IEI REPORT | SEPTEMBER 2020

Rethinking Energy Efficiency as a Carbon Resource

Prepared for:
Institute for Electric Innovation

Prepared by:
Val Jensen, Senior Fellow, ICF International

EXECUTIVE SUMMARY

Energy efficiency has delivered huge benefits over the last 40 years. However, the imperative to achieve deep carbon reductions, combined with a more distributed and dynamic energy grid, creates a need for even greater levels of efficiency that can be targeted to where and when it is most needed. Meeting the challenges associated with delivering more energy efficiency as a low-cost and flexible resource will require both policy and program design, delivery, and evaluation changes.

The key policy changes center on clarifying energy efficiency program objectives and then aligning the electric company regulatory model with these objectives. Reducing electricity use remains an important objective, but deep carbon reductions and a need to manage an increasingly dynamic grid require efficiency programs that can accommodate increased electrification and that can be deployed to meet time- and location-dependent grid management needs.

Delivering increasing amounts of energy efficiency at low cost also requires a shift in the program design and delivery approach. Historically, efficiency programs have been relatively blunt instruments with the bulk of savings derived from technology-based programs aimed at broad swaths of customers. The data and analytics revolution sweeping the electric power industry offers exciting opportunities both to improve energy efficiency program marketing and delivery and to support more customized and market-based programs that can be targeted to location and timing needs at potentially lower cost. By utilizing the wide range of inexpensive sensing and control technologies available today, data-driven programs offer the promise of energy "orchestration" as opposed to simply energy reduction as part of the next generation of smart energy programs that are consistent with deep carbon reduction goals and increased electrification.

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INTRODUCTION

Electric company-administered energy efficiency programs have been offered for 40 years. Since the early 1990s, investment in customer-funded electricity efficiency has climbed from $1.8 billion (spent mostly in California, the Northeast, and the Northwest) to more than $7.23 billion in 2018 with investment occurring across the country.[1] This investment drove substantial impact; over that same period, total annual energy savings grew from just less than 50 billion kilowatt-hours (kWh) to 211 billion kWh. Absent this investment, 2018 electricity use would have been almost 7 percent higher. Roughly 20 percent of the carbon dioxide (CO_2) reductions coming from the electric power sector since 2005 have been the result of reduced energy use.[2] In 2018, the magnitude of energy efficiency savings (211 billion kWh) was more than double the output of solar generation (96 billion kWh).[3]

Despite this success or perhaps because of it, there is a growing sense across the industry that "what got us here won't get us there," where "there" is a largely clean energy economy underpinned by a very different electric power industry. Successfully achieving deep carbon reductions will require both further reductions in energy use at least as great as those already achieved and the replacement of significant existing fossil generation with zero-carbon technologies. Most industry experts expect these zero-carbon technologies to be largely wind and solar; and variable and, in some cases, distributed technologies that require reengineering the grid, particularly at the distribution level to accommodate variable and two-way power flows. Today, nuclear energy generates the majority of zero-carbon electricity in the United States (52 percent), followed by wind energy (19 percent), hydropower (18 percent), and solar energy (7 percent).[4] Energy efficiency typically is not considered in the zero-carbon resource mix.

Getting to a clean energy economy requires work in **three broad areas** as it relates to energy efficiency:

1. For a number of electric companies, the **regulatory regimes** they work within **are not fully supportive of significant investment in customer energy efficiency.** While 34 states provide some form of adjustment to compensate for lost sales and 29 provide a performance incentive for energy efficiency, significant disincentives to electric company promotion of customer energy efficiency remain in other states.[5] Even if cost-recovery, lost revenue, and financial incentive issues are addressed, some electric companies remain concerned that significant investment in efficiency will drive average prices higher.
2. Those electric companies operating in jurisdictions encouraging significant energy efficiency investment face a variety of **program design, delivery, and evaluation issues** that need to be resolved prior to realizing substantially greater efficiency savings.
3. The combined effect of **the need to reduce carbon and to adapt to the architecture of a more distributed and dynamic grid requires us**

1. Twenty-six states now have some form of energy efficiency target in-place. American Council for an Energy Efficient Economy. The 2019 State Energy Efficiency Scorecard. October 2019. https://www.aceee.org/research-report/u1908
2. Estimate based on dividing 149 MMT CO_2 by 796 MMT CO_2. See Institute for Electric Innovation. Energy Efficiency Trends in the Electric Power Industry (2008-2018). March 2020. https://www.edisonfoundation.net/-/media/Files/IEI/publications/IEI_Energy-Efficiency-Report_Mar2020.ashx
3. Institute for Electric Innovation. Electric Companies Are Committed to a Clean Energy Future: 2020 Update. April 2020. https:// https://www.edisonfoundation.net/-/media/Files/IEI/publications/IEI_Clean-Energy-Top-10_April-2020
4. Ibid.
5. Institute for Electric Innovation. Energy Efficiency Trends in the Electric Power Industry (2008-2018). March 2020. https://www.edisonfoundation.net/-/media/Files/IEI/publications/IEI_Energy-Efficiency-Top-10_Mar2020.ashx

to rethink both the policy framework for, and the purpose of, energy efficiency programs. We will need policies that harmonize reduced energy use and increased electrification, and we will need program designs that can deliver both efficiency and demand reduction in the specific locations and at the times most needed for emissions reductions and grid stability.

We know that regulatory policies intended to make electric companies indifferent to spending on efficiency or investing in infrastructure can drive powerful changes in company strategy and culture.[6]

The need for regulatory change that encourages electric company energy efficiency investment (area #1) has been widely documented and described. Therefore, the focus of this paper is on areas #2 and #3.

PROGRAM DESIGN, DELIVERY, AND EVALUATION CHALLENGES

The primary type of electric company-administered energy efficiency programs for close to 40 years has been to promote customer adoption of more efficient electricity-using devices. This typically involved a monetary incentive aimed at customers to purchase and to install the technologies, generally without regard for where these customers were located within a service territory. Programs often were highly structured with respect to customer and technology eligibility and the program delivery process.[7]

There is a growing sense within the industry and its stakeholders that the current approach to program design, delivery, and evaluation is reaching its limits for the following reasons:[8]

First, throughout the 40-year history of electric company-administered efficiency programs, most savings came from rebate-driven commercial and residential lighting programs. However, increases in federal lighting efficiency standards effectively reduce the savings that electric companies can reap from lighting-focused rebate programs significantly. Similar increases in the baseline efficiency of major appliances due to federal standards further reduce achievable efficiency potential in a variety of end uses.

Second, and as a direct function of the first issue, the cost-per-saved-kWh has been increasing, particularly for those electric companies that have been operating energy efficiency programs for a number of years. This reflects three phenomena.

