"Now I'm an Expert on the Customer": Utility DSM and ET Departments Respond to Industry Disruption

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ABSTRACT

It's not "business as usual" these days for utility demand-side management (DSM) departments. Internally, program cost-effectiveness is decreasing and participation rates for programs are often considerably below expectations, making it challenging to achieve increasing savings goals. Externally, the expansion of third-party rooftop solar, the potential effects of electric vehicle (EV) charging on the grid, rising energy-efficiency codes and standards, the tantalizing promise of energy-storage applications, and the emergence of a technologically demanding customer whose expectations of convenience and performance have been defined by the Nest thermostat coalesce into an unsettling groundswell of disruption. To our knowledge, the utility sector has never faced this volume of coincidental threats, opportunities, and challenges.

To gauge the potential impact of these disruptive forces on utilities' DSM technology analysis groups and learn how they are responding, we conducted in-depth interviews with leading DSM and emerging technology (ET) staff at eight select utilities across the US. We found that many utilities are changing how they organize and manage their technology analysis groups in response to disruptive trends. ET groups are changing focus to include distributed generation and electricity-storage technologies. Program planning teams are moving away from widget-based DSM, focusing on the potential savings of specific technologies, and broadening their views to encompass a more holistic focus on meeting customers' needs and solving their problems. They are using non-energy benefits as a way to recast their utilities as problem solvers in customers' minds while simultaneously meeting program goals.

We see a transition in progress that expands the focus of utility DSM departments from demand-side management to customer-side management—a transition that places the customer as the central focus in the process of achieving efficiency goals.

Industry Disruption

Experts have remarked that the electric utility industry is either already in a cycle of disruption or it soon will be, usually identifying the major factors as technological change, government policies, and economic conditions. For example, technologies that are rapidly evolving and have the potential to either disrupt the market or offer new opportunities to utilities include zero-net-energy buildings, microgrids, rooftop solar, the internet of things, big data, inexpensive lithium-ion batteries, and electric vehicles. A prominent example of contributing government policies is the trend toward higher energy-efficiency requirements in building codes. Reduced economic growth, as well as the increased efficiency spurred on by the disrupters above, is likely contributing to the flat or declining energy sales that utilities have weathered over the course of the past decade. Another economic factor is the new demands of customers who are conditioned by doing business with nimble online companies such as Amazon and

Netflix. Combined, these factors have the potential to dramatically challenge the electric utility industry's existing business model and, simultaneously, offer new and exciting opportunities for growth.

The author best known for calling attention to this latest disruptive cycle is arguably Peter Kind, a consultant who authored a white paper for the Edison Electric Institute titled "Disruptive Challenges." (Kind 2013) Kind was largely concerned with the financial risks and pressures that additional competition could put on the utility industry. One such risk he identified was that industry costs attributed to solar customers could reach the point that nonsolar customers would put political pressure on regulators to keep utilities from recovering those costs. He called for revising government policies that enable distributed-energy-owning utility customers to be subsidized by nonowners.

Around the same time as Kind, Gregory Aliff, a senior partner with the global consulting company Deloitte, published a paper that noted trends similar to those identified above. In it, Aliff expressed concern about the industry's future (Aliff 2013); he was largely concerned with how industry leaders could respond to disruption, and he called for innovation and for companies to "redefine their value propositions." He questioned whether "today's electric-sector participants have the capacity and the will to transition to new business models in order to participate in the coming transformation?"

In 2014, the business consulting company Accenture published an industry analysis that included a survey of 85 utility executives in 20 countries. (Accenture 2014) The authors concluded that many of those executives were concerned about the impact the rising adoption of distributed energy and other technologies would have on their industry. For example, most of the survey's respondents expected that "competition from new entrants in power electronics hardware and services will increase in the next five years." A similar survey from the consulting company PricewaterhouseCoopers (73 senior executives from power and utility companies in 50 countries) found that nearly half of the respondents said that "there is a medium to high probability that distributed generation could shrink the role of some power utility companies to providers of back-up power." (PricewaterhouseCoopers 2015)

Dr. Adam Borison, an analyst with the consulting company Berkeley Research Group, noted that the electric utility industry has been subject to several disruptive cycles going back to the 1970s. (Borison 2015) He concluded that these previous cycles were driven by economic conditions and government regulations, but that this cycle of disruption is different, given that the dominant drivers are technological change and increased customer expectations. He called on the industry to become more like Silicon Valley, "a high velocity industry driven by rapid technology change, new market entrants, and increased customer expectations."

