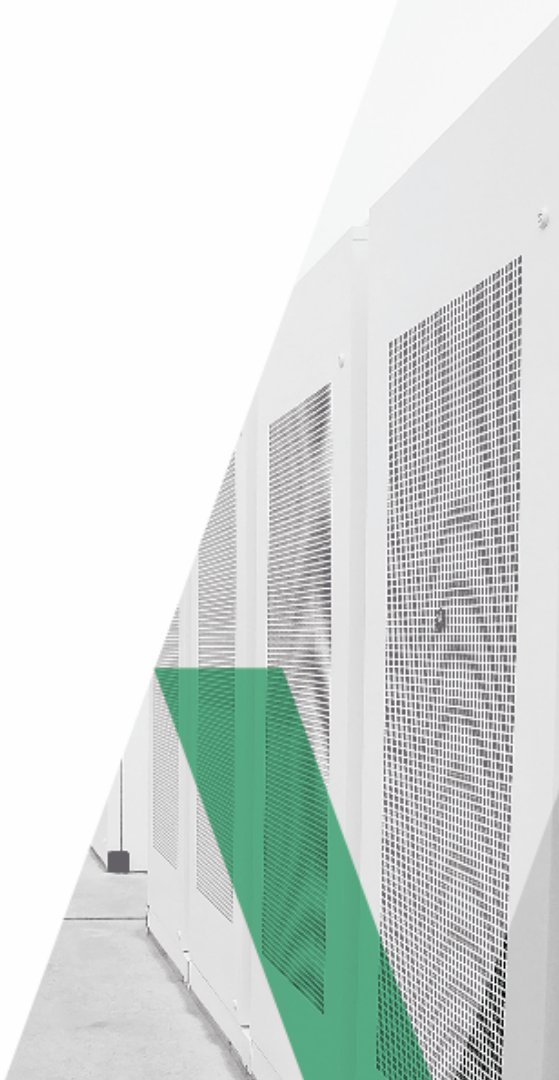
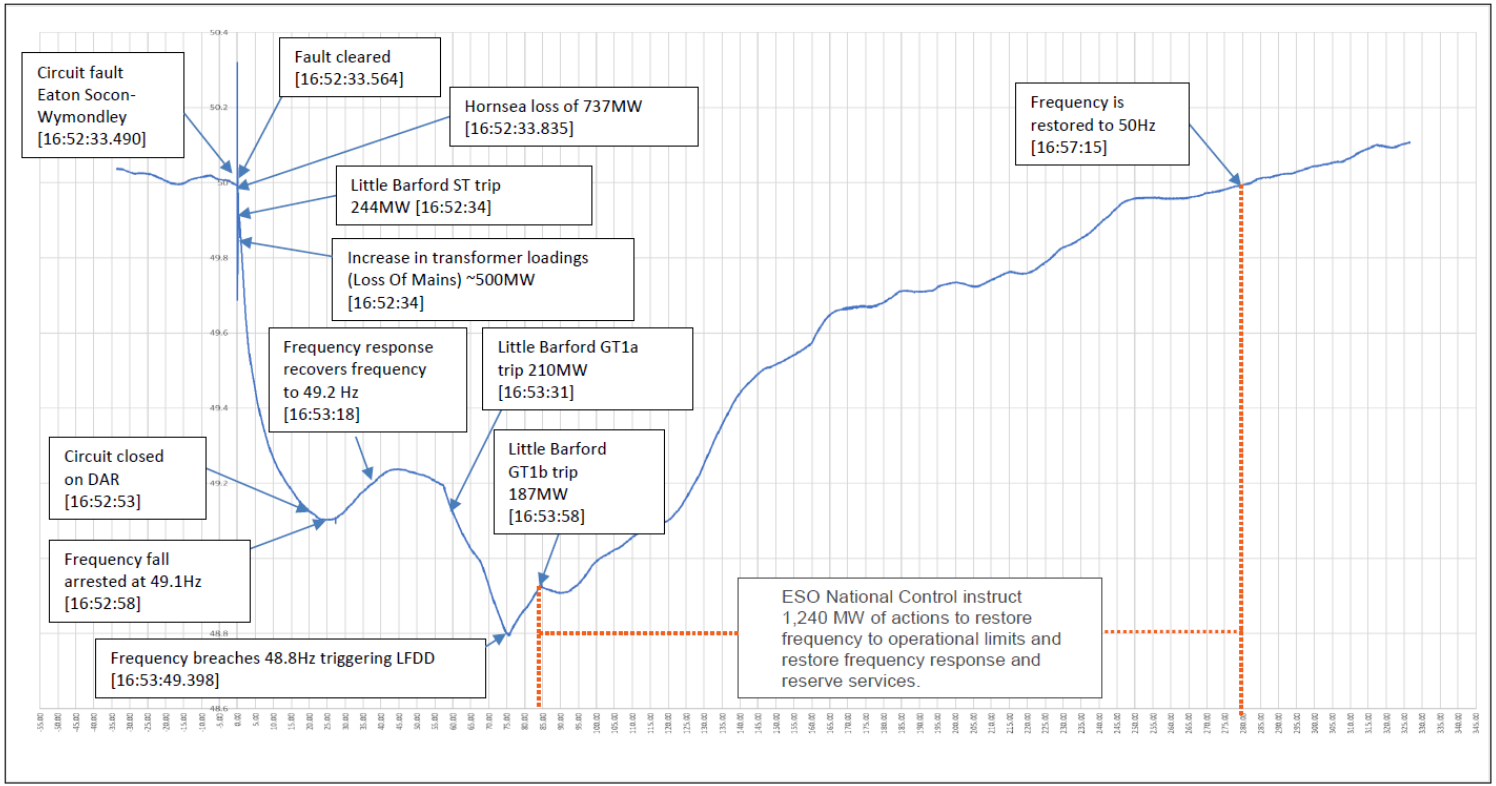
The role of batteries on August 9th