1. Electric companies that have managed programs for 5-10 years have captured large amounts of the least expensive efficiency—typically, through lighting and residential behavioral programs.
2. Customer acquisition costs rise as electric companies capture those customers most likely to participate in conventional programs. As these customer segments are exhausted, acquiring

6. Several electric companies participating in an Institute for Electric Innovation Key Issues Executive Dialogue in March 2020 described how corporate strategy quickly shifted in response to the opportunity to earn financial returns on energy efficiency investments.

7. One major change in program structure over this period came in the targeting of upstream market actors (i.e., manufacturers and distributors began to work in concert to provide an instant, point of sale rebate to a customer) as a way to increase market leverage and steer a customer's purchasing decision toward high-efficiency equipment. Such programs were very successful in certain markets in driving large-scale technology replacement, but they were even less geographically targeted than conventional programs. A second innovation came in the use of behavioral norms as opposed to financial incentives to drive reductions in customer energy use. While also very successful and able to be locationally targeted, behavioral programs have faced measurement and evaluation challenges, particularly with respect to persistence.

8. A similar review of the challenges to energy efficiency written by Dian Grueneich in 2016 identified five challenges: (1) The magnitude of savings must increase dramatically; (2) The sources of efficiency savings must diversify; (3) Measuring and ensuring savings persistence must become commonplace; (4) Efficiency outcomes must be integrated with a carbon reduction framework; and (5) Energy efficiency must be understood and valued as part of an evolving grid.
The Electricity Journal. The Next Level of Energy Efficiency: The Five Challenges Ahead. August 2015.

additional customers takes more and more effort and expense in the form of incentives and marketing.

3. The program portfolios of electric companies that have managed programs for longer periods of time shift in composition from largely lighting- and appliance-based, to having a greater proportion of budget and savings targets allocated to more comprehensive (whole building) programs that are more expensive to implement.

Although a recent Lawrence Berkeley National Lab study found that the national average cost of saved energy continues to be low at 2.5 cents-per-saved kWh over the life of the programs, the report also highlighted significant cost disparities. Whole home retrofit programs are roughly six times the cost of residential lighting rebate programs, and those electric companies that have offered programs for the longest spans have overall portfolio costs that can be more than twice as high as those companies that are relatively new to the business. For example, the average cost of programs offered in the Midwest is 1.5 cents per kWh, compared to 2.6 cents in the West, and 3.3 cents in the Northeast.[9]

The effect of rising cost-per-saved kWh is that budgets required to achieve any given level of savings must increase or, in the case of electric companies with statutory or regulatory budget caps, savings will be lower than they otherwise might be. While the obvious solution to a budget constraint issue is simply to lift caps that exist, raising the share of customer bills associated with efficiency carries the risk that the programs will lose support. A decade ago, it was rare to find electric companies spending more than 2-3 percent of revenue on efficiency programs. By 2018, 17 states were spending above that level, 10 states were spending above 3 percent, and the top three states ranked according to this metric were spending above 6 percent. There is some evidence that the spending burden might be growing too large at least in the view of some policy makers. At the end of 2019, 14 states allowed at least some customers to opt-out of energy efficiency programs. Four states (Iowa, Kentucky, Ohio, and Utah) also scaled back or eliminated the efficiency investments electric companies are required to make.[10]

Third, existing program designs have been heavily influenced by evaluation, measurement, and verification (EM&V) beliefs and practices that less and less reflect energy efficiency policy aims, advances in data analytics, or the growing understanding of customer behavior. Programs are designed typically to minimize the risk of not delivering target levels of electricity savings. This puts a premium on designs that make it easy to count and attribute measures of program activity and impact. Standard rebate programs have dominated efficiency program design in part because the number of rebates issued is easily countable, and the savings associated with the action being rewarded often are "deemed" or relatively easy to measure. The focus on evaluation also concentrates program administrator effort on minimizing free riders—the number of customers those who take advantage of financial incentives but would have taken the action even without them.

The bias toward programs that easily are evaluated created a disincentive to explore more innovative program designs that would require complicated analysis to determine program performance. However, the fact that electric companies now have deployed more than 100 million smart meters in the United States means that extremely granular

9. Lawrence Berkeley National Laboratory. The Cost of Saving Electricity Through Energy Efficiency Programs Funded by Utility Customers: 2009–2015. June 2018. https://emp.lbl.gov/publications/cost-saving-electricity-through

10. American Council for an Energy Efficient Economy. The 2019 State Energy Efficiency Scorecard. October 2019. https://www.aceee.org/research-report/u1908

data are now available to support performance-based energy efficiency program evaluation.

THE NEED TO RECONCILE EFFICIENCY AND INCREASED ELECTRIFICATION TO ACHIEVE DEEP CARBON REDUCTIONS AND TO ADAPT TO A MORE DISTRIBUTED AND DYNAMIC ENERGY GRID

Momentum is building for climate action at the state and local levels. Twenty-six states have joined the U.S. Climate Alliance, pledging economy wide greenhouse gas (GHG) emissions reductions of at least 26 percent (relative to 2005) by 2025. The electric power industry is committed to a clean energy future as demonstrated by its significant CO_2 emissions reductions. As of the end of 2019, carbon emissions in the U.S. power sector were 33 percent below 2005 levels (i.e., equivalent to 1987 levels). In fact, based on projected trends and publicly announced goals, CO_2 emissions from investor-owned electric companies are projected to be at least 80 percent below 2005 levels by 2050.

Every strategy to achieve deep carbon reductions assigns a major role to energy efficiency. A recent ACEEE analysis of efficiency's potential role in an 80 X 50 strategy found roughly 15 percent of required emissions reductions could come from buildings and industrial efficiency.[11]

At the same time, every strategy also places even greater emphasis on building and vehicle electrification. For example, the California Energy Commission estimated that achieving an 80-percent reduction in GHG emissions by 2050 in California could require not only a 34 percent reduction in building energy use, but also a 100 percent incremental market share for electric space and water heating and electrification of 96 percent of the light duty vehicle stock by 2050.[12] A recent McKinsey analysis of New York's Climate Leadership and Community Protection Act estimates that achieving the Act's goals will result in a 30 percent increase in electricity use.[13]

Challenge and conflict arise as state energy efficiency targets, often expressed as reductions in electricity use relative to some baseline level, meet state carbon reduction targets that will require increases in electricity use. Ultimately, policies focused on reducing energy use will need to evolve to reconcile efficiency and electrification in the context of deep carbon reductions. This is particularly the case in jurisdictions that, decades ago, prohibited electric companies from promoting increased usage and fuel switching.

