Renewable Energy Will Force Change in Utilities

Chris Vlahoplus, Cristin Lyons, and Paul Quinlan

Renewable generation resources, coupled with the innovation of enabling technology on the distribution grid, are creating the potential for disruptive change for electric utilities. While utility-scale renewable strategies can be similar to traditional utility-scale generation (i.e., large-scale assets with purchase power agreements (PPAs)), the utility business model may face significant changes from customer-sited distributed resources, especially distributed solar photovoltaics (PV).

Utilities' responses to distributed generation have varied, ranging from financing projects outside of the service territory to owning and operating distributed generation within the service territory. Regardless of direction, utilities are faced with the need to rethink how distributed resources affect their approach to real-time operations; system planning; customer engagement; and strategy, regulatory, financial, and stakeholder management.

Utilities are faced with the need to rethink.

In response, utilities should take proactive action to do the following:

- Renew the regulatory compact
- Market, test, or pilot alternative resources
- Define adjustments to the operating model
- Define adjustments to the business model

Despite some rhetoric to the contrary, utilities will continue to exist and play a vital role in providing valuable services to customers. Therefore, utilities must have room to become valuable partners to ensure that distributed generation becomes a long-term, positive enhancement of the electric grid.

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In renewable energy project development, regulatory risk can often be one of the more frustrating issues that renewable energy developers must address. To date, US Department of Defense officials—in particular, the US Army Energy Initiatives Task Force—have taken a conservative approach to state regulatory risk by including requirements in requests for proposals that the bidder comply with all state utility laws. Understanding the nuances of state regulation may provide an opportunity for power purchase agreements to be executed that might otherwise not be considered readily feasible.

Federal regulation of public utilities by the Federal Energy Regulatory Commission is relatively well understood, and therefore is not the focus of this article.

DRIVERS OF CHANGE

Resources that have the potential to shift the utility business model are generally appearing

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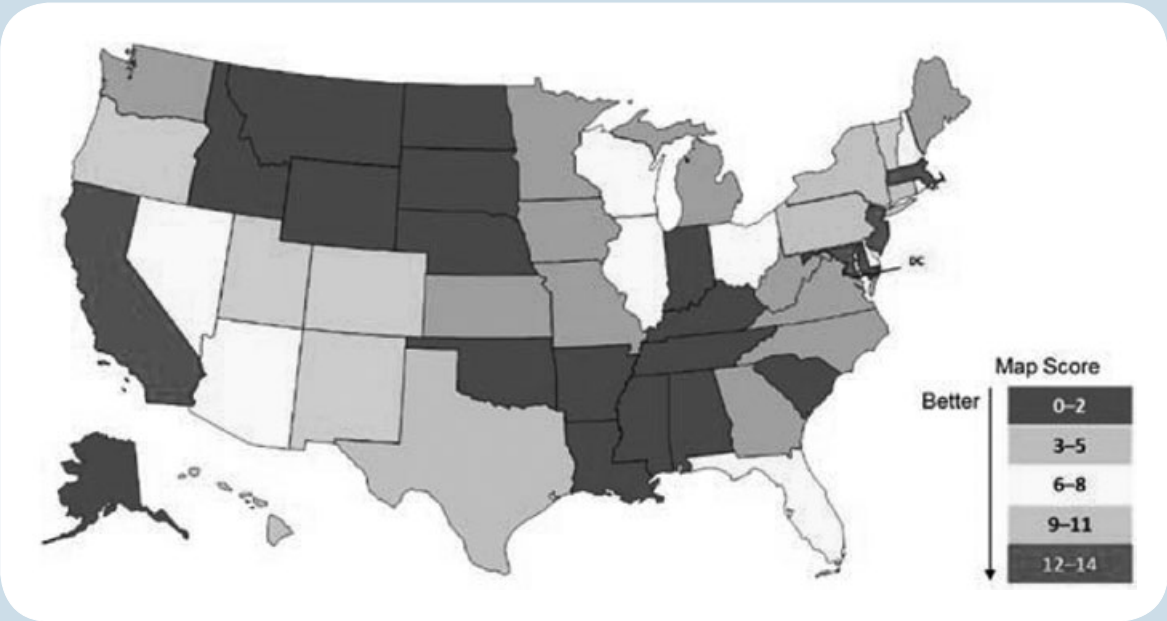
on the customer side of the meter and providing utility customers with alternatives to supply their electricity needs that did not previously exist. Principal self-supply energy resources include solar PV, combined heat and power, demand response, and microgrids. The primary drivers propelling the growth of distributed generation resources include the following:

