

Demand-side flexibility in practice

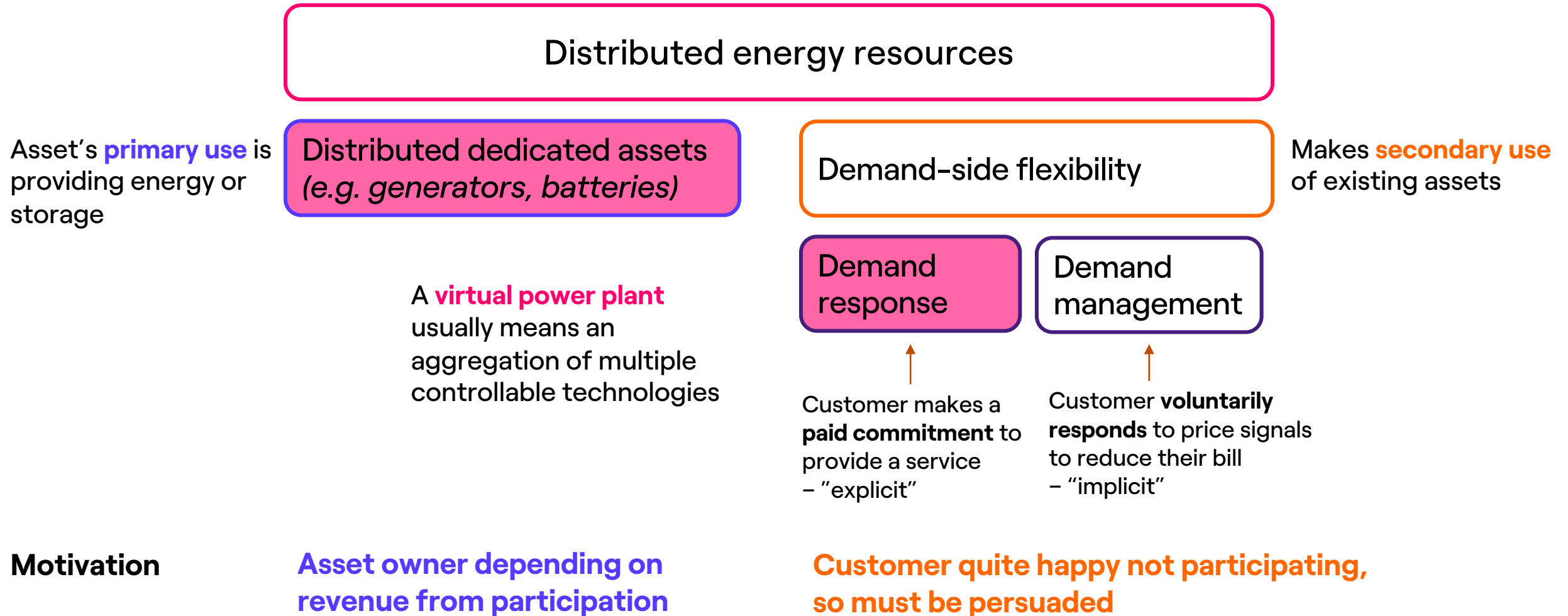
World Bank Italy Study Tour

27 May 2026

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1. What is demand-side flexibility?
2. Why is demand-side flexibility useful?
3. What does an aggregator do?
4. What makes a market work well for the demand side?

What is demand-side flexibility?



What happens during a dispatch?



Notify:

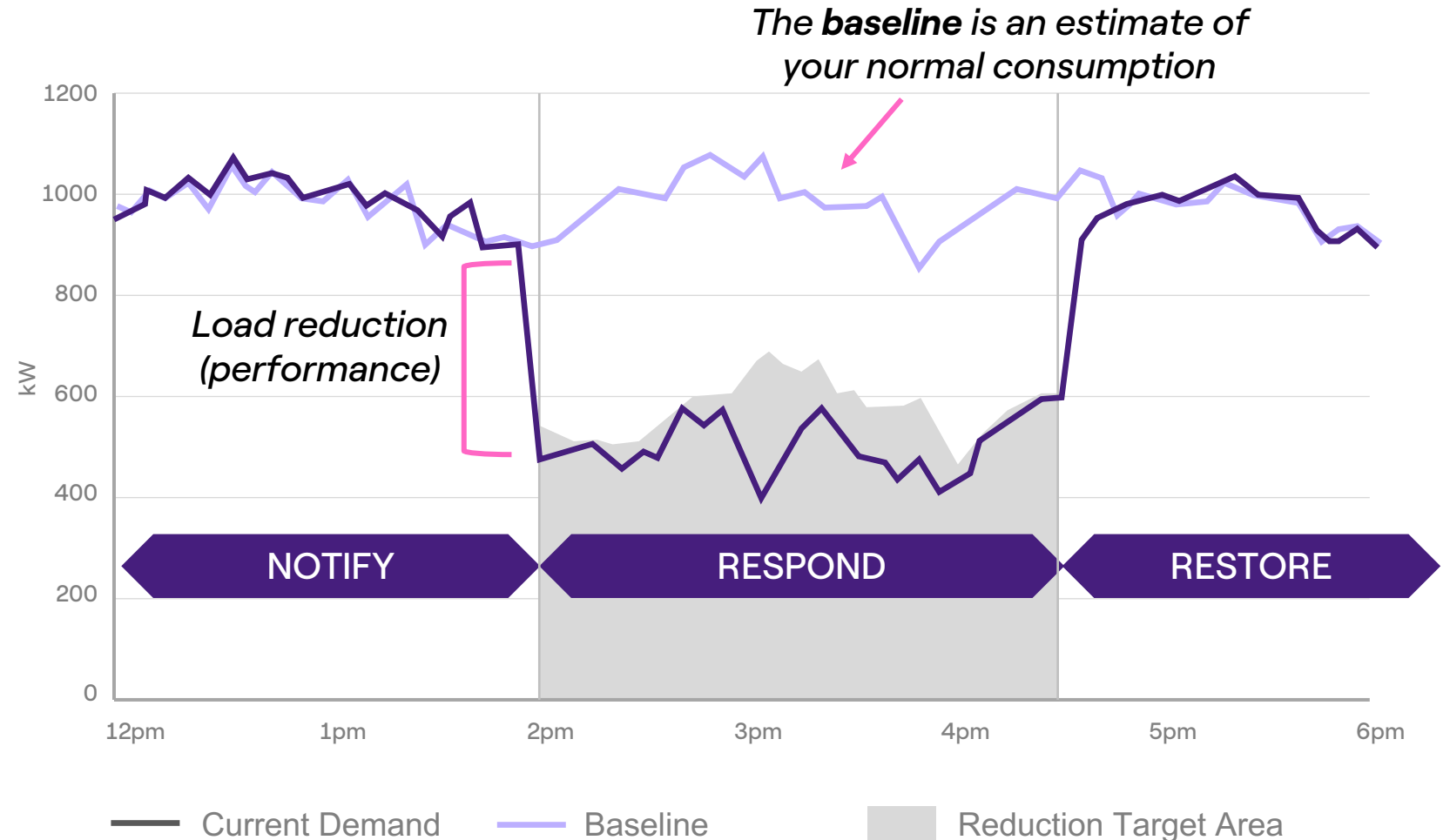
When a dispatch is called, we immediately notify your site contacts via phone, text and/or email.

