Grid Modernization

Description:

The electric grid is a complex system of generation, transmission, distribution, and demand. Not only is this infrastructure aging, recent advances in technology mean that the electric industry is undergoing a major shift in the manner in which electricity is produced, delivered, and used. High quality and reliable electricity is required to support the transition to a digital economy. Emerging physical and cyber security threats, along with increased demand for faster outage response times, require, at minimum, real-time incident response capabilities. Enabling the integration of energy efficient technologies and practices, clean energy technologies like distributed and utility-scale renewable energy resources, and electric vehicles, while also ensuring the adoption of advanced metering, energy storage, and micro-grid technologies, modernizing our electric system will provide economic benefits, increased security, and more reliable, resilient, and clean electricity. However, this next level of innovation requires a large investment in improving grid technology: The electric utility grid is one of the last components of our society without robust digital data capabilities.

Discussion of the Policy:

In the last two decades, digital technologies have been developed that enable utilities to better manage the grid and also provide opportunities for consumers to customize their services to fit their priorities. These technologies allow a two-way flow of information between the electric grid and grid operators and between utilities and their customers.

Emerging technologies improve system reliability and resiliency by enabling better tracking and management of resources. These technologies allow grid operators to incorporate central and distributed energy resources, energy storage technologies, electric vehicles, and assist in addressing the challenges associated with planning, congestion, asset utilization, and energy and system efficiency. This can make the operational side of the utility more efficient.

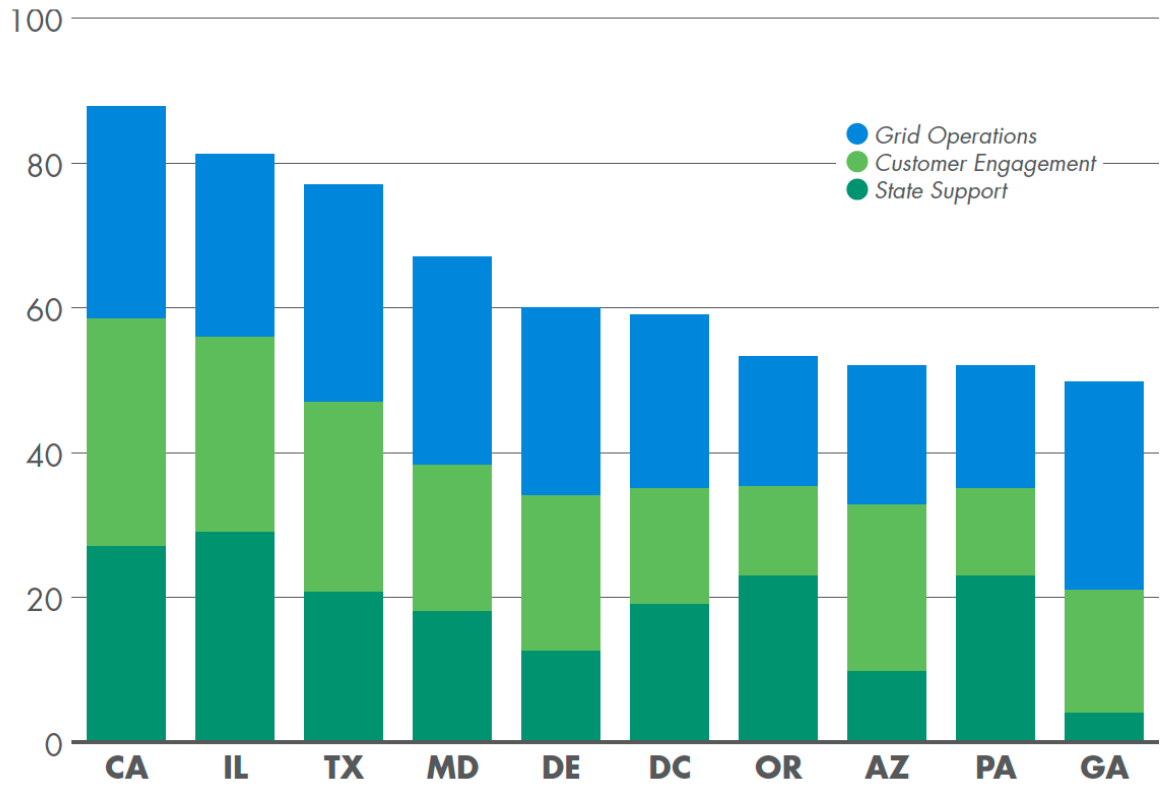
On the customer's side of the meter, advanced metering infrastructure, dynamic pricing, and other emerging technologies allow an exchange of information and electricity between a consumer and their electric provider. Grid modernization will be associated with greater consumer choice, allowing customers to meet their energy priorities by producing their own energy or to selecting to receive innovative energy efficient or clean energy services from different providers.

