Principles to get the most out of grid modernisation efforts

Grid modernisation | The proliferation of renewables and other distributed energy resources is pushing existing grid infrastructure to the limit, prompting renewed efforts to modernise. But with new hardware coming at such a high price, it's imperative these investments get the biggest bang for their buck. Here, the US Interstate Renewable Energy Council establishes five key principles for grid modernisation.

Credit: NextEra

While replacing aging infrastructure and incorporating new technologies may help to improve the reliability of the distribution grid, approached strategically, grid modernisation can achieve much more.

Grid modernisation investments can leverage the capabilities of new technologies to increase transparency, make the grid more resilient (particularly important in the context of increasing natural disasters and extreme weather), and make future grid investments less risky.

Not all grid modernisation proposals are equal—or even beneficial—however. Some may prioritise investment in legacy infrastructure that ultimately crowds out or impedes the adoption of clean energy resources, while others may prioritise newer technologies, such as advanced metering infrastructure, but have little alignment with public policy goals, such as resilience and climate change mitigation. Weighing the relative merits of these proposals to determine cost effective investments that will benefit consumers and the grid is a significant challenge for states in the US.

Recognising the complex nature of evaluating grid modernisation proposals, the Interstate Renewable Energy Council (IREC) partnered with GridLab, a non-profit that provides technical grid expertise to enhance policy decision-making, to develop a resource that establishes guiding principles and a framework for evaluating grid modernisation plans and investments.

As greater quantities of solar are connected, grids must modernise effectively.

'A Playbook for Modernizing the Distribution Grid', or 'The GridMod Playbook' as it is otherwise known, aims to help stakeholders make more informed decisions and ensure more efficient and impactful grid modernisation activities. This article examines the grid modernisation principles established in the Playbook and grounds them in several real-world examples of grid modernisation activities around the US.

Five principles for more effective grid modernisation

IREC and GridLab assert that, irrespective of specific policy objectives articulated for particular grid modernisation initiatives,

Credit: Tesla

the overarching goals of grid modernisation plans and investments should be to enable the swift evolution of the grid to integrate modern technologies that meet public policy and clean energy objectives, such as reducing carbon emissions and achieving 100% clean energy goals.

In particular, credible grid modernisation proposals will facilitate the decarbonisation and electrification of buildings and transportation; increased energy efficiency, reliability, and resilience; and the deployment of distributed energy resources (DERs), like solar, energy storage, and electric vehicles (EVs).

With these big picture goals as a foundation, the following five principles of grid modernisation provide a helpful lens for evaluating the strengths and weaknesses of grid modernisation plans, proposals, and investments:

Support and enable policy goals, including the decarbonisation of the electricity system and the beneficial electrification of the transportation and building sectors

As climate change intensifies and the urgency for solutions grows, decarbonisation and the related "beneficial electrification" of the buildings and transportation sectors will be crucial. (Beneficial electrification refers to replacing direct fossil fuel use with electricity in a way that reduces overall emissions and energy costs.) In the US, building and transportation contribute 40% and 28% of greenhouse gas emissions respectively. Appropriate grid modernisation proposals are grounded in this context.

As a baseline, proposals and plans should account for existing programs and policies that are driving increased adoption of DERs like EVs and rooftop solar. Beyond that, effective grid modernization proposals will leverage these consumer investments as alternatives to costly centralized grid investments.

Other DERs like electric vehicles and chargers should be accommodated wherever possible

Five principles of grid modernisation

- Support and enable policy goals, including the decarbonisation of the electricity system and the beneficial electrification of the transportation and building sectors
- Enable the adoption and optimisation of distributed energy resources
- Empower people, communities, and businesses to adopt affordable clean energy technologies and clean energy solutions
- Support secure and transparent information sharing and data access
- Enable innovation in technology and business models

Enable the adoption and optimisation of distributed energy resources

Similarly, strong grid modernisation proposals recognise the economic, reliability, resilience, and environmental benefits that can be achieved through DER adoption and enable their wider use.

There are a number of mechanisms that states can employ to reduce barriers to the development of DERs, including updating interconnection processes to account for the unique characteristics of energy storage systems.

Earlier this year, Maryland approved changes to its interconnection rules as part of the state's grid modernisation proceeding, Transforming Maryland's Electric Grid (Public Conference 44). Specifically, regulators adopted new provisions that require utilities to evaluate energy storage and solar-plus-storage systems based on their intended use rather than their maximum output based on nameplate capacity. By updating its interconnection rules to recognise the flexibility and varying operating profiles of storage, Maryland has provided a pathway for greater DER deployment that can help to increase grid resiliency and meet the state's clean energy goals.

Grid modernisation can take many forms, from individual programs and investments proposed in relative isolation (e.g., advanced communications or control system investments proposed outside the context of comprehensive utility transformation processes); proceedings that target a wider set of select grid modernisation issues; and sweeping proceedings that attempt to establish a comprehensive framework for grid modernisation across a wide range of issues.

New York's Reforming the Energy Vision is an example of a more comprehensive approach to grid modernisation. It has, over the past several years, tackled a number of policy and regulatory matters, ranging from transportation and buildings electrification, to Non-Wires Alternatives, and developing new utility business models, rate designs, and DER valuation tariffs.

Among states that have launched more comprehensive grid modernisation proceedings, each jurisdiction applies a different set of priorities and often slightly differing definitions of "grid modernisation" and its objectives. However, many of them share common elements.

For example, DER integration and interconnection have featured as important components of the broader grid mod processes in the District of Columbia, New York, California, New Hampshire, and Maryland (as described under principle two above, however this is not an exhaustive list of grid modernisation efforts in the US). Other common elements can include a consideration of the role of energy storage in supporting a more resilient and transactive grid; the development of comprehensive benefit-cost analysis frameworks to guide investments; and distribution system planning that enables a more transactive grid, to name a few.

Regardless of the precise scale and scope of the undertaking, regulators should ideally take a holistic approach to grid modernisation that leverages the interrelated impacts and benefits of the individual issues the proceedings cover, in order to maximise the effectiveness of individual programs and investments in achieving state policy goals. For example, well-developed interconnection procedures are essential on their own, but pairing those rules with increased grid visibility and transparency, as well as Integrated Distribution Planning, can pave the way for even more DER deployment.

Empower people, communities, and businesses to adopt affordable clean energy technologies and clean energy solutions

Done well, grid modernisation should advance a more distributed grid that gives consumers greater control over their energy usage, costs, and carbon footprints—such as through DER adoption, increased energy efficiency, or greater transparency into their energy consumption. Streamlined processes for interconnection and leveraging emerging approaches like hosting capacity analysis can help. Grid modernisation plans and investments should empower consumers, while safeguarding grid reliability and safety.

New York has looked to stimulate the deployment of distributed energy resources

Credit: ConEdison

Support secure and transparent information sharing and data access

Transparency and ease of data access are pillars of effective grid modernisation. Increasing grid transparency, such as through the use of hosting capacity analyses (HCA) and maps, can help consumers, local governments, and developers to more easily identify optimal locations for DER development.

An excellent example of this can be seen in California's groundbreaking interconnection policy updates earlier this year. In September, the California Public Utilities Commission approved sweeping changes to Rule 21; among many other innovations, with this ruling, California became the first US state to use HCA results to allow simplified interconnection processes for certain projects and enable developers to select optimal project locations. The updates also recognise some of the unique characteristics of energy storage, making it easier for developers to advance these projects.

Enable innovation in technology and business models

Finally, grid modernisation plans and investments should support the development of new technologies and business models, allowing third-parties to provide information, services, and technical and financial support to consumers.

In the US alone, utilities are proposing grid modernisation investments that total billions of ratepayer dollars. These proposals can be shrouded in complexity, filled with technical acronyms and spanning dozens or hundreds of pages. With an eye toward the outcomes we want to achieve on our "modern grid" and an understanding of the principles of effective grid modernisation initiatives that will get us there, regulators and other stakeholders can more easily assess the merits of individual proposals. This will be particularly important as we collectively confront numerous challenges to the resilience of our grid resulting from climate change.

For a deeper dive into key considerations when evaluating a grid modernisation plan, proposal, or investment, download 'A Playbook for Modernizing the Distribution Grid' from IREC. In addition to the goals and principles of grid modernisation articulated in this article, the playbook also provides a detailed evaluation checklist and in-depth guidance on questions to ask about specific terms and types of investments. ■

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About IREC

The Interstate Renewable Energy Council (IREC) builds the foundation for rapid adoption of clean energy and energy efficiency, toward a 100% clean energy future that is reliable, resilient and equitable. IREC is an independent not-for-profit organization leading transformational work since 1982.