Energy Security Initiative
at BROOKINGS

MAKING THE BUSINESS OF ENERGY EFFICIENCY BOTH SCALABLE AND SUSTAINABLE

Lisa Wood
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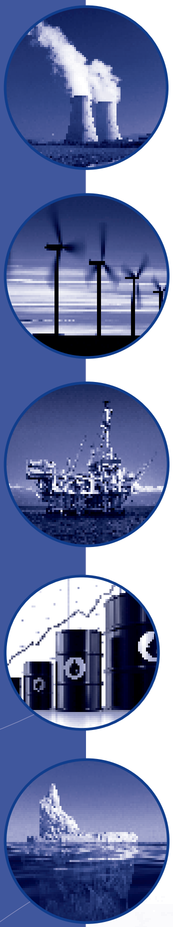

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The Energy Security Initiative (ESI) is a cross-program effort by the Brookings Institution designed to foster multidisciplinary research and dialogue on all aspects of energy security today. ESI recognizes that public and private choices related to energy production and use will shape the global economic, environmental and strategic landscape in profound ways and that achieving a more secure future will therefore require a determined effort to understand the likely consequences of these choices and their implications for sound policymaking. The ESI Policy Brief Series is intended to showcase serious and focused scholarship on topical issues in one or more of these broad research areas, with an emphasis on targeted policy recommendations.

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Introduction

In today's environment, as we face climate change, rising fuel costs, rising power plant construction costs, increasing demand, and shrinking reserve margins, regulators, legislators, electric utilities and energy users are now recognizing the value of energy efficiency as a fundamental component of a utility's business strategy for managing costs while meeting demand and environmental challenges. In some states, such as California, energy efficiency is considered the "first fuel," meaning that all cost-effective energy efficiency must be deployed prior to building new supply-side power sources. In other states, such as Missouri, future emissions from a recently sited coal power plant had to be offset with energy efficiency and renewable energy prior to gaining state commission approval to build the plant.[1]

As utilities rely more and more on energy efficiency in their portfolios of energy resources, it is important to recognize that making energy efficiency (EE) a sustainable and scalable business requires a partnership among utilities, regulators, legislators, and customers. Recent projections by the Electric Power Research Institute (EPRI) show that the electric power industry can offset significant growth in both usage and summer peak demand over the next 20 years by increased energy efficiency programs and demand response measures alone.[2] Although we cannot meet all of our projected increases in demand with energy efficiency and demand response, it clearly can play a very significant role.

Figure 1 shows energy savings that can be achieved through energy efficiency programs; this is the difference between the baseline electricity usage forecast for the U.S. of 4,858 billion kWh (TWh) in 2030 and a forecast of 4,460 billion kWh, which includes "realistic achievable potential" (RAP) estimates of energy efficiency, as well as a forecast of 4,314 billion kWh which includes "maximum achievable potential" (MAP) estimates of energy efficiency. The difference between the baseline forecast and RAP in 2030 is 398 billion kWh, which is the potential savings due to energy efficiency programs. Based on these estimates, energy efficiency can offset about 35% of the expected increase in energy usage between now and 2030. The baseline forecast is the U.S. Energy Information Administration's Annual Energy Outlook (AEO) forecast minus the embedded estimate of energy efficiency over this time period.[3]

[1] For a summary, see Electric Perspectives, EE at Work column, November-December 2008. See Issue Briefs at <http://www.edisonfoundation.net/IEE>.

[2] The savings projections in this paper focus on savings as a result of utility- or third party-managed energy efficiency and demand response programs. Energy efficiency savings are also achieved through government mandated codes and standards (e.g., building codes and appliance efficiency standards). These estimated savings are not explicitly discussed in this paper, but the impacts of existing codes and standards are included in the baseline forecasts. Total energy efficiency savings thus has two components—savings due to programs and savings due to codes and standards.

[3] The forecasts of RAP and MAP in this paper are based on: "Assessment of Achievable Potential from Energy Efficiency and Demand Response Programs in the U.S. (2010-2030)." EPRI Report No. 1016987, January 2009, www.epri.com. The AEO 2008 reference case of 4,696 billion kWh of electricity demand in 2030 includes embedded energy efficiency of 162 billion kWh. The baseline forecast in Figure 1 of 4,858 billion kWh removes the embedded energy efficiency from the AEO reference case forecast.

RAP is a forecast of likely customer behavior and penetration rates of efficient technologies. It takes into account existing market, financial, political, and regulatory barriers that are likely to limit the amount of savings that might be achieved through energy efficiency or demand response programs as well as recent utility experience and reported savings. Hence, RAP is a somewhat conservative forecast of potential energy savings rather than an aspirational goal. MAP is larger than RAP and assumes no impediments to program implementation and delivery.[4] Figure 2 shows that realistically achievable savings due to energy efficiency programs comprise about 8% of total load in 2030 or 398 billion kWh; maximum achievable savings due to energy efficiency programs comprise about 11% of total load in 2030 or 544 billion kWh. Contrast this with the EIA reported total savings due to actual energy efficiency programs in 2007 of about 67 billion kWh (see Figure 3).[5] Growing savings from energy efficiency programs from about 70 billion kWh today to 398 billion kWh by 2030 will require a focused and collaborative effort among utilities, regulators, legislators, and customers.

Figure 4 compares a baseline electricity summer peak demand forecast for the U.S. to a forecast including realistically achievable energy efficiency and demand response—the difference of 157 GW is the potential summer peak demand savings that can be achieved through energy efficiency and demand response (DR) programs.[6] Demand response programs include the set of programs that utilities use to mitigate peak demand such as price-responsive demand programs (e.g., real time rates, critical peak rates, and time of use rates), interruptible demand programs, and load control programs. Energy efficiency programs include the set of programs that utilities use to lower kWh such as promoting efficient appliances, efficient lighting, efficient motors, and home or building retrofitting. Based on these estimates, a combination of energy efficiency and demand response can offset about 50% of the expected growth in summer peak demand between now and 2030. Figure 5 shows that savings due to EE and DR comprise 14% of summer peak demand in 2030 —this is split about evenly between EE and DR programs. Realizing the maximum achievable potential would increase the savings to about 20% of summer peak demand in 2030. In contrast to the potential savings of 157 GW in 2030, actual peak demand savings due to EE and DR programs in 2007 were about 30 GW nationwide (see Figure 6).[7]

Figures 7 and 8 show the specific energy efficiency and DR programs that can be used to achieve these estimated savings in usage and demand. Specifically, Figure 7 shows that three end-uses—consumer electronics, commercial lighting, and industrial motors and drives—represent about 50% of the 398 billion kWh energy efficiency savings potential in 2030. In terms of summer peak demand reduction, Figure 8 shows that price responsive demand across all sectors, interruptible demand for commercial and industrial customers, and direct load control (DLC) represent the largest potential for summer peak demand savings in 2030.