One common thread in this body of work is that executives in the utility industry are well aware of the disruptive effect that new technologies and government policies could have, and were having, on their industries. Among these authors there seemed to be little agreement on how to address these trends. Some argued for changing government policies that encouraged the adoption of such technologies. Others called for utility executives to evolve their businesses to become more focused on meeting customer needs. Few discussed the actual changes current executives are making in response.

Methodology

To investigate how utilities are changing the structure and management of their technology-analysis groups to respond to disruptive trends, we conducted interviews with eight leaders in the field. The participants, who were interviewed between April 23 and June 15, 2015, were:

- Dave Bisbee, Project Manager II, Sacramento Municipal Utility District
- Tom Coughlin, Manager, Technical Policy, National Grid
- Ryan Fedie, Engineering Manager, Energy Efficiency and Demand Side, Bonneville Power Administration
- Vicki Kuo, Director, Energy Efficiency and Demand Management, Consolidated Edison
- George Malek, Director of Energy Efficiency Services, Commonwealth Edison
- Russell Shaver, Emerging Technology Engineer, Austin Energy
- Phil Tornelli, Program Manager, Business Energy Evaluation and Business Custom Incentive Programs, Florida Power and Light
- Peter Turnbull, Principal Program Manager, ZNE, Pacific Gas and Electric

The interviewees represented a broad cross section of the industry, including representatives from both investor-owned utilities and public utilities. Some of these leaders were in organizations that were ramping down their technology-analysis groups and others were building them up.

To focus the discussions, we developed a list of topics and questions to explore and fine-tuned them as the interviews progressed. The topics included:

- Are utilities feeling the heat from disruptive forces and trends?
- Are utilities changing their approach to emerging technology programs?
- Are utilities rethinking their reliance on widget-based DSM programs?
- Is staffing in ET departments changing? Are the groups that analyze established technologies for DSM programs being restructured?
- Are areas of technical expertise changing? Are utilities adding new technologies or restructuring their staff?
- Is the focus on non-energy benefits shifting?
- Are DSM goals changing, and if so, how?

Results

Are utilities feeling the heat from disruptive forces and trends?

Nearly all of the respondents described disruptive forces that challenge their companies. The main disruptive threats they noted were new market entrants, customer expectations, and government policies. Where some found disruption to be particularly threatening, others perceived opportunities to make long-overdue changes.

For an example of new market entrants disrupting the utility business, one respondent told us about the energy management consultants that are increasingly being hired by big-box

stores. These consultants interface directly with the utility, which then eliminates the utility's key account relationship. When the key account manager contacts the store, he is referred to the consultant rather than the facility manager. The consultant does all the energy auditing, procurement, and identifying renewable strategies, taking over many of the services key account managers would typically offer to customers. As a result, the utility loses the opportunity to be the trusted energy advisor with that major account.

Another respondent gave us a clear example of how disruptive customer expectations around utility data can be. This respondent reported that customers are no longer willing to wait until the end of the month; they want to see their energy use and cost in as close to real time as possible. Once customers begin to see whole-day data, they want even more granular data. And because they can do so much from their smartphones, they want apps that give them more control over their energy use. Utilities are struggling mightily because they have to manage the increased data load, make sense of it, and make it available to customers in a useful and appealing way. The path from creating monthly energy bills to supporting a near-real-time mobile app is a daunting undertaking.

> *"One of the main disrupters is that customers are demanding much better access to their energy information." —Russell Shaver, Austin Energy*

As for disruptive government policies, the responses we received were consistent with those of other studies. Our respondents reported difficulties with crafting equitable rate structures for customers with distributed-energy systems. One respondent spoke of advocating for regulatory support for rates that are equitable for both customers and the utility. According to this respondent, such rates would include a demand charge for all customers.

