

North American Demand Response Models

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Bogotá Colombia

Scott Coe

GRID *OPTIMIZE*

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Load Management Expertise

Leverage practical experience to address evolving industry needs.

Peer-to-Peer Engagement

PLMA brings members together to develop, implement and share proven practices.

Linking Strategy and Implementation

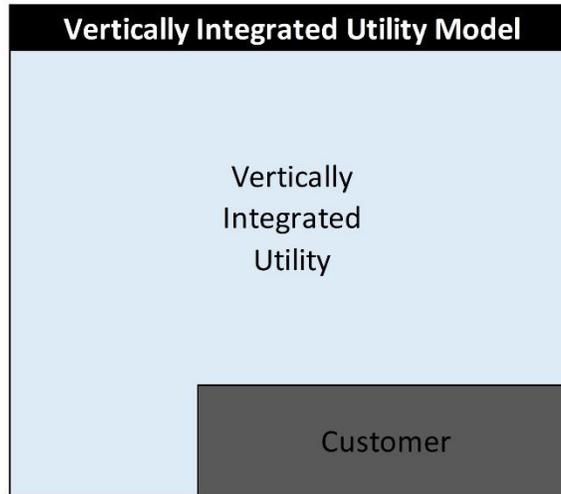
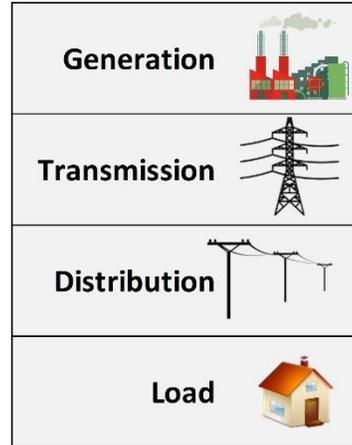
Help enhance connections between energy thought leaders, strategists and practitioners.

International Interest Group

For PLMA members interested in learning more about innovation outside North America and to provide tailored content for our members from outside of North America



Deregulation Models



DR Program Options

Today's Focus

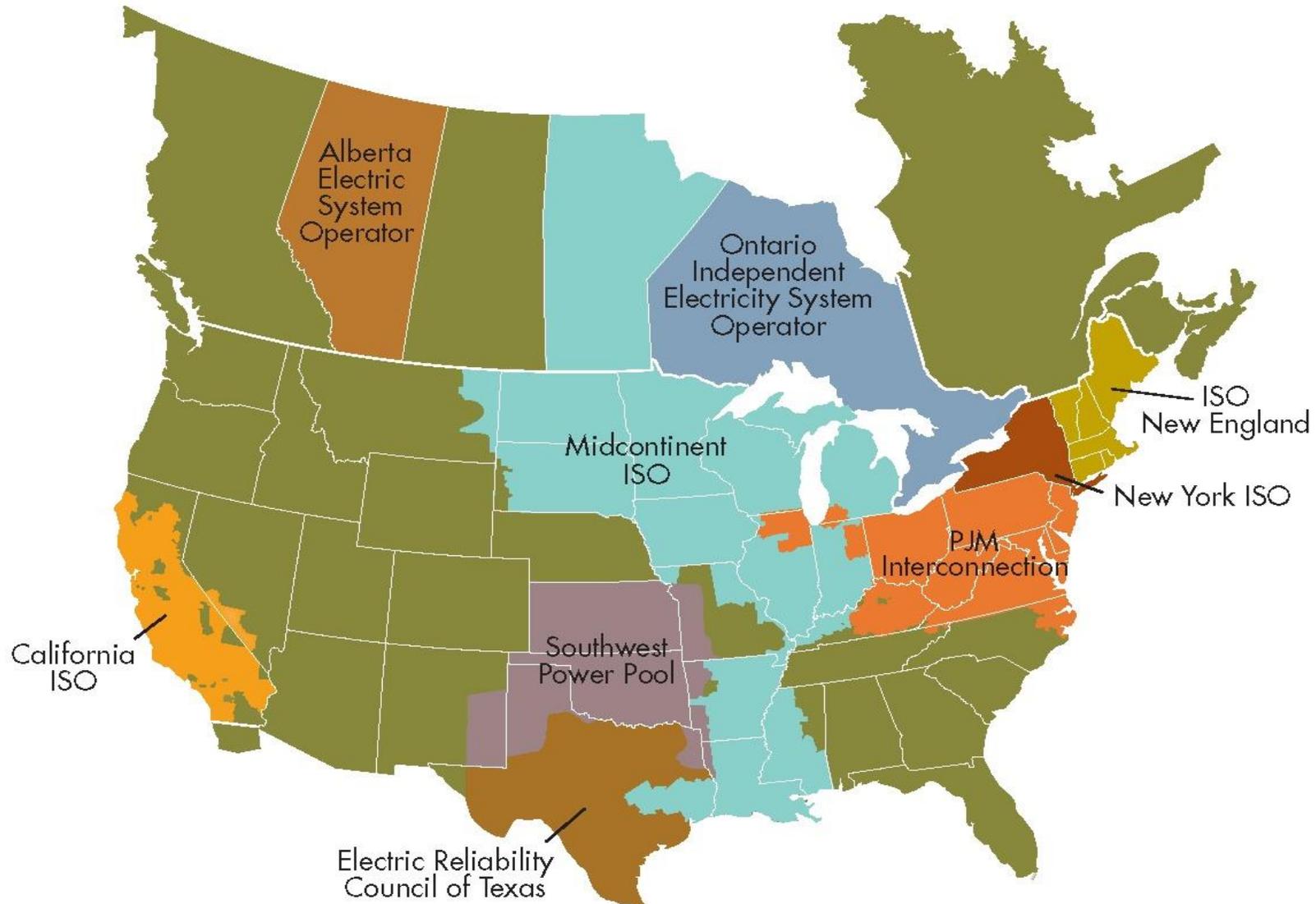
Financial Risk 	Own Assets 	Operate Assets 
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Generation	
Transmission	
Distribution	
Load	

Generation Company		Independent System Operator (ISO)
T Transmission Owner (TO)	M	
D Distribution System Operator (DSO)		
R Energy Retailer	A Customer	

- M** Market Operators (ISOs) allow DR to compete against traditional generation supply
- T** TO purchases DR services to manage transmission issues
- D** DSO purchases DR services to manage distribution issues
- R** Energy Retailer credits customers for providing DR services as a procurement hedge
- A** Aggregator acts as broker for customers to provide service in any of the above scenarios

North American ISOs & RTOs



Retail DR versus Wholesale DR

Retail DR

- Distribution System Operator (DSO) operate unique DR programs
- Each program has constraints, e.g. event duration, maximum calls per year
- Revenues fixed to contract terms
- Each DR resource is effectively competing with other DR resources

Wholesale DR

- ISO/RTO facilitate the wholesale markets
- Market rules are not altered for demand response
- Revenues fluctuate with market prices
- Participation levels directly related to DR offer prices
- DR competes with all other sources, most importantly traditional generation

Benefits of Retail DR

“Natural” Configuration

- Wholesale market are generally for bulk-power resources, not distribution resources
- DSOs can use local resources more strategically, based on location

“Implicit” Demand Response

- Resource can manage peak loads to minimize capacity charges
- Energy retailers can use demand response as a hedge for energy purchases

