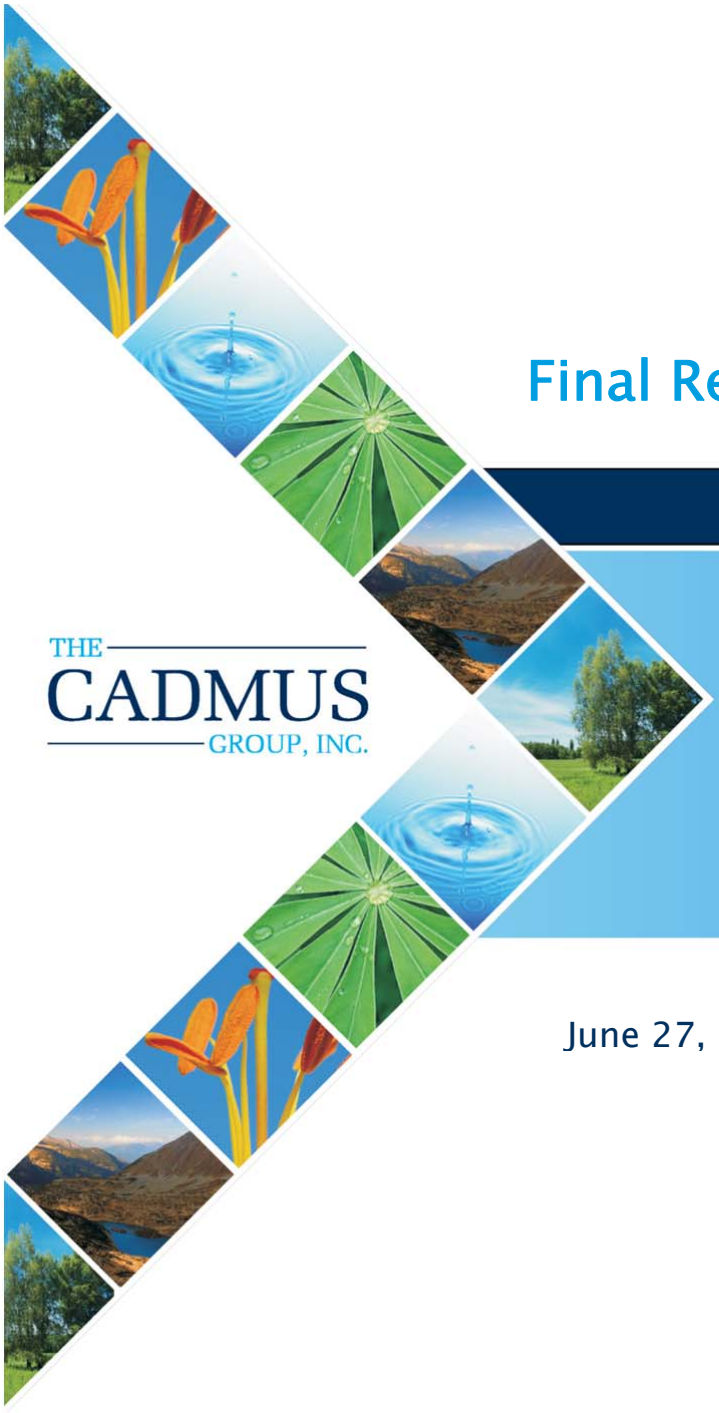
Integrated Resource Plan

Appendix 4D

DSM Jurisdiction Review Comparison of DSM Achievements



Final Report

DSM Jurisdiction Review – Comparison of DSM Achievements

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Prepared by:

The Cadmus Group Inc. / Energy Services
720 SW Washington Street, Suite 400
Portland, OR 97205

503.228.2992

Prepared for:

BC Hydro

Corporate Headquarters:
57 Water Street
Watertown, MA 02472
Tel: 617.673.7000
Fax: 617.673.7001

An Employee-Owned Company
www.cadmusgroup.com

720 SW Washington St.
Suite 400
Portland, OR 97205
Tel: 503.228.2992
Fax: 503.228.3696

Table of Contents

Executive Summary

To support its current and future demand-side management (DSM) program planning, British Columbia Hydro (BC Hydro) engaged The Cadmus Group Inc. (Cadmus) to review DSM efforts in other jurisdictions across Canada and the United States. This study was designed to answer the following questions:

1. What DSM savings targets are being established by leading North American jurisdictions?
2. What level of savings have leading utilities achieved over the past several years?
3. How do achieved savings compare to these utilities' planned savings?

