RATE IMPACTS OF DSM PROGRAMS: LOOKING PAST THE RHETORIC

Miriam Pye and Steven Nadel
American Council for an Energy-Efficient Economy

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INTRODUCTION

In many states large industrial customers have complained that Demand-side Management (DSM) programs result in substantial rate increases that put industrial firms at a competitive disadvantage (ELCON 1990). In a few instances, it has been suggested that DSM programs raise rates for residential customers while primarily benefitting commercial and industrial (C/I) customers . Utilities are also concerned with DSM rate impact in terms of competition for their wholesale and large industrial loads; reducing rates could improve utilities' competitiveness (NYSEO et al. 1994).

These concerns stem primarily from the impact that energy efficiency programs can have on the bills of program nonparticipants. As energy efficiency programs reduce energy use, revenues from energy sales decline. A portion of these revenues are needed to cover utility fixed costs; in order to make up for these lost revenues, rates often must be increased. For energy efficiency program participants, bill reductions resulting from the efficiency improvements generally more than compensate for the rate increase. For nonparticipants, however, rates increase with no offsetting reductions in consumption.

The rate impact of DSM programs is affected not only by the need to recover lost revenues, but also to recover the costs of DSM programs themselves. Impacts on nonparticipants can be exacerbated by program offerings which favor some customer classes over others: the less favored customer classes are likely to be dominated by nonparticipants.

DSM rate impacts, however, are only part of the picture. As mentioned earlier, DSM participant bill reductions usually more than offset increased rates. In order to pass the utility test -- one of the most commonly used cost-effectiveness screening test for DSM programs -- bills must decline for ratepayers as a group, which means bill reductions for program participants are greater than bill increases for nonparticipants. Increasing DSM participation would avail more customers of the benefit of lower bills.

Another part of the picture is environmental issues. DSM programs reduce the amount of electricity generated, thereby reducing power plant emissions. These emissions reductions benefit both participants and nonparticipants. The quantification of these benefits is difficult; however, with increasing clean air requirements, the value of conserving energy will rise. At present, quantification of DSM benefits is understated because environmental externalities are excluded from the picture. Participants and nonparticipants alike benefit from reduced pollution and avoided costs of complying with environmental regulations.

From our examination of rate impact claims, it appears that most claims regarding rate impacts are based on ideology or theory rather than on hard empirical evidence. In an attempt to provide utilities, regulators and intervenors with a more solid basis for evaluating these claims, ACEEE analyzed available actual DSM rate impact experience as well as rate impacts calculated using utility cost allocation models.

We divided the balance of the paper into several sections. In the next section we examine overall trends across the different studies. Next, we review findings from individual studies. We then attempt to put DSM rate impacts in perspective relative to rate increases due to supply-side investments and with respect to the impact of rate increases on business expenses and profits. Finally, we discuss approaches that can be used to reduce rate impacts and draw a series of conclusions.

OVERALL TRENDS

We were able to find data from ten existing published and unpublished studies on the rate impacts of DSM programs. We define 'rate impact' here as the percent difference between electricity rates which include DSM in their resource plan as compared to either existing rates or rates which reflect supply-only resource plans (two different approaches are used because use of a single approach would significantly restrict the number of studies available for analysis). In addition to collecting data on rate impacts, we collected data on the level of DSM expenditures by each utility and how utilities recovered DSM expenditures. Nine of the studies reflect actual utility data or forecasts made by or about actual utilities. The remaining study utilizes hypothetical utility data.

The ten studies for which we found data took different approaches in calculating rate impact. To get a true understanding of how DSM affects rates, we want to look at rate impacts which fully reflect the costs (including lost revenues) and benefits of ongoing DSM programs as compared to rates which reflect a supply-only resource plan. In this context, certain key variables should be kept in mind when comparing rate impact calculations in the ten studies we reviewed:

* Whether DSM costs are expensed or amortized (capitalized, levelized[1], or recovered as a deferred expense) affects how quickly these costs appear in electricity rates. Expensed costs are reflected in rates in the year they occur, while amortized costs are spread over several years with the intent of matching the timing of costs with benefits. As a result, the rate impact from amortized DSM costs is more gradual, building as a utility accumulates more years of DSM programs.

* The number of years of DSM expenditures reflected in rates relative to the number of years over which DSM expenditures are recovered is a second consideration. If the number of years of DSM expenditures is less than the period over which they are

[1]The levelized lifetime approach calculates how much rates would change (in real, inflation-adjusted terms) if program costs were amortized over the measure life. It is calculated by dividing the present value of program costs (net of avoided costs), net lost revenues, and DSM incentives by the present value of total sales revenues over the lifetime of DSM measures.

recovered, only a portion of the long-term rate impacts will be reflected in rates. Also, as DSM continues for many years, lost revenue impacts will continue to increase until the time DSM measures installed in initial years are retired.

* The basis for comparison -- existing rates or supply-only rates -- affects the definition of 'rate impact'. Comparing DSM rates to existing rates indicates rate impact at one point in time but may not reflect fully the avoided supply costs, as would a supply-only rate used as a basis for comparison.

Such issues should be kept in mind as data from individual studies are interpreted. Table 1 presents a summary of these key variables along with the range in rate impact resulting from each study and DSM as a percent of gross revenues. Additional database details are included in Table A-1.

Table 1: Summary of Key Variables and Data for Ten Studies Reviewed

Study	Yrs. of DSM	Financial Treatment	Range of Rate Impact	DSM Exp. as % Gross Revs.	Base for Comparison
Faruqui & Chamberlin	10-15	levelized/LOM[1]	0.2% - 4.3%	N/A	'92 nat'l avg rate
New York State Dept.	2	levelized/LOM[1]	0.2% - 3.7%	.5% - 4.7%	existing rate
of Public Service	1	expensed[2]	0.7% - 6.2%	.5% - 4.7%	existing rate
New York State	18	levelized/LOM[1]	3.2% - 8.0%	1.2% - 3.2%[3]	supply-only rates
Energy Office	9	expensed	2.6% - 10.2%	1.2% - 3.2%[3]	supply-only rates
Florida Power & Light	28	levelized/LOM[1]	-0.3%	3% - 5%	supply-only rates
	28	expensed	-3.3% - 2.4%	3% - 5%	supply-only rates
Massachusetts	1	95% expensed	0.7% - 9.4%	1.3% - 6.1%	existing rate
Rhode Island	1	expensed	1.5% - 2.6%	2.5% - 3.2%	existing rate
Public Svc. of Indiana	20	amortized / 4 yrs[4]	0.2% - 4.7%	2.8%	existing rate
Detroit Edison	4 - 5	part capitalized (5yrs)/ part expensed	-2.4% - 13%	0.4% - 2.5%	existing rate
Chamberlin, Herman & Wikler	30	levelized/LOM (1)	-2.8% - 8.8%	N/A	existing rate
Hirst	20	capitalized / 15 yrs	-1.1% - 5.0%	N/A	supply-only rate

(1) LOM = life of measure
(2) NYSDPS used the effective annual rate impact approach, which assumes all DSM costs to be expensed.
(3) Reflects DSM spending at 1992 levels
(4) PSI recovers DSM costs as deferred expenses over a 4-year period.

