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IEA Workshop: Demand Response

3 July, 2014

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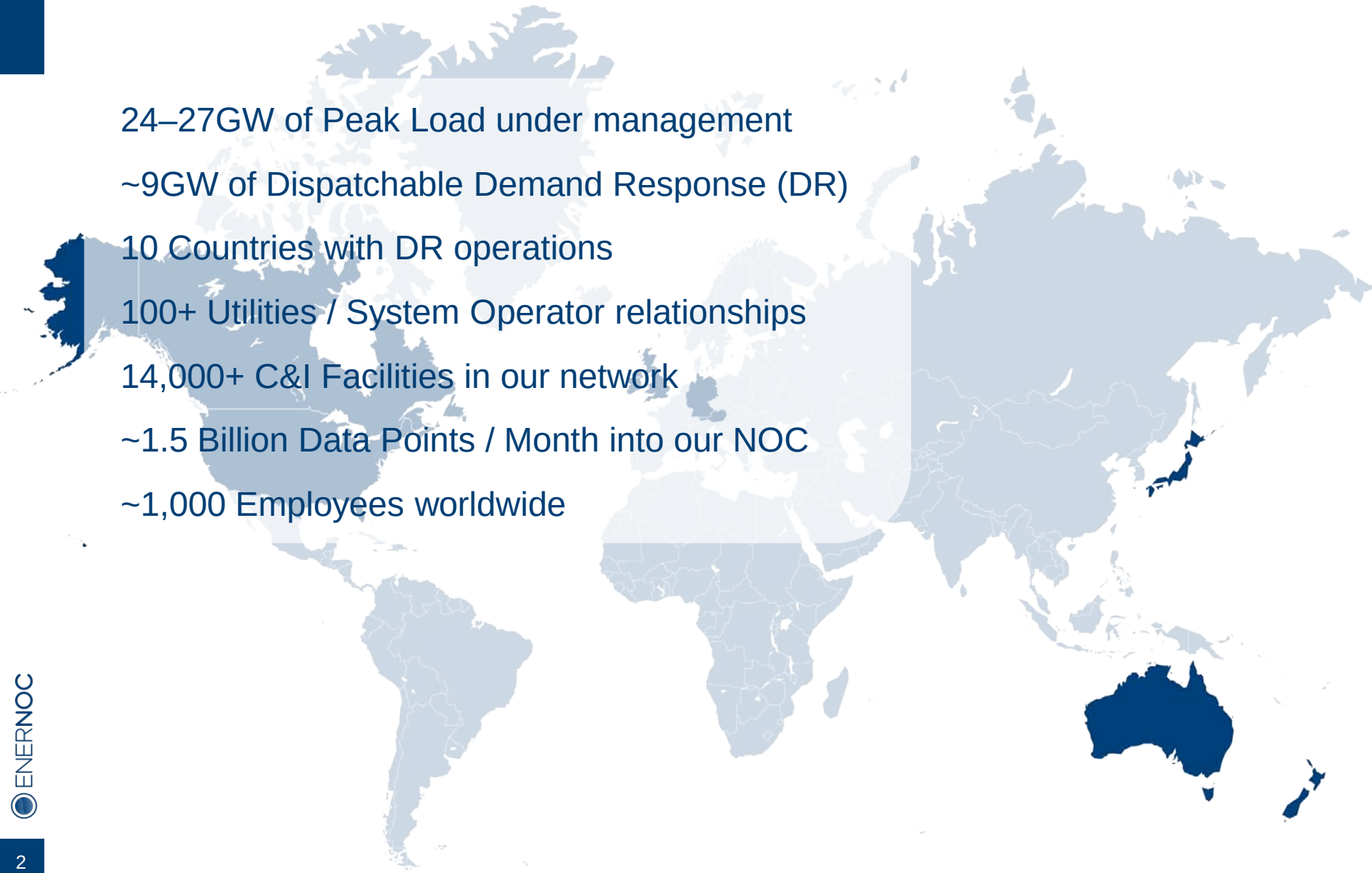


24–27GW of Peak Load under management

~9GW of Dispatchable Demand Response (DR)

