

7 August 2020

# Reliability in wholesale power systems

Testimony before Alaska State Legislative Committees

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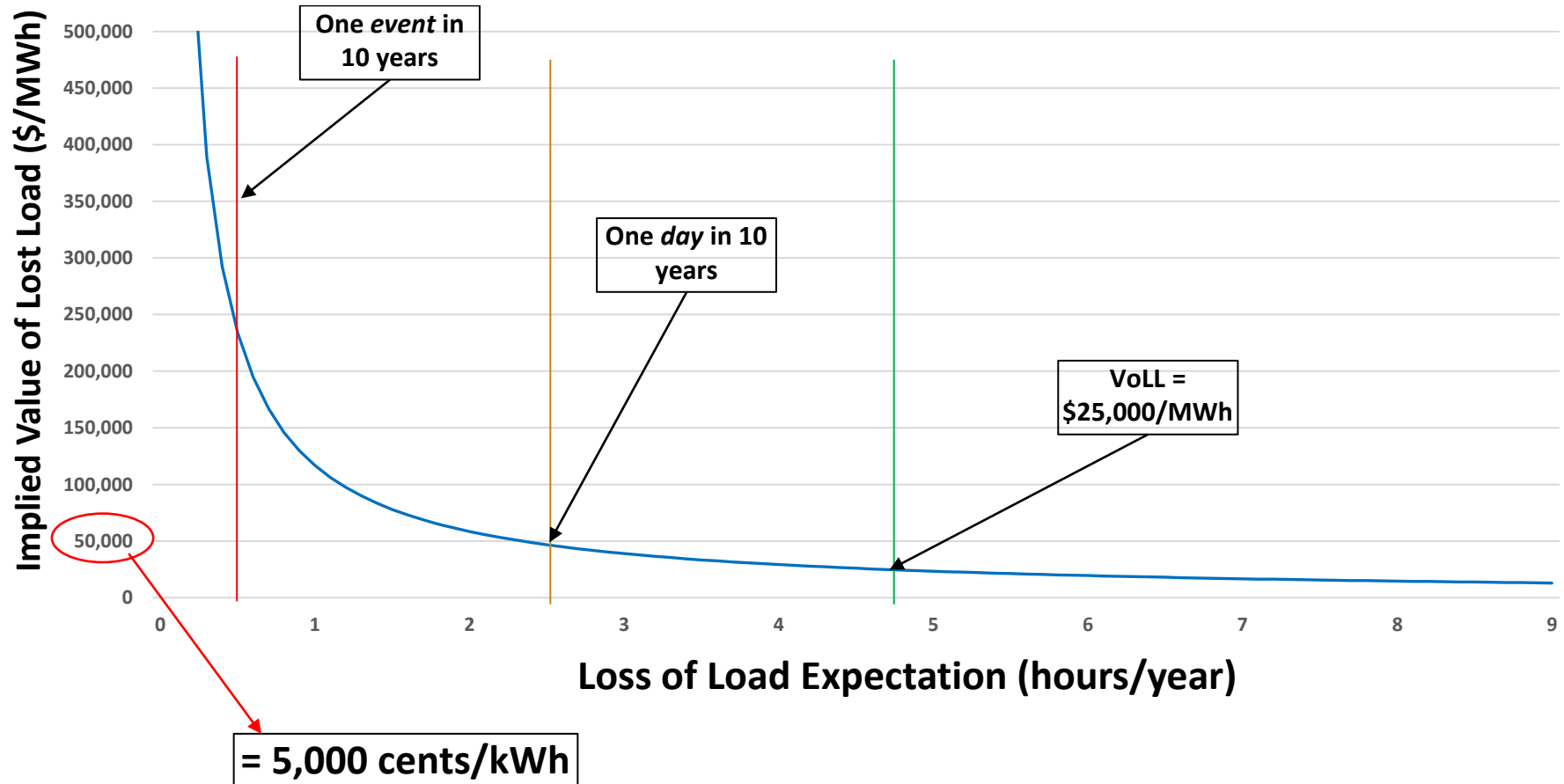