The disparity in approaches to analyzing rate impact means that comparisons can only be made with great caution and that any conclusions must be considered preliminary. Available data do not allow for the translation of these different approaches into "apples-to-apples" comparable data.

The average ratio of DSM expenditures to gross revenues for our study is approximately 2.5% (for those utilities for which these data were available). For perspective, in a study done by Hirst (1993), only 12% of reporting utilities spent more than 2% of total revenues on DSM programs in 1991. Thus, the utilities in our sample are among the more active DSM players; eight fall into the group of 25 utilities with the highest DSM expenditures (Hirst 1993).

Certain trends can be observed in the body of existing data. Rate impacts for the studies in our sample range from -2.8% to 9.4%, with a median impact of 1.7% and a 90th percentile impact of 5.1% in real terms (net of inflation). Table 2 shows the range of rate impacts for studies in which DSM costs were amortized versus those in which they were expensed. Rate increases for amortized cases were significantly less than that for expensed cases[2], as reflected by median rate impacts of 1.4% versus 3.1%, respectively. We looked at median values because a few high values distort average values, particularly with small sample sizes. For further comparison, each category is subdivided into programs for commercial and industrial customers (C/I), residential customers and customers in all classes.

Table 2 Rate Impact for Certain Key Variables

		Rate Impact (%)				
		Range			Percentile	
Variable	# Data Points	Low	High	Median	75th	90th
Amortized Cases:						
C/I programs	19	-2.8%	7.9%	1.0%	2.1%	3.7%
Residential programs	15	0.2	8.8	1.9	2.6	7.6
All-Class programs	33	-1.1	6.9	1.0	2.8	4.8
Total	67	-2.8	8.8	1.4	2.7	4.8
Expensed Cases:						
C/I programs	19	0.2	9.4	4.0	4.7	5.1
Residential programs	13	0.7	5.6	1.8	3.3	5.4
All-Class programs	9	-0.8	6.2	2.6	4.2	4.8
Total	41	-0.8	9.4	3.1	4.4	5.4

Expensed values are more likely reflective of long-term rate impacts for several reasons. For some amortized values, the number of years of DSM expenditures is less than the amortization

[2] We found the difference in rates to be significant at the 99% confidence level using a two-sample t-test assuming unequal variances.

period and thus, not all DSM expenses are included in rates. Also, many of the amortized values are levelized, which discounts DSM's costs and benefits over time. As a result, the lower rate impacts in early years are counted more heavily (because they are discounted over fewer years) than rate impacts in later years, which may be higher because the number of years of DSM expenditures approaches and surpasses the amortization period.

Although the differences between the approaches of each study precluded extensive statistical analysis, a simple correlation found a statistically significant correlation (95% confidence level) between rate impacts and DSM expenditures as a percent of gross revenues, and between rate impacts and existing rates. The former correlation makes sense intuitively -- the more you spend on DSM, the greater the rate impact. The reason behind the correlation between rate impact and existing rates is less clear, but may stem from higher existing rates resulting from higher fixed costs which increase the amount of lost revenues to be recovered. Another simple statistical test showed no significant difference in rate impacts between data reflecting costs allocated to eligible customers and data reflecting costs allocated across classes.

DISCUSSION OF INDIVIDUAL STUDIES

Faruqui and Chamberlin

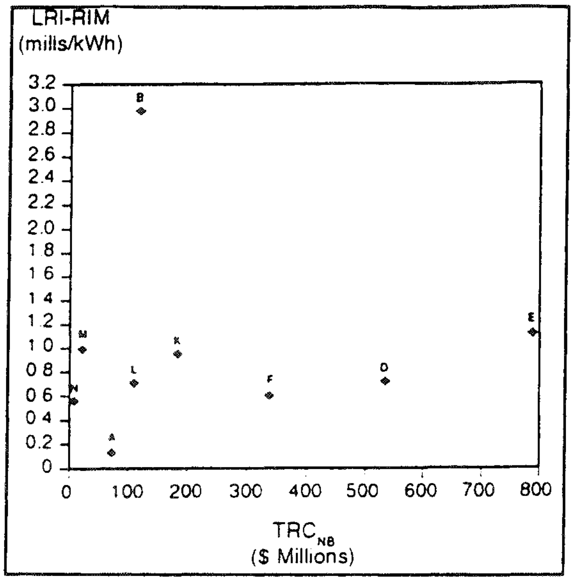
Faruqui and Chamberlin (1993) gathered DSM rate impact data for nine (undisclosed) utilities' DSM portfolios. They used the levelized lifetime rate impact approach, also known as the Lifecycle Rate Impact (LRI-RIM) concept, to measure the one-time change in rates caused by portfolios of 10 to 15 years of DSM implementation.

Faruqui and Chamberlin calculated utility-wide (entire DSM portfolio) rate impacts ranging from 0.13 mills/kWh to 2.95 mills/kWh, with a mean value of 1.03 mills/kWh and a median value of 0.72 mills/kWh. Faruqui and Chamberlin did not interpret these findings in light of existing rates at the utilities examined. If, however, we compare these impacts to the national average retail electric price of $0.068 (EIA 1993), this implies rate impacts of 0.2 - 4.3%, with a median impact of 1.1%. As shown in Figures 1 and 2, the rate impact appears to be unaffected by program size, as measured by the program's total resource cost net benefits (TRC_{NB}). Faruqui and Chamberlin consider this conclusion to be tentative, based on a small sample size and the application of simple statistical methods.

