ENERGY EFFICIENCY AS A RESOURCE

The Power of Getting More from Less

A 21st Century Electricity System Issue Brief

By Advanced Energy Economy

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ADVANCED ENERGY ECONOMY

San Francisco | Washington D.C. | Boston
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ABOUT ADVANCED ENERGY ECONOMY

Advanced Energy Economy (AEE) is a national association of businesses and business leaders who are making the global energy system more secure, clean and affordable. Advanced energy encompasses a broad range of products and services that constitute the best available technologies for meeting energy needs today and tomorrow. AEE's mission is to transform public policy to enable rapid growth of advanced energy businesses. AEE and its State Partner organizations are active in 26 states across the country, representing roughly 1,000 companies and organizations in the advanced energy industry. Visit www.aee.net for more information.

ABOUT THIS ISSUE BRIEF

The U.S. utility sector has entered a period of foundational change not seen since the restructuring of the late 1990s. Change is being driven by new technologies, evolving customer needs and desires, environmental imperatives, and an increased focus on grid resiliency. With these developments come challenges, but also new opportunities to create an energy system that meets the changing expectations of consumers and society for the coming decades. We call this the *21st Century Electricity System:* a high-performing, customer-focused electricity system that is efficient, flexible, resilient, reliable, affordable, safe, secure, and clean. A successful transition to a 21st Century Electricity System requires careful consideration of a range of interrelated issues that will ultimately redefine the regulatory framework and utility business model while creating new opportunities for third-party providers and customers to contribute to the operation of the electricity system.

To support this transition, Advanced Energy Economy (AEE) has prepared several issue briefs that are intended to be a resource for regulators, policymakers, and other interested parties as they tackle issues arising in the rapidly evolving electric power regulatory and business landscape.[1] This issue brief on **Energy Efficiency as a Resource** lays out challenges and opportunities for energy efficiency in the context of the evolving grid, describes several potential obstacles and questions that utilities and regulators should consider, and makes recommendations on the path forward.[2]

SUMMARY

Energy efficiency (EE), broadly defined, means using less energy to provide the same, or often superior, energy services. EE is most commonly thought of as technology that reduces energy use relative to traditional technologies, such as LED lighting and high efficiency appliances and heating and cooling equipment. But today, EE also includes the use of sophisticated energy management systems, internet-connected thermostats, and data analytics. EE can deliver both sustained reductions in energy use by improving baseline efficiency, as well as targeted reductions by giving customers actionable information to manage energy use during specific times, such as during peak demand periods.

Many benefits come from EE technologies and practices, including: cost savings to customers, consumer empowerment and engagement, improved facility operations and building energy systems reliability, enhanced grid performance, reductions in future electricity rates, and job creation.[3] EE is widely recognized as the lowest cost resource for meeting electricity needs. Even in states that have pursued EE policies for many years, EE remains cost effective, with significant untapped market potential. Strong EE polices and investment help keep electricity bills low for all by reducing the need for investment in new and expensive generating assets, as well as new transmission and distribution infrastructure.

The EE market has undergone significant changes in response to developments in technologies, markets, and public policies. This has largely been driven by the influx of connected devices, deployment of advanced metering functionality[4] and the "internet of things," which have increased the ability of utilities, third parties, and customers to remotely access data and act upon it. In addition, there continue to be advances in EE technologies and new innovative tools that leverage this new data through analytics to provide personalized and actionable information about energy consumption.[5] As a result, increasingly sophisticated energy consumers continue to drive toward purchases of energy efficient products and services.

Despite its many benefits, EE faces barriers to achieving its full potential. To overcome these barriers, states should implement policies supporting energy efficiency, creating market certainty for services and products that reduce energy consumption and helping customers manage their energy bills. Well-developed policies such as energy efficiency resource standards (EERS), revenue decoupling, and building codes and standards are critical for driving higher levels of efficiency. Integrated resource plans (IRPs) that take into consideration the value that demand-side technologies can provide, as well as robust EE potential studies, are also necessary components for setting strong EE targets and funding requirements. States that enable robust markets for EE will benefit from more

efficient use of energy and the economic growth and investment of successful companies providing energy efficiency services.

In addition to these foundational policies, the increasing sophistication of EE products and services opens up the possibility for innovative solutions and approaches that value EE as a resource on par with traditional, supply-side options. AEE believes that such market-driven EE, in its various forms, can serve as an important component of the electric grid of the future, and be a complement to more traditional EE policies. Specifically, AEE finds that **open procurements** for EE resources; **diverse financing options, targeted demand side management; increased customer engagement; updated evaluation, measurement, and verification practices** (EM&V); and **rewards for performance** can accelerate EE deployment, spur EE industry growth, and provide savings for electricity customers.

