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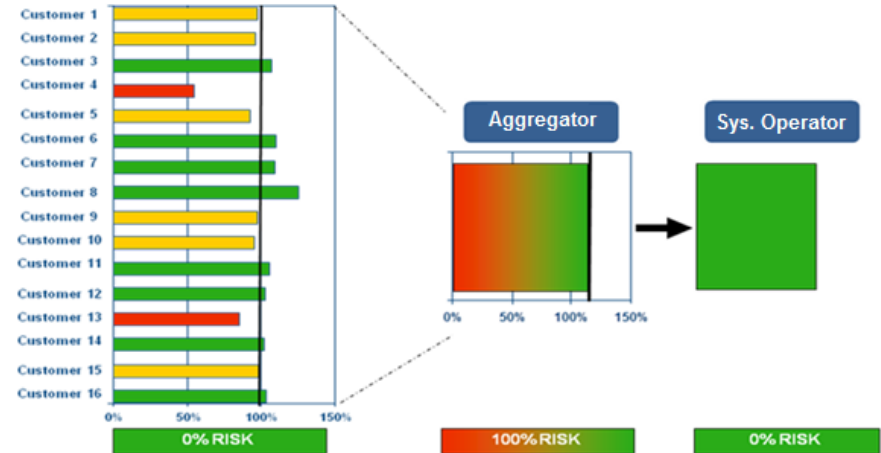
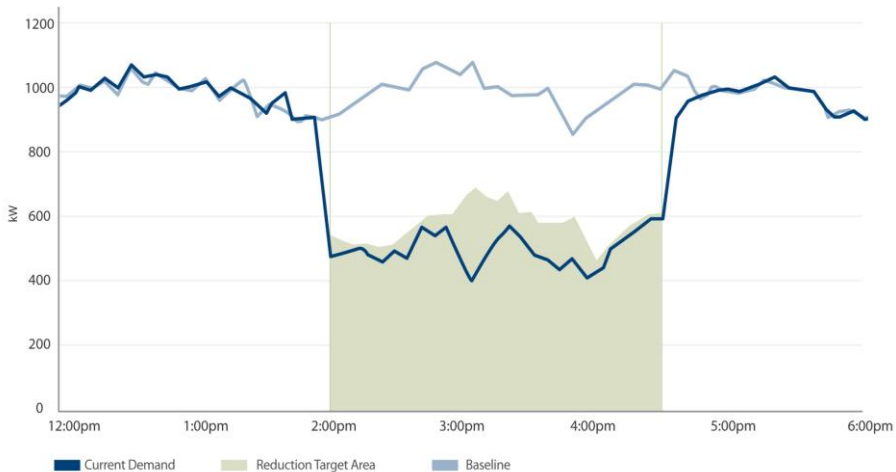
Demand Response in the future NEM: The least cost dispatchable resource for reliability

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20 November 2017

Demand Response

A dispatchable “virtual power plant” built from a network of distributed behind-the-meter assets



Introduction(s)



>38GW of installed
renewable capacity



>7GW of dispatchable
Demand Response



Behind-the-meter
battery storage

Putting storage in context

Batteries will complement and enhance existing behind-the-meter sources of DR

Various forms of storage are already used extensively today on the grid

Form	Example
Gravity	Water pumps
Thermal	Cold store compressors HVAC pre-cooling
Biological	Aerators, composters
Physical	Intermediate stockpiles Buffer to sale

Batteries will massively enhance what the demand-side can offer



Demand Response in the NEM

There are four distinct use cases for DR in any grid

A single energy user can provide multiple of these distinct services at once

#	Type	Concept	In the NEM today?	Reduced costs?
1	Network DR	Build fewer poles and wires within a defined geographic monopoly network	Very little	Yes - RAB
2	Economic DR	Respond to avoid paying high wholesale spot prices (must be facilitated by retailer)	A modest amount	Yes - Wholesale
3	Ancillary Services DR (Contingency FCAS)	Respond instantly to low-frequency contingencies on the grid	A little, and growing fast	Yes - Wholesale
4	Reliability DR	Build less supply side peaking capacity, & ensure system reliability on peak demand days.	None, but growing soon.	Yes - VCR