New York State Department of Public Service

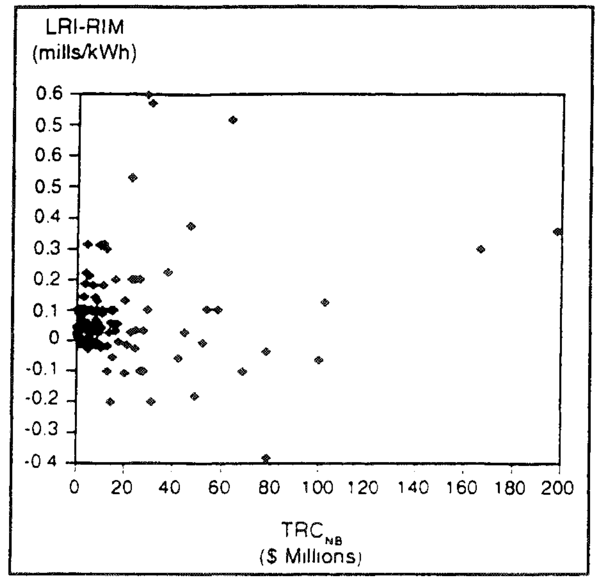
The New York State Department of Public Service (NYSDPS) summarized their utilities' preliminary estimates of bill and rate impacts for 1993-1994 DSM programs, based on certain simplifying cost-recovery assumptions which were necessary to make statewide comparisons (NYSPSC 1993). Cost-recovery assumptions include levelized lifetime rate impacts and effective annual rate impacts.

Figure 1: Portfolio Comparison
LRI-RIM Against TRC_{NB}



(Faruqui and Chamberlin 1993)

Figure 2: Program-by-Program Comparison
LRI-RIM Against TRC_{NB}



(Faruqui and Chamberlin 1993)

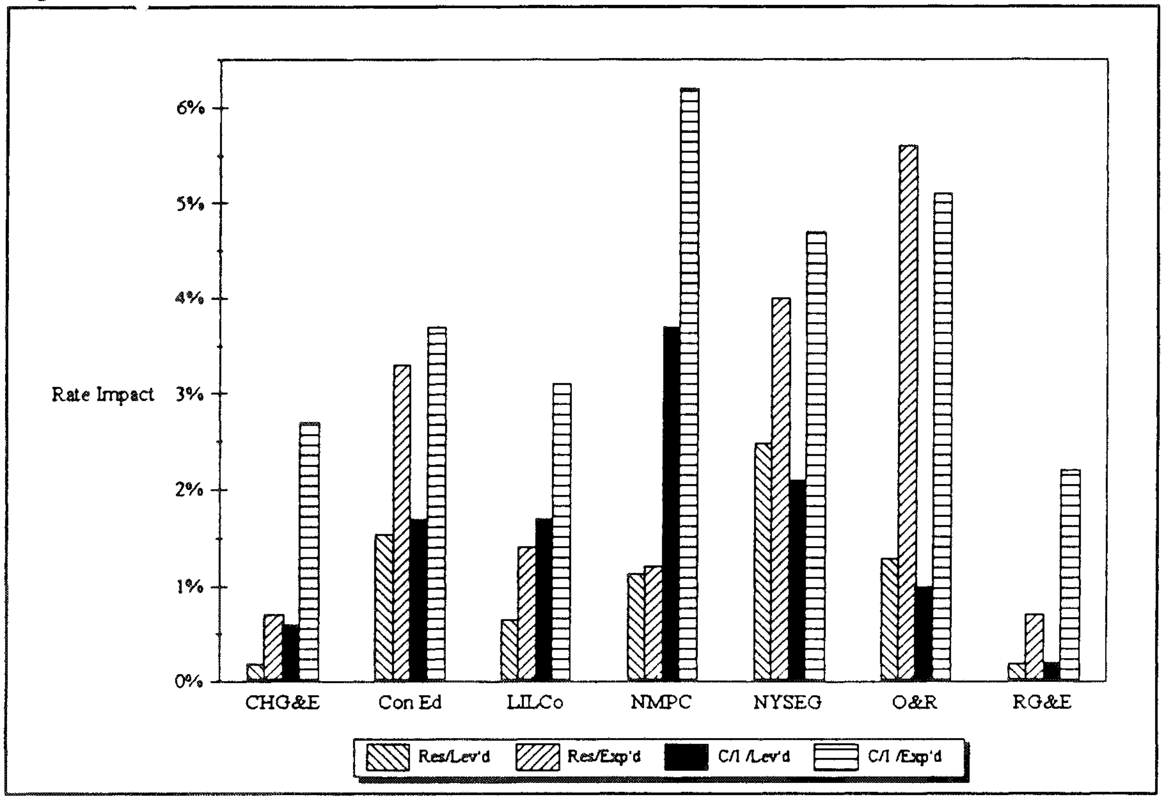
- NYSDPS used the levelized lifetime rate impact approach to show the one-time increase in retail rates (cents/kWh), due to two years of DSM programs, relative to what retail rates would have been absent DSM.

- NYSDPS used the effective annual rate impact approach to show the change in average retail rates (cents/kWh) relative to what retail rates would have been absent DSM for an average of two years of DSM programs, assuming all DSM costs (spending, 'recovery' of net lost revenues, and performance incentives) were expensed (Subbakrishna, 1994).

We compared NYSDPS's estimated rate changes to existing rates in order to calculate rate impact, which we found ranged from 0.2% to 6.2%. Figure 3 shows that effective annual rate impacts are greater than levelized lifetime rate impacts by a factor of two to four; and residential rate impacts are lower than corresponding C/I rate impacts in most cases. Residential and C/I DSM budgets as a percent of their respective gross revenues ranged from 0.5% to 4.7%.

This study also calculated the present value of the expected lifetime bill impacts to participant, average and nonparticipant bills over the lifetime of the measures installed in 1993 and 1994. The analysis shows that for most utilities the average residential DSM participant will save hundreds of dollars and the average C/I participant will save thousands of dollars over the life of the measures installed. For example, as a result of the 1993 DSM programs at New York State Electric and Gas (NYSEG), the present value of expected lifetime bill impacts is a savings of $648 for participating residential customers (9.8% of all residential customers) and an incremental cost of $56 for nonparticipating residential customers (90.2% of all residential customers). Participating C/I customers (2.2% of total C/I customers) are expected to save $29,328 over the lifetime of DSM measures installed in 1993, while nonparticipating C/I customers (97.8%) will spend an extra $503.

Figure 3: New York State Estimated Rate Impacts for 1993/1994 DSM Programs.



(NYSPSC 1993)

NYSDPS notes that the calculation of DSM-related bill impacts requires further development. As utilities gain more experience quantifying DSM bill and rate impacts, more comprehensive methodologies to verify these impacts will be developed.