Other respondents found government policies regarding building codes to be disruptive. When new technology standards or building codes are released, according to one respondent, efficiency staff wince because they know that the potential savings per measure for their programs has once again been reduced. At the same time, they take a certain amount of pride in being part of the effort to enact public policy that ensures building codes advance every time the model codes do because those codes produce holistic building energy savings sooner than efficiency measures can. So although new regulations do provide challenges for energy-efficiency programs and staff, they are also an opportunity to look for the next wave of efficiency technologies and building design practices that can be incorporated into new programs. This respondent took pride in knowing that efficiency programs have helped contribute to the success of sustainable energy savings and will continue to do so as the market is transformed.

Several other respondents took similarly optimistic points of view regarding the disruptive forces they faced. Some told us that they valued the growth opportunities presented by disruption. One respondent in particular told us he saw industry disruption as an opportunity to focus on deploying advanced metering infrastructure (AMI), redesigning rates, building more smart technologies into the grid, developing more community solar projects, and continuing the utility's energy-efficiency efforts.

> *"You take away disruptiveness when you figure out how to pay for maintaining the grid." —George Malek, ComEd*

Are utilities changing their approach to ET programs?

Some of our respondents were concerned with the high costs associated with ET programs; they were seeking less-expensive ways of providing their DSM programs with new savings opportunities. Others were under pressure from regulators to change the focus of their DSM programs to better support the needs of the electrical grid, so they were working on their ET programs to incorporate new technologies. Still other respondents sought to make their ET efforts more effective by engaging in a more meaningful way with their customers.

Some respondents expressed concern regarding the increasing cost and long timelines associated with developing and delivering cost-effective new technologies to incorporate into their DSM programs. These utilities are experiencing increasing goals, rising program costs, and reduced savings per measure, and they are feeling the pressure to meet goals more cheaply. To that end, they are exploring new ways to deliver existing technologies at a lower program cost.

> *"We are seeing a shift away from studying widgets and toward experimenting with market-delivery mechanisms. For example, administrating LED rebates through Amazon based on ZIP code and midstream programs." —Dave Bisbee, SMUD*

Respondents in the Northeast who are influenced by the Reforming the Energy Vision (REV) efforts discussed a new regulatory model that will analyze cost-effectiveness in a way that's similar to the way they work on capital projects. They now have to take into account how the grid can benefit as well as the customer. For example, a commercial and industrial (C&I) customer on a constrained feeder who submits an application for a distributed-generation project would be rated much higher than an application for a similar project on an unconstrained feeder. Or a customer who wants solar might be asked to install it on a west-facing roof—so that the utility can harvest peak demand savings during those afternoon hours of need—instead of on a south-facing roof, which would generate the most kilowatt-hours for the customer. Going forward, the challenge these respondents face will be to incorporate this grid-centered perspective into their analysis of emerging technologies: How will the technology benefit the grid simultaneously with the customer?

Similar comments were made by utilities in other regions. They noted that the DSM model is in transition, becoming less of an energy-efficiency model and more of demand-savings model as the needs of the grid are given more consideration. As a result, they are seeking to change the mix of technologies that their ET programs focus on.

> *"There's been a shift in ET since our AMI rollout to identify technologies and ideas that will leverage the smartness of the grid and lower our customers' consumption." —George Malek, ComEd*

According to several of our respondents, customers are increasingly being viewed as active rather than passive participants in ET programs, and the new goal is to develop an interactive relationship with them. Customers' needs and actions are being considered at the very early stages of ET program development with questions such as: How can we engage and motivate customers? How do we intervene to get them to take the action?

One respondent offered her company's experience with a smart thermostat pilot as an example. By installing smart meters in customers' homes, the utility was able to provide them

interactivity with a Wi-Fi thermostat that could provide pricing signals. With this information, customers could potentially understand that the block of power they might be buying would be expensive but that they could take action to curtail consumption. Her company found, though, that just giving customers such technology was not enough. To bridge the gap, the utility sought to boost its customers' interactions with the thermostat to make their experience more like a game, so that customers would regularly take action based on input from the thermostat.

One means to improve interactivity is to add a smartphone app that provides customers easy access to their energy information. For engineers in the ET group, considering the behavioral aspect of customer engagement is a new challenge—how does one get customers to buy the product? In this case, the product the utility is selling is not a technology; instead, it's persuading customers to take action. For engineers, that's revolutionary.