Simon Williamson



August 9th sequence of events



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Frequency response delivered

Frequency Response type			Number of units	Low frequency holding (MW)	Low frequency delivered (MW)
Dynamic	Primary (Secondary)	BM	8	284 (325)	266
	Primary (Secondary)	NBM	36	280 (270)	231
	Enhanced Frequency Response	NBM	10	227	165
Static	Triggered at 49.7 Hz, delivered within 30 seconds (Secondary)	BM		0	-
		NBM	19	(285)	198
	Triggered at 49.6 Hz, delivered within 1 second	BM	2	200	200
		NBM	7	31	30
Demand effect*			350		
Total	(excl. demand effect)			1022 (1338)	1090

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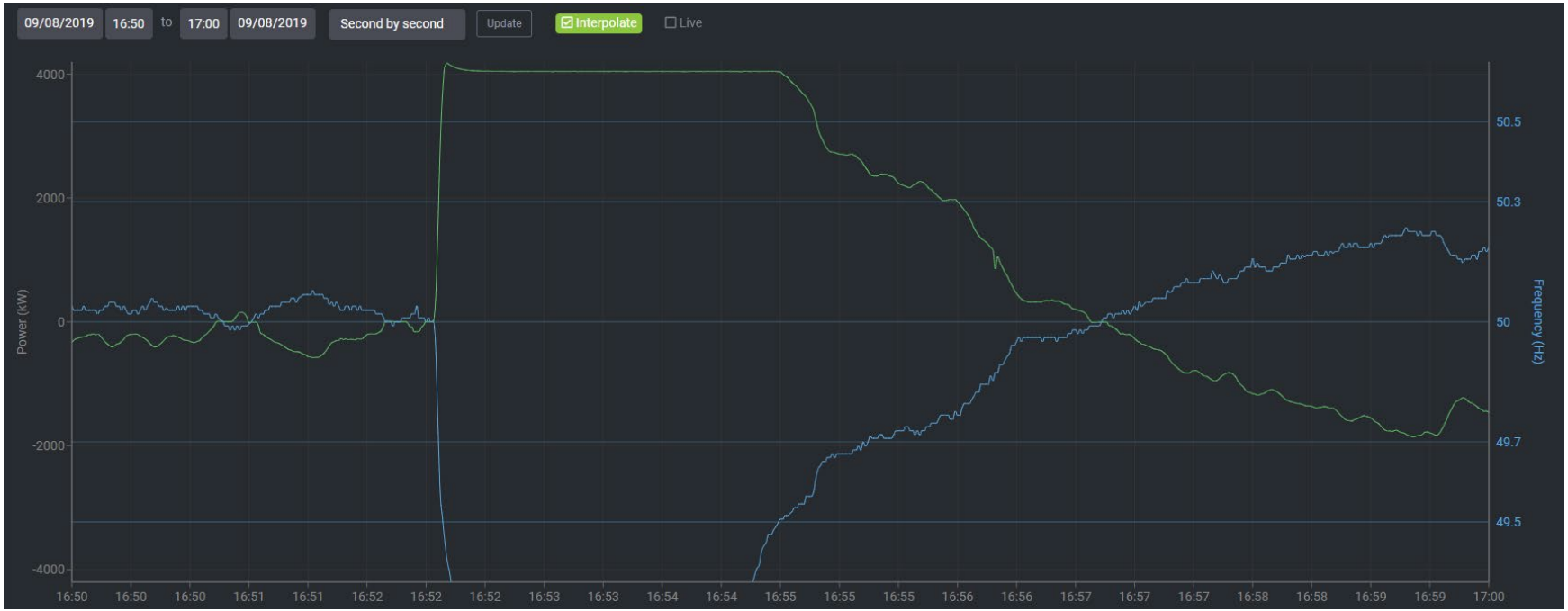
475MW of sub-second response came from battery energy storage

- Cenin 4MW/4.8MWh system co -located with PV, wind and AD



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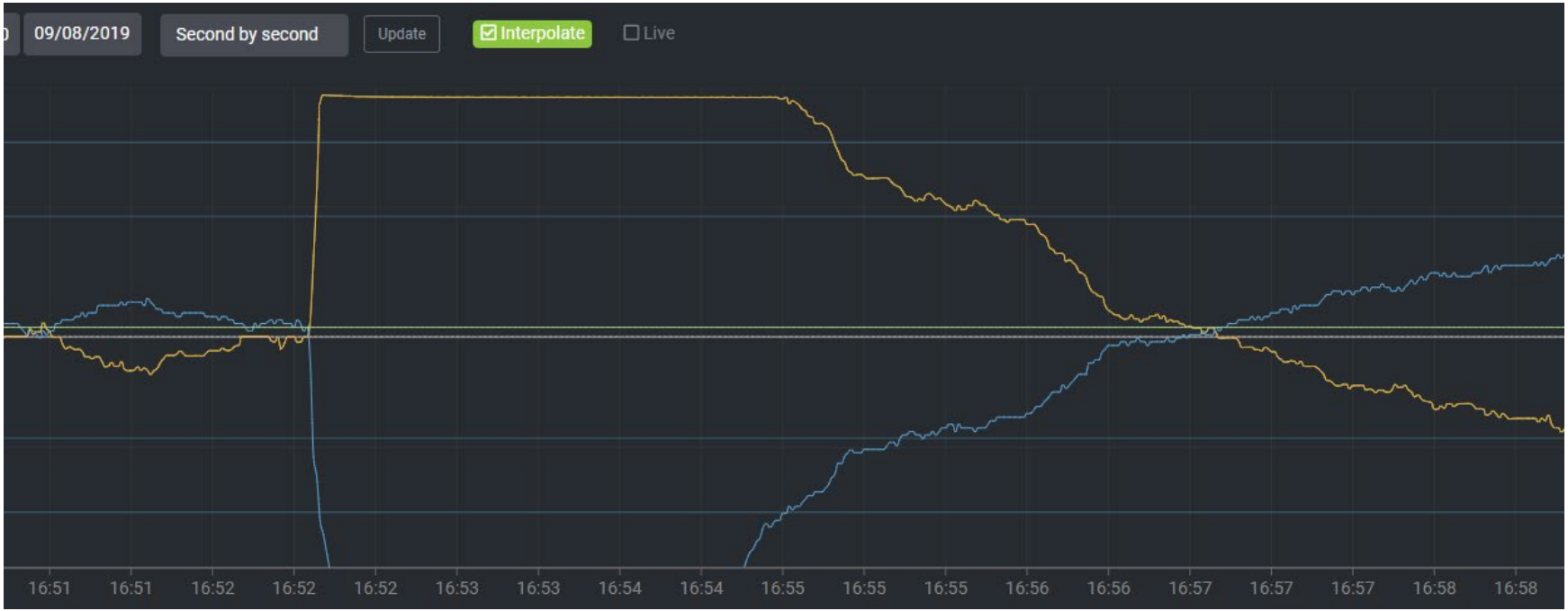
475MW of sub-second response came from battery energy storage