New York State Energy Office

The New York State Energy Office (NYSEO et al. 1994) estimated the effect of proposed long-range DSM plans on rate impacts at New York's three largest investor-owned utilities: Consolidated Edison (ConEd), Long Island Lighting Co. (LILCO) and Niagara Mohawk Power Corp. (NMPC). This study differs from that performed by NYSDPS in that it projects rate impacts of long-range DSM plans rather than rate impacts of two individual years' programs. This study is also different from the NYSDPS study because it uses a supply-only baseline, rather than a baseline of existing rates, for calculating the rate impact of DSM. The analysis nets out the utilities' cost savings from implementation of DSM programs (such as fuel not burned in the generation of electricity due to DSM). Utility costs include direct spending on programs, recovery of lost sales revenues and authorized shareholder incentives. The analysis assumes DSM expenditures are expensed and allocated across all customer classes. Rate impacts reflect each utility's long-range DSM plan and budgets as filed in 1992 or as updated in 1993. Table 3 gives a sense for the intensity of New York's long-run DSM plans, which are expected to reduce energy by 6.6% by 2000 and by 8.8% by 2008.

Table 3 : NY State Utility Planned Energy Savings as % of Energy Forecast Absent DSM.

Year	ConEd	LILCo	NMPC	Statewide Average
2000	8.7%	6.2%	6.9%	6.6%
2008	14.8%	5.9%	6.3%	8.8%

(NYSEO et al. 1994)

Table 4 shows NYSEO's most likely estimate of rate impacts for the years 1992, 1995 and 2000, and levelized projected utility rate impacts associated with currently filed utility long-range DSM program plans through 2008 for ConEd, LILCo and NMPC. While rates would actually rise gradually, levelized values indicate the present value of the stream of rate increases. The levelized rate impact on a statewide basis is approximated as a 4.8% one-time rate increase in 1991. Although rates are projected to increase, total bills are expected to decrease.

Table 4 : NYSEO's Estimated DSM Rate Impacts versus Most Likely Supply-Side Scenario.

Year	ConEd	LILCo	NMPC	Statewide Average
1992	4.5%	2.7%	3.4%	3.6%
1995	5.4%	4.3%	4.2%	4.6%
2000	8.7%	5.2%	4.9%	6.2%
Levelized*	6.9%	4.2%	3.7%	4.8%

* Levelized cash flows are discounted over the period 1991 through 2008 at the utility average cost of capital of 8.66%.

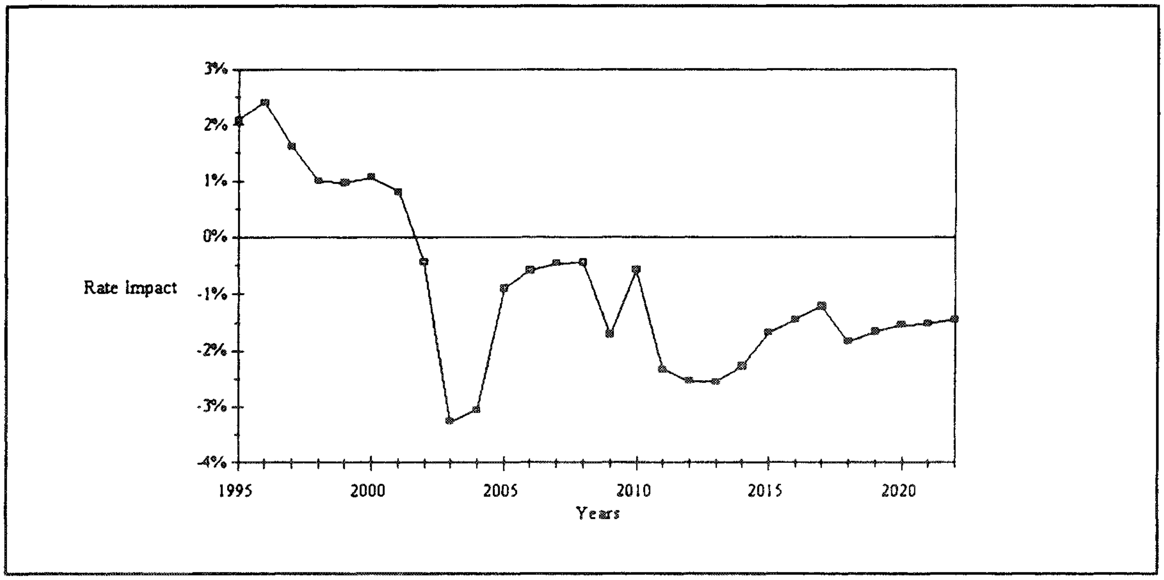
(NYSEO et al. 1994)

Florida Power & Light

Florida Power and Light (FP&L) recently submitted a 28 year forecast of rate impacts of competing resource plans (FP&L 1994). The analysis compared a resource plan incorporating a DSM portfolio which passed the Total Resource Cost (TRC) test with a supply-only resource plan. The results showed levelized system average rates to be approximately 0.3% lower for the resource plan which included DSM as compared to the supply-only plan. FP&L also compared a resource plan utilizing a DSM portfolio which passed the rate impact measure (RIM) test with the supply-only plan. Levelized system average rates were 1.0% lower for the plan including DSM than the supply-only case. (The DSM-RIM data were not included in our calculations of average rate impact across studies.)

Figure 4 shows that rates (in real terms) for the DSM-TRC resource plan were at most 2.4% higher than the supply-only plan in the early years, but that the rate differential became favorable for the DSM plan beginning in 2002. The favorable rate impact occurs as FP&L begins to avoid building new generating capacity. This analysis assumes that DSM expenditures are expensed and allocated across all classes. DSM expenditures as a percent of gross revenues range from 3 - 5% (Shine 1994).

Figure 4: Rate Impact of DSM Resource Plan versus Supply-Only Plan at FP&L.