Respond:

Your site responds by curtailing load manually or automatically following your energy reduction plan.

Restore:

When the dispatch is over, your operations can return to normal levels.



Why is demand-side flexibility useful?

Demand-side cost structures are quite different to those of generators and dedicated batteries

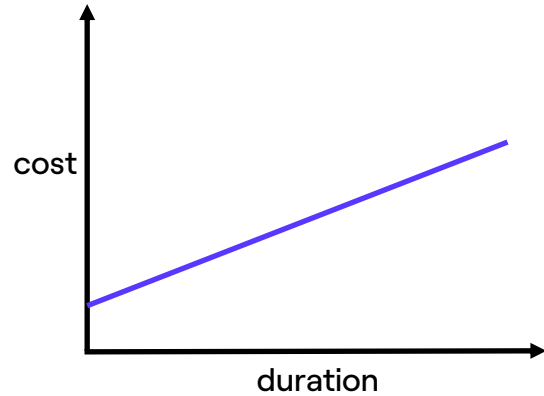


	Generators	Dedicated batteries	Demand response
Capital costs per MW	High : Cost of generator and construction	High : Cost of battery	None : Already covered by primary use
	High : Network connection	High : Network connection	None : Uses existing network connection
			Low : Additional metering and control equipment
Fixed costs per MW-yr	High : Fixed O&M costs	Low : Few moving parts	None : Already covered by primary use
			Low : Customer and aggregator's operational costs
Variable costs per MWh	Medium : Variable O&M costs	Medium : Cell degradation	Only if backup generators being used
	Depends : Fuel costs (except renewables)	Depends : Energy purchases for charging	Only if backup generators being used
			Highly variable : Opportunity costs

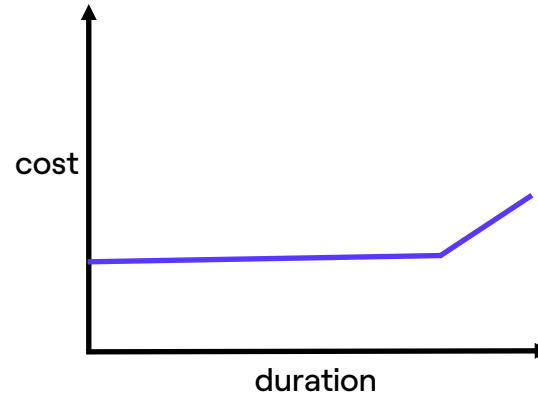
Dispatch costs vary hugely between customers and by time and duration of dispatch