10 Countries with DR operations

100+ Utilities / System Operator relationships

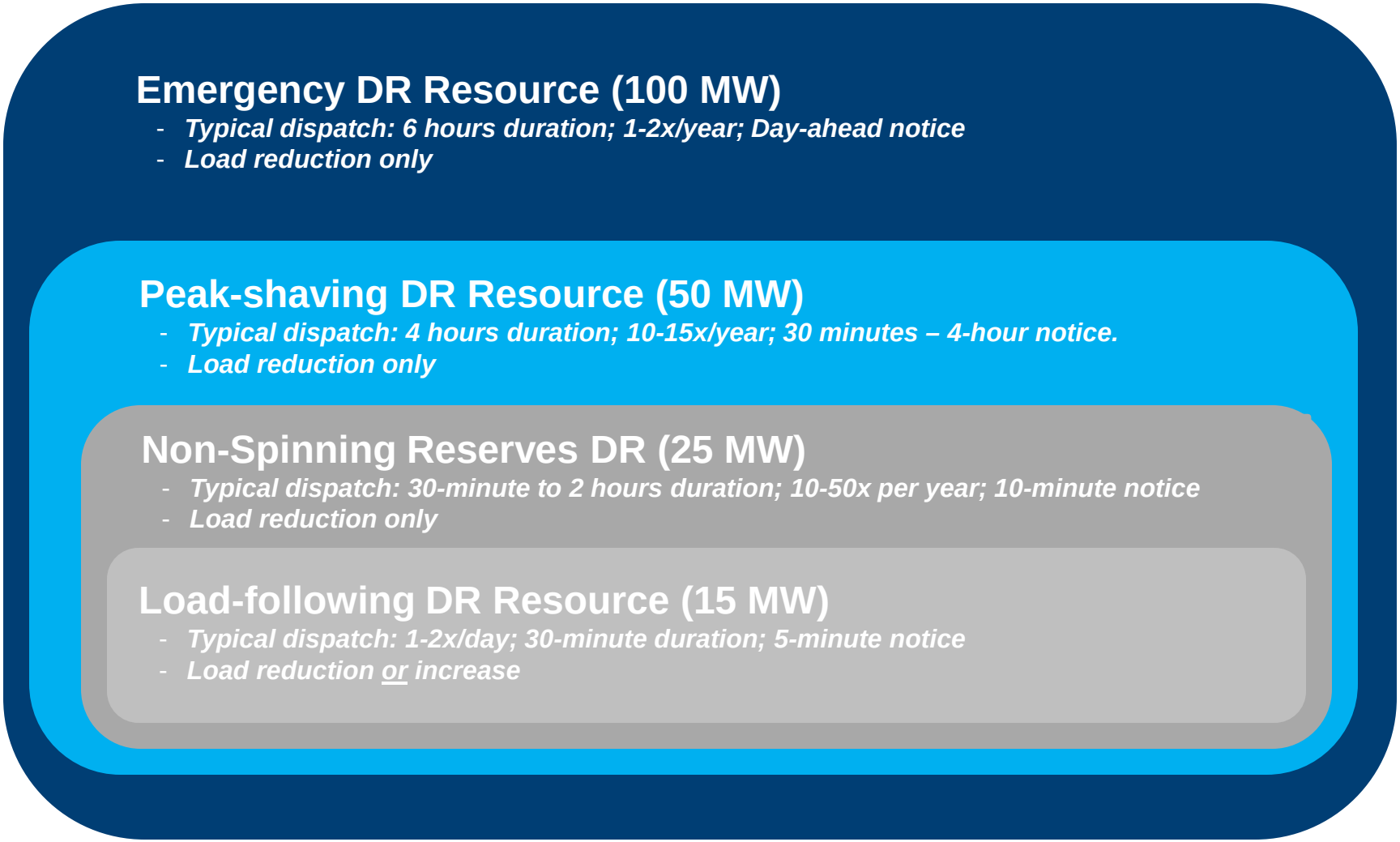
14,000+ C&I Facilities in our network

~1.5 Billion Data Points / Month into our NOC

~1,000 Employees worldwide

DR is a flexible system resource

The same participant is often capable of providing multiple grid services



DR in Global Capacity Markets

Given market access, DR has proven to be an important resource in capacity markets

