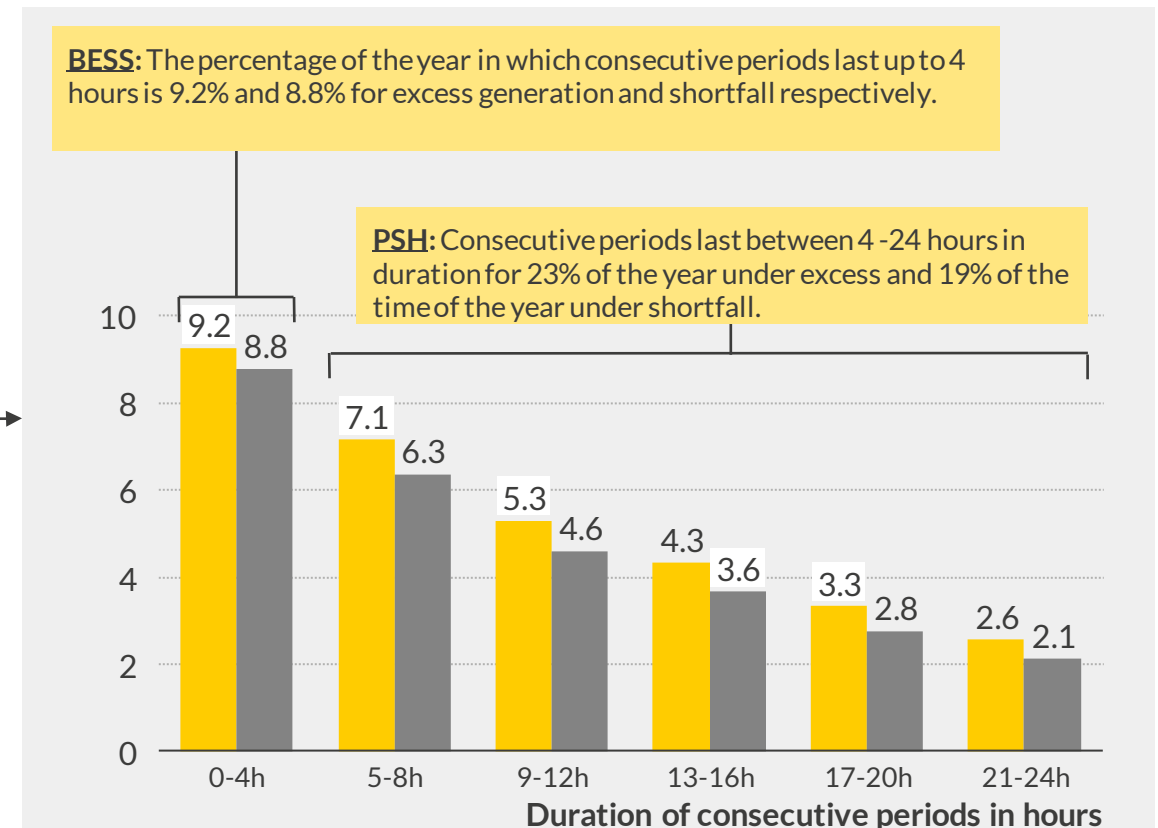
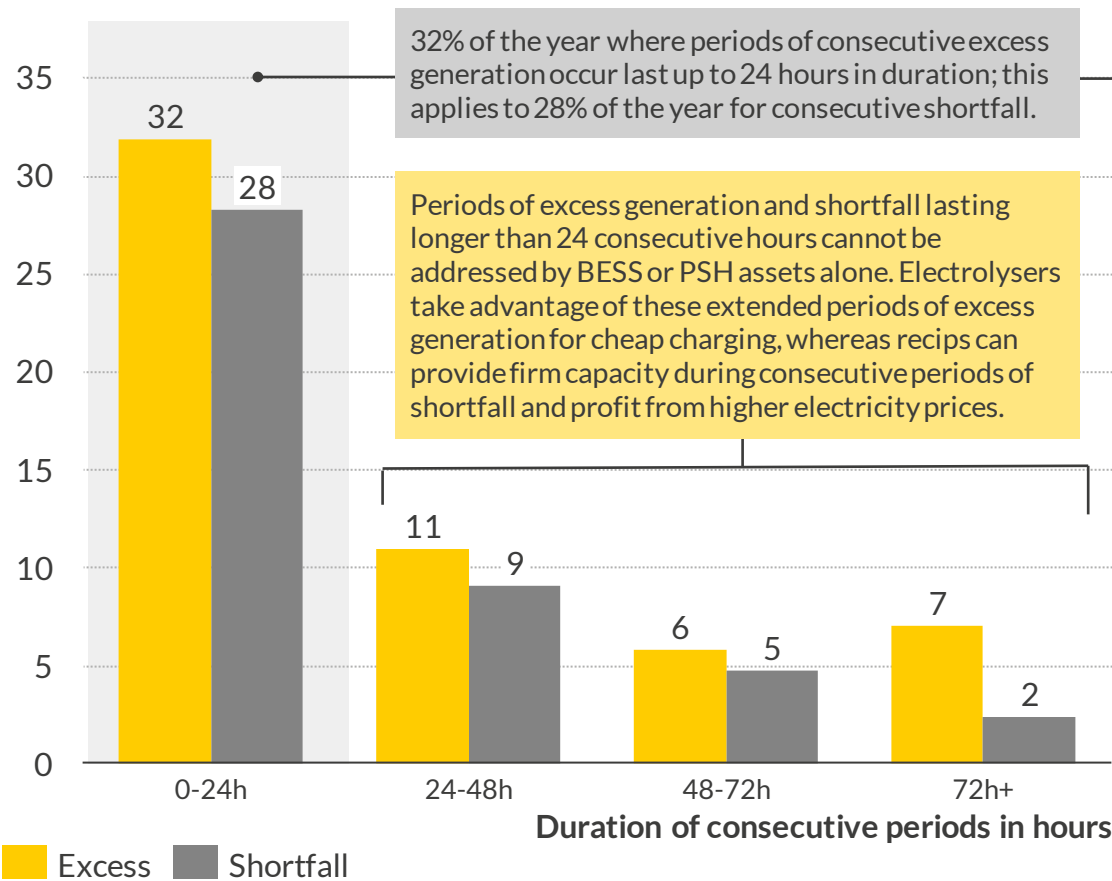