A BREADTH OF ENERGY EFFICIENCY OPTIONS

Energy efficiency refers broadly to products and services intended to reduce the energy used by consumers and businesses while providing the same or superior quality of the energy services. Examples are many, and include energy efficient LED lighting, Energy Star rated appliances and electronics, building energy management systems and high-efficiency heating and cooling systems. In the era of big data and data analytics, EE also includes behavioral programs, where customers are given actionable energy information and insights and are able to reduce energy use in response. Because many of these energy efficient technologies and services offer superior performance to their standard counterparts, they can also positively impact business productivity. For example, an EE retrofit in a commercial building can make workers more productive by improving lighting and providing more comfortable indoor temperatures.

The U.S. Energy Efficiency Market

The U.S. building efficiency sector is large, accounting for $68.8 billion in revenue in 2016.[6] Overall, U.S. Building Efficiency products and services grew 8%, or $5 billion, that year, led by energy efficient lighting and commercial building retrofits, both up 7%, reaching $26.4 billion and $8.4 billion, respectively.

MARKET BARRIERS

Incremental needs for energy services can be met by either increased supply or increased efficiency of energy use. In most cases, pursuing energy efficiency is the lowest-cost option for meeting those additional needs. Nevertheless, energy efficiency markets have historically faced barriers that have prevented EE from reaching its full potential. The American Council for an Energy Efficient Economy identifies four common barriers:

- Imperfect information on potential technological options and performance.
- Incentives that differ between energy users and those who would invest in EE measures, such as landlord-tenant relationships.
- Externalities that occur when costs or benefits are not included in prices, such as unaccounted-for societal benefits.
- Imperfect competition of quasi-competitive markets, as in the case of markets with limited suppliers of EE services
- Limited financing options, especially given that EE often entails incremental investment over traditional technologies, with savings accruing over time.

Additional barriers include:

- Limited data access and visibility into energy use and costs (visibility helps to spur action)
- Utility EE programs may not offer deep EE savings to enough customer types
- Some rate designs can hurt EE returns on investment, such as recent efforts by some utilities to increase fixed charges and reduce volumetric energy charges.7

In addition to these barriers, most electric utilities operate under a regulatory framework and business model that encourages them to increase sales, as opposed to helping their customers use energy more efficiently. Thus, in the absence of policies that incentivize utilities to promote EE, utilities focus on traditional drivers of growth, such as increased electricity sales and new investments in traditional generating capacity and electricity system infrastructure.

As a result, many customers are not taking advantage of all cost-effective energy efficiency available to them, despite it being in their economic interest.

POLICY AND MARKET RESPONSE

In recognition of these well identified market barriers, as well as the significant public benefits of greater EE deployment, policymakers have developed a number of responses. These include:

- More stringent codes and standards for buildings, appliances, and other equipment.
- Utility- or state-run (or authorized) EE programs.
- Energy Efficiency Resource Standards (EERS), which require utilities and other obligated parties to procure mandated levels of energy efficiency, similar to renewable portfolio standards for renewable energy.
- Statutory requirements that utilities pursue all cost-effective EE.
- System benefits funds, where a small amount of money is collected from each utility customer each month and pooled to fund EE delivery.
- Regulatory changes, such as revenue decoupling, that mitigate the financial incentive for utilities to continually increase volumetric sales.
- Performance incentives for utilities to achieve high levels of energy efficiency.8

Competitive suppliers of EE products and services are also responding by pursuing free-market mechanisms with new energy efficiency technologies and services that can deliver solid returns on investment for building owners.

FORMS OF ENERGY EFFICIENCY DELIVERY

A variety of delivery mechanisms exist for EE, tailored to the needs of different customer types. So-called mass-market customers (residential and small commercial) are typically best served directly by utility programs whereas free-market mechanisms by industry, ESCOs, as well as utilities, serve larger commercial and industrial customers.

Public utility-sponsored programs are evaluated through a cost-effectiveness framework. In some jurisdictions, benefit-to-cost ratios for each *individual program* must be greater than one. In others, the *overall portfolio of programs* must pass the benefit-cost test, which AEE views as a superior approach. Measuring cost-effectiveness at the portfolio level can be beneficial because it allows for flexibility to include innovative programs that do not directly produce savings but are necessary to increase overall participation in EE programs, such as marketing. Regardless, if utility programs, which are funded by public purpose customer surcharges on ratepayer electric bills, are not cost-effective, state utility commissions do not authorize them. Lawrence Berkeley National Laboratory estimates the U.S. average "total cost of saved energy" for customer-funded utility EE programs at $46/MWh, based on an analysis of programs in 20 states over a five-year period.[9] And because some of these costs are borne by participants, the average costs to the program administrator (usually the utility) are even less, at just over $20/MWh.