Market	DR capacity	% of total
PJM	14,118 MW	8.6%
NYISO	2,248 MW	6.7%
ISO-NE	2,164 MW	7.4%
WEM	499 MW	8.2%

pjm

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Steven R. Herling
Vice President - Planning

August 28, 2012

Transmission Expansion Advisory Committee

Re: PJM Board of Manager Decision on MAPP and PATH

On August 24, 2012 the PJM Board of Managers met to consider the PJM staff recommendation to remove the MAPP and PATH projects from the Regional Transmission Expansion Plan (RTEP). PJM staff reviewed results of analyses showing reliability drivers no longer exist for the project throughout the 15-year planning cycle. The analyses incorporated the continued trends of decreasing customer load growth, increasing participation in demand response programs and the recent commitment of new generating capacity in eastern PJM.

The PJM Board of Managers considered the communication received from stakeholders, and results of the reliability analyses completed by staff and decided to terminate the MAPP and PATH projects and remove them from the RTEP effective immediately.

Sincerely,

Steven R. Herling
Vice President, Planning

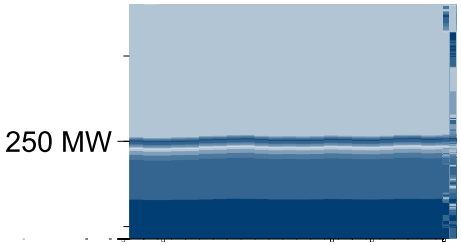
$11.8 Billion Saved

2013/14 BRA: Impact of DSM

PJM Market Monitor. Analysis of the 2013/2014 RPM Base Residual Auction Revised and Updated, September 2010
PJM 2014/15 Base Residual Auction Results, Doc #645284, page 9. 14,118.4 MW of DR Cleared in the RPM.
PJM 2014/15 RPM Base Residual Auction Parameters, Doc #631095, pg 2. Forecasted peak of 164,758 MW
NYISO's Demand Response Programs. Donna Pratt, Manager Demand Response Products. May 2011.
NYISO Press Release, 22 July 2011. Peak demand reached 33,454 MW on 21 July 2011.
Forward Capacity Auction 5 (FCA5, 2014-15) Results Summary, ISO New England, 2011.
ISO Installed Capacity Requirements, PAC Meeting. ISO New England, July 2011. Compares cleared FCA5 MW to the CELT 2011 Forecast 50/50 Peak of 29,380 MW for 2015 Year.
WA: Summary of Capacity Credits for the 2011 Reserve Capacity Cycle (October 2012-2013), IMO, Sep 2011
WA: Ibid. Compares cleared DSM capacity to the Reserve Capacity Requirement of 5,312 MW.

DR in Ancillary Services Markets

Given market access, DR has proven to be an important A/S resource



New Zealand Instantaneous Reserves

DR now provides 20%+ of the reserve, increasing competition, reducing costs

DR responds faster than generation, potentially reducing reserve requirement

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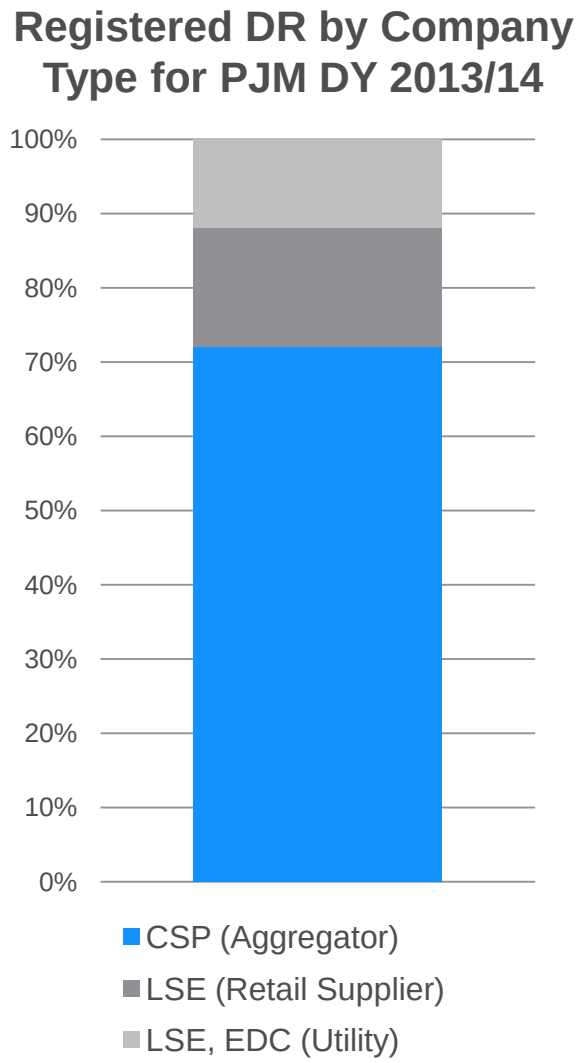
Data: 1 second meter data from 79 devices which responded to North Island UFE on 9 Dec 2011.