Energy efficiency can play a significant role in shaping our energy future especially if we make it our "first fuel," as many utilities are considering today. Recognizing the potential significance of energy efficiency, the Energy Independence and Security Act of 2007 called for state regulators to remove disincentives to utility energy efficiency investments. Toward this end, three

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[4] MAP takes into account market, societal, and attitudinal barriers that limit customer participation in energy efficiency programs but assumes no impediments to the effective implementation and delivery of programs. RAP discounts MAP by taking into account impediments to program implementation, including financial, political, and regulatory barriers that are likely to limit the amount of energy efficiency savings that can be achieved. For example, utilities have budget limitations that may restrict funding of energy efficiency and demand response programs to below optimal levels. Political barriers may include differences in regional attitudes toward energy efficiency as a resource. See EPRI Report No. 1016987 for specific definitions.

[5] U.S. DOE Energy Information Administration, EIA form 861 data, File 3, 2007.

[6] Assessment of Achievable Potential for Energy Efficiency and Demand Response in the U.S. (2010-2030). EPRI Report 1016987, January 2009, <http://www.EPRI.com>.

[7] U.S. DOE Energy Information Administration, EIA form 861 data, File 3, 2007.

sets of policy responses have been discussed to align utility incentives with energy efficiency investments: program cost recovery, lost revenue recovery, and performance incentives. For demand response programs that shift load from peak to off-peak periods, the main policy issue is rate-basing or obtaining cost recovery for deploying technologies such as "smart meters" that facilitate two-way communication between the utility and the customer. Demand response and energy efficiency must both be actively pursued to realize the huge savings potential in both usage and peak demand. In addition, smart meters—the basic technology for pursuing demand response in the mass market—will allow utilities and customers to take advantage of energy-related technology innovations on the horizon such as home area networks for customer energy management, cost-effective distributed renewable generation, and smart grid-related technologies. The primary focus of this paper is on the specific policy instruments that could "level the playing field" for utilities investing in energy efficiency programs to save energy (rather than investing in power plants to produce energy) in order to meet demand at the lowest possible cost. However, given the additional carbon reduction benefits of energy efficiency, we also discuss some options that go beyond simply "leveling the playing field," in order to help achieve related environmental objectives before an economy-wide price on carbon is enacted.

Mechanisms for Making Energy Efficiency Scalable

Similar to power plant investments, utilities and regulators generally agree that utility investments in energy efficiency must be cost-effective and, if so, that the cost of the programs is recoverable in rates. However, assuming energy efficiency program cost recovery is timely and costs are recovered (although this is not always a given), cost recovery alone will not work to promote a sustainable investment in energy efficiency or to scale energy efficiency up to its realistically achievable potential. Energy efficiency will still not be on an equal playing field with supply-side options. That's because reductions in sales can lower utility financial margins and energy efficiency may not earn the same return as a supply side resource, thereby reducing earnings. Making energy efficiency scalable requires treating such expenditures like a supply-side investment option. The National Action Plan for Energy Efficiency (NAPEE)—a collaborative initiative launched in 2006 by a consortium of governmental, regulatory, utility, and non-governmental organizations—recommended removing regulatory barriers to all cost-effective energy efficiency programs. NAPEE supports treating energy efficiency as an investment; specifically, the plan made recommendations to "modify policies to align utility incentives with the delivery of cost-effective energy efficiency and modify ratemaking practices to promote energy efficiency investments."[8] This implies some mechanism for lost revenue recovery as well as potentially some type of performance incentive.

Given the structure of today's electric rates, recovery of the lost revenues to cover fixed costs (including earnings or profits for investor-owned utilities) due to the energy-efficiency induced drop in electricity sales is important. Otherwise utilities have limited incentives to invest significantly in energy efficiency. Regulated utilities typically recover their fixed costs based on a throughput formula. Therefore, if sales fall below the estimated levels used to set rates, the utility will not collect sufficient revenue to match its revenue requirement (a combination of fixed and variable costs including approved earnings) and fixed costs may not be totally recovered. In such cases, the component of fixed costs that will decline is typically a utility's earnings or profits; hence, recovery of lost revenue is sometimes called "lost margin" or "lost profit" recovery. The following simplistic example shows how this occurs.

Example. Consider a utility with an authorized rate of return on equity (ROE) of 10%, equity of $5 million, and revenues of $10 million. This utility has authorized earnings of $500,000.

[8] National Action Plan for Energy Efficiency, Report, July 2006. For a complete review of these policy issues, see "Aligning Utility Incentives with Investment in Energy Efficiency: A Resource of the National Action Plan for Energy Efficiency," prepared by Val R. Jensen. November 2007. <http://www.epa.gov/eeactionplan>.

- Assume this utility loses 2% of its revenue ($200,000) as a result of energy efficiency programs (and no other factors change). The result is that earnings will decline from $500,000 to $300,000. The 2% loss in revenue results in a 40% drop in earnings (or margin) showing how lost revenue very directly results in "lost margin."[9]

- On the other hand, if this utility gains 2% more in revenue (with no increase in costs), its earnings will increase from $500,000 to $700,000. The 2% gain in revenue results in a 40% increase in earnings.

Two approaches to lost margin recovery are lost revenue adjustment mechanisms (i.e., recover lost revenue with an adjustment to rates) and decoupling revenues from sales. Under decoupling, at the end of a specified period (such as one year), if electricity sales are lower than projections (e.g., due to energy efficiency), a balancing or "true up" occurs so that the drop in revenue does not affect margins.[10] These are described in more detail in the next section.