- *Technology and Distributed Generation Advances:* Advances in PV technology, coupled with commodity-price declines, are introducing unprecedented levels of nontraditional generation to the grid. In addition, distribution automation, advanced and aggregated demand response, energy efficiency, and automated metering infrastructure are improving the reliability and efficiency of the grid.
- *Public Policy and Regulatory Support:* Policies driving adoption include net metering, renewable portfolio standards with distributed generation requirements, authorization to allow third-party ownership models, and incentives. States are beginning to explore these dynamics and their impact on electric utilities and customers. Policies built around the "value of solar" or other distributed generation may become more prevalent and may replace net metering. Regulators are also encouraging utilities to explore advanced technologies and new business models. Examples of these efforts include Minnesota's value of solar, grid modernization in Massachusetts, and "utility of the future" discussions in Maryland and New York.
- *Customer Preference:* Businesses are demonstrating a growing interest in incorporating distributed generation in their energy supply. For example, Wal-Mart generates 1 percent of its electricity or 174 gigawatt-hours per year from on-site biogas, solar, and wind.[1] In addition, residential customers are considering distributed generation in growing numbers as costs continue to decline. Demographics will increase this trend as younger customers have stronger preferences for green solutions. The adoption and impact of these drivers will not be consistent across the United States. Instead, states with more favorable environments (e.g., more lucrative net metering, third-party solar leasing and PPAs, higher electricity prices, etc.) are more likely to have a significant influx of distributed resources. The majority of these states are in the Northeast and Southwest (see **Exhibit 1**).

ISSUES AND CONSEQUENCES

Distributed resources introduce complexity to the traditional model of central-station generation

Exhibit 1. Prospects for Distributed Generation



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and long-haul transmission. The issues range from the strategic to tactical. For example:

- Third-party sales of electricity may displace the utility's role with the retail customer.
- Microgrids introduce the question of franchise rights and the definition of a utility.
- Utilities may need to upgrade distribution infrastructure (relaying, reclosers, conductors, and transformers) to accommodate two-way power flows that come from these installations.
- The utility needs to be able to "see" where resources are located on the grid and manage intermittency at the distribution level.
- Distributed resources and demand response have the potential to change the load curve of a utility in specific networks in the distribution system.
- Due to net metering provisions, distributed generation customers may not participate fully in paying for the distribution upgrades required to interconnect their rooftop solar installation.
- Some argue that cross-subsidization of rate classes is taking place in the deployment of distributed generation (beyond existing cross-subsidization of low-income and between other rate classes, i.e., between industrial, commercial, and residential).
- Large corporations, which are utilities' largest customers, are facing pressure from produced products and services.

TODAY'S UTILITY ACTIVITY

Utilities are contemplating the degree to which they want to own or operate distributed generation assets. There is particular interest in solar PV assets, and that is the focus of this section. Approaches to this technology fall broadly into the following categories:

- *Finance Outside of Service Territory*: Companies may pursue opportunities by providing project financing or equity investments in companies. In 2010, Pacific Energy Capital (a subsidiary of PG&E) agreed to fund SolarCity to install solar on homes and businesses. Examples of equity investments, which appear to be the preferred approach in recent years, include Duke Energy's investment in Clean Power Finance and Edison International's acquisition of solar installer SoCore Energy.
- *Own/Operate Outside of Service Territory*: Numerous utilities have invested in utility-scale solar outside of their service territories to learn about the technology while potentially increasing earnings. Direct ownership of distributed solar has been more limited. However, Integrys announced in January 2014 that its subsidiary, Integrys Energy Services (IES), would invest $40 to $50 million per year in commercial and residential solar. Clean Power Finance will provide origination and operation services, while IES remains the owner of the solar assets.
- *Provide "Green" Options to Customers*: Utilities may meet customer needs by providing community solar initiatives or green rates. For example, the Salt River Project offers customers access to a 20-megawatt community solar project. Meanwhile, Duke Energy, NV Energy, Dominion, Georgia Power, and others provide credits or tariffs for customers to purchase renewable energy, thereby eliminating the need for customer-sited infrastructure from their perspective. The utility benefits because these resources are generally utility scale and have minimal impact on the distribution system.
- *Own/Operate Within Service Territory*: Utility-owned distributed solar may become a regulated asset within a company's service territory. This approach mitigates issues related to net metering while providing operational benefits, as the utility can potentially site the solar in the part of the system best equipped to accommodate it, and where it may help solve congestion or reliability issues. Dominion is testing utility-owned distributed solar in a 30-megawatt pilot program.

See **Exhibit 2.**

Some utilities have begun to contemplate a role akin to a distributed regional transmission organization.