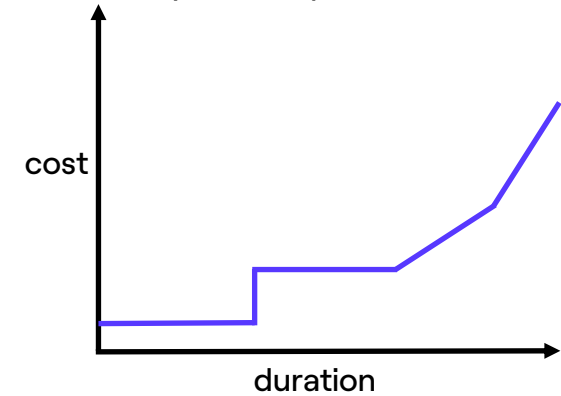
Generators' costs are easy to model



Some customers' costs are mostly fixed

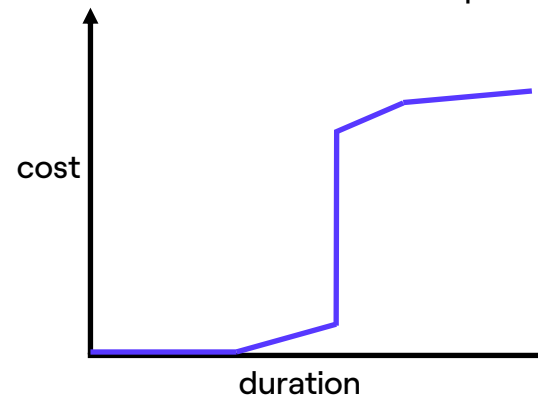


But a manufacturing plant might face overtime, and potentially a lost contract

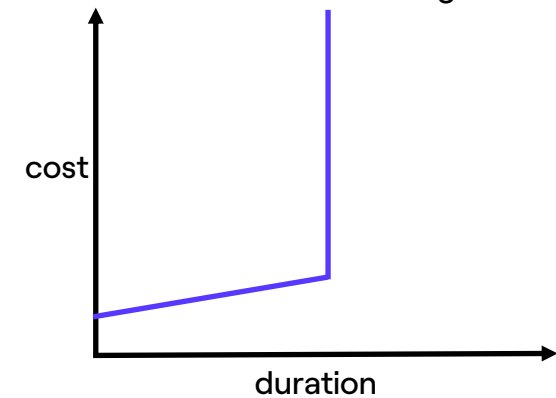


You can only discover these costs through negotiation

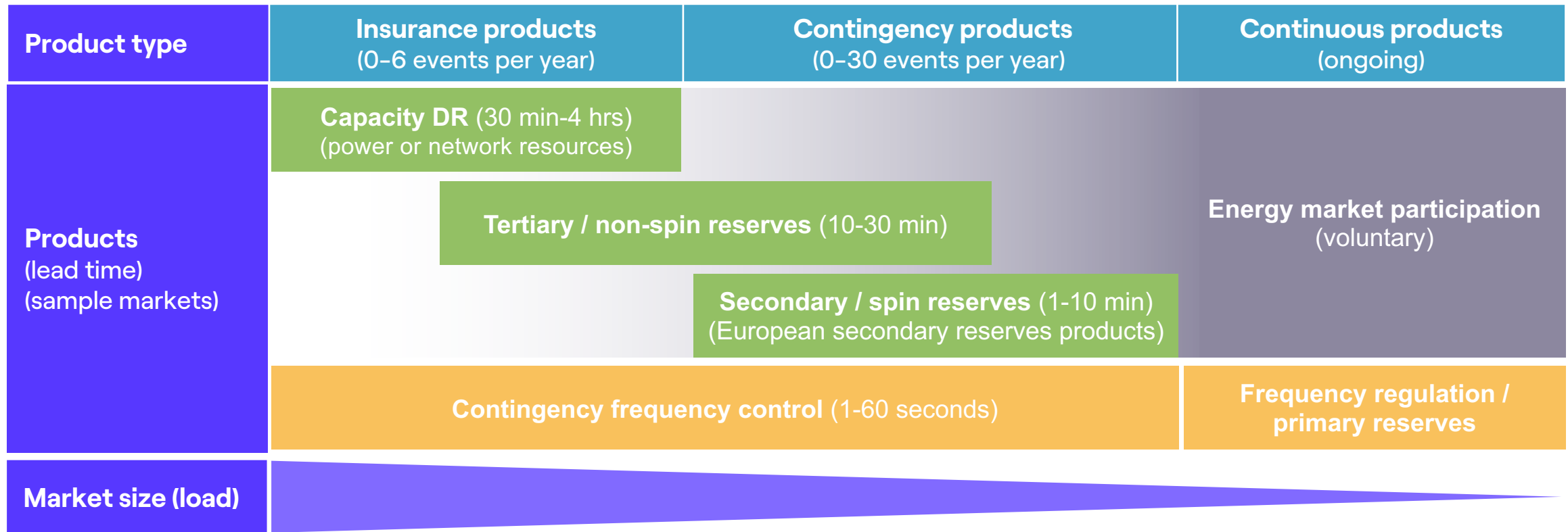
Cold storage can only respond for so long – food will start to spoil



An aluminium smelter would incur huge costs if the metal cooled enough to solidify



