

GUIRR Cross Sector Impact of the Smart Grid

Smart Grid Panel Discussion

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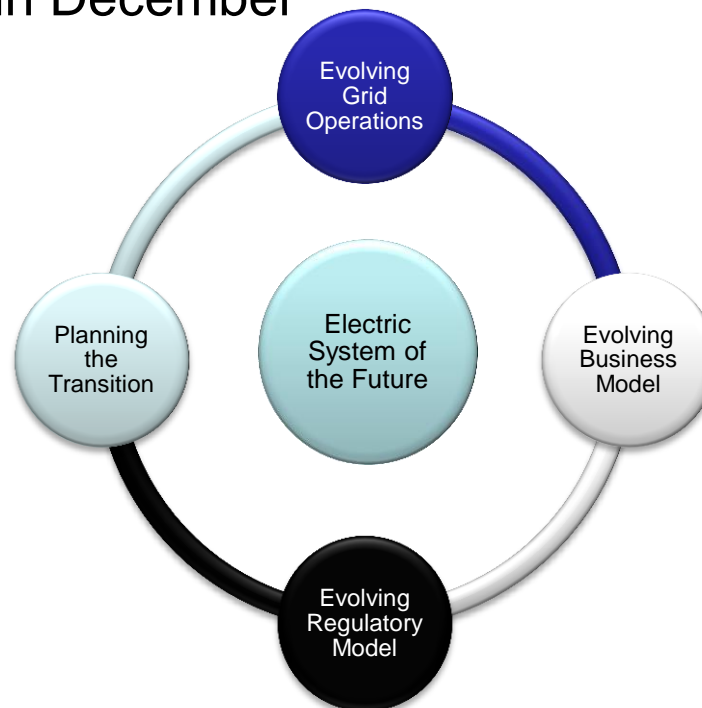


GridWise Alliance Members

A consortium of passionate stakeholders focused on modernizing our electric grid, collaborating to transform the nation's electric power grid



- Developed through a public/private partnership with the Office of Electricity Delivery and Energy Reliability at Department of Energy
 - Four Regional Workshops & National Summit
 - Final report issued in December



Characteristics Electric System of the Future

- **Generation**
 - Centralized and distributed
 - Dispatchable and non-dispatchable
 - Microgrids – complementary not replacement
- **Energy storage** – won't replace the need for “dispatchable” options
- **Balancing supply and demand** increasing complex and important
- **Consumers**
 - Different expectations and options
 - Prosumers
- **Markets**
 - Wholesale and retail
 - Third party non-regulated competitive players