Benefits of Wholesale DR

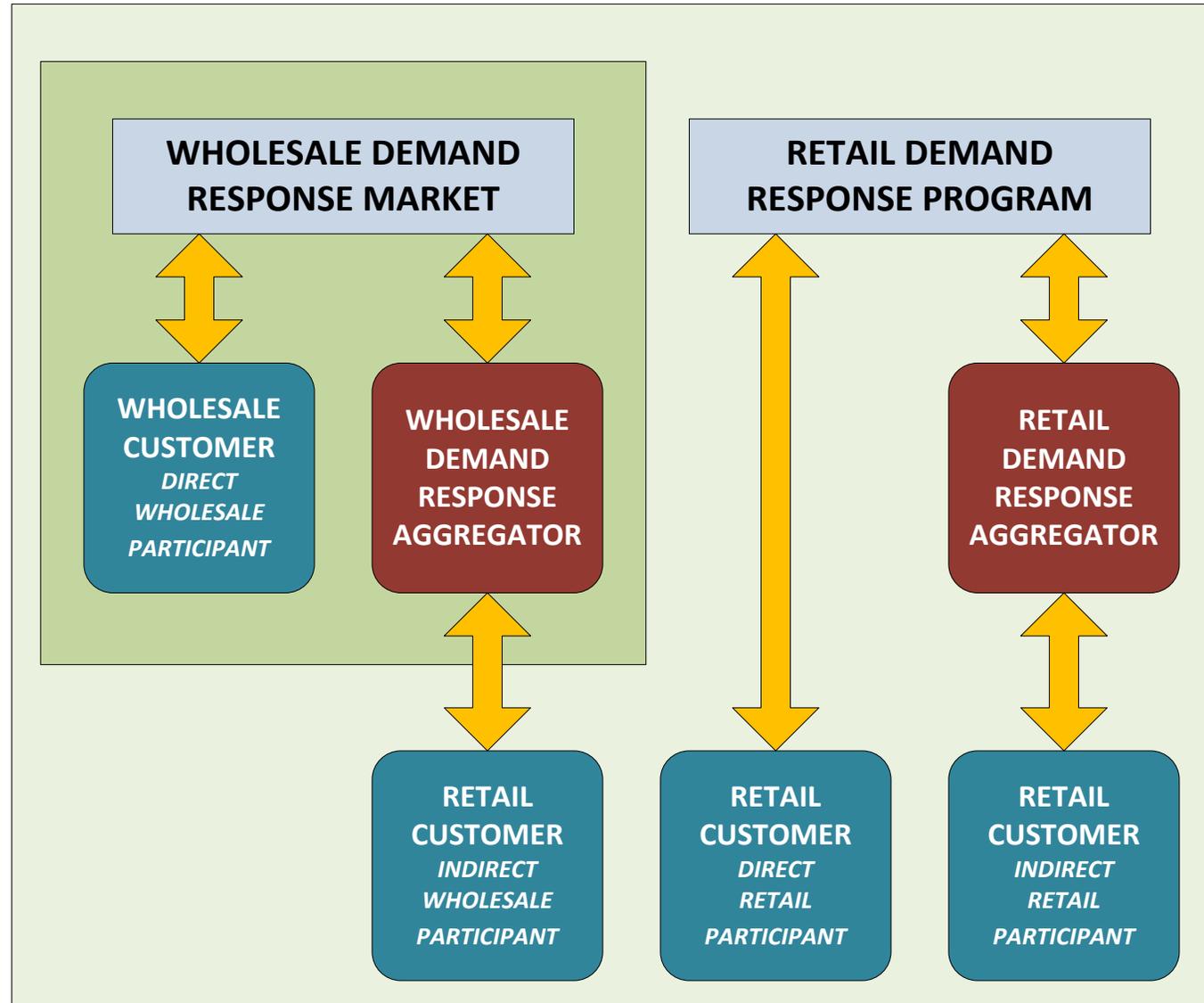
Economic Foundation

- DR value set by markets, not by contractual terms
- Transparent pricing, including historical and forward prices
- Energy, capacity, and ancillary services are available

Level Playing Field

- Economics and reliability requirements are defined
- All resources compete equally based on offer price
- Settlement rules established

Wholesale / Retail Overlap



“Standard” Market Design

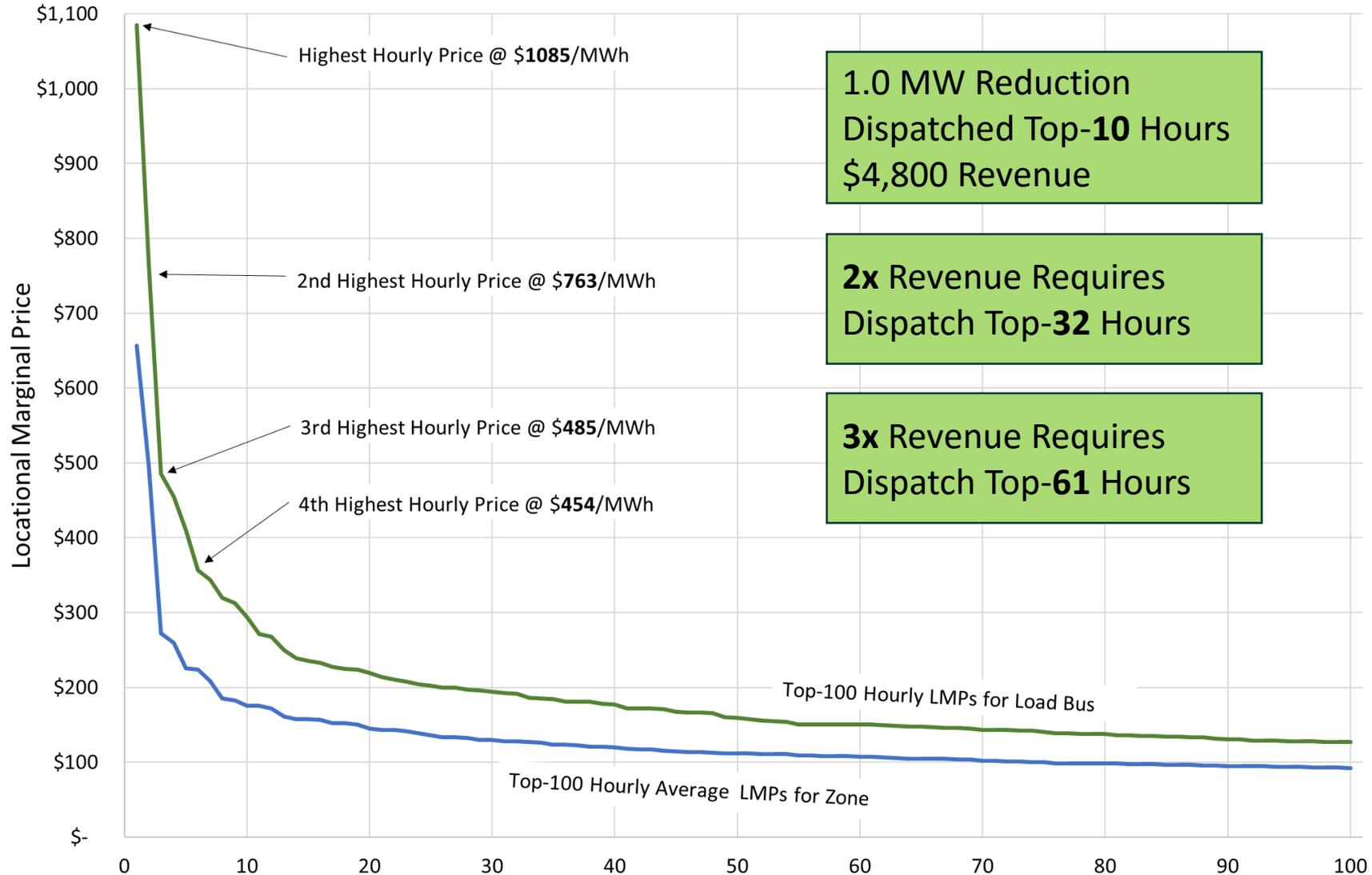
Commodities

- Energy
- Ancillary Services
 - Regulation Service
 - 10-Minute Reserve
 - 30-Minute Reserve
- Capacity
 - Forward Generation Capacity

Timeframes

- Long-Term Forward
 - Years
 - Months
- Short Term Forward
 - Day-Ahead
 - Hour-Ahead
- Near Real-Time