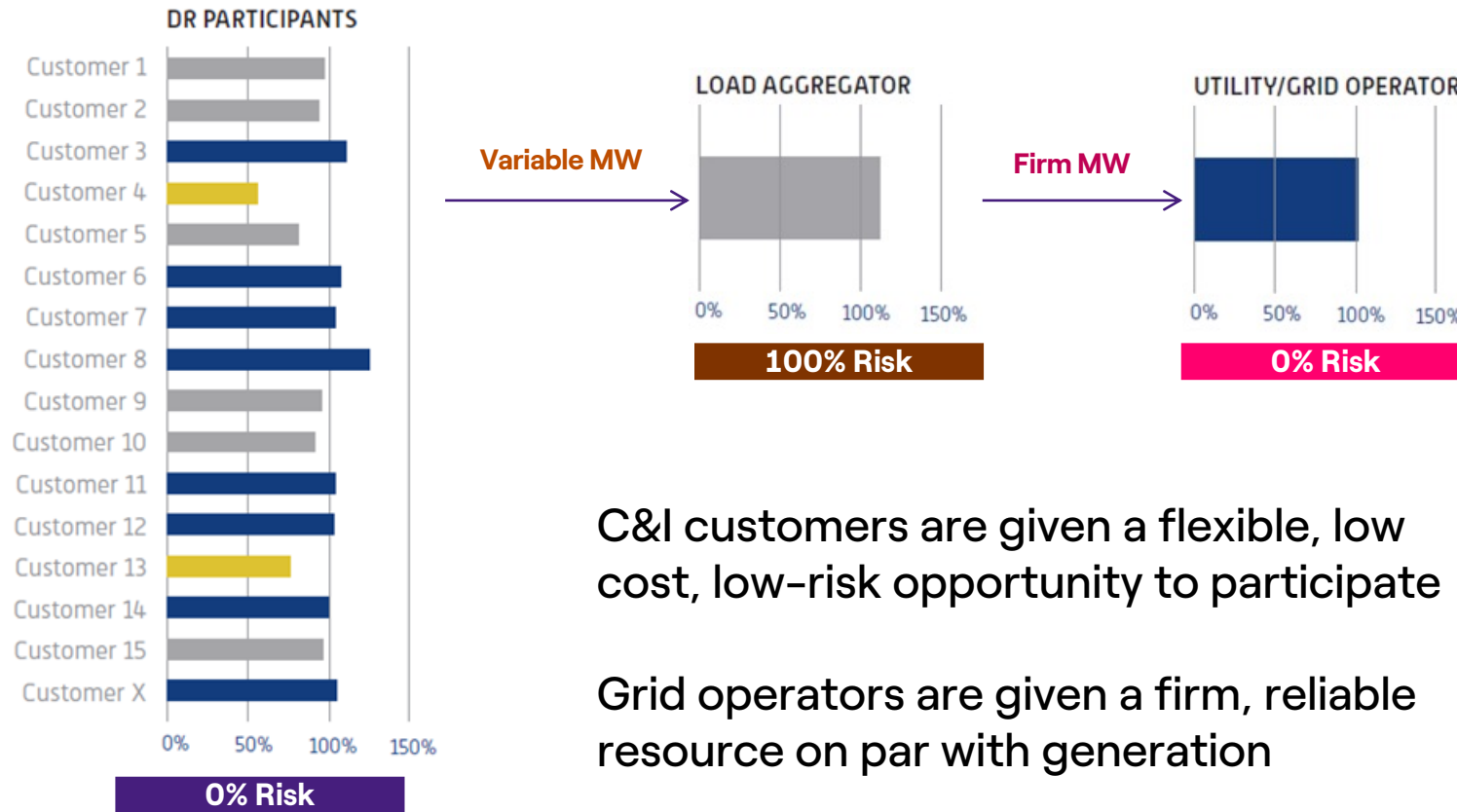
Demand response can provide all kinds of services



... but it is uniquely cost-effective at providing rarely-dispatched services.

What does an aggregator do?