Finally, to truly put energy efficiency on an equal footing with power plant investments, providing the potential for a "return" on successful energy efficiency investments (similar to earning a return on other capital investments) can make energy efficiency a sustainable and scalable business. The lost margin recovery and performance incentives issues are discussed in more detail in the next section.

Lost Revenue Recovery Mechanisms

For regulated investor-owned utilities (IOUs), rates are typically set over a one- to three-year period using the following approach:

- IOUs forecast total costs including variable costs plus the fixed costs of capital used to finance infrastructure (i.e., depreciation, interest and return on equity) and other fixed costs. Regulators authorize a 'revenue requirement' which includes both the fixed and variable costs to produce and deliver electricity.[11]

- IOUs forecast sales over the same period; and

- Regulators set rates for the period to recover allowed costs. Average rate = revenue requirement ($)/estimated sales (kWh).

Consider two scenarios—one where the utility's sales are above the estimated level and one where sales are below the estimated level. Under the regulatory mechanism outlined above, if the utility's actual sales are above the estimated level, the utility will collect more revenue than required to cover its revenue requirement. Thus the interest, depreciation, and other fixed costs will be covered by the forecasted level of sales, and the excess will go to higher earnings (or margin). Likewise, if sales fall below the estimated level, the utility will collect less revenue than required to cover all of its fixed costs and the shortfall will result in lower earnings. Hence, a utility under this regulatory mechanism is financially rewarded for increasing electricity sales and is financially penalized by successfully implementing energy efficiency programs.

Example. Assume a sales forecast of 100 kWh. If the fixed operating costs for the utility are $6, and the variable costs for the fuel to generate the energy is $0.04 per kWh, the authorized revenue requirement becomes $10 = ($6 + ($0.04 x 100 kWh)). The rate or tariff is equal to $10/100 kWh or $0.10 per kWh.

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9 For a more detailed example, see Table 2-1 in "Aligning Utility Incentives with Investment in Energy Efficiency: A Resource of the National Action Plan for Energy Efficiency," prepared by Val R. Jensen. November 2007.

10 The specifics of how decoupling works varies somewhat from state to state. See "An Overview of Revenue Decoupling Mechanisms," by Dan Hansen, Christensen Associates Energy Consulting, November 2007.

11 Revenue requirement = [variable costs + depreciation + other fixed costs + interest + (capital costs x authorized rate of return)]. For an investor owned utility, the rate of return is a blend of the cost of debt and the return on equity (ROE).

As demonstrated below, if the utility sells more or less electricity than forecast, the result is over or under recovery of the fixed cost element of their revenue requirement.[12]

- If the utility sells only 95 kWh, the variable revenue now drops from $4 to $3.80 ($0.04 x 95); the fixed costs remain at $6, so the total cost is $9.80 (i.e., ($6 + ($0.04 x 95)). However, the actual revenues are now $9.50 (i.e., 95 kWh x $0.10). *This means that the utility under recovers fixed costs by $0.30.*

- Alternatively, if the utility sells more energy than forecast, say 105 kWh, it now receives revenues in excess of fixed costs by $0.30. Actual sales of 105 kW x $0.04 kWh result in an increase in variable revenue from $4 to $4.20. The fixed costs remain at $6, so the total cost is $10.20 (i.e., $6 + ($0.04 x 105)). The actual revenues are now $10.50 (i.e., 105 kWh x $0.10). *This means that the utility over recovers by $0.30.*

Considering solely the above recovery mechanism, there is a financial incentive to sell more electricity and a financial disincentive to save energy. However, in today's environment, it is important to note that climate change and other issues make these incentives more nuanced.

Two broad regulatory mechanisms are typically used to address the issue of lost revenue recovery: (1) lost revenue adjustment mechanisms that recover the lost margin revenues through an adjustment to rates, and (2) decoupling mechanisms which eliminate (or weaken) the relationship between utility sales and revenues by allowing rate adjustments (or true-ups) to recover authorized revenues independently of sales.[13]

Lost revenue recovery attempts to isolate the amount of margin that is under-recovered due to energy efficiency programs and this shortfall becomes a recoverable cost, which leads to a rate adjustment. Under this mechanism, a utility still earns more profit as sales increase so it does not eliminate the relationship between sales and profit entirely. In addition, recovering the appropriate amount of lost revenue depends on estimating energy efficiency program savings correctly.

Decoupling can be viewed as a rate adjustment mechanism that decouples sales volume from fixed cost recovery and removes disincentives to support energy saving programs. Decoupling can be implemented in different ways including total revenue decoupling, where the revenue a utility is allowed to earn is capped; revenue per customer decoupling, where the revenue per customer is capped (recognizing that total revenue grows as the number of customers increases); and other ways.

With decoupling the regulator still sets rates based upon recovering fixed investments and operating costs based upon predicted or forecasted sales. However, if actual sales are less than predicted, the utility recovers the fixed costs the next year (for example) in a rate adjustment. Alternatively, if the sales exceed projections, the utility will return the excess revenues through a lower rate the following year. Since profit or margin is factored into the revenue requirement, profit is independent of sales. In contrast to lost revenue recovery, decoupling does not require a precise estimate of energy efficiency program savings to determine the amount of fixed cost recovery. However, decoupling does require frequent balancing or true-ups which consumes regulatory resources. This can be mitigated if the process and formula for true-ups are established in advance.

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[12] Even in states where electricity deregulation has occurred, the incumbent company that distributes (i.e., delivers) the electricity (sometimes referred to as the wires company) still has regulated rates.

[13] A third approach is a straight fixed-variable (SVF) rate where most or all of the fixed costs are allocated to a fixed charge (rather than loading some of the fixed costs into a volumetric charge). SVF is an efficient pricing method but some argue that this approach reduces consumer incentives to conserve energy by reducing the bill impact associated with reducing consumption.

Even with decoupling, the utility still has a strong incentive to reduce operating costs. Since the rates are set by the regulators based on expected fixed operating costs, to the extent the utility can be more efficient and reduce costs, these savings accrue to the utility and are not impacted by a change in sales volume. Similarly, if a utility is less efficient and operating costs are higher than expected, this results in lower revenues and reduces the expected profit, just as in the non-decoupled utility.[14]

For example, if a decoupled utility is able to reduce the costs to serve customers below what was projected in their rates (e.g., \$0.01/month per customer times 1000 customers = \$10), it has additional revenues available immediately that are not subject to adjustment due to decoupling. Likewise, if a utility increases its costs to serve customers above what was projected, the associated drop in revenue is not subject to adjustment due to decoupling.