Higher Peaks = Higher Return-on-Investment



Active versus Stand-By

Active Demand Response

Paid To Change Energy Consumption

- Real-Time Energy Market
- Day-Ahead Energy Market
- Up/Down Regulation Market (Automatic Generation Control)

Stand-By Demand Response

Paid To Be Available To Change Consumption

- Emergency Response
- 30-Minute Reserve Market aka “Non-Spinning Reserve”
- 10-Minute Reserve Market aka “Spinning Reserve”
- Capacity Market Award Availability

Active versus Stand-By

Active Demand Response

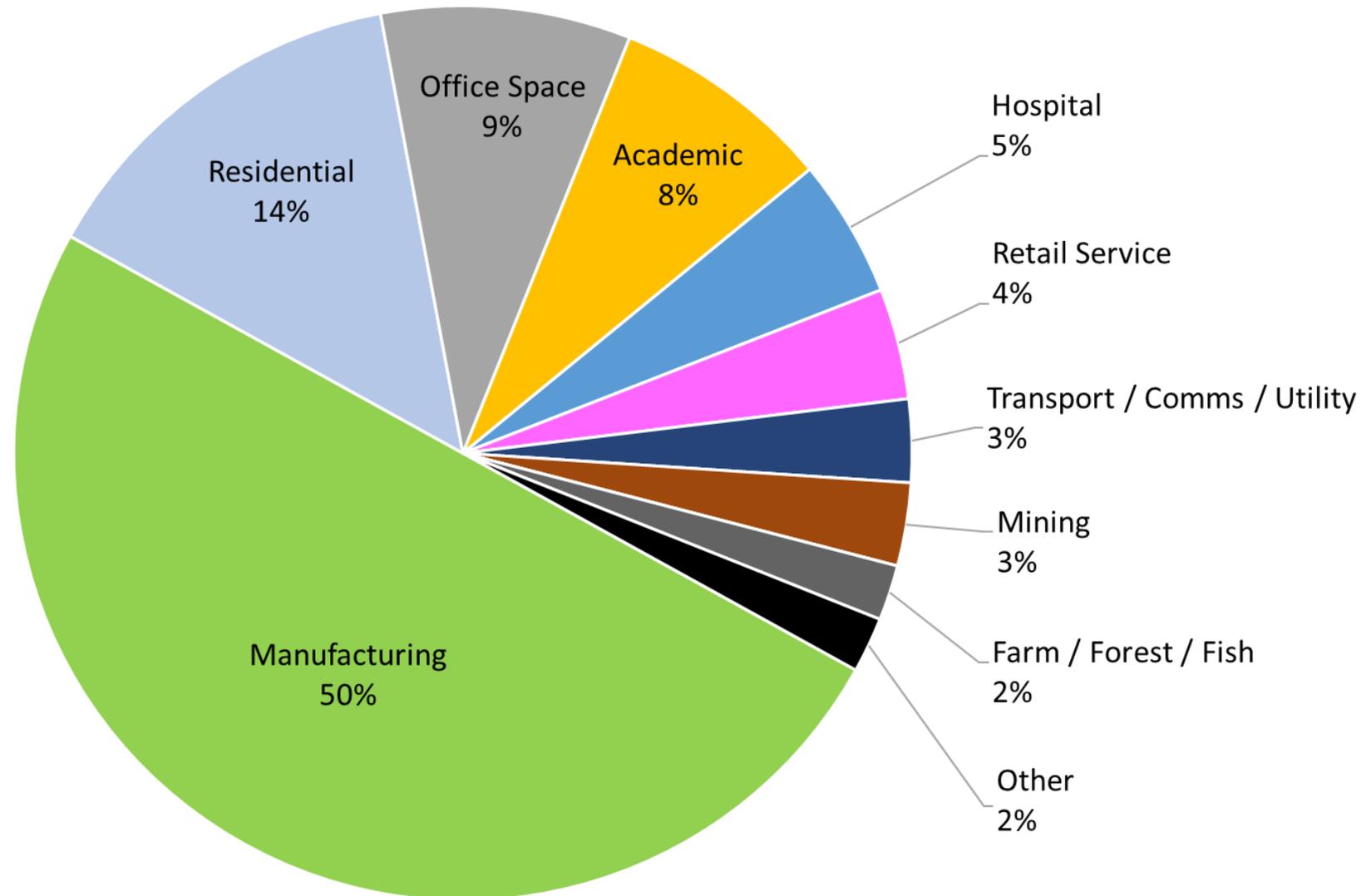
- Economic Foundation
- Price Trigger
- Dispatch 50-200 Hours/Year

Stand-By Demand Response

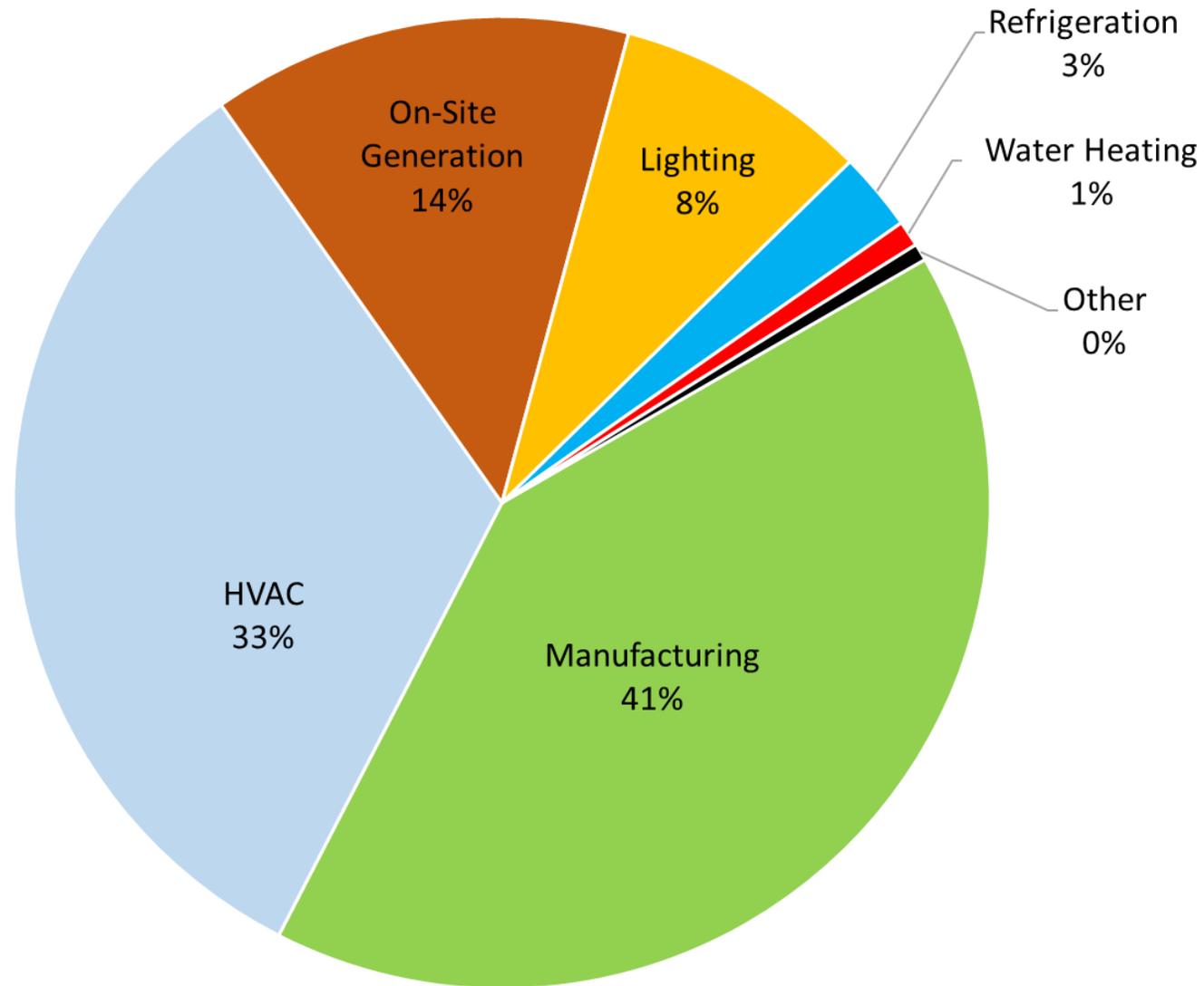
- Reliability Foundation
- Still economically selected
- Dispatch <50 Hours Year
- Revenue from many hours



