# THE POLICY PROCESS OF GRID TRANSFORMATION

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# INTRODUCTION
## The Policy Process of Grid Transformation

Grid transformation is a growing hot topic in the energy industry. In 2017, over 200 state, city, and utility-level actions related to grid transformation were proposed, pending, or enacted.[1] For many policymakers, however, understanding the role of grid investments, regulatory and legislative policy, as well as changes in the market place in the transformation of the grid is still unclear. The Solar Energy Industries Association recently initiated a series of policy briefs that take an in-depth look at state-level efforts to modernize the electric utility grid.[2] The North Carolina Clean Energy Technology Center, a N.C. State University-based research organization, also developed its *50 States of Grid Modernization* to catalogue proposed and adopted policy changes related to grid modernization and distributed energy resources (DER).[3]

Following those initial efforts, Vote Solar will author a series of white papers to help lawmakers and other legislative stakeholders understand the what grid transformation is and isn't, what components are necessary to transition well, and the importance of a strong policy process to support the transformation of our nation's electric grid.

As the first installment, this paper provides a brief overview of the *what* and the *how* of grid transformation, focusing on the necessary tenants of a strong grid transformation process. A strong policy process can help ensure that any effort in transitioning the grid will result in a reliable, affordable, clean, flexible and innovative electric system.

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[1] North Carolina Clean Energy Technology Center. 2017. 50 States of Grid Modernization https://nccleantech.ncsu.edu/the-inaugural-50-states-of-grid-modernization-report-now-available; Black & Veach. 2018. Strategic Directions: Smart Cities/Smart Utilities. https://pages.bv.com/SDR-Smart-City-Smart-Utility-DL.html#_ga=2.1467191.706672811.1511881544-2018393701.1511881544

[2] Solar Energy Industry Association. 2017. Grid Modernization White Papers. Available at: https://www.seia.org/grid-modernization-whitepaper-series

[3] North Carolina Clean Energy Technology Center. 2017. 50 States of Grid Modernization https://nccleantech.ncsu.edu/the-inaugural-50-states-of-grid-modernization-report-now-available/

# DEFINING GRID TRANSFORMATION

Grid Transformation is the strategic transition in the planning, operations, investments, regulation, and markets of the electric system. There are three basic elements of grid transformation: *grid modernization, market transformation, and regulatory transformation.* In order to transition to the grid of the future, all three aspects of Grid Transformation must be addressed in concert and supported by a strong policy process.

## Grid Modernization

***Grid Modernization is the strategic investments in the distribution system to accommodate two-way flows of energy and distributed energy resources with the purpose of creating a cleaner, more efficient, and intelligent grid.***

The advent of Grid Transformation is in large part a result of the growth in new technology solutions to enable a smarter, cleaner, more efficient use of energy. Advancements in information technologies, distributed energy resources, and distribution system operations technologies are progressing rapidly. In order to transition to a more modern grid, strategic investments in new supporting infrastructure are necessary. Some investments are intended to improve grid reliability, resiliency, and safety, while others are targeted to enable consumers to meet future energy needs with DER. However, many distribution system investments can accomplish both objectives. For example, smart inverters enable the interconnection of distributed solar and storage to the grid, while also providing valuable services to increase system reliability and stability.

## Market Transformation

Investments in Grid Modernization have the opportunity to open up an entire new market for the products, services, and management of the future grid. However, to fully utilize the technologies of the future will require changes to market structures to allow for or incentivize third-parties in the provision of grid services, and/or incentivize third-party investments and leverage the adoption of new technologies. The technical and market structures currently in place often do not fit well with the adoption of technologies such as distributed storage, electric vehicles, microgrids, and distributed solar, and may need adjustment in order to utilize DERs for their full value.

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***Market transformation is the expansion of the ecosystem of entities that can provide grid services, and the new regulatory structure that supports this ecosystem.***

One of the most innovative aspects of grid modernization is the potential for third-party investments in **non-wire alternatives (NWAs)** to meet grid needs. Non-wire alternatives are projects that use non-traditional solutions, such as distributed energy resources and IT infrastructure, to defer or eliminate the need for traditional equipment upgrades. Utilizing NWAs is predicated on the creation of new market structures that recognize the value of NWAs over traditional investments and allow for new participants to engage in the provision of grid services. Thought leaders in the field of grid modernization envision transitioning to a distribution system platform than can be used as a market for NWAs. Policymakers need to determine how to create competitive markets that allow for innovation and how to best compensate parties that provide market solutions to grid needs. For example, in wholesale markets there exist a number of market barriers that limit DERs ability to participate in certain wholesale market products, such as demand response or ancillary services. Regulatory reform that removes these barriers can help unlock the value of DERs.