Performance Incentives for Energy Efficiency

Under lost revenue recovery or decoupling, a utility no longer has a disincentive for reducing their customers' energy use through energy efficiency. But, leveling the playing field requires one more consideration. Allowing the same return on energy efficiency investments as on capital investments will create the same financial incentive for building an actual power plant that produces energy, and for building a "virtual power plant" that saves energy and the utility will simply follow the least cost option. Providing performance incentives for achieving energy efficiency goals, for example by allowing utilities to share in the savings achieved or to receive an additional return on earnings from energy efficiency, can significantly increase the level of investment in energy efficiency.

Alternative methods for providing performance incentives to utilities for pursuing energy efficiency are described below. In some cases, the approach addresses broader EE policy issues beyond a performance incentive:

(1) allowing all or some portion of the investment in energy efficiency to become part of the utility rate base (approximately equivalent to generation or other capital investments, which allows a rate of return including embedded earnings as set by the Public Utility Commission). This means higher utility investments in energy efficiency also provide an opportunity for higher shareholder earnings. This is both an approach to cost recovery and, at the same time, a method for providing a performance incentive. However, capitalizing and depreciating energy efficiency program costs is currently out of favor;

(2) increasing the utility rate of return for energy efficiency investments provides a performance incentive or "kicker" for energy efficiency; this higher incentive can offset the negative impacts of increased energy efficiency in a way that is financially similar to decoupling and subsequent true-ups. In this case, the utility will still be negatively impacted by reduced revenues from lower energy sales due to energy efficiency, but the higher return (if set properly) can offset this impact (so lost revenue recovery may not be pursued separately);

(3) providing a financial incentive for achieving certain energy savings targets and a penalty for not meeting targets (this could be a fixed value, a variable value based upon achieving certain savings thresholds, or retaining a portion of the savings the program delivers to customers.). If set correctly, this approach can create significant management alignment

[14] In California, gas utility revenues were decoupled in 1978 and electric utility revenues in 1982. As of today, about 20 states have adopted gas decoupling, but fewer states have adopted electric decoupling (10 states as of this writing).

around increasing energy savings while ensuring that the cost of these incentives (along with other program costs) are less than the total benefit of the program.[15] Hence, both the utility and the customers share in the benefit. This approach is currently used in most states that provide performance incentives; and

(4) managing the investment in energy efficiency like a virtual power plant (sometimes referred to as Save-a-Watt). In the case of a virtual power plant, the utility simply manages the overall investment in energy efficiency and does not separately deal with issues of cost recovery, decoupling, and performance incentives, per se.

Different states and utilities have taken different approaches to performance incentives and the approaches are constantly evolving; these are the different mechanisms currently in place or under consideration in the U.S.[16] Cost recovery, some type of lost revenue recovery, and a shared savings mechanism can level the playing field for investments in energy efficiency; but there are variations on how to approach this. In the end, these are all approaches for capturing earnings on investments in energy efficiency.

[15] All utility-sponsored energy efficiency programs must pass a benefit-cost test. The exact components of the test vary by utility and by state.
[16] For a more detailed discussion, see Chapter 6 in "Aligning Utility Incentives with Investment in Energy Efficiency: A Resource of the National Action Plan for Energy Efficiency," prepared by Val R. Jensen. November 2007. <http://www.epa.gov/eeactionplan>.

Conclusions

If a utility aggressively pursues energy efficiency and overall sales are reduced, how does this impact a customer's energy bill? Customers that install energy efficiency measures in their homes or businesses will see reduced monthly bills. The payback period for measures varies by technology, climate zone, and other factors, but many are cost effective within a year or two.

For those customers that do not invest in energy efficiency, these customers may also benefit over time. Energy efficiency lowers the energy requirements of the system thereby reducing both power generation and power purchase costs. Over time, energy efficiency can also defer or reduce distribution costs. This means that while customers that do not participate in energy efficiency programs will not see an immediate reduction in their typical bill, they may benefit from lower rate increases in the future.

Energy efficiency programs vary in cost. Based on EIA data, the average cost of saving one kWh through energy efficiency programs was approximately 3.5 cents in 2007.[17] This is significantly lower than the cost of building a power plant to produce that power. The net benefit of energy efficiency (the difference between the cost of deploying a unit of efficiency and the cost of a unit of power from a new generation plant) is likely to increase significantly in the future as a carbon price is applied to many supply-side generation options. Hence, energy efficiency can be considered the "first fuel" for two reasons—it is cheaper to pursue than a traditional power plant and it produces carbon savings, meaning that it will become even cheaper relative to future generation options. So, as the cost of carbon increases and calls for increasing percentages of "clean energy" as part of an electric power portfolio increase, the amount of energy efficiency that is cost effective to pursue will also likely increase. Many of the other low- or no-carbon power sources under consideration such as wind, photovoltaic, nuclear, and "clean" coal are significantly more costly than historical fossil fuel-fired power plants today. Hence, pursuing all cost-effective energy efficiency will become even more important because it will offset the higher costs of clean fuels.

Beyond the Energy Efficiency Business Model

This paper has focused on making the business of energy efficiency both scalable and sustainable. In practice, although a handful of states allow electricity lost revenue recovery or decoupling and several provide performance incentives, the specifics of the "energy efficiency business model" are still hotly debated and have been for over two decades. Moderating growth in summer peak demand will require a 50/50 combina-

[17] U.S. DOE Energy Information Administration, EIA form 861 data, File 3, 2007.

tion of both energy efficiency and demand response programs (see Figures 4 and 5). The deployment of advanced metering infrastructure (AMI) with two-way communication between the customer and the utility is the first step toward allowing customers to respond to fluctuations in energy prices, manage their usage, manage their appliances/technologies, and bring distributed resources onto the grid including renewable energy and plug-in hybrid electric vehicles. Although a number of utilities across the country are in the process of deploying AMI in their service areas, the recognition of the critical need for this infrastructure is still not widespread. The role of the electric power industry in fostering and advancing innovation in energy usage and management will depend critically on creating a regulatory and policy environment that encourages energy efficiency, demand response, and the rollout of advanced meters and other technologies that provide the building blocks to the smart grid.