While utilities serve as program administrators, program delivery is typically done by third parties, either acting on behalf of the utilities as contracted agents, or in delivering products and services directly to participating customers via the competitive marketplace. This combination has proved very effective at delivering value for all customers – participants and non-participants alike – while achieving state policy objectives.

Across the United States, utility-sponsored energy efficiency programs have grown into a multi-billion annual market that is delivering highly cost-effective energy services to customers.

Outside of utility programs, various market constructs provide opportunities for cost-effective energy efficiency delivery, including Pay for Performance (P4P) and other industry-led innovations. This includes performance contracting offered by Energy Service Companies (ESCOs), who primarily service municipalities, universities, schools, and hospitals, which collectively have been termed the "MUSH" market.

For performance contracting, ESCOs evaluate and install a package of EE measures for their customers. Often, those installations have little or no up-front cost to the customer, as the ESCOs recover their costs through the energy savings generated. In fact, if the project does not generate the savings forecasted, ESCOs pay the customer the difference.

In other P4P models, there are two primary ways in which energy efficiency savings are paid:

- **Standard-offer programs,** which set a price for each unit of energy saved

- **Bidding programs**, in which implementers or customers compete for contracts that specify an amount of energy savings to be achieved, and pay the price offered by bidders (e.g., the utility) for savings as they occur.

P4P has the potential to grow as more granular data about customer energy use becomes available, allowing for more accurate measurement of actual savings, as opposed to the deemed savings approaches that have been used in the past. While more common with commercial and industrial customers, the approach could expand to smaller customers via the participation of third-party aggregators.

EMERGING PRACTICES FOR THE FUTURE OF ENERGY EFFICIENCY

While traditional programs remain the cornerstone of energy efficiency deployment, some jurisdictions are examining whether it is possible to move toward more market-based models for EE, which would effectively treat EE more like a resource on par with traditional supply resources. Advances in evaluation, measurement, and verification (EM&V) mechanisms and measuring savings at the meter will be a key enabler of this evolution. EM&V has always been an important aspect of energy efficiency delivery, but data analytics and automated EM&V practices can enable more precise assessment of EE effectiveness. This, in turn, would allow for new procurement models. For example, when a utility determines that an upgrade of a portion of its transmission and/or distribution grid will be needed in the future to avoid a load constraint, a "Non-Wires Alternative" (NWA) that uses targeted energy efficiency or other means to reduce future load on the grid may prove to be more cost effective.

To deliver value to consumers and energy savings to electricity systems, markets must provide sufficient certainty for a wide array of technologies and business models. AEE recommends specific design elements to encourage effective EE implementations. In particular, AEE encourages regulators to consider policies and practices that encourage open procurement, customer engagement, EE financing, targeted DSM and use EM&V to reward performance. These different procurement models could still be supported with an underlying policy requiring utilities to meet annual EE targets or requiring them to pursue all cost-effective EE.

OPEN PROCUREMENT.

Market procurement of EE implementations must be open, clear, and sufficiently predictable enough to sustain energy efficiency as a business opportunity. Flexible approaches to procurement should reward innovation and encourage investment in EE. Markets rules should set clear requirements and aim to reduce transaction costs of EE measures and address barriers.

As an example, utilities can issue EE requests for offers (RFO) to the competitive market to solve an identified need. Pacific Gas & Electric in California is issuing RFOs for EE projects and other greenhouse gas-free energy resources to replace the generation from the Diablo Canyon nuclear power plant, which is set to retire in 2025. The first round of RFOs will be for EE only.[10]

CUSTOMER ENGAGEMENT.

Information feedback and customer engagement programs are helping customers discover new ways to save energy through on-line energy management tools. By leveraging data analytics and customer intelligence, these tools provide customized energy insights and actionable information to encourage energy savings. On-line web portals provide customers with energy saving tips, load disaggregation, billing insights, energy data access, and usage alerts. Collectively, these insights empower customers to become more engaged, while increasing satisfaction and leading to higher participation in EE programs.

DIVERSITY OF FINANCING OPTIONS.