> *"It boils down to more than just lighting or HVAC. Now it's: Do I understand grocery stores? And oh, by the way, I need to provide everything from billing to security lighting to new technologies that will help lower the energy bill. But more importantly, preserve products, lower spoilage technology, and meet green mandates. We're transitioning from a team of specialists to being experts on the customer." —Dave Bisbee, SMUD*

Are utilities rethinking their reliance on widget-based DSM programs?

Traditional utility efficiency programs typically identify the energy savings of a specific technology, test for cost-effectiveness, and then, if the technology meets the criteria, create a program. The technology is promoted and awareness is created in the marketplace. People become familiar with the technology and its value proposition. Sales volumes increase, resulting in reduced prices, and eventually codes are updated. This is a passive approach that launches the technology measure into the market without really knowing whether the technology and the market are mature enough for the measure to be taken to scale and have it be repeatable. Nearly all respondents indicated that they were beginning to transition away from meeting goals with individual technologies (or "widgets") and developing a broader-based approach.

Several themes emerged: finding ways to reduce program costs by leveraging existing codes and standards, moving from widgets to whole-building savings, exploring the potential of a technology's non-energy benefits to help establish a longer-term relationship with customers, and considering distributed energy combined with efficiency technologies that can deliver benefits to both the utility and its customers.

There are many factors driving changes to the widget-based model, including increased implementation and administration costs, lower-than-expected program participation rates, increasing efficiency goals, and rising codes and standards baselines. Utility staff are experimenting with new program design approaches so that they can deliver more savings at less cost.

> *"The effort is not so much testing new toys as looking at new ways to reduce implementation and admin costs and leveraging existing codes and standards." —Dave Bisbee, SMUD*

In California, where goals have been established specifying the percentage of building stock that will be required to meet zero-net-energy criteria by a specific date, the increased

savings offered by whole-building energy-efficiency measures is becoming increasingly important.

> *"As we work toward achieving zero net energy, the industry is beginning to think in terms of whole-building performance and whole-building consumption footprints instead of how many widgets we put in a building. Goal-setting around EUI [energy-use intensity] footprints is becoming a standard practice." —Peter Turnbull, PG&E*

To increase program participation and customer loyalty, staff are starting to explore marketing messages that will motivate customers based on non-energy benefits rather than on energy savings. Learning more about customers and finding ways to solve their problems is becoming a primary focus—on par with or greater than utility energy savings and saving customers money. In the digital marketplace, with technologically savvy and demanding consumers, the new question is becoming what technologies will facilitate a deeper, longer-term relationship with our customers?

Is staffing in ET departments changing?

Several of our ET respondents reported that their groups were actively seeking ways to change their staffing and structure to become more responsive to customers and drive that responsiveness into other parts of the organization. One company was realigning engineering disciplines within its ET group; another was seeking the right place within the organizational structure to place that group, and learning how to better focus on solving customer problems.

> *"We annually look to refine our structure, process, and research management principles. We expect more connected devices and building-to-grid interactions. Our staff will need to be versed in what's coming to integrate new expertise and methods. I think the ET staff have a skill set and market intelligence that is more valuable to the utility than new measures." —Ryan Fedie, BPA*

One respondent is considering realigning the utility analysts who are focused on building technologies into groups by engineering discipline rather than by building sector. For example, instead of aligning analysts into separate C&I and residential sectors, a lighting team would support applications in both sectors.

Perhaps the biggest challenge facing ET staff is developing expertise in customers' needs. As utilities continue to find value in facilitating a deeper, longer-term relationship with their customers, ET staff will need to understand those customers' businesses, their problems, and the technologies that they rely on to solve those problems.

> *"We need to develop staff that can address both the customer's and the utility's needs simultaneously. Right now we're in the 'building an argument' phase of reallocating staff or bringing on new staff to meet that need. I expect that as the market gets transformed, the ET staff will be part of a utility planning group." —Tom Coughlin, National Grid*

Are areas of technical expertise changing?

Our respondents told us that ET departments are definitely expanding the sorts of technologies they analyze. For example, the Internet of Things is exerting pressure on staff expertise as customers' desire for connected devices continues to advance and their expectations of quality and functionality are defined by products like the Nest thermostat. Respondents also told us that they are both training current staff and adding staff to build expertise in such areas as big data, rooftop solar, batteries, and advanced controls. Staffing for ET departments appears to be staying about the same, so existing staff are being redirected to take on this work.

