Chapter 3
Demand-Side Resources

Demand-side resources serve resource adequacy needs by reducing load, which reduces the need for additional generation. Typically, these resources result from one of two methods of reducing load: energy efficiency or demand response / load management. The energy efficiency method designs and deploys technologies and design practices that reduce energy use while delivering the same service (light, heat, etc.). Demand response / load management method encourages consumers to reduce their electricity consumption, particularly during times of high demand, and commonly involves reduced service during these times.

For more than two decades, many utilities have employed demand-side resource programs to help manage energy supply. Although currently these resources constitute a multi-billion dollar industry,[1] an increased focus on the development and use of demand-side resources is critical to meeting the nation's growing demand for electricity.

Furthermore, with concern about global warming now widespread and a growing consensus that greenhouse gas emissions need to be reduced dramatically, demand-side resources will be a key strategy for reducing greenhouse gas emissions from the electricity sector.

3.1 Trends, Drivers and Potential

To establish a foundation for our discussion and recommendations, it is useful to first discuss recent trends and current drivers relating to demand-side resources and remaining demand-side potential. In the sections below we discuss trends relating to investments, savings and policies, the role of environmental, economic and reliability drivers, and bring these threads together in a discussion of future demand-side potential.

Investment Growth

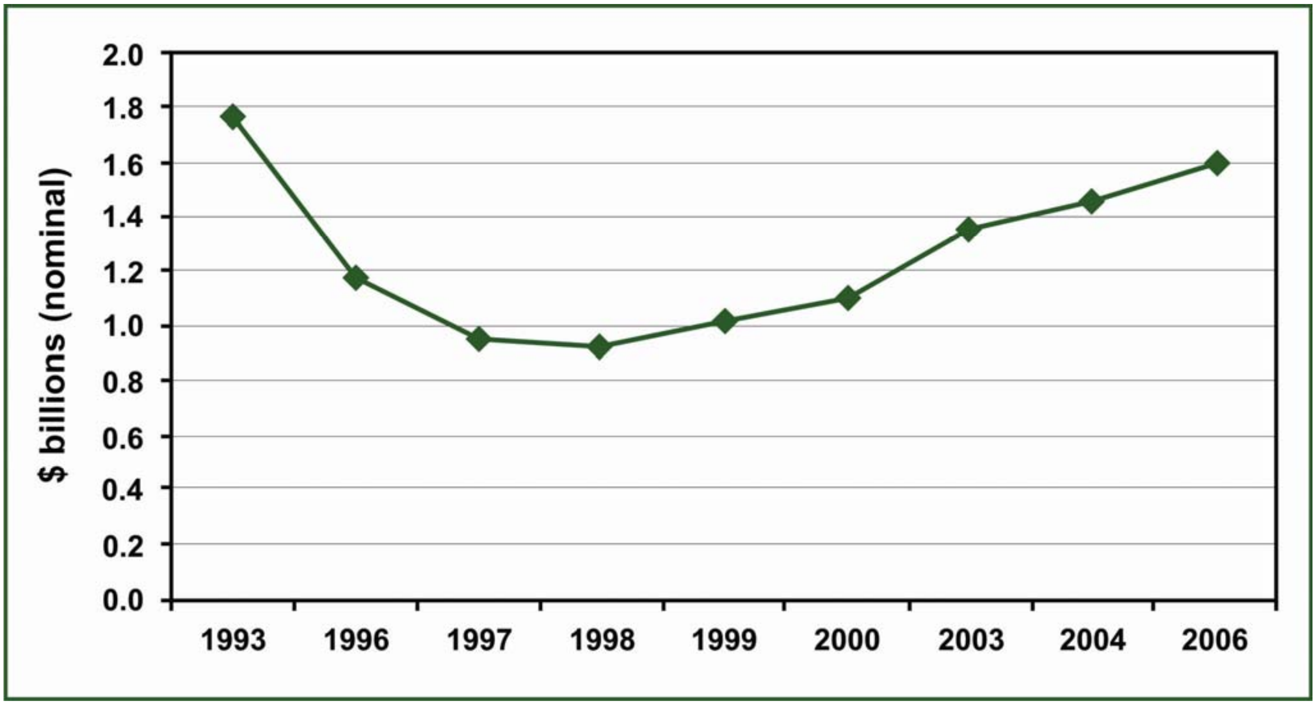
Interest in demand-side resource programs gradually grew in the 1980s and early 1990s, with a decline in the mid-1990s when many states and utilities cut back on their demand-side efforts to prepare for electric industry restructuring. Growth resumed in the late 1990s as many states decided not to restructure, and even those that did decided to create mechanisms to fund and provide such programs.[2] As a result, between 1989 and 1999, U.S. electric utilities spent $14.7 billion (an average $1.3 billion per year) on demand-side programs.[3]

[1]

[2] Most notably, "public benefits" programs, which in some cases are administered and implemented by non-utility organizations. See, Kushler, "Five-Years In" [need to flesh out rest of cite]

[3] David S. Loughran and Jonathan Kulick, "Demand-side Management and Energy Efficiency in the United States," *The Energy Journal* (January 2004).

Figure 3-1. Annual Utility Sector Spending on Energy Efficiency Programs, 1993-2006.



Source: ACEEE data.[7]

Since the turn of the century, investments in demand-side resources have steadily increased. In 2006, spending on electric energy efficiency programs (both utility and non-utility programs) totaled $1.6 billion (see Figure 3-1).[4] In 2007, the Consortium for Energy Efficiency estimated that spending on electric demand-side programs increased 14% relative to 2006.[5] Furthermore, in 2007 and 2008, many states directed their utilities to substantially expand demand-side programs;[6] a decision that should lead to budget growth in future years.

Increasing Savings But Wide Variations

As spending on demand-side programs has grown, so has energy savings. Cumulative annual savings from electric energy efficiency programs in 2006 was nearly 90 terawatt-hours (TWh) or 2.4% of total electricity sales to end-users in 2006.[8] Some states are currently achieving savings of 7–8% or more due to these programs, constituting a significant utility resource. These are savings in 2006 achieved as a result of programs operating over multiple years. Programs operated in 2006 alone reduced energy use by about 8 TWh, an average of 0.2% of 2006 retail electric sales, with program costs in 2006 representing about 0.5% of total utility revenues nationwide.

Collectively, electric energy efficiency and demand response / load management programs also have

[4] Eldridge and others, *State Energy Efficiency Scorecard.* ACEEE Report E086 (Washington, D.C.: American Council for an Energy-Efficient Economy, 2008). This number is lower than estimates for 2006 spending previously published by the Consortium for Energy Efficiency (CEE 2007) since CEE collected data on estimated spending and the ACEEE data was collected on actual spending. Such spending in some key states, particularly California, was significantly lower than budgeted (estimated).

[5] Consortium for Energy Efficiency, *U.S. Energy Efficiency Programs: A 2.6 Billion Industry;* and 2007, *Energy Efficiency Programs: A $3.1 Billion U.S. and Canadian Industry*, 2006. CEE's total estimates include natural gas, low-income, and load-management programs—three types of programs not included in ACEEE's national estimates (electric energy efficiency programs only).

[6] For example, legislation encouraging or mandating energy efficiency programs has been enacted in the past two years in Colorado, Connecticut, Delaware, Florida, Illinois, Maryland, Massachusetts, Michigan, Minnesota, New Jersey, New Mexico, North Carolina, Ohio, Oregon, Pennsylvania, Rhode Island, Texas and Washington. Michigan and Pennsylvania enacted new laws in October 2008. See ACEEE, "State Energy Efficiency Resource Standard Activity", Nov. 2008. http://aceee.org/energy/state/policies/State_EERS%20Summary_11-12-08.pdf

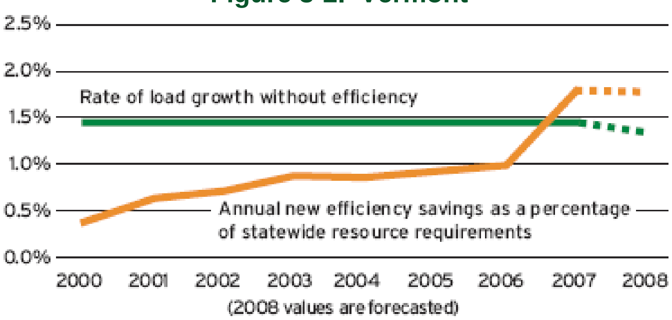
[7]

[8]

achieved significant levels of demand savings. The Energy Information Administration (EIA) estimates that in 2006, these programs together reduced peak demand in the United States by 27,240 megawatts (MW), of which 59% came from energy efficiency programs and 41% from demand response / load management programs.[9]

A growing number of states are recognizing the savings benefits of instituting demand-side resource programs. These tend to be states in which regulators have adopted schemes to make demand-side investments at least revenue-neutral, if not profitable, to utility shareholders.[10] For example, during 2000–2007, Vermont has reduced electricity sales by about 7%; in 2007, demand-side savings completely offset load growth (see Figure 3-2).[11] Also, in California, programs have operated for more than 20 years, leveling load per capita. California law requires energy efficiency and demand response / load management to be pursued before new supply resources can be built (see Figure 3-3). In Minnesota, programs have also been operating for close to two decades and are saving more than 0.5% per year annually.[12]

Figure 3-2. Vermont



Energy Savings v. Load Growth 2000-2008.