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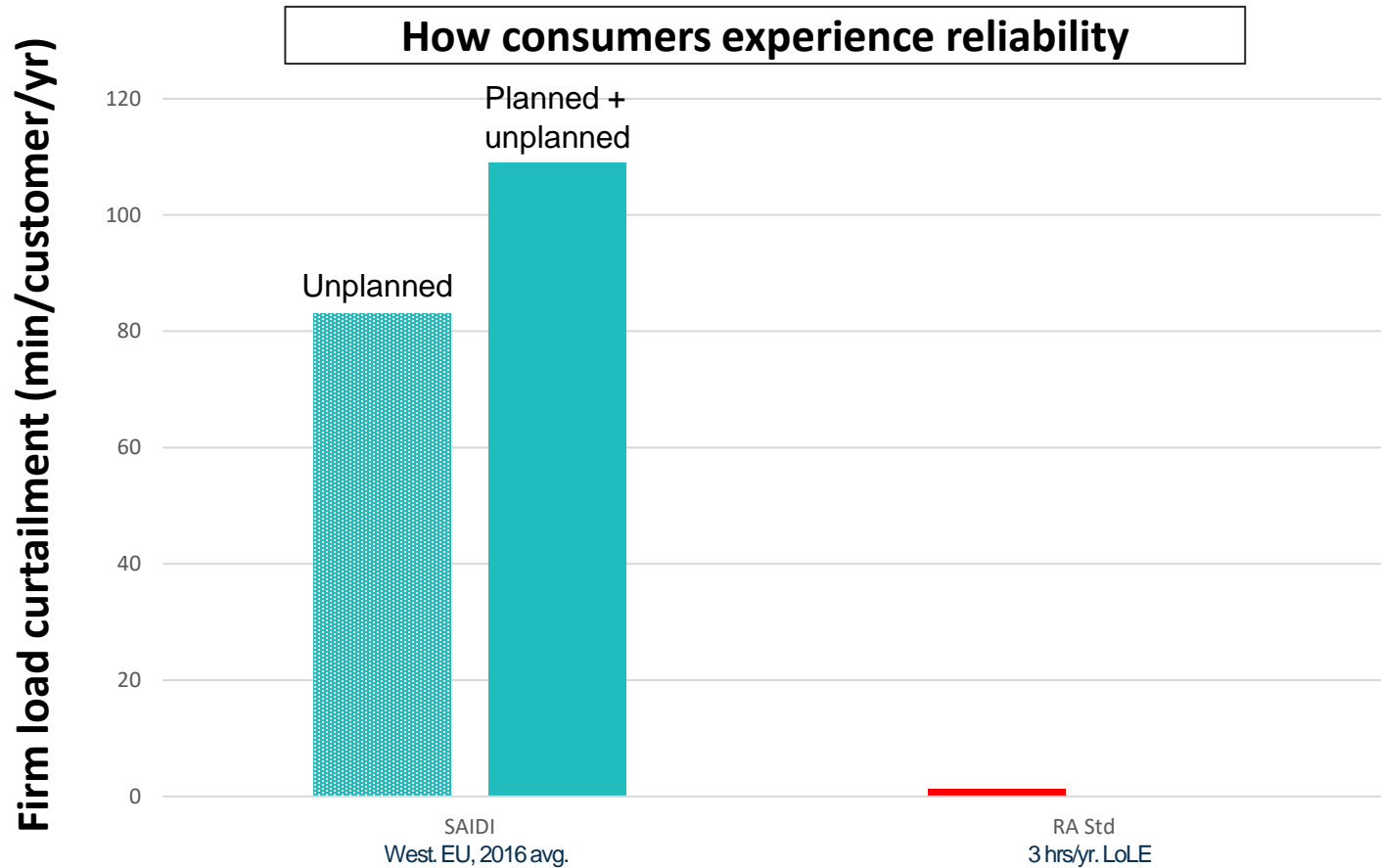
# Power system reliability

- Key concepts and metrics:
  - Value of lost load
  - Reserve margin/LOLE/LOLH/EUE
  - System average [load] interruption indices
- Probabilistic methodology
- Incremental benefit vs incremental cost – *no system can or should expect zero supply-related load curtailments*
- Historic degree of uncertainty + shorter investment cycles
- Shift from “how much” to “how flexible”
- Important new kid on the block: controllable demand, active consumers => rate design

