A Nationwide Assessment of Utility Sector Energy Efficiency Spending, Savings, and Integration with Utility System Resource Acquisition

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ABSTRACT

Ratepayer-funded electric energy efficiency programs have entered an era of renewed focus and importance after a decade of relative neglect in the wake of electric industry restructuring. This paper presents nationwide data on electric energy efficiency programs over the period 1993–2004.[1] The trend is clear. States and regions are increasing their investment and support for energy efficiency. There is a renewed focus on including energy efficiency as a resource within utility system planning and resource acquisition in selected states and regions—particularly California; the Pacific Northwest; and certain states in the Northeast, West, and Midwest. The trends we observe and report in this paper will accelerate in these areas based on increased commitments to energy efficiency program funding for the near-term future.

Trends in Nationwide Spending and Savings

The electric utility industry in the United States has undergone major changes over the past decade. A wave of restructuring activity swept over the nation beginning in the mid-1990s, with many states choosing to partially deregulate and restructure their electric utility industries to introduce competition at both the retail and wholesale levels. One result of such restructuring was a precipitous decrease in funding for ratepayer-funded electric energy efficiency programs[2]—from almost $1.8 billion in 1993 to about $900 million in 1998 (nominal dollars). Principal reasons for this decline included uncertainty about newly restructured markets and the expected loss of cost recovery mechanisms for energy efficiency and demand-side management (DSM) programs. Generally utilities and many regulators did not see most DSM programs as being compatible with competitive retail markets. The thinking was that pricing and other market mechanisms would guide customer decisions about energy efficiency, not regulatory-driven DSM programs.

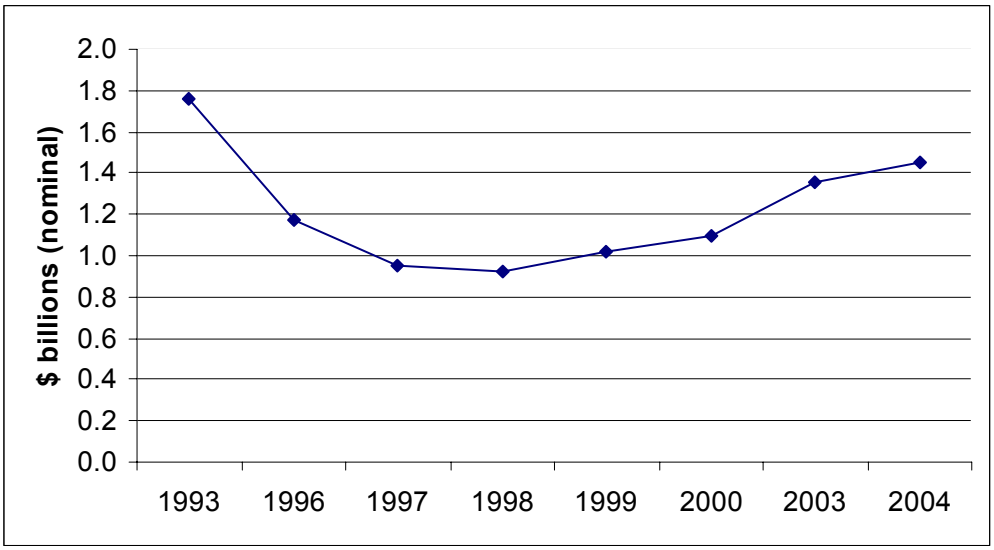
Earlier published data on state-level electric energy efficiency spending and savings document a steep decline through the end of the ‘90s (Nadel, Kubo, and Geller 2000). However, more recent data (York and Kushler 2002, 2005) show a modest rebound from the low point reached in 1998—an increase to about $1.1 billion in 2000 and up to about $1.3 billion in 2003. Data that we have compiled for 2004 show this continued upward trend—to a nation-wide total of about $1.4 billion. And there are numerous signs from some of the leading states in terms of their funding of energy efficiency programs that the upward trend will continue for 2005 and

[1] Complete data were only available through 2004 as there generally is a 1–2 year lag for key sources to compile and report program year data. Also this paper only addresses electric energy efficiency programs; utility/public benefits natural gas energy efficiency programs are not included.