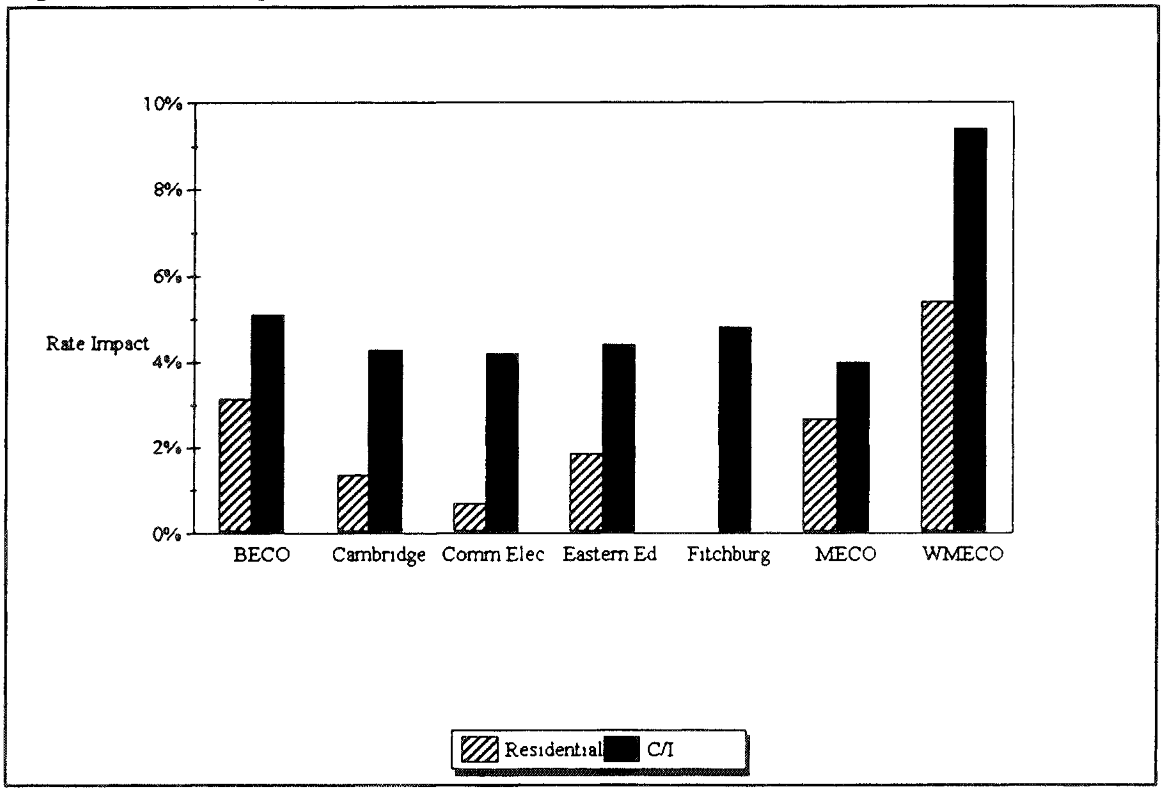
(FP&L 1994)

<u>Massachusetts</u>

In Massachusetts, DSM program costs are allocated to participating rate classes by means of conservation charges. In 1993 these conservation charges ranged from 0.7% to 9.4% of the 1992 rate. Figure 5 shows that residential rate impact was less than the C/I rate impact for all seven utilities. Overall, approximately 95% of DSM expenditures were expensed, and costs were allocated to eligible classes. DSM budgets ranged from 1.3% to 6.1% of gross revenues (Greenberg, 1993).

Massachusetts' conservation charges reflect short-term rate impact without accounting for avoided generation and transmission and distribution (T&D) investments. In this regard, rate impact may be overstated, especially if utilities are at or near capacity. All utilities except Eastern Edison receive a lost revenue adjustment. Western Massachusetts Electric's especially high rate impact reflects a high level of lost revenues (Raab 1994).

Figure 5: Rate Impact of Massachusetts' 1993 Conservation Charges.



(Greenberg 1993)

Rhode Island

At Rhode Island utilities, DSM expenditures are expensed and allocated across all classes. As in Massachusetts, rate impacts reported here are short-term and may be overstated because they do not account for avoided generation and T&D investment. Table 5 shows the rate impact for 1993 DSM versus 1992 rates and for proposed 1994 DSM versus 1992 rates adjusted for 1993's DSM impact.

Table 5: DSM Rate Impact as a Percent of 1992 Rates for Rhode Island Utilities.

Utility	1993 DSM vs 1992	1994 DSM vs adjusted 1992
Narragansett	N/A	2.6%
Newport Electric	1.8%	1.8%
Blackstone Valley	1.5%	1.8%

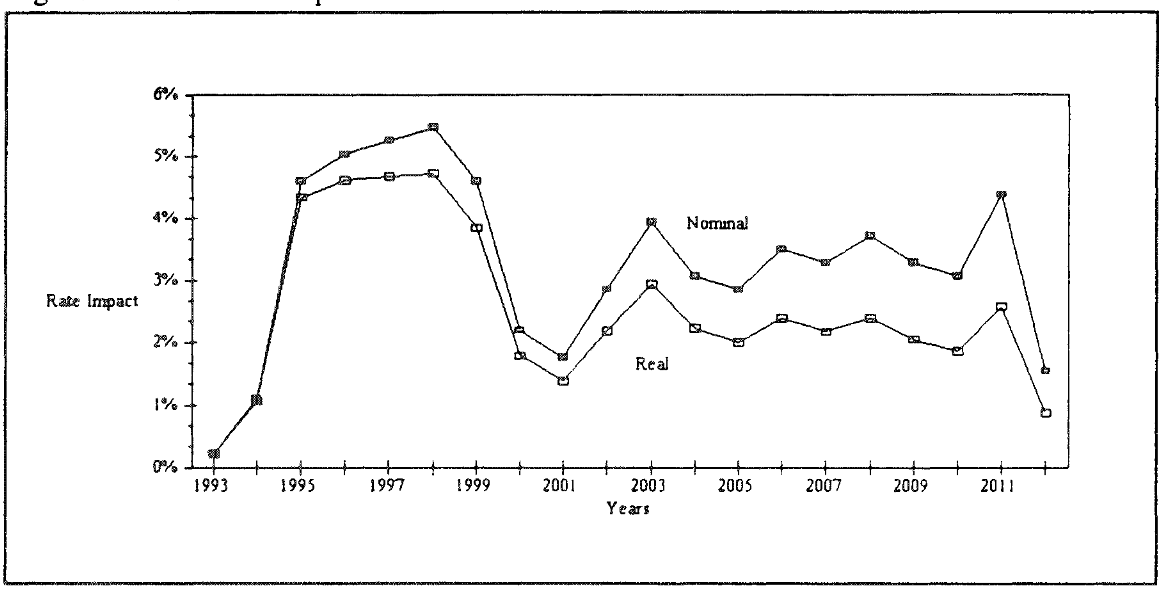
(Raab 1994)

Newport Electric and Blackstone Valley do not receive incentives or a lost revenue adjustment. Narragansett receives incentives but not a lost revenue adjustment. The utilities' DSM budgets range between 2.5% and 3.2% of gross revenues (Raab 1994).