Demand Response in the NEM

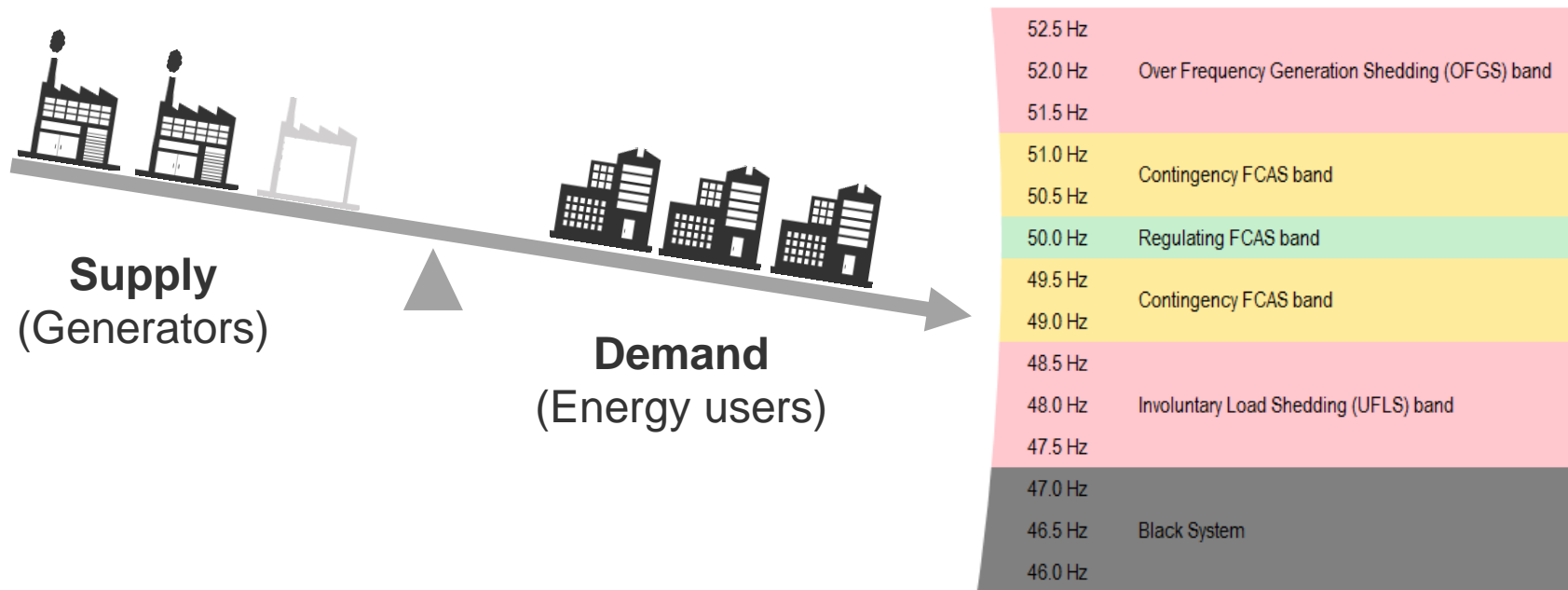
Trains in motion

#	Type	Mandate	Manifestation	Status
1	Network DR	TEC + COAG EC rule change request (2015)	AER's <i>Demand Management Incentive Scheme</i>	AER to publish scheme Dec 2017 w/ expedited rule change
2	Economic DR	Finkel Review 6.7 – “The AEMC should undertake a review to recommend <i>a mechanism that facilitates demand response in the wholesale energy market</i> . This review should be completed by mid-2018 and include a draft rule change proposal”	AEMC's <i>Reliability Frameworks Review</i>	AEMC to make progress report to COAG EC by end of 2017