# Resource adequacy: What's more generating capacity worth?



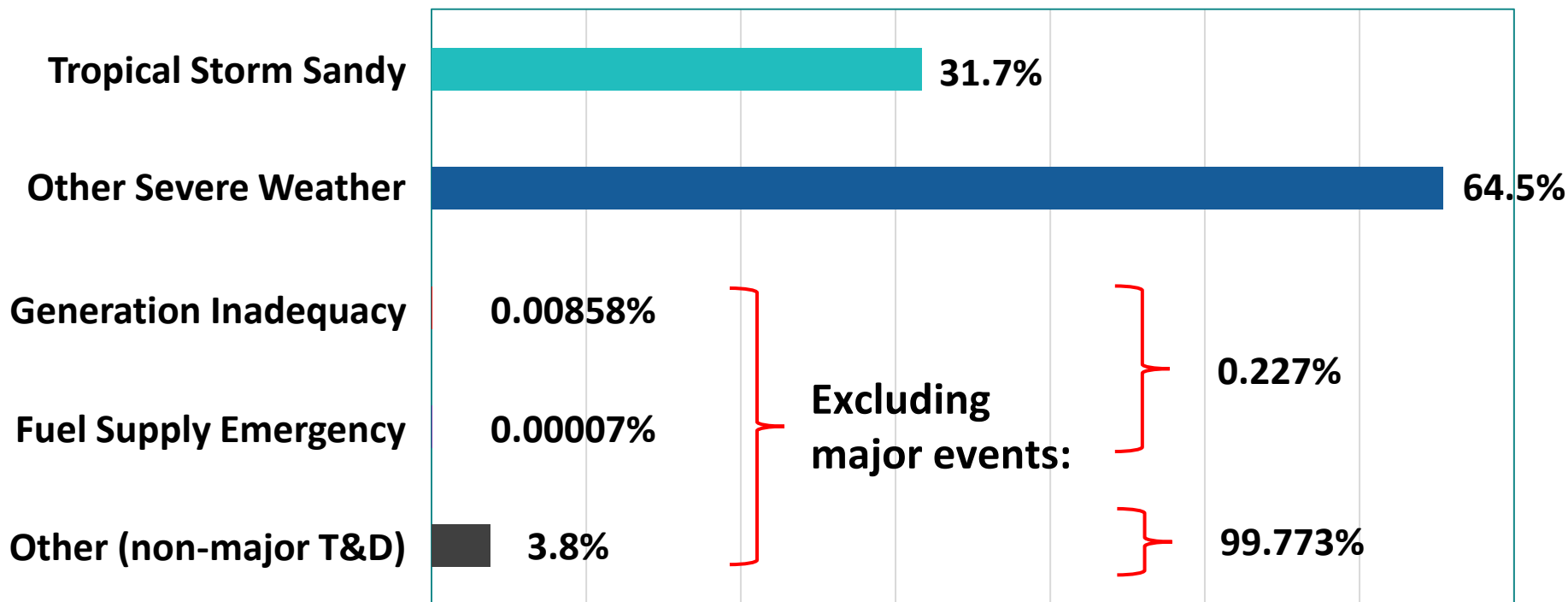
# Putting “standards” in perspective



Source (SAIDI data): Council of European Energy Regulators, “Benchmarking Report 6.1 on Continuity of Electric and Gas Supply, Data Update 2015/2016” (26 July 2018)

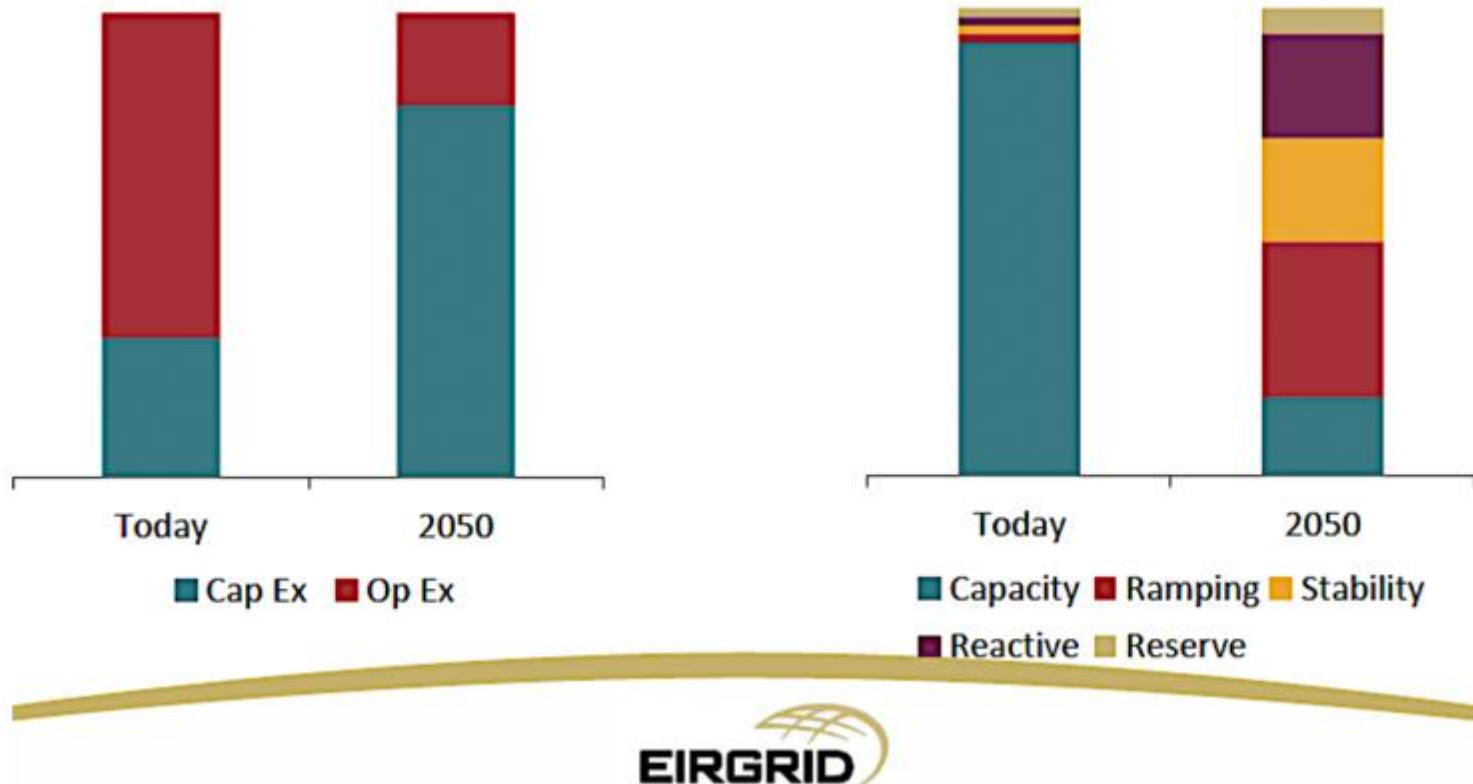
# A breakdown of US electric reliability