Source: Efficiency Vermont 2007 Highlights.[13]

In 2007, two states (California and Vermont) reduced electricity sales through their programs by about 1.75%. Another 13 states saved 0.5% or more in 2006 (Connecticut, Hawaii, Idaho, Iowa, Maine, Massachusetts, Minnesota, Nevada, New Hampshire, New York, Oregon, Rhode Island, and Washington). The average state however reduced sales only about 0.2% from 2006 programs. Much more needs to be done to raise the rest of the states up to at least the 0.5% savings per year level, and to get leading states to 1–1.5% per year or more.

Similarly, savings from demand response programs are also increasing but vary substantially between states and regions, with FERC estimating that the demand response resource in 2008 ranged from 1.7% of internal demand in ERCOT (Texas) and SPP (primarily Oklahoma and Nebraska) to more than 6% of demand in FRCC (Florida) and MRO (upper plains states). The resource is much larger in 2008 than 2007 in several key regions (see Figure 3-4).[14]

Increasing Policy Support

As more and more states adopt demand-side resource programs, policy support for these programs at the state level has also been on the rise. In addition to California's inclusion of demand-side resources as a key element in the state's climate plan, Minnesota enacted a new law in 2007 that directs electric and gas utilities to ramp-up demand-side savings to 1.5% per year. Seventeen other states have also adopted mandatory targets.[15] While these future goals are often ambitious and in many states have not yet been achieved on the ground, initial experience in states that have implemented such goals are that the goals are met.[16] In other states, these goals have encouraged these states to embark on major expansions of their programs.

Complementary Policies

At the federal level, there have also been a variety of policy efforts that have had a substantial influence on energy efficiency. For example, Congress has adopted appliance and efficiency standards on more than 40 products, ranging from incandescent light bulbs to refrigerators to industrial motors, which the U.S. Department of Energy (DOE) periodically revises.

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[9] Energy Information Administration, Office of Coal, Nuclear, Electric and Alternative Fuels, *Electric Power Annual 2006* (Washington, D.C.: Energy Information Administration, 2007): 5, table 9.1, http://www.eia.doe.gov/cneaf/electricity/epa/epa.pdf.
[10] Eldridge, et al., *State Energy Efficiency Scorecard.* ACEEE Report E086 (Washington, D.C.: American Council for an Energy-Efficient Economy, 2008).
[11] *Efficiency Vermont 2007 Highlights*, (Burlington, VT: Efficiency Vermont, 2008). http://www.efficiencyvermont.com/stella/filelib/2007%20Highlights%20Piece%20FINAL_09_08.pdf
[12] Eldridge, et al., *State Energy Efficiency Scorecard.* ACEEE Report E086 (Washington, D.C.: American Council for an Energy-Efficient Economy, 2008).
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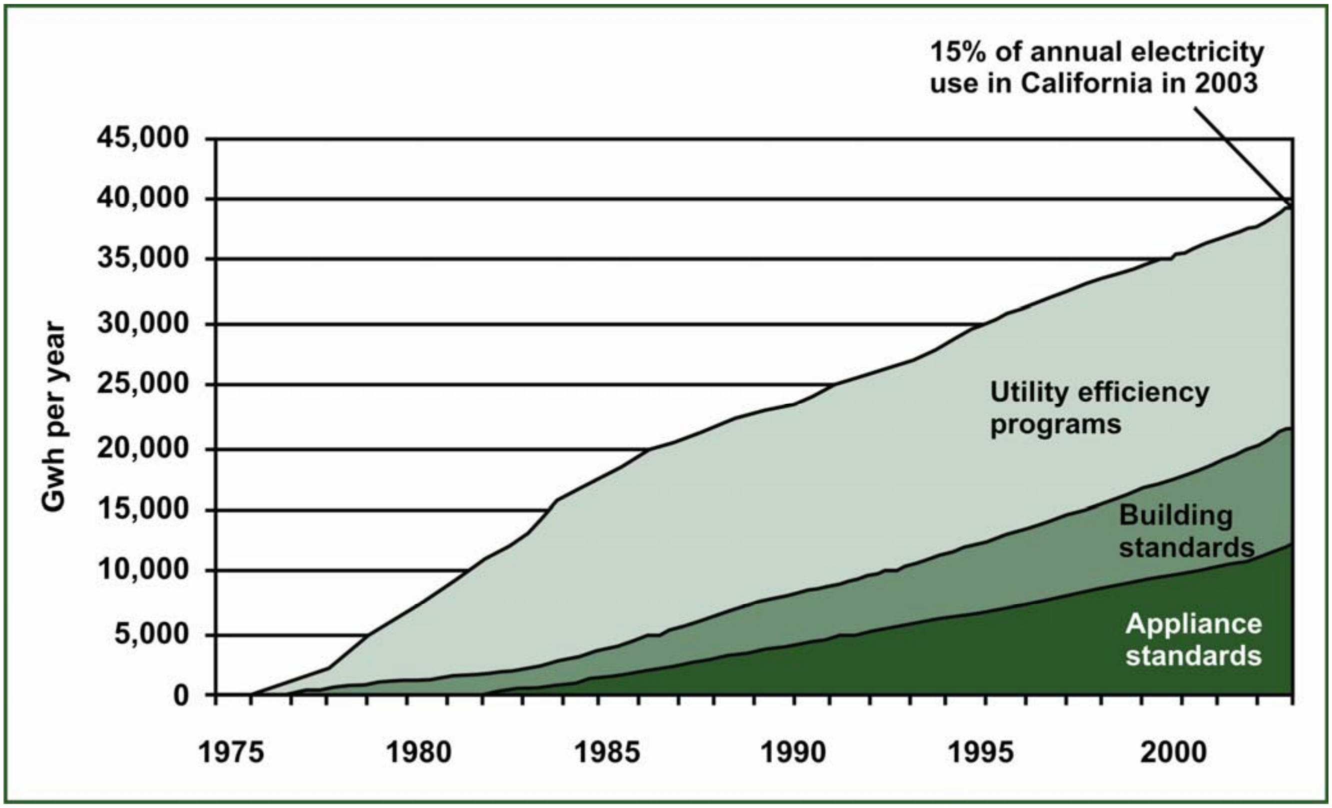
[14] FERC. 2008 Summer Market and Reliability Assessment.
[15] ACEEE 3-page summary
[16] ACEEE 6-page summary.

Figure 3-3. Electric Savings from California's Energy Efficiency Programs



Source: American Physics Association, September 2008.[18]

Collectively, standards adopted to date are reducing U.S. electricity use by about 10%.[17]

Likewise, states and municipalities have adopted energy codes for new and substantially remodeled buildings. DOE helps support development of national model codes that many states adopt and DOE also provides technical assistance and some grant funding for state code adoption and implementation efforts. An analysis prepared in 2004 for the National Commission on Energy Policy estimates that these codes reduced U.S. electricity use in 2000 by more than 30 billion kilowatt hours (kWh).[19] DOE also funds extensive research and development (R&D) on new energy efficiency and demand response / load management technologies. A 2001 report prepared by a National Academy of Sciences panel estimated that just a few of the most successful initiatives are saving about 1 quadrillion Btu per year, or about 1% of U.S. energy use.[20] Overall, these other initiatives have probably saved substantially more energy in the past than utility energy efficiency and demand response / load management programs,[21] although as utility programs ramp-up, they are likely to become the largest energy efficiency effort, as is the case in California (see Figure 3-3). Still, it is important to consider utility programs in the context of a broad array of energy efficiency policies and programs.

Driving Factors

There are a number of factors driving this growing investment in demand-side resources:

- **Environmental concerns**. These concerns include global climate change, emissions of

[17] American Council for an Energy Efficient Economy, stds savings. ACEEE analysis – Need citation information here.

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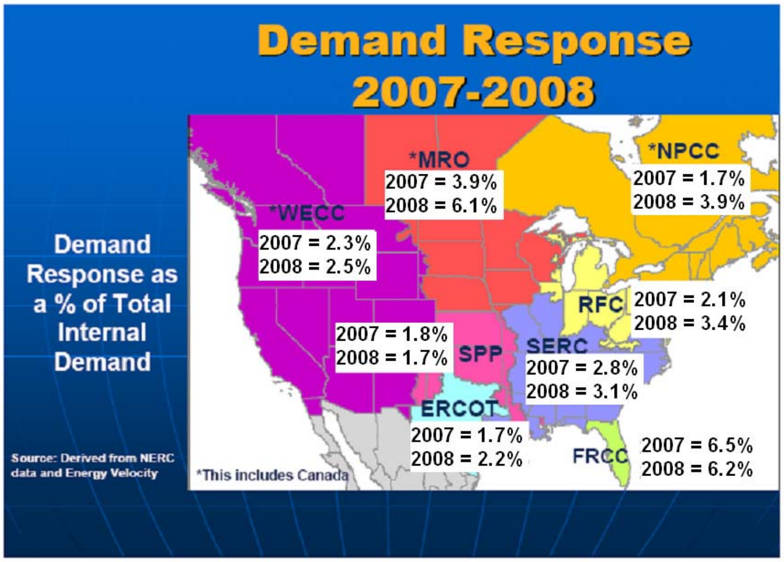
[19] Steven Nadel, "Supplementary Information on Energy Efficiency for the National Commission on Energy Policy," (Washington, D.C.: American Council for an Energy-Efficient Economy, 2004), http://www.bipartisanpolicy.org/files/news/finalReport/III.2.c%20-%20Supplemental%20Info%20on%20EE.pdf .