Finally, as increasing amounts of distributed generation and storage are installed on distribution grids, the value of energy efficiency that can be targeted to place and time is growing. When the

11. American Council for an Energy Efficient Economy. Halfway There: Energy Efficiency Can Cut Energy Use and Greenhouse Gas Emissions in Half by 2050. September 2019. https://www.aceee.org/research-report/u1907
    Energy and Environmental Economics, Inc. Pathways to Deep Decarbonization in the United States, The U.S. Report of the Deep Decarbonization Pathways Project of the Sustainable Development Solutions Network and the Institute for Sustainable Development and International Relations. November 2014.
    http://deepdecarbonization.org/wp-content/uploads/2015/09/US_DDPP_Report_Final.pdf
    Energy and Environmental Economics, Inc. Xcel Energy Low Carbon Scenario Analysis: Decarbonizing the Generation Portfolio of Xcel Energy's Upper Midwest System. July 2019.
    https://www.ethree.com/wp-content/uploads/2020/01/E3_Xcel_MN_IRP_Report_2019-07_FINAL.pdf

    World Resources Institute. Delivering on the U.S. Climate Commitment: A 10-Point Plan Toward a Low-Carbon Future. May 2015. https://www.wri.org/publication/delivering-us-climate-commitment-10-point-plan-toward-low-carbon-future

12. California Energy Commission. Deep Decarbonization in a High Renewables Future: Updated Results from the California PATHWAYS Model. June 2018.
    https://www.ethree.com/wp-content/uploads/2018/06/Deep_Decarbonization_in_a_High_Renewables_Future_CEC-500-2018-012-1.pdf

13. McKinsey. What New York's Plans to Decarbonize Mean for the World. November 2019. https://www.mckinsey.com/business-functions/sustainability/our-insights/sustainability-blog/what-new-yorks-plans-to-decarbonize-mean-for-the-world

objective was to lower overall energy use and demand, broad-based energy efficiency programs worked well. When the objective is to target load relief to specific feeders and/or to help smooth the evening load ramp, come-one-come-all rebate programs may no longer work. In many respects demand-side management (DSM), which in many jurisdictions had become synonymous with energy efficiency, now is being viewed as a suite of tools for managing the timing and location of demand to help defer the need for expensive capital projects.[14] This time, however, DSM is being powered by much more sophisticated data analytics and control equipment.

ELEMENTS OF A NEW APPROACH TO ELECTRIC COMPANY-ADMINISTERED ENERGY EFFICIENCY

These challenges to the traditional approach to energy efficiency investment don't diminish the value of the resource but do beg for a variety of policy, design, implementation, and evaluation changes. Fortunately, approaches have been implemented in one or more jurisdictions that provide a guide to action and are summarized below.

Getting the policy framework right

Electric company-administered energy efficiency programs are artifacts of state regulatory policy, which sets the goals to be achieved by the programs and the terms under which they are paid for and implemented. In that respect, almost every change to how electric companies plan, implement, and evaluate efficiency investments is a matter of policy. However, there are several broad policy actions that frame virtually all program investment decisions.

1. Set clear policy objectives: Over time, rather than establishing a few clear objectives, policy makers have attached a variety of objectives to energy efficiency, particularly in jurisdictions where little if any new generation is needed. These include:

   a. Reducing aggregate customer bills
   b. Deferring/avoiding the need for generation, transmission, and/or distribution investment
   c. Reducing criteria emissions from existing power plants
   d. Reducing carbon emissions more broadly
   e. Creating jobs
   f. Providing bill relief for economically disadvantaged customers
   g. Improving customer service

Each of these objectives can have merit depending on a state's/electric company's circumstances, but failure to align on the specific objectives and how achievement is to be measured creates uncertainty and risk. In particular, policy objectives that continue to be focused on reducing energy use must be reconciled with existing and forthcoming carbon reduction goals (that often promote increased electrification).

Some states, such as New York and Massachusetts, have broadened efficiency goals from simply reducing electricity sales to reducing BTU consumption. Massachusetts has now included "strategic electrification" as an allowable electric company efficiency measure.[15] The Sacramento Municipal Utility District has taken an even bigger step by redefining the objective of its energy efficiency programs from reducing electricity use to reducing carbon emissions.[16] While a shift to a carbon goal focuses energy efficiency investment

14. For example, the NARUC Center for Partnerships and Innovation has undertaken a major effort to support state distribution system planning (DSP); a process patterned after integrated resource planning. Within a DSP process, energy efficiency and demand response are considered as non-wires alternatives to conventional distribution system investments.

15. American Council for an Energy Efficient Economy. What will Massachusetts' New Efficiency Targets Mean for Future Policy. November 2018. https://www.aceee.org/blog/2018/11/what-will-massachusetts-new

16. Sacramento Municipal Utility District. SMUD First in US to Change Efficiency Metric to 'Avoided Carbon. February 2020. https://www.smud.org/en/Corporate/About-us/News-and-Media/2020/2020/SMUD-first-in-US-to-change-efficiency-metric-to-avoided-carbon

on a very clear objective, it could drive a substantial shift in the portfolio of programs and specific energy management measures an electric company offers depending on the area's carbon emissions profile. The value of efficiency measures that reduce energy use during low emission periods would drop, while the value of measures that could be "turned on" during high emission periods would increase.

2. Align the regulatory environment with the policy objectives: As public service enterprises, electric companies never have been in the business exclusively of generating and selling electricity; every regulatory jurisdiction has assigned multiple economic, social, and environmental objectives to the companies. Often, however, the way that a company generates revenue and profit is related exclusively to customer demand and energy use. Satisfaction of other objectives often is treated as a compliance function. As states increasingly assign responsibilities to electric companies that shift the focus of the business from production and delivery to energy and carbon management, the way electric companies generate revenue also needs to shift away from commodity sales to network and energy management.

GETTING THE MECHANICS RIGHT: FROM ENERGY EFFICIENCY TO SMART ENERGY PROGRAMS

Meeting the challenges associated with a changing program mix, rising program costs, and the need for time- and location-responsive demand requires a change from what largely has been a technology replacement-based design philosophy to one that is more attuned to the users of that technology. The model for the traditional energy efficiency program was oriented to replacing a piece of equipment with a more efficient piece of equipment. Customers were important insofar as they needed to be convinced to make the change (how much would I need to pay you to use a different kind of lightbulb?). The model was not too concerned with why the lighting fixture was there in the first place or with how to make the process of getting the amount of light customers need where and when they need it less complex.