Public Service of Indiana

Public Service Co. of Indiana (PSI) projected increases in average rates ranging from 0.1 to 2.5 mills/kWh in nominal (non-inflation-adjusted) terms over the next 20 years. These impacts translate into an average nominal impact of 3.3% of 1992 rates -- adjusting for an estimated 3% annual inflation reduces this impact to 2.5% (see Figure 6). These projections reflect avoided capacity and T&D costs and recovery of lost revenues but not incentives earned by the utility (PSI Energy 1993). DSM costs are allocated across all classes and recovered as deferred expenses over a four year period. The rise in rate impact over the first four years most probably reflects this four year lag in expensing a full years' worth of DSM expenses. The sharp drop in rate impact around the turn of the century is attributed to a drop in initial program implementation costs and the deferral of two capacity additions (Holmes, 1994).

Figure 6: PSI Rate Impact Forecast: 1993 - 2012.



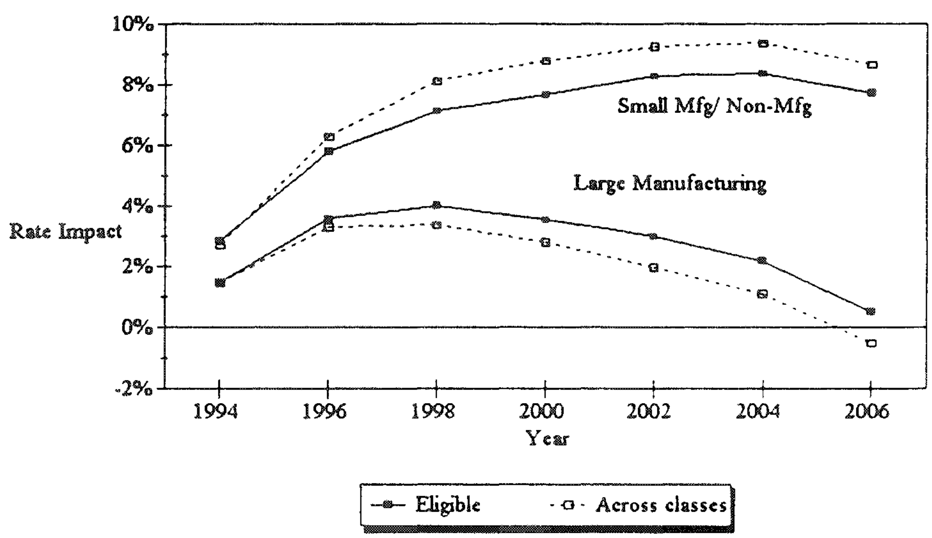
(PSI Energy 1993)

Detroit Edison

At Detroit Edison, Locher and Toulson (1993) used the Load Management Strategy Testing Model (LMSTM) to analyze the impacts that different types of DSM programs and cost recovery methods have on class rates and average bills. For various scenarios, for the 1996 to 2006 period, the study found nominal rate impacts to range from -1.6 to 3.2 mills/kWh for large manufacturing customers and 2.3 to 10.2 mills/kWh for small manufacturing and non-manufacturing customers. The midpoints of these ranges translate, respectively, into 2% and 7.8% of existing 1992 rates adjusted for 3% inflation. These scenarios reflect DSM budgets ranging from 0.4% to 2.5% of gross revenues.

Although higher rate impacts tended to accompany larger DSM programs, the larger programs had proportionately less load management, thus precluding the conclusion that higher rate impacts were due solely to increased DSM spending. The most significant determinant of rate impact appeared to be the mix of load management programs and energy efficiency programs not oriented toward lowering peak. Rate impacts were lower and sometimes favorable for programs emphasizing lowering peak demand because peak demand is most expensive and thus saves the most money per kWh saved. Figure 7 illustrates this conclusion, showing higher rate impacts for the small- and non-manufacturing customers, who were offered a minimal amount of load management, as compared to lower rate impacts for large manufacturing customers, who were offered more load management programs.

Figure 7: Detroit Edison DSM Rate Impact by Allocation Method.



(Locher and Toulson 1993)

Figure 7 also illustrates the effect of allocation method in determining rate impacts for customer classes which are offered different types of DSM programs. This is done by allocating DSM costs across classes on the basis of kWh sales rather than to eligible customers only. This allocation across classes results in higher rate impacts for the small- and non-manufacturing class and lower rate impacts for the large manufacturing class. The reason for the different direction of these changes stems from the fact that the small-and non-manufacturing class is offered mostly efficiency programs, for which costs are capitalized and therefore smaller than the large manufacturing class's load reduction program costs, which are expensed because they are annual payments. By allocating DSM costs across classes the large manufacturing class is transferring out costs which are expensed and therefore larger than the capitalized costs transferred in from the small- and non-manufacturing class's efficiency programs. Conversely, when DSM costs are allocated across classes the small- and non-manufacturing class transfers out less cost than is transferred in due to load management, resulting in higher rates to the small- and non-manufactu. ing customers.

Locher and Toulson concluded:

* programs can be designed to minimize rate impact to a class by offering programs that lower the class's contribution to peak;

* while average bills can be lowered for all classes, average rates can only be minimized for some classes; and

* types of programs implemented (i.e., load management versus non-peak oriented) can affect rate impacts.

Chamberlin, Herman and Wikler

Chamberlin, Herman and Wikler (1993) applied several rate mitigation strategies, detailed below, to data for an undisclosed utility (Herman 1994) in order to study the rate impacts of each strategy. The variables tested included four DSM strategies and two rate strategies:

Rate Mitigation Strategies:

DSM Strategies:

1. All TRC-Passing Strategy
2. Only RIM-Passing Strategy
3. RIM-Passing Package Strategy[3]
4. DSM Residential and C/I Strategy[4]

Rate Strategies:

1. Rate Allocation Within (or Across) Classes Strategy
2. Rate Redesign from Flat Rates to Declining-Block Rates

[3]In the RIM-Passing Package Strategy a set of RIM-failing programs (chosen to maximize TRC benefits) is combined with the RIM-passing programs to bring the total net benefits result as close to zero as possible.

[4]The DSM Residential and C/I Strategy attempts to maximize DSM benefits to all customer classes. The goal for the residential class was to reduce energy bills. The goal for C/I customers was to reduce rates.

The fact that all scenarios showed positive Utility Cost (UC) net benefits indicates that average bills will go down. This means if customers participate in at least one program, their bills will probably be lower even if their rates increase.