Aggregators are crucial to the success of demand response programmes

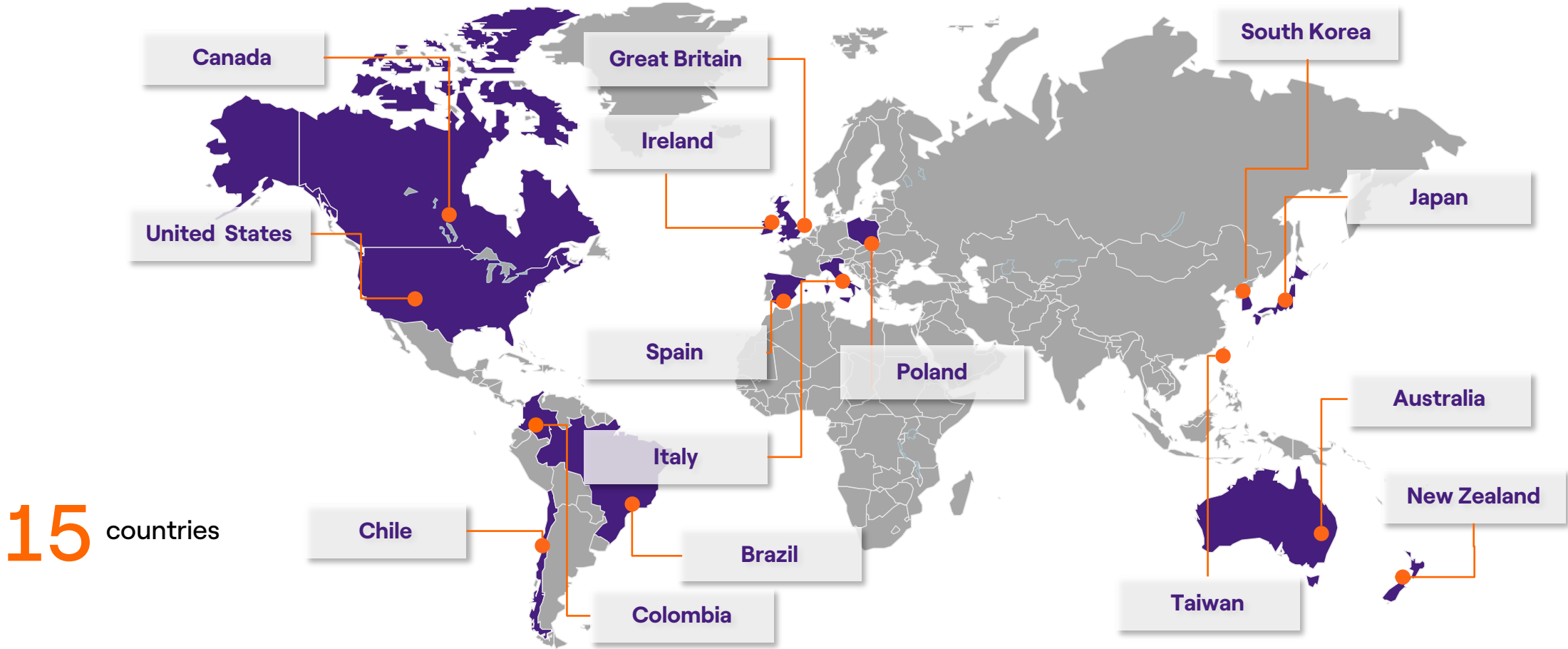


- Aggregators are specialists focused on doing DR well
- They find customers and persuade them to participate
- They invest in technology and process
- They allow more customers to do DR (more MW)
- Their portfolio management delivers greater reliability