The near-simultaneous rise of powerful data analytics, powerful insights about how customers make energy use decisions, and powerful, inexpensive measurement and control devices have made possible a very different approach to program design that is driving an evolution from energy efficiency to smart energy programs. The evolution to **smart energy programs** is driven by five interrelated capabilities:

1. **Data-driven Insights.** Granular energy use data can yield very specific insights about how a customer uses electricity and where opportunities for reducing/shifting use can be found. These insights can be paired with propensity data/models to identify the most valuable and likely participants in a smart energy program much more effectively.
2. **Personalized Offerings**. These same data insights can help electric companies deliver actionable information tailored to individual customers through the channel most likely to attract their attention.
3. **EM&V 2.0.** These same data combined with sophisticated analytics greatly can improve program EM&V. The wider application of statistical techniques such as randomized control trials has boosted confidence in the savings associated with programs not reliant on specific technologies being installed. These techniques allow electric companies to shift the focus of EM&V from the behavior of individual customers to the aggregate behavior of groups

of participants.[17] Further, analytical platforms that support robust program evaluation also can deliver accurate, near-real-time results to program managers.

4. **Pay-for-Performance.** This shift in focus supports the broader use of pay-for-performance (P4P) programs that reward customers not for taking specific prescribed or allowed actions but for achieving specific policy objectives (e.g., saving energy, reducing GHG emissions, etc.). These programs greatly simplify program logic models as the program administrator no longer decides which technology will be incented through which channels, leaving those choices to customers and the market. Complex program design issues remain, however. For example, customers with relatively larger savings potential could be more attractive participants than residential, and particularly low-income, customers from the perspective of the energy service companies likely to pursue them. There also could be a tendency for customers and their agents simply to pursue the cheap and easy efficiency measures. The complexity of program design, therefore, shifts to the mechanics of setting prices that reflect the timing, location, and duration of the savings.[18]

5. **Energy Orchestration**. The rapid fall in the cost of digital sensing and control technology has given rise to a new set of energy management technologies. From smart communicating thermostats to sophisticated campus-wide building energy management systems, technology gives customers and electric companies the ability automatically to adjust energy use quickly in response to system conditions. For example, residential central air conditioners could be controlled to pre-cool during low load/price and/or carbon emission hours and to cycle off during high load/price or carbon emission times. In theory, control schemes could be tailored at the system, community, feeder, transformer, or premise level.

CONCLUSION

Energy efficiency has delivered huge benefits for nearly 40 years, whether those are measured as avoided power plants, lower carbon emissions, lower electric bills, jobs created, or simply as increased customer control and satisfaction. However, acquiring future energy savings will require different approaches; relatively inexpensive and easy-to-acquire efficiency has, in many jurisdictions, been acquired. Efficiency is growing more expensive as incremental savings targets grow. At the same time, energy efficiency is being called upon to deliver even more as electric companies and states pursue deep carbon reduction and as the amount of distributed, variable renewable resources on the grid increases.

Meeting the challenges associated with delivering more energy efficiency will require both policy and program design/delivery/evaluation changes. A large minority of states still effectively penalize electric companies for promoting energy efficiency through regulations that do not allow for revenue

17. The practice of EM&V itself could be changed greatly in ways that make it more efficient and less expensive. As programs have become more and more standardized across the industry, it is worthwhile considering whether the nature of EM&V processes could be changed to mirror the process of financial auditing. Each program implementer could be responsible for its own EM&V based on a set of industry standards (similar to those adopted by the Financial Accounting Standards Board) developed for each program type. These results then could be audited and certified with respect to adherence to the standards. Where deficiencies are found, these could be detailed and provided to regulators.

18. For a thorough review of the status of pay-for-performance see: Natural Resources Defense Council and Vermont Energy Investment Corporation. Putting Your Money Where You Meter Is: A Study of Pay-for-Performance Energy Efficiency Programs in the United States. January 2017. https://www.nrdc.org/sites/default/files/pay-for-performance-efficiency-report.pdf

adjustments in response to reduced sales, let alone provide financial incentives. Even states that have created supportive policy frameworks for energy efficiency will need to ensure that carbon reduction policies (including increased electrification) are not working at cross-purposes with efficiency programs targeting reduced electricity sales. ***It is critical to reconcile efficiency and electrification in the context of carbon reduction goals.***

The data and analytics revolution sweeping the industry offers exciting opportunities both to improve program marketing and implementation and to support more customized and market-based efficiency programs at potentially lower cost. ***Combined with a wide range of inexpensive new sensing and control technologies, data-driven programs offer great promise as part of the next generation smart energy programs.***

Technology Company Perspectives

Using Data Science to Advance Energy Efficiency as a Carbon Resource

E Source

POWERING WHAT'S **NEXT**

To achieve deep carbon reductions, electric company energy efficiency programs need a technology makeover. They need to become effective carbon resources that support a dynamic and distributed energy grid. The technology makeover is two-fold in that we must broaden our definition of energy efficiency to include new end-use technologies and use data science to enable energy efficiency to be deployed where and when it is needed the most. We need policy changes to create an environment that unleashes the innovation and investment required to achieve this technology makeover. Assuming we can get there on the policy front with a business model that inspires electric company investment, let's focus on using technology to realize the full potential of energy efficiency.

EXPANDED END-USE TECHNOLOGIES

Energy efficiency must continue to take advantage of new end-use technologies to achieve the goal of integrating into a portfolio of customer-based carbon reduction programs that also includes solar, storage, demand response, and EVs. E Source recently released an electrification framework that outlines a path for such a portfolio of customer-focused programs to reduce carbon, lower rates and costs for customers, and run the energy grid more efficiently.[1] The win-win-win carbon reduction opportunity summarized in the framework requires an integrated, data-driven approach to deploying energy efficiency where and when it is most needed.

CUSTOMER CENTRICITY

With all customer resources, success depends on customers making a purchase decision, so we need to gain a deeper understanding of our customers in order to define value from their perspective. This will optimize the customers' contribution as a resource over time through a portfolio of programs. The conventional approach at many electric companies is to interpret their core mission—to provide safe, reliable, affordable, clean energy to all customers—as a mandate to treat all customers the same. This results in systematically underserving all customers.

The data and technologies are available to become truly customer-centric, allowing electric companies to celebrate customer differences and to better serve them with personalized offerings. This strategy will benefit all customers. The ability to process massive volumes of electric company data, combine it with behind-the-meter customer data, and apply data science enables us to understand individual residential and business customers. This granularity allows us to better identify customer wants and needs, to design programs customers will want to participate in, and to create compelling value propositions for specific customers. The result will

1. E Source. The Electrification Framework that Benefits Customers, the Grid, and the Planet. June 2020. http://pages.esource.com/beneficial-electrification.html

be a portfolio of electric company programs that effectively and fairly serve all customers with varying engagement strategies applied over time based on customer micro-personas for each program. For example, imagine a micro-persona that identifies 15 percent of customers with double the normalized usage for the size and makeup of their household. We can tell they are using electric strip heat with an older electric water heater, and we can help them cut their annual electric bill in half. Do we send them an energy kit and move on, or do we craft a program for these specific customers?