Finally, reaching the realistically achievable energy efficiency potential estimates presented earlier in this paper and significantly moderating the expected growth in both electricity usage and peak demand, will require consistent regulatory policies that align the customer, utility, and investor interests around energy efficiency.

Figures

Figure 1. Potential U.S. Electricity Usage Reduction Due to Energy Efficiency is 398 TWh in 2030 - Difference between Baseline Forecast and Realistic Achievable Potential *(Source: EPRI 2009)*

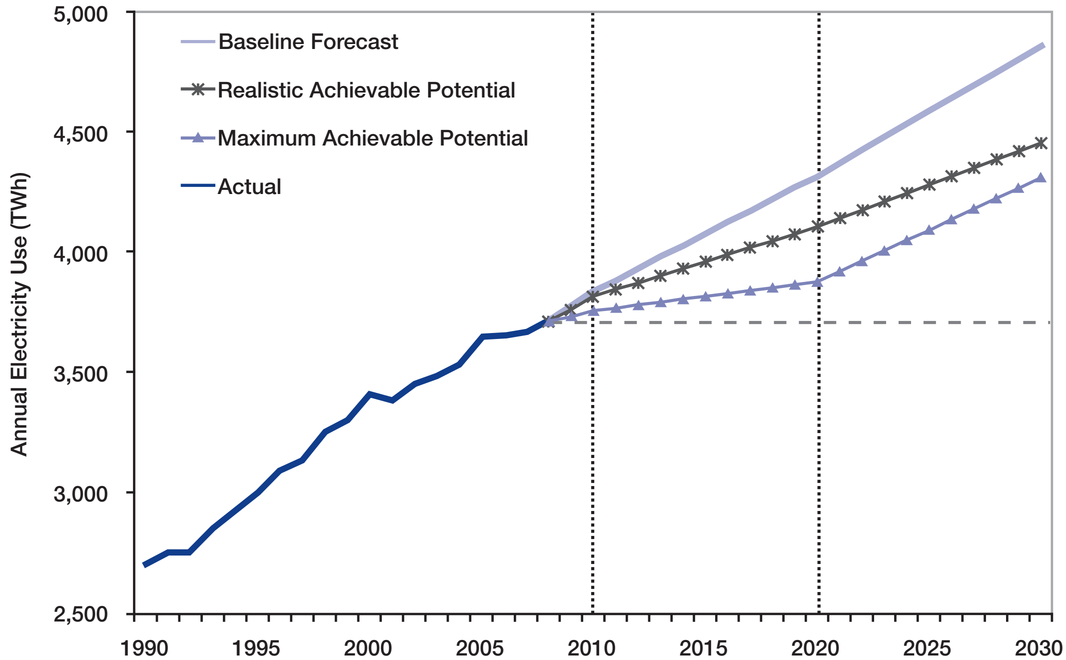


Figure 2. Energy Efficiency Programs can Save 398 TWh Nationwide by 2030 or 8% of Total Electricity Load Based on Realistic Achievable Potential *(Source: EPRI 2009)*

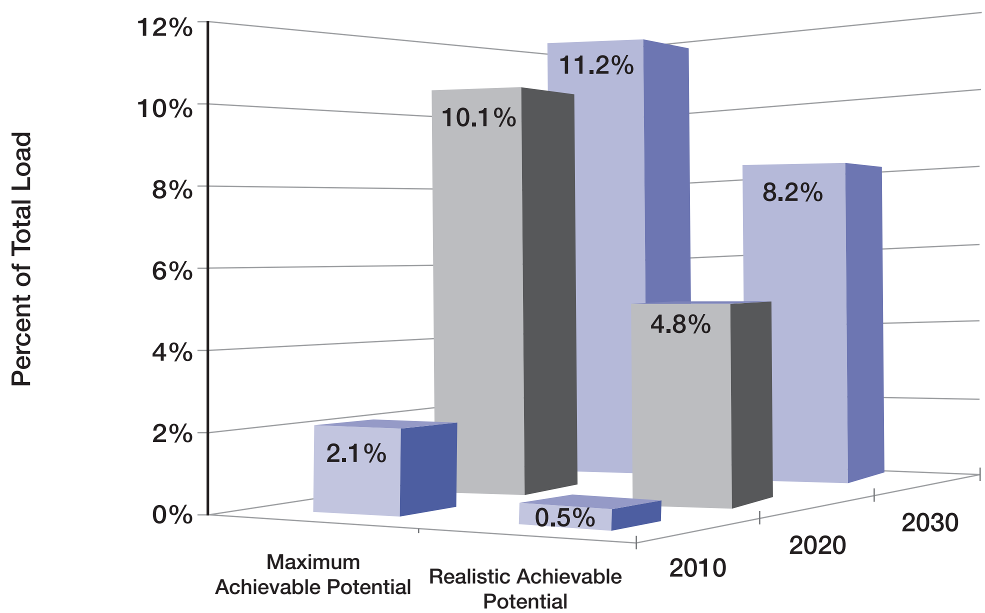


FIGURE 3. Historical and Projected TWh Electricity Savings in the U.S. Due to Energy Efficiency Programs *(Sources: EIA and EPRI 2009)*