## Regulatory Transformation

Grid Transformation requires consideration of changes to regulatory structures and rate design to advance a market for grid services. Investments in grid modernization technologies are meant to improve grid services, but the optimization of those services is dependent on the actions taken by both the utility and other parties. Regulatory transformation is largely concerned with two primary objectives-rate transformation, and business model transformation.

Investments in Grid Modernization needs to be supported by rate design that will facilitate and incentivize the smart use of energy, strategic investments in distributed resources, and accurately reflect the value of customer's private investments. While historically rate design has been formulated based on an 'average customer' usage pattern, the future grid will need rate design that recognizes the temporal and locational use of energy.

> The regulated utility business model allows a return on investment for infrastructure spending but not services investments.

***Rate Transformation is the transition to rate schedules that are most reflective of the temporal and locational value of energy, and provide pathways to incorporate customers as active agents in the generation and consumption of energy.***

In addition to rate design changes, he business model for most regulated utilities allows a return on investment for monies spent on infrastructure but not on the provision of services. Given that one of the purposes of Grid Transformation is to offer new, improved, and/or expanded services to ratepayers, it may be necessary to examine potential changes to the utility business model and what mechanisms of regulatory oversight are most appropriate. For example, in New York and Rhode Island, regulators are determining how to incentivize the use of DERs as NWAs rather than allowing more expensive investments in the rate base. This change will require determining the appropriate means of compensating utilities that invest in DERs as grid service providers as opposed to just generation resources.

## ESTABLISHING A POLICY PROCESS FOR GRID TRANSFORMATION

In order to tackle the complicated transition to the future grid, Grid Transformation must be supported by a strong and robust policy process. Grid Transformation proceedings can take several forms and be initiated at either the state, local, or regulatory level. It can be done through a formal regulatory rulemaking; as part of an existing resource planning process; or as part of a state or local initiative. Typically, a regulatory body will need to formally authorize the investment required to modernize the grid as well as the supporting changes in rate design and market reform. Legislation can help define the process of regulatory review of grid modernization and outline the vision and goals for transition. Table 1. outlines a few initiatives that state legislature, local governments, and regulatory commissioners can take to move towards a modern grid.

| State Legislature | Local Government | Regulatory Commission |
|---|---|---|
| -Commission Statewide Grid Transformation process and studies to examine the role of DERs and supportive infrastructure for grid modernization<br><br>-Legislation creating markets for third-parties to provide grid services<br><br>-Creating statewide goal for a Grid Transformation process<br><br>-Provide incentives for the use DERs and the use of NWAs<br><br>-Facilitate a stakeholder process for Grid Transformation<br><br>-Directly invest in DERs for state infrastructure and work with utilities to optimize the use and value of investments | -Commission local studies to examine the role of DERs and supportive infrastructure for grid modernization<br><br>-Creating local goals for the modern grid<br><br>-Provide incentives for the use DERs and NWAs<br><br>-Facilitate a stakeholder process for Grid Transformation<br><br>-Work with utilities to determine local pathways for Grid Transformation<br><br>-Directly invest in DERs for municipal infrastructure and work with utilities to optimize the use and rate structures that support the value of investments | -Commission utility-specific studies to examine the role of DERs and necessary grid modernization investments for Grid Transformation<br><br>-Explore new rate designs to incentivize smarter use of energy and correctly value the use of DERs and NWAs<br><br>-Commission pilot projects to study DERs use as NWAs<br><br>-Explore new rate regulation models that value services or performance metrics over capital investments<br><br>-Facilitate stakeholder process for Grid Transformation<br><br>-Commission utilities to perform integrated resource planning<br><br>-Commission utilities to perform robust cost/benefit analyses to examine different technologies for Grid Transformation<br><br>-Request utilities provide publicly available maps and information on the distribution system to facilitate DER interconnection and identify potential NWA projects |

**Table 1. Policymakers actions to work towards a modern grid**

In order to determine the 'best practices' of Grid Transformation from a policy process perspective, Vote Solar reviewed numerous Grid Transformation proceedings transpiring throughout the United States. Our review determined that there are five critical policy process components of Grid Transformation:

1. Stakeholder Engagement
2. Clear and Measurable Goals
3. Integrated Distribution Planning
4. Cost Benefit Analysis
5. Benchmarking

These five components of the policy process support the on-going modernization of the grid and are necessary at the onset any grid modernization proceeding and throughout the transition.