We have our 24x7 operations center in Dublin



... managing programmes worldwide



100+
active programs



10 GW
flexibility
managed



6 000+
customers



15 000+
industrial sites



\$200m
invested in
technology

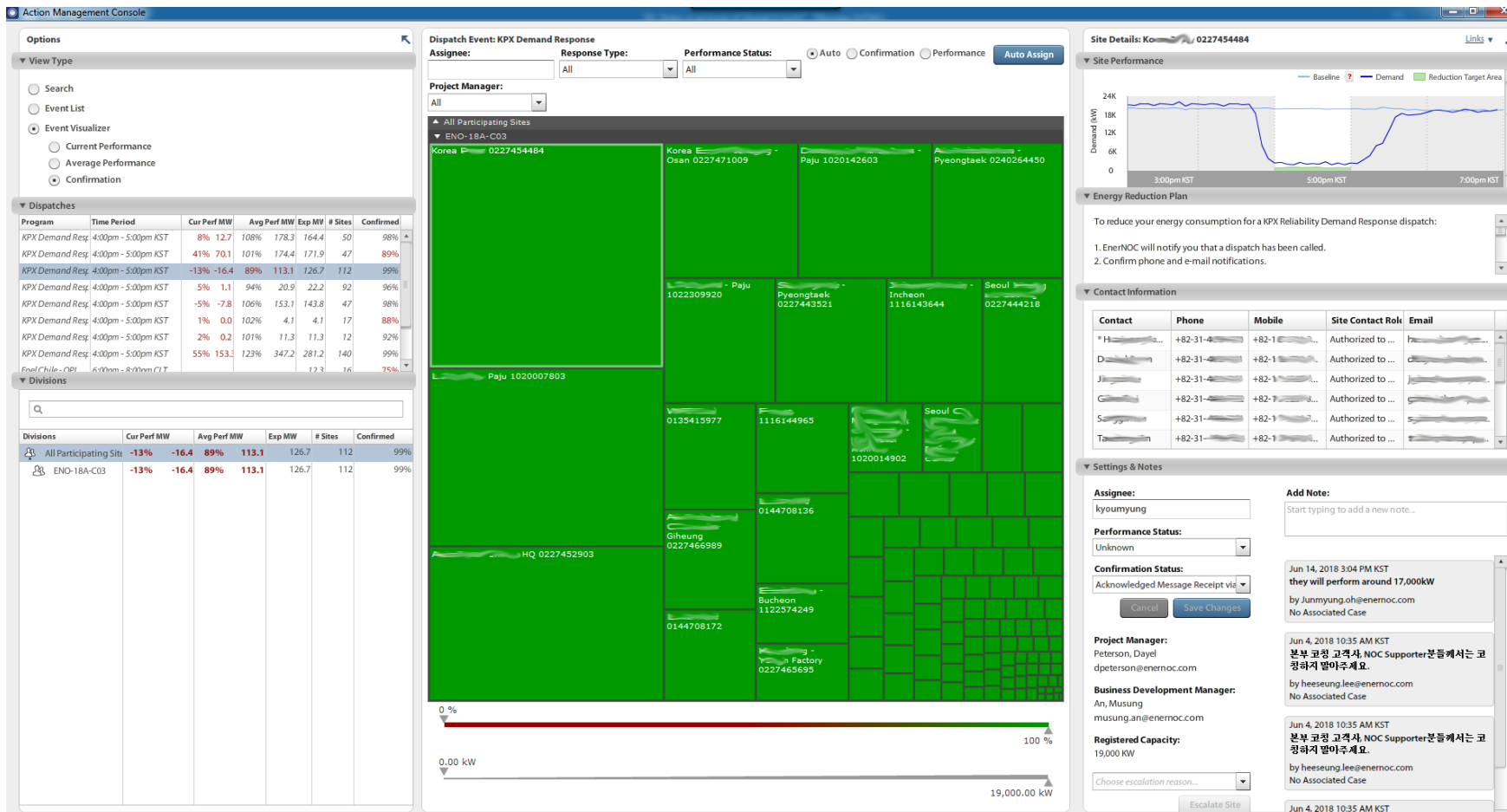


3 000+
employees

We have some very large programmes



- This is a dispatch of 945 MW in South Korea



Aggregated demand response is resilient



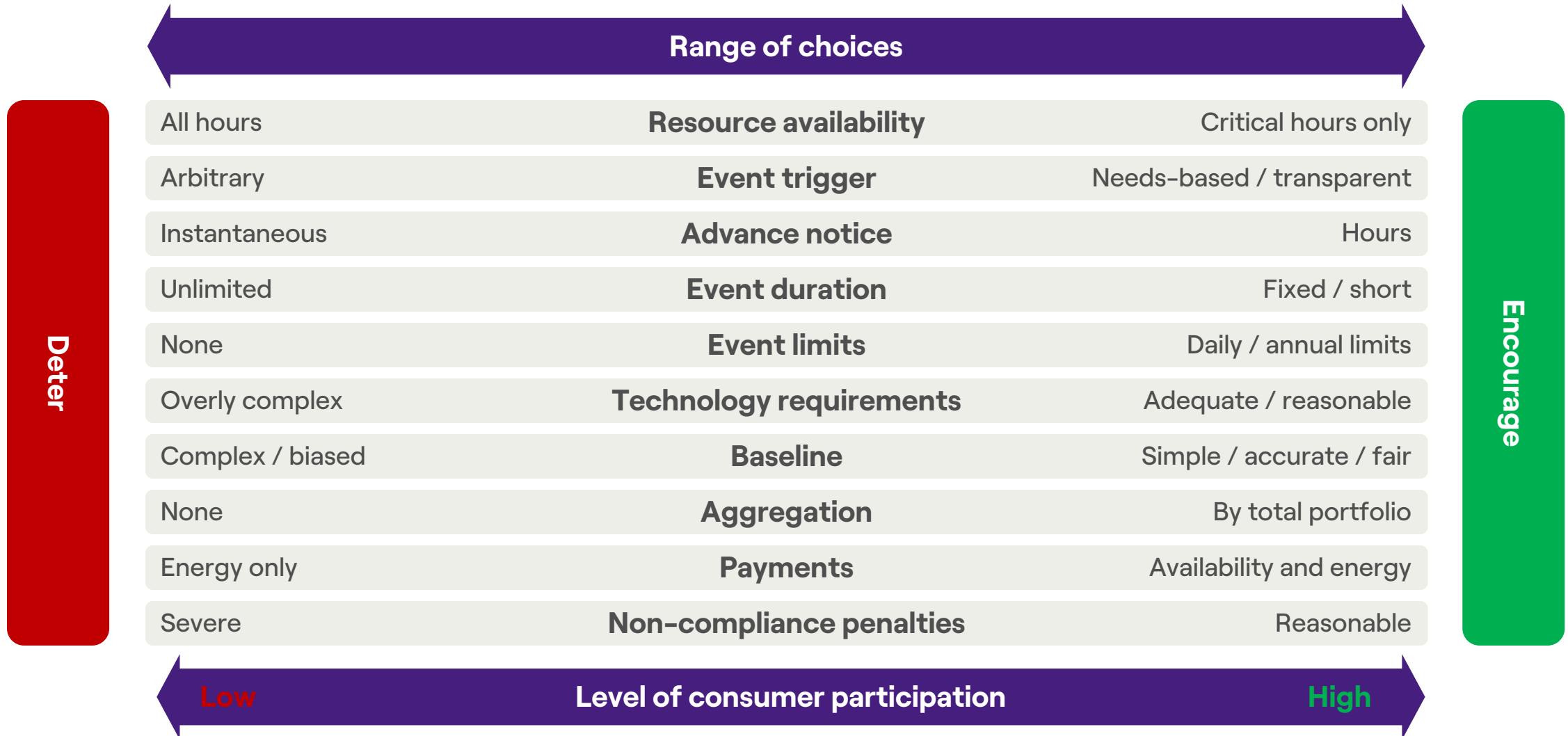
If you ask market operators who have suffered extreme events, you don't hear anything bad about demand response.



- 734 sites had to deliver 223 MW
- Mix of load & decentralised generation
- Things went very badly
- 3 of the largest sites substantially underperformed
- But we still delivered 90% of our obligation

**What makes a market work well
for the demand side?**

Attributes that affect participation



Lessons learned

Common features of successful programmes



- Simple products
- Competition between technologies
- Participation by smaller loads enabled by minimising per-site costs
- Sufficient predictable payments to make participation attractive for customers

Questions?

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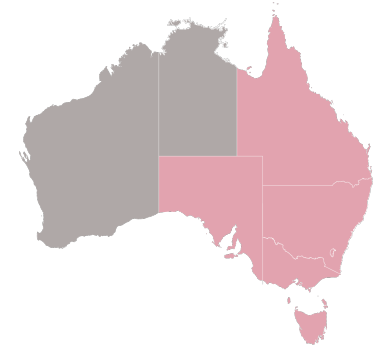
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Frequency Control Ancillary Services (FCAS)



Australia getting many things right

-  DR participation across **eight frequency programs**, from very fast (1-second response) to slow (5 minutes)
-  **High-resolution data** used to validate service delivery, but not needed in real time
-  **One test** at the start of the contract; at a pre-agreed time; repeated only if major changes
-  DR resources **paid for availability** at the marginal price, just like generators