[20] National Research Council, 2001, *Energy Research at DOE: Was It Worth It? Energy Efficiency and Fossil Energy Research 1978 to 2000.* (Washington, D.C.: National Academy Press, 2001).

[21] Steven Nadel, "Supplementary Information on Energy Efficiency for the National Commission on Energy Policy," (Washington, D.C.: American Council for an Energy-Efficient Economy, 2004), http://www.bipartisanpolicy.org/files/news/finalReport/III.2.c%20-%20Supplemental%20Info%20on%20EE.pdf .

Figure 3-4. Demand Response / Load Management Resource in 2007-2008 as a Percent of Total Internal Demand.



Source: FERC, 2008 Summer Market and Reliability Assessment.[22]

currently regulated criteria pollutants, and energy-facility siting issues. With an increasing scientific consensus that the earth is warming, many states are using energy efficiency programs as a key strategy for reducing greenhouse gas emissions. Some states, such as Texas, are using these programs as a key part of efforts to reduce nitrogen oxide (NOx) emissions and to come into compliance with the Clean Air Act. Within states, opponents to specific power plants and transmission lines are also touting demand-side resource alternatives (e.g., Virginia and Vermont).

- **Economic factors**. A 2004 study examining the results of demand-side program evaluations in six states found that the average energy efficiency program cost approximately 3¢ per kWh saved over its lifetime (levelized cost).[23] By comparison, conventional electricity supplies are becoming more expensive, driven by rising construction and fuel costs. The EIA's 2008 *Annual Energy Outlook* notes that construction costs have risen by 50% or more in recent years, and projects that power from new power plants will cost more than 6¢ per kWh.[24] Other analysts are projecting higher costs. For example, Lazard Associates, in a presentation to the National Association of Regulatory Utility Commissioners (NARUC), found that new conventional baseload production sources generate electricity at a rate between 7.3¢ and 13.5¢ per kWh.[25] For peak electric supply, the comparison is also dramatic. When power demand peaks, many power pools are finding that marginal supplies can cost 40¢ per kWh or more, with spikes as high as $4 per kWh being reported.[26] By comparison, demand response / load management strategies can range in cost, depending on the program, from just a few cents to perhaps as much as 25¢ per kWh.[27] However, while many efficiency and demand response / load management programs are cost-effective, not all programs are. There is still some debate about the cost-effectiveness of specific programs (from the ratepayer perspective, see section 3.3; from the utility and shareholder perspective, see section 3.2).

- **Reliability concerns**. These concerns have been used to justify both demand-side and supply-side resources. The North American Electric Reliability Corporation (NERC) projects that new resources will be needed over the 2009–2011 period in California, New England, Texas, the Southwest, and the Rocky Mountain states, and over the 2012–2013 period in the Midwest (see Figure 3-5). Large power plants can take 8–10 years to build, so where resource needs are more imminent, either gas-fired power plants (which can be built as quickly as 3 years) or demand-side

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[23] M. Kushler, D. York, and P. Witte, *Five Years In: An Examination of the First Half-Decade of Public Benefits Energy Efficiency Policies*. ACEEE Report U042 (Washington, D.C.: American Council for an Energy-Efficient Economy, 2004). Levelized cost is the average annual cost of a measure, amortized over the measure life, divided by annual energy savings.

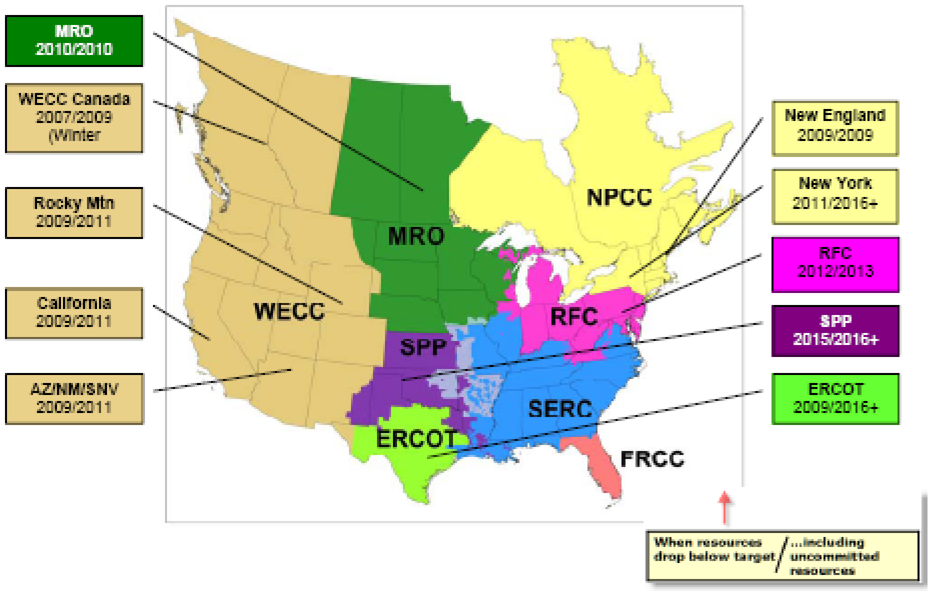
[24] Energy Information Administration, *Annual Energy Outlook* (Washington, DC: U.S. Energy Information Administration, 2008).

[25] Lazard, *Levelized Cost of Energy Analysis – Version 2.0*, June 2008, http://www.narucmeetings.org/Presentations/2008%20EMP%20Levelized%20Cost%20of%20Energy%20-%20Master%20June%202008%20(2).pdf

[26] R. Smith, "Deregulation Jolts Texas Electric Bills," *Wall Street Journal*. sec. A1, July 17, 2008.

[27] The high end of this range can apply to standby generation programs in which owners of standby generators are paid $0.20/kWh or more for taking load off the grid during critical peak periods and serving these loads with backup (standby) generators. Need citation for this information here.

Figure 3-5. Year When New Power Resources are Needed



Source: NERC, 2007 Long-Term Reliability Assessment

resources (which, in an emergency, can produce substantial savings in one year[28] or can enable savings to steadily compound over several years[29]) will be needed.

Future Potential

With environmental concerns, economic issues, and reliability concerns continuing to drive growth, a key question remains: what is the potential quantity of demand-side resources in the future? More than a dozen studies at the state or utility level have been conducted in recent years to attempt to answer this question. Table 3-1 summarizes the results of these studies.

Overall, these studies indicate that the median achievable efficiency potential[30] is 18% over an approximately 13-year period. Efficiency potential tends to vary strongly as a function of the number of years in the analysis; over long time periods, most existing equipment is replaced and opportunities for cost-effective savings are greater.[31] These studies also indicate that the average achievable potential per year of program implementation is about 1.5%, in line with today's most aggressive programs (about 1.7%) and much greater than the approximately 0.2% per year savings that are being achieved on average nationwide.[32] In other words, current efficiency programs are barely scratching the surface of what is potentially achievable. Additionally, average load growth in the U.S. is approximately 1.1%,[33] implying that in many areas, aggressive demand-side resource procurement could offset load growth. Vermont is already doing this and Connecticut is planning to do so shortly (see Figures 3-6 and 3-7).[34]

Some observers believe that estimating the market potential for energy efficiency is not a useful exercise because the estimates are often taken out of context and politicized.[35] They argue that the credibility of the estimates also suffers from the fact that past efforts were not subject to measurement and verification methodologies that had broad industry

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[28] For example, during the 2001 electricity crisis, California demand-side efforts reduced peak demand by 10% and electricity sales by 6.7% Kushler and Vine 2003 – Need citation for this information here.

[29] For example, Vermont has ramped up programs beginning in 2000, and by 2007, had reduced sales approximately 7% relative to what sales would have been without these programs. *Efficiency Vermont 2007 Highlights*, (Burlington, VT: Efficiency Vermont, 2008). http://www.efficiencyvermont.com/stella/filelib/2007%20Highlights%20Piece%20FINAL_09_08.pdf

[30] See the notes under Table 3-1 for a definition of this term.

[31] Many efficiency measures are cost-effective when equipment is replaced, since the cost of efficiency is only the increment between average-efficiency and high-efficiency equipment. Need citation for this information here.