> *"A long-term vision is to leverage the Internet of Energy, an integrated system that communicates from the independent system operator all the way down to an air conditioner in someone's home. The components all communicate to provide maximum benefit to the electric grid as well as the customer." —Russell Shaver, Austin Energy*

> *"Expertise in the Internet of Things is going to be huge. Customers want off-the-shelf devices that can manage their energy and security and consolidate their bills. They want these systems to turn on their lights, lock their doors, set their alarms, and record their favorite TV programs." —Dave Bisbee, SMUD*

> *"New areas of expertise that we're developing: grid-level and distributed solar and storage. And as we collect more and more data and make it available to the customer, we need to further develop expertise in the management and analysis of big data." —Russell Shaver, Austin Energy*

Is the focus on non-energy benefits shifting?

Non-energy benefits (NEBs) have long been considered an afterthought in program design and deployment because it's hard to quantify their value as a contributor to energy savings. Instead, many of our respondents told us that they were taking a closer look at the potential of using NEBs to persuade customers to install new technology, instead of focusing solely on energy savings.

One example a respondent gave was marketing to the healthcare industry. If a utility could identify a lighting technology that improves patient care, a hospital decision-maker would likely find such benefits to be more compelling than energy savings. In a another example, LED fixtures that require infrequent relamping in areas with high occupancy and long operating hours or areas that contain expensive equipment are more likely to be attractive to facility staff based on maintenance savings and reduced frustration. By marketing technologies in this way, utilities could come to be seen as problem-solvers, with energy savings that are viewed as the icing on the cake.

> *"We're going to a more relationship-based approach rather than a widget-rebate based approach. The new tech focus will be identifying what technologies facilitate a deeper longer-term relationship with our customers. We want to help solve our customer's problems and also help them save energy." —Dave Bisbee, SMUD*

Such an approach requires that analysts take the time to figure out what customers want and what motivates them. Although customer problem-solving has been a focus for many consumer-driven businesses for many years, it's often new territory for utility DSM and ET teams that have relied on energy savings as the main driver for program participation.

> *"On the residential side, it's often about a lot more than saving customers money. You have to figure out what it is they really want—sometimes it's comfort, sometimes it's control, sometimes it's convenience, as well as less cost." —Vicki Kuo, Con Edison*

As more large cities require commercial building owners to benchmark building energy use and the research and start-up communities race to develop analytic and modeling tools to quantify the value of a building's efficiency, an opportunity is emerging for a building's energy-efficiency potential to be considered as an asset. Once that is legitimized, participation in efficiency programs will be driven as much by the increase in value that the completed efficiency measure imparts to the building as by the resulting energy savings.

> *"Industry is beginning to realize that high-performance buildings are just plain better places to be—there's a consensus that they are beautiful, healthy places that stimulate productivity. In terms of dollars and cents, we are starting to see this added value reflected in higher rent premiums and reduced vacancy rates—this value, which is in the tens of dollars per square foot annually, dwarfs the value of the energy savings, which is at most one or two dollars per square foot." —Peter Turnbull, PG&E*

Are DSM goals changing, and if so, how?

Many of our respondents reported that their DSM program goals were changing, but we got reports of those changes occurring in nearly every way imaginable. One respondent reported a leveling-off of goals, but even that change left challenges to address. Several others told us that new ways of evaluating cost-effectiveness had led to big changes in the sorts of measures the utility could offer. And several respondents noted that their programs goals were changing from a focus on efficiency to a focus on demand response.

One respondent who experienced a leveling-off of goals attributed that change to the company's ability to maintain a good relationship with stakeholders and regulators. And even with unchanging goals, this respondent reported challenges with lower energy savings per measure due to improved codes and standards. To mitigate this problem, the company is looking for new ways to achieve savings, and it's investigating commercial and residential zero-net-energy buildings, the behavioral aspects of a smart grid pilot, and customer engagement opportunities.

Procedures for determining the cost benefits of DSM programs led to new ways of setting goals for some utilities in the Electric Reliability Council of Texas (ERCOT) market.