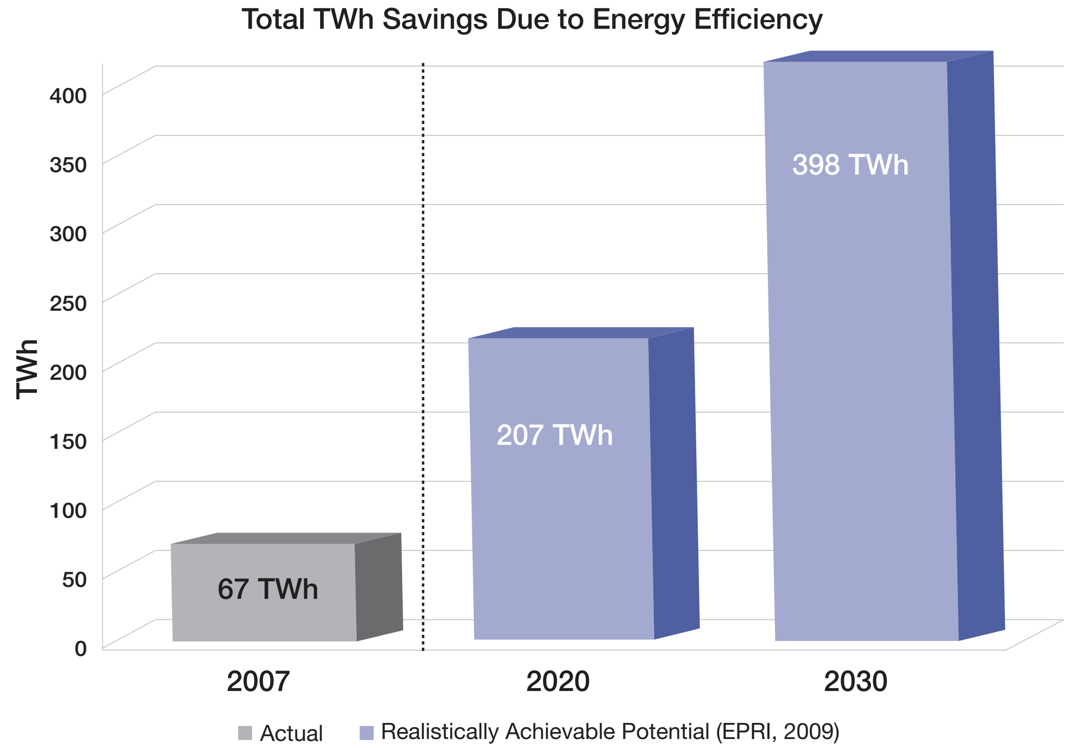


FIGURE 4. Potential U.S. Summer Peak Load Reduction Due to EE and DR is 157 GW in 2030 – Difference between Baseline Forecast and Realistic Achievable Potential *(Source: EPRI 2009)*

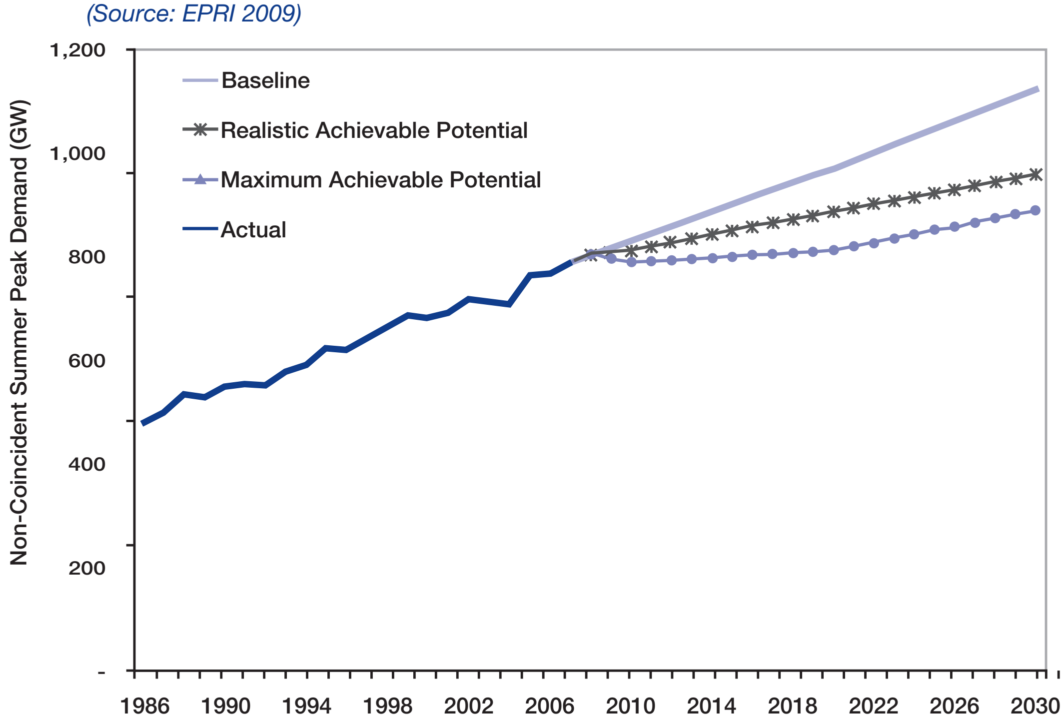


FIGURE 5. Energy Efficiency and DR Programs Can Save 157 GW Nationwide by 2030 or 14% of Summer Peak Demand Based on Realistic Achievable Potential *(Source: EPRI 2009)*