The results of this study will be used to inform BC Hydro's current and planned DSM activities. This section of the report provides a summary of the results of each task, with more detailed results in the following sections of this report.

DSM Savings Targets

Many jurisdictions across North America have established short- and/or long-term savings goals for utilities. Some of these mandates require utilities to submit planned savings for approval whereas some specify the required savings in absolute or percentage terms. Within the subset of states with specified levels of savings through at least 2015, targets vary greatly (Table 1). Cumulative required savings in 2015 range from five percent to 15 percent. The average across these states is a nine percent reduction in 2015 sales, or an average of 1.5 percent annually.

DSM Achievements

To help BC Hydro put its DSM accomplishments in context, Cadmus compiled a list of 26 of the leading utilities and third-party implementers across North America. Each organization's DSM savings were converted to a percent of retail sales to allow for comparison across organizations of varying sizes.

The analysis showed that in 2009, energy savings for these organizations ranged from 0.15 percent to 2.89 percent of retail sales, with an average achievement of 1.11 percent. These savings also corresponded to an average savings of 0.88 percent of peak demand. Where possible, Cadmus supplemented these data with achievements from 2005 through 2008 for these same organizations. This analysis showed that over the five-year period from 2005 to 2009, average savings was lower than 2009 alone, at 0.85 percent of retail sales.

DSM Achievements Compared to Planned Savings

Before implementing DSM programs, many utilities file plans with regulatory bodies detailing expected program costs and savings. Cadmus found information on 2009 goals for 18 of the 26 organizations mentioned above, allowing for a comparison of achievements relative to plans. The data indicate that in 2009, most of these organizations met or exceeded their goals, with an average achievement of 117 percent of planned energy savings. For the nine organizations where peak capacity savings could be compared to goals, the average achievement was 155 percent of the goal.

1. Jurisdictional DSM Savings Targets

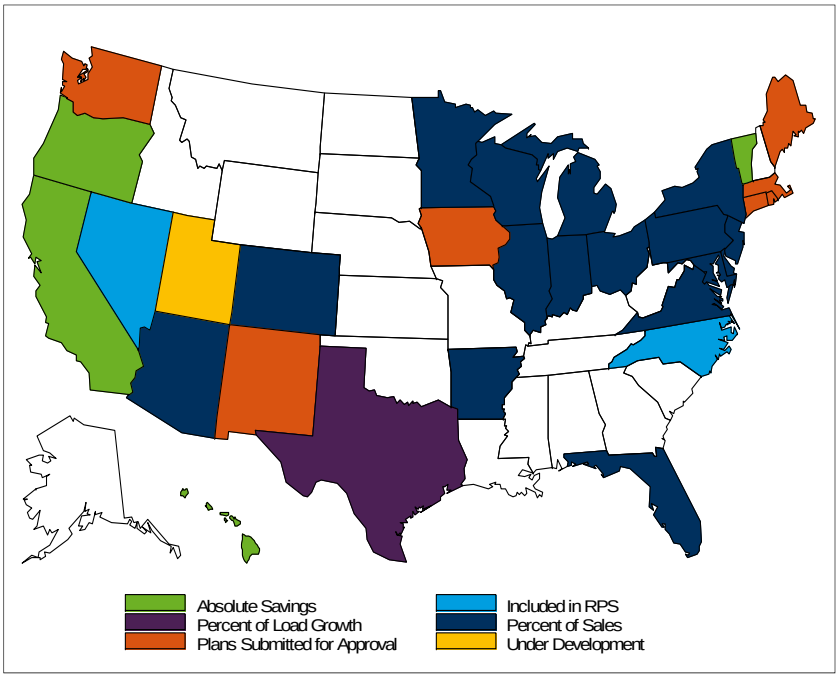
In the past several years, many states have established formal procedures for setting and approving utility DSM targets. Typically referred to as Energy Efficiency Resource Standards (EERS), these requirements are typically set by legislative mandate or regulatory order, but in at least one case have been the result of a public initiative.