> *"DSM program evaluation is changing. With the Nodal System, generation is now dispatched by the Electric Reliability Council of Texas (ERCOT). Austin Energy generates, sells to ERCOT, and buys back energy to serve our load. In addition to reduced capital costs for avoided generation and traditional benefit cost analysis, we*

now also need to consider other value streams, including the energy market and ancillary services, when evaluating DSM programs." —Russell Shaver, Austin Energy

Other respondents expect that their goals are likely to change from a largely kilowatt-hour focus to include a kilowatt focus. Increasingly, utilities are exploring time-based rates as a way to spread out the cost of maintaining the grid. As different sets of programs to incorporate time-based rates are proposed to the regulators, DSM staff will have to explore where they have synergy and where they conflict with regulators' expectations. Overall, goals for these utilities are expected to be much more challenging going forward.

A relatively steep decline in goals was reported by a utility that uses the Rate Impact Measure (RIM) test for cost-effectiveness. Many factors combine to make new power plant construction more cost-effective than DSM programs, including rising program costs, increasingly efficient codes and standards that reduce net savings, low natural gas costs, and lower construction costs for natural gas power plants that are 30 percent more efficient than the aging plants they replace. Given the results of this calculation, savings goals for this utility will be reduced by nearly 65 percent.

Discussion and Conclusions

We found that utility technology-analysis groups are changing in response to disruptive forces. Although no two utilities that we spoke with are adapting in the same manner, most are attempting to restructure themselves internally to enable more focus on solving customers' problems. Indeed, several respondents saw industry disruption as a compelling opportunity to make such changes. One such change several expressed was to do away with the expense and long timeframes associated with current ET program models. Instead, these companies sought to find new department-management models that would enable them to identify technologies that customers already wanted. As a corollary, they were expanding their analytical capabilities to include more technologies, such as the Internet of Things, distributed energy, and data analytics.

New opportunities

In the face of disruptive forces buffeting the industry, several companies framed these forces as challenges that also offered new and long-awaited opportunities. They spoke of the potential to break free from the constraints of the traditional efficiency model and experiment with developing more collaborative relationships with their customers, reevaluating the utility's stance on the benefits of distributed-generation technologies for the utility and customers and of leveraging AMI and smart grid technologies to move toward demand-based rates that enable fairer pricing. As the traditional efficiency model continues to evolve, we expect to see customers and their needs becoming an integral part of all aspects of the technology department's efficiency planning.

Focus on problem-solving

A few respondents told us of their intention to focus less on marketing energy savings to customers and more on helping customers solve problems. For example, respondents told us of their efforts to learn more about customers and their challenges. They also spoke of their intent

to include a wide variety of NEBs in the marketing messages to customers. On the residential side, marketing efforts will begin to shift to piggyback on Internet-connected devices to identify and deliver what customers really want, be it comfort, control, or convenience, as well as energy savings.

Disenchantment with ET

Several respondents expressed disenchantment with the emerging-technology model in which companies do intensive research to bring new technologies into their DSM programs. They expressed concerns about the cost of these activities and about the frequency with which technologies that pan out both technically and economically achieve exceedingly low market penetration. In response to this frustration, we expect to see a shift in focus toward the development of new and unique program-delivery mechanisms for proven but underutilized technologies that leverage interconnectivity from both the technical and customer-engagement perspectives.

Rethinking the ET pipeline

Some of the companies that remained committed to their ET programs were determined to drive their intensive support of new technologies deeper into their program processes. They intend to achieve this by providing even longer-term support for marketing and product development. We expect to see internal silos within the utility begin to erode as technology-planning departments begin to take a longer-term perspective on ET. Being able to scale measures in a way that's repeatable and that achieves high adoption rates will require a better understanding of technology and market readiness. Technology departments are beginning collaborative efforts to include the insights and expertise of program planning, marketing, and customer experience departments to help achieve higher adoption rates.

Expand expertise

To better serve customers and simultaneously improve grid stability and customer experience, many respondents spoke of expanding the technology areas their ET departments analyzed. The biggest area for such expansion seemed to be Internet-connected devices, also known as the Internet of Things. Other areas included big data, rooftop solar, batteries, and advanced controls.

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