[2] By “ratepayer-funded energy efficiency” programs, we mean energy efficiency programs funded through charges included in customer rates or otherwise paid via some type of charge on customer bills. This includes both demand-side management programs and “public benefits” programs. We do not include data on separately funded low-income programs, load management programs, or energy efficiency research and development.

beyond. Preliminary estimates of authorized budgets for a set of 26 leading states yield a total of more than $1.5 billion (ACEEE 2006). An important observation, however, is that nationwide spending still is not back to what it was in 1993, a likely peak level of that era since that was just prior to the on-set of deregulation initiatives in many states, such as California. Also, the data reported here and in related publications are nominal data—if we adjusted spending for inflation, the rebound and upward trend we observe would be less pronounced. Figure 1 tracks total ratepayer-funded electric energy efficiency spending from 1993 to 2004; it illustrates this decline and continued rebound. A final note is that these data do not include private investment in energy efficiency—either in conjunction with utility or public benefits programs or independent of such programs. Private investment clearly is important and likely to be significant in magnitude. However, we know of no data sources that compile and report such private investments.

Figure 1. Total Ratepayer-Funded Electric Energy Efficiency Program Spending from 1993 through 2004



Key factors responsible for this rebound and upward trend include:

- Many states renewed and reaffirmed their commitments to ratepayer-funded energy efficiency programs—both in states that had restructured their utilities and in states that have not.
- Other values and attributes of energy efficiency are helping spur additional support for energy efficiency programs. The 2000–2001 electricity "crisis" that occurred in California and other western states spurred many states to bolster their energy efficiency investments as a means to help address system reliability. In the Northwest, for example, Bonneville Power Administration is examining "non-wires solutions" to transmission constraints and related problems. Energy efficiency and load management are key elements in such solutions. States and regions—notably California and a set of Northeastern states—are also taking actions to reach environmental objectives, such as reducing greenhouse gases. Energy efficiency is seen as a key policy tool to help achieve such objectives.

- Some of the largest increases in state-level spending have come from states that have implemented "public benefits programs." Around the year 2000, many of these programs, such as in Vermont, Oregon, Wisconsin, and New Hampshire, were ramping up after their initial creation. By 2003 and 2004, most of these programs had reached full funding levels. However, some of these states also experienced state government budget deficits, which led to some "raiding" of these funds in the early 2000s. Such raids appear to be over (for now) and the funds in these states are mostly back on track to reach authorized levels.
- States that have utility demand-side management under regulated structures have continued to support these programs at about historical funding levels, with some notable increases in states that see energy efficiency as a key, low-cost strategic resource, such as Iowa, Nevada, Utah, and Washington.
- Some leading states and regions—those with long, successful records of significant levels of energy savings achieved through energy efficiency programs—are in the early stages of greatly increased levels of investments in energy efficiency—notably California, the Pacific Northwest, and New York.
- Despite many of these positive developments relating to support for ratepayer-funded energy efficiency programs, utilities in roughly half of the states provide little or no funding for such programs. These states generally have no regulations or policies in place that require utilities or other organizations to provide energy efficiency programs.

While spending on energy efficiency programs is a key indicator for utility and state commitments to energy efficiency, ultimately the most important measure of such programs is the impact they achieve—that is, the energy savings that result from program activities. Like program spending, energy savings show a similar increase over this period. Total cumulative annual energy savings from ratepayer-funded electric energy efficiency programs through 2004 were over 74 TWh (i.e., annual savings achieved in 2004 as a result of programs operated in 2004 *and* earlier years; this is *not* lifetime savings attributable to the programs). These savings are equivalent to the annual electricity consumption of a medium-sized state such as Maryland, Missouri, Louisiana, or Washington, or the equivalent annual output of about 18 average-sized coal-fired power plants.[3] We caution that savings data are likely less accurate than spending data due to a variety of factors, including:

- Inconsistencies in collection and reporting of data to state and national authorities (such as the Energy Information Administration);
- Variations in the quality and quantity of evaluation data available on program impacts;
- Unavailability of data in some cases; and
- Variations in conventions and interpretations of data parameters on program impacts.