Grid Modernization efforts compliment other policies such as demand response policies, customer data management, smart metering infrastructure, electric vehicles and others. Policy approaches around grid modernization should be seen as an umbrella to put in place a structure that supports and ties together these other individual policy initiatives.

The ability to price power on a real time basis can avoid cross-subsidization issues that are inherent with flat pricing schemes and can also enable customers to take greater control of their energy usage in a way that will benefit the entire system. It also provides regulators with more tools for tracking energy trends and considering a wide variety of options to meet utility system challenges.

Example State Programs:

State scores, as determined by the 2016 Grid Modernization Index (GMI), for the top 10 states, are provided in the chart below.



Source: GridWise Alliance and Clean Edge.

- California's Smart Grid:
  http://www.cpuc.ca.gov/General.aspx?id=4693
- Hawaii State Energy Office, Grid Modernization:
  http://energy.hawaii.gov/renewable-energy/grid-modernization
- Massachusetts Department of Public Utilities' Grid Modernization Homepage:
  http://www.mass.gov/eea/energy-utilities-clean-tech/electric-power/grid-mod/grid-modernization.html
- New York's Reforming the Energy Vision (REV) utility proceedings include grid modernization.
- See also: Texas A&M Smart Grid Center:
  http://smartgridcenter.tamu.edu/sgc/web/

In January 2016, the U.S. Department of Energy (DOE) announced the release of the Grid Modernization Multi-Year Program Plan. Part of the Department's comprehensive Grid Modernization Initiative, the plan includes up to $220 million dollars, over the course of three years and subject to appropriations,

to fund grid modernization research and development by DOE's National Laboratories and other participants in the Grid Modernization Lab Consortium (GMLC). Created by Executive Order, the Obama Administration's Quadrennial Energy Review's (QER) second installment, "An Integrated Study of the Electricity System" will develop a set of policy recommendations to guide grid modernization activities.

Key Components:

Grid modernization will not come about as a result of a single policy change. Rather, grid modernization requires a suite of state and federal policy changes to support change in grid technologies, grid management, and regulation of utilities. Grid modernization strategies, while recognizing regional and inter-state diversity and avoiding one-size-fits-all plans, should also take a holistic view of the electric system. The following general best practices can be used to inform the development of a state's grid modernization strategy:

- Develop a strategy through a stakeholder process that incorporates the viewpoints of utility customers, utilities regulators, utilities, and other stakeholders.
- States may decide to mandate a ten-year grid modernization plan to be proposed by utilities to the utility commission within a specified timeframe. This mandate would include requirements for implementation by utilities within a certain amount of time.
- Strategies and / or plans should outline a clear set of grid modernization goals and describe methods to measure, report, verify, and enforce progress towards those goals.
- The technologies associated with grid modernization generate a wealth of information about the grid itself and about customer behavior. State policy should include measures to protect this data, but should also encourage the use of this information to facilitate additional improvements to grid management and customer services.
- Grid modernization plans and strategies should incorporate consideration of the impacts of electric vehicles on the grid. Providing for electric vehicle charging rates and incentives can control the impact of these vehicles on grid operations.
- States should provide incentives or cost recovery mechanisms for utilities to meet grid modernization goals. States should also consider policies to update utility business models and utility regulation.

More Information:

- The Electric Power Research Institute's Grid Modernization Resources:

  http://www.epri.com/Our-Work/Pages/Grid-Modernization.aspx
- The Future of the Grid: Evolving to Meet America's Needs:

  http://energy.gov/oe/downloads/future-grid-evolving-meet-america-s-needs-december-2014
- The Quadrennial Technology Review (compliments the Quadrennial Energy Review):

  http://energy.gov/quadrennial-technology-review-2015
- Energy Digital:

  http://www.energydigital.com/utilities/3691/Which-US-States-are-Leading-the-Way-in-Grid-Modernization
- The DOE's Smart Grid Page:

  http://energy.gov/science-innovation/electric-power/smart-grid

- DOE's Grid Tech Team: http://energy.gov/oe/services/doe-grid-tech-team/about-gtt
- Institute of Electrical and Electronics Engineers: http://smartgrid.ieee.org/january-2013/738-doe-s-strategic-plan-for-grid-modernization
- The DOE's Office of Electric Delivery and Energy Reliability provides a wealth of information: http://energy.gov/oe/office-electricity-delivery-and-energy-reliability