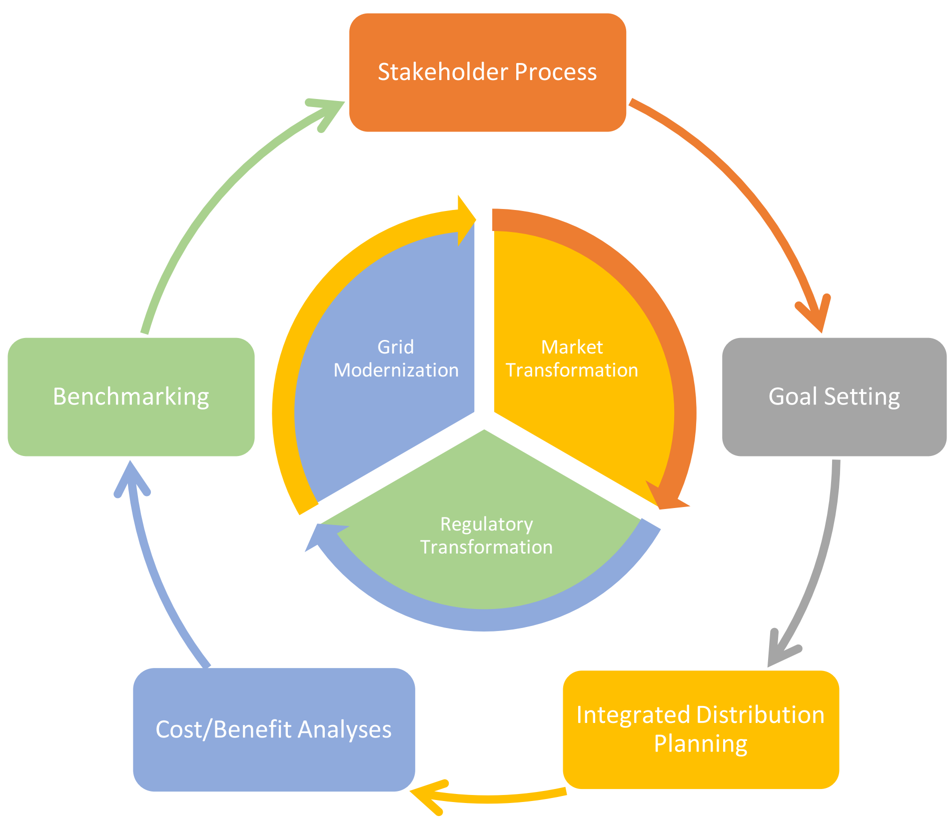


**Figure 1. The Policy Process of Grid Transformation**

## Stakeholder Engagement

Stakeholder engagement is critical for successful Grid Transformation and underpins the entire policy process. A formal stakeholder process needs to bring together utility and non-utility experts in the field of grid modernization, rate transformation, and market transformation to define and chart a clear pathway for modernizing the grid. The benefit of a stakeholder process is to share information, ideas, and expertise on technologies, options, and strategies for Grid Modernization. Ultimately a strong stakeholder process should create an open, transparent dialog on key Grid Transformation topics, and attempt to reach consensus on opportunities for meeting the agreed upon goals of grid modernization and the strategic investments that will facilitate achieving those goals.

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While stakeholder processes can vary, areas of discussion in a stakeholder process should tackle all three components of Grid Transformation (i.e. strategic technology investment for grid modernization, market transformation and regulatory transformation) and serve to inform the additional elements of a strong policy process.

## Setting Clear and Measurable Goals

Before engaging in any investment in the grid of the future, or introducing supportive market and regulatory changes, it is important to clearly define the goals of a Grid Transformation proceeding and any grid investments.

Common goals include:

- Improved Utilization of Grid Assets
- Increased Penetration of Distributed Energy Resources
- Improved Reliability
- Improved Efficiency
- Improved Resiliency
- Improved Flexibility
- Improved Information Sharing
- Improved Security
- Increased Customer Options
- Improved Transparency and Data Access

These goals should be based on benchmarks of performance and associated with metric that can be measured, so utilities and regulators can assess and track progress. For example, a goal of 'increased penetration of distributed energy resource' or 'improved efficiency' may be strategic, grid modernization investments of Advanced Metering Infrastructure coupled with Rate Transformation that expands the value of DERs, such as the combination of solar and storage used for ancillary services. Clear and measurable goals help facilitate efficient investments and the use of existing infrastructure, as well as provide a means to assess the usefulness of an investment, regulatory change, or market change towards achieving a specified goal. Goals can also help determine compensation for market participants based on their performance in achieving targets.