[32]

[33] Energy Information Administration, *Electric Power Annual* (Energy Information Administration, 2007), table 7.2, http://www.eia.doe.gov/cneaf/electricity/epa/epat7p2.html. This is both the projected load growth from 2008-2030 (Energy Information Administration, *Annual Energy Outlook*, 2008) and the average growth rate over the 2000-2006 period.

[34] K. Galbraith, "Energy Efficiency the Green Mountain Way," *New York Times*. October 8, 2008; Connecticut Light & Power, United Illuminating Company, and the Brattle Group, *Integrated Resource Plan for Connecticut*, prepared for the Connecticut Energy Advisory Board. January 1, 2008, http://www.ctsavesenergy.org/files/IRP_CLP_UI1.pdf

[35] See Robert N. Stavins, Judson Jaffe, and Todd Schatzki, "Too Good to be True? An Examination of Three Economic Assessments of California Climate Change Policy" JFK School of Government, Harvard University, Regulatory Policy Program, RPP-2007-01, 2007.

Table 3-1. Meta-Analysis of Electricity Energy Efficiency Potential Study Results

Region of Study	Total Efficiency Potential over Study Time Period (%)			Study Time Period (years)	Average Annual Efficiency Potential (%)		
	Technical	Economic	Achievable		Technical	Economic	Achievable
U.S. (Interlaboratory Working Group 2000)	NA	NA	24%	20	NA	NA	1.2%
Mass. (RLW 2001)	NA	24%	NA	5	NA	4.8%	NA
California (Xenergy/EF 2002)	18%	13%	10%	10	1.8%	1.3%	1.0%
Southwest (SWEEP 2002)	NA	NA	33%	17	NA	NA	1.9%
New York (NYSERDA/OE 2003)	36%	27%	NA	20	1.8%	1.4%	NA
Oregon (Ecotope 2003)	31%	NA	NA	10	3.1%	NA	NA
Puget (2003)	35%	19%	11%	20	1.8%	1.0%	0.6%
Vermont (Optimal 2003)	NA	NA	31%	10	NA	NA	3.1%
Quebec (Optimal 2004)	NA	NA	32%	8	NA	NA	4.0%
New Jersey (Kema 2004)	23%	17%	11%	16	1.4%	1.1%	0.7%
Connecticut (GDS 2004)	24%	13%	NA	10	2.4%	1.3%	NA
New England (Optimal 2005)	NA	NA	23%	10	NA	NA	2.3%
Northwest (NW Council 2005)	25%	17%	13%	20	1.3%	0.9%	0.6%
Georgia (ICF 2005)	29%	20%	9%	10	2.9%	2.0%	0.9%
Wisconsin (ECW 2005)	NA	NA	4%	5	NA	NA	0.7%
California (Itron 2006)	21%	17%	8%	13	1.6%	1.3%	0.6%
North Carolina (GDS 2006)	33%	20%	14%	10	3.3%	2.0%	1.4%
Florida (ACEEE 2007)	NA	25%	20%	15	NA	1.7%	1.3%
Texas (ACEEE 2007)	NA	30%	18%	15	NA	2.0%	1.2%
Utah (SWEEP 2007)	NA	NA	26%	15	NA	NA	1.7%
Vermont (GDS 2007)	35%	22%	19%	10	3.5%	2.2%	1.9%
Average	NA	NA	NA	12.8	2.3%	1.8%	1.5%
Median	29%	20%	18%				

Source: Eldridge et al., 2008.[37]

Note: "Technical potential" are measures that are technically possible to implement without regard to cost effectiveness. "Economic potential" is a subset of technical potential and is limited to measures that are cost effective (although the definition of "cost effective" varies from study to study. "Achievable potential" is what can actually be achieved as a result of specific programs, policies, and implementation rates.

support, making any determination of "cost effectiveness" speculative and a poor basis for estimating future cost effectiveness potential. On the other hand, some observers believe these results are much too conservative.[36]

A similarly thorough analysis of potential savings from demand response / load management programs has not been compiled yet, but some estimates have been attempted. A Federal Energy Regulatory Commission (FERC) report to Congress in 2006 estimated a strong potential level for demand response / load management in most of the NERC reliability regions, although these estimates may be understated due to a lack of Independent System Operator (ISO) and Regional Transmission Organization (RTO) response to the FERC survey.[38] Analyses conducted by the American Council for an Energy-Efficient Economy (ACEEE) for Florida, Texas, Maryland, and Virginia estimate a potential peak demand savings of 7–22%, varying primarily as a function of load duration curve and avoided costs for critical-peak, peak, and near-peak hours.[39]

[36] See D. Goldstein, *Extreme Efficiency: How Far Can We Go If We Really Need To?* Proceedings of ACEEE Summer Study on Energy Efficiency in Buildings, (Washington, D.C.: American Council for an Energy-Efficient Economy, 2008).

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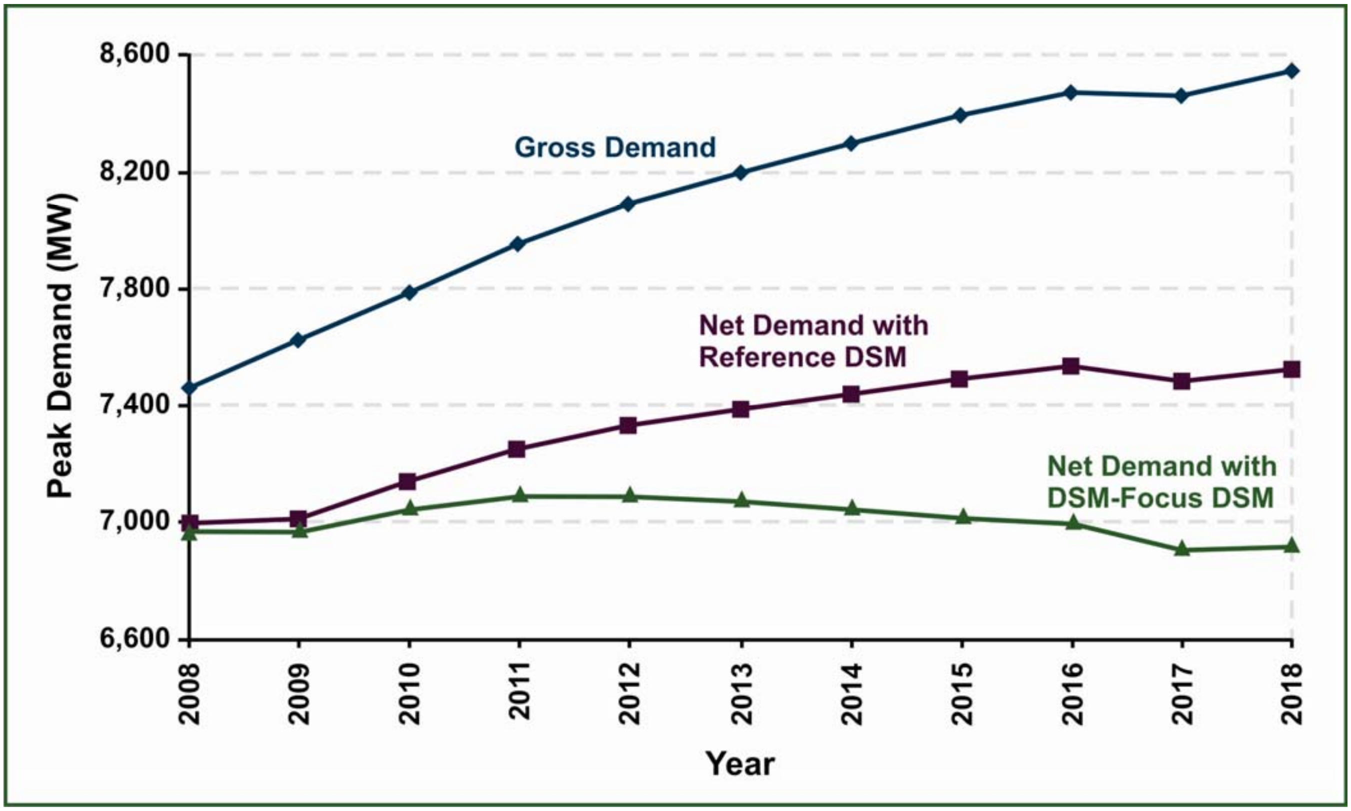
[38] Federal Energy Regulatory Commission, Assessment of Demand Response and Advanced Metering (Washington, D.C.: Federal Energy Regulatory Commission, August 2006), http://www.ferc.gov/legal/staff-reports/demand-response.pdf Graph is from page 85 of the FERC Report.