Typical Participation By Customer Segment

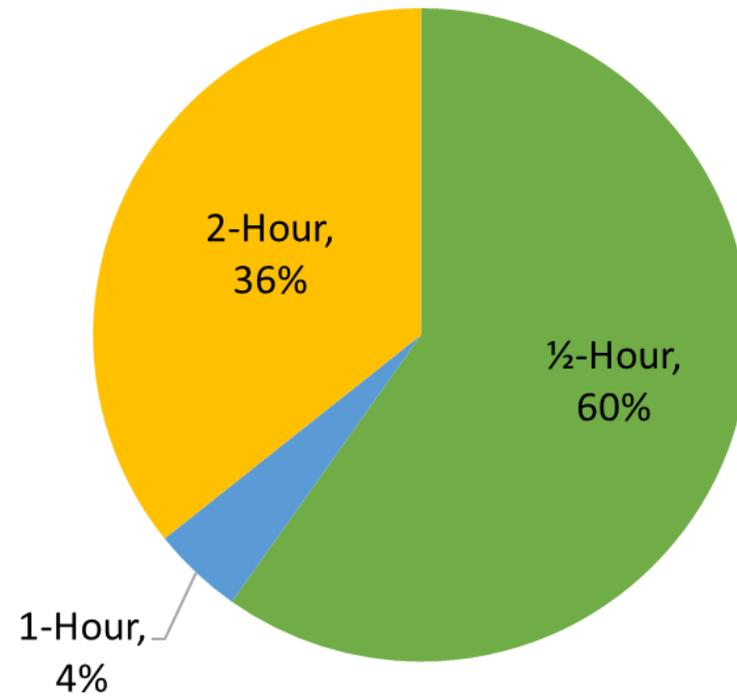


Typical Participation By Resource Type

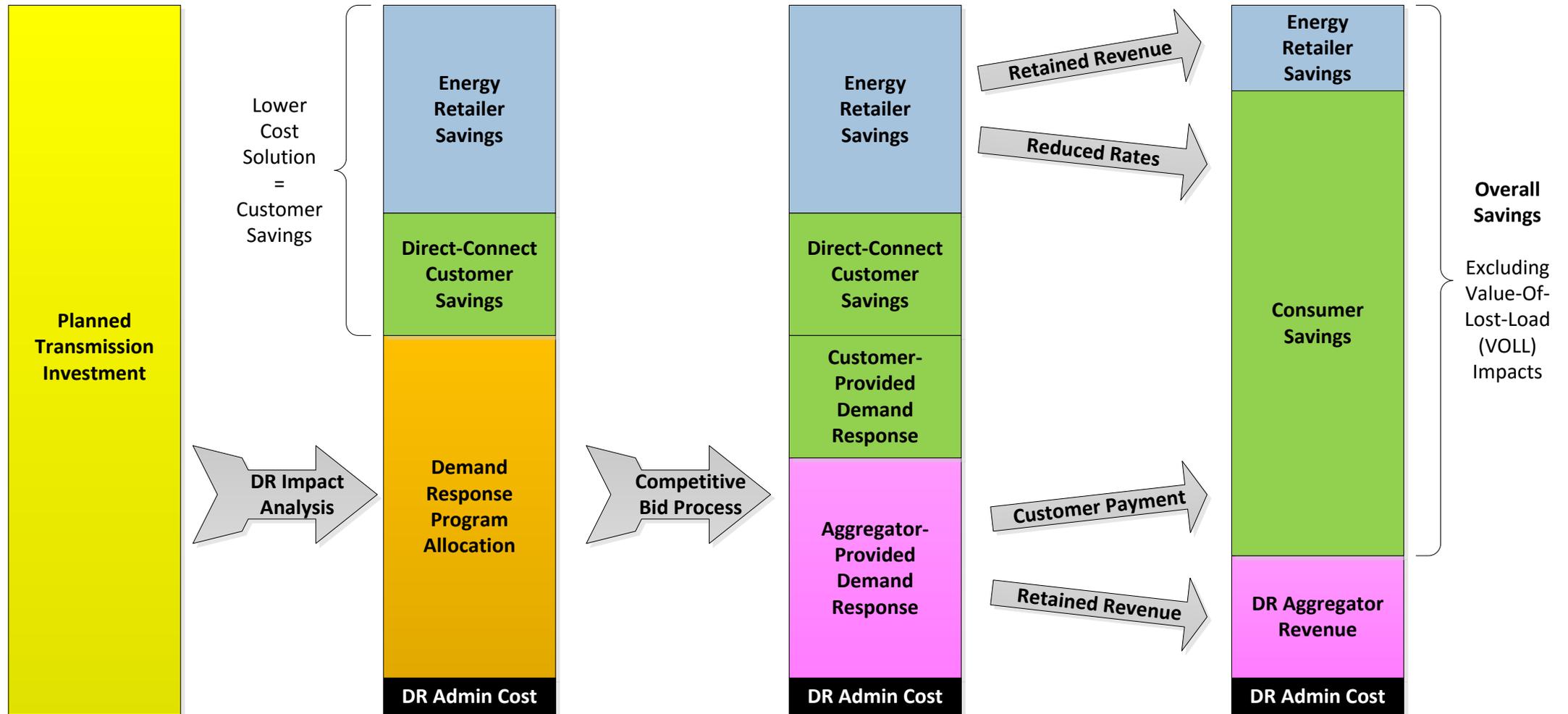


Typical Participation By Lead-Time

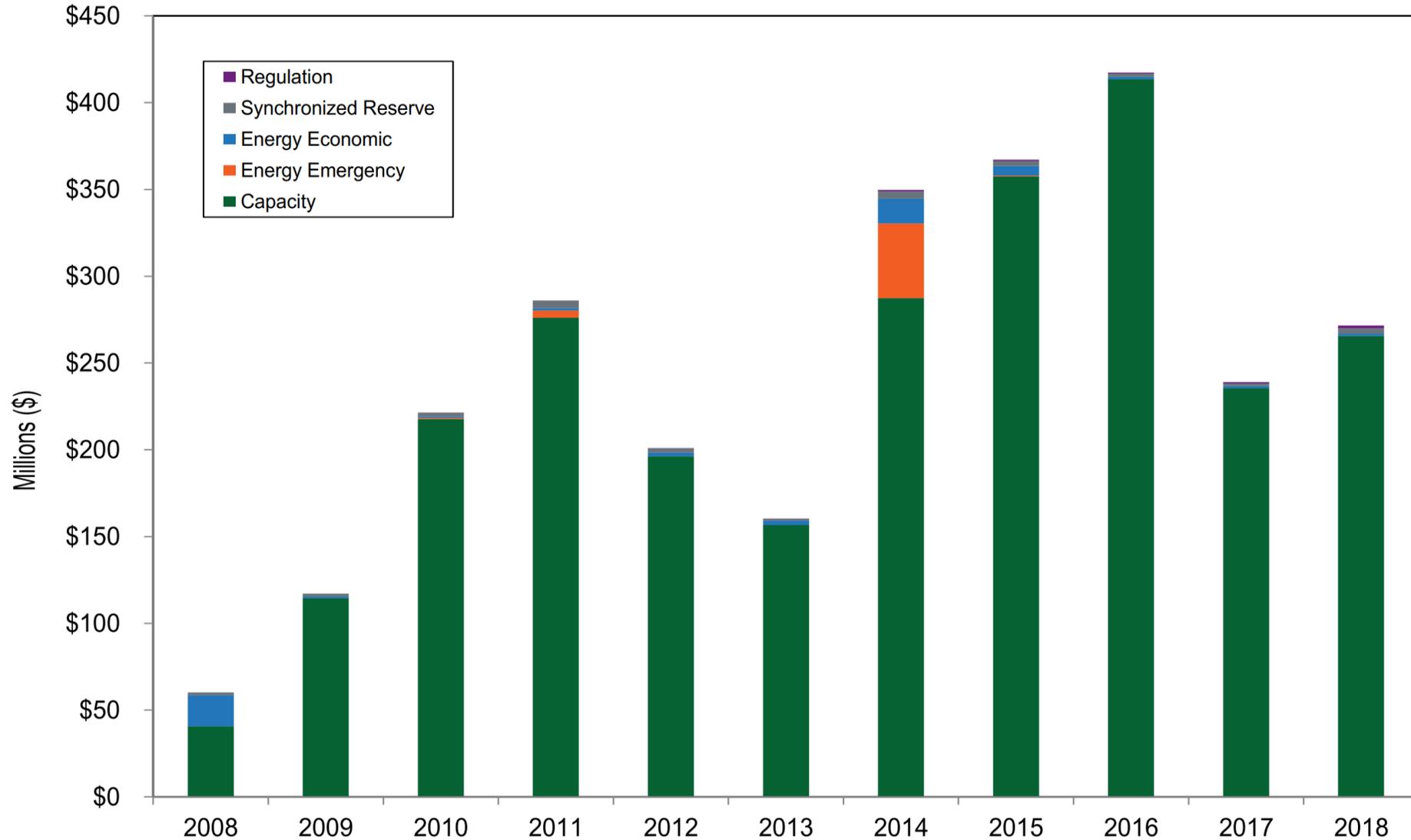
Emergency Demand Response Minimum Lead-Time