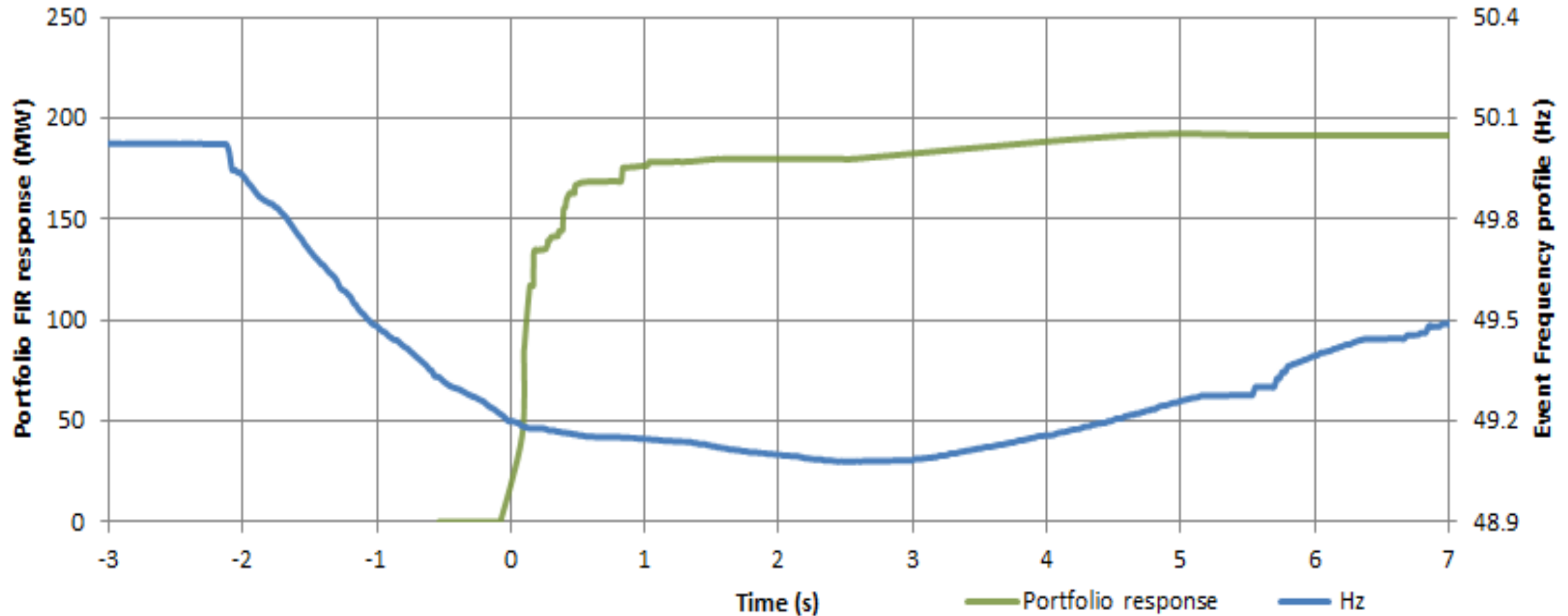


New Zealand Instantaneous Reserves



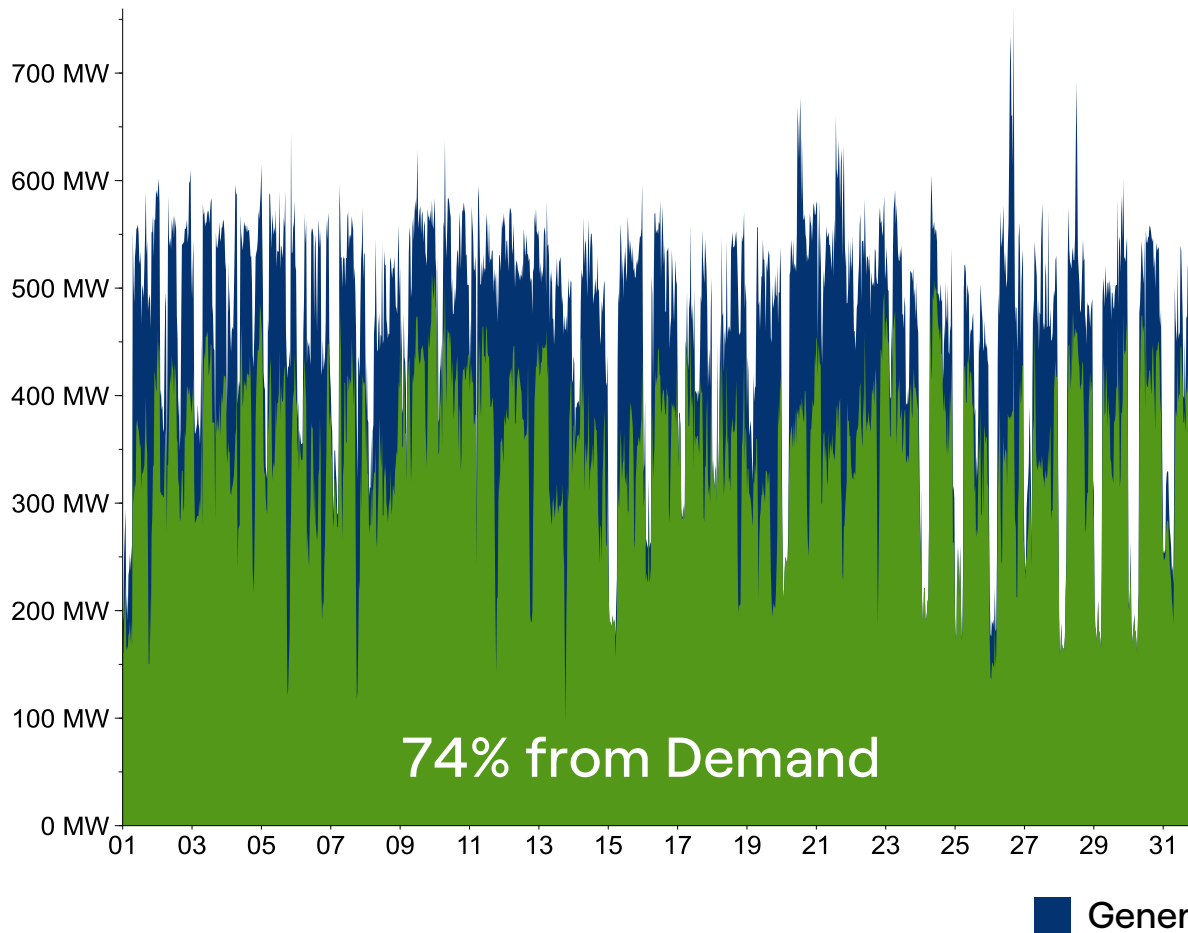
DR responds in under one second to stabilise the grid

