

Grid Modernization

Description:

The [electric grid](#) is a complex system of generation, transmission, distribution, and demand. Aging infrastructure and recent technological developments are forcing changes in electricity production, delivery, and use.

The transition to a digital economy requires affordable, sustainable, and reliable electricity and presents challenges and opportunities to the grid. Emerging physical and cyber security threats, along with increased demand for faster outage response times, require, at minimum, real-time incident tracking and response capabilities. Increased grid penetration of renewable energy coupled with the adoption of [advanced metering](#), [energy storage](#), microgrids, electric vehicles, and other technologies to modernize our electric system will provide economic benefits, increase security, and ensure more reliable, resilient, and clean electricity. These innovations will require substantial planning and investment in grid technologies.

Discussion of the Policy:

New digital technologies have enabled utilities to better manage the grid and 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, and assist in addressing the challenges associated with planning, congestion, asset utilization, and energy and system efficiency. 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 for customers by allowing them to meet their energy priorities through independent energy production or through innovative clean energy services from different providers.

Grid modernization will require a suite of state and federal policy changes to support advancements in grid technologies, grid management, and utility regulation. Grid modernization strategies, while recognizing regional and inter-state diversity and avoiding one-size-fits-all plans, should take a holistic view of the electric system. The following can be used to inform the development of a state's grid modernization strategy:

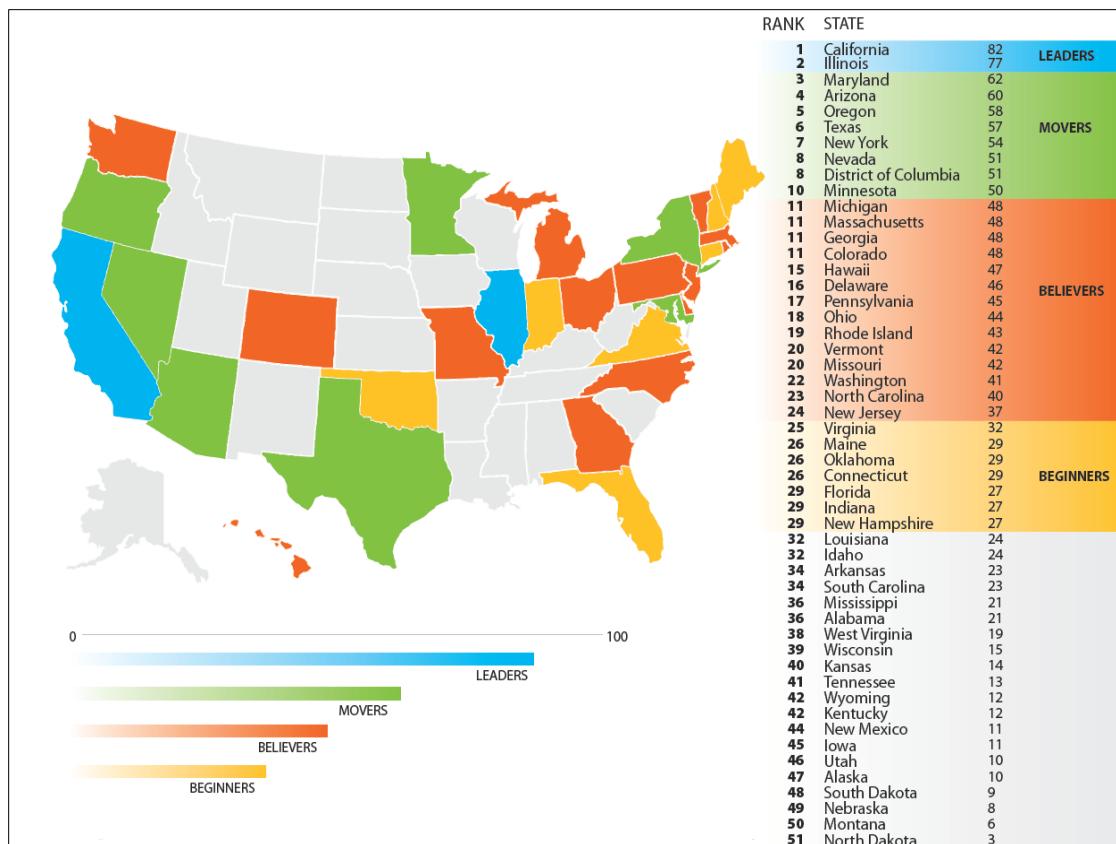
1. Establish a collaborative process to develop a grid modernization strategy that will incorporate the viewpoints of utility customers, utility regulators, utilities, and other stakeholders.
2. States can require that utilities develop and propose a ten-year grid modernization plan to the public utilities commission within a specified timeframe. Utilities would then be required to implement that plan within another specified timeframe. 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. States might also provide incentives or cost recovery mechanisms for utilities that meet grid modernization goals.
3. Grid modernization plans and strategies can incorporate consideration of the impacts of electric vehicles on the grid. Providing for electric vehicle charging rates and incentives, and planning for increased adoption can help control the impact of these vehicles on grid operations.
4. States can require that utilities' integrated resource or long-term plans include strategies to enhance cybersecurity, integrate distributed energy resources (including electric vehicles and energy storage), increase

smart meter deployment and demand response and/or demand-side management (DSM) programs, and measure and report on the results of these efforts.

5. 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 can also encourage the use of this information to facilitate additional improvements in grid management and customer service. To address this, policymakers can develop legislation or rules that clarify who owns the energy data associated with customer energy usage; protect customer privacy; outline the process for allowing direct access to data by third parties; and promote access to the highest resolution of data by third parties. States could establish customer access to energy data through the [Green Button Connect](#) program, for example.
6. Utility regulation varies, to some extent, by a state’s utilities commission. Most commissioners and commission staff, however, still adhere to the regulatory principles outlined when utility companies were vertically integrated; experiencing increases in load and had the ability to capitalize on economies of scale for new generation. These “natural monopolies” warranted a state regulatory body that could balance the tradeoff between efficiency (in the form of least cost production) and equity (consumer protection). Many have argued recently that the regulated utility industry needs a new set of principles that are more sophisticated, forward-planning, and incentive-based. States could implement alternative ratemaking mechanisms, adopt [performance-based regulation](#), and/or work with utilities to develop new business models that support grid modernization.

Example State Programs:

State scores, as determined by the [2018 Grid Modernization Index \(GMI\)](#), are in the figure below.



Source: [GridWise Alliance](#)

- 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>
- Illinois' Next Grid:
<https://nextgrid.illinois.gov/>
- Transforming Maryland's Electric Grid (PC44):
<https://www.psc.state.md.us/transforming-marylands-electric-grid-pc44/>
- Texas A&M Smart Grid Center:
<http://smartgridcenter.tamu.edu/sgc/web/>

More Information:

- DOE: Grid Modernization and the Smart Grid:
<https://energy.gov/oe/activities/technology-development/grid-modernization-and-smart-grid>
- DOE: Grid Modernization Laboratory Consortium:
<https://gridmod.labworks.org/>
 - National Renewable Energy Laboratory: Grid Modernization: <https://www.nrel.gov/grid/>
 - Sandia National Laboratories: Grid Modernization: <http://energy.sandia.gov/energy/ssrei/gridmod/>
- The Electric Power Research Institute: Smart Grid Resource Center:
http://smartgrid.epri.com/Data_Analytics_Initiatives_for_Transmission_and_Distribution.aspx
- Renewable Energy World: DERs and Grid Optimization – The Next Phase of the Grid Modernization Journey:
<https://www.renewableenergyworld.com/articles/2017/11/ders-and-grid-optimization-the-next-phase-of-the-grid-modernization-journey.html>
- Solar Energy Industries Association: Grid Modernization Whitepaper Series:
<https://www.seia.org/grid-modernization-whitepaper-series>

For additional information on this topic, please review Chapter 2.4: Grid Modernization in the *Clean Energy Policy Guide for State Legislatures* available at: <http://cnee.colostate.edu/cleanenergypolicyguide/>

This information, along with additional resources, is also available on the Clean Energy Legislative Academy's resources page at: <http://cnee.colostate.edu/academyresources/>