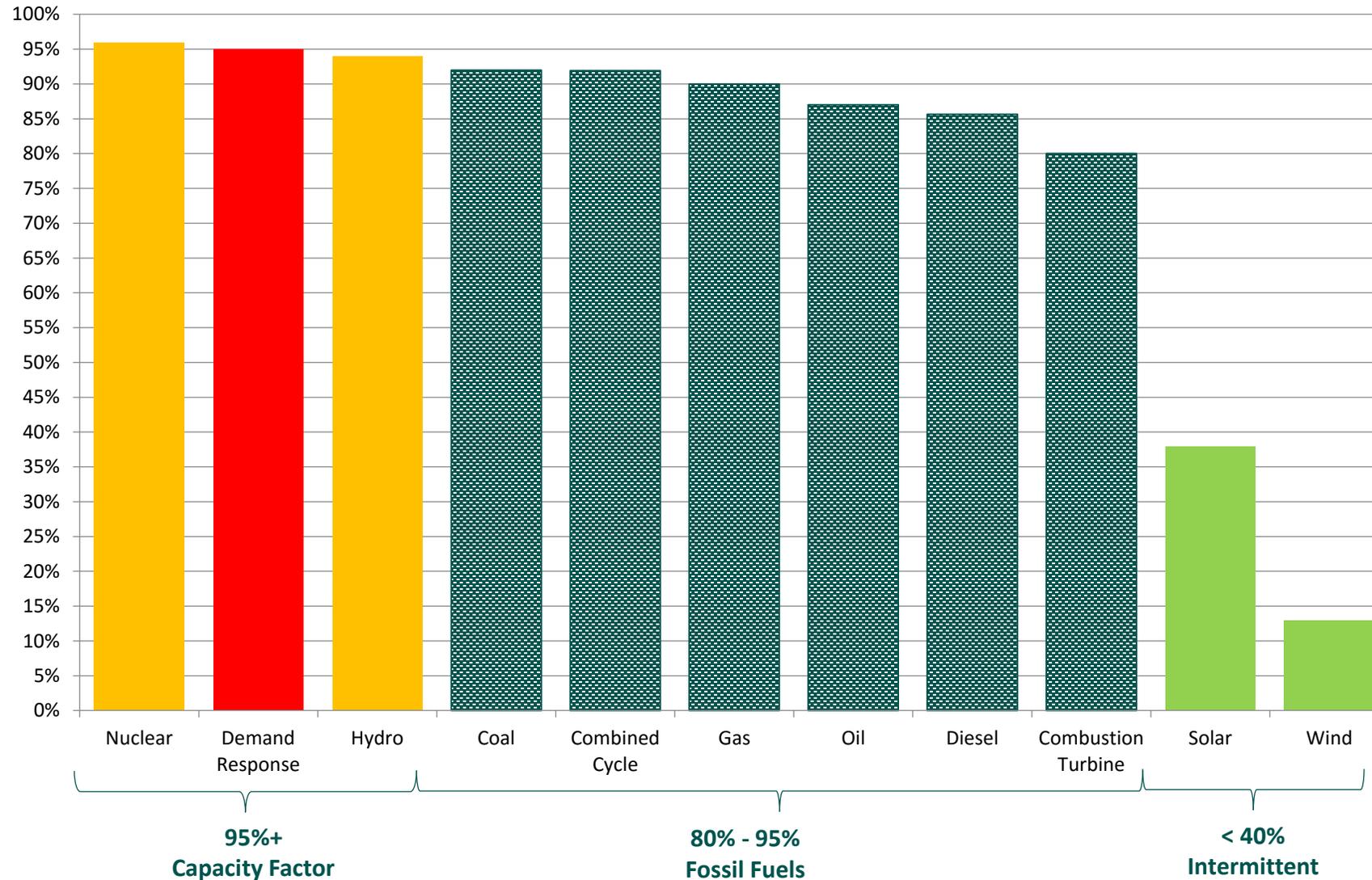
Demand Response Revenue Allocations



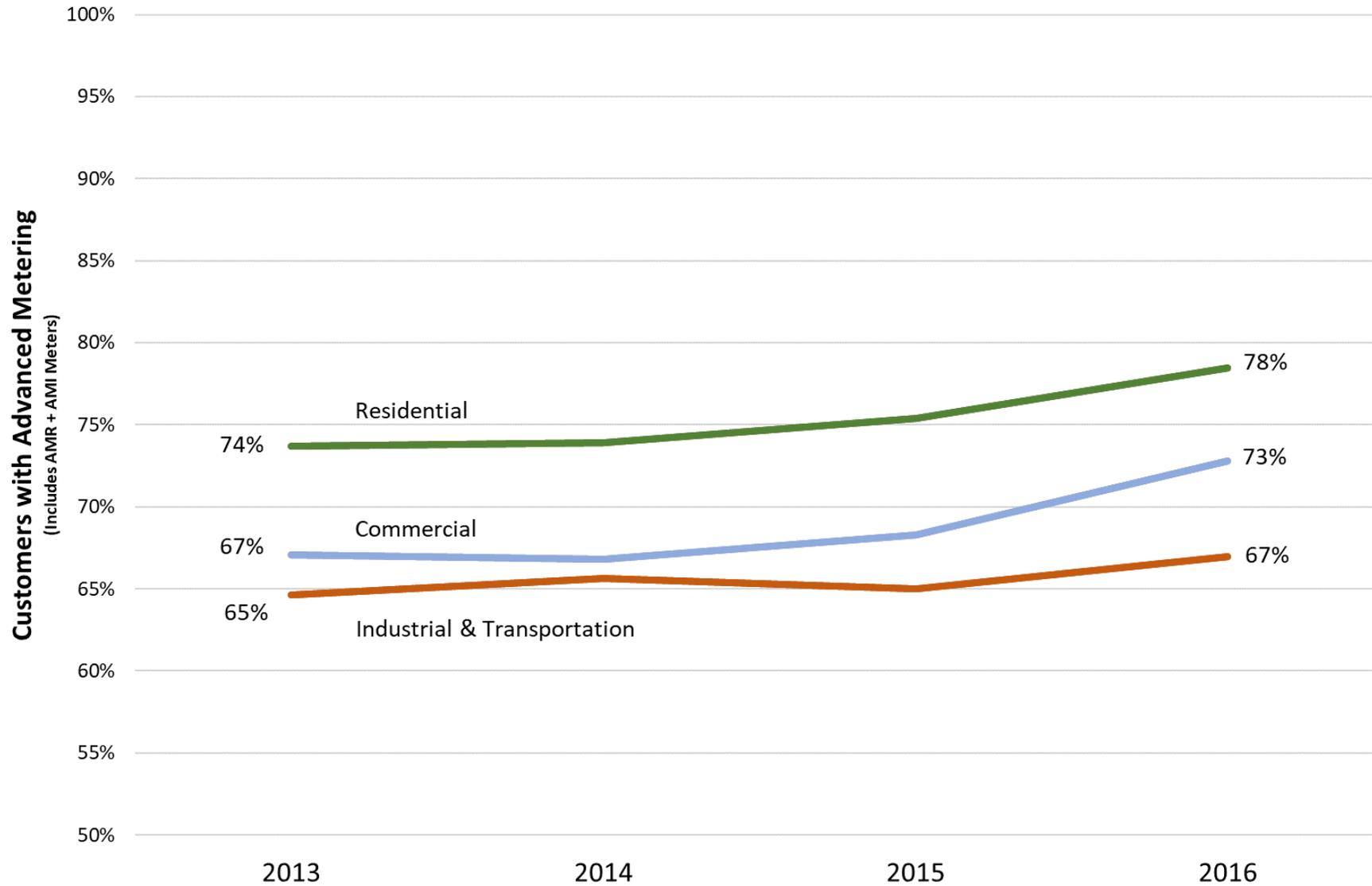
Given The Options: Customers Pick Capacity Market



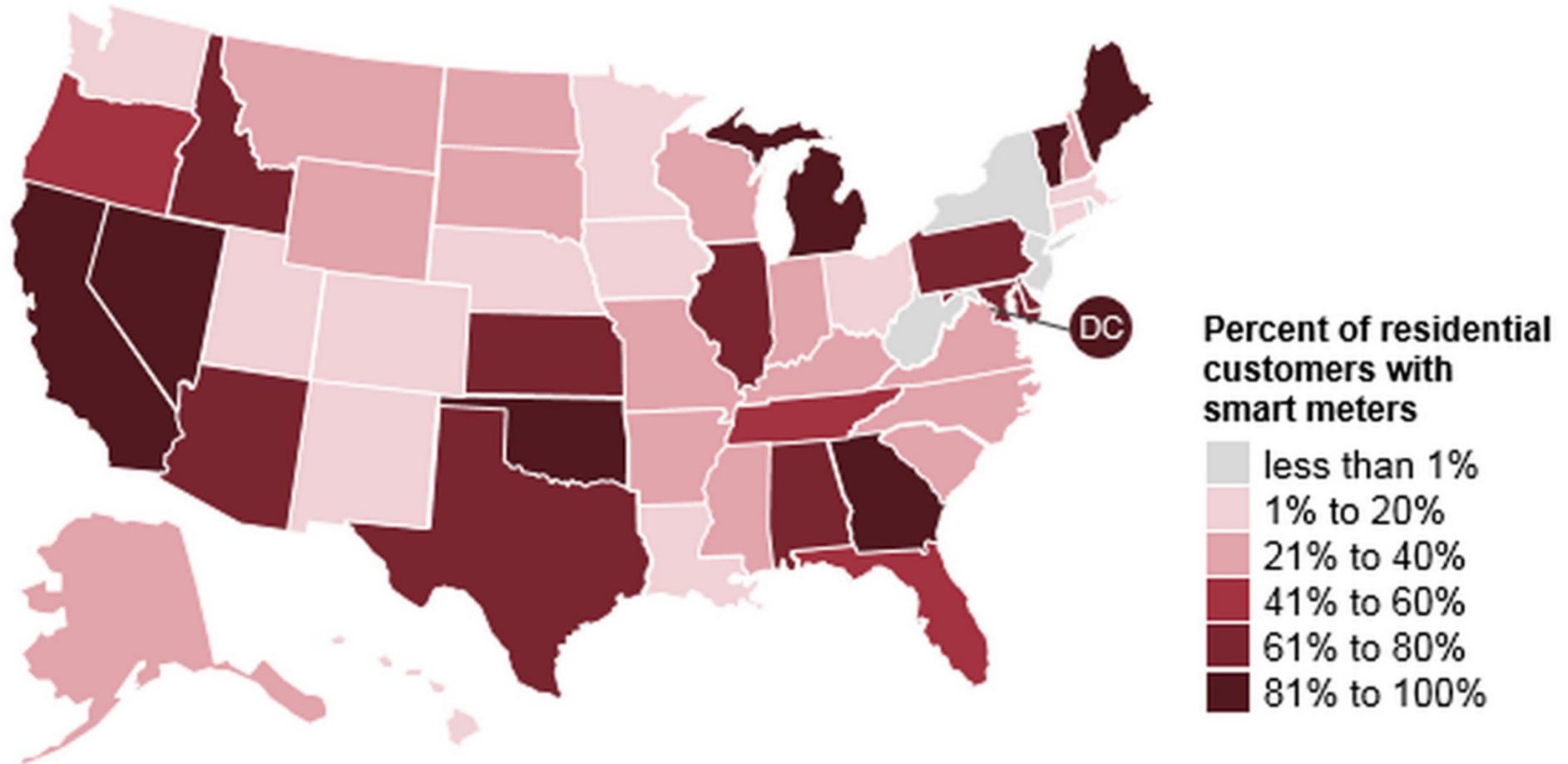
Demand Response = High Reliability



Customers Ready For Demand Response?