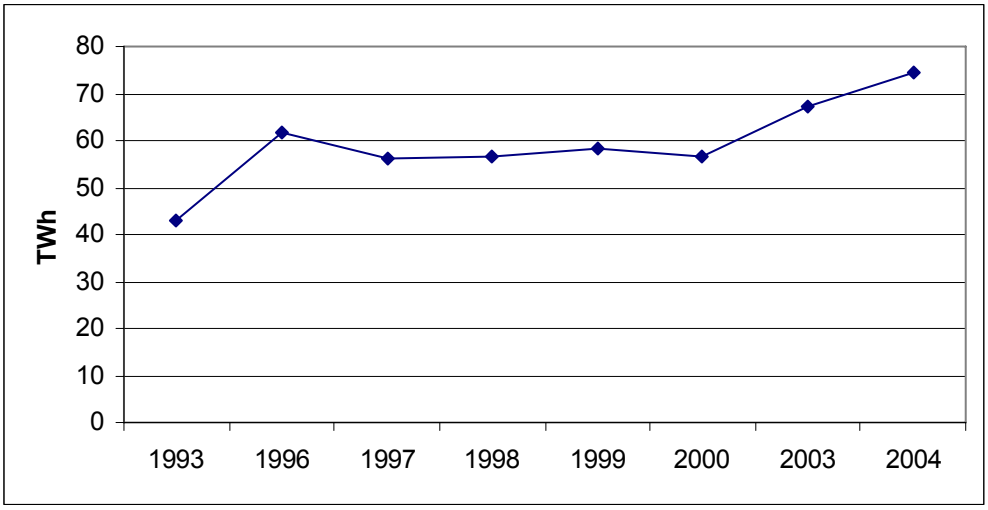
However, the overall upward trend in savings is consistent with reported spending.

Figure 2 shows total savings from 1993–2004. While the savings data exhibit an overall upward trend, there is not the precipitous drop as shown in Figure 1 with the spending data. The reason is that these are *cumulative* annual savings, not *incremental* (reporting year only—or "first-year") savings. The savings achieved in a given program year will continue for some time

[3] Assumes an average size of 600 MW with an annual generation of about 4 TWh.

into the future even if the program is discontinued. Thus, as spending and associated program activity declined from 1993–1998, the savings achieved by programs during—and even prior to—1993 continued to be realized with some degree of overall "decay" as certain energy efficiency measures implemented by programs cease to provide savings for any number of reasons. This impact, combined with continued achievement of new savings from ongoing programs, effectively "dampens" and even flattens the total savings curve shown in Figure 2 compared to the spending curve shown in Figure 1.

Figure 2. Cumulative Annual Electric Energy Efficiency Program Savings from 1993 to 2004



State Spending and Savings Data on Energy Efficiency Programs

Table 1 shows individual state data on energy efficiency program spending and savings. A primary source of data is the Energy Information Administration (EIA 2005), which collects and reports utility data annually. However, given the advent and rise of non-utility energy efficiency programs (primarily "public benefits" programs), we also collected data from individual state programs as necessary. These data are for electric energy efficiency programs and include data from investor-owned utilities, municipal utilities, cooperative utilities, other public power companies or authorities, non-utility public benefits programs, and utility public benefits programs. The data do not include low-income energy efficiency program spending and savings, which are generally tracked and reported separately.