There should be creativity in options for financing to ensure the value of EE is delivered and that parties share in costs and benefits appropriately. Upfront costs to consumers, including those who could most benefit from EE measures, should be considered a barrier to market activity. Increasing access to financing options may create new and compelling value propositions for customers, utilities, and financing institutions. Property Assessed Clean Energy financing, or PACE, which uses tax liens to engage commercial debt markets and provide repayment of energy upgrade costs through property tax bills, is one example. Emerging models, including on-bill financing for utility customers, may also drive energy efficiency investment.

The P4P and open procurement arrangements described earlier also create opportunities for innovative EE financing that treats EE similar to supply side options. Whereas a utility might enter into a power purchase agreement (PPA) for electricity supply, it could instead enter into a savings purchase agreement (SPA) for specific load reductions brought about by EE deployment. This opens up the possibility of using project finance for EE instead of traditional financing options, which often rely on individual customers investing out-of-pocket or borrowing to pay for EE. With project finance, the stream of savings over time produces a cash flow that can be financed like any other project.

UPDATING EVALUATION, MEASUREMENT, AND VERIFICATION PRACTICES.

Traditional EM&V consists of comparing a given measure to the performance characteristics of a replaced measure, then multiplying the difference by the life of the new measure. However, new technologies provide increasingly sophisticated ways to quantify the actual performance of EE measures once in use. For example, smart meter data can be used for energy savings calculations and rewards. Advances in monitoring EE performance may help market participants guide decisions about EE investments.

REWARDING PERFORMANCE.

Performance-based frameworks for utilities identify outcomes that are sought, and then align earnings, often through specific rewards, for attaining certain levels of performance. Linkages between financial rewards (or penalties) for utilities and desired outcomes must be better aligned with EE innovations. In markets for utility programs, desired outcomes can be linked to an index of performance in addition to, or in place of, the basic cost of providing services.[11]

Rewarding performance should be accompanies by other regulatory reforms. General rate-setting practices create an inherent financial disincentive for utilities to participate in EE programs, given that a successful energy usage reduction program would have a direct negative impact on utility revenue, and could impede a utility's ability to fully recover its costs. Revenue decoupling mechanisms are now being used in many states to ameliorate these disincentives, so that utilities may invest in EE programs without the associated negative effect on earnings. Revenue decoupling breaks the traditional link between a utility's revenues and earnings. For most mass-market customers of utilities, their monthly bill contains a relatively small fixed monthly charge, and most of the bill is derived from a volumetric charge based on electricity consumed. But as customers consume less, they avoid the related volumetric charges, which reduces revenue collection. By employing a decoupling mechanism, the volumetric charge is adjusted (e.g., through a surcharge mechanism) so that the required revenues are collected, even though consumption has declined.

CONCLUSION

Energy efficiency will continue to play an increasingly important role in a modern electricity system. Policymakers and regulators have a range of established and emerging practices to ensure that markets for EE continue to grow and make the most out of innovative technology and services. Taking advantage of the latest technology and data analytics, in particular, opens up possibilities for new EE procurement models that can continue to drive cost-effective EE deployment, save money for customers, and improve the electric power system for all.

END NOTES

[1] http://info.aee.net/21ces-issue-briefs

[2] Advanced Energy Economy (AEE) is comprised of a diverse membership. As such, the information contained herein may not represent the position of all AEE's members.

[3] Approximately 2.2 million jobs in the United States are associated with energy efficiency. http://blog.aee.net/at-more-than-3-million-jobs-advanced-energy-is-a-big-and-growing-source-of-employment-in-the-us

[4] For more information, see AEE Institute's Issue Brief on *Advanced Metering.*

[5] For more information see AEE Institute's Issue Brief on *Access to Data*

[6] Advanced Energy Economy. *Advanced Energy Now 2017 Market Report.* http://info.aee.net/aen-2017-market-report

[7] For more on this topic see our Issue Brief on *Rate Design for a DER Future.*

[8] For more information, see our Issue Brief on *Performance-Based Regulation*

[9] The Total Cost of Saving Electricity through Utility Customer-Funded Energy Efficiency Programs: Estimates at the National, State, Sector and Program Level, Ian M. Hoffman, Gregory Rybka, Greg Leventis, Charles A. Goldman, Lisa Schwartz, Megan Billingsley, and Steven Schiller, April 2015.

[10] https://www.hubs.com/power/explore/2016/06/efficiency-energy-storage-renewables-planned-due-to-diablo-canyon-retirement.

[11] For more information, see our AEE Issue Brief *Performance Based Regulation*