Markets need to be open to 3rd parties for DR to thrive

In existing DR markets, 3rd parties provide the majority of DR resources

- Open access enables a variety of business models
- Specialists find DR more efficiently than utilities
- DR is not a utility's core business focus
- Retailers are limited by contractual churn (and potentially trading considerations)
- DSOs are limited by their regulatory construct, organizational inertia
- Competition leads to a better deal for participants
- **Allowing customers to do DR independently of their retailer while ensuring retailers are unaffected is a solved (and solvable) problem**



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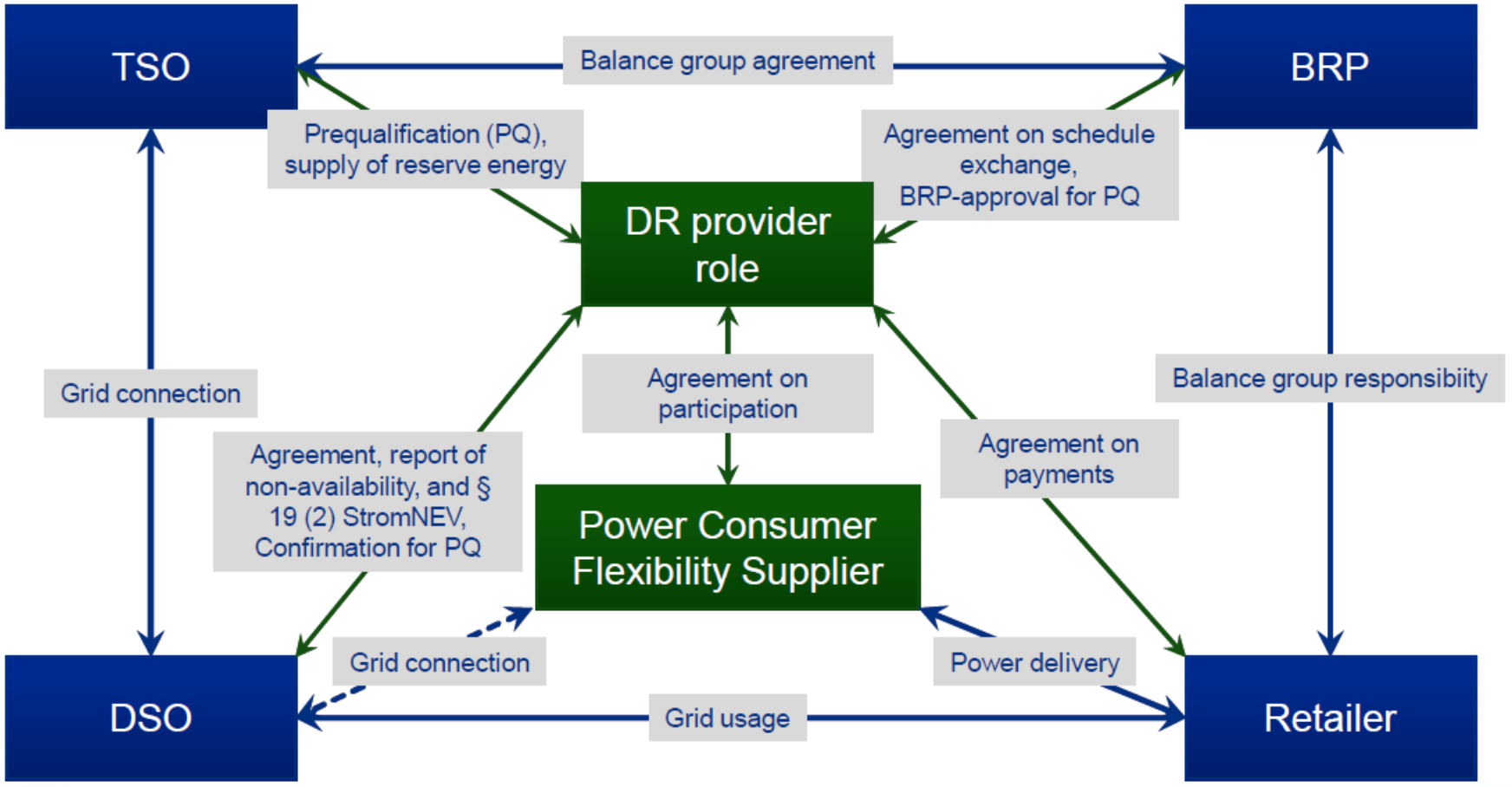
Markets need to be open to 3rd parties for DR to thrive