Table 1. 2004 Energy Efficiency Program Spending and Savings

	Total Spending			Cumulative Savings	
	$1000	Per capita	% revenues	GWh	% sales
Alabama	438	$0.10	0.0%	382	0.4%
Alaska	103	$0.16	0.0%	3	0.1%
Arizona	4,000	$0.70	0.1%	106	0.2%
Arkansas	231	$0.08	0.0%	32	0.1%
California	380,009	$10.60	1.3%	19,590	7.8%
Colorado	13,715	$2.98	0.4%	687	1.5%
Connecticut	58,098	$16.60	1.8%	2,651	8.3%
Delaware	NA	NA	NA	0	0.0%
District of Columbia	2,200	$3.97	0.3%	251	2.3%
Florida	72,014	$4.14	0.4%	5,951	2.7%
Georgia	1,356	$0.15	0.0%	291	0.2%
Hawaii	9,190	$7.28	0.5%	85	0.8%
Idaho	7,023	$5.03	0.6%	813	3.7%
Illinois	3,000	$0.24	0.0%	130	0.1%
Indiana	2,062	$0.33	0.0%	812	0.8%
Iowa	28,833	$9.76	1.1%	1,310	3.2%
Kansas	0	$0.00	0.0%	0	0.0%
Kentucky	4,146	$1.00	0.1%	161	0.2%
Louisiana	324	$0.07	0.0%	25	0.0%
Maine	13,118	$9.98	1.1%	33	0.3%
Maryland	50	$0.01	0.0%	2,221	3.3%
Massachusetts	133,326	$20.81	2.2%	3,514	6.3%
Michigan	8,000	$0.79	0.1%	1	0.0%
Minnesota	55,784	$10.95	1.4%	4,791	7.6%
Mississippi	497	$0.17	0.0%	83	0.2%
Missouri	928	$0.16	0.0%	22	0.0%
Montana	8,002	$8.63	1.0%	560	4.3%
Nebraska	4,348	$2.49	0.3%	56	0.2%
Nevada	8,473	$3.63	0.3%	75	0.2%
New Hampshire	15,120	$11.64	1.2%	340	3.1%
New Jersey	92,753	$10.68	1.2%	3,234	4.2%
New Mexico	2,000	$1.05	0.1%	26	0.1%
New York	147,193	$7.63	0.8%	4,772	3.4%
North Carolina	3,722	$0.44	0.0%	12	0.0%
North Dakota	465	$0.73	0.1%	0	0.0%
Ohio	16,195	$1.41	0.2%	394	0.3%
Oklahoma	316	$0.09	0.0%	91	0.2%
Oregon	62,888	$17.51	2.2%	2,940	6.4%
Pennsylvania	3,446	$0.28	0.0%	16	0.0%
Rhode Island	13,990	$12.95	1.6%	492	6.2%
South Carolina	4,920	$1.17	0.1%	107	0.1%
South Dakota	542	$0.70	0.1%	0	0.0%
Tennessee	10,937	$1.86	0.2%	441	0.4%
Texas	80,000	$3.56	0.3%	6,229	1.9%
Utah	16,450	$6.80	1.2%	762	3.1%
Vermont	14,000	$22.54	2.2%	400	7.1%
Virginia	0	$0.00	0.0%	166	0.2%
Washington	88,522	$14.26	1.9%	5,974	7.5%
West Virginia	992	$0.55	0.1%	23	0.1%
Wisconsin	53,734	$9.76	1.1%	3,233	4.8%
Wyoming	0	$0.00	0.0%	0	0.0%
USA TOTAL	1,447,453	$4.93	0.5%	74,286	2.1%

Spending per Capita

Nationally the average electric energy efficiency spending per capita in 2004 was $4.93. The range was zero to $22.54 per capita. A total of 10 states spent more than $10 per capita on ratepayer-funded energy efficiency programs; a total of 17 states spent $5 or more per capita. The top twenty states (in terms of their spending per capita) account for 88% of nationwide spending on energy efficiency programs. The top ten states account for 63% of total national spending; adding the next five (the top 15) brings this up to 80%. These top states also represent a relative large share of population, which improves this picture in terms of spending relative to population. The top ten states comprise 25% of total U.S. population; the top 20 comprise 43%. Table 2 presents the top ten states in terms of their spending per capita in 2004.

Table 2. 2004 Electric Energy Efficiency Spending Per Capita: Top 10

Rank	State	Spending/Capita
1	Vermont	$22.54
2	Massachusetts	$20.81
3	Oregon	$17.51
4	Connecticut	$16.60
5	Washington	$14.28
6	Rhode Island	$12.95
7	New Hampshire	$11.64
8	Minnesota	$10.95
9	New Jersey	$10.68
10	California	$10.60
	U.S. Average	$4.93

Spending as a Percentage of Utility Revenues

Another indicator of energy efficiency program activity and funding commitment is program spending as a percentage of utility revenues from sales to end-use customers. Nationally in 2004 the average was 0.5%. Eighteen states are above this national average. The range is from zero to 2.2%. The range for the top ten states is 1.2 to 2.2%. Table 3 presents the top ten states in terms of their spending as a percentage of utility revenues in 2004.