The percent change in existing rates resulting from cost-of-service allocation is a rough estimate of rate changes allocated based on peak demand. Since the DSM programs chosen reduce C/I peak demand more than that of the residential class, C/I customers receive an additional reduction in rates.

Chamberlin et al. observed that all strategies gained from going from the flat to declining-block rate structure, which more closely matches marginal costs in the last block. Under the Declining-Block Rate Structure, more programs pass the RIM test, resulting in larger DSM packages (except for the All TRC-Passing strategy package) as compared to those implemented under flat rates. Table 6 details data resulting from the analysis.

Table 6: Rate Impacts from Various Rate Mitigation Strategies.

	All TRC-Passing	Only RIM-Passing	RIM-Passing Package	Residential & C/I Strategy
Flat Rate Structure:				
1996 % MW reduction	8.4%	2.8%	3.0%	5.5%
UC net benefits ($mil)	$207	$18	$28	$87
LRI-RIM % change in rates:				
residential	5.8%	0.0%	N/A	5.8%
C/I	5.8%	-0.2%	N/A	-0.2%
system	5.7%	-0.1%	0.0%	N/A
% change in rates taking into account cost-of-service allocation (shift in peak load):				
residential	8.8%	1.9%	1.8%	7.6%
C/I	3.1%	-2.2%	-2.0%	-1.4%
system	5.7%	-0.1%	0.0%	N/A
Declining-Block Rate Structure:				
1996 % MW reduction	8.4%	3.6%	4.5%	6.1%
UC net benefits ($mil)	$207	$70	$113	$119
LRI-RIM % change in rates:				
residential	1.1%	-0.2%	N/A	1.1%
C/I	1.9%	-0.5%	N/A	-0.5%
system	1.5%	-0.3%	-0.1%	N/A
% change in rates taking into account cost-of-service allocation (shift in peak load):				
residential	4.1%	2.0%	2.6%	3.1%
C/I	-0.9%	-2.8%	-2.8%	-2.1%
system	1.5%	-0.3%	0.1%	N/A

(Chamberlin, Herman and Wikler 1993)

The study concluded that different strategies support various goals. An All TRC-Passing strategy which ensures all customers access to bill-reducing DSM programs maximizes economically efficient MW reduction. The Only RIM-Passing strategy minimizes rates but also minimizes DSM. The other strategies represent attempts at balancing these two goals.

Hirst

Hirst (1991) used a dynamic model, the Decision Impact Assessment Model (DIAMOND), to assess effects of DSM programs on electricity rates for the period 1990 to 2010. The analyses, which assumed that the utility paid 100% of DSM costs, considered three types of utilities: a "base," typical of U.S. utilities; a "surplus" utility, with excess capacity; and a "deficit" utility, with little excess capacity, many planned retirements, and rapid growth in fossil-fuel prices.

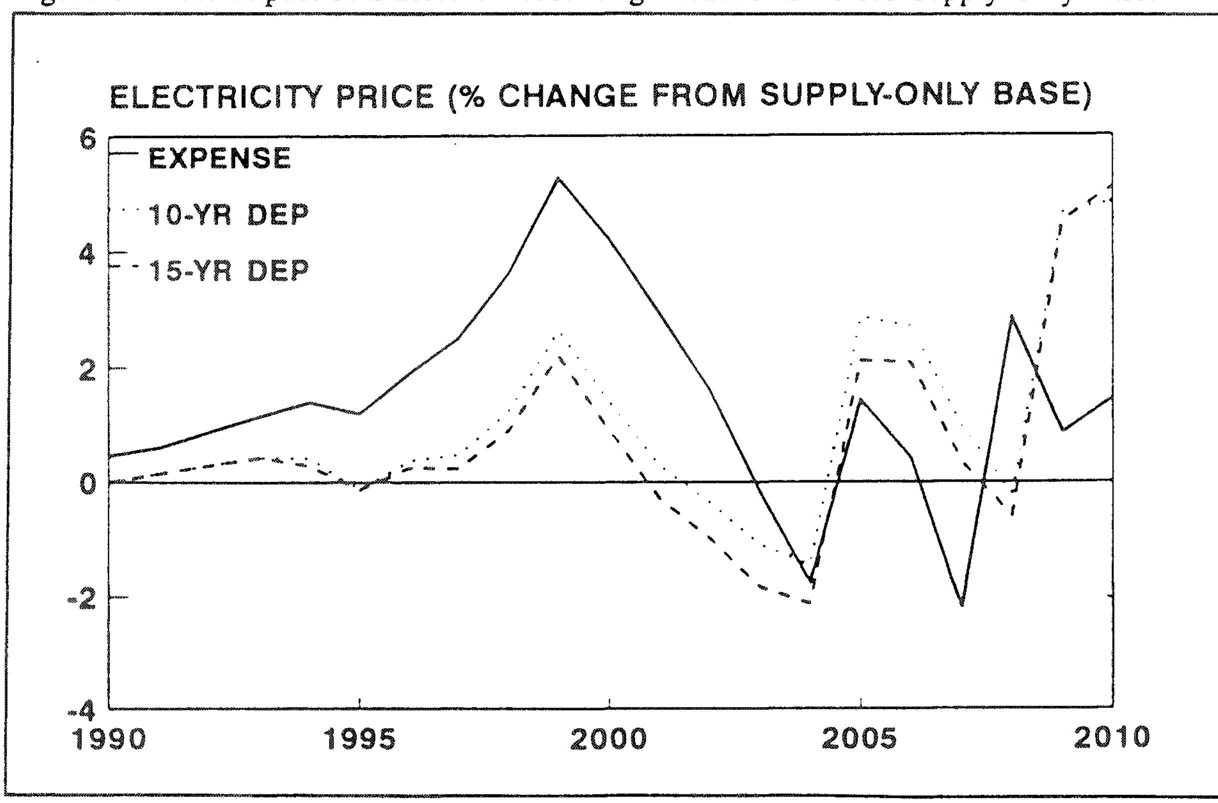
In regard to rate impact, Hirst's key findings from these simulations include:

* In general, DSM programs reduce electricity costs (as reflected by revenue requirements) and raise electricity rates.

* Expensing DSM program costs raises electricity rates more in the short term. Capitalizing costs defers rate increases for several years and reduces their size. Figure 8 compares different accounting treatments (expensing, 10-year depreciation, and 15-year depreciation) in terms of percent change from the supply-only base case scenario.

* Regardless of whether costs are expensed or capitalized, the percentage reduction in electricity costs (as reflected by revenue requirements) exceeds the percentage increase in electricity rates by: 2:1 for the surplus utility, 5:1 for the base utility, and 8:1 for the deficit utility.