- Plessey 2MW/2.4MWh BtM system



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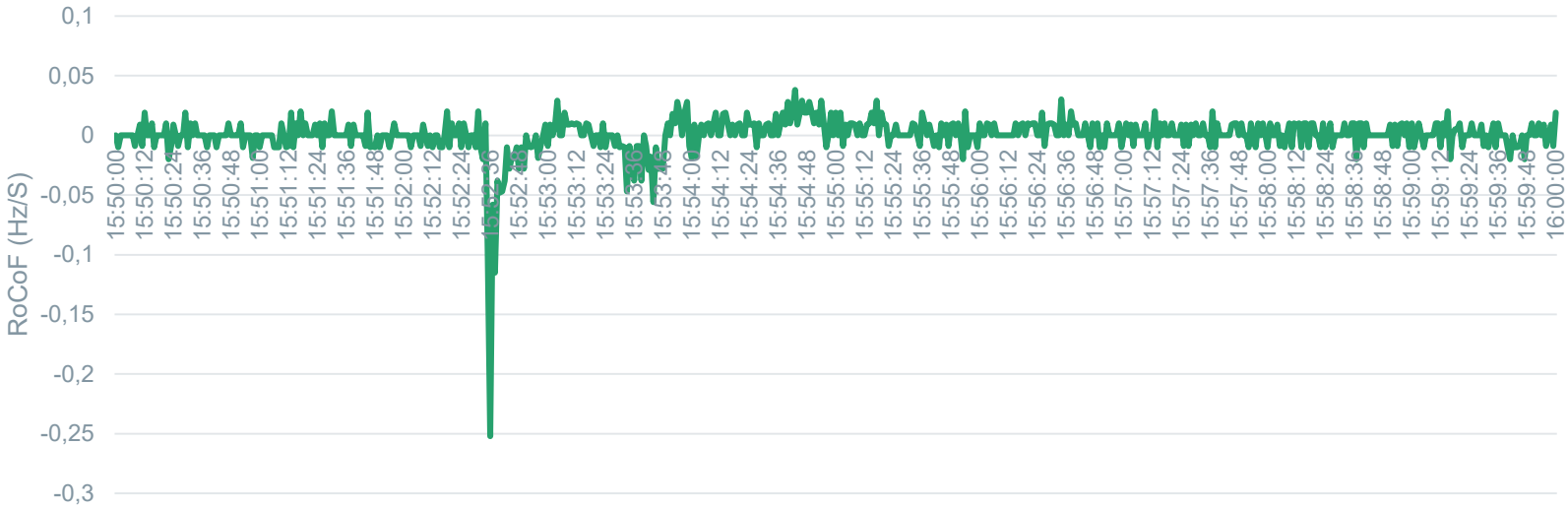
Rate of Change of Frequency (RoCoF)



National Grid ESO seeks to limit RoCoF (determined by the size of loss and system inertia) to 0.125 Hz/s. If RoCoF exceeds 0.125 Hz/s ~2GW of small generation connected to the distribution network may be automatically disconnected by relay. On August 9th frequency fell to 49.1 Hz in 8 seconds. About 500MW of distributed generation came offline.