[39] R. Neal Elliot and others, *Potential for Energy Efficiency and Renewable Energy to Meet Florida's Growing Energy Demand*, ACEEE Report E072, (Washington, D.C.: American Council for an Energy-Efficient Economy, 2007); Neal Elliot and others,

Figure 3-6. Connecticut Peak Demand (MW) Forecast under Different DSM Scenarios



Source: Environment Northeast[41]

Preliminary results from a study by the Electric Power Research Institute (EPRI) and the Edison Electric Institute (EEI) estimate a "realistic achievable" peak demand savings of 5.8% in 2020 and 6.3% in 2030, and a "maximum achievable" peak demand savings of 7.6% in 2020 and 9.8% in 2030.[40]

Energy savings from demand response / load management are not very well determined. Findings thus far from pilot programs are that while energy use increases and decreases fluctuate somewhat, on average there is little effect on energy sales.[42]

The Electricity Advisory Committee (EAC) finds that the estimates it has gathered show that there are substantial, cost-effective savings available. In order to move forward, the Committee concludes that rather than spending time determining the exact size of the resource, that efforts to tap this resource should be increased, as long as such resource options remain cost effective. The experience gained in initial efforts to increase implementation of demand-side resources will provide additional information on the ultimate potential of these demand-side resources.

3.2 BARRIERS

As demonstrated in the past and projected for the future, demand-side resources have the potential to help manage the ever-increasing demand for electricity. Examining the barriers to achieving this

*Texas Potential for Energy Efficiency, Demand Response, and Onsite Renewable Energy to Meet Texas's Growing Electricity Needs***.** ACEEE Report E073, (Washington, D.C.: American Council for an Energy-Efficient Economy, 2007); Eldridge and others, *Maryland Energy Efficiency: The First Fuel for a Clean Energy Future*. ACEEE Report E082, (Washington, D.C.: American Council for an Energy-Efficient Economy, 2008); Eldridge, et al., *Energizing Virginia: Efficiency First*. ACEEE Report E085, (Washington, D.C.: American Council for an Energy-Efficient Economy, 2008).

[40] Rohmund and others, "Assessment of Achievable Potential for Energy Efficiency and Demand Response in the U.S. (2010-2030)," *Proceedings 2008 ACEEE Summer Study on Energy-Efficiency in Buildings* (Washington, D.C.: American Council for an Energy-Efficient Economy, 2008).

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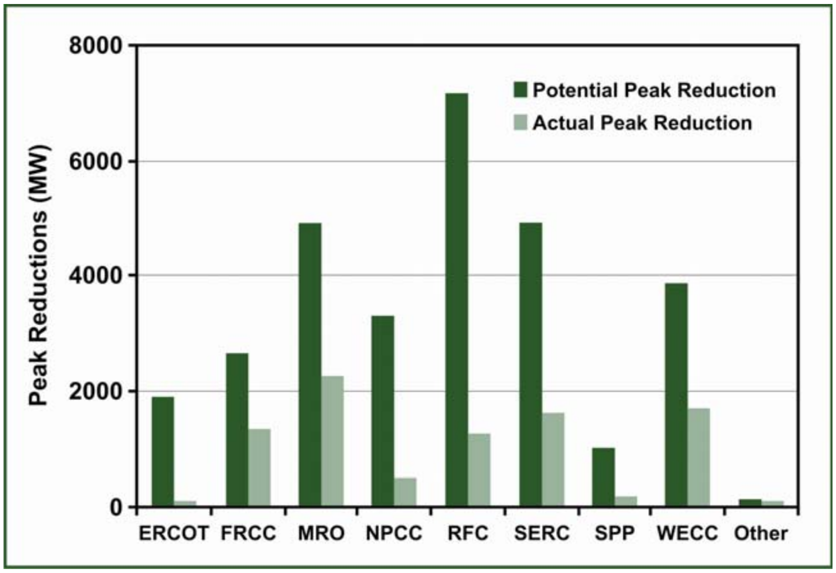
[42] Electric Power Research Institute, Need citation information for the forthcoming EPRI study if it is ready in time.

Figure 3-7. Demand Response Resource Potential Versus Actual Deployed Demand response Resources by Region



In addition, the lack of consensus program metrics also prevents the definition of energy efficiency program impacts in terms of discrete, measurable, time-based products (energy, capacity, and ancillary services) that can be understood and used by system operators and system planners, and which warrant recognition by NERC. This results in uneven efforts to integrate energy efficiency programs with resource planning and operations. These concerns increase as the proportion of load to be met by demand-side resources increases.

potential will help ensure that the industry is prepared to utilize demand-side resources fully.

Lack of Standardized Impact Metrics for Energy Efficiency Programs

There are currently no nationally recognized standard protocols for the impact evaluation of energy efficiency programs. Nor is there agreement on when and how to use specific measurement and verification (M&V) approaches. Additionally, the transparency of protocols that are currently in use varies from state to state, making it difficult to ascertain which protocols are reasonable and which are not.

Impact evaluation is necessary to determine credible estimates of net savings in both energy (kWh) and capacity (kW) and when those savings occur. Commonly accepted standards for baseline calculations, the estimation of net-to-gross ratios, the estimation of free-ridership and spillover effects, and persistence analysis, among others, are needed to better predict the supply of and utilize demand-side resources nationwide. Without greater attention and resources devoted to the measurement and verification of utility energy efficiency programs, it is difficult to quantify the resource value in terms of firm energy and capacity savings (kWh and kW) that allows the consideration of demand-side resources on comparable terms with generation resources. It also further complicates any attempt to identify the generation types whose outputs are reduced as well as measurement of any concomitant emissions.

Utilities May Have an Economic Disincentive to Undertake Demand-Side Investments

Traditional rate structures for utilities often reward increased energy throughput with increased profits, while increasing energy efficiency reduces throughput and utility revenue. Many utilities can lose money when efficiency programs expand, due to lost sales, particularly the base revenue portion of those sales.

In addition, all utilities earn a return on supply-side investments, but only a few earn a return or profits on demand-side expenditures or investments. These losses result from rate designs that are inconsistent with a utility business model that includes both supply-side and demand-side resources and also to differences and inconsistent treatment between demand-side and supply-side resources (see section 3.3 for further discussion). While some states have addressed these issues, most have not.

State and Federal Regulations

Another critical barrier is the potential conflict between state and federal regulation of price-responsive demand response / load management programs. Although FERC regulates wholesale markets and the ISOs that operate those markets, it has no jurisdiction over retail activities. Meanwhile, state public utility commissions have authority over sales and service to retail consumers but no direct control over wholesale markets. While typically state public utility commissions oversee utility implementation of demand response / load management programs, FERC may suggest the implementation of demand response / load management programs. These costs can only be recovered if approved by state public utility commissions who may have no or limited say in the demand response / load management program's implementation.

In a related vein, restructuring of the electric power industry into unique component parts across various state and ISO boundaries can make it difficult to develop an integrated, least-cost planning process to assess alternatives to supply options.

Interstate Program Differences

Increasingly, due to utility mergers, more utilities have service areas in more than one state. Each state has its own policies, often making planning and implementing common programs across state boundaries difficult. Differences between states also make it more difficult for program contractors, trade allies and businesses operating in multiple states to participate in programs.

While many demand-side programs have been very successful, some have not. In some states, there is a confusing array of programs, particularly where different utilities operate different programs in the same state. However, there is always room to improve programs, learning from best practice programs around the country.

Size of Demand-Side Resources Market

Demand-side resources are typically smaller, more diverse, and geographically dispersed compared to supply side assets. Understanding and organizing effective market-oriented approaches through these demand-side resources poses numerous challenges. A market typically favors larger, more knowledgeable participants, so the electric marketplace has been dominated by the electricity suppliers. This leaves residential consumers, commercial businesses, and even most large energy users on the fringes of this over $300 billion market. With a very large and diverse group of constituents, demand-side resources have difficulty establishing a unifying agenda and even in getting involved in the often obtuse infrastructure planning process.

Variable Program Interest

Interest in demand-side programs has ebbed and flowed over time, making it difficult to develop and sustain long-term efforts. Programs work best when they are treated as a long-term resource and this resource is gradually procured over time. When run as a series of short-term efforts, it is harder to retain staff and consumer interest. Recently, with programs in many states ramping up, there is also a shortage of skilled staff to plan, implement and evaluate programs.

Consumer Prices Do Not Always Reflect Market Prices

Ideally, electricity would follow a perfect market with a large number of knowledgeable suppliers and consumers interacting in an open and transparent process to determine electricity's price. However, electricity is a unique commodity—supply cannot readily be stored and the demand for electricity may dramatically vary hour by hour. Most residential, commercial or even industrial consumers do not face time-varying prices that reflect the underlying time-varying cost of supply. Since their electric rates are based on average annual costs or some other regulated pricing regime, they effectively underpay for consumption during peak periods and overpay for consumption during off-peak periods. End-users not paying their fair share could contribute to electricity's over-use and to under-investment in demand-side resources.

Market Predilection Toward Supply-Side Solutions

Historically, the electricity market has been financially and structurally biased toward supply-side resources (e.g., building generation or transmission facilities) to balance energy supply and demand needs, while demand-side resources (e.g., large-scale deployment of demand response / load management systems) are frequently overlooked. While use of demand-side resources has grown in recent years, this growth has often happened while fighting this bias. Socializing transmission costs and allocating payments and other incentives to encourage new generation are major contributors to this bias. While FERC has favored regional flexibility through its varied transmission cost allocation schemes for the different RTOs, these approved cost allocations mechanisms still finance the development of more supply-side resources.