The standards currently in place in the United States can be grouped into five general categories, ordered from most to least common:

1. **Percent of Retail Sales:** Utility targets are calculated as a percentage of the utilities' retail sales, either based on a constant base year or a rolling window. These percentages apply to all utilities in the state and may include requirements on peak capacity savings and/or spending limits.
2. **DSM Plans Submitted for Approval:** Utilities propose their own targets, which are then approved by a regulatory body. These targets are typically informed by assessments of available cost-effective potential in a utility's service territory.
3. **Absolute Savings:** States set energy savings goals in absolute (rather than percentage) terms, which are then allocated to individual utilities.
4. **Part of Renewable Portfolio Standard:** Some states have combined requirements for renewable energy generation and DSM, typically a specified percent of retail sales in a given year. These goals may mandate a minimum or maximum amount of the standard that can be met through DSM, but do not set DSM-specific targets.
5. **Percent of Load Growth:** Similar to targets set as a percent of retail sales, these standards are established based on forecasted sales. DSM is required to offset a specified portion of expected load growth over a given period of time.

Figure 1 shows which states have implemented each type of standard as of December 2010.

Figure 1. Map of United States Energy Efficiency Resource Standards



While over half of the states currently have some form of EERS, these standards vary greatly in aggressiveness. Table 1 shows mandated savings targets from 2010 through 2015 for those states that specify targets in this range of years, rather than simply having long-term reduction goals. As shown, some states have targets for each year, while others specify only a 2015 cumulative value. In 2015, the mandated cumulative impacts vary greatly, from 5 to 15 percent of annual sales in that year. California's mandates include savings attributed to improved codes and standards, while all other states are based solely on savings from utility DSM programs.

Table 1. Mandated Cumulative Energy Savings as a Percent of Retail Sales, 2010-2015

State	Energy Savings Target (% of Sales)					
	2010	2011	2012	2013	2014	2015
Delaware		2.0%				15.0%
Maryland						15.0%
New York						15%
Arizona		1.25%	3.0%	5.0%	7.25%	9.5%
Illinois	0.6%	1.4%	2.4%	3.8%	5.6%	7.6%
California* ^	1.4%	2.8%	4.1%	5.1%	6.1%	7.0%
Minnesota	1.0%	2.0%	3.0%	4.0%	5.0%	6.0%
Michigan	0.5%	1.25%	2.25%	3.25%	4.25%	5.25%
New Mexico					5.0%	
Ohio	0.5%	1.2%	2.0%	2.9%	3.9%	4.9%
Indiana	0.30%	0.80%	1.50%	2.40%	3.50%	4.80%
Pennsylvania	1.0%			3.0%		

* Includes investor-owned utilities, SCE, PG&E, and SDG&E. MWh savings goals converted to percent of sales.
^ Goals include savings from improved codes and standards.

By comparison, the cumulative net impact of BC Hydro's planned DSM programs would reduce 2015 loads by about 4.9 percent. In addition to traditional DSM programs, BC Hydro also counts

savings from improved codes and standards. The combined impact of BC Hydro's planned DSM programs and expected changes to codes and standards would reduce 2015 loads by about 8.0 percent.

Given its low average retail rates (shown in Table 2), BC Hydro is able to further increase its DSM savings by implementing conservation rates with higher price signals. The combined impact of programs, codes and standards, and conservation rates is anticipated to reduce 2015 loads by about 12.0 percent. However, no direct comparison of the conservation rates component with other jurisdictions is available to put this DSM target in context, as jurisdictions with higher rates are already receiving energy savings from higher prices (acquired as natural conservation), and instead typically focus on achieving capacity savings from their rate designs.

Aside from the percent-of-sales mandates, some utilities in states that allow utilities to propose savings targets are also aggressively pursuing DSM. The levels of savings achieved in 2009 by leading utilities are presented in the next section. It should be noted when comparing the standards and achievements in different jurisdictions that, in addition to different types of savings being counted (i.e. DSM programs, codes and standards, conservation rates), there are also differing methods of attributing savings to such initiatives. BC Hydro's savings noted above are all net of free-ridership and spillover, whereas many jurisdictions base their targets on gross savings or do not specify a measurement procedure at all.