Smart Meters Regional Deployment Variation



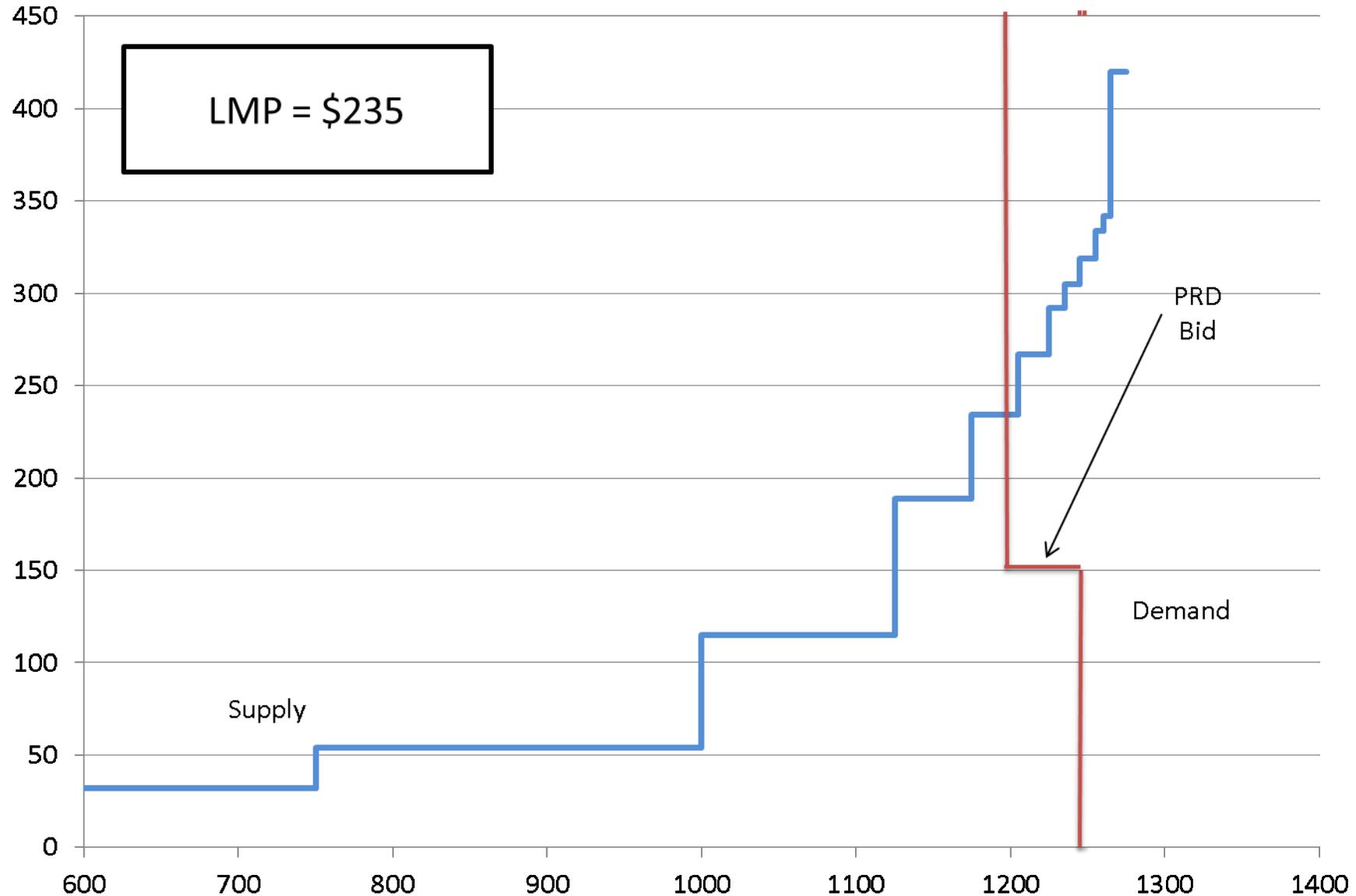
Interval Metering Alternatives

If interval metering is unavailable, can demand response still work?

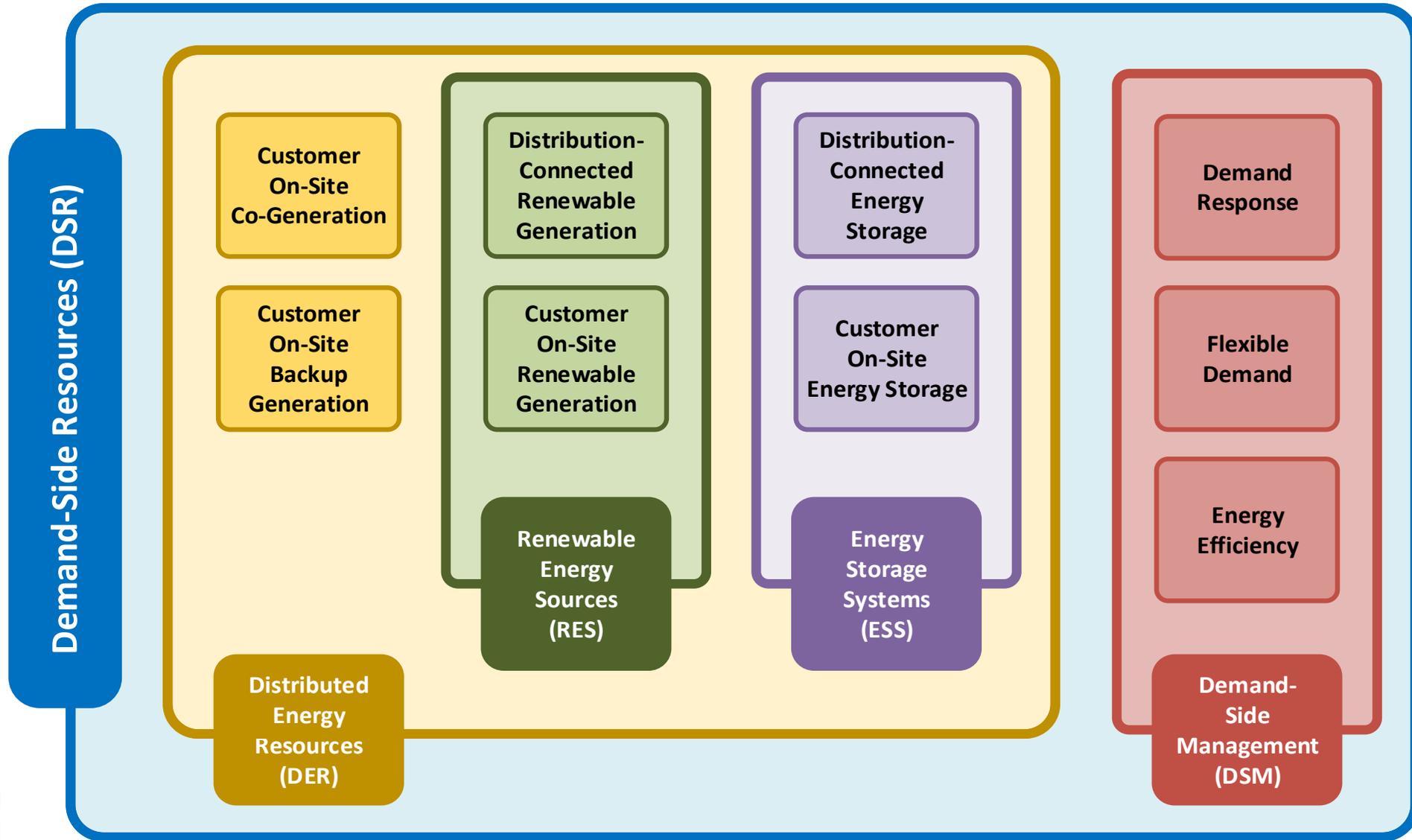
Yes, for Residential; Maybe, for Commercial

1. Remote-disconnect switches can be used to interrupt loads:
 - Air-conditioning compressors
 - Domestic hot water heaters
2. Smart electronics can provide even better response information
 - Smart thermostats
 - Smart lighting
3. Statistical sampling of interval-meter installations
 - Install meters for a subset, e.g. 10%, to estimate full reduction

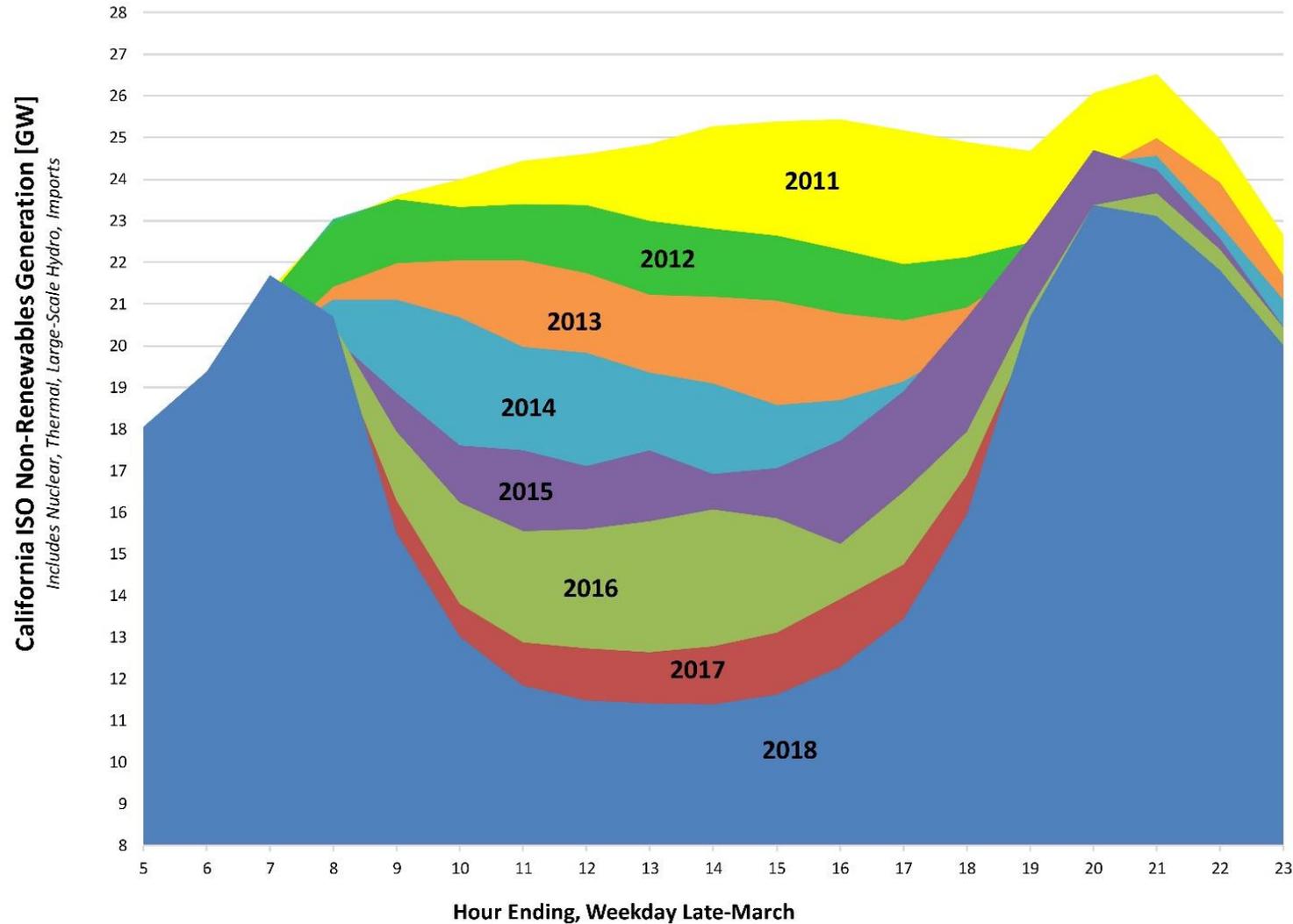
Moving from Supply-Side to Demand-Side



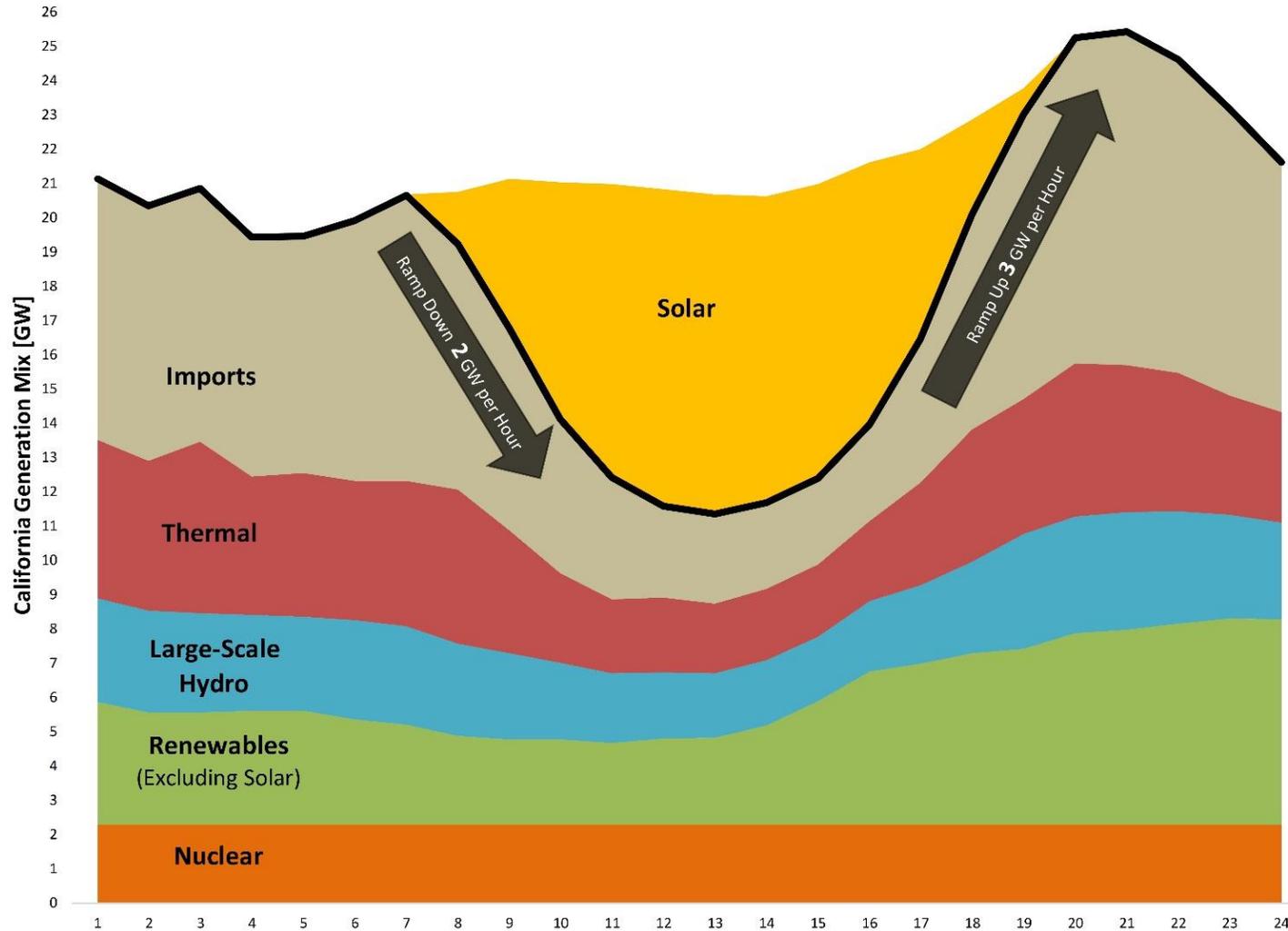
Evolution To Demand-Side Resources



Solar Impacts Increasing Over Time



Need for Ramping with Solar Effects



New Market Products For New Challenges

Example: California Flexible Ramping Product (FRP)

- Designed to procure “flexible ramping capacity in the real-time market to help manage volatility and uncertainty of real-time imbalance demand”
- The amount is based on the net demand curve
- CAISO forecasts the future levels, based on a projection of the net demand curve
- Resources must meet the forecasted levels, but also be available for larger ranges

Conclusions

North America's Current State

- Demand Response is a mature component of all wholesale markets
- Improvements continue, especially with capacity market options
- Most Distribution System Operators also very experienced
- Opportunities still largely untapped for retailers

North America's Future State

- Supply-Side to Demand-Side shift
- Renewable energy means the need for new support services
- DR's future inexorably linked with the future of DERs

PLMA Activities

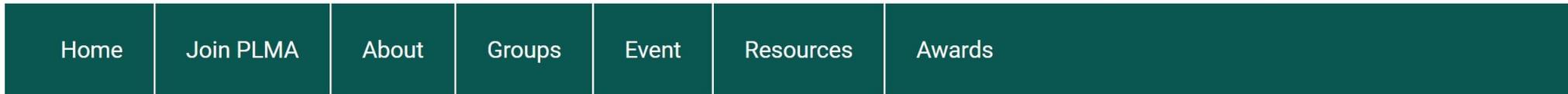
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- DER Integration
 - Connected Devices
 - Women in DM
 - Customer Engagement
 - International
- Webcast: DR in Brazil, October 04
 - Training October 8-12, Phoenix, AZ
 - Conference November 12-14, Austin, TX

Thank You



Scott.Coe@GridOptimize.com

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