The electric infrastructure has also traditionally been designed from a supply-side perspective to handle the peak period (usually per hour) usage patterns of its customers. Peak demand happens just a few times a year (typically less than 1% of the year), so the transmission, distribution and generation assets are operating below their design capacity for a significant portion of the year. Planning and building this generation and transmission infrastructure takes years, so inherently this process requires the addition of new electric generation and transmission in large increments. Interacting with a relatively small number of existing supply-side participants still seems easier and potentially more cost-effective to the electric power industry than creating new strategies to include these emerging demand-side resource

Consumers have also leaned toward the use of supply-side resources. Relatively low and stable energy costs have enabled end-users and others to use existing, inefficient end-use energy systems without significant price consequences. Until recently, there has been minimal economic incentive to upgrade these older systems to newer, more efficient systems. Even with the impact of higher energy prices, consumers may have the behavioral inclination to leave the existing systems in place or not upgrade to recommended newer, more appropriate systems. This inertia for change leads consumers into using existing products.

Program Costs

Financing energy efficiency programs is another barrier for demand-side resources. The large capital costs required to retrofit facilities or install more efficient equipment in new buildings are first-cost problems. Consumers have limited capital resources or are unable to obtain traditional financing for these energy efficiency improvements. There are also a limited number of financial institutions providing assistance for energy efficiency projects as evidenced by the lack of energy efficient mortgages being processed.

Companies operating in several states bemoan the often-cumbersome process of trying to implement nationwide programs through varying local, state and federal jurisdictions. The high transaction costs for delivering and installing many small efficiency improvements across numerous facilities may thwart corporate efforts. With their internal rate-of-return thresholds and focus on core businesses, companies tend to fund other projects rather than energy efficiency.

Investment Uncertainty

Many utilities and end-users have been reluctant to invest in demand-side resources due to investment uncertainty and the allocation of their benefits. The combination of large initial capital costs and uncertainty about how many years the upgraded facility or system will be used (the payback period) prevents energy efficiency and demand response systems from being installed by homeowners, property owners, and businesses. Furthermore, recent dramatic increases in utility industry capital costs, issues about siting these facilities, and uncertainties associated with carbon emissions and other issues creates an uncertain investment climate within the electric supply-side infrastructure. There now seems to be greater recognition by a growing consensus within the industry (that now includes, for example, NERC and FERC), that a combination of both supply- and demand-side resources will be essential simply for maintaining reliability.[43]

The problem of investment uncertainty is further compounded when the developer or owner of the facility is not the occupant or user of the installed equipment. Developers and owners lack a strong incentive to specify, purchase, or install energy-efficient equipment, since they are not responsible for operating expenses. This "split incentive" exists between builders and buyer as well as between property owners and tenants. Split incentives even hamper governmental and corporate decision making as different departments might be responsible for capital and operating budgets.

Lack of Understanding of Energy Efficiency Technologies

End users, contractors, builders, developers, and others buying, installing, or even recommending energy systems might not be sufficiently aware of or lack comprehensive information about energy efficiency technologies and costs. While technology constantly changes, there is a reluctance to try newer systems that have a limited performance record. Besides apprehension about installing a "newer and

[43] Recognizing these planning problems, FERC Order 890 even attempts to include demand-side approaches in transmission providers' planning processes. Need citation for this information here.

better" system, designers, builders, and end-users might not even realize that other newer alternatives exist. Even if there is an awareness that alternatives exist, they may not be readily available in that region because of local code issues or because the better replacement equipment is not readily stocked.

Advanced Metering

The lack of consensus on implementing an advanced metering system and measuring system also serves as a barrier to companies and state public utility commissions investigating the cost-effectiveness of installing these systems.[44] Advanced metering systems could readily be incorporated into a Smart Grid system (a sophisticated two-way communication process that manages and oversees the entire grid), but the feasibility of this method is still under debate.[45]

3.3 Key Considerations

In addition to overcoming the barriers above, there are a number of considerations that the electric power industry needs to explore in order to effectively develop and implement demand-side resources now and in the future. These considerations are explored below.

Integration of Demand-Side and Supply-Side Resources

Demand response / load management resources and energy efficiency strategies can be used as part of a concerted effort to meet portions of U.S. electric demand while also realizing other advantages, such as reducing greenhouse gas emissions and reducing electricity's carbon footprint. If the impacts of demand response / load management and energy efficiency programs are recognized as resources (in kW and kWh) comparable to traditional generation supply—and subject to appropriate impact evaluation protocols—then these programs should be treated on a non-discriminatory basis in a utility's resource plan. There are currently four general approaches which should all be considered as ways for regulated electric utilities to integrate resource planning (IRP):

1. Demand-side planning ("first fuel" approach): Adoption of targets such as "15-by-15" or "20-by-20," meaning 15 or 20% load reduction by 2015 or 2020, respectively. Such targets are generally set based on studies of the available cost-effective demand-side resource. This resource is factored into load forecasts. Demand-side programs should be evaluated, for actual savings achieved, and forecasts adjusted as needed. If demand growth is low, demand-side resources can fully offset load growth. If demand growth is higher, demand-side resources will reduce but not eliminate the need for new power supplies as well as replacement power sources when aging power plants are retired. The advantage of the demand-side planning approach is that it quickly leads to the development of demand-side resources, resources that have not received a lot of attention in many states. The disadvantage of this planning approach is that if targets are set without regard to the size of the cost-effective resource, or if programs are ineffective and not evaluated and improved, then suboptimal investment levels will result.

2. Regulation and Integrated Resource Planning: Demand-side and supply-side resources are simultaneously evaluated in the context of long-term planning and operational needs of the utility. Such evaluations have planning horizons of varying periods, but typically extend for 10-20 years. The advantage of this approach is that all resources can be evaluated on a common basis and the optimal amount of each resource selected. The disadvantage of this approach is that it can be time-consuming, particularly since IRP plans are often controversial, and many details are frequently adjudicated.

3. Market-based methods, such as competitive bidding: Utilities' short- and long-term planning and operational needs are acquired through competitive solicitations or auctions. This approach is becoming common in FERC-jurisdictional wholesale capacity markets and in the Electric Reliability Council of Texas (ERCOT). There is growing acceptance of demand-side resources in these markets, but when demand-side resources are bid into the market, the emphasis is on demand response / load management, and improvements to very large facilities. Reluctance to accept bids from energy efficiency programs results in part from historical emphasis of such programs to save energy (kWh)

[44] Need a citation about this lack of consensus. Can someone (the author of this section?) suggest one?

[45] For more information, see *Smart Grid: Enabling an Economically and Environmentally Sustainable Future*, Electricity Advisory Committee, December 2008.

and not capacity (kW). Hard-to-reach markets, such as small commercial and residential consumers (particularly multifamily housing and low-income households), are rarely bid in. The advantage of this approach is that all interested market players can participate, and prices are set by the market. The disadvantages are that cost-effective demand-side resources are frequently left on the table and costs can be high, as bidders are generally sophisticated enough to estimate the market clearing price, and come in with bids just below this value.[46]

4. Supply-side planning: Utilities plan their next generator based on long-term load forecasts that may or may not internalize demand-side effects. This type of plan may have to be done after "demand-side planning," or as a stand-alone process. The advantage of this process is that if cost-effective demand-side resources are first maximized, supply-side decisions are frequently less controversial. The disadvantage of this approach is that demand-side resources can be ignored in some cases.

These different approaches can be integrated. For example, Connecticut has a demand-side planning target set in law of 1% savings per year, but then conducts an IRP, and through this IRP has identified additional demand-side resources to procure. They also bid out a portion of their demand-side needs.

While members of the EAC do not agree on which demand-side resource options should be promoted, all members of the EAC agree that whatever demand-side resource method is implemented, it must be deployed and executed well, with demand-side resources fully considered, and investments selected (both demand- and supply-side) that minimize long-term costs to ratepayers. It should be noted that a key component to the use of demand-side resources is a well-defined and standardized evaluation M&V process (see Section 3.4).

Funding Demand-Side Resources

The cost of demand-side investments are generally recovered by utilities in rates. Historically, program costs are included as part of a rate case, ultimately leading to an approved set of costs that are allocated to all consumer classes through the normal rate case process. Alternatively, in the 1990s, it became common to pay for energy efficiency programs through a special per kWh "system benefit charge" or "public benefit fund" that is added to electric rates. Many of these riders are still in effect, although in recent years the historic rate case approach has again begun to dominate.

Despite the fact that demand-side resource programs have been implemented for three decades, there remains considerable debate on how the costs of energy efficiency and demand response / load management resources should be allocated and recovered. If generators sell capacity and energy under long-term contracts or purchased-power agreements at market-based rates, it is rarely the case that demand-side resources are eligible for the same form of compensation. Thus, demand response / load management and energy efficiency costs and the allocation and recovery of generation costs are typically inconsistently determined.