2. Historic DSM Achievements

To assess the aggressiveness and success of BC Hydro's DSM programs, Cadmus reviewed savings achieved by other organizations across North America from 2005 to 2009. The term "organization" is used here to encompass utilities who implement their own DSM programs, as well as third-party implementers, such as statewide implementers. Cadmus worked with BC Hydro staff to develop a list of such organizations for this analysis, aiming to span a range of geographies, implementation mechanisms, and levels of savings. The list included:

- Leading utilities in Canadian jurisdictions outside of British Columbia (Hydro Quebec, Manitoba Hydro, and the Ontario Power Authority).
- U.S. investor-owned utilities with at least 10,000 GWh in annual retail sales, that reported DSM savings on Energy Information Administration (EIA) Form 861[1] for at least the period from 2007 through 2009. Cadmus filtered this list of qualifying utilities to those averaging DSM savings of at least 0.15 percent of retail sales from 2007 to 2009, in order to focus the analysis on leading utilities.
- Several states who implement DSM through a third party (Vermont, Energy Trust of Oregon, NYSERDA, and New Jersey Clean Energy).
- Additional utilities that were included in BC Hydro's 2008 review of DSM planned savings (National Grid and San Diego Gas & Electric).

Table 2 provides the list of all organizations included in this analysis, along with summary information on their sales, customers, revenues, and savings in 2009. Spending and impacts are intended to reflect energy-efficiency efforts only, and do not include demand response programs. The data used for this analysis was a combination of annual reports of sales and DSM accomplishments and information reported by U.S. utilities to the Energy Information Administration on Form 861.

[1] http://www.eia.doe.gov/cneaf/electricity/page/eia861.html

Table 2. Summary of Utilities Included in DSM Achievement Review - 2009

Organization	Jurisdictions(s)	2009 Baseline Data						DSM Savings	
		Customers	Sales (GWh)	Revenues (Million $)	Average Retail Rate ($/kWh)	Summer Peak (MW)	Winter Peak (MW)	% of Energy Sales	% of Peak Demand
San Diego Gas & Electric	US - CA	1,370,621	16,994	2,929	0.17	4,482	3,691	2.89%	2.59%
Wisconsin Electric Power Co	US - MI, WI	1,115,500	25,818	2,459	0.10	5,751	4,758	2.42%	0.03%
Massachusetts Electric Co	US - MA	1,153,519	10,973	1,714	0.16	4,494	3,711	2.14%	0.87%
Southern California Edison Co	US - CA	4,855,071	77,983	10,973	0.14	21,786	15,262	2.14%	1.36%
Pacific Gas & Electric Co	US - CA	5,215,171	79,985	10,894	0.14	18,410	12,553	1.91%	1.48%
Nevada Power Co	US - NV	826,637	21,189	2,358	0.11	5,586	3,545	1.54%	0.86%
Vermont* ^	US - VT	356,132	5,621	710	0.13	1,103		1.51%	1.24%
Puget Sound Energy Inc	US - WA	1,072,811	21,866	2,021	0.09	3,508	4,906	1.47%	0.00%
Connecticut Light & Power Co	US - CT	1,077,735	12,090	2,349	0.19	4,873	4,016	1.32%	0.49%
Interstate Power and Light Co	US - IA, IL, MN	526,023	14,876	1,242	0.08	2,949	2,568	1.18%	1.12%
MidAmerican Energy Co	US - IA, IL, SD	723,178	20,184	1,210	0.06	4,299	3,522	1.08%	1.07%
Idaho Power Co	US - ID, OR	488,176	13,948	893	0.06	3,031	2,528	0.94%	0.59%
Energy Trust of Oregon*	US - OR	1,370,642	30,841	2,533	0.08			0.91%	
PacifiCorp**	US - CA, ID, UT, WA, WY	1,163,416	39,287	2,506	0.06			0.77%	
Arizona Public Service Co	US - AZ	1,117,199	28,173	2,962	0.11	7,218	4,086	0.74%	0.47%
Manitoba Hydro	Canada - MB	527,472	21,266	1,784	0.08			0.70%	
British Columbia Hydro	Canada - BC	1,801,328	50,771	4,269	0.08			0.69%	
Wisconsin Power & Light Co	US - WI	455,794	9,858	915	0.09	2,558	2,265	0.62%	0.35%
New Jersey Clean Energy*	US - NJ	3,892,544	79,130	12,686	0.16	18,189		0.58%	0.25%
Hydro Quebec	Canada - QC	3,300,000	165,300	12,055	0.07			0.55%	
Public Service Co of Colorado	US - CO	1,356,014	27,316	2,223	0.08	6,272	5,941	0.54%	2.66%
Kansas City Power & Light Co	US - KS, MO	510,296	14,681	1,134	0.08	3,448	2,631	0.27%	0.44%
Consolidated Edison Co-NY Inc	US - NY	2,672,296	23,477	5,038	0.21	5,329	3,849	0.18%	0.15%
NYSERDA*	US - NY	7,937,995	140,043	25,253	0.18	37,642		0.17%	
Florida Power & Light Co	US - FL	4,502,355	102,682	11,542	0.11	22,351	20,081	0.15%	0.33%
Ontario Power Authority*	Canada - ON		150,999						
Average Excluding BC Hydro								1.11%	0.86%

