Using U.S. Energy Information Administration Data to Benchmark Electric Utility DSM Portfolios

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ABSTRACT

The Energy Information Administration (EIA), part of the U.S. Department of Energy, collects data annually from electric utilities on Form EIA-861, "Annual Electric Power Industry Report." One section of Form EIA-861 is devoted to DSM programs, including their costs and impacts. Using the resulting published data files, it is possible to summarize and compare utilities' DSM spending and impacts in a variety of ways. Form EIA-861 is not perfect as a vehicle for analysis, but it is useful to utilities, regulators, and industry analysts who want to develop broad-based comparisons of DSM activity. The data can be used to quantify utilities' performance on various cost and savings metrics, to develop rankings, and to assemble groups of peer utilities (based on size, location, ownership type, or other variables) for benchmarking purposes.

This paper illustrates the use of Form EIA-861 data to identify top states and utilities in several areas of DSM performance. Limitations in the data are identified, and recommendations to EIA that would make the Form EIA-861 data even more useful are presented.

Introduction

Energy utilities undertaking demand-side management (DSM) programs have an instinctual desire to compare their program portfolios to those of other utilities: How much are other utilities spending on DSM per customer, or per dollar of revenue? What levels of savings in energy and peak demand are top programs achieving? As a company that advises utilities on DSM, E Source frequently gets questions from its clients along these lines.

While the questions are straightforward, finding the data required to answer them can be challenging. Within a given state or province, utilities frequently have a good idea of what their peers are doing in DSM; sometimes, summary information on all utilities' portfolios within a jurisdiction is available in regulatory reports or decisions. But assembling the information needed to make broader regional or national comparisons is tedious at best, and information compiled from different jurisdictions is unlikely to be developed and reported on a common basis.

Fortunately, the U.S. government runs a large-scale data collection and publishing effort that extends to every electric utility in the country. The Energy Information Administration (EIA), part of the U.S. Department of Energy, administers the collection of data via the "Annual Electric Power Industry Report," also known as Form EIA-861. Data collected through this mechanism feeds into key EIA publications, including the *Electric Power Annual* and the *Annual Energy Outlook.* One section of Form EIA-861 is devoted to electric DSM programs.[1]

Using the Form EIA-861 data files published annually by EIA, it is possible to summarize and compare utilities' DSM spending and impacts in a variety of ways. The data files from multiple years can be combined to facilitate time-series analysis of utilities' DSM activities.

Form EIA-861 is not perfect as a vehicle for analysis, but it is useful to utilities, regulators, and industry analysts who want to develop broad-based comparisons of DSM activity. Among other things, it can be used to quantify utilities' performance on various cost and savings metrics, to develop

[1] Form EIA-176 is an analogous report filed by gas utilities, but it does not cover gas DSM activities.

rankings, and to assemble groups of peer utilities (based on size, location, ownership type, or other variables) for benchmarking purposes.

Form EIA-861 Data Files

Files containing the data from Form EIA-861 back to 1990 are posted on EIA's web site.[2] The analyses presented in this paper are based largely on the 2007 data files, the most recent available. Some analyses also rely on data from 2003 through 2006.

Filing Requirements

Completion of Form EIA-861 is mandatory for all electric utilities as well as federally registered wholesale power marketers, state-registered energy service providers, and certain non-utility power producers. Failure to file is punishable by "criminal fines, civil penalties and other sanctions as provided by law" (EIA 2008a). Responses are due April 30 and cover the previous calendar year. Filing is accomplished using secure Internet forms.

Filings are made at the utility operating-company level, rather than at the holding-company level. This means, for example, that the utility holding company National Grid USA files separate forms for each of its five U.S. operating companies. In cases where an operating company's service territory crosses state boundaries, a single Form EIA-861 is used, with state-level breakouts required for some data.

Contents

The information collected on Form EIA-861 has undergone periodic changes, but the basic approach has remained constant over the years. A printed version of the 2007 form is 13 pages in length. Major areas on which data is collected include sources and disposition of energy; generating capacity; customer counts, revenues, and energy sold by customer class (residential, commercial, industrial, and transportation); and DSM.