3	Ancillary Services DR	Power of Choice → COAG EC Rule Change request (2015)	<i>Ancillary Services Unbundling</i> rule change (2016)	Fully implemented since 1 July 2017
4	Reliability DR	Finkel Review 3.4 – “By mid-2018, AEMO & AEMC should assess: <i>The need for a Strategic Reserve to act as a safety net in exceptional circumstances</i> as an enhancement or replacement to the existing RERT mechanism”	AEMC's <i>Reliability Frameworks Review</i> , & AEMO high level design underway.	AEMO to present high level design to ESB/COAG

Case study: FCAS

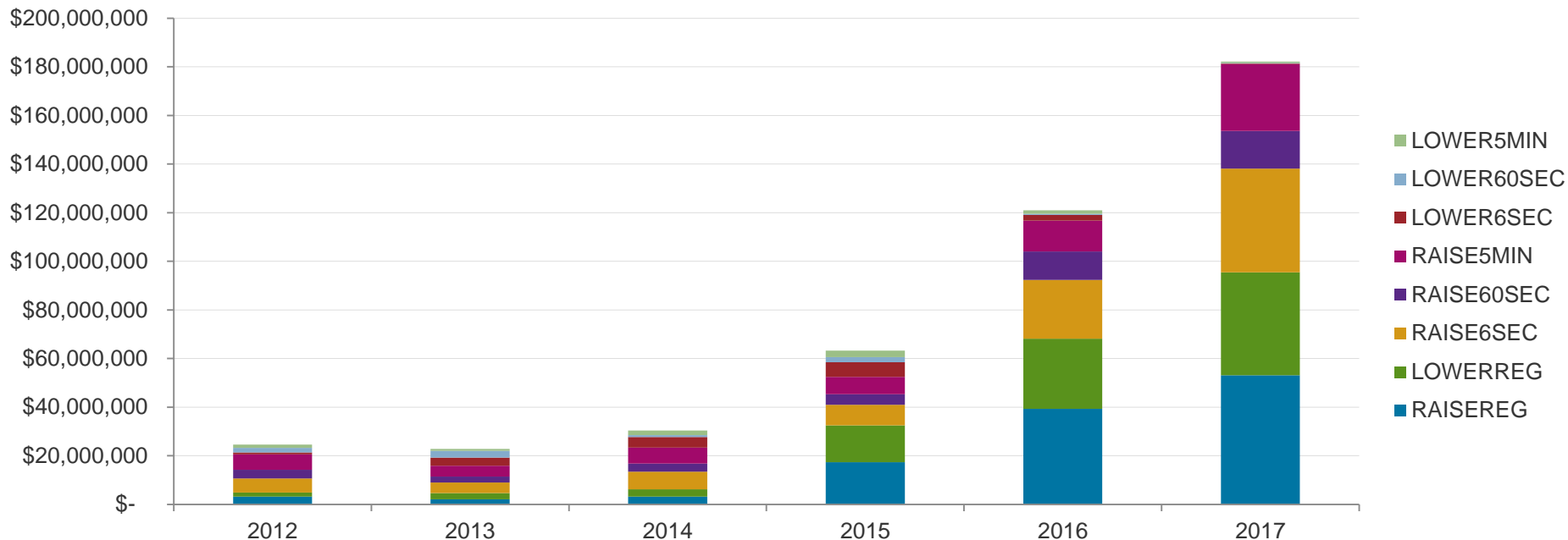
DR is also beginning to supply Contingency FCAS