Share of total customer-hrs disrupted 2012-2016

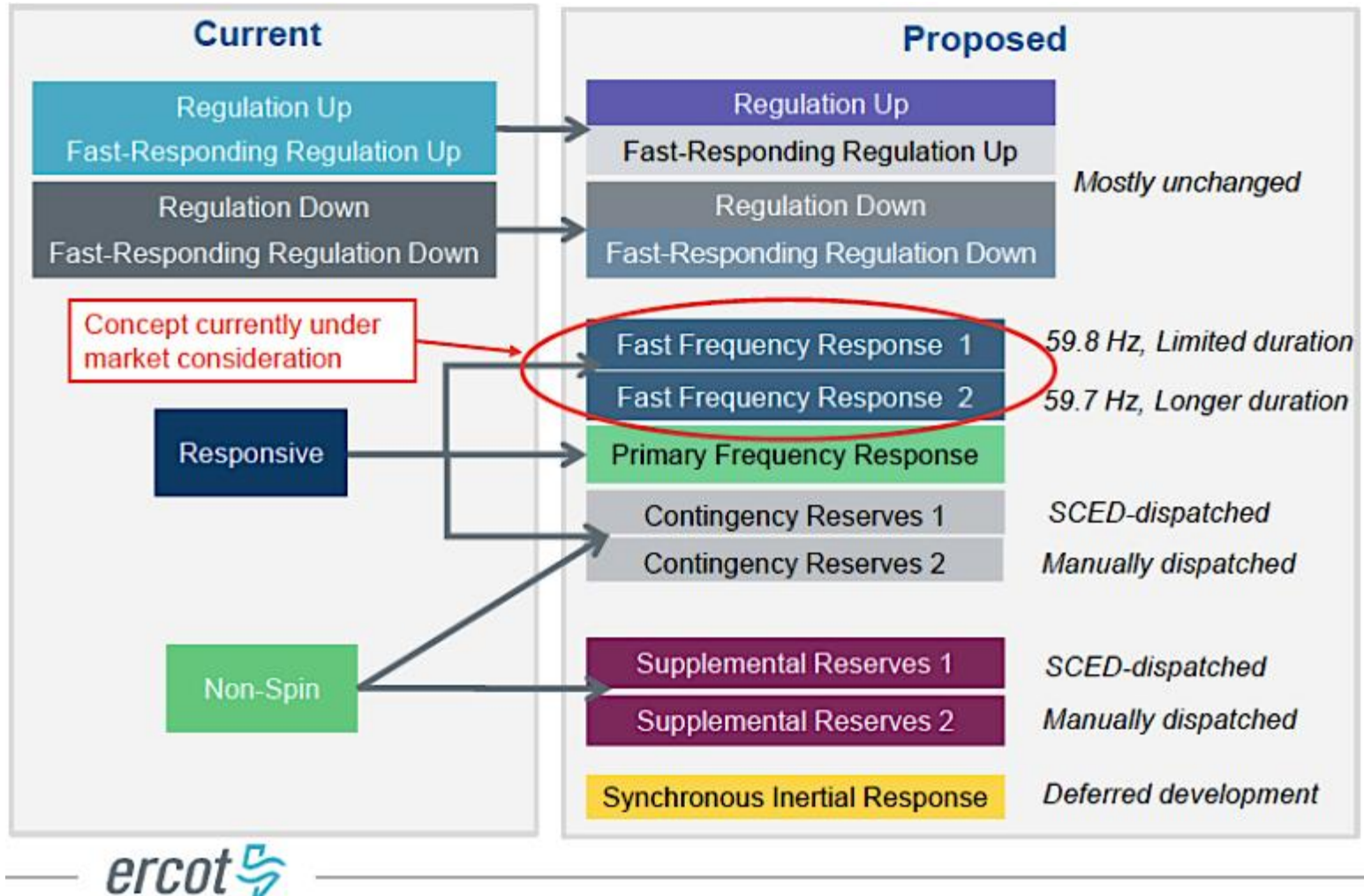


Sources: US Dept of Energy, US Energy Information Agency and analysis by Rhodium Group