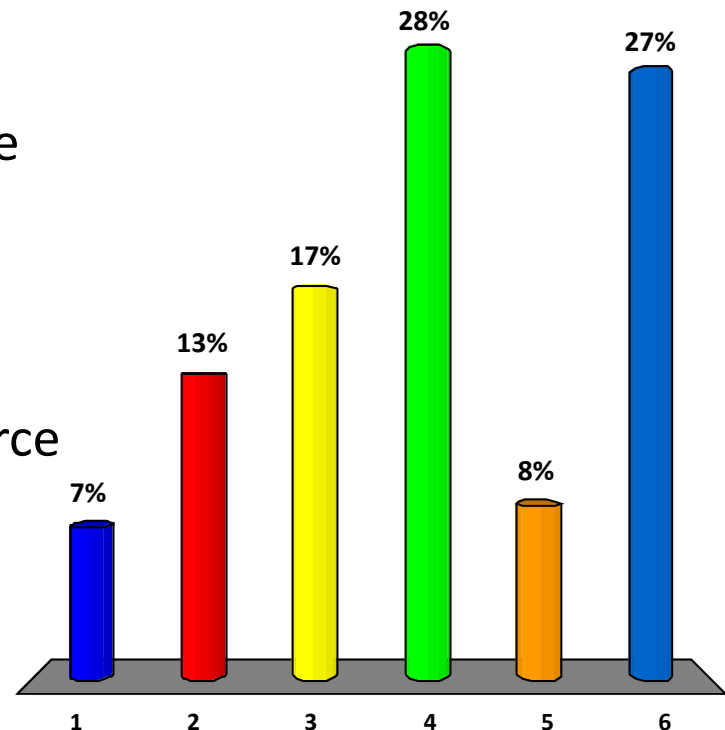
Evolving Grid Operations

Key Themes from Workshops

- Will still want and need a grid
- No longer just a delivery “pipe” => two way power flow
- Must be agile and “fractal” - flexible, adaptable, responsive
- Enabling platform for very dynamic and complex system
- Enabling a robust retail market
- Distribution grid will look and act more like transmission grid
- Balancing supply and demand will be increasingly complex and important
- Connecting wholesale and retail markets will be essential

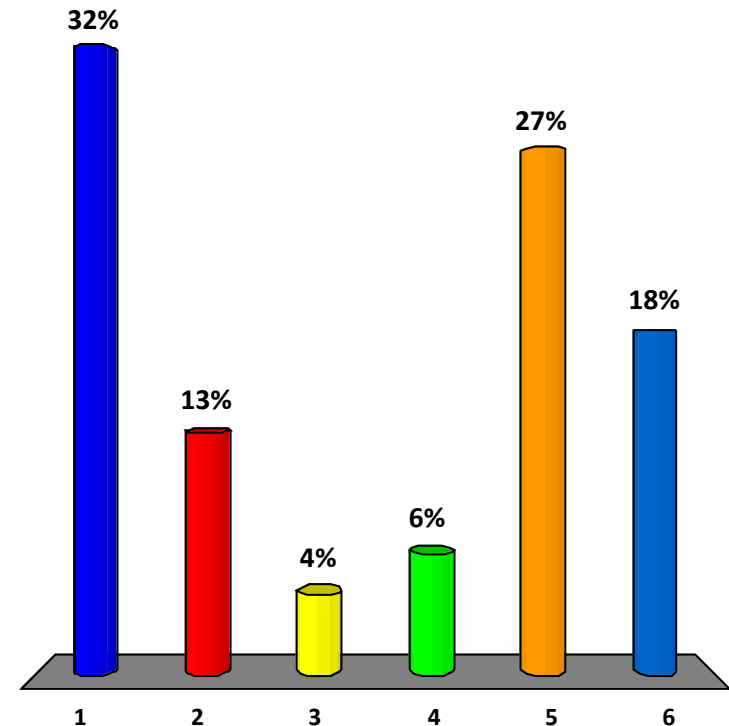
What is the most critical technology challenge that needs to be addressed in the next 15 years?

1. Improving situational awareness down to end device
2. Implementing high bandwidth, low latency, cost effective and interoperable communications systems
3. Leveraging “big data” analytics and integrating into real-time operations
4. Incorporating distributed energy resource management
5. Integrating multi-customer microgrids
6. Achieving cost effective energy storage



What is the most urgent technological challenge today?

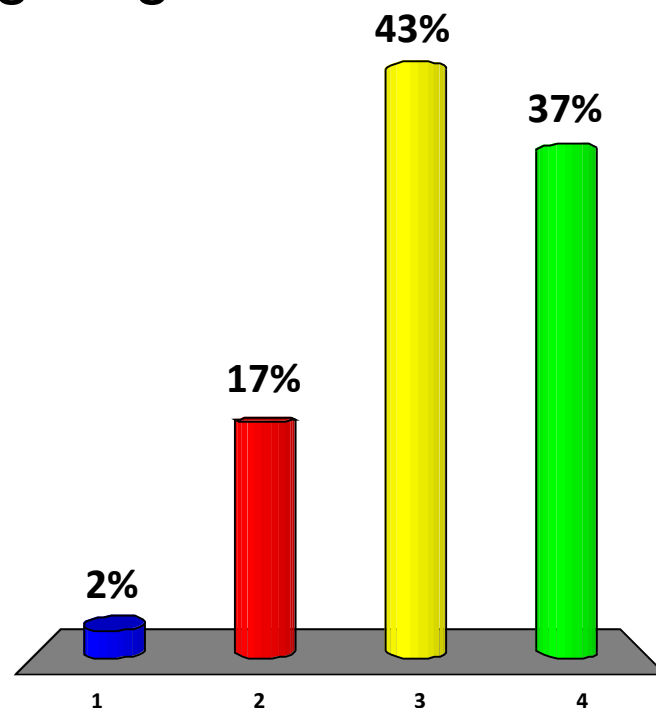
1. Dealing with intermittency of renewable generation
2. Dealing with extreme weather events
3. Incorporating advanced weather modeling into operations
4. Reducing peak demand
5. Dealing with “big data”
6. Meeting environmental mandates



How many years will it take from project start to finish for distribution utilities to install and implement systems and tools to effectively manage significant DERs?

1. 0-2 years
2. 3-5 years
3. 6-8 years
4. More than 8 years

NOTE: DERs defined to include all distributed energy resources including DR and responsive loads



Evolving Business Model Fair Compensation for Value Delivered

- Future value props for grid operators:
 - Integrating all types of generations
 - Being agnostic as to where supply comes from
 - Increasing grid efficiency
 - Enabling customers to provide services back to grid
 - Facilitating a retail market for consumers to buy and sell services
 - Optimizing assets utilization
 - Supporting/implementing public policies
 - Maintaining a safe and reliable grid
 - Enabling highly reliable and resilient energy services to end consumers
 - Identifying most cost-effective way to achieve outcomes

Evolving Business Model Portfolio of Selectable Services

- Basic service
- Enhanced service
- High-reliability services
- Microgrid services
- Financing services
- Buying/selling ancillary services, such as:
 - VAR Support
 - Voltage Support
 - Frequency Response
 - Spinning Reserve
 - Backup Power Support

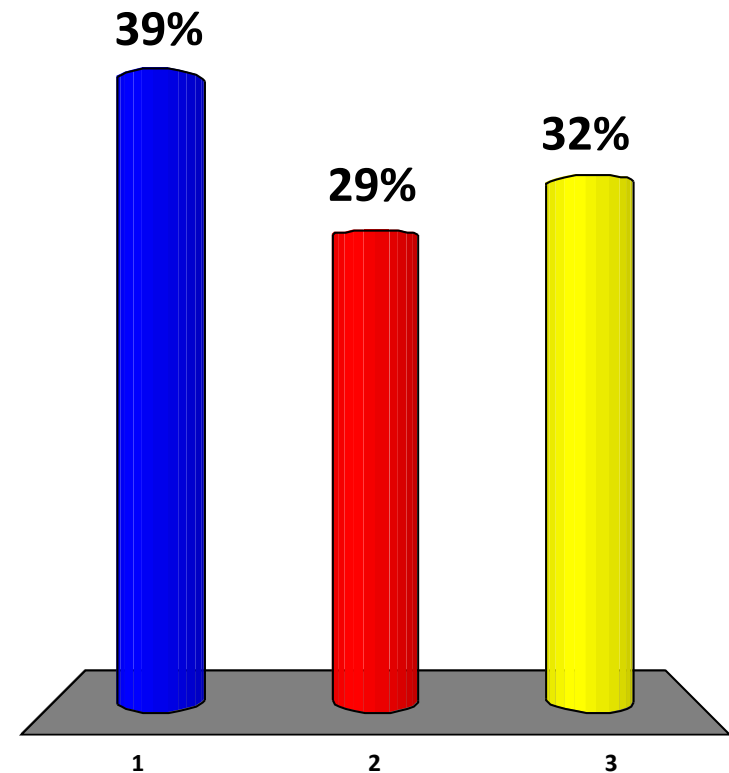


Evolving Regulatory Model Challenges for Regulators

- Providing regulatory clarity in time of significant change
- Align regulatory process to embrace speed of change and technology innovation
- Balancing public good with the needs and desires of individual consumers
- Addressing consumers' obligations to the grid as well as utilities' obligations to consumers in the future

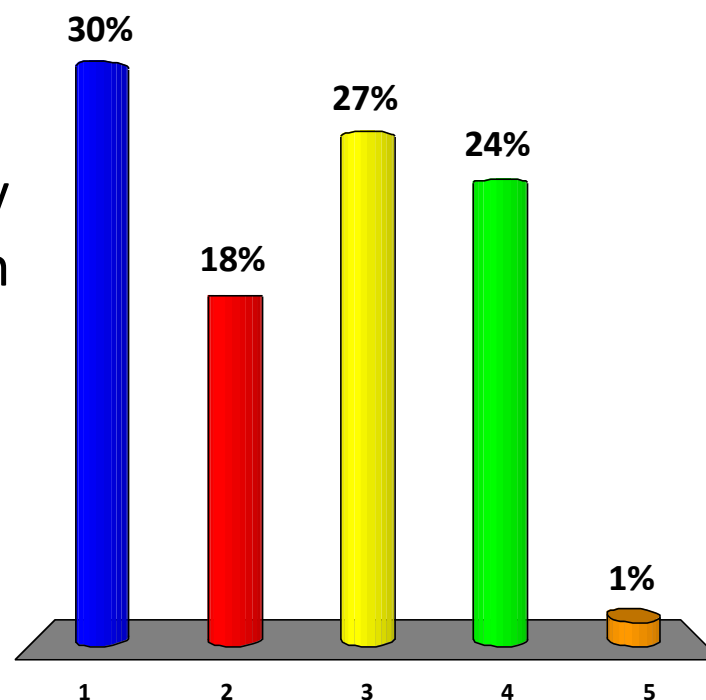
Which is the highest risk scenario in transitioning utility pricing to a products and services model:

1. Debating change but continuing with status quo
2. Transitioning to a services pricing model and eliminating all policy related cross subsidies built into today's rates
3. Transitioning to services pricing model while continuing current policy related cross subsidies



What is the biggest risk if we don't get this right

1. Significant impact to our national economy
2. Significant impact to the cost of electricity
3. Significant impact to the reliability and resiliency of electric service in US
4. Will create a new “electricity divide” in US
5. No big risk – everything will work out over time



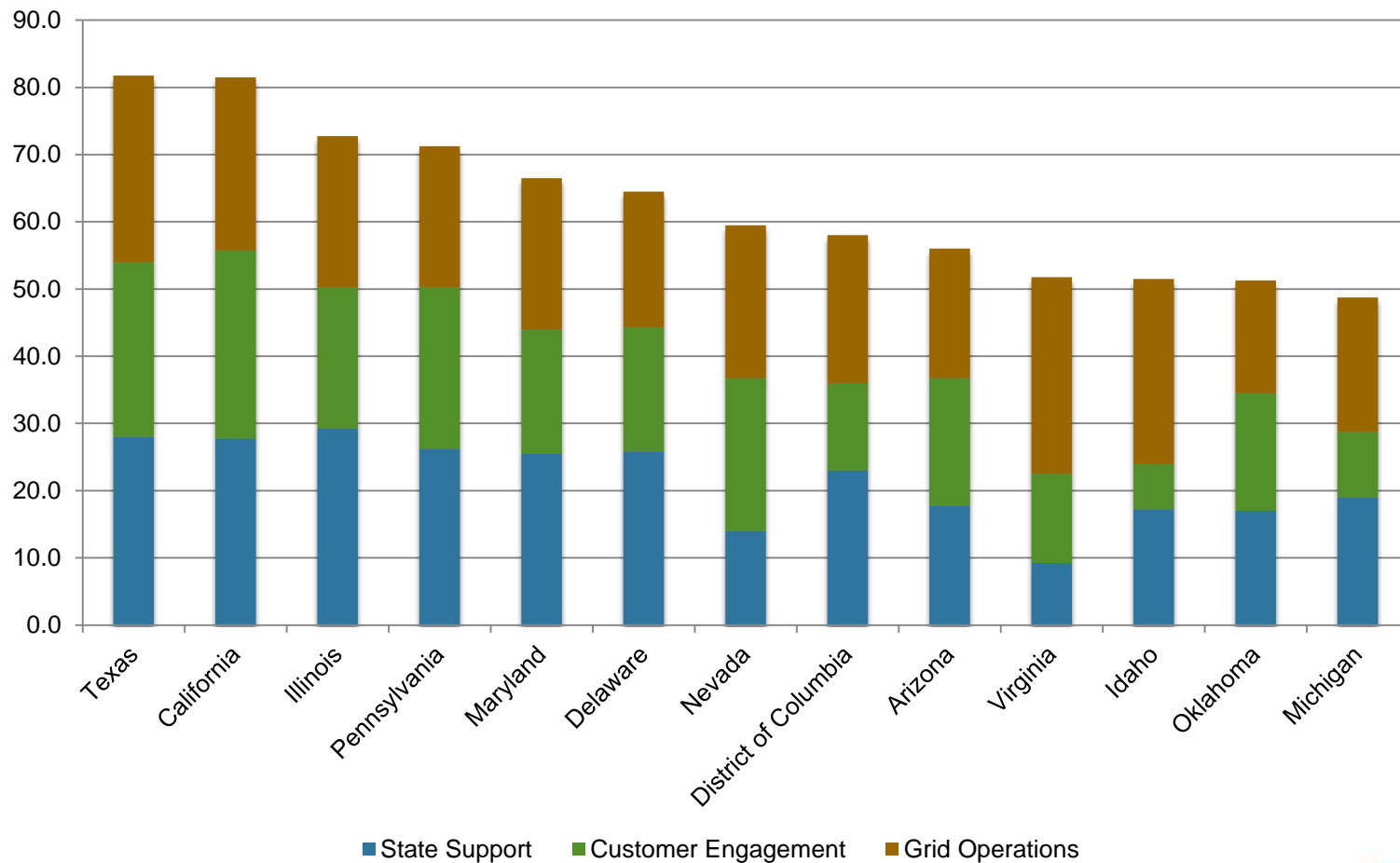
- Establish clear and comprehensive guiding principles
- Develop a unifying architecture to ensure interoperability across the entire grid
- Create a framework for guiding investments and the development of state/regional roadmaps.
- Drive solutions through stakeholder engagement and education.
- Address technology challenges and limitations through robust research and analysis.

2014 Grid Modernization Index

- GridWise Alliance and Smart Grid Policy Center published the second annual state-by-state Grid Modernization Index (GMI).
- The GMI is a simple, easy to understand scorecard with three components:
 - **State Support:** State policies and regulatory mechanisms that facilitate grid investment;
 - **Customer Engagement:** Investments throughout the state in customer-enabling technologies and capabilities; and,
 - **Grid Operations:** Investments throughout the state in grid-enhancing technologies and capabilities.

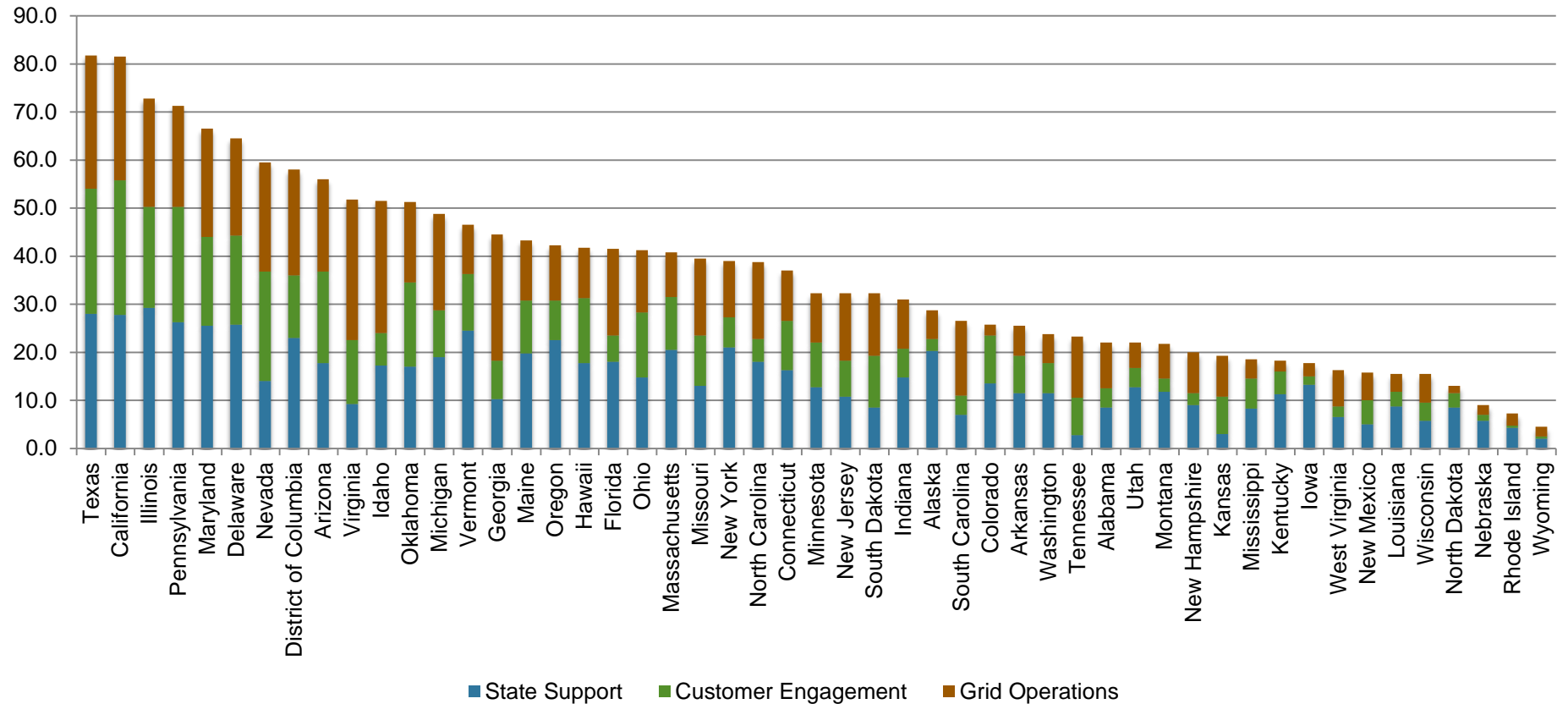
2014 Results

Leading States - Top 25 Percent



2014 Results

2014 Grid Modernization Index



2014 Key Insights

- Energy policies not directly targeted at Grid Modernization are driving investments in grid modernization. These state policies include:
 - Mandatory Renewable Portfolio Standards (RPS);
 - Energy Efficiency Resource Standards (EERS);
 - Retail Deregulation;
 - Wholesale Deregulations;
 - Independent System Operator (ISO)/Regional Transmission Operator (RTO) Markets and,
 - Mass Market Demand Response Programs.
- The states that received ARRA SGIP grants have higher overall GMI scores with the most significant impacts reflected in their Grid Operations scores.
- Higher penetration of DERs, particularly rooftop PV, is starting to drive an increasing urgency for grid modernization in order to enable the effective integration of these resources in many jurisdictions.

2014 Key State Activities

- **California**
 - Distribution Resource Planning – fully leverage DERs on Distribution – locational value
 - Energy Storage – IOUs plan for achieving targets
- **Texas**
 - Leader in the implementation of deregulated retail services
 - Leader in effectively integrating large-scale wind generation including large-scale energy storage.
 - ERCOT has an effort underway to “rethink” the entire existing set of ancillary services.
- **Illinois**
 - 2014 GMI ranking having increased by 13 points over its prior year’s ranking
 - Reflects the implementation of it’s “Energy Infrastructure and Modernization Act” passed in October 2011
- **Massachusetts**
 - Developed Commonwealth-wide Grid Modernization Plan
- **New York**
 - Initiated a State-wide Reforming the Energy Vision (REV) process in April 2014.
 - Defining new role for distribution utilities and establishment of retail market
- **Hawaii**
 - Increasing penetrations of rooftop solar have led to the need to focus on the modernization of the electric grid to be able to effectively integrate and utilize DERs.

Q&A

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