In addition, some utilities have begun to contemplate a role akin to a distributed regional transmission organization. In this scenario, the utility becomes a manager of transactions across a diverse set of resources, including distributed generation,

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Exhibit 2. Benefits and Challenges of Current Utility Activity

Types of Utility Involvement	Benefits	Challenges
Finance Outside of Service Territory Own/Operate Outside of Service Territory	▸ Allows for participation in growing market and potential return on investment through direct (energy revenues, renewable energy certificates) and indirect benefits (tax credits, diversification) ▸ Facilitates an understanding of technology and market considerations	▸ Technologies and regulations outside of the service territory may not provide adequate knowledge transfer for future service territory installs
Provide "Green" Options to Customers Own/Operate within Service Territory	▸ Provides an opportunity to gain first-hand knowledge of how to maximize resource value ▸ Understanding technology may provide ancillary benefits (e.g., voltage regulation) ▸ More likely to be eligible for rate recovery	▸ Requires larger investment in capital and resources to acquire and manage ▸ Needs to be coordinated with other facets of the company

demand response, energy efficiency, and customer loads. This model presupposes changes to rate design and significant advances in utility operations.

OVERVIEW OF UTILITY COURSES OF ACTION

A utility should begin by evaluating the potential market size of distributed generation in its service territory. Key drivers will be the local renewable resources, installation costs, and policy structure. With an understanding of the potential market, a utility should follow the steps below.

- *Renew the Regulatory Compact*: The current rate model was designed for a different environment. The convenience of cost allocation to a few major rate classes, using volumetric rates, breaks down in a world of varied and distributed customers. If distributed resources are to see long-term, viable penetration, this model must be rethought. The utility risk profile, business model, and financial structure all depend on the regulatory contract. Key actions to renew the regulatory compact include the following:
  - Addressing net metering inequality issues
  - Immunizing returns against flat to declining consumption through rate decoupling or other mechanisms
  - Protecting franchise rights and responsibilities
  - Creating grid-reliability interconnect and operating protocols
  - Creating flexible tariffs to serve distributed generation customers
- *Market Test or Pilot Alternative Resources*: Market tests and pilots allow utilities to develop operational experience with new technologies. Utilities may also test pricing principles through market experiments and differentiated pricing. Market tests or pilots within a service territory may establish a precedent for full-scale implementation.
- *Define Adjustments to the Operating Model*: Utilities will need to refine operating models to account for the lessons learned through market tests and pilots. Key areas of focus include real-time operations, system planning, and customer engagement (see **Exhibit 3**).

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- *Define Adjustments to the Business Model*: Utilities must also refine business models based on the lessons learned from the market test or pilot. Key areas of focus include strategy, regulatory, financial, and stakeholder engagement (see **Exhibit 4**).

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Exhibit 3. Operating Model Adjustments

Areas of Concern	Implications	Considerations
Real-Time Operations	▸ A market test or pilot will allow operators to see and operate new resources connected to the grid	▸ Consider expanded, more granular visualization tools ▸ Determine how coordination with non-utility entities that operate assets should work ▸ Protocols dictating the availability of resources may become important if they are to be relied upon by operations
System Planning	▸ Central station generation and long-haul transmission planning will need to incorporate a market test or pilot	▸ Models need to account for new resources ▸ Location and time are now important variables and need to be considered both in transmission and distribution
Customer Engagement	▸ A market test or pilot allows utilities to provide customers new services	▸ The utility will be called upon to interconnect to various entities; the roles and responsibilities in that interface need to be clear ▸ Customers may require additional types of service

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NOTE

1. EPA. (2014, January 27). *Top 30 on-site generation.* Retrieved from http://www.epa.gov/greenpower/toplists/top30onsite.htm.

Exhibit 4. Business Model Adjustments

Areas of Concern	Implications	Considerations
Strategy	▸ The utility will face competition and loss of revenue ▸ Alternative business opportunities may exist	▸ The utility needs to consider which businesses it wants to be in ▸ Is there an opportunity to become the "single point of contact" to the customer? ▸ Are there other lines of businesses the utility should enter?
Regulatory	▸ Utility loads will decline with the influx of resources; the existing rate construct may be insufficient to address declining demand growth and customer generation	▸ Consider rate decoupling, riders, and other strategies to protect revenues today ▸ Open the dialogue with the regulator on changes to the business model and the "value of the grid" ▸ Consider further bifurcation of customers and rate classes
Financial	▸ Customers are using less electricity or self-supplying	▸ Clarify approach to net metering ▸ Consider new growth strategies (e.g., electrification of infrastructure, etc.)
Stakeholder Management	▸ A strategy to manage all stakeholders will be critical	▸ The utility needs to manage and communicate to all stakeholders through transition ▸ This approach should be coordinated with other strategies

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