Storage assets can address supply and demand imbalances ranging from hourly to weekly timescales

To illustrate the need for different durations of storage, the proportion of time in periods of consecutive excess generation or shortfall are plotted by duration for the Aurora Central scenario in 2035. Though excess generation occurs for more of the year, the longest period of consecutive shortfall lasts over 10 days.

Percentage of consecutive half hourly periods per year with excess generation¹ or shortfall (Aurora Central, 2035)

% of half hourly periods per year



1) Excess inflexible generation is defined as renewable generation (uncurtailed wind, solar, biomass, run-of-river, hydro, tidal) plus inflexible generation (nuclear) minus base and inflexible demand (i.e. excluding smart electric vehicles, electrolysers, and flexible heat pumps). The analysis excludes batteries, pumped hydro and interconnector flows.

A suite of options to provide direct support to LDES are available to policymakers

	Policy option	Description	Assessment criteria			
			Accelerate LDES deployment	Incentivise effective dispatch of LDES ⁵	Prevent market distortions	Provide investor confidence
Deep-dive	Merchant (no support or reform)	<ul style="list-style-type: none"> Relies on existing market arrangements and would rely on investors gaining confidence over different elements of a forecasted merchant revenue stack. 	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>
	Reformed CM ¹	<ul style="list-style-type: none"> Entails a reform of the existing capacity market to directly incentivise low-carbon generators and plants able to contribute towards system security. 	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>
	CfD ² for storage	<ul style="list-style-type: none"> This model has been successful in providing long-term revenue stability for renewable generators, where a generator is guaranteed a pre-agreed price level (the Strike price) in £/MWh for the duration of the contract. Wholesale revenues for generation above the strike price are returned by the generator. 	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	DPA ³	<ul style="list-style-type: none"> Similar to the CfD, with the key difference being that payment terms comprise of a capacity based availability payment and an variable payment designed to incentivise dispatch. This is being proposed to support power CCUS. 	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>
	RAB ⁴	<ul style="list-style-type: none"> Companies receive a licence from an economic regulator to charge a regulated price to consumers in exchange for providing the proposed infrastructure with customers face risks of overruns. This is proposed for future nuclear projects 	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>
	Cap & Floor	<ul style="list-style-type: none"> This model provides a guarantee underwritten by energy consumers of a revenue floor so that investors would be guaranteed a minimum revenue for an efficient project construction cost and cost of debt. Equity investors would have all their profits at risk which would also be capped at a reasonable rate of return. This model was able to attract investment for the development of interconnectors⁶ 	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