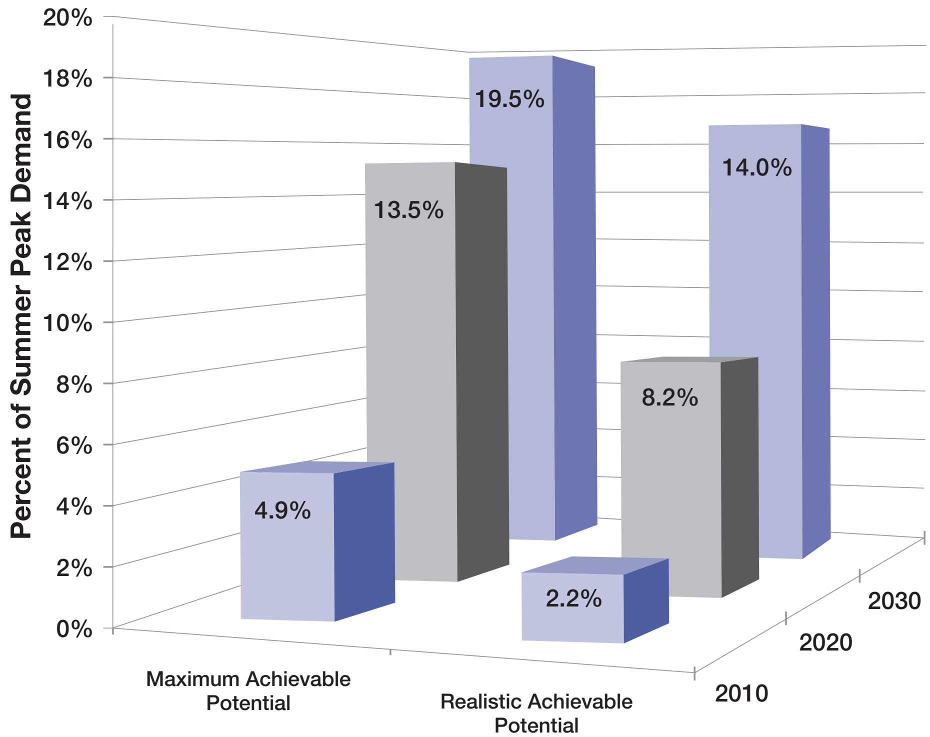


FIGURE 6. Historical and Projected U.S. Summer Peak Demand GW Savings Due to Energy Efficiency and Demand Response Programs *(Sources: EIA and EPRI 2009)*

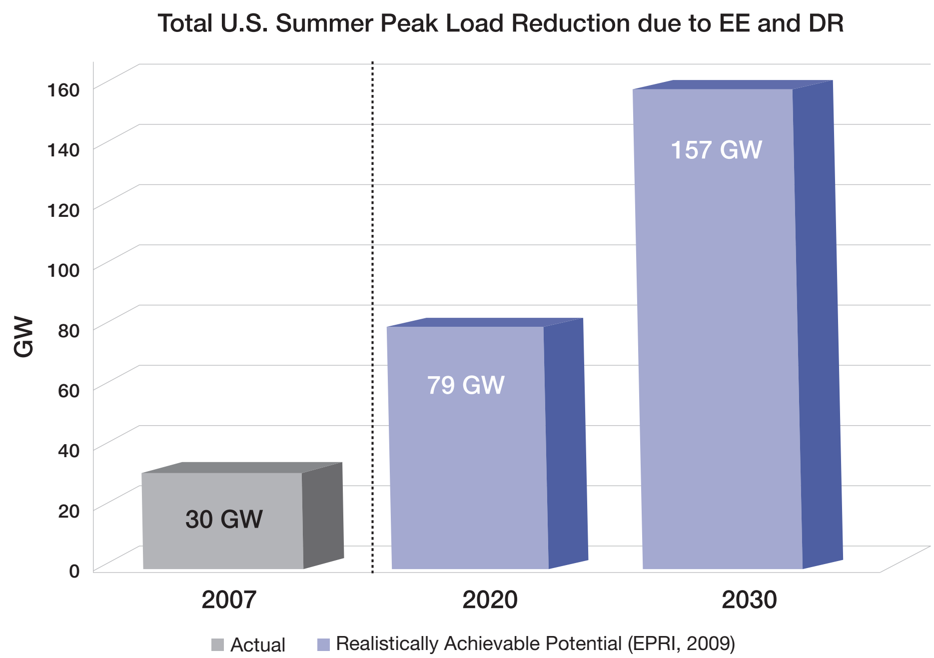


FIGURE 7. Energy Efficiency Realistically Achievable Savings Potential by End Use

(Source: EPRI 2009)