Table 3. 2004 Electric Energy Efficiency Spending as a Percentage of Utility Revenues: Top Ten

Rank	State	Spending as a Percentage of Annual Total Revenues
1	Vermont	2.2%
2	Oregon	2.2%
3	Massachusetts	2.2%
4	Washington	1.9%
5	Connecticut	1.8%
6	Rhode Island	1.6%
7	Minnesota	1.4%
8	California	1.3%
9	New Hampshire	1.2%
10	Utah	1.2%
	U.S. Average	0.5%

Savings as a Percentage of Retail Energy Sales

Cumulative annual energy savings as a percentage of retail energy sales provide an indicator of the contribution of energy efficiency to overall system energy resource requirements. Nationwide energy efficiency programs are saving about 2% of the total system energy resource requirements. The range is from zero to 2.3%. The range for the top ten states is 4.3% to 8.3% Table 4 gives the top ten states by this indicator.

Table 4. 2004 Cumulative Annual Energy Savings as a Percentage of Annual Utility Energy Sales: Top Ten

Rank	State	Cumulative Annual Savings As a Percentage of Annual Energy Sales
1	Connecticut	8.3%
2	California	7.8%
3	Minnesota	7.6%
4	Washington	7.5%
5	Vermont	7.1%
6	Oregon	6.4%
7	Massachusetts	6.3%
8	Rhode Island	6.2%
9	Wisconsin	4.8%
10	Montana	4.3%
	U.S. Average	2.1%

Energy Efficiency As a Resource

Over two decades of experience with energy efficiency programs demonstrate that energy efficiency savings ("negawatts") are real—these savings can be measured and relied upon to

deliver savings as projected and needed. The contribution of such resource savings has been significant in many states and regions, yielding both economic and environmental benefits.

The success of energy efficiency programs in delivering energy savings and related benefits as they were designed to do is leading some states and regions to "raise the bar" in terms of the role of energy efficiency in resource planning and acquisition. The Northwest offers a prime example. The Northwest Power and Conservation Council estimated that energy efficiency programs and related investments since such efforts were begun in 1978 in the region have yielded a cumulative impact of about 3,000 average megawatts[4] of energy savings in 2004. According to its latest long-range, integrated resource plan, the region plans to meet all demand growth through the year 2012 through energy efficiency (NPCC 2005). The near-term target for additional energy efficiency savings is 700 average megawatts by 2009. NPCC developed this latest plan (the region's 5th since 1980) through a rigorous and comprehensive analysis of multiple resource options via over 400 different scenarios. Energy efficiency emerged as the clear preference as the priority resource under all scenarios because it reduces system costs and risk. Energy efficiency's attributes include (Eckman 2005):

- Low-cost: average 2.4 cents/kWh total resource cost;
- It's a hedge against all electricity market price spikes;
- It has value even when market prices are low;
- It's not subject to fuel price risks or carbon control risks; and
- It's significant enough in size to delay "build" decisions on new generation.

California similarly has a long, successful record of successful utility energy efficiency programs. The legacy and value of such programs was clearly put to a critical test during California's 2000–2001 energy crisis. Energy efficiency and conservation literally "kept the lights on" during the crisis—providing an estimated 5,000 MW demand reduction when needed—and annual energy savings of about 6%. Such savings saved California from massive economic damage that the economy would have incurred had the state been forced to endure massive rolling outages. The lesson is clear: energy efficiency and other demand-side measures are tangible resources that can provide savings readily and reliably.