# Focus is shifting to flexibility services



# Rapid evolution in reliability services

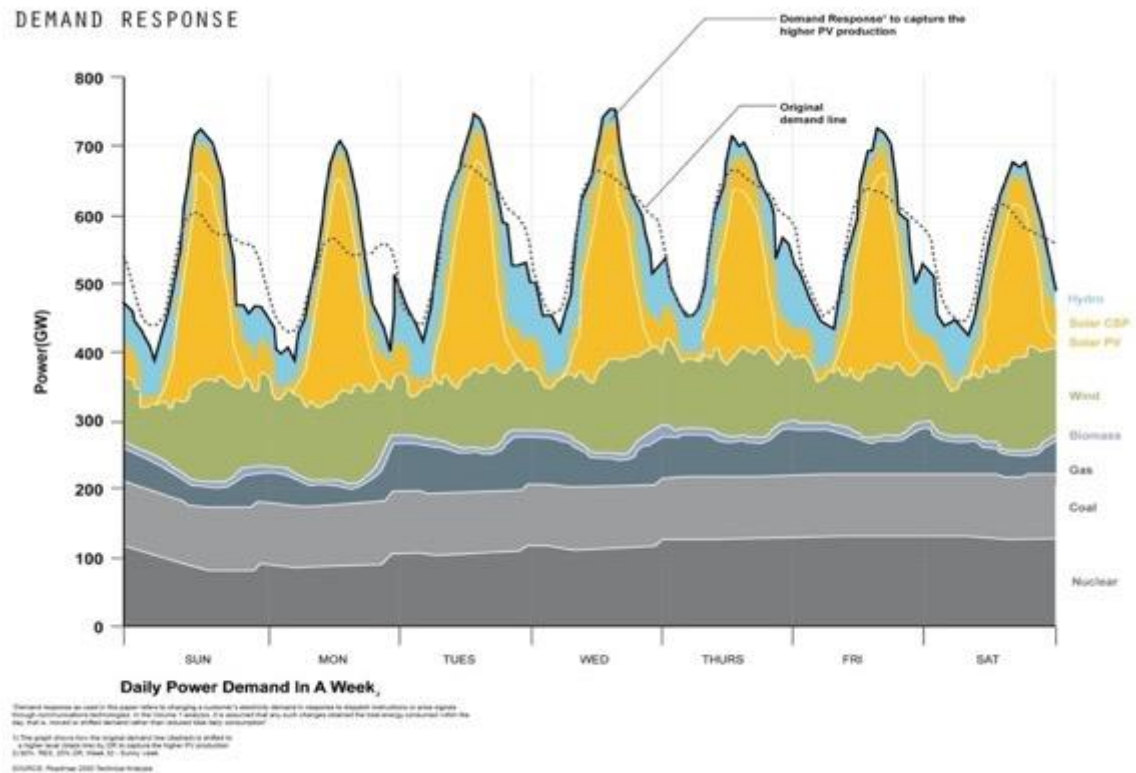




# New role for responsive demand

Moving from a world where we forecast load and schedule generation, to a world where we forecast generation and schedule load