Contingency FCAS: its singular purpose is to prevent load/generation shedding



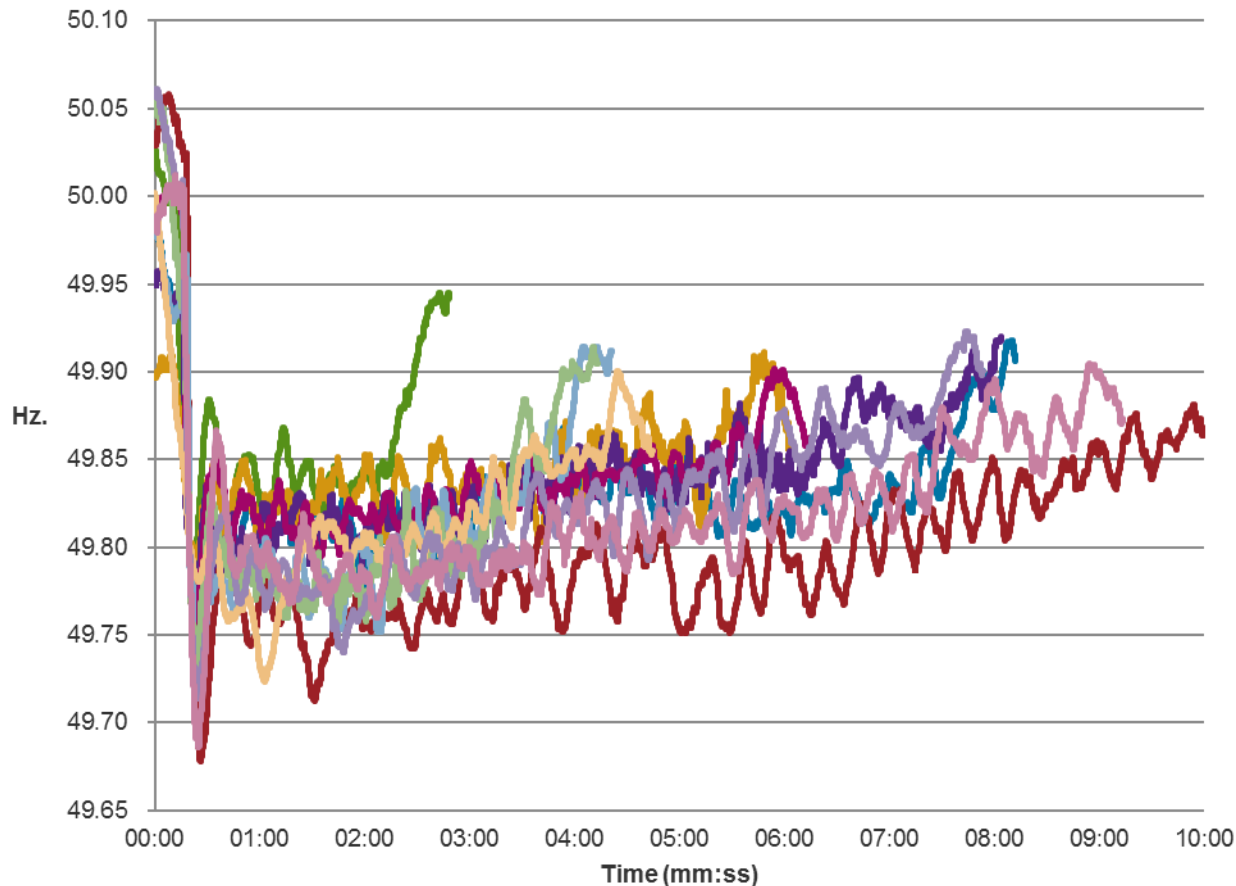
FCAS markets: in need of increased competition

FCAS costs up 8X since 2013



Source: AEMO AS Payment Summary Reports 2012-2017. 2017 through week 34, multiplied by 1/34/52 to project full 2017 calendar year.