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Synthetic inertia

- Coal and gas typically relied on to provide inertia – via kinetic energy provided by the spinning mass of (synchronous) generators that produce electricity from fossil fuels.
- As the proportion of energy from (non-synchronous) wind and solar grows this source of traditional 'analogue' inertia is in increasingly short supply.
- Battery based energy storage can provide synthetic inertia to compensate for reduction in inertia from synchronous generation.
- The response time of battery energy storage – approaching 0.1s– provides the same effective stabilisation as analogue inertia.
- Research by Queens University Belfast found 360MW of battery-based energy storage could provide the equivalent stabilisation to Ireland's All-Island electricity system as would normally be provided by 3,000MW of conventional thermal generation, delivering cost savings of up to 19 million euros.

3,000MW

synch generators

=

360MW

batteries

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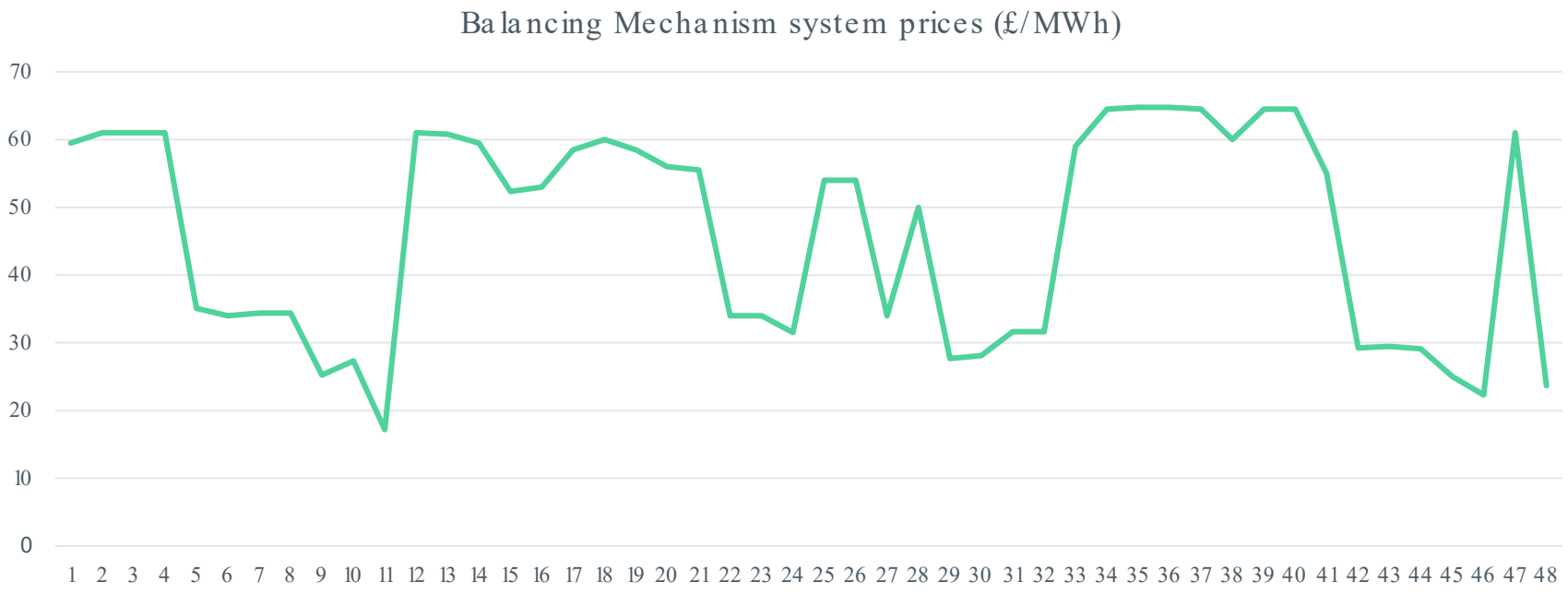
How did markets react?



How does National Grid ESO avoid a repeat of August 9th?

1. Buy more fast-acting frequency response?
2. Increase system inertia (or limit the infeed loss)?
3. Reduce sensitivity of response to RoCoF?
4. Review market mechanisms?

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