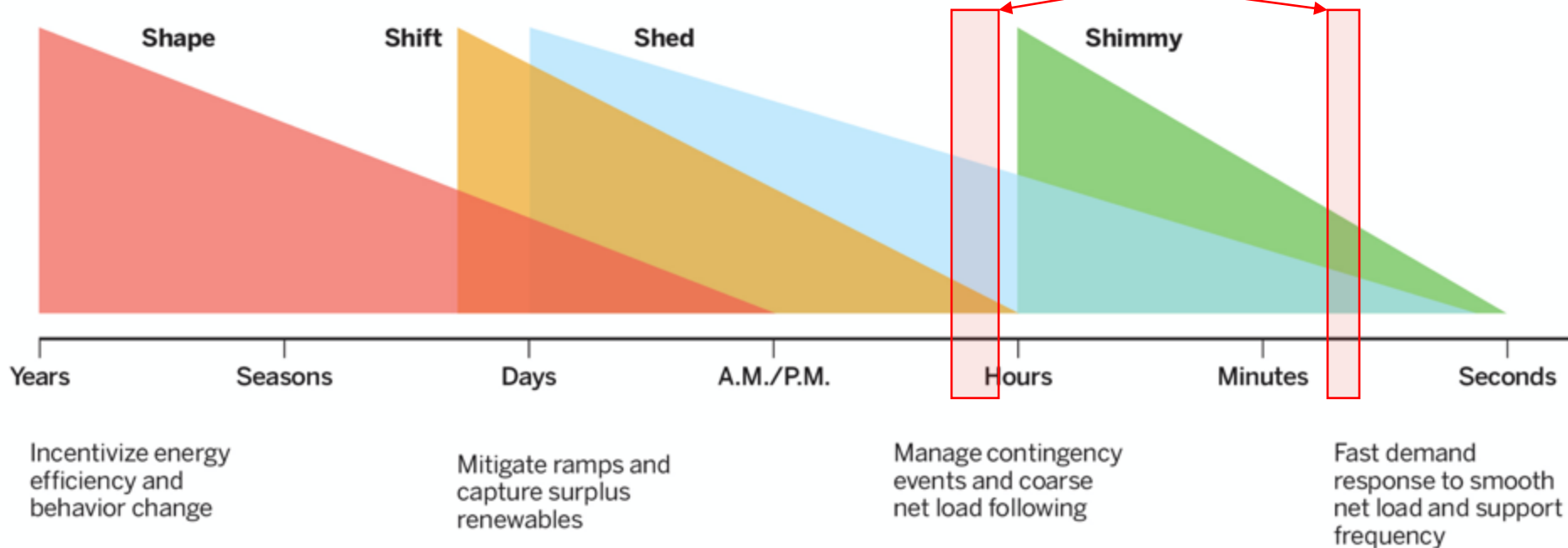
*will now need to shape, not just shave, demand*





# Wide range of demand potential...

## Flexibility strategies for the demand side



Source: Alstone, P., et al. (2017). *2025 California Demand Response Potential Study — Charting California's Demand Response Future: Final Report on Phase 2 Results*

# About RAP

The Regulatory Assistance Project (RAP)® is an independent, non-partisan, non-governmental organization dedicated to accelerating the transition to a clean, reliable, and efficient energy future.

Learn more about our work at [raponline.org](https://raponline.org)



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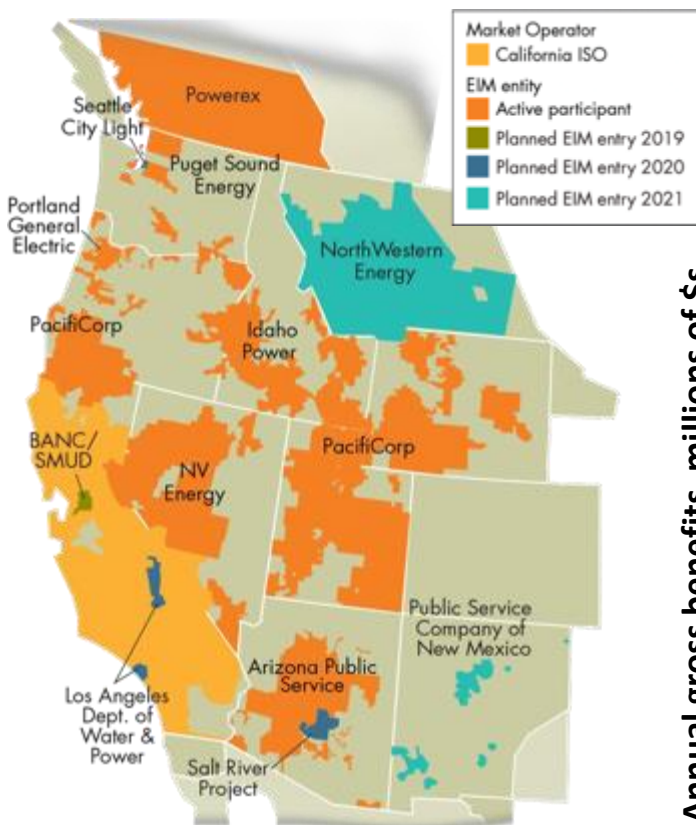
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United States