NEM frequency excursions: Oct & Nov 2017

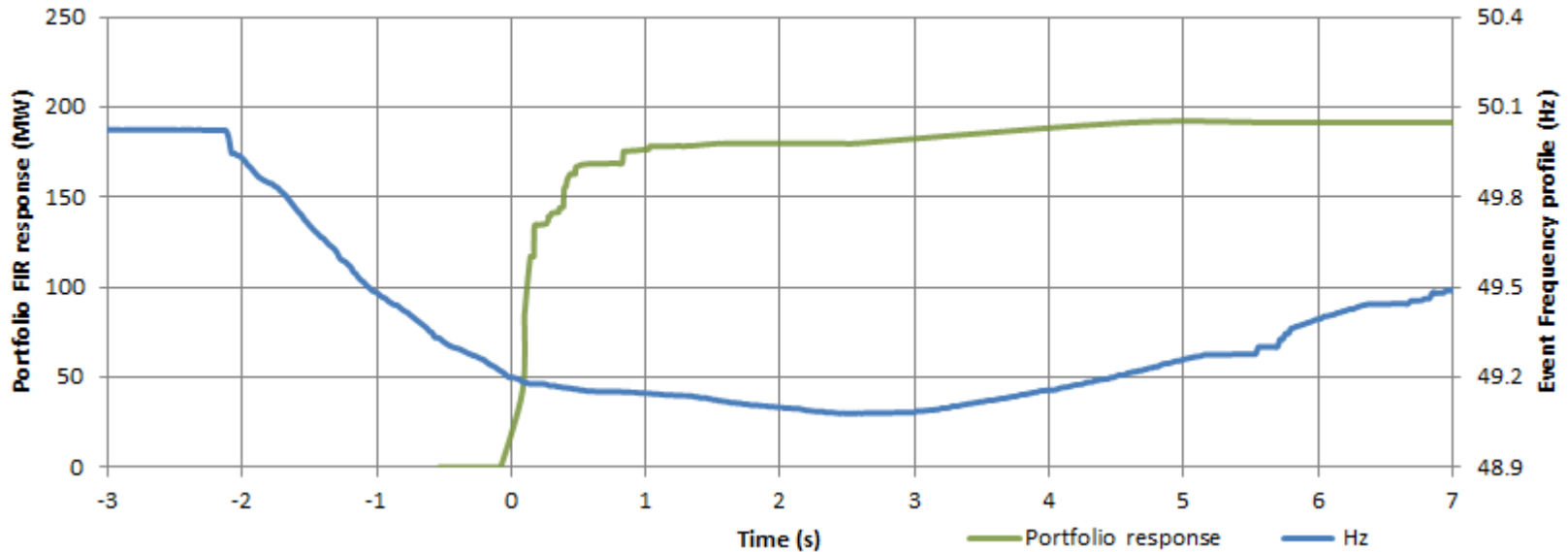


DR provides Fast Frequency Response (FFR)

