Distributed Resources and Utility Business Models – The Chronicle of a Death Foretold?

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INTRODUCTION

As utilities are faced with increasingly distributed resources on the grid, the industry is awash in discussion and commentary about the "utility business model" and what these changes may mean for it. Phrases like "death spiral" and "mortal threat" have been bantered about as if the entire industry were about to implode.

ScottMadden believes that the death of the electric utility has been greatly exaggerated. While we may be facing profound changes to the manner in which electricity is produced and delivered, there is an opportunity for utilities to begin to integrate new resources in a way that leverages existing infrastructure and ensures (and even improves) reliability.

This is the time for thoughtful dialogue and innovative discussion about what might be possible in a world of more distributed resources, smarter distribution systems, and an installed base of aging, legacy infrastructure. Our dialogue should be broad-based and include discussion of: strategy, operations, load forecasting and system planning, regulatory and public policy, and customer outreach.

The resources that have the potential to shift the utility business model are generally appearing on the customer side of the meter and providing utility customers with alternatives to supply their electricity needs that did not exist before. The principal self-supply energy resources we will discuss include distributed generation, such as solar photovoltaic (PV) and combined heat and power (CHP), demand response, and microgrids.

Self-supply resources, when coupled with enabling technological innovation on the distribution grid, create the potential for disruptive change. This potential change calls for careful consideration and dialogue. In this paper, we will discuss:

- Drivers of Change
- Issues and Consequences
- What Utilities Should Do Now

The fact that these changes to the manner in which electricity is generated and delivered are happening against the backdrop of declining demand growth across the United States exacerbates the issues and increases the urgency with which the industry needs to consider these challenges. Figure 1 illustrates projected declining demand growth through 2040.

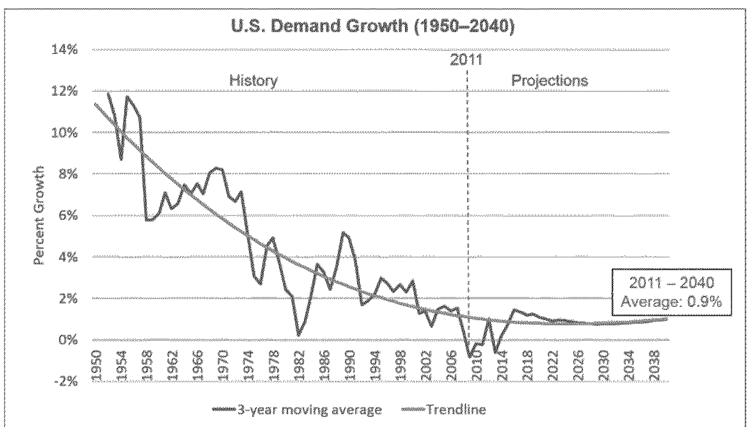

***Figure 1: Declining Demand Growth*[1]**

[1] Energy Information Administration, Annual Energy Outlook 2013 Early Release, (http://www.eia.gov/todayinenergy/detail.cfm?id=10491).

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Interestingly, there is one category of electricity sales end use that has increased steadily since 2009, according to the Energy Information Agency (EIA). That category is "Direct Use" —it includes the self-supply of generation by commercial and industrial customers as shown in Figure 2.

For the purposes of this white paper, we have excluded discussion of utility -scale renewables (e.g., wind, solar, and hydro). While they impact grid operations, they do not fundamentally change the business model of a utility company, as they continue to rely on the "central station generation/long-haul transmission" model of delivering electricity to customers.