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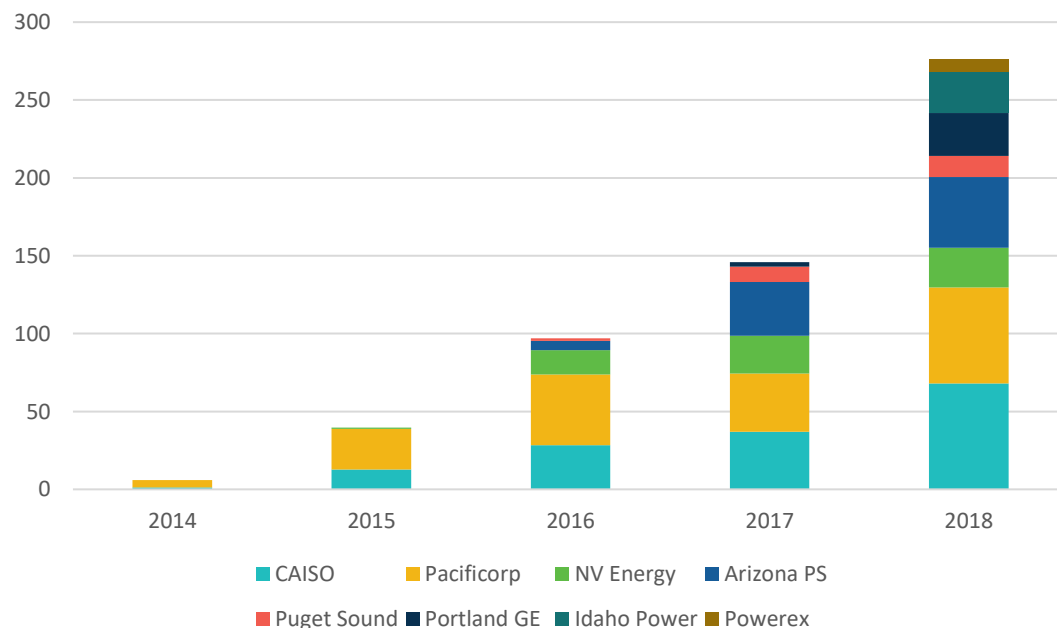
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Market Operator  
 California ISO  
 EIM entity  
 Active participant  
 Planned EIM entry 2019  
 Planned EIM entry 2020  
 Planned EIM entry 2021

# Create larger, faster markets



Annual gross benefits, millions of \$

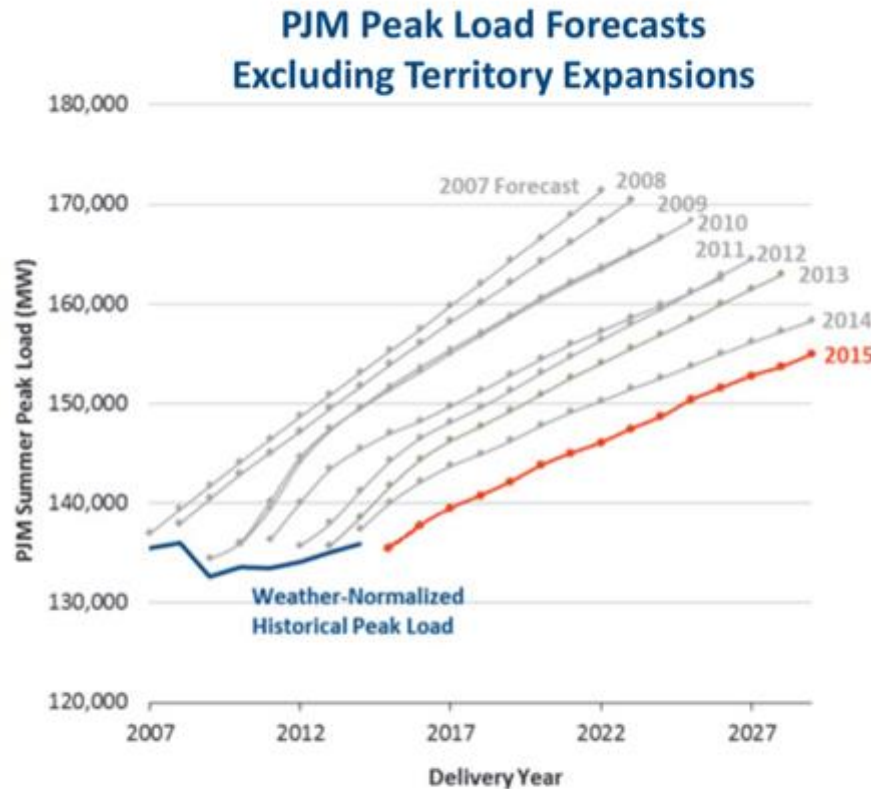


## The Western Energy Imbalance Market

# Limited market access under centralized procurement

	DR Service Product	California Market
Shed	Peak Capacity	System and Local RA Credit
	Economic DR	Economic DR / Proxy Demand Resource
	Contingency Reserve Capacity	AS- spinning
	Contingency Reserve Capacity	AS- non-spin reserves
	Emergency DR	Emergency DR / Reliability DR Resource
	DR for Distribution System	Distribution
Shift	Economic DR	Combination of Energy Market Participation
	Flexible Ramping Capacity	Flexible RA -- energy market participation w/ ramping response availability
Shimmy	Load Following	Flexible Ramping Product (similar)
	Regulating Reserve Capacity	AS- Regulation
Shape	Load modifying DR - Event-based	CPP
	Load Modifying DR - Load shaping	TOU