NZ example: Huntly unit 5 (400 MW CCGT) tripped unexpectedly

180 MW of EnerNOC FCAS response in < 1 sec

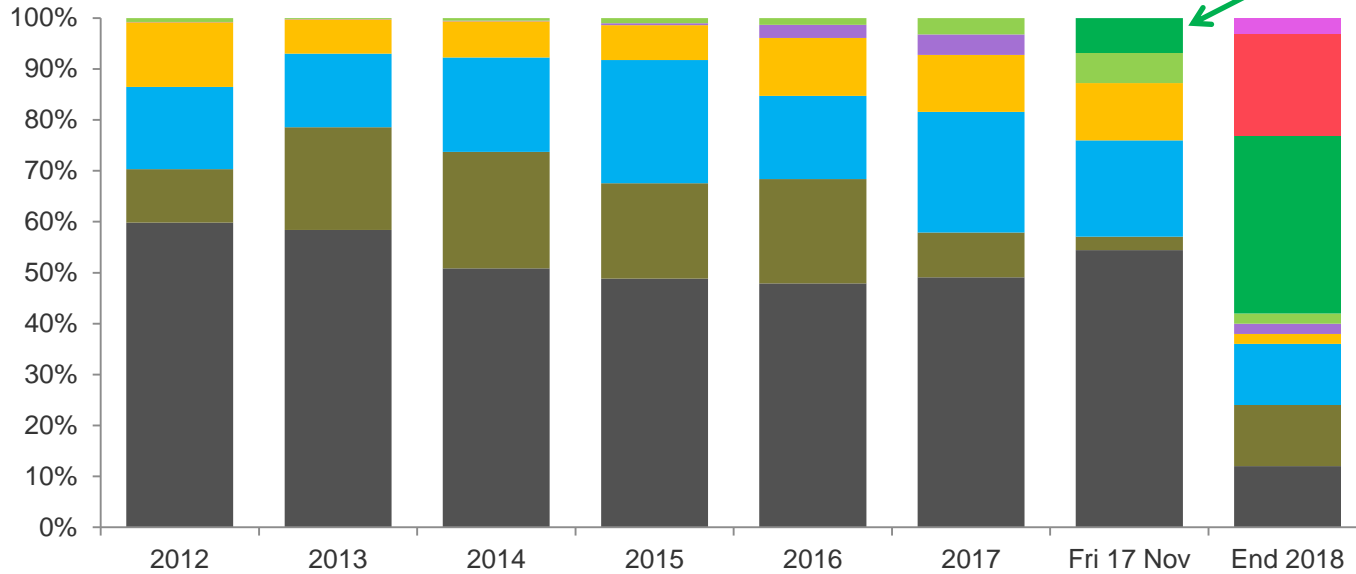
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The FCAS supply mix is changing dramatically

In less than 1 year, expect to go from 0% → > 50% provision from new market entrants

Contingency Raise FCAS (R60)
Enabled MWh (not 'energy supplied') by technology type
Calendar years - 2012 to 30 September



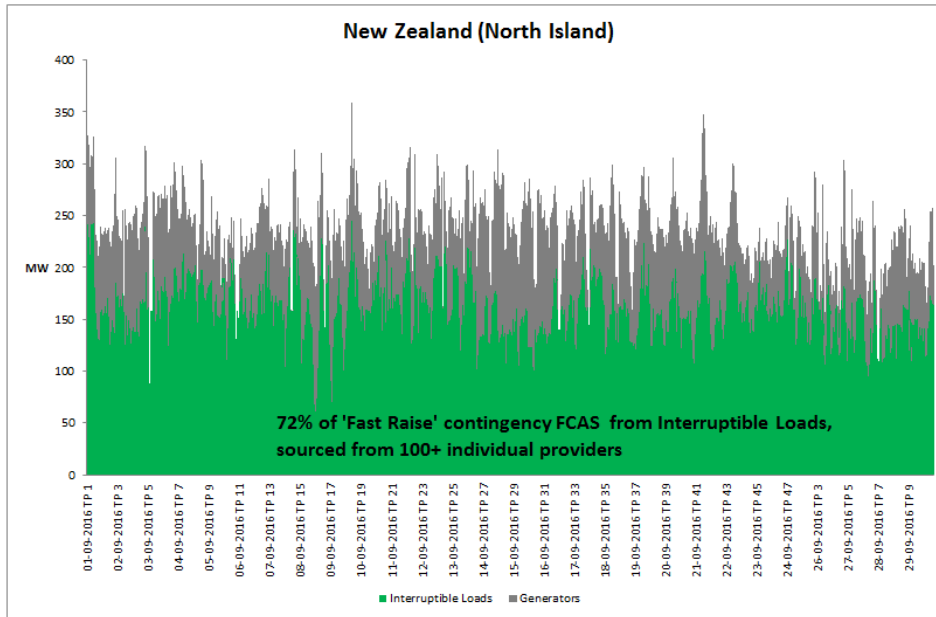
New EnerNOC DR

- 7% of daily average
- Up to 13% of instantaneously (56 MW)

- Resi batteries
- Grid scale batteries
- Demand Response - Aggregated
- Demand Response - Single Smelter
- Pumped Hydro (Pumps)
- Natural Gas (Pipeline)
- Hydro
- Brown coal
- Black coal