Within the DSM section, utilities are asked to provide data on the effects of DSM programs, broadly divided into energy efficiency programs and load management programs. Effects are reported for both energy savings (megawatt-hours) and peak demand reduction (megawatts). For load management programs, both actual and potential peak-reduction data is collected. Additionally, two types of effects are recorded: incremental effects, referring to increases in energy savings or demand reduction attributable to new programs, and to new participants in existing programs; and annual effects, referring to the impacts in the reporting year from all DSM activities, including prior-year programs that continue to save energy or reduce demand. Annual effects are supposed to account for the diminution of program impacts over time due to equipment degradation, measure removal, building demolition, and the like. This scheme leads to collection of 40 separate DSM impact values. (See Table 1.)

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

Table 1. Form EIA-861 DSM Impact Data Collection Scheme

	Incremental Effects				Annual Effects			
	Residen-tial	Commer-cial	Indus-trial	Transpor-tation	Residen-tial	Commer-cial	Indus-trial	Transpor-tation
Energy Efficiency								
Energy Effects (MWh)	x_1	x_2	x_3	x_4	x_5	x_6	x_7	x_8
Actual Peak Reduction (MW)	x_9	x_{10}	x_{11}	x_{12}	x_{13}	x_{14}	x_{15}	x_{16}
Load Management								
Energy Effects (MWh)	x_{17}	x_{18}	x_{19}	x_{20}	x_{21}	x_{22}	x_{23}	x_{24}
Potential Peak Reduction (MW)	x_{25}	x_{26}	x_{27}	x_{28}	x_{29}	x_{30}	x_{31}	x_{32}
Actual Peak Reduction (MW)	x_{33}	x_{34}	x_{35}	x_{36}	x_{37}	x_{38}	x_{39}	x_{40}

The DSM costs portion of Form EIA-861 is simpler. Cost figures are collected in five categories:

- Direct costs of energy efficiency programs, excluding incentive payments
- Incentive payments for energy efficiency programs
- Direct costs of load management programs, excluding incentive payments
- Incentive payments for load management programs
- Indirect costs

The last category, indirect costs, is defined by EIA as "Costs that may not be meaningfully included in any program category, but could be identified with an accounting cost category (e.g., Administrative, Marketing, Monitoring & Evaluation, Company-Earned Incentives, Other)" (EIA 2008b).

Utilities incurring DSM costs for more than one state are directed to provide percentages that apportion the costs in each of the five cost categories across the states served.

As posted on the Internet, Form EIA-861 data is spread across seven different data files. The analyses presented in this paper rely on data from three files:

- File 1, which contains utilities' summer and winter peak demands (megawatts).
- File 2, which contains utilities' retail sales (megawatt-hours), revenue (dollars), and customers (number). Utilities that serve multiple states have multiple records in this file, and those serving deregulated markets have separate records for bundled service (where the utility provides both energy and delivery) and delivery-only service.
- File 3, which contains information on DSM activities.

Limitations

There are some limitations inherent in the Form EIA-861 data.

A key issue with respect to DSM policy analysis is that Form EIA-861 does not cover *non-utility* DSM activities. In some states (for example, New York, Oregon Vermont, and Wisconsin) substantial portions of DSM program administration has been delegated to government agencies or public-benefits organizations. Since those non-utility entities do not file Form EIA-861, the picture available from the EIA data of DSM in those states is incomplete.[3]

[3] The Consortium for Energy Efficiency (CEE) publishes state-level estimates of energy efficiency spending that are inclusive of public-benefits programs. CEE data is not published at the company level, and its coverage of program impacts is limited to CEE member companies only (CEE 2009).

Another issue involves treatment of utilities that report activities in multiple states on a single form. As noted above, those utilities provide percentages to apportion the costs across their states; yet EIA does not include those percentages in the published data files. Moreover, the program impacts (megawatts and megawatt-hours) are not similarly apportioned. A consequence is that any state-level analysis must rest on assumptions or guesses as to the states in which the costs and impacts occurred.

Third, although all utilities are required to complete Form EIA-861, very small utilities—specifically, those with total annual sales under 150,000 MWh—are excused from providing full details on their programs: They are asked to furnish only incremental-effects data and a single total-cost figure. Due to the absence of detail, these small utilities were excluded from the analyses presented below.

Fourth, there are data quality issues. As other analysts have noted, the data is self-reported, and its accuracy is not independently verified (York and Kushler 2005).