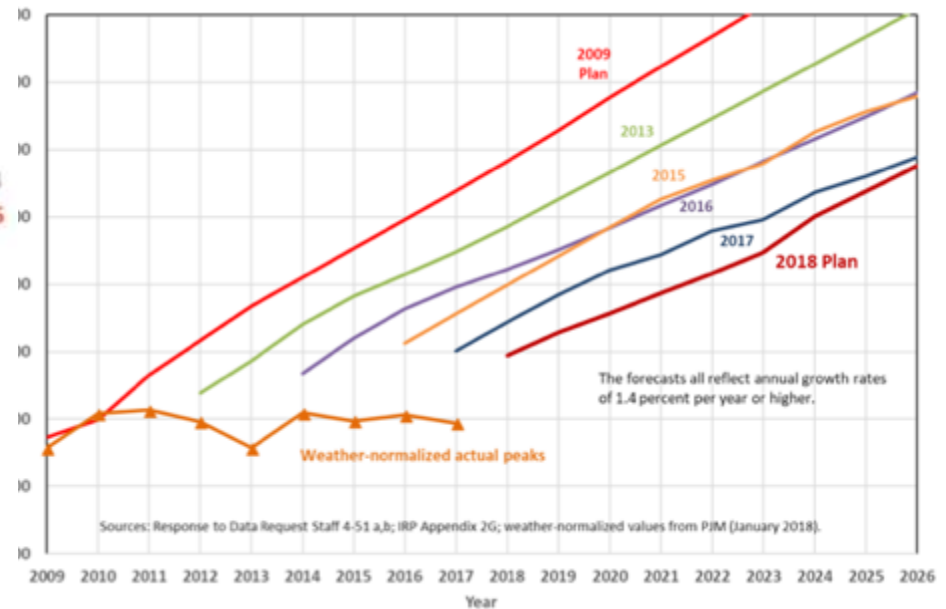
# Peak load forecasts



## Sources and Notes:

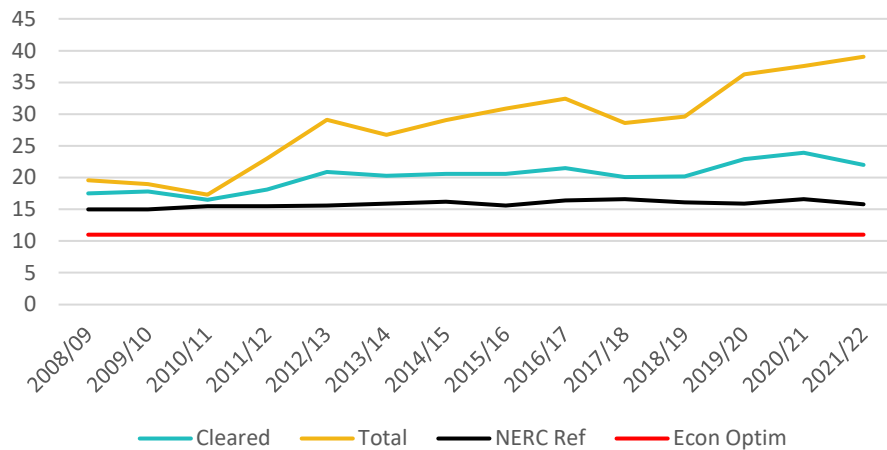
Data from PJM. Forecasts shown here exclude territory expansions in order to enable comparisons across time, thus current load forecast including all current PJM zones are substantially higher.

## Avista Energy



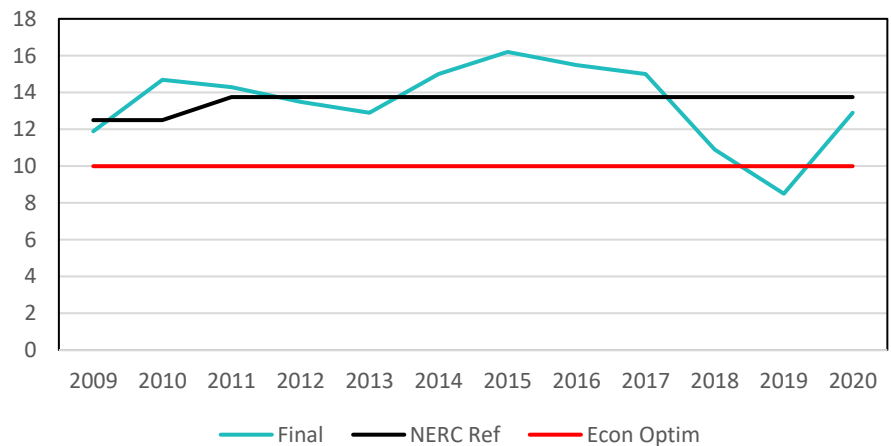
# Different investment patterns, different circumstances...

PJM Reserve Margins



Little load growth, negligible RES penetration

ERCOT reserve margins



High load growth, high RES penetration

## ...no difference in supply reliability