The electric power industry is entering a sustained period in which demand-side resources will become a natural part of the regulated utility's business model. How to expense or allow in rate-based funds committed to energy efficiency and demand response / load management programs needs to be resolved in the context of normal rate design and cost allocation procedures. Separate ratemaking treatment, such as with special riders (e.g. system-benefit charges) or single-issue proceedings, for the purpose of adjusting rates in isolation of other costs of doing business should generally be avoided.[47]

Historically, investments in supply-side resources were raised in capital markets and included in the rate base, allowing shareholders a reasonable opportunity to earn a recovery of and a rate of return on their investments at a level of profit commensurate to the investments' risk. Demand-side resource program costs are generally expensed and not included in the rate base. Thus, it is ratepayers who are providing the

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[46] Kushler, M.D. and P. Witte, *Can We Just "Rely on the Market" to Provide Energy Efficiency? An Examination of the Role of Private Market Actors in an Era of Electric Utility Restructuring.* ACEEE Report U01. (Washington, D.C.: American Council for an Energy-Efficient Economy, 2001).

[47] Almost all state public utility commissions provide a rate case process to evaluate and measure the appropriate overall cost of service where a balanced review of jurisdictional expenses, rate base investment, the cost of capital, and revenues at present rates are investigated at a common point in time (i.e., the test period). Need citation for this information.

"capital" for demand-side resources. On the other hand, under this approach, ratepayers do not have to pay a rate of return on these investments, and utilities do not earn such a rate of return.

Many utilities and regulators have come to recognize that utilities can make profits by building supply-side resources, but they do not generally earn a profit from demand-side resources. This is partly because returns are only earned on capitalized investments, and partly due to how utility kWh sales affect profits. One way many utilities earn profits is to increase sales beyond the level of sales assumed when rates were calculated. Rates are set to recover fixed and variable costs at the predicted sales level. However, if sales exceed the forecast, then the fixed cost portion of rates is added profit. On the other hand, if sales are less than forecast, then fixed costs are not fully recovered and profits decline.

To address the issue of return on investments, two approaches have been used and should be considered going forward:

1. Include demand-side investments in the rate base and allow utilities to earn a return on these investments. (This approach is used in Nevada, and Florida is likely to use this approach.)

2. Provide utilities with some small profit incentive for successfully reaching or exceeding demand-side goals. Such incentives could be in the form of specific payments for achieving specific goals (e.g., $x million to shareholders if kWh savings goals are met[48]); a set percentage incentive for achieving a specified percentage of the savings goal[49]; or sharing the savings from the difference between demand-side and supply-side costs[50] (e.g., California utilities now can earn 9% of the net benefits from demand-side programs once they approach their demand-side goals and 12% of net benefits if they exceed their goals[51]).[52]

To address the impact of sales on profits, there are several policy options to consider:

1. Decouple revenues from sales[53]
2. Allow recovery of "lost revenues" in retail rates
3. Redesign retail rates with a Straight-Fixed-Variable (SFV) rate design to remove fixed costs from tail blocks[54]
4. Do nothing because many electric utilities continue to experience positive growth in sales and consumer numbers regardless of the level of energy efficiency programs.

In general, the EAC supports financially remunerating utilities for undertaking demand-side initiatives and investments, proportionate with the risks. These returns need to be reasonable, with a substantial majority of demand-side benefits going to ratepayers.

3.4 RECOMMENDATIONS

The United States has a long tradition of relying on the market to drive results. Often, these results are based on sound economic principles that attract market participants who endeavor to capitalize on market opportunities. It is with this mindset that the EAC provides these specific recommendations to the U.S. Department of Energy for improving the use of demand-side resources:

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[48] This approach is now used Vermont. Kushler, York and Witte, 2006, *Aligning Utility Interests with Energy Efficiency Objectives: A Review of Recent Efforts at Decoupling and Performance Initiatives.* Washington, DC: American Council for an Energy-Efficient Economy.

[49] This approach is currently used in Massachusetts, Michigan, Nevada, Ohio, and Rhode Island. *Ibid.*

[50] This approach, in various forms, is used in California, Connecticut, Colorado, Georgia, Hawaii, Minnesota, New Hampshire, New Jersey, and Texas. *Ibid.*

[51] Public Utilities Commission of the State of California, "Interim Opinion: Energy Savings Goals for Program Year 2006 and Beyond,".Order Instituting Rulemaking to Examine the commission's Future Energy Efficiency Policies, Administration and Programs. Rulemaking 01-08-028. Decision 04-09-060. September 23, 2004.

[52] However, not all these approaches are risk adjusted and some stakeholders (e.g. ELCON) believe that utilities are potentially being lavished with financial incentives for expenditures that pose little risk to the utilities' shareholders. IRV -- Need citation for this information here or else we'll have to delete the point.

[53] See National Action Plan for Energy Efficiency, *Aligning Utility Incentives with Energy Efficiency Investment*, Prepared by Val R. Jensen, ICF International, November 2007, http://epa.gov/eeactionplan. For an alternative point of view, see Electricity Consumers Resource Council, "Revenue Decoupling: A Policy Brief of the Electricity Consumers Resource Council" (Washington, D.C.: Electricity Consumers Resource Council, January 2007).

[54] See David Boonin, "A Rate Design to Encourage Energy Efficiency and Reduce Revenue Requirements" (National Regulatory Research Institute, July 2008).

1. Develop national measurement and verification protocols/standards that will better measure the savings that are being achieved.

DOE should advocate the development of measurable and verifiable (M&V) metrics for estimating reliable resource values (kW and kWh) of mass-market energy efficiency programs, if the intent of such programs is to defer or avoid new utility infrastructure or obtain net reductions in GHG emissions. These protocols and standards will enable savings to be more reliably counted upon as a substitute for or to defer the need for new power plant construction, while maintaining reliability. They will also help to better ensure that demand-side investments are cost-effective.

In fulfilling this objective, DOE should advocate the development of national consensus M&V protocols, standards, and business practices, with input from a broad range of interested parties. Such an effort should build upon existing protocols and standards developed by individual states, the Northwest Power and Conservation Council, and emerging efforts by the North American Energy Standards Board (NAESB), Northeast Energy Efficiency Partnerships (NEEP), and the National Action Plan for Energy Efficiency (NAPEE). DOE should also provide federal technical assistance to States to participate in this effort. Additionally, DOE should encourage NERC to continue its efforts to refine the reporting of demand-side resources in NERC's reliability assessment activities.

2. Place priority on expanding existing DOE programs that capture energy efficiency savings (updating Federal Appliance/ Equipment Standards and national model building codes) and that help develop new energy-saving technologies that can be used in future decades (research and development initiatives).

DOE has "missed all 34 congressional deadlines for setting energy efficiency standards for the 20 product categories with statutory deadlines that have passed," according to a General Accounting Office (GAO) Report from January 2007.[55] The report further states that, "Lawrence Berkeley National Laboratory estimates that delays in setting standards for the four consumer product categories that consume the most energy—refrigerators and freezers, central air conditioners and heat pumps, water heaters, and clothes washers—will cost at least $28 billion in forgone energy savings by 2030."[56] The new DOE Secretary should give top priority to this internal DOE effort.

In addition, national model building codes, developed by the International Code Council (ICC) and the American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE) are now undergoing revision. ASHRAE is targeting a 30% reduction in energy use relative to the 2004 standard. The ICC recently updated its residential energy standard to reduce energy use by an average of about 13%, and narrowly defeated a proposal to increase the energy savings to 30%.[57] This "30% solution" proposal is likely to be proposed again in 2009. DOE should actively support these efforts to reduce energy use in new buildings by at least 30%, including providing technical and analytic support for these efforts and testifying/commenting on behalf of cost-effective approaches that achieve these savings levels. In the longer term, DOE should provide similar support for making new buildings 50% more efficient than current codes, in line with the efficiency levels for new buildings now being promoted by federal tax incentives included in the Energy Policy Act of 2005.

DOE also has a major R&D program to develop new energy saving technologies and practices. In Fiscal Year 2008, energy efficiency expenditures totaled approximately $700 million.[58] Many independent panels have recommended that resources devoted to energy efficiency R&D be substantially expanded, including the President's Committee of Advisors on Science and Technology (PCAST), the National Commission on Energy Policy, and the American Physical Society, in order to help reduce energy use, costs, and emissions in the long-term and to keep the

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55 GAO, January 2007, ENERGYEFFICIENCY, Long-standing Problems with DOE's Program for Setting Efficiency Standards Continue to Result in Forgone Energy Savings. www.gao.gov/new.items/d0742.pdf

56 *Ibid*.

57 Need citation for Forthcoming ICF analysis here – report being released 12/8/08.

58 [This number comes from Alliance to Save Energy but may well substitute a DOE number and cite.]

United States at the cutting edge of new technology development.[59] As programs are expanded, EAC recommends that these efforts include increased joint R&D with utilities and states, demonstration projects, Golden Carrot programs, and other technology procurement efforts.

3. Promote at the federal and state levels policies that can encourage expanded cost-effective energy efficiency and demand response / load management efforts.