Analysis

I performed several analyses that illustrate what can be done with Form EIA-861 data—but by no means do these exhaust the analytical possibilities. Most of the analyses are based on the 2007 data set.

DSM Spending by State

Table 2 aggregates 2007 electric utility DSM spending by state, showing the top ten states and the total for the U.S. as a whole.

To develop these figures, I had to make assumptions about the spending of multi-state utilities, since the data necessary to apportion the costs across states is not published—even though it is collected by EIA. I assumed for this analysis that a utility's spending across its states was proportional to its megawatt-hour sales in those states.

DSM spending was reported in all fifty states but not in the District of Columbia. The results show a heavy concentration of DSM in a few states: The top three—California, Florida, and New Jersey—account for more than half of the national total. It bears repeating, however, that the figures below are based only on *utility* spending—the activities of non-utility public-benefits organizations are not included. For purposes of comparison, CEE estimated $2,722,800,000 in electric DSM spending in 2007. CEE's estimate includes public benefits organizations but excludes most smaller municipal and cooperative utilities (CEE 2009).

Table 2. Total Electric Utility DSM Spending and Top States, 2007

State	DSM Program Costs ($)	Percentage of Total
California	976,162,000	37%
Florida	260,712,000	10%
New Jersey	163,714,000	6%
New York	124,147,000	5%
Connecticut	115,110,000	4%
Minnesota	109,949,000	4%
Texas	97,318,000	4%
Iowa	83,233,000	3%
Washington	81,823,000	3%
Massachusetts	64,012,000	2%
All other states	543,023,000	21%
Total	2,619,202,000	100%

DSM Spending by Utility

Table 3 shows the ten utilities that reported the largest electric DSM budgets in 2007. Most of these are "household names" in the utility industry, but a few bear comment. Northern States Power (Minnesota) is one of the operating companies of holding company Xcel Energy; although the operating company uses the Xcel Energy branding for customer-facing purposes, it reports to EIA under the legal name that predates the formation of Xcel Energy, and the spending reported here is for Minnesota only—Northern States Power (Wisconsin) reports as a separate entity. Connecticut Light & Power and Massachusetts Electric are better-known today by their parent brands, Northeast Utilities and National Grid, respectively. New York Power Authority is the only non-investor-owned utility on the list, and it is also the only one that is largely a wholesale power provider.

Table 3. Top Ten Electric DSM Budgets, 2007

Utility	State	DSM Program Costs ($)
Southern California Edison	CA	446,463,000
Pacific Gas & Electric	CA	369,132,000
Florida Power & Light	FL	160,750,000
Public Service Electric & Gas	NJ	134,182,000
San Diego Gas & Electric	CA	99,250,000
Connecticut Light & Power	CT	82,879,000
Northern States Power (Minnesota)	MN	82,280,000
Progress Energy Florida	FL	66,207,000
New York Power Authority	NY	66,047,000
Massachusetts Electric	MA	54,685,000

DSM Spending per Customer

The analysis in Table 4 normalizes DSM budgets by placing them on a per-customer basis. For this purpose, the customer count is the sum of the counts reported separately on Form EIA-861 for the residential, commercial, industrial, and transportation sectors, in all states served. DSM program costs are the total amount reported by each company (not allocated by state).

Table 4. DSM Spending per Customer, 2007

Utility	State	DSM Program Costs ($)	Customers	DSM Program Cost per Customer ($)
Interstate Power and Light	IA	50,477,000	528,093	96
Southern California Edison	CA	446,463,000	4,836,739	92
United Illuminating	CT	31,129,000	340,893	91
Eugene Water & Electric Board	OR	7,736,000	86,531	89
San Diego Gas & Electric	CA	99,250,000	1,360,773	73
Silicon Valley Power	CA	3,602,000	50,426	71
Pacific Gas & Electric	CA	369,132,000	5,190,973	71
Connecticut Light & Power	CT	82,879,000	1,210,584	68
Public Service Electric & Gas	NJ	134,182,000	2,099,626	64
Hawaiian Electric	HI	18,312,000	294,591	62
Mean of 141 utilities				27
Median of 141 utilities				11

For this and subsequent analyses, I decided to exclude utilities with fewer than 50,000 retail customers; collectively, the utilities above that threshold accounted for 94 percent of DSM spending in 2007. After eliminating utilities that didn't report any DSM spending, I was left with an analysis set of 141 utilities.