* Third-party implementer across multiple utility service territories.

** Excludes Oregon service territory where DSM is implemented by the Energy Trust of Oregon

^ Statewide, including Efficiency Vermont and Burlington Electric Department programs.

The data indicate that for utilities included in the analysis, 2009 program savings ranged from 0.15 percent to 2.89 percent of retail sales, with an average of 1.11 percent, excluding BC Hydro. On average, energy efficiency also reduced peak demand by 0.86 percent. It is important to note that many of these utilities also run capacity-focused demand response programs, which would create additional peak demand reductions not included in these numbers. Additionally, reductions in peak may not be comparable between organizations due to differences in weather, sectoral composition of customers, and other factors.

While these numbers provide an excellent sample across utility size, geography, and historic DSM accomplishments, they are all based on a single year. Savings achieved in a single year are a function of economic conditions, new construction rates, available budgets, and other factors, so it is important to base such an analysis on multiple years of data, where possible. Table 3 shows the savings achieved from 2005 to 2009 for those same utilities listed in Table 2, where available.

Table 3. Summary of DSM Achievements – 2005 to 2009

Organization	Annual Energy Savings as Percent of Retail Sales					
	2005	2006	2007	2008	2009	Average
San Diego Gas & Electric		1.00%	2.13%	1.99%	2.89%	2.0%
Wisconsin Electric Power Co		0.20%	0.17%	0.27%	2.42%	0.8%
Massachusetts Electric Co	1.27%	1.94%	1.53%	0.92%	2.14%	1.6%
Southern California Edison Co	1.62%	0.99%	1.91%	1.98%	2.14%	1.7%
Pacific Gas & Electric Co	1.61%	1.00%	2.05%	3.35%	1.91%	2.0%
Nevada Power Co	0.34%	0.69%	0.82%	1.39%	1.54%	1.0%
Vermont	1.04%	1.06%	1.88%	2.51%	1.51%	1.6%
Puget Sound Energy Inc	0.83%	0.78%	1.02%	1.23%	1.47%	1.1%
Connecticut Light & Power Co	0.97%	1.18%	1.72%	1.95%	1.32%	1.4%
Interstate Power and Light Co	0.74%	0.83%	0.83%	0.80%	1.18%	0.9%
MidAmerican Energy Co	0.60%	0.78%	0.77%	0.83%	1.08%	0.8%
Idaho Power Co	0.31%	0.51%	0.62%	0.94%	0.94%	0.7%
Energy Trust of Oregon	1.10%	0.69%	0.96%	0.88%	0.91%	0.9%
PacifiCorp	0.41%	0.51%	0.44%	0.57%	0.77%	0.5%
Arizona Public Service Co		0.28%	0.93%	0.88%	0.74%	0.7%
Manitoba Hydro	0.51%	0.67%	1.13%	0.42%	0.70%	0.7%
British Columbia Hydro	1.09%	1.25%	1.09%	0.88%	0.69%	1.0%
Wisconsin Power & Light Co	0.57%	0.62%	0.65%	0.74%	0.62%	0.6%
New Jersey Clean Energy	0.47%	0.16%	0.27%	0.41%	0.58%	0.4%
Hydro Quebec					0.55%	0.5%
Public Service Co of Colorado	0.38%	0.17%	0.45%	0.63%	0.54%	0.4%
Kansas City Power & Light Co			0.09%	0.21%	0.27%	0.2%
Consolidated Edison Co-NY Inc	0.02%	0.16%	0.21%	0.38%	0.18%	0.2%
New York State Research and	0.36%	0.28%	0.48%	0.11%	0.17%	0.3%
Florida Power & Light Co	0.18%	0.19%	0.20%	0.16%	0.15%	0.2%
Ontario Power Authority			0.17%	0.25%		0.2%
Average Excluding BC Hydro	0.70%	0.67%	0.89%	0.99%	1.11%	0.85%