DOE should promote policies at both the federal and state level that encourage expanded cost-effective energy efficiency and demand response/ load management efforts. Specifically, the EAC recommends that DOE support:

- Development of utility business models and rate-setting approaches that encourage and reward cost-effective energy efficiency and demand response / load management investments while providing a substantial majority of benefits to ratepayers
- Expansion of federal technical assistance to states and utilities
- Allowing demand resources to participate in ISO forward capacity markets
- Expansion of regional coordination on demand resources so utilities, states, other program administrators, businesses, and trade allies can more easily work across state/utility territory lines in the same region.
- Enactment of binding energy-savings targets for utilities and/or state agencies that are based on sound analysis of cost-effective opportunities relative to other resource options and that fairly treat each consumer class

[59] The President's Committee of Advisors on Science and Technology, *Federal Energy Research and Development Challenges of the Twenty-First Century* (Energy Research and Development Panel, 1997): 3-26; The National Commission on Energy Policy, *Ending the Energy Stalemate: A Bipartisan Strategy to Meet America's Energy Challenges* (Washington, D.C.: National Commission on Energy Policy, 2004): 30.; American Physical Society *Energy Future: Think Efficiency* (American Physical Society, September 2008): Sec. 1:9, http://www.aps.org/energyefficiencyreport/report/aps-energyreport.pdf.

State public utility commissions regulate utility operations and have tried different approaches to encourage more demand-side resource deployment. State public utility commissions have approved approaches that decouple utility profits from utility sales, created incentives that reward energy efficiency, and allowed utilities to recoup lost sales through a lost revenue adjustment clause. Despite these efforts, in many states utility profits can suffer if energy efficiency is promoted; therefore, these states do not maximize the potential contributions that distributed resources could contribute to the electric power delivery infrastructure.

The EAC recommends that state public utility commissions seriously examine these issues and introduce regulatory reforms so that utility profits do not suffer when they make cost-effective investments in energy efficiency and demand response / load management. DOE can assist in these efforts by providing a coordinated strategy and guidance to help state public utility commissions and utilities analyze information and develop/execute strategies that will positively contribute to the overall cost-effective utilization of distributed resources. DOE may be able to capitalize on the use of its national labs and other resources to conduct analyses that will help determine the economic implications of regulatory options to address these issues.

Further, DOE can advocate before FERC, the appropriate state public utility commissions, and other local regulatory bodies in favor of utility business models and ratemaking procedures that are resource neutral. DOE should advocate ratemaking procedures that allocate costs of demand-side and supply-side resources on a comparable basis, such that investments in either form of resource afford the utility a reasonable opportunity to earn a return on the investment, provided that the resource mix is least-cost to ratepayers. Ultimately, decisions will remain at the state level but DOE can provide (perhaps by working with other associations such as NARUC, NRRI, and EEI) significant guidance and resources to evaluate potential regulatory reforms.

Expand federal technical assistance to states and utilities

In the 1990s, DOE had a substantial IRP program that worked with NARUC and other organizations to conduct research and provide technical assistance on demand-side resource issues. This effort has since shrunk to a small proportion of its prior size. DOE and EPA also initiated the National Action Plan for Energy Efficiency (NAPEE) to foster the collaborative efforts of key energy market stakeholders, including utilities, regulators, energy consumers, and partnership organizations, to establish and further a national commitment to cost-effective energy efficiency and demand response / load management. The results of this commitment were meant to generate investment in energy efficiency and demand response / load management through sound and economically viable business cases, identification and implementation of best practices, and education of various audiences. Today the NAPEE program provides assistance to state regulators in the form of focused education helping states meet their desired energy and capacity needs cleanly and efficiently. However, relative to the need for information and technical assistance, both the DOE and NAPEE efforts are small and should be expanded.

EAC recommends a major focus on working with NARUC, in which DOE provides technical assistance to states, and coordinates technical assistance efforts by others, such as the work currently underway at EPRI and EEI's Energy Efficiency Institute. Such an effort can also compile and provide to U.S. organizations information on best practice programs and policies elsewhere in the world.

As part of this effort, DOE should assist states with development of state long-term energy efficiency strategic plans that provide a comprehensive roadmap for state efforts, including mandatory codes and standards, utility or third party programs, and private market efforts, focusing on all end use sectors, workforce training, marketing & education, etc. Such a roadmap has proven very useful in California and would likely be useful in many other states.[60]

Allowing demand resources to participate in ISO forward capacity markets

DOE should also advocate before the Federal Energy Regulatory Commission (FERC) and the appropriate regional transmission organizations (RTOs) and state public utility commissions that any retail consumer (including aggregators of retail consumer loads) should have access to demand response / load management and forward capacity markets at either the retail or wholesale levels. Such consumers should receive appropriate payment for reducing or curtailing their loads (kW capacity) for specific time periods, subject to adequate evaluation of actual load reductions. This includes energy efficiency and demand response / load management programs and actions. Some members of the EAC prefer such access at the retail level and subject to state regulation, while other EAC members prefer access at the ISO and RTO level, subject to federal regulation.

Encourage and assist with regional coordination on demand resources so utilities, states, other program administrators, businesses, and trade allies can more easily work across state/utility territory lines in the same region

The electric power delivery infrastructure of the future seeks to maximize its utilization, increase reliability, minimize unproductive investment and minimize its adverse impact on the environment. Demand- side resources can successfully contribute to these goals. However, in order to do so it is necessary to establish and execute a coordinated demand resource strategy. This strategy must focus on optimizing the installation and utilization of these types of equipment. The desire to have a fully integrated electric grid that maximizes the use of its components necessitates potential demand-side resource solutions that offer independence from the jurisdictional borders established by state/utility/municipal boundaries. Accordingly, coordination (and the acceptance of a coordinated resource strategy) among these bounded entities needs to be facilitated to ensure that demand-side resource opportunities are maximized. These efforts can be integrated with the increased technical assistance called for in the preceding recommendation. A possible model for these efforts is the work of the Northwest Power and Conservation Council, which facilitates common approaches to demand-side issues in the northwest.

Enact binding energy- savings targets for utilities and/or state agencies that are based on sound analysis of cost-effective opportunities relative to other resource options and that fairly treat each consumer class

As discussed earlier in this Chapter, 18 states have now established energy efficiency resource

[60] California Public Utilities Commission, *California Energy Efficiency Strategic Plan* (California Public Utilities Commission, September 2008). http://www.californiaenergyefficiency.com/docs/EEStrategicPlan.pdf.

standards—binding energy-saving and/or peak reduction targets that utilities (or state agencies[61]) must meet. Such targets typically start at low levels initially and gradually ramp-up, allowing programs to start small and expand over time. Advocates of these targets argue, based on implementation experience to date, that these targets spur a substantial increase in energy efficiency investments and are the best ways to meet targets at minimal costs. Energy-savings targets should be based on recent studies of and experience with achievable cost-effective savings. Such programs can also be structured to allow consumers to meet targets on their own, without participating in utility programs (e.g., provisions in Ohio and Michigan[62]). Many EAC members believe that DOE should encourage additional states to develop targets based on these principles and should also assist and support efforts by Congress to adopt appropriate targets at the national level. Other EAC members believe that DOE should research this issue further before taking a position, and that DOE should assist states to conduct such research.

4. Research, develop and support promising new energy efficiency policies.

There are many additional promising policies to increase energy efficiency and better manage loads. Three such promising policies are:

- On-bill financing for energy-saving retrofits
- Energy performance ratings and labels for existing buildings
- Use of energy use feedback devices to provide real-time information on energy use and costs to consumers, helping them to better manage their use.

On-bill financing allows consumers to easily finance energy-saving improvements, and pay for them on their energy bills. Properly structured (balancing loan amount, term and interest rate), it will generally be possible for consumers to realize immediate bill savings, with the value of energy savings exceeding the monthly loan payment.[63]

Building ratings and labels inform prospective building purchasers and renters about the energy use of a building they may purchase or lease, helping to create a demand for and value for efficient buildings. U.S. EPA presently rates and labels many types of existing commercial buildings through the Energy Star program, but not all building types are covered and a similar program would be useful for existing residences, including multi-family buildings.[64]

Energy use feedback devices provide information to consumers on their current energy use and how it compares to their own use in earlier periods and to similar homes and buildings in their community. As a result of this feedback, short-term energy use reductions of 5-20% have been documented, making these devices very promising.[65] Approaches range from in-home displays to internet-based systems. However, little research has been conducted on changes in energy use over the long-term and is sorely needed.[66] DOE should support such research.

DOE should research each of these opportunities, develop best practice approaches, and support adoption of these approaches by utilities, states, municipalities, and end-users. In some cases, DOE should coordinate with other agencies, such as with EPA on building energy performance ratings and labels.

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[61] Of the states that have enacted such targets, Illinois, Maryland, and New York assign a minority role on implementation to state agencies. Need citation for this information here.

[62]

[63] Need a good cite.

[64] Need a good cite.

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[66] Need a good cite.