More applicable Less applicable

Individual policies may be insufficient to incentivise LDES capacity and effective dispatch in isolation. Policy support could be combined with other market reforms to incentivise dispatch behaviour to maximise the benefit to the system

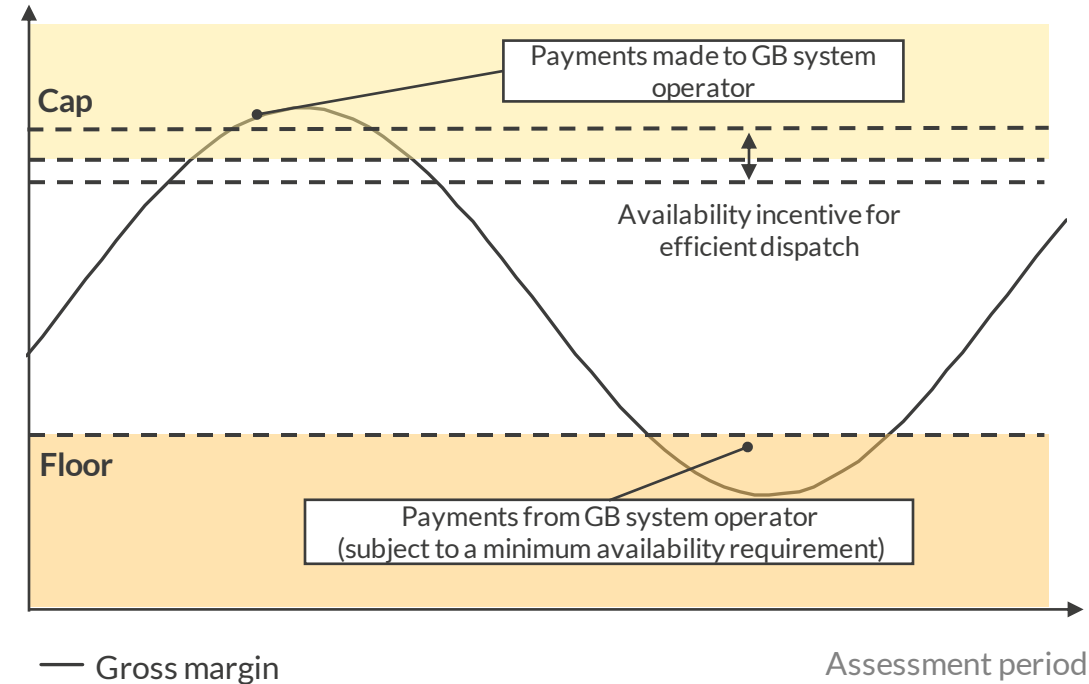
1) Capacity Market; 2) Contracts for Difference; 3) Dispatchable Power Agreement; 4) Regulated Asset Base. 5) With respect to the system. 6) Note that LDES can provide a range of grid services, like interconnectors, but without the firm OPEX costs.

A Cap & Floor mechanism is best positioned to support the deployment of LDES, however additional signals may be needed

The Cap and Floor mechanism is currently the best positioned to support investment in LDES, however there are several limitations and potential modifications that should be considered.

Cap and Floor mechanism

Gross Margin £/kW/yr



1 Cap and Floor policy limitations

- Does not fully incentivise optimal dispatch to benefit the grid
- May not support equity investment into LDES projects

2 Potential considerations and modifications

- **Forecasted returns from energy and system actions** – LDES provides services that are not currently contracted in separated markets; a cap & floor scheme should consider recognising value from all services contributing to grid operation (such as inertia, SCL, constraint relief)
- **Length of contracts and timing of revenues assessment** – contract length should be considered to reflect LDES lifespans and could be combined with revenue assessments to ensure fairness for developers and consumers
- **Contract awarding** – contracts will likely need to be decided on a case by case basis initially but a move towards a competitive auction should be considered
- **Cap and floor prices** – Policymakers should consider whether the cap & floor is set: a) to be technology agnostic, such as only based on market signals and revenues (assuming reforms can provide these), or; b) set for individual assets based more granularly on their locational benefit and grid services provided
- **Hard floor and flexible cap** – projects should have to maintain a minimum level of performance to receive the floor price. A flexible cap would incentivise further output when needed by the grid if the cap is reached, this should be set to ensure services continue to be provided
- **Support to debt & equity** – price floors will need to be high enough to reduce merchant risk, to secure debt and operational costs. Better market signals may be needed to avoid revenues staying at the floor, to attract equity investors
- **Other reforms** – A cap & floor mechanism could be implemented in conjunction with further market reforms to improve market signals

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