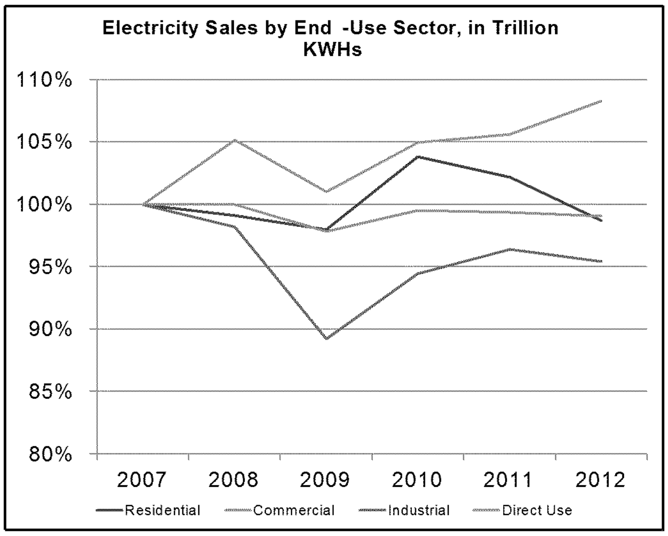

Figure 2: Electricity Sales Trends[2]

DRIVERS OF CHANGE

There are several drivers of this movement toward self-supply:

- Technology and Distributed Generation Advances
- Policy Support
- Customer Preferences

Technology and Distributed Generation Advances

The Smart Grid, distributed generation, and microgrids continue to advance, providing both enhancements and alternatives to the traditional central station generation /long-haul transmission model.

Technology

Technology advances play an important role in the shifting utility business model, because they are potentially disruptive in two ways.

First, through distribution automation, advanced and aggregated demand response, energy efficiency, and automated metering infrastructure (AMI), utilities are improving the reliability and efficiency of the grid. These technologies also have the potential to reduce utility loads, worsening the impacts of declining demand growth.

Second, the advent of self-supply technologies, like distributed generation and microgrids, give customers new alternatives. CHP has been available to industrial customers for a long time; there are currently 71GW[3] of capacity on the U.S. system, and this will likely continue to grow, particularly given

[2] Energy Information Administration, *Electric Power Monthly*, (http://www.eia.gov/electricity/data.cfm).
[3] Energy Information Agency Form-860 data, (http://www.eia.gov/todayinenergy/detail.cfm?id=8250).

low gas prices. PV is growing exponentially and will c ontinue to proliferate thanks to supportive policy and declining costs. There are a growing number of microgrids in the United States, and the technology is garnering significant attention today. The U.S. military, university campuses, hospitals, and commercial customers have been the primary early adopters , and microgrids have been touted as a potential solution to enhance the reliability of the grid in the wake of Superstorm Sandy.

These self-supply technologies are by far more potentially disruptive, as they may enable customers to leave the utility entirely, beginn ing the so -called "death spiral ." While these technologies are rapidly advancing, it is important to note that few alternatives exist today for customers to become entirely self-sufficient.

Distributed Generation Advancements

Solar PV has grown significantly in recent years and this trajectory is expected to continue. According to the Solar Electric Power Association (SEPA), solar PV projects, effectively the customer-facing par t of the market, accounted for 99% of the number of installed systems in 2012, and 80% of these are concentrated in five states (California, New Jersey, Arizona, Hawaii, and Massachusetts).[4] U.S. utilities reported more than 90,000 PV systems installed in 2012, accounting for nearly one-third of all distributed solar PV at the end of the year.[5] An additional 59,000 distributed systems were installed in the first half of 2013 , and solar capacity is expected to double ever y two years in the near term.[6]