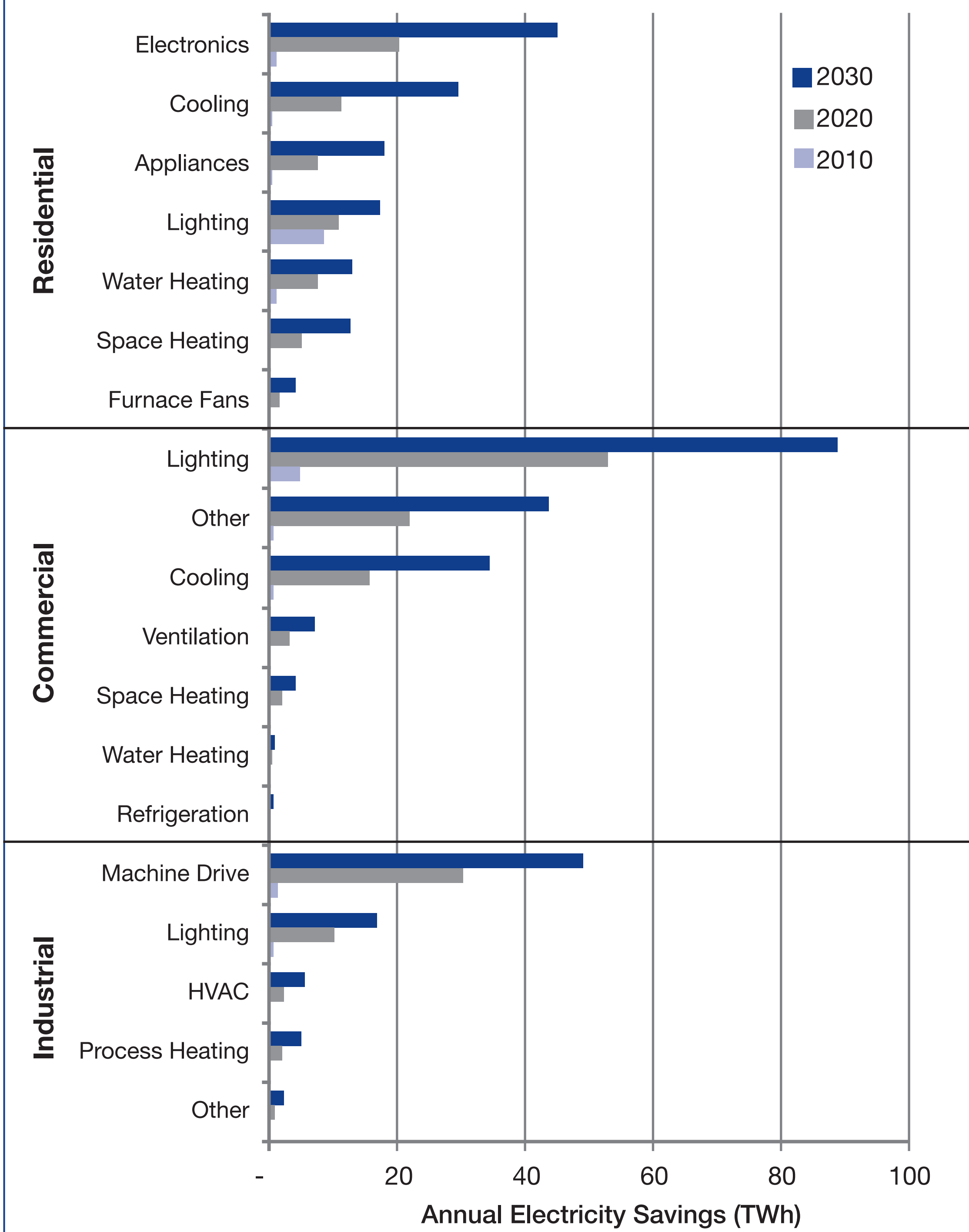
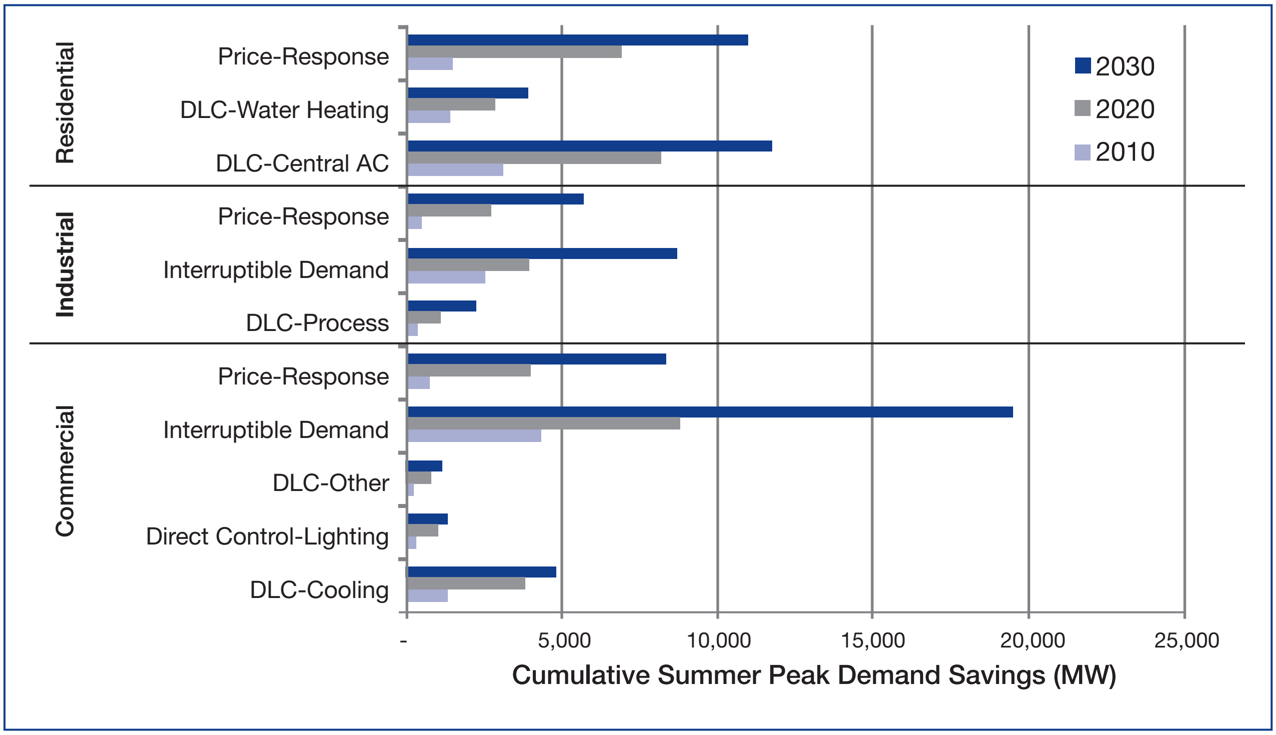


FIGURE 8. Portfolio of Demand Response Sources for Summer Peak Demand Reduction: Realistic Achievable Potential *(Source: EPRI 2009)*



About The Authors

Lisa V. Wood is the Executive Director of the Institute for Electric Efficiency. The Institute for Electric Efficiency (IEE) was recently established by the Edison Foundation to advance energy efficiency practices and demand response in the electric utility industry.

Wood joined the IEE after more than two decades of consulting experience with electric utilities on a range of retail issues. Her clients included the nation's leading electric utilities. In that role, she directed numerous economic, financial and market analysis studies, with an emphasis on energy efficiency, dynamic pricing, value of electric service reliability, and customer choice for rate options.

Prior to joining the IEE, Wood was a Principal with The Brattle Group. Prior to that, she was a Principal at PHB Hagler Bailly and a Program Director at Research Triangle Institute. She has a Ph.D. in Public Policy and Management from the Wharton School of the University of Pennsylvania and an M.A. from the University of Pennsylvania.

Roland Risser is Director of Customer Energy Efficiency for Pacific Gas and Electric Company. In this role, he is responsible for developing the strategies that support PG&E's delivery of energy savings, and strategies to support a Zero Net Energy future. In addition, he is responsible for assessing and deploying new technologies and products into the Energy Efficiency Portfolio, managing a building and appliance codes and standards program, as well as PG&E's Pacific Energy Center, Energy Training Center, and Food Service Technology Center.

During his 30-year tenure at PG&E, Roland has also held several other positions including Director of Energy Efficiency and Low Income programs; Director, Tariffs and Compliance; Manager, Business Account Services and Corporate Sales; Manager, New Energy Markets; and Manager, Customer Systems Research and Development. In addition, while on executive loan from PG&E, Roland served as the Executive Director of the Washington D.C. based Electric Vehicle Association of the Americas.

Roland Risser is a member of the National Action Plan for Energy Efficiency Leadership Group, a board member and officer of the Consortium for Energy Efficiency, board member of the American Council for an Energy Efficient Economy, an advisor to the Institute of Electric Efficiency, and is the Chair of the US Technical Advisory Committee to the ISO for a new Energy Management standard (ISO 50001).

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