DR RESPONSE TO A SUDDEN DROP IN FREQUENCY ON 16 MAY 2016, 17:50:50

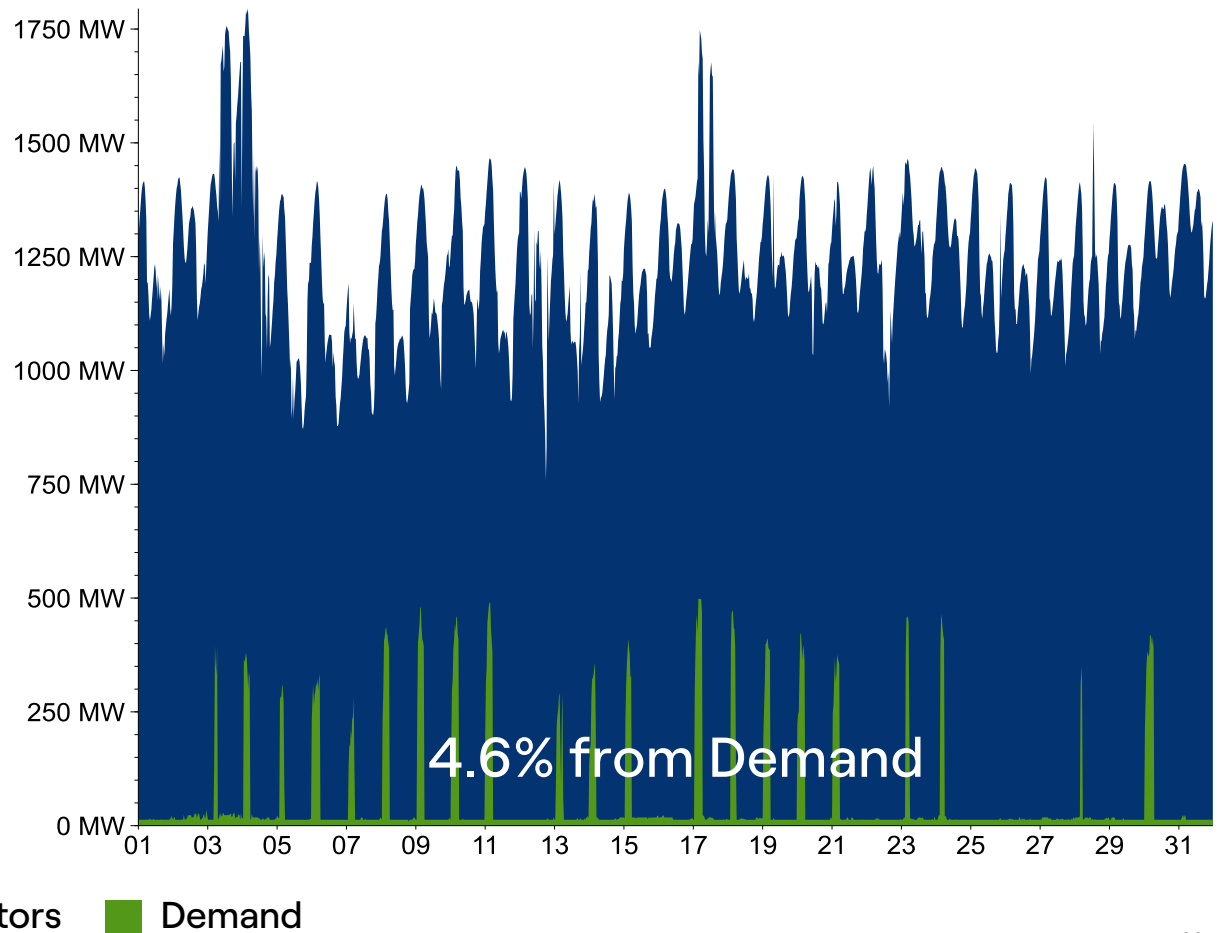


New Zealand vs. Australia

New Zealand in 2016
– aggregators allowed



Australia in 2016
– aggregators not yet allowed



Frequency Control Ancillary Services (FCAS)



DR and battery storage are “baseload” sources of ancillary services in Australia