Reconciling 3rd party access with the BRP regime is the #1 issue for DR in Europe

Building DR Resources as a 3rd-party in Germany's Balancing Markets



Availability payments are crucial for DR success

Availability payments help overcome many real-world issues with decision-making

Decisions are hard. It is generally easier to do what you did yesterday

Electricity is typically a relatively small cost of doing business

DR participation requires significant up-front investment

- Technology
- Decision-making

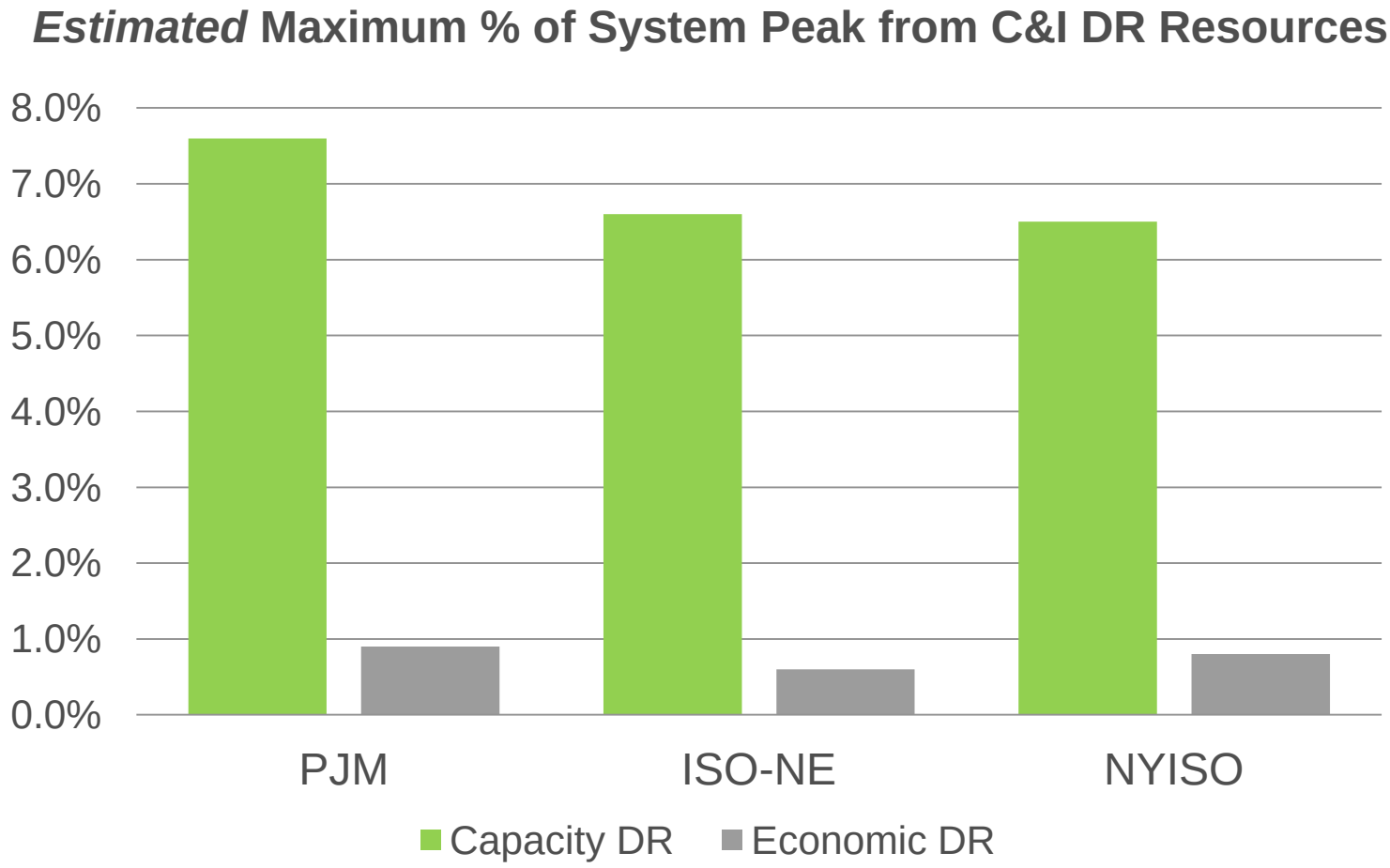
The benefits that accrue from DR are both in the future and uncertain

- Customers have very high discount rates for energy investments (see: EE)
- Customers want an asymmetric risk equation

Availability payments guarantee that participants start out ahead, and they guarantee an ongoing return to those participants

Availability payments are crucial for DR success

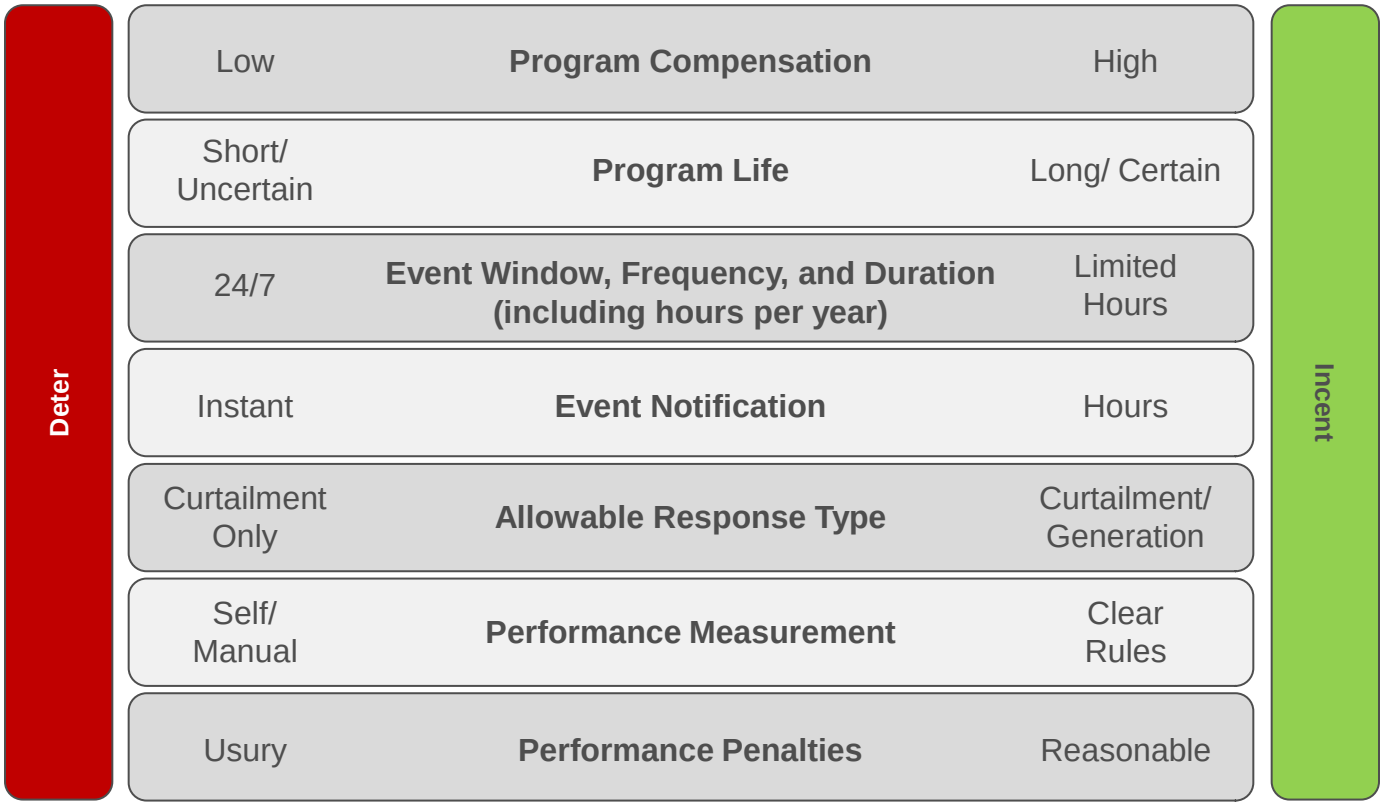
Market data confirms that availability payments are key to customer participation