This customer-centric, bottoms-up approach will provide a more realistic estimate of market potential. And, it gives us the ability to act based on customer-specific insights because it's an aggregation of the potential at specific households and businesses. Traditional econometric market and technical potential studies are effective for aligning stakeholders around a product-centric view of end-use technologies. They served us well to push more efficient end-use technologies and to recognize energy efficiency as a valuable resource. As we turn our focus to achieving deep carbon reductions with a dynamic, distributed energy grid, the diversity among customers as a valuable resource should not be ignored.

ENERGY GRID EFFICIENCY

By taking a granular approach to customers, we can provide value to the energy grid, to customers, and to the electric company. With a dynamic grid that includes variable solar and wind resources, value differs based on where those resources are located on the distribution grid and when they're available. Energy efficiency needs to be a more flexible resource, moving from generic system-wide solutions to geographic and time-specific solutions that support localized grid constraints in addition to system-wide carbon reductions.

By applying data science at the individual customer level, we easily can map customer resources to a digital replica of the transmission and distribution network. We can apply predictive digital simulations to understand with a high degree of confidence the expected location and time impacts of energy-efficiency and other carbon-reduction programs. Electric companies can be confident not only that these resources will deliver system-level support, but that they can be counted on to support investments in non-wires alternatives. This confidence enables energy efficiency to deliver benefits to multiple parts of the electric company value chain.

Using smart meter data, we also can forecast granular usage over time. Simulations can provide insights at any aggregation point along the grid down to the transformer level. Once the planning is complete, electric companies have the data to acquire customer resources through surgical targeting—for example, to improve a specific feeder. After executing the plan, we measure actual results and feed them back into the models for continual learning and calibration.

COLLABORATION

Collaboration among key stakeholders and policymakers is essential to make the significant changes needed to achieve deep carbon reductions. The technological capabilities we've outlined here provide a starting point for making decisions based on actual customer and energy grid data. Achieving deep carbon reductions will require transparency and a willingness to learn together. It will not be easy.

We are in the midst of another fundamental change. Electric companies will play a key role, working closely with states, cities, and many stakeholders to improve the environment, optimize rates and costs for customers, and identify investments that make sense for electric companies. Technology can help facilitate collaboration. We can move more quickly if we focus on the goal and make data-driven decisions. We need timely change to achieve carbon reduction goals, and one step in that direction is using technology to ensure that customer resources are available to make a difference.

Smart Thermostats are Critical Demand Side Management and Efficiency Tools for Electric Companies

Google

Smart thermostats are critical energy resources that both can enable demand response (DR) programs and provide energy efficiency benefits. As clean energy targets, policies, and electric company program designs evolve, technologies that maximize the value of DR programs and keep customers engaged in the long term are incredibly valuable.

Electric companies must seize the current opportunity. Smart thermostat-enabled energy efficiency and DR programs can deliver energy savings to cost-conscious customers, while also decreasing emissions and making it easier for electric companies to manage demand shifts. The environmental, grid-balancing, and social benefits of smart thermostat programs scale up with the growing number of installed devices. Therefore, electric companies should be focusing on how to expand access to as many customers as possible.

The industry is ready for an integrated demand-side management approach, one that focuses not only on how much energy is used, but also when it is used. The execution of this approach has been challenging in the past due to siloed implementation, filing periods, and program benefits and requirements across different markets. The technology behind smart thermostat DR programs, including machine learning and grid balancing software, has now matured enough to move forward with an integrated approach that is more streamlined and scalable.

THE SMART THERMOSTAT TIPPING POINT

Smart thermostat penetration across the country is still relatively low despite accessible prices (which become even more affordable with electric company incentives) and growing customer interest in smart home technology. An even smaller percentage of installed smart thermostats are enrolled in DR programs. According to SEPA, 1.1 million U.S. electric company customers collectively reduced demand by more than 900 megawatts through smart thermostat DR programs in 2018. The cumulative savings could be much higher if all existing and future smart thermostat households were activated as grid balancing tools. For example, in 2018, more than 14 million U.S. broadband households owned a smart thermostat, so fewer than 8 percent of homes equipped with these devices were enrolled in an electric company smart thermostat-enabled DR program that year. This represents a massive opportunity for the industry as it considers how to deliver demand-side resources that can support deep carbon reductions while also managing an increasingly dynamic grid.

Of course, residential energy use is changing during the COVID-19 pandemic as more people stay at home. Even with so much economic and social uncertainty, U.S. electric companies are not shying away from investing in these tech-centric efficiency and DR programs that also deliver customer benefits. Consumers Energy recently announced a partnership with Google and Uplight to provide Google

Nest thermostats to up to 100,000 households and to help Michigan residents power through the COVID-19 pandemic. Google Nest also is working with National Grid and Eversource Energy on similar programs to alleviate cost burdens by providing no-cost thermostats to customers during these challenging times.

When the upfront cost burden of smart devices is lightened or eliminated, either through electric company-sponsored reimbursement, credit programs, or newer and more affordable hardware, technology then can be leveraged to achieve efficiency goals and reduce emissions. This also addresses the very real problem of energy affordability for a healthier community, economy, and environment.

EXPANDING ACCESS BY CREATING COMPELLING OFFERS AND STREAMLINED USER EXPERIENCE

Energy efficiency and DR programs were around long before COVID-19 and have experienced growing pains with their program complexities and ambiguous participation guidelines. The newest online electric company marketplaces and ecommerce experiences are solving these issues by providing the frictionless experience that customers have come to expect with online retail.

The key to driving scale with smart thermostat-enabled programs is to create compelling offers and to combine them with a streamlined experience that makes customer participation simple. For example, "Bring Your Own Thermostat" DR programs reward customers who enroll their existing smart thermostats. Customers can sign up online and register an existing device to receive an electric company rebate, which can help transform the devices already on the market into grid resources that strategically shift energy use.

Electric company marketplaces that sell smart thermostats also are evolving by stacking energy efficiency and DR offers for customers at checkout, which substantially lowers the overall cost at purchase. Customers don't have to pay a higher upfront fee and then wait for a rebate to arrive later—they are enrolled right at checkout and then receive a device that can be activated as a grid resource immediately. Both opportunities are highly scalable, help leverage smart thermostats as energy-saving and grid-balancing resources, and drive more value to customers and electric companies.