California's history with significant levels of investment in energy efficiency programs might suggest that its energy efficiency resource is largely depleted—analogous perhaps to an oil well running dry. In fact, Californians were among the most energy-efficient customers in the nation at the onset of its electricity crisis. Upon careful examination of the resource potential, however, the California Public Utilities Commission concluded strongly that there remained a large, cost-effective energy efficiency resource potential. State policy, as adopted through the CPUC "Energy Action Plan" (CPUC 2005), places energy efficiency as the first resource in utility loading order—meaning that the first dollars spent by California's utilities are to be on cost-effective energy efficiency. This policy in turn is translating to unprecedented levels of investment in new energy efficiency resource in California. Over the next three years, 2006–2008, California plans to invest a total of $2 billion in energy efficiency through programs offered by utilities and other organizations. To gain a perspective on this level of investment, in 2004 California's investor-owned utilities spent $380 million on their energy efficiency

[4] "Average megawatt" is a unit of energy used as a convention in the Northwest region—largely because of the hydropower dominance for power generation. An average megawatt is equal to the energy produced by one megawatt over one entire year (8,760 hours), or 8,760 megawatt-hours.

programs. Under the CPUC's approved plan, these utilities will spend about $800 million in 2008—just over double of what many might already view as an aggressive level of investment in energy efficiency (Kennedy 2005).

State and regional policymakers also are looking to energy efficiency to play an increasing role in meeting future energy needs. The Western Governors Association has adopted a "Clean and Diversified Energy Initiative" that seeks to increase the efficiency of energy use in member states by 20 percent by 2020 (WGA 2005). Already there have been notable increases in funding (or planned funding) and support for energy efficiency in selected western states, including Nevada, Utah, Arizona, New Mexico, and Colorado.

Like California and the Northwest, the Northeast also has a long, successful record with ratepayer-funded energy efficiency programs. Individual states within the Northeast show great diversity in their specific approaches and structures for the administration and implementation of energy efficiency programs. As many of these states look to the future, their common experience with successful energy efficiency programs is shaping how they plan to meet their future energy needs. There is a growing and increased emphasis on using energy efficiency to meet specific, quantified energy and demand savings goals. An examination of the energy efficiency resource potential in the Northeast shows that cost-effective energy efficiency could not only meet the entire projected demand growth (estimated to be 1.2%) in the region, but could also actually reduce energy demand in the region to 1993 levels by the year 2013—effectively reducing energy demand by 1.38% per year (Coakley 2005). This is the achievable energy conservation potential at costs of $0.031/kWh and lower, which compares very favorably to the cost of new supply resources, estimated to be $0.094/kWh. Below are examples of how selected states in this region are using energy efficiency as a strategic resource.

- The Connecticut Legislature passed the "Energy Independence Act" in 2005 that sets specific, quantifiable conservation and load management targets—including a portfolio standard calling for 1% of demand to be met from energy efficiency (including combined heat and power systems) by 2007, and 4% by 2010.
- New Jersey is establishing specific energy and demand savings goals for its statewide public benefits program; the proposed energy efficiency target is 1,814 GWh for the period 2005–2008.
- The Vermont Legislature in its 2005 "Omnibus Energy Act" removed the spending cap ($17.5 million/year) on its "energy efficiency utility" (Efficiency Vermont) and required annual reviews of unrealized energy efficiency potential. The Act allows budget adjustments in order to realize "all reasonably available, cost-effective energy efficiency savings."
- The State of New York estimated that between 1990 and 2001, the state's major energy efficiency programs saved 57,256 GWh of electricity and reduced summer peak demand by nearly 1,700 MW (NYSERDA 2002). New York just recently renewed its public benefits program for another five years and increased funding levels by a total of $25 million per year.

Energy efficiency's broader environmental and economic benefits are leading to new efforts to secure higher levels of energy savings through cost-effective energy efficiency. For example, nine Northeast and Mid-Atlantic states have come together as the "Regional Greenhouse Gas Initiative" (RGGI), a collaborative that seeks to reduce regional emissions of

greenhouse gases via a "cap-and-trade" rule for carbon emissions. Under proposed rules, 25% of the allocation of carbon credits would be for energy efficiency measures (RGGI 2006). In the Midwest, eight states have formed the "Midwest Natural Gas Initiative," to try to achieve a 1% reduction in each state's natural gas use per year for the next several years. By doing so, these states hope not only to realize the immediate benefits of energy efficiency to individual customers, but collectively they hope to affect regional markets for natural gas sufficiently to help moderate prices—yielding additional benefits from such cost reductions (MEEA 2006).

Challenges for Energy Efficiency As a Resource

With the movement towards greater reliance on energy efficiency as a resource come a variety of challenges. One of these is the fragmented, more decentralized nature of today's energy markets and supply systems. Questions on the structure and delivery of programs seem mostly resolved at this time. Numerous models have emerged—from "traditional" utility-based demand-side management overseen by public utilities commissions to public benefits programs provided by non-utility organizations. A challenge that has arisen from the creation of new market and program structures is that in some cases, non-utility providers are tasked with energy efficiency while other types of companies and organizations (utilities, competitive generation companies, and others) are responsible for energy planning and decision-making regarding new energy system investments. In order to conduct long-range, integrated resource planning, including energy efficiency as a resource option, there consequently is a need to "re-integrate" certain functions in order to get a complete and accurate picture of present and future energy demand and system resources.

Another challenge for increasing reliance on energy efficiency as a resource is the need for such investments to be viewed as a resource that requires consistent, adequate funding and infrastructure. States that "raided" their public benefits funds to help cover overall state budget deficits in the early 2000s essentially "pulled the plug" on many planned programs and services. This can greatly erode future customer confidence and credibility, as well as simply under-invest in cost-effective resources. It should be seen as the equivalent of legislatures trying to "raid" investment funds for new power plant construction—something that obviously can't and wouldn't be done by state governments. Yet the different perceptions of energy efficiency and the way programs were funded in certain cases led to such outcomes.

Conclusions

Energy efficiency programs supported by ratepayers—whether provided by utilities or non-utilities—continue to show modest growth in spending and savings impacts from the late '90s. There is a noticeable return to "integrated resource planning"—if not in name, in concept. System planners are looking at energy efficiency and related demand-side measures as vital, cost-effective resources capable of helping address present and future energy needs.

Key observations from our analysis of national spending and savings impacts are:

- Total funding nationwide for ratepayer-funded electric energy efficiency programs—both utility DSM and public benefits programs (either non-utility or utility-based)—has continued its modest rebound since reaching its apparent low points in the late 1990s.

- This upward trend is likely to continue as states such as California have increased their commitment to supporting energy efficiency programs as part of long-term energy resource plans. Other states and regions across the country (including New York, Nevada, Utah, and the Pacific Northwest) are looking to increasing energy efficiency as part of their energy, economic, and environmental strategies
- Ratepayer-funded energy efficiency programs have entered an era of renewed focus and importance after a decade of relative neglect in the wake of electric industry restructuring. This renewal has been driven by a combination of factors, including dramatic increases in fossil fuel prices including significant concerns with natural gas prices and availability; growing concern over electric system capacity; and the emerging recognition of financial risks associated with future environmental costs. Another key driver has been the recognition of the reliability benefits of energy efficiency, demonstrated most clearly in California during its 2000–2001 energy crisis.
- The energy utility industry is once again looking upon energy efficiency as a viable and proven energy resource in terms of meeting customer demand and providing long-term cost-effective resource solutions for system planning and operation.

Energy efficiency programs have gone through a series of adjustments as a result of significant changes occurring within the electric utility industry. The industry upheavals have subsided and sufficient time has elapsed for many of the newly created structures for administering and implementing energy efficiency programs to have reached full operation and attained a certain level of maturity in the marketplace. At the same time, a number of states have simply maintained and even expanded utility DSM under a "traditional" regulated structure.

The economic, environmental, and system benefits possible through increased energy efficiency are not being achieved in all states, however. One consistent finding from research and tracking of state data is that ratepayer-funded energy efficiency spending is heavily concentrated in a relatively small proportion of states. The top twenty states in terms of their spending per capita account for almost 90% of nationwide spending on energy efficiency programs. Success in these leading states with energy efficiency programs provides ample evidence that there remain great opportunities yet untapped to use energy efficiency as a least-cost, viable, and strategic energy resource.

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