The top-spending on a per-customer basis is Interstate Power & Light, part of Alliant Energy, with retail operations largely in Iowa. Two relatively small municipal utilities, Oregon's Eugene Water & Electric Board and California's Silicon Valley Power, also appear among the top ten.

The mean and median statistics at the bottom of the table help fill in the picture. If the budgets and customers of all utilities in the analysis set were pooled, an average of $27 would have been spent per customer. However, the median value reveals that half of the utilities spent no more than $11 per customer.

DSM Spending Relative to Revenue

Table 5 shows the top-spending utilities on a different basis: the percentage of retail electric revenue spent on DSM. On this basis, Eugene Water & Electric Board is the most aggressive electric utility in DSM.

Table 5. DSM Spending as a Percentage of Retail Revenue, 2007

Utility	State	DSM Program Cost as % of Retail Electric Revenue
Eugene Water & Electric Board	OR	4.4%
Interstate Power and Light	IA	4.3%
Southern California Edison	CA	3.8%
San Diego Gas & Electric	CA	3.7%
Seattle City Light	WA	3.3%
Pacific Gas & Electric	CA	3.3%
Laurens Electric Cooperative	SC	3.2%
United Illuminating	CT	3.1%
Northern States Power (Minnesota)	MN	2.9%
Public Service Electric & Gas	NJ	2.8%
Median of 141 utilities		0.5%

Allocation of Spending

The results in Tables 2 through 5 were derived using utilities' total DSM spending, encompassing both energy efficiency and load management. Figure 1 breaks out the spending for all 141 utilities as a whole into the five cost categories used on Form EIA-861. At 66 percent of the total, energy efficiency is clearly the dominant activity.

Inspection of the individual utility figures, though, shows that use of the Indirect Costs category is puzzlingly inconsistent. Out of 141 utilities, 60 reported no indirect costs. But the percentage claimed as indirect varies hugely: 19 utilities report more than 20% in the direct category, and one utility, Nebraska Public Power District, reported 100% of its costs as indirect.

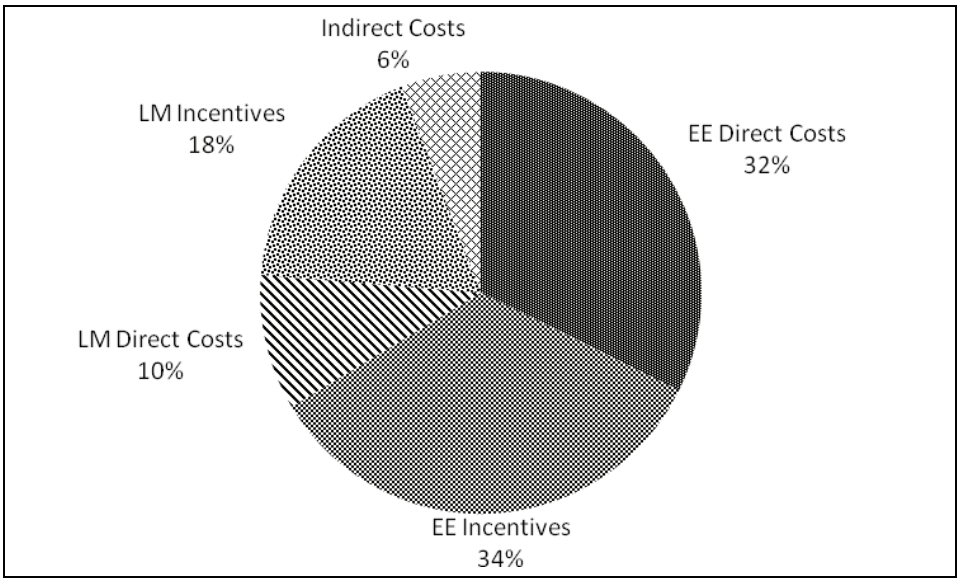

Figure 1. Composition of Utilities' DSM Spending, 2007 (EE = energy efficiency, LM = load management)

Cumulative Energy Efficiency Impacts

Table 6 identifies the ten utilities that report the largest cumulative effects from their energy efficiency programs. It is based on utilities' "annual effects" figures, which include the effects both new programs and programs put in place in prior years, adjusted for diminishing effects over time. The savings from prior years' programs are counted in the reporting year only. Companies reporting no energy-efficiency program impacts (i.e., those reporting only load-management impacts) are excluded from the analysis.