Figure 8: Rate Impact of Different Accounting Treatments versus Supply-Only Base.

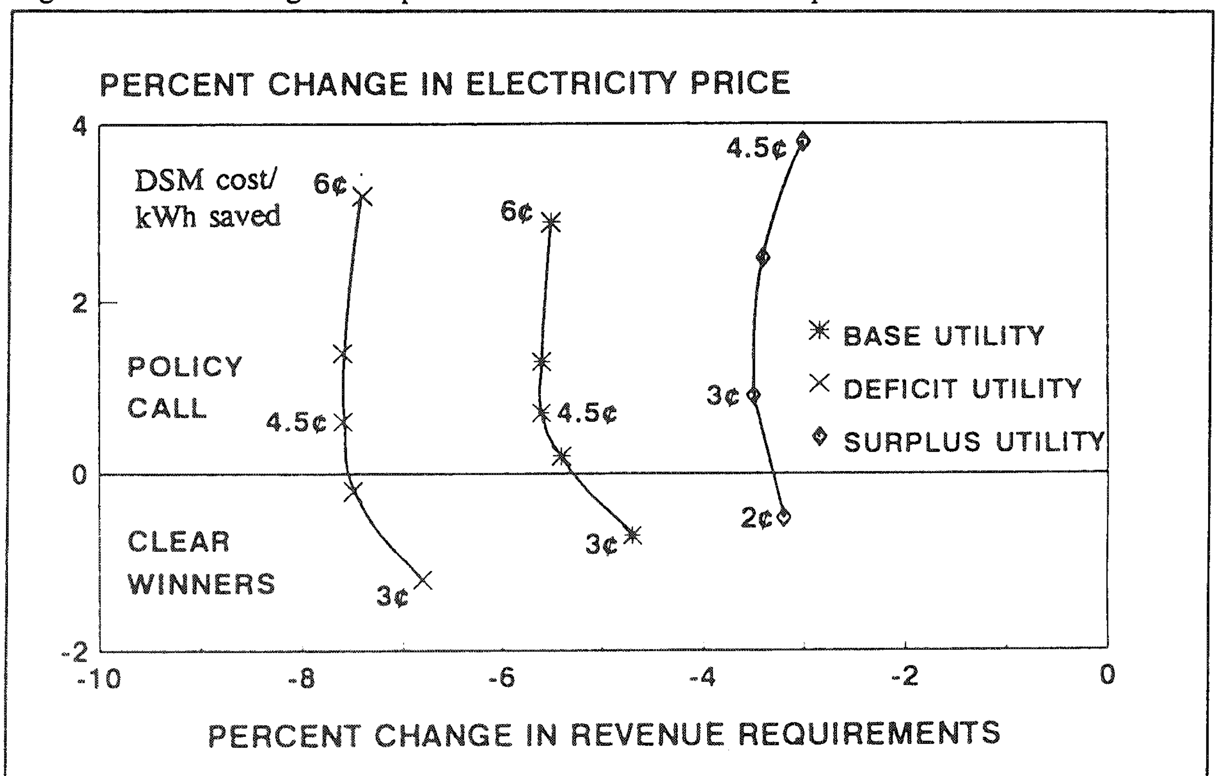


(Hirst 1991)

Hirst calculated an average change in rates (versus supply-only case) ranging from -1.1% (for the deficit utility with a DSM cost of conserved energy of $.03/kWh) to 5% (for a surplus utility with a DSM cost of $.05/kWh). Average electricity bills declined 4.3% to 8.7% as compared to the supply-only case. Figure 9 shows the effects of DSM programs on the net present value of utility revenues and average electricity rates (1990 through 2010) for the base, surplus, and deficit u⁺ilities for varying costs of conserved energy.

Hirst notes that if he were to redo this 1991 study in 1994, he would assume lower avoided costs on the supply side, to reflect lower natural-gas prices, improved combustion turbine/combined cycle technologies, and increased competition in the generation sector. He would also assume slightly higher DSM program costs. The net effect would be to increase the price impacts of DSM. In other words, the three curves shown in Figure 9 would all shift up and to the right. Without redoing the study, Hirst cannot say whether these changes would yield substantially different conclusions or not (Hirst 1994).

Figure 9: DSM Program Impact on Rates and Revenue Requirement.



(Hirst 1991)

DSM RATE IMPACTS IN PERSPECTIVE

Based on available data, we found DSM rate impacts to be generally modest, with a median impact of 1.7%; 90% of the rate impacts in our sample were less than or equal to 5.1%. Although DSM programs tend to raise rates somewhat, data show that participation in a DSM program will generally lower electricity bills significantly. Providing more opportunities to all customers to participate in and benefit from DSM programs would allow more customers to experience bill savings.

C/I customers who are rate sensitive worry that rate increases will hurt their competitiveness. The Bureau of Census' 1991 *Annual Survey of Manufacturing* indicates that the average electricity cost for U.S manufacturers is 1.2% of the value of shipped goods, or wholesale value (see Table A-2). Only for aluminum producers does electricity exceed 4% of the value of shipped goods. A 5% electricity rate increase (near the 90th percentile of our sample) would translate into a profit impact of only 0.06 % of wholesale value for an average non-participating industrial customer, who receives no bill reductions from DSM. Data show that C/I customers who participate in DSM programs can realize substantial savings in their electricity bills (NYSDPS 1993).

Rate impacts from DSM gain perspective when compared to rate impacts from building new power plants. At one extreme, rate impacts of building nuclear plants have been very high. For example, in 1993 Texas Utilities Electric Company filed a petition for a 15.3% increase in annual revenues to cover costs related to the Comanche Peak nuclear plant, increased state and local taxes and a change in accounting treatment for retirement and health benefits (PUF 1993a). An example of recent (1991) new generation with more reasonable costs is Baltimore Gas & Electric's 600 MW Brandon Shores steam plant, which resulted in an average rate increase of 3.3% (Kingerski 1994). We were not able to find rate impact data on new high efficiency gas-fired combined-cycle power plants, which will probably grow in importance as a source of new capacity.

More generally, one can get a sense of the relative magnitude of the contribution of new power plants and other supply-side investments to rate increases versus DSM rate impact by comparing the investment in each. We make such a comparison in Table A-3 for investor-owned utilities with the greatest 1991 DSM expenditures (Hirst 1993). The ratio of DSM expenditures to Net Plant Additions ranges from 3% to 48.7%, with a median of 18%, indicating that even for those utilities spending the most on DSM, DSM is not the dominant component in capