2013 Grid Modernization Index

July 2013

About GridWise Alliance

The GridWise Alliance (GWA) represents the broad and diverse stakeholders that design, build, and operate the electric grid, and consists of: electric utilities; information and communications technology service and equipment providers; Independent System Operators (ISOs) and Regional Transmission Organizations (RTOs); academic institutions; and, energy consulting firms. The GWA works to enhance electric grid performance, and to transform our nation's electric system to meet the needs of the twenty-first century.

About Smart Grid Policy Center

The Smart Grid Policy Center (SGPC) is a not-for-profit foundation of public and private smart grid stakeholders who are aligned around a shared vision to transform and modernize the U.S. electric system.

Executive Summary

The U.S. economy is increasingly dependent on an affordable, secure, reliable, and resilient electric grid. Modernizing America's electric grid is vital to ensuring that our electric system will be able to meet the demands of our digital society. Grid modernization will enable the effective and efficient integration of new devices, including customer-owned generation, connected appliances and electric vehicles, to the grid to deliver a sustainable energy future. Some also use the term "smart grid" interchangeably with "grid modernization".

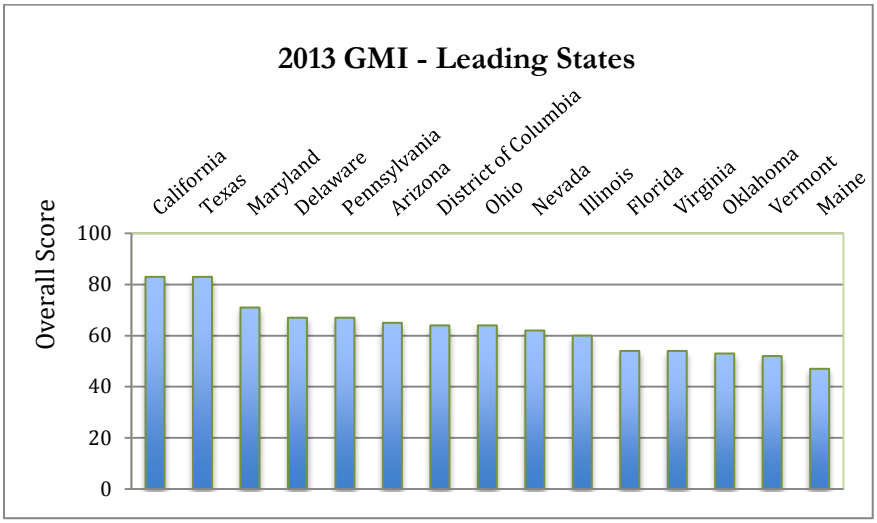
If the U.S. is to achieve a modernized grid, state and federal energy policies will be needed to facilitate this process. In addition, a change in structure and mindset, in which utilities shift from commodity-oriented toward service-oriented entities, will be vital for the twenty-first century electricity system. Customer engagement also will be crucial – increasingly, they will become both energy consumers and producers (i.e., "prosumers"). Grid-related investments will be needed not just for daily operations or "least cost" approaches, but for this new future, which includes extreme weather events and cyber threats, which were not part of the reality when much of the electricity infrastructure was built over the past century.

The GridWise Alliance (GWA) and Smart Grid Policy Center (SGPC) have created the first ranking of states, based on grid modernization policies and activities, entitled the "Grid Modernization Index" (GMI). The purpose of this GMI is to evaluate and communicate the status of electric grid modernization in the United States. It also explains some of the relationships or connections between state policies and regulations, customer engagement, and utility investments in the modernization of the grid, given sometimes significant variations in state authorities, market structures, and business models.

The GMI ranking system, or "scorecard," uses a clearly defined set of criteria to evaluate and convey the progress and impacts of this transformative set of improvements to the nation's electric infrastructure. This Grid Modernization Index consists of three components:

1. **Policy:** State policies and regulatory mechanisms that facilitate grid investment;
2. **Customer Engagement:** Investments throughout the state in customer–enabling technologies and capabilities; and,
3. **Grid Operations:** Investments throughout the state in grid-enhancement technologies and capabilities.

Data were gathered on 41 states and the District of Columbia. A distinguished Advisory Committee also assisted in developing and validating the GMI. This report highlights the 15 states that scored the highest, based on criteria defined for each of the three component areas. The report also identifies practices that were common across these states. Finally, it presents overarching insights acquired from having examined the data collected for all 42 jurisdictions.



The 2013 GMI survey results and subsequent analysis reveal the following key observations:

- GMI scores for states that have retail choice, belong to Regional Transmission Organizations (RTOs) or Independent System Operators (ISOs), and have Renewable Portfolio Standards all showed high positive correlations, indicating a relationship exists between these federal and state policies and greater investments in grid modernization.
- Analysis shows a positive correlation between the state Policy component scores and Grid Operations component scores, but the correlation is not statistically significant for the top 15 states.
- Analysis shows a high positive and statistically significant correlation between states that received ARRA Smart Grid Investment Grants and the scoring across all three components (i.e., Policy, Customer Engagement and Grid Operations) of the GMI.
- No correlation was found between electricity end use prices in any customer segment and the GMI scores, indicating that the price of electricity is not a primary driver for grid modernization.
- The states that scored higher overall in the GMI also demonstrate higher scores in addressing cybersecurity and data privacy than other states. This could be driven either by the electric service providers (ESPs) themselves or by the state as a whole.
- States that scored higher overall also have higher scores in engaging customers, e.g., by educating them, as well as by offering them products and services, including more dynamic pricing options.
- States that scored higher overall also have deployed more sensors and advanced modeling tools for both transmission and distribution grids.
- The 15 highest-scoring states all have deployed smart meters to their residential and small commercial customers to some extent. Ten of these 15 states have installed smart meters for at least 60 percent of their consumers.

Each state has different drivers for investing in grid modernization and the sequencing of these investments. This 2013 survey also reveals that most states are lagging in the areas of establishing metrics, measuring the value of grid investments, and in determining appropriate cost recovery mechanisms.

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Introduction

The U.S. economy is increasingly dependent on an affordable, secure, reliable, and resilient electric grid. Modernizing America's electric grid is vital to ensuring that our electric system will be able to meet the demands of our digital society. Grid modernization will enable the effective and efficient integration of new devices, including customer-owned generation, connected appliances and electric vehicles, to the grid to deliver a sustainable energy future. Some also use the term "smart grid" interchangeably with "grid modernization".

If the U.S. is to achieve a modernized grid, state and federal energy policies will be needed to facilitate this process. In addition, a change in structure and mindset, in which utilities shift from commodity-oriented entities toward service-oriented entities, will be vital for this twenty-first century electricity system. Customer engagement also will be crucial – increasingly, they will become both energy consumers and producers (i.e., "prosumers"). And, grid-related investments will be needed not just for daily operations or "least cost" approaches, but for this new future, which includes extreme weather events and cyber threats, which were not part of the reality when much of the electricity infrastructure was built over the past century.

The electric industry is in transition. It is moving from a commodity business, where power flows in one direction, toward a services-oriented business, in which customers are both producers and consumers. This is a new business model, for which active demand side management as well as supply side management provide value. In addition, under this new and evolving scenario, innovations allow for a different paradigm around the way in which energy is produced, delivered and consumed. Moreover, in this new environment, the grid will play a key role in balancing supply-side and demand-side capabilities to optimize the energy value chain from generation through consumption. Consumers will be empowered to make choices regarding the ways in which they interact with their energy service providers; how, when, and from whom they purchase electricity or offer demand reductions; and, even, whether to become producers themselves. This transition is taking place across the United States with different priorities in terms of both the sequencing and pace of these investments.

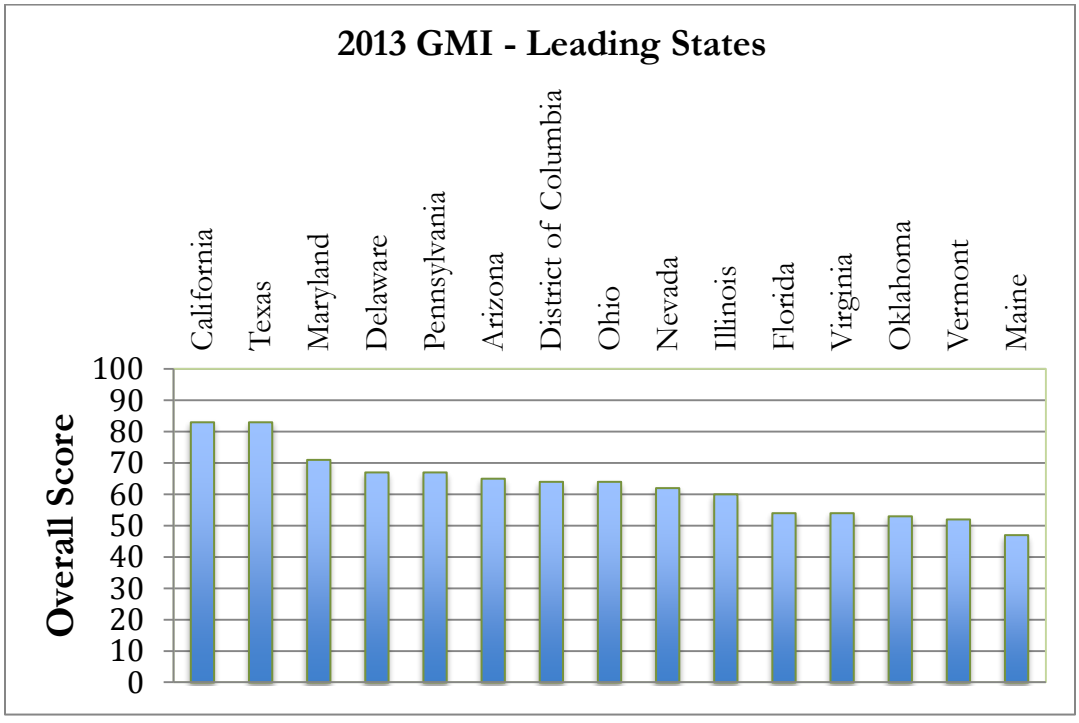
States play a major role in how and at what pace this transition will occur in their respective jurisdictions. State regulators review and approve expenditures and set rates for investor-owned utilities (IOUs) in their states. Certain states may also regulate municipal utilities or rural electric cooperatives. State policy makers operate within a highly-structured legal and regulatory framework, much of which was not designed to address the complex issues arising from the rapid grid modernization occurring today. Thus, updating the regulatory paradigm is a continuing challenge, particularly in terms of customer value, consumer protections, and utility risk and cost-recovery, for innovative grid modernization investments.

Over the last 20-plus years, the electric utility business models and regulatory frameworks across the 50 states and the District of Columbia have changed with the introduction of wholesale markets, retail deregulation, and Regional Transmission Organizations (RTOs) and Independent System Operators (ISOs). In some jurisdictions, the utility services have been "unbundled", so that transmission and distribution (T&D) companies are no longer associated with the generation provider. In some states, these T&D wires

companies no longer "own" the relationship with retail customers, or offer only limited services to these customers. In these states, retail service providers are introducing new options for "bundling" services, or packages of service offerings, as well as for billing for electric energy usage. Whereas a standard business model for IOUs once existed, in which the utilities controlled the entire energy value chain from generation to consumption, today a range of business models exist, reflecting the variety of services and providers.

These differences in state policies, regulatory structures, and business models affect the benefits, risks, and sequencing of grid modernization investments. In reviewing these issues, the GridWise Alliance (GWA) and the Smart Grid Policy Center (SGPC) determined that one of the challenges to advancing grid modernization was a lack of clarity around the relationships between state policies and utility grid modernization investments. GWA and SGPC also recognized a need to identify and share best practices around successful grid modernization policies and implementation efforts. Each state (jurisdiction) must design and deploy grid modernization efforts at an appropriate pace that will enable it to realize value from these investments. Nevertheless, understanding state efforts in this arena and analyzing the drivers of different strategies and approaches to grid investments are critical.

To address this issue, GWA and SGPC have created the first ranking of states, based on grid modernization policies and activities, entitled the "Grid Modernization Index" (GMI). The purpose of this GMI is to evaluate and communicate the status of electric grid modernization in the United States. It also explains some of the relationships or connections between state policies and regulations, customer engagement, and utility investments in the modernization of the grid, given sometimes-significant variations in state authorities, market structures, and business models.



Methodology

The GMI ranking system, or "scorecard," uses a clearly defined set of criteria to evaluate and convey the progress and impacts of this transformative set of improvements to the nation's electric infrastructure. This Grid Modernization Index consists of three components:

1. **Policy:** State policies and regulatory mechanisms that facilitate grid investment;
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Policy

The state policies and regulatory "enablers" component of the Index is composed of the following elements:

- Does the state have a grid modernization strategy, policy, or requirement that electric service providers (ESPs) in the state develop and submit a plan?
- Does the state have an energy sustainability plan, environmental plan and/or a Renewable Portfolio Standard?
- Do the state or ESPs have or does the utility commission require ESPs to have a security/cyber-security plan for:
  - Electric delivery; and/or
  - Customer energy data?
- Does the state have, or review and approve, ESPs customer energy data privacy policies?
- Does the state have a formal plan to educate customers and/or conduct outreach on grid modernization, and does it allow ESPs to recover costs of implementation?
- Are metrics being reported publicly to legislators, regulators, or other state officials to track the progress of grid modernization progress?
- Are incentives provided for distributed energy resources, such as photovoltaic (PV) solar systems, electric vehicles, energy storage, wind, fuel cells, and so forth, through state funding mechanisms and/or supported in the state legislature or through rulemakings?
- Has the state established clear mechanisms for project approval and cost recovery of grid modernization projects?
- Is the utility industry workforce, including that of commissions, system operators, and utilities, changing to meet the needs of a modernized grid?
- Is the state measuring the value of modernizing grid operations (i.e., has the state adopted or identified a cost-effectiveness/performance methodology for investments in grid technologies and capabilities)?

Customer Engagement

The customer engagement component of the GMI is composed of the following elements:

- Does the state have dynamic pricing plans or rates that leverage smart grid technologies, including the following:
  - Residential time-of-use or time-of-day rates;
  - Small commercial time-of-use or time-of-day rates;
  - Residential critical peak pricing;
  - Small commercial critical peak pricing;
  - Residential demand response;
  - Small commercial demand response;
  - Real-time, market-based pricing; and/or,
  - A price for reactive energy?
- Are pricing events, such as demand response, critical peak pricing, or peak time rebates, communicated to customers via one or more personalized methods, such as:
  - Electronic mail;
  - Mobile text message;
  - Outbound dialer;
  - Twitter; and/or,
  - Other?
- Is there a tariff and/or standard methodology for integrating the grid with new technologies such as:
  - Electric vehicles;
  - Energy storage;
  - Photovoltaics; and/or,
  - Fuel cells?
- Is there a platform that allows third-party device integration (e.g., Home Area Network devices such as in-home displays, programmable communicating thermostats, "smart" appliances, electric vehicle charging) with real-time smart meter data?
- Is there a platform (e.g., "Green Button") that enables:
  - Customers to obtain their own energy usage information; and,
  - Automated third-party access to customer energy usage information, which incorporates strong privacy provisions?
- Is customer education/outreach on grid modernization being implemented successfully?
- Are software analytics being used to segment, understand, and communicate with customers?

Grid Operations

The grid operations component of the GMI considers and analyzes whether ESPs in the state are implementing technologies to deliver the benefits of a modernized electric grid, and is comprised of the following technologies and capabilities::

- Automated Meter Reading (AMR)
- Advanced Metering Infrastructure (AMI)
- Advanced, communicating transmission sensors, such as:
  - Phasor Measurement Units (PMUs)
  - Dynamic line rating
  - Fault indicators
  - Transformer monitoring
- Advanced, communicating distribution sensors, such as:
  - Phasor Measurement Units (PMUs)
  - Dynamic line rating
  - Fault indicators
  - Transformer monitoring

This section also considers whether:

- Energy storage is leveraged as a tool for system planning?
- Price-responsive and/or ride-through (voltage and/or frequency) capable microgrids exist?
- Advanced Metering Infrastructure (AMI) is integrated with other utility systems to increase benefits, such as outage detection, remote connect/disconnect, tamper detection, power quality monitoring, and more?
- Distributed Automation (DA) deployed at:
  - Substations;
  - Line switches;
  - Circuit ties?
- Distribution Management System (DMS) functionality is integrated with sensor data, capacitor bank monitoring and/or control, voltage regulator monitoring and/or control, or storage charge and/or discharge?
- Probabilistic planning – based on new data from equipment and sensors – is being used in distribution, transmission, or customer interactions and/or across the enterprise for increased system value?
- "Self-healing" (i.e., to autonomously operate and/or reconfigure) capability is deployed?
- Advanced Geographical Information System (GIS) capabilities and functionality are deployed?
- GIS is integrated with Asset Management (AM)?
- Advanced visualization tools are being used?

To ensure consistency of interpretation and scoring, the GWA established a GMI project team, comprised of several of its members to research the progress of grid modernization in each state. The team used publicly available documents and conducted interviews with key stakeholders. Leveraging this information, the project team scored and ranked each state, according to the criteria or questions in each category highlighted at the outset (i.e., policy, consumer engagement, grid operations).

GWA and SGPC also established a distinguished Advisory Committee made up of key stakeholders and influencers, including; state commissioners, commission staff, Federal Energy Regulatory Commission (FERC), Department of Energy (DOE), other non-profit organizations representatives, national lab representative, both transmission and distribution utility representatives, and equipment provider representative. This Advisory Committee provided valuable input into the criteria, evaluation and analysis, which greatly enhanced the value of the GMI.

Since different states can sometimes have various electric service providers (ESPs), the GMI uses this term, "ESP," to indicate the collection of entities providing electric service in that state. This includes, but is not limited to, investor-owned utilities, retail service providers, rural electric cooperatives, and municipal-owned utilities.

The GMI provides a score for each of the 41 states and the District of Columbia. The term, "state," when used to evaluate grid modernization criteria, refers to the public utility commission, state legislature, and/or the majority of ESPs in that jurisdiction. The state is being measured for grid modernization progress, regardless of which entities within that state are driving that forward. States received a high score in the Policy component of the GMI survey, if the majority of utilities in that state are making progress in these areas (e.g., ESPs have data security policies), even if the state lacks specific policies requiring the ESPs to do so. To achieve the maximum ratings, 60 percent of the consumers within that state must be covered by the criteria being evaluated.

Findings and Analysis

Top 15 States

For 2013, GWA and SGPC decided that the GMI would only highlight the rankings only of the 15 highest-scoring states, given this is the first year the criteria and evaluations for this Index are being established. Table 1 below shows the scoring results for the top 15 states in each category.

Overall Score		Policy Score		Customer Engagement Score		Grid Investment Score	
California	83	California	27	California	30	Virginia	29
Texas	83	Illinois	27	Texas	30	California	26
Maryland	71	Texas	27	Arizona	24	Maryland	26
Delaware	67	Delaware	26	Nevada	23	Texas	26
Pennsylvania	67	Maryland	26	Ohio	21	Delaware	24
Arizona	65	Vermont	26	Pennsylvania	21	District of Columbia	24
District of Columbia	64	Pennsylvania	25	Maryland	20	Nevada	23
Ohio	64	Ohio	24	Oklahoma	19	Arizona	22
Nevada	62	District of Columbia	23	Delaware	17	North Carolina	21
Illinois	60	New York	22	District of Columbia	17	Pennsylvania	21
Florida	54	Arizona	20	Florida	16	Florida	20
Virginia	54	Maine	20	Connecticut	14	Georgia	20
Oklahoma	53	Florida	19	Virginia	14	Illinois	20
Vermont	52	Michigan	19	Illinois	13	Ohio	20
Maine	47	Oklahoma	17	Maine	13	South Carolina	20
				Vermont	13		

Table 1: Top 15 states in each scoring category

Common Practices for the Top 15 States

In reviewing the scores for the top 15 states, the following observations were made:

In the Policy Component

- ESPs and/or commissions are proactive in developing customer data policies
- ESPs and/or commissions are proactive in the areas of customer education and engagement
- ESPs and/or commissions are proactively looking at metrics and measuring the value of grid modernization investments
- Cost recovery is being proactively addressed

In the Customer Engagement Component

- States scored higher for increased capabilities in customer segmentation and analytics to better understand customers' needs and desires
- States are implementing new dynamic rate structures

- ESPs are communicating and engaging with customers about their energy usage and new services or rates
- ESPs are integrating grid modernization technologies with other systems and using associated data to gain additional benefits

In the Grid Operations Component

- Leading ESPs are implementing new sensors on Transmission and Distribution grids
- ESPs are starting to work on self-healing, energy storage, microgrids, and advanced visualization capabilities
- ESPs have deployed Distribution Management Systems (DMS) and are integrating new devices to better model what is happening on the grid (i.e., "field" conditions)
- Leading ESPs are leveraging new information from grid modernization technologies they have deployed to enhance utility planning processes for capacity increases and for more targeted system maintenance
- ESPs in 10 of the 15 highest-scoring (or "leading") states have deployed smart meters (AMI) to over 60 percent of their customers. Three of the top 15 states are in the process of doing so; and, in two of the top 15 states, the ESPs are actively piloting or planning AMI deployments

Analysis

Based on feedback from the GMI Advisory Committee (AC), GWA and SGPC worked with Accenture to perform a statistical analysis of the data and looked for correlations with factors that the AC felt were important to assess.

GWA's members assisted with the data for the GMI. The customer engagement component was evaluated in greater depth, because it is the component that scored the lowest of the three in the Index. Since significant investments have been made in AMI, developing a deeper understanding of this component was deemed important.

Customer Engagement

The Customer Engagement component of the GMI focuses on whether customers have access to new offerings as a result of the investments made by their ESP.

Table 2 below shows the three GMI component scores for the 15 highest-scoring states. For these 15 states, the Customer Engagement scores are the lowest of the three component scores. The average scores (based on a scale of 1 to 100) for the top 15 states are: 70 for Policy; 57 for Customer Engagement; and, 60 for Grid Operations.

In evaluating the top 15 states with respect to their Customer Engagement scores, the following insights were identified:

- ESPs in these states are doing more customer segmentation and data analytics to better understand their customers' needs and desires.
- ESPs in these states are implementing new time varying rate structures.
- ESPs in these states are communicating and engaging with customers about their energy usage and new services or rates.
- ESPs are integrating grid modernization technologies with other systems and using data to gain additional operational benefits.
- The top six states all have mandatory Renewable Portfolio Standards.
- Ten of the top 15 states have deployed smart meters to 60 percent or more of their customers.
- Even in these states there is limited third-party access to energy usage data.

State	GMI Ranking	Customer Engagement Ranking	Customer Engagement Weighted (out of 34)	Policy Weighted (out of 30)	Grid Optimization (out of 36)	Total Weighted GMI Index
California	1	1	30	27	26	83
Texas	1	1	30	27	26	83
Maryland	3	7	20	26	26	71
Pennsylvania	4	5	21	25	21	67
Delaware	4	9	17	26	24	67
Arizona	6	3	24	20	22	65
Ohio	7	5	21	24	20	64
District of Columbia	7	9	17	23	24	64
Nevada	9	4	23	16	23	62
Illinois	10	13	13	27	20	60
Florida	11	11	16	19	20	54
Virginia	13	12	14	11	29	54
Oklahoma	12	8	19	26	17	53
Vermont	14	13	13	26	13	52
Maine	15	13	13	20	15	47

Table 2 (Top 6 States in Customer Engagement highlighted in blue)

Customer enablement and engagement are two of the key benefits for many of the smart meter projects undertaken to date. Many ESPs began their grid modernization efforts by moving to Automated Meter Reading (AMR), where meters with electronic one-way communication are read monthly via "drive-by" meter readings versus pre-AMR meters that were read monthly via "walk-by" meter readers. Many AMR systems have the capability to migrate to "fixed network" systems that allow the data to be collected and transmitted electronically through collectors mounted on equipment, such as street lights, rather than mobile collectors mounted in vehicles. With this "fixed network" capability, it is possible to collect data more frequently and, potentially provide some insights to ESPs and customers at a more granular level and on more frequent intervals. For 2013, the GMI did not capture whether ESPs within a state have upgraded their AMR systems from "drive-by" to a "fixed network." The GMI did, however, capture whether AMR had been deployed. In 2014, GWA and SGPC anticipate that the GMI will be expanded to capture this information, and more.

In recent years, many ESPs have moved to deploying Advanced Metering Infrastructure (AMI) or "smart meters", which provides two-way electronic communication between the customer's meter and the ESP. Although both AMR and AMI technology solutions can provide benefits to the customer, ESPs with AMI have increased their ability to engage more directly with their customers. These AMI systems provide the capabilities to offer new pricing programs as well as give the ESPs the opportunity to provide targeted information and communication to customers, based on their desires and needs. Depending on the capabilities deployed by their ESP, customers with smart meters are often able to view their energy usage data via portals (e.g., mobile telephones, computers, tablets, and other devices via the Internet) and may even be able to leverage third-party applications through "Green Button" type capabilities to better understand their energy usage and opportunities to save money.

Smart meters may also have the capability to provide additional demand side management benefits through direct load control of devices, such as air conditioners, thermostats, and other appliances, as well as to lower the cost of switching in retail choice areas. Many ESPs are starting to offer prepay pricing programs for customers who prefer greater control of their electric bills, for example, to better manage their household budgets. Smart meters also allow ESPs to lower operating costs and enhance their responsiveness with such capabilities as outage detection and remote connect/disconnect functionality. Smart meters make it easier for ESPs to offer net metering and feed-in tariffs for customer who own generation such as rooftop solar, where state policies exist to promote the adoption of such systems.

Historically, many medium and large commercial customers have been able to participate in their ESP's demand response and interruptible programs, providing financial benefits to reduce usage during specific times of day or during a peak load situation. A part of grid modernization is extending these same options to residential and small commercial customers.

The Customer Engagement component of the GMI was designed to capture the level of progress that was being made in deploying these customer-enabling capabilities across the states. GWA and SGPC anticipate that, going forward, the criteria/questions in this portion of the GMI will evolve, as the

objectives and approaches to engaging residential and small commercial customers develop and new innovative products and services emerge.

Statistical Analysis

Accenture performed a statistical analysis of the data collected for the 42 jurisdictions (41 states and the District of Columbia) that the GWA/SGPC project team reviewed. The analysis was conducted to determine whether there are any correlations between the regulatory structures, the existence of renewable portfolio standards, electricity pricing, the ARRA Smart Grid Investment Grants, economic growth, and the GMI scores.

Independent System Operators (ISO) or Regional Transmission Organizations (RTO) participation:

23 of the states analyzed by the project team during the GMI process participate in an ISO or RTO.

These states are: *California, Connecticut, Delaware, District of Columbia, Illinois, Iowa, Kansas, Maine, Maryland, Massachusetts, Michigan, Minnesota, New Hampshire, New Jersey, New York, Ohio, Oklahoma, Pennsylvania, South Dakota, Texas, Vermont, Virginia, and Indiana.*

In looking at the average scores for these states, they scored higher in every component of the GMI than the 19 states (of the 42 jurisdictions) that are not in an ISO or RTO.

RTO/ISO States	State Support	Customer Engagement	Grid Operations	Total Score
Average Score	**0.68**	**0.51**	**0.54**	**0.58**
Std. Deviation	**0.19**	**0.18**	**0.17**	**0.16**

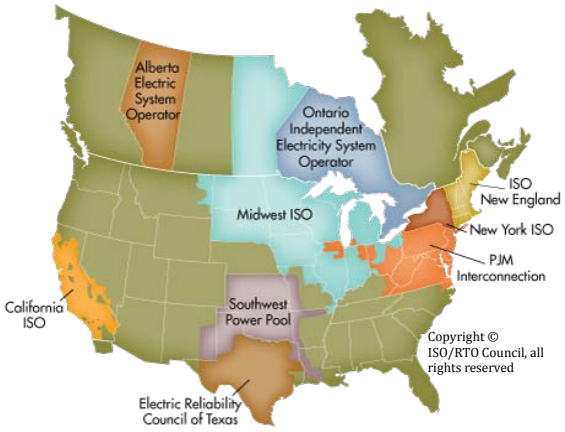
19 of the states analyzed by the project team during the GMI process are in non-ISO/RTO states.

These states are: *Alabama, Alaska, Arizona, Arkansas, Florida, Georgia, Hawaii, Louisiana, Mississippi, Montana, Nebraska, Nevada, New Mexico, North Carolina, Oregon, South Carolina, Washington, Wyoming, and Utah.*

The average scores for these 19 states are lower in all the GMI components.

Non-RTO/ISO States	State Support	Customer Engagement	Grid Operations	Total Score
Average Score	**0.51**	**0.36**	**0.46**	**0.44**
Std. Deviation	**0.11**	**0.16**	**0.16**	**0.12**

Even though the states that participate in a RTO or ISO have higher average grid modernization scores than non-RTO/ISO states, the statistical correlations between the score components are similar for both groups. This indicates that RTO/ISO states are moving forward faster than non-RTO/ISO states, but some non-RTO/ISO states are also making grid modernization investments.



Renewable Portfolio Standards

An analysis of states with mandatory renewable portfolio standards (RPSs) was conducted; these states were compared with those that have voluntary renewable energy (RE) goals or targets, and those without any renewable goal or requirement, to determine whether there were any correlations with GMI scores.

The analysis showed that the average scores for all three GMI components ranked from highest to lowest across the board going from mandatory to voluntary to no renewable energy requirements or goals.

26 States – Mandatory RPSs

RPS Goals Mandatory	Policy	Customer Engagement	Grid Operations	Total Score
Average Score	0.66	0.50	0.54	0.57
Std. Deviation	0.17	0.19	0.16	0.16

26 States with mandatory Renewable Portfolio Standards (RPSs) showed a high positive statistical correlation within the Policy, Customer Engagement, and Grid Operations components of the GMI.

6 States –Voluntary RE Goals

RE Goals Voluntary	Policy	Customer Engagement	Grid Operations	Total Score
Average Score	0.56	0.43	0.48	0.49
Std. Deviation	0.17	0.16	0.19	0.14

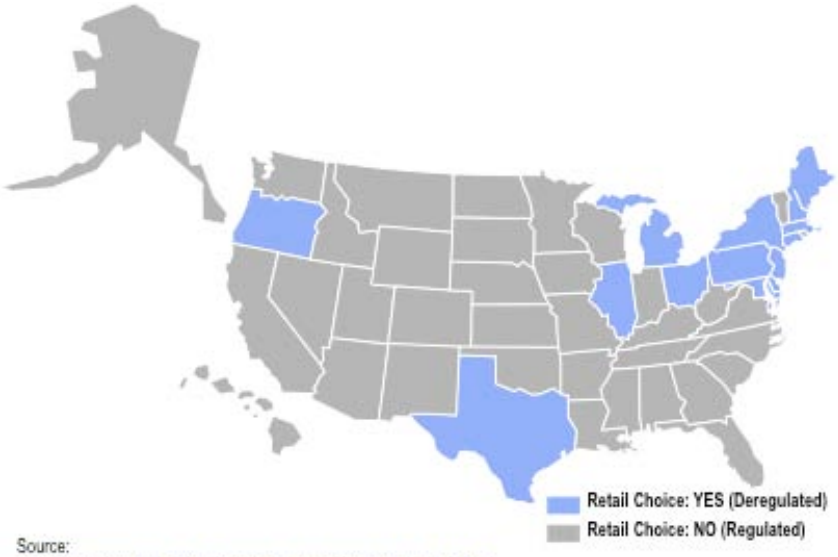
6 States with voluntary Renewable Energy (RE) goals showed no statistical correlation between Policy, Customer Engagement and Grid Operations.

10 States – No RPS Goals

No RPS Goals	Policy	Customer Engagement	Grid Operations	Total Score
Average Score	0.48	0.32	0.42	0.41
Std. Deviation	0.11	0.10	0.15	0.10

10 States with no renewable energy requirements or goals showed a high statistical correlation between Policy and Customer Engagement, although these scores are lower for this group than for the other two groups.

Retail Choice:



Source:
www.eia.gov/cneaf/electricity/page/restructuring/restructure_elect.html

The analysis of states with and without retail choice revealed that the states with retail choice (i.e., "deregulated" states) scored higher in all three components. However, there was no difference in the statistical correlations between any of the components related to whether the state had retail choice or not.

De Regulated states	State Support	Customer Engagement	Grid Operations	Total Score
Average Score	0.74	0.55	0.58	0.62
Std. Deviation	0.17	0.18	0.15	0.15

Regulated states	State Support	Customer Engagement	Grid Operations	Total Score
Average Score	0.52	0.38	0.46	0.45
Std. Deviation	0.12	0.16	0.16	0.13

Electricity Pricing:

Accenture performed a statistical assessment of electricity prices compared to GMI scores. The firm found no correlation between prices for any of the three types of customer segments (residential, commercial, industrial) and the GMI scores. Therefore, it was concluded that retail pricing is not a primary driver of investments in grid modernization.

ARRA Smart Grid Investment Grants:

For the 42 jurisdictions analyzed in the 2013 GMI, the Smart Grid Investment Grants (SGIG) program and total project value showed high positive correlation across all three GMI components of Policy (or, "State Support"), Customer Engagement, and Grid Operations. It was therefore concluded that the ARRA SGIG program was a significant driver in increasing grid modernization investments and capabilities.

Linkage to economic growth:

Accenture utilized "all industry" and "utility industry" Gross Domestic Product (GDP) to determine whether a correlation existed between GDP and any or all of the GMI components herein. Examining all 42 jurisdictions, they identified high positive correlations with Policy and Customer Engagement; however there was low positive correlation with Grid Operations.

Conclusion

This Grid Modernization Index (GMI) has been created to serve as a barometer of the progress being made across the U.S. in modernizing the electric grid and in leveraging the new capabilities enabled by these investments to enhance utility operations and empower customers. By examining this progress at the state level, the GMI provides insights to state policy makers, regulators, and others stakeholders regarding the progress and insights into best practices and success.

The 2013 GMI analysis and subsequent results reveal the following key observations:

- GMI scores for states that have retail choice, belong to Regional Transmission Organizations (RTOs) or Independent System Operators (ISOs), and have Renewable Portfolio Standards all showed high positive correlations, indicating a relationship exists between these federal and state policies and greater investments in grid modernization.
- Analysis shows a positive correlation between the state Policy component scores and Grid Operations component scores, but the correlation is not statistically significant for the top 15 states.
- Analysis shows a high positive and statistically significant correlation between states that received ARRA Smart Grid Investment Grants and the scoring across all three components (i.e., Policy, Customer Engagement and Grid Operations) of the GMI.
- No correlation was found between electricity end use prices in any customer segment and the GMI scores, indicating that the price of electricity is not a primary driver for grid modernization.
- The states that scored higher overall in the GMI also demonstrate higher scores in addressing cybersecurity and data privacy than other states. This could be driven either by the utilities themselves or by the state as a whole.
- States that scored higher overall also have higher scores in engaging customers, e.g., by educating them, as well as by offering them products and services, including more dynamic pricing options.
- States that scored higher overall also have deployed more sensors and advanced modeling tools for both transmission and distribution grids.
- The 15 highest-scoring states all have deployed smart meters to their residential and small commercial customers to some extent. Ten of these 15 states have installed smart meters for at least 60 percent of their consumers.

2013 is the inaugural year for the GWA/SGPC Grid Modernization Index. GWA and SGPC plan to update the GMI annually to track the progress of modernizing our nation's electric grid.

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- Michael Champley (Commissioner, Hawaii Public Utility Commission)
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[1] Affiliations are noted for informational purposes only. All members participated as individuals, not on behalf of their professional organizations.

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