LOOKING AHEAD

Electric companies have the tools available now to take an integrated demand-side management approach with smart thermostat programs. Thirty-two million U.S. broadband internet households are planning to purchase a smart thermostat this year, aligning nicely with marketplaces offering low- or no-cost devices with automatic DR program enrollment.[1] By making slight adjustments to how DR programs are implemented and making customer benefits and opportunities clear, smart thermostats that already are installed in homes can be turned into critical grid assets.

Electric companies and other energy stakeholders are getting creative with programs that bring smart devices to more customers at a lower cost, in order to tap into their full potential as carbon reduction resources. Bringing simple and effective energy-saving technology to all customers helps electric companies manage shifts in grid demand while delivering energy savings to customers and achieving efficiency targets. Understanding the value of smart thermostats as critical demand-side management tools helps increase device adoption and program enrollment, which is good for families and good for the energy grid.

1. Parks Associates. Twenty-nine percent of US Broadband Households Plan to Purchase a Smart Thermostat in 2020. February 2020. http://www.parksassociates.com/blog/article/pr-02042020

Technology Company Perspectives

Charting a Clean Energy Future with Smart Energy Programs

ORACLE® Utilities

Ever since Amory Lovins coined the term "negawatt" in 1990, electric company-funded energy efficiency programs have generated massive quantities of clean, cost-effective energy savings. In an increasing number of states, these programs have contributed to lowering per capita energy usage and flattening demand.

However, the programs of yesterday will not meet the needs of tomorrow. Simply saving energy will no longer be enough. Demands placed on energy efficiency programs are increasing with expectations that they meet a range of new objectives, including achieving measurable greenhouse gas (GHG) emission reductions, balancing variable renewable generation, helping vulnerable populations better manage energy bills, and advancing electrification. These expectations, however, must be balanced with the costs of achieving such outcomes to ensure electric company customers are not shouldering a disproportionate share of the costs for mitigating impacts to society overall from climate change. A key way to achieve this balance is to pursue scalable, flexible, smart energy efficiency programs.

THE KEYS TO SUCCESSFUL ENERGY EFFICIENCY PROGRAMS IN THE FUTURE

We see four key imperatives for smart energy programs moving forward:

1. They must achieve the intended savings targets today;
2. They must be capable of driving energy efficiency at specific times of the day;
3. They must be highly personalized to set customers on a path to future adoption; and
4. They must be rigorously measured, opening more opportunity for performance-based funding.

Below, we elaborate on each point.

Smart energy programs must achieve the intended savings targets today. Not every program achieves its savings targets. Yet, with climate change as one of the biggest threats to our generation, we must take steps now to reduce, even eliminate, our dependence on carbon. Achieving deep carbon reductions requires capital-intensive clean generation and grid modernization investments. These investments represent the long game. Climate change demands we act to reduce emissions today. Therefore, energy efficiency must be judged based on how quickly energy savings can be achieved at scale. A kilowatt-hour (kWh) saved today is more valuable from a climate change mitigation standpoint than a kWh saved in 10 or 20 years. This is true because: (1) mitigating the damages of climate change is a race against the clock, and (2) as the generation resource mix gets cleaner over time, the embedded GHG emissions in each incremental kWh reduced will decrease. [1]

Smart energy programs must be capable of driving energy efficiency at specific times of the day. While there is a clear need to achieve increasing

1. Analysis Group. Utility Energy Efficiency Program Performance From a Climate Change Perspective. August 2020 https://www.oracle.com/a/ocom/docs/dc/em/analysis group report.pdf

amounts of energy savings quickly, when these savings occur is also important. Due to the prevalence of variable generation, we must generate savings at specific times of the day, when the energy grid needs them most. The programs of the future will require us to target more intentionally when energy efficiency is occurring throughout the day in order to align savings with the most GHG-intensive generation resources, thereby maximizing efficiency's contribution to carbon reductions—in other words, flexible, smart energy efficiency.

Smart energy programs must be highly personalized to set customers on a path to future adoption. The actions required by customers will shift over time. Simple actions such as closing the blinds in summer to keep the home cooler still will have a place. But, moving forward, we expect customers to make more involved, long-term decisions, such as making home and appliance upgrades; adopting more efficient or smart devices; enrolling in electric company automation programs that control devices like smart thermostats, water heaters, or electric vehicle (EV) chargers to modify energy demand (and ensuring they remain in such programs); or purchasing EVs. Savvy electric companies must use advanced data analytics to identify their customers' appetites for smart energy programs and put them on a personalized journey toward adoption.

Smart energy programs must be measured rigorously. Smart energy programs must be reliably measured, with rapid insight into results. Software and data-driven smart energy programs such as behavioral demand-side-management generate large amounts of usage and time-based granular data that can be measured and analyzed on a sub-hourly, hourly, daily, monthly, seasonal, or annual basis to provide fast and clear insights into changes in energy use and to measure program performance accurately. For smart demand-side programs to match variability in supply reliably and to achieve customer benefits, timely, accurate measurement is essential.

THE ROLE OF BEHAVIORAL SCIENCE IN CHARTING OUR PATH TO A CLEAN ENERGY FUTURE

Behavioral demand-side-management programs are uniquely suited to meet these new demands and to do so with extraordinary scale and cost-effectiveness. Behavioral programs employ applied data science, cloud computing, human-centered design, and customer experience automation to influence customer actions. In doing so, they can help meet carbon reduction goals immediately, and at scale. And, simultaneously, they can serve flexible demand resources and accelerate the development of portfolios of demand resources by getting a customer's attention and influencing the customer to engage in other programs in the portfolio. And, finally, behavioral demand-side-management programs that leverage an EM&V 2.0 approach based on randomized controlled trials are considered the gold standard of measurement by the U.S. Department of Energy.[2]

One example is Oracle's Behavioral Load Shaping (BLS) program, which provides customers a personal comparison of their electricity usage in peak vs. off-peak times and encourages them to shift their biggest everyday energy loads to off-peak times.

BLS is generating sustained peak shifting behavior among time-of-use (TOU) customers receiving "rate coaching" via ongoing education about when they

2. National Renewable Energy Laboratory. Chapter 17: Residential Behavior Protocol, The Uniform Methods Project: Methods for Determining Energy-Efficiency Savings for Specific Measures. 2017. https://www.nrel.gov/docs/fy17osti/68573.pdf

   State and Local Energy Efficiency Action Network. Evaluation, Measurement, and Verification (EM&V) of Residential Behavior-Based Energy Efficiency Programs: Issues and Recommendations. 2012. https://www4.eere.energy.gov/seeaction/system/files/documents/emv_behaviorbased_eeprograms.pdf are using energy throughout the day and feedback on ways to shift their usage to off-peak times to help them maximize the benefit of the TOU rate above and beyond the impact of the rate alone (compared to a control group on the rate, but not receiving rate coaching).

BLS achieves the four outcomes above:

- it can be deployed immediately, and at scale;
- it is specific to the times of day that have the greatest impact and value on both grid management and carbon reduction;
- it can lead customers on a path to adoption of other programs like smart devices; and,
- it can be measured through rigorous EM&V.

Energy efficiency programs pursued over the last several decades that have been slow to scale and laborious to measure and evaluate, may dominate today, but they aren't equipped to achieve the outcomes and policy goals that so many stakeholders now demand. As clean energy and carbon reduction targets increasingly are met by variable renewable energy, smart energy programs including behavioral demand-side management must have an expanded role both to balance the grid and to achieve customer benefits.

Challenging the Old Paradigm of Energy Efficiency

powerley

For the last 100 years, electric companies have delivered reliable energy to customers. The relationship has been unidirectional, with electric companies sending bills to customers after they use energy, while promoting and mobilizing energy efficiency programs per the electric companies' understanding of the customer base—typically a one-size-fits-all relationship with the customer. Traditional energy efficiency programs like home energy reports, ENERGY STAR appliance incentives, and HVAC demand response have been effective but are within the old paradigms of success – lacking the depth of insight and engagement that customers have come to expect in today's connected world.

A lot has changed and is changing within the electric company landscape, focusing on customer expectations and technology advances. This refreshed focus is helping to define and to drive new benchmarks of success and the impact for energy efficiency.

SHIFTING TOWARD A CUSTOMER-FIRST FOCUS

The first shift in thinking is to turn from an electric company-first to a customer-first focus. Although changing, electric companies have not kept up with the customer environment, which has become "the world of now or instant gratification". Electric companies still are lagging in digital engagement among consumer-facing companies, scoring in the bottom quartile according to J.D. Power's 2019 Utility Digital Experience Study.

Energy efficiency programs typically use latent and generalized results that are often not actionable; and, while segmentation is being applied, other industries have gone much further toward hyper-personalization. Promoting and mobilizing energy efficiency and other programs based on a generalized understanding of the customer base is no longer a viable option. The one-size-fits-all relationship with the customer is obsolete.

Customers are more interested than ever in reducing energy waste and environmental impacts. McKinsey's 2019 Voice of the Customers Research found that, based on customer feedback, there are seven areas that customers want their electric company to focus on. Four of these areas are of specific interest to customers, including investing in smart energy infrastructure, serving customers in ways that make their experience easier, leading the way on clean energy and carbon reduction, and investing in digital tools to help customers manage their energy. This increased interest in energy education and engagement has been further catalyzed by the adoption of smart thermostats and EVs. It is up to the ecosystem of technology providers, regulators, and electric companies to take energy engagement further and deliver a new benchmark for energy efficiency. In doing so, electric companies deliver personalized energy insight while empowering customer with control to cut their bills and their carbon footprints.

UNLEASHING THE CUSTOMER SIDE VALUE PROPOSITION OF SMART METERS

By the end of 2020, electric companies will have deployed around 107 million smart meters in the United States. This technology has delivered a variety of operational and grid-level benefits. Today, we are witnessing a customer-centric shift to deliver new levels of customer benefits from these smart meter investments.

Electric companies have an opportunity to unleash the customer-side value proposition of smart meters by moving beyond the latent, day-old usage data used on websites and monthly bills and creating a daily dialogue with customers based on real-time energy intelligence. This will bring the electric company on par with "the world of instant gratification." But customer expectations are only one-facet of the changing energy ecosystem. Moving forward, it is going to be more about when customers reduce their energy use, not just by how much. As time-of-use and dynamic pricing continue to be adopted and the penetration of carbon-free electricity generation increases, real-time energy management becomes even more important as a tool that can empower customers to manage their energy and clean energy goals.

CREATING A PERSONALIZED AND PRESCRIPTIVE ENERGY EXPERIENCE

The technology is available today to help electric companies reach new benchmarks in energy efficiency. By hyper-segmenting customers based on their interests and behaviors, electric companies can drive deeper engagement through automated, personalized communications and actionable insights. Through this enabling technology, we can tap into smart meter data and empower customers by providing real-time access to energy use, pricing, and billing information. We can go beyond the traditional demographic segmentation and provide hyper- personalized insights to customers. Electric companies like AEP Ohio and DTE Energy are leveraging the power of their smart meter infrastructure to transform the customer journey. They have created a daily connection, engaging customers eight times per week on average – delivering up to ten times more energy savings than traditional behavioral change programs.

Electric companies can exceed customer expectations by turning smart meter data into a personalized energy experience—changing a one-size-fits-all approach into a "one-to-one" dialogue. Through a real-time relationship with their energy, customers will create a newfound connection with their electric company, enabling the alignment of electric company and customer goals, empowering customers to manage their energy, and providing the ability to deliver continuous energy efficiency benefits jointly. The future electric company will not be built on monthly transactions, but rather daily interaction. Through a stronger, deeper customer relationship, electric companies will set a new benchmark for energy efficiency in the near-term, while driving new business opportunities in the long-term.

Rethinking the Evaluation and Incentive Approaches for Customer-Sited Energy Resources

Electric companies and their regulators face a clear opportunity to lead on deep carbon reductions in the economy and to find new ways to manage an increasingly volatile supply and demand dynamic on the energy grid. Key to both is unlocking the potential of energy efficiency and demand response programs (collectively, demand-side management, or DSM) by motivating individual customers to make smarter energy decisions and delivering system and customer-specific benefits. Electric company partners are positioned to deliver on this promise through five interrelated approaches:

1. Identification and application of data-driven insights
2. Increasingly personalized customer offerings
3. Reform of DSM evaluation, measurement, and verification (EM&V 2.0)
4. Direct alignment between energy outcomes and incentives throughout the value chain (i.e., pay-for-performance)
5. Real-time demand management (i.e., energy orchestration)

Uplight already partners with nearly 90 electricity providers to deploy three of these—data-driven insights, personalization, and orchestration. We integrate the three together to create connected customer journeys, resulting in lower friction for customers to participate in smart energy programs, which in turn lowers participant acquisition costs, boosts program enrollment, and significantly increases customer satisfaction.[1]

But applying two of the five capabilities—EM&V and aligned incentives—is beyond our capabilities and, instead, in the realm of regulators. Innovative approaches to these have been developed, and, in the case of aligned incentives, we have evidence of the value they can provide.

APPLYING THE "RESOURCE VALUE TEST"

The current system of EM&V is based on measure and program cost-effectiveness, and there are a variety of approaches for evaluating DSM cost-effectiveness, known as "cost tests." These cost tests are used through the planning, execution, and evaluation process, from market potential studies through consideration of individual technologies, programs, and portfolios. The selection and application of these cost tests vary greatly from jurisdiction to jurisdiction, and there remains much room for improvement through standardization of best practice.[2]

None of these tests effectively captures all the value of DSM measures, such as comfort, health, reliability/resilience, or environmental benefits. Nor

1. Uplight's demand response program enrollment (DPRE) solution compares favorable to industry standard bring-your-own device (BYOD), with around 80 percent enrollment through DRPE versus10 percent for BYOD; Uplight-powered, electric company-branded marketplaces typically rate net promoter scores over 70, which favorably compares to that of Apple and Amazon.

2. See the Database of State Efficiency Screening Practices. https://nationalefficiencyscreening.org/state-database-dsesp/

are they applied equally to all behind-the-meter resources, such as private (or rooftop) solar or managed EV charging. A new approach, called the "Resource Value Test" (RVT) addresses the flaws of the standard cost tests.[3] The RVT is an approach for allowing regulators to sum all the costs and benefits their particular jurisdiction deems relevant, creating a more bespoke, transparent, and aligned approach to evaluate potential technologies and programs, with a better foundation for evaluating provider performance in DSM deployment. The RVT also allows more novel benefits or consumer experience ("CX")—critical to transition to the "consumer-centric grid"—to be incorporated into design and EM&V of DSM measures and programs.[4] Arkansas, Pennsylvania, and Rhode Island have applied the RVT, with several additional states exploring potential adoption.

INCENTIVES: ALIGNMENT IS KEY

Ensuring EM&V matches with the desired outcomes leads to the next opportunity for reform—the alignment of electric company shareholder incentives. A 2019 study by the Brattle Group, commissioned by Uplight, showed a clear correlation between program performance and incentive structure, with policy mandates being achieved most cost-effectively when program cost recovery, revenue decoupling, and performance incentives are in place.[5] These mechanisms can take a variety of forms—shared savings, performance trackers, regulatory assets, return on equity (ROE) adjustments, full performance-based regulation—but it appears regulatory assets with ROE bonuses may be the most straightforward approach. Regulatory assets have established precedent and provide transparency to electric company management, investors, stakeholders, and regulators.[6]

In the few jurisdictions where these mechanisms have been implemented, electric companies have responded with clear signals that they are ready to make DSM a strategic focus for their organizations, not simply a regulatory compliance burden.[7]

REALIZING THE BENEFITS OF INTEGRATED DSM & DER

For the most part, DSM program evaluation and incentives are not top of mind for regulators. To integrate DSM optimally with distributed energy resources (DERs) like private solar, EV charging, and behind-the-meter batteries, regulators must update both. In the near-term, this will improve DSM cost-effectiveness and electric company program CX; in the medium-term it will close the gap between economic and achievable potential of DSM programs; and, in the long-term, it will reduce carbon emissions by unlocking the full potential of

3. National Efficiency Screening Project. National Standard Practice Manual for Assessing Cost-Effectiveness of Energy Efficiency Resources. May 2017.
https://nationalefficiencyscreening.org/wp-content/uploads/2017/05/NSPM_May-2017_final.pdf

4. To match the long-established operational excellence of electric companies with excellence in consumer engagement, clear and robust CX metrics and an evaluation system must be developed. See JD Power Utility Client Conference. Delivering a Modern Customer Experience. March 2020.
https://cdn2.hubspot.net/hubfs/4239280/Events/2020%20Events/Utility%20Client%20Conference/Yes,%20We%20Can%20Deliver%20a%20Truly%20Modern%20Customer%20Experience%20-%20Tanuj%20Deora,%20Uplight.pdf

5. The Brattle Group. Energy Efficiency Administrator Models: Relative Strengths and Impacts on Energy Efficiency Program Success. November 2019.
https://brattlefiles.blob.core.windows.net/files/17632_2019_11_18__brattle-uplight__energy-efficiency-administrator-models.pdf

6. Utility Dive. Four Steps Electric Utilities Can Take to Support Their Communities During the COVID Crisis. April 2020
https://www.utilitydive.com/news/four-steps-electric-utilities-can-take-to-support-their-communities-during/576926/

7. The Wall Street Journal. How a Utility's Counterintuitive Strategy Might Fuel a Greener Future. February 2020.
https://www.wsj.com/articles/how-a-utilitys-counterintuitive-strategy-might-fuel-a-greener-future-11581170394
and PSE&G. Powering Progress: Energy Efficiency.
https://www.psegpoweringprogress.com/energy-efficiency/

demand flexibility through integrated planning and dispatch of all energy, capacity, and ancillary service resources.

The EM&V and incentive changes proposed here will not solve every issue holding back deployment of DSM for grid flexibility—the siloing of strategy, organizational structures, work processes, and budgets remain challenging. But, the signals from regulators to reform EM&V practices and incentives will serve as prompts for electric companies and ecosystem partners to address these operational barriers for across-the-meter optimization.

At Uplight, we are excited about our partnership with electric companies to fulfill our mission to motivate and to enable energy customers and providers to accelerate the clean energy ecosystem through the application of data-driven insights, personalized customer offerings, and orchestration of customer resources. In order to accelerate the deployment of the energy customer action system, we need regulators to focus on EM&V 2.0 and electric company performance incentive reforms and to help lead us to a more sustainable energy future.

About the Institute for Electric Innovation

The Institute for Electric Innovation focuses on advancing the adoption and application of new technologies that will strengthen and transform the energy grid. IEI's members are the investor-owned electric companies that represent about 70 percent of the U.S. electric power industry. The membership is committed to an affordable, reliable, secure, and clean energy future.

IEI promotes the sharing of information, ideas, and experiences among regulators, policymakers, technology companies, thought leaders, and the electric power industry. IEI also identifies policies that support the business case for the adoption of cost-effective technologies.

IEI is governed by a Management Committee of electric industry Chief Executive Officers. In addition, IEI has a select group of technology companies on its Technology Partner Roundtable.

About the Edison Foundation

The Edison Foundation is a 501(c)(3) charitable organization dedicated to bringing the benefits of electricity to families, businesses, and industries worldwide. Furthering Thomas Alva Edison's spirit of invention, the Foundation works to encourage a greater understanding of the production, delivery, and use of electric power to foster economic progress; to ensure a safe and clean environment; and to improve the quality of life for all people. The Edison Foundation provides knowledge, insight, and leadership to achieve its goals through research, conferences, grants, and other outreach activities.

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Institute for Electric Innovation
701 Pennsylvania Avenue, N.W. | Washington, D.C. 20004-2696
202.508.5169 | Visit us at: www.edisonfoundation.net