DR is capable of providing a vast majority of FCAS reserves

Case study: New Zealand Instantaneous Reserves



NZ NI Peak: ~5,000MW
Avg. DR offers: ~180MW



NEM Peak: ~32,000MW
FCAS DR Potential: ~1,150MW
(3X the physical requirement)

Demand Response in the NEM

Trains in motion

- DR sits **IN** the energy market
- Competes with generators to set spot prices (TBC: in central dispatch?)
- Procured & organised by retailers (w/ help of aggregators) to meet Reliability Obligations under NEG

2	Economic DR	Finkel Review 6.7 – “The AEMC should undertake a review to recommend <i>a mechanism that facilitates demand response in the wholesale energy market</i> . This review should be completed by mid-2018 and include a draft rule change proposal”	AEMC’s <i>Reliability Frameworks Review</i>	AEMC to make progress report to COAG EC by end of 2017
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- DR sits **OUTSIDE** the energy market
- Only activated by AEMO in LOR 2/3 scenario, is a market intervention, triggers what-if pricing
- Procured & organised by AEMO (replacement for Long Notice RERT)

4	Reliability DR	Finkel Review 3.4 – “By mid-2018, AEMO & AEMC should assess: <i>The need for a Strategic Reserve to act as a safety net in exceptional circumstances</i> as an enhancement or replacement to the existing RERT mechanism”	AEMC’s <i>Reliability Frameworks Review</i> , & AEMO high level design underway.	AEMO to present high level design to ESB/COAG
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Case study: Reliability DR

Reliability DR ('Strategic Reserve') is coming:

ARENA trial (143 MW) and RERT (X00 MW) should help ensure no load shedding occurs this summer

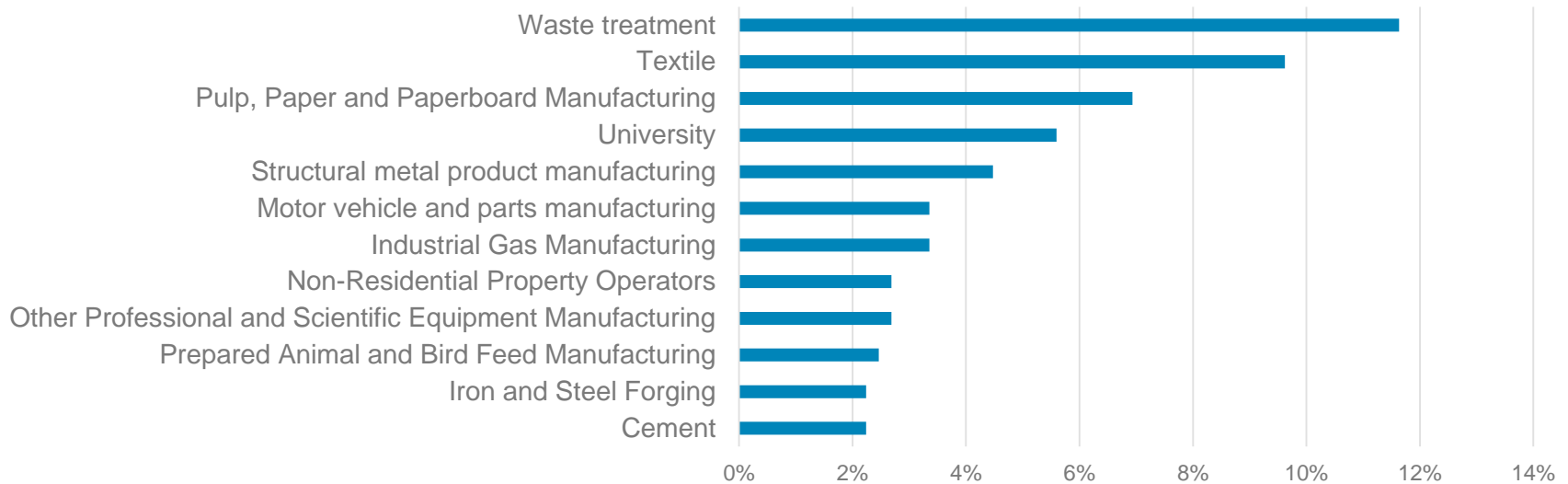


Reliability DR

Korea: Example of industry diversity (more than just smelters!)