Source: Reports to FERC and/or stakeholder meetings

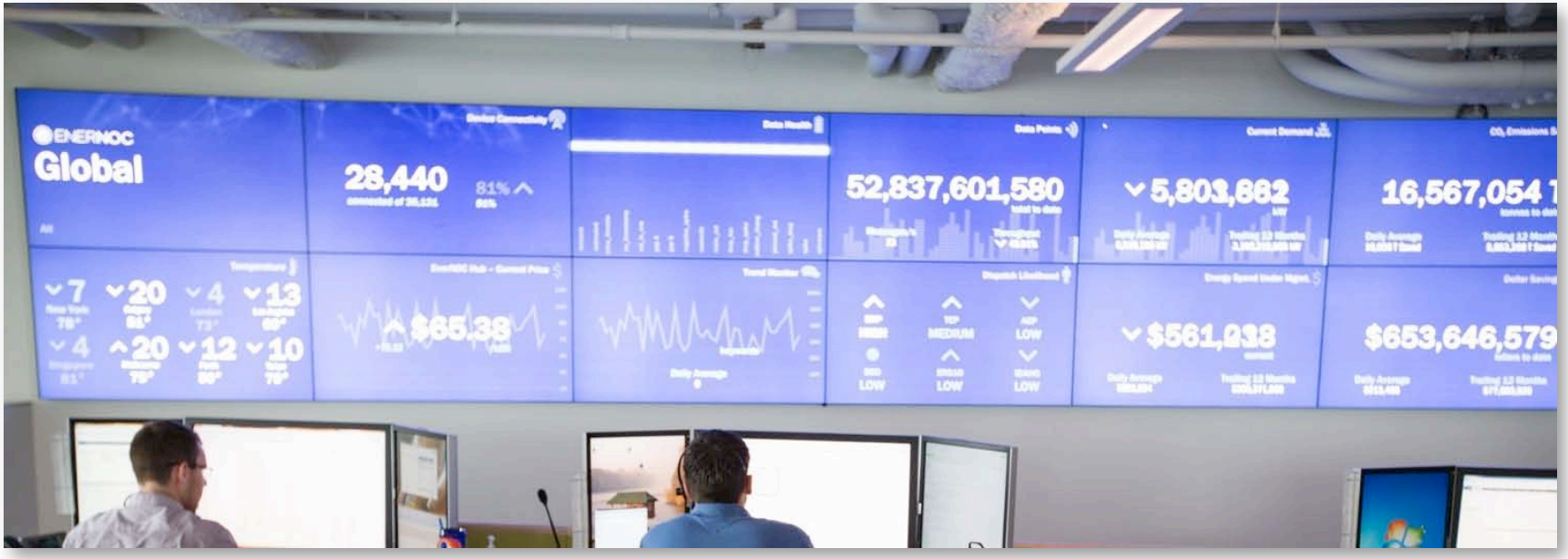
Designing a Demand Response Program

Each program design element needs to be carefully chosen to balance system needs with the need to incent customer program participation.



- Design DR for system needs, not exact equivalence with supply-side resources
- DR should be valued based on the avoided costs it delivers to the system

Thank You



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