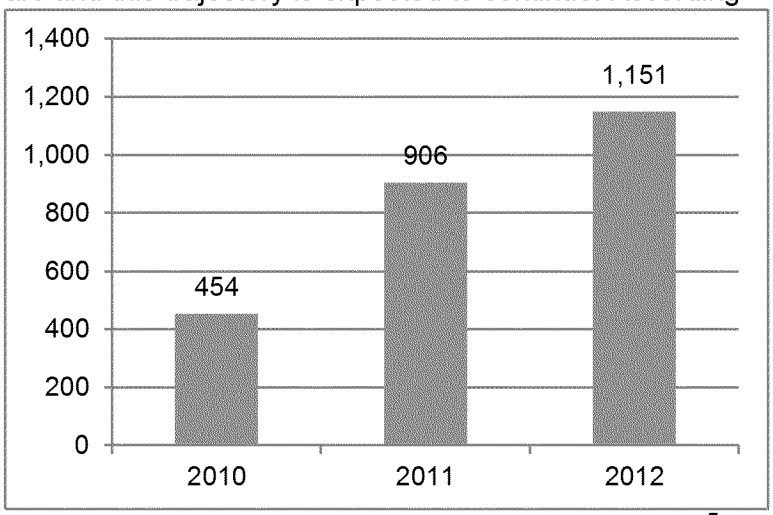

Figure 3: Annual Customer Sited Solar (MW-ac)[7]

While experts disagree about the costs and benefits of solar PV, it is generally agreed that the direct cost is approaching or has reached grid parity in some areas of the country. The experience curve effect suggests that prices may continue to decline, making the economics more attractive over time.

In addition, subsidies for solar installations have made the relative cost attractive , even in regions where the technology has not yet reached grid parity. Figure 4 illustrates the declining costs associated with PV.

[4] Solar Electric Power Association, "2012 SEPA Utility Solar Rankings," June 2013.
[5] GTM Research and Solar Energy Industries Association, "U.S. Solar Market Insight Report: 2012 Year in Review," March 2013.
[6] GTM Research and Solar Energy Industries Association, "U.S. Solar Market Insight Report: Q2 2013," September 2013.
[7] Solar Electric Power Association, *2012 SEPA Utility Solar Rankings,* June 2013.

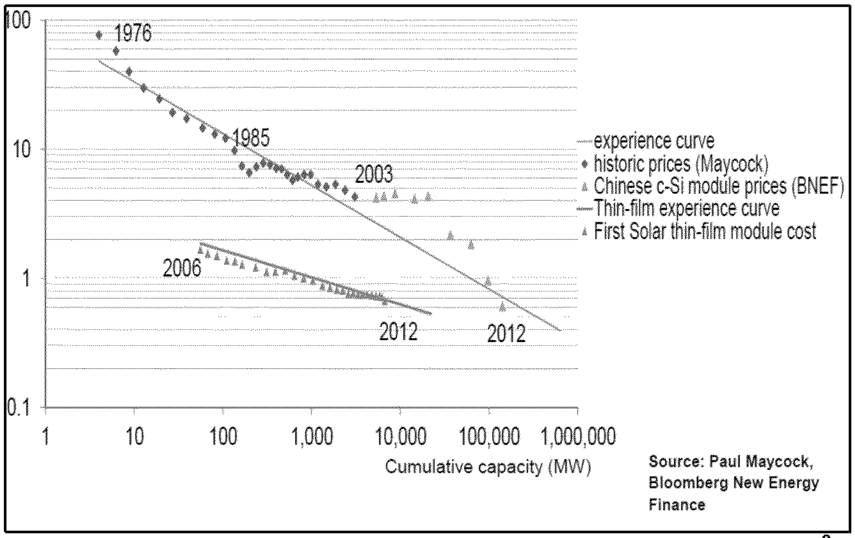

Figure 4: PV Module Experience Curve, 1976–2012 ($/W)[8]

Advances in PV are introducing unprecedented levels of non-traditional generation to the grid. While the cumulative MWs are not yet large, the number of installations is growing and we expect this trend to continue.

Policy Support

Public policy support has been a key driver in the growth of distributed generation. Policies driving adoption include net metering, renewable portfolio standards (RPS) with distributed generation requirements, authorization to allow third-party ownership models, and incentives. Policymakers often support these and other clean energy policies in an effort to:

- Promote local economic development and job creation
- Diversify generation resources to ensure reliability and stability
- Encourage private investment and customer-sited generation
- Reduce pollution and improve public health
- Increase energy independence

Aggregated and Virtual Net Metering

Net metering continues to evolve and generate controversy. In some states, regulators allow aggregated net metering or virtual net metering. Aggregated net metering allows credits generated from a single distributed resource to offset electricity load from multiple meters on a contiguous property. For example, a farmer may offset the energy use of an irrigation system with excess generation from a solar system located on an independently metered barn. Virtual net metering expands this concept to allow multiple participants to receive net metering credits from a distributed generator that may not be located on their property. In 2012, 18 states allowed aggregated net metering, and 8 states allowed virtual net metering.

Aggregated and virtual net metering could change the definition of a utility customer. This change allows for the potential bypass of the utility in providing service to a customer. The utility regulatory compact is based on an exclusive right, and obligation, to serve all (or most) customers in the franchise service territory. These rate structures can be highly disruptive to utility business models, especially when coupled with the new enabling technologies discussed above. In essence, they allow customers or third parties to set up their own virtual utility, at least in terms of the financial transaction. This could prove to be a Trojan Horse for utility business model disruption.

[8] Bloomberg New Energy Finance, *BNEF University,* April 2013.

Incentives

In addition to favorable regulations, financial incentives can improve the attractiveness of distributed generation. The federal Investment Tax Credit (ITC) is the most important incentive, providing a 30% tax credit for solar and other renewable energy technologies.[9] In 2017, the ITC will revert to a 10% tax credit for commercial and third -party owned systems and be eliminated for direct - owned residential systems. The federal government also allows accelerated depreciation of commercial and third -party owned systems through the Modified Accelerated Cost Recovery System (MACRS). At the state level, project finances may be enhanced by state rebates or tax credit programs. For example, Massachusetts offers rebates up to $0.85/W for solar PV systems, while North Carolina offers a 35% state credit for eligible renewable energy technologies.[10] In addition, utilities may also offer customer incentives in return for the renewable energy certificates generated from the system. In most cases, distributed generation systems are designed and financed in a manner that maximizes applicable federal, sta te, and utility incentives.

The policy to allow net metering has provided significant support for distributed generation. This affords a billing arrangement by which customers receive credit for excess generation supplied to the electric grid, usually at retail rates.

The Energy Policy Act of 2005 required state public utility commissions to consider and make a determination on net metering standards (modifying the Public Utility Regulatory Policies Act). Many states implemented or upgraded net metering standards. Net metering policies now exist in 44 states and the District of Columbia. According to the Interstate Renewable Energy Council (RE C), 33 of these are distributed generation friendly, receiving a grade of A or B.

There is growing debate about the costs and ben efits of distributed generation, hence, distributed generation rate treatment and net metering. Costs arise as customers sell excess electricity and reduce or eliminate payments toward fixed transmission and distribution (T&D) costs. Conversely, distributed generation can provide benefits by providing energy savings, generation capacity savings, T&D capacity savings, fuel price hedging, and ancillary services. States are beginning to explore these dynamics and their impact on electric utili ties and customers. Policies built around the "value of solar" or other distributed generation will become more prevalent and may replace net metering in some markets.

In conjunction with net metering policies, several states have enacted specific distrib uted generation and/or solar PV requirements within their broader RPS. These requirements support the deployment and adoption of solar PV. In turn, this is supporting the growth of new business models in a variety of markets across the United States.

For example, we have seen the rapid growth of third -party ownership of solar PV. Third-party ownership models consist of solar power purchase agreements and/or solar leases. Under this kind of model, a customer signs a long -term contract for the installation a nd maintenance of a solar system. The arrangement often reduces the annual energy expenditure for the customer and eliminates or reduces the need for an upfront investment. The third -party owners maintain the system and may collect any utility incentives or tax benefits associated with the project.

[9] Geothermal, microturbines, and CHP technologies are eligible for a 10% ITC tax credit. Technologies eligible for the federal production tax credit (e.g., utility -scale wind) also became eligible for the ITC with passage of the American Recovery and Reinvestment Act of 2009.
[10] Both programs are designed with maximum incentive levels.

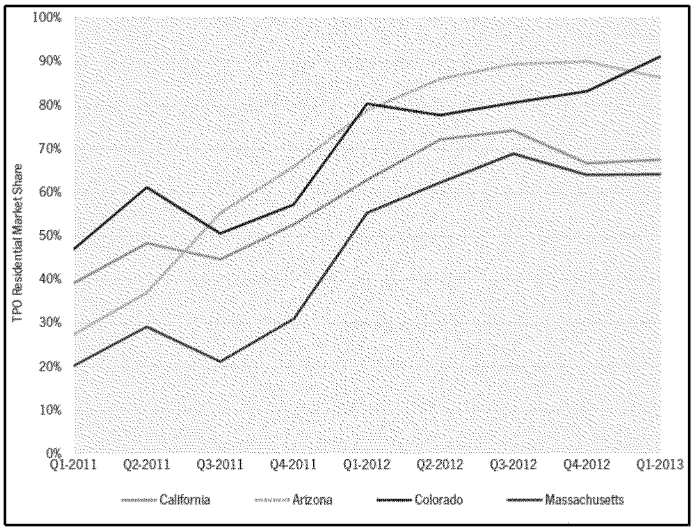

Figure 5: Percentage of Residential Installations Owned by Third Parties in Select Markets[11]

More than 20 states authorize or allow third-party ownership of renewable generation. Most of these markets are located in the Southwest and Northeast. Figure 5 indicates third-party ownership has been a significant driver in the advancement of distributed generation among residential customers in these states. In other states, regulators have decided that third-party ownership violates the regulatory compact provided to the electric utility. Efforts to remove restrictions to third-party ownership are active in several states, but most notably in the Southeast. Widespread authorization of third-party ownership would accelerate the adoption of distributed generation in new markets.

Customer Preferences

Electric customers are increasingly looking for "green" or sustainable choices in electricity supply. ScottMadden believes customer preferences may be the wild card in the proliferation of distributed generation and microgrid alternatives.

We are seeing increased pressure on and interest by businesses to present the public with green solutions, and for this reason, many are taking steps to incorporate or use renewables in their energy supply. It is driving some businesses to seek more sustainable energy solutions or grid independence. The past year has seen announcements by Apple[12] and others about the development of completely self-sufficient data centers using microgrid solutions. Walmart has stated that one of its three sustainability goals is "to be supplied 100% by renewable energy."[13] Examples like these abound as companies attempt to meet their customers' requirements for sustainable practices.

The preference for green alternatives is also driving individual customers to consider distributed generation, particularly as costs continue to decline and incentives remain available. Demographics will increase this trend as younger customers have stronger preferences for green solutions.

This trend may mean that regions or states that do not have the most favorable policies for distributed generation or microgrids see increased proliferation of these resources as large companies introduce these resources and retail customers demand alternatives.

[11] GTM Research, U.S. Solar Market Insight Q1 2013.
[12] SNL, "Apple to go 100% renewable at NC data center," May 17, 2012.
[13] http://corporate.walmart.com/global-responsibility/environment-sustainability.

Where Do We Expect to See These Changes??

ScottMadden's view is that those regions with relatively high electricity prices, policy support for distributed generation, and customer preferences for green alternatives wil l likely face the greatest penetrations of distributed resources and potentially disruptive change. For those regions not heavily impacted yet, these should serve as guideposts to potential future changes.

Figure 6 highlights those regions most likely t o see customer moves toward self -supply alternatives, based on ScottMadden's analysis of the following factors:

- Electricity prices
- Comparison of electricity rates with the cost of distributed generation
- Net metering and interconnection policies
- Allowance of third-party sales

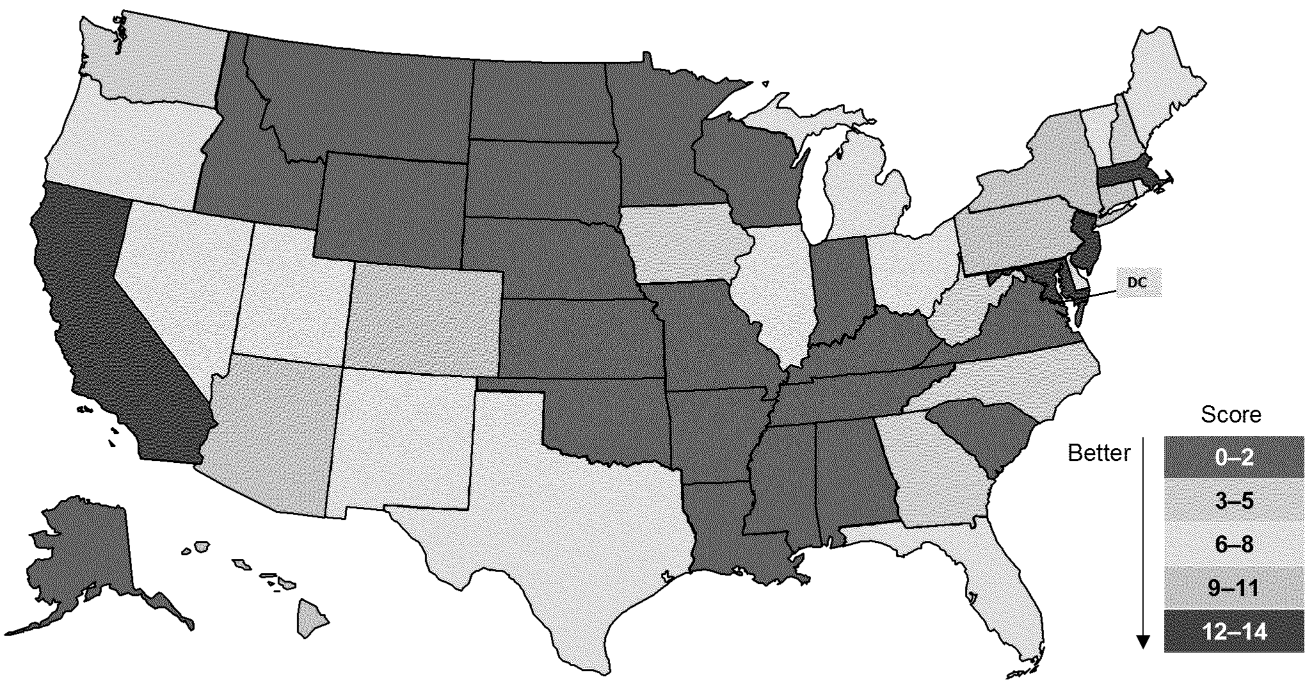

Figure 6: Map of Potential for Self-Supply

Based on these factors, the emergence of significant distributed generation and microgrid activity will be regional in nature. Those regions most likely to see significant change in the short term are ranked 9–14 and appear in red and brown on the map above. Those states with scores of 6 –8 (yellow) may see this activity in the future. As stated before, customer preferences may well force the emergence o f these resources even in le ss "favorable" states, but the general trends will likely appear as shown in Figure 6.

ISSUES AND CONSEQUENCES

Distributed resources introduce complexity to the traditional central station generation/long -haul transmission model. This complexity touche s everything from the utility's fundamental role as an electric service provider, to the manner in which the resources should be integrated into the grid, to how they are paid for. The issues range from strategic to highly 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 need s to be able to "see" where resources are located on the grid and manage intermittency at the distribution level.
- Distributed resources an d demand response (and its aggregation) 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.
- Cross-subsidization of rate classes is taking place.
- Large corporations (which are utilities' largest customers) are facing pressure from their customers to create sustainably produced products and services.

Each utility will have a specific set of issues to address as these resources are introduced. The following section introduces a framework in which to consider them.

WHAT UTILITIES SHOULD DO NOW

While ScottMadden believes that the industry is not about to implode, this is the right time for thoughtful consideration of the implications of customer self-supply on the utility business model. This discussion must be both strategic and tactical. Utilities in regions facing the most significant potential for change should begin to assess the implications for strategy, operations, load forecasting and system planning, regulatory, public policy, and customers.

Strategy

The existing utility business model is based on assumptions that sometimes are no longer explicit or questioned. Such assumptions include, but are not limited to:

- Supply comes from a central station generation and is distributed by a hub and spoke, one - way grid.
- Supply sources are relatively homogenous in what the y provide the grid and how we use them.
- Customers are customers; suppliers are suppliers.
- The vertically integrated utility is a largely closed source -to-sink system. It is the only actor that aggregates customers to supply and deliver electricity to them per exclusive franchise

rights granted by regulators due to the economics of natural monopolies. (In deregulated markets, this assumption can be made about an ecosystem of organizations: generators, regional transmission organizations, wirecos, retailers, etc., taken together.)

It is time to make sure that each of these assumptions, and others like them, are made evident and questioned. How true are they? If they are not as true as they once were, is it possible that the forces in play will impact utility business models ? In areas that face potential disruptive change, vertically integrated utilities should ask themselves the following:

- What will be the "extent of condition" of customer bypass or disintermediation of our business? What are the implications?
- How do we evaluate and communicate costs and benefits?
- Are distributed generation and microgrids good business lines for us? And, if so, are they regulated, unregulated, or both?
- Who is/are the system integrators? How does this impact our business model? Are we the physical system integrator? And do we dispatch, orchestrate, set the rules, or just react and balance? Are we the financial system integrator (i.e., we run the transaction platform for peer-to-peer sales, purchases, and coordination)?
- Do our returns on equity contemplate the risks a ttendant with conducting a high -fixed cost business in the face of flat (or declining) load growth? What happens as real options emerge for customers to bypass and self-provide many or all of the services the utility provides?

The list of questions that should be considered differs depending on the type of entity asking them. A wires-only business will have a different perspective, as will a merchant generator.

Company Type	Example of Business Model Questions
Generation Businesses	▪ Will this change the trajectory of load growth, potentially stranding some of our planned investments in environmental retrofits and new generation units? ▪ Does this create the potential for us to offer new services to existing and new customers' standby, ramping, fast response ancillary services, etc.? ▪ Is distributed generation our business? What is our business? Are we builders, owners, and operators of central station generation? Or are we electricity suppliers?
Wires Businesses	▪ Is distributed generation a new and important business line for us? What about microgrids? ▪ What is our role? Do we become the "system integrators"? ▪ How do we manage, dispatch, or control a large collection of heterogeneous resources with different capabilities, performance signatures, and owners (who have differing interests)? ▪ Is this an opportunity for us to integrate backwards into generation to provide standby, firming, or shaping supply or, in other words, to deliver bundled reliability to customers who have evolving needs?

Operations

Increased penetration of distributed resources will force changes in the planning, design, and operation of electricity systems. The electrical grid was designed and is operated under a model in which power flows one way from large, dispatchable central-generating stations through the T&D system to the customer. The vertically integrated utility typically controls most, if not all, of this infrastructure, particularly T&D.

With higher penetrations of distributed resources, this model will change. These resources will be in many locations, have time (and weather) sensitive behavior, and often may not be controlled by the utility. Integrating distributed resources into the grid will require a more sophisticated understanding of their effects in order to optimize the system—not just overall impact on load, but the more refined locational and temporal behavior. This will require a shift from the current deterministic approach to a more predictive approach to planning and managing this new network of resources.

Protocols that dictate distributed resources availability and "callability" will be required. For example, there is currently a standard in place that limits the ability of utilities to control inverters (which serve as the interface for distributed solar panels); this prevents the utility from managing that resource. While there are different sides to this argument, the degree to which utilities are able to effectively leverage distributed resources may improve their ability to manage the grid in critical areas.

Once these protocols are defined, the utility will have the opportunity either to manage or integrate with a growing base of diverse resources. These resources may be managed centrally (by the utility or a third party) or locally by a distributed network of providers. These distributed resources can then be used to help reduce overloads on specific feeders, provide VAR support, or address local reliability. The utility has the opportunity to begin to shape this discussion to integrate these resources in the most reliable manner.

Load Forecasting and System Planning

Distributed generation and demand response are changing traditional utility load forecasting and system planning. Gordon van Welie, president and CEO of ISO-NE, recently remarked, "As distributed generation and microgrids continue to blur the line between retail and wholesale power, ISO New England Inc. is finding it increasingly difficult to model those products in system operations and planning."[14]

Utilities typically predict future load (in aggregate and in sub-regions) and then plan the infrastructure to meet peak demand. Incorporating demand response, energy efficiency, and distributed generation into load forecasts reduces the peak loads to which assets must be planned and, as these are localized resources, may shift the geographical areas of the grid requiring expansion, reinforcement, or upgrade.

Distributed resources will affect planning for system peak and, more importantly, for peak at specific locations in time, as these resources will reshape the demand curve. The promotion of distributed resources in constrained areas may be used as a strategy to delay capital investment and improve reliability; however, this requires a move away from traditional T&D planning. Proactive consideration of the changes to the planning process will be important.

[14] SNL, "Distributed generation, microgrids pose new planning challenge for ISO-NE, CEO says," June 19, 2013.

Regulatory, Public Policy, and Customers

In these arenas , utilities should consider the implications on their ability to earn their allowed rate of return and on their rate structure. Even in states that are revenue decoupled, the combined loss of load and customers will likely put increased pressure on rates. Many have highlighted the issue of net metering and the potential cross-subsidization of customers. Utilities need to make their positions clear about the consequences of net metering across all customer classes. It is increasingly important to identify the value provided by the grid itself and devise rate structures which compensate for that value whether customers self-supply or not.

The utility may also want to consider further segmentation of customer rate classes and associated tariffs. It may need to consider a new regulatory paradigm with different rate structures, perhaps charging separately and using different pricing mechanisms for different business components (e.g., supply, wires, reliability, standby, and back office).

As customers become more differentiated in their needs, utilities may be able to provide greater flexibility and potentially have the opportunity to earn a premium on "specialized" services where customers require them. This approach should consider fairness questions and appropriate treatment of various customer classes.

There are myriad policies driving the proliferation of self-supply options. Utilities need to think carefully about the advocacy positions they take to ensure they are consistent with the obligation to serve and provide reliable service, as well as enable customers to access the alternatives they are seeking. Through consideration of operational and system planning needs, the utility should advocate for policies and ratemaking constructs that support the reliable, cost effective integration of these resources.

Regardless of the strategy that each utility pursues to address the above questions, customer outreach needs to be conducted in a manner that is consistent with the answers to the strategic questions posed above.

There are new segments of customers emerging with different needs than the traditional residential, commercial, and industrial customer classes. By taking a proactive stance with these customers, the utility has the opportunity to effectively and reliably manage the integration of these non-traditional resources into the grid.

Some utilities have publicly talked about the need to remain the single point of contact for their customers, regardless of the technologies being implemented on the grid. If utilities can find a way to do this, in light of changing regulation and customer needs and alternatives, they will have a better chance of weathering the storm in the coming years.

CONCLUSION

Utilities are facing an unprecedented set of challenges due to the combined impacts of declining demand growth and customer alternatives for self-supply on offer. While these challenges are real, they need not be the death knell for the industry. Yes, there will be significant changes in the years to come (this has started in California and New York), but the entire country will not shift at the same pace.

This is the time to think strategically and tactically about what the introduction of these resources means and to ensure that strategic and tactical responses are aligned in a cohesive course of action. The companies that get this right will be here to talk about the experience; those that do not may well be reading the "Chronicle of a Death Foretold."

ABOUT SCOTTMADDEN'S ENERGY AND CLEAN TECH & SUSTAINABILITY PRACTICES

Since 1983, we have been energy consultants. We have helped our clients develop strategies, improve operations, reorganize companies, and implement initiatives. Leveraging our energy expertise, ScottMadden's Clean Tech & Sustainability practice helps our clients effectively navigate the quickly changing landscape. We specialize in assisting our clients with sustainable energy strategies and making smart portfolio choices.

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