The data show that there is a wide spread in levels of savings across these organizations. Average savings over the time period ranged from as low as 0.2 percent to as high as 2 percent of sales, with an average across years and organizations (excluding BC Hydro) of .9 percent. It is also evident that even for a given organization, savings can fluctuate greatly over an extended time period. For example, Pacific Gas & Electric's savings ranged from one percent up to well over three percent. This volatility can be used to inform BC Hydro's treatment of uncertainty in planning and forecasting, as discussed further in the next section.

It is important to note that the savings that organizations are allowed to claim varies by jurisdiction. Most organizations are only able to claim savings realized directly through their DSM programs. However, in some jurisdictions (e.g. California) utilities can claim savings from improved codes and standards, which is one reason savings reported for these utilities tend to be higher than other organizations. To make reported savings as comparable as possible across utilities, savings from codes and standards and conservation rates have been removed form BC Hydro's annual DSM savings.

3. DSM Achievements Relative to Goals

Before implementing DSM programs, many utilities file plans with regulatory bodies detailing expected program costs and savings. In some cases, these budgets represent hard caps (i.e., once funds are exhausted, programs end for the year), while other utilities are allowed to continue spending above anticipated levels as long as they continue to provide cost-effective savings. At the end of a program year, a retrospective analysis can be conducted to assess program or portfolio achievements compared to planned savings. However, there are a few reasons why such a comparison can prove difficult:

- Some utilities do not file formal energy-efficiency plans, or they file plans that include only budgets and no savings goals.
- Some goals span multiple years (e.g., one savings goal for 2009-2011) without targets for individual years. In these cases, the analysis has taken a pro-rated share in each year for comparison to actual achievements.
- Utilities that cover multiple states may have different requirements and performance metrics for each jurisdiction.

Any number of factors can lead to utilities under- or over-achieving their goals. Some of these include:

- Overly conservative or aggressive planning
- Delays in approval of plans
- Economic conditions
- Unexpected realization rates
- Net-to-gross ratios (for those utilities with goals based on net savings)
- Lost savings due to federal or state programs or improved codes and standards

These caveats aside, Cadmus reviewed planned savings for the utilities shown in Section 2 of this report. The results of this analysis will inform BC Hydro's future DSM targets and identify appropriate ranges of uncertainty for integrated resource planning. Planned energy savings for 2009 were available for 19 of these 27 organizations, and the results of this comparison are shown in Table 4. The table also includes peak savings relative to plans, where available.

Table 4. 2009 DSM Performance Relative to Goals

Organization	Energy			Peak Capacity		
	Planned (GWh)	Achieved (GWh)	% of Planned Achieved	Planned (MW)	Achieved (MW)	% of Planned Achieved
San Diego Gas & Electric**	281	506	180%	54	116	213%
Southern California Edison Co**	1,189	1,704	143%	207	296	143%
Pacific Gas & Electric Co**	1,014	1,560	154%	230	267	116%
Nevada Power Co	186	332	179%	45	48	106%
Vermont	127	86	68%			
Puget Sound Energy Inc	296	326	110%		-	
Interstate Power and Light Co	134	177	132%		37	
MidAmerican Energy Co	200	221	110%	255	46	18%
Energy Trust of Oregon	337	283	84%	39	32	84%
PacifiCorp	304	305	100%	49	66	134%
Arizona Public Service Co	198	209	106%		34	
Manitoba Hydro	145	150	103%	589		
British Columbia Hydro*	467	468	100%			
Hydro Quebec	985	912	93%			
Public Service Co of Colorado	181	149	82%	35	167	481%
Kansas City Power & Light Co	15	40	256%		15	
Consolidated Edison Co-NY Inc	177	43	24%			
NYSERDA	214	234	110%		55	
National Grid	248	189	76%	34	33	97%
Average Excluding BC Hydro			117%			155%

* Includes savings from codes and standards, and rate structures

** Includes savings from codes and standards

The data indicate that in 2009, most of these organizations met or exceeded their goals. The average achievement across the 18 organization was 117 percent of planned energy savings. For the nine organizations where peak capacity savings could be compared to goals, the average achievement was 155 percent of the goal.