## Integrated Distribution Planning

Integrated distribution planning (IDP) is a process for proactively identifying the impact on the grid from existing and forecasted penetrations of DER. The process also identifies locations on the distribution system where DER solutions may be preferred over traditional utility investment alternatives. IDP builds on traditional methods for distribution planning by including assessments of individual circuits' ability to accommodate DER (i.e., hosting capacity), advanced load and DER forecasting using probabilistic methods and scenario analyses, and the determination of the locational value of DER deployment. Like a stakeholder process, effective IDP is transparent, participative, and can enable the inclusion of more cost-effective investments, as well as increase opportunities for third-party participation. There are several resources available to help guide integrated distribution planning, including:

- *Distribution Systems in A High Distributed Energy Resources Future* by Lawrence Berkeley National Laboratory;
- *Integrated Distribution Planning Concept Paper* by the Interstate Renewable Energy Council;
- *Integrated Distribution Planning – A Holistic Approach to Meeting Grid Needs and Expanding Customer Choice by Unlocking the Benefits of Distributed Energy Resources* by SolarCity (now Tesla);
- *It's All in the Plans: Maximizing the Benefits and Minimizing the Impacts of DERs in an Integrated Grid* by Smith, Rylander, Rogers, and Dugan;
- *More Than Smart: A Framework to Make the Distribution Grid More Open, Efficient and Resilient* by the Greentech Leadership Group;
- *Planning the Distributed Energy Future* by Black & Veatch and the Smart Electric Power Association; and
- *Improving Distribution System Planning to Incorporate Distributed Energy Resources* by the Solar Energy Industries Association. [4]

## Cost/Benefit Analyses

Cost/benefit analyses, as they relate to grid modernization investments, are an appraisal of the costs, including the opportunity costs, and benefits of investing in a specific technology. Cost benefit analysis should be conducted for the purpose of each investment independently, and in combination with other complementary or supporting investments. Cost benefit analyses are utilized to determine if the proposed investments achieve the definitive goals of the grid modernization proposal. At minimum, cost benefit analyses include a business case analysis on the impacts of the proposed grid modernization investments against a baseline scenario where no grid modernization investments are made.

## Benchmarking

Benchmarking involves the measurement and comparison of a utility's performance against comparable or peer utilities and other relevant organizations. The comparisons may include operating performance measures (e.g., reliability indices, customer satisfaction, etc.) and measures of efficiency or cost performance. Effective benchmarking also provides insight into the underlying policies, practices or procedures that contribute to a utility's performance, and identifies the relative strengths and

[4] Lindel, T. (2013). Integrated Distribution Planning Concept Paper, Interstate Renewable Energy Council. Inc. & Sandia National labs. Available at: http://www.irecusa.org/publications/integrated-distribution-planning-concept-paper; SolarCity (now Tesla). 2015. *Integrated Distribution Planning – A Holistic Approach to Meeting Grid Needs and Expanding Customer Choice by Unlocking the Benefits of Distributed Energy Resources*. Available at: http://www.solarcity.com/sites/default/files/SolarCity%20White%20Paper%20-%20Integrated%20Distribution%20Planning_final.pdf; Smith, J., Rylander, M., Rogers, L., & Dugan, R. (2015). It's all in the plans: Maximizing the benefits and minimizing the impacts of DERs in an integrated grid. *IEEE Power and Energy Magazine*, *13*(2), 20-29.; De Martini, P. (2014). MORE THAN SMART: A Framework to Make the Distribution Grid More Open, Efficient and Resilient. Available at: http://morethansmart.org/wp-content/uploads/2015/06/More-Than-Smart-Report-by-GTLG-and-Caltech-08.11.14.pdf; Black & Veatch and the Smart Electric Power Association 2016. *Planning the Distributed Energy Future*. Available at: https://pages.bv.com/rs/916-IZV-611/images/planning-the-distributed-energy-future.pdf; Solar Energy Industries Association*. 2017. Improving Distribution System Planning to Incorporate Distributed Energy Resource*s. Available at: https://www.seia.org/sites/default/files/resources/SEIA-GridMod-Series-2_2017-July-FINAL_0.pdf

opportunities for improvement for each organization. Finally, benchmarking can serve as the basis for establishing goals or targets for improving performance.

## CONCLUSION

Lawmakers and utility regulators throughout the country are engaged in efforts to modernize the distribution system. This paper draws attention to the importance of a strong policy process to support any grid modernization effort.

There are three basic elements of grid modernization - strategic technology investment, regulatory reform, and market reform. In order to support all three elements of Grid Transformation, a strong policy process is necessary. The components of a strong policy process include: establishing a stakeholder engagement process, setting clear and measurable goals, conducting integrated distribution resource planning, performing robust cost/benefit analyses, and benchmarking the performance of investments made for grid modernization. There are a number of questions surrounding grid modernization that have yet to be answered but the roles of local and state lawmakers and utility commissioners are critical to ensuring a smarter future.

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