Table 6. Cumulative Effects of Energy Efficiency Programs, 2007

Utility	State	Cumulative Energy Savings from Energy Efficiency as % of Sales
Eugene Water & Electric Board	OR	17.3%
Glendale Water & Power	CA	14.8%
Western Massachusetts Electric	MA	12.2%
Sacramento Municipal Utility District	CA	12.0%
Northern States Power (Minnesota)	MN	11.7%
Snohomish County Public Utility District	WA	10.8%
Southern California Edison	CA	10.8%
Minnesota Power	MN	10.8%
Wisconsin Power & Light	WI	10.5%
Seattle City Light	WA	10.3%
Median of 107 utilities		1.8%

The top ten utilities were achieving energy efficiency savings roughly six to ten times as great as the savings achieved by the median utility in 2007.

Incremental Energy Efficiency Savings

Table 7 also looks at savings from energy efficiency programs but narrows the scope to incremental savings in 2007—that is, the savings from new programs and from new participants in existing programs. Form EIA-861 directs utilities to report incremental effects on a full-year basis, as if participants had entered the programs on January 1.

The top utilities were achieving below 2 percent savings per year. For comparison, a 2004 analysis that aggregated the results of several national studies placed achievable energy savings in the range of 0.5 percent to 3 percent per year, with a mean of 1.2 percent (Nadel et. al 2004).

Table 7. Incremental Energy Savings from Energy Efficiency Programs, 2007

Utility	State	Incremental Energy Savings from Energy Efficiency as % of Sales
Pacific Gas & Electric	CA	1.9%
Southern California Edison	CA	1.7%
Laurens Electric Cooperative	SC	1.3%
Connecticut Light & Power	CT	1.2%
United Illuminating	CT	1.1%
Austin Energy	TX	1.0%
Eugene Water & Electric Board	OR	1.0%
Arizona Public Service	AZ	0.9%
Puget Sound Energy	WA	0.9%
Snohomish County Public Utility District	WA	0.9%
Median of 100 utilities		0.2%

Cumulative Load Management Impacts

Form EIA-861 presents load management impacts two ways: "actual" and "potential." The former describes the magnitude of actual load reductions that were realized during the reporting year, while the latter represents the amount of load the utility claims it *could* drop, if conditions so required. The analyses shown here are based on values derived from the "potential" data and encompass all utilities in our analysis set that reported potential load-management impacts in 2007.

Table 8 shows the ten utilities with the largest cumulative potential load management impacts—that is, counting the impacts from all programs, regardless of when the customer began to participate. Cooperative power utilities occupy six of the top ten positions, a finding that is consistent with co-ops' longstanding use of load-control technologies.

Table 8. Cumulative Potential Peak Reduction from Load Management, 2007

Utility	State	Annual Potential Peak Reduction from Load Management
Southern Maryland Electric Cooperative	MD	35.4%
Nebraska Public Power District	NE	32.4%
Berkeley Electric Cooperative	SC	22.1%
Northern States Power (Wisconsin)	WI	14.9%
First Electric Cooperative	AR	14.8%
Rappahannock Electric Cooperative	VA	14.6%
Delaware Electric Cooperative	DE	13.4%
Otter Tail Power	MN	12.1%
Choptank Electric Cooperative	MD	11.6%
Alabama Power	AL	11.4%
Median of 84 utilities		4.0%

Incremental Load Management Impacts

Fewer utilities, 44 in total, reported incremental load management impacts in 2007. The top ten utilities are listed in Table 9. An anomaly discovered in assembling these numbers is that several utilities reported incremental potential peak reductions even while showing zero annual (cumulative) potential peak reductions—an implausible combination.[4]

Table 9. Incremental Potential Peak Reduction from Load Management, 2007

Utility	State	Incremental Potential Peak Reduction from Load Management
Anaheim Public Utilities	CA	5.1%
Silicon Valley Power	CA	4.4%
Sawnee Electric Membership Corp.	GA	3.4%
Cuivre River Electric Cooperative	MO	3.1%
Sumter Electric Cooperative	FL	2.9%
Nebraska Public Power District	NE	1.7%
Idaho Power	ID	1.5%
Roseville Electric	CA	1.2%
Jackson Electric Membership Corp.	GA	1.0%
Long Island Power Authority	NY	1.0%
Median of 48 utilities		0.4%

Time-Series Analysis Using Form EIA-861

The preceding analyses have all been based on 2007 data. Because the available Form EIA-861 data sets go all the back to 1990, it is possible to construct time-series analyses. For examples of the possibilities, I combined data on the incremental energy savings from energy efficiency programs into a single file to look at how savings have changed over the period 2003 – 2007. I then confined the analysis

[4] Utilities in this category include PacifiCorp, United Illuminating, Connecticut Light & Power, and others.

to those utilities that had positive incremental savings in each of the five years, the intent being to discern any trends among the set of utilities with continuing experience in energy efficiency.

Table 10 shows the five-year trend for this set of utilities. Interestingly, from 2005 to 2006 there was a drop in the level of incremental savings achieved.

Table 10. Incremental Energy Savings from Energy Efficiency Programs, 173 utilities

Year	Incremental Energy Efficiency Savings (MWh)
2003	2,596,324
2004	3,585,281
2005	4,074,835
2006	3,759,777
2007	4,736,039

For another approach to this data, I compared each utility's 2007 savings to its 2003 value. Table 11 shows that the majority of utilities increased their incremental savings over this period, more than one in three utilities (68 out of 173) went in the other direction.

Table 11. Change from 2003 to 2007 in Utilities' Incremental Savings from Energy Efficiency Programs

Incremental Energy Savings from Energy Efficiency Programs: 2007 vs. 2003	Number of Utilities
Increased	97
No change	8
Decreased	68

A side effect of constructing the time-series data set was the discovery of apparent errors in some utilities' data. The 2003 records for Pacific Gas & Electric are blank. Boston Edison, the major utility operating company of NSTAR, reported no DSM data in four of the five years. And the time series for Austin Energy, a utility well-known for its efficiency programs, showed no incremental energy savings in 2006 and an implausibly large one-year reduction—from 528,000 MWh to 86,050 MWh—in annual (cumulative) energy savings from energy efficiency programs. In neither case is it clear whether the utility or EIA was responsible for the error.

Recommendations for EIA

Changes in the way EIA collects and publishes Form EIA-861 data would improve the usefulness of this resource as a benchmarking tool for DSM planners and analysts. Specifically:

- EIA should expand the treatment of DSM data for multi-state utilities. While these utilities are required to allocate their DSM costs across the states they serve, the state-level cost breakdowns are not published. That should be an easy change to make. Additionally, utilities should be required to report their DSM impacts at the state level. Since multi-state utilities are likely already reporting state-specific data to their regulatory commissions, adding this level of detail to Form EIA-861 should not impose an undue burden.
- EIA should consider expanding the DSM impacts portion of Form EIA-861 to collect information on the duration of energy efficiency savings. A simple addition would require

utilities to provide the weighted-average lifetime of their reported incremental savings. A more complicated implementation would require projections, by year, of the ongoing impacts of each year's incremental savings.

- EIA should establish clearer definitions and cost-accounting rules for cost reporting. Utilities that currently report a high percentage of costs as "indirect" (i.e., unallocable to either energy efficiency or load management programs) should be provided with uniform guidelines for allocating those costs.
- EIA should implement data-validation procedures so as to safeguard against implausible results in the published data (such as incremental load management savings exceeding annual savings). Algorithms that look for significant discontinuities in utilities' data from one year to the next could help detect omissions erroneous data before publication.
- EIA should strive to reduce the time that elapses between data collection and publication. Data is due from utilities for the preceding calendar year on April 30, and publication typically occurs in November or December. Publication of the 2007 DSM data, however, was delayed until March 2009. More timely publication would likely increase the value of the data for planning purposes.

Conclusions

Form EIA-861 is an imperfect but nonetheless highly useful tool for benchmarking electric utilities' DSM portfolios. The analyses presented in this paper have demonstrated that the data published by EIA can be used to identify top states and utilities in several areas of DSM performance. Utilities can follow the approaches suggested here, and others of their own devising, to benchmark their companies' performance and to develop targets for use in portfolio planning. Enhancements to EIA's data collection, validation, and publishing processes would make Form EIA-861 even more useful to electric utilities and industry analysts.

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