Top industry sectors within EnerNOC Korea's Portfolio (~1,100MW, ~800 Sites)

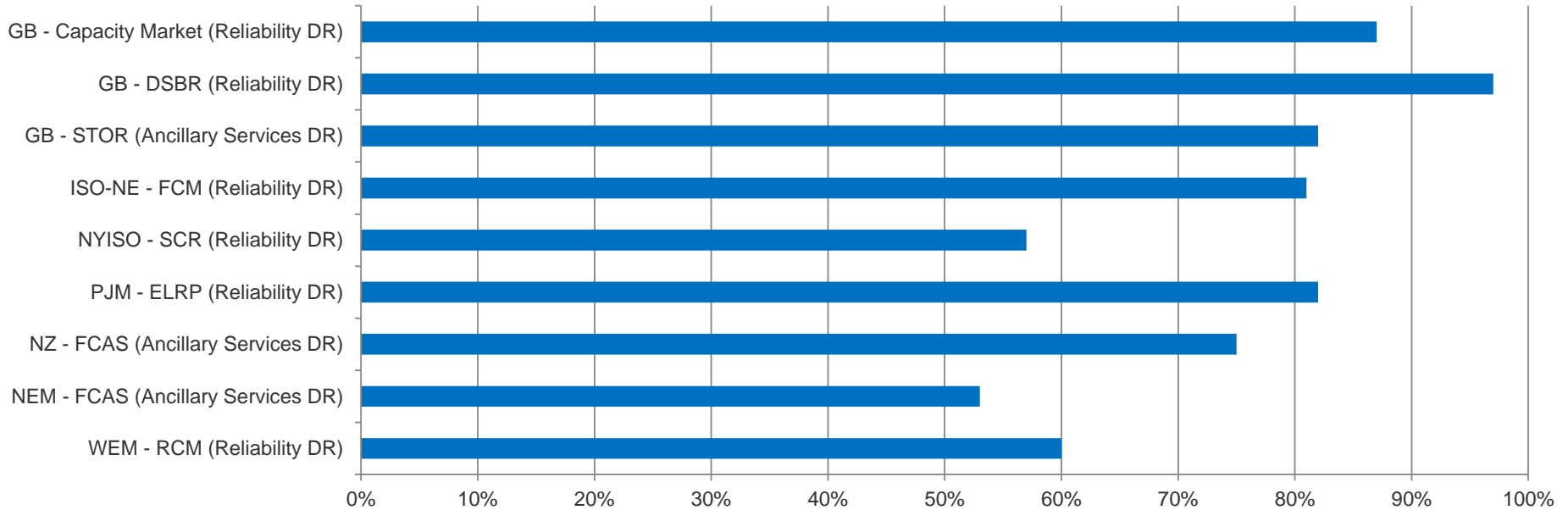


Share of total EnerNOC Korea DR portfolio based on facility count. These sectors represent <60% of the total portfolio

Reliability DR

Global markets show the importance of independent “aggregators”

% of market DR provided by independent aggregators



Sources available upon request

Parting thoughts

If we're going to have a NEG + Reliability Guarantee at lowest cost & maximum benefit to consumers...

The ESB and the AEMC:

1. Must **classify** DR properly:
 - Classify DR as a dispatchable resource that retailers can contract in order to meet their reliability obligations
2. Must **unbundle** DR from retail supply:
 - Make DR a contestable, competitive service, so that energy users are able to contract their DR to parties other than their current retailer. This allows independent aggregators to help retailers meet their obligations.
 - Implement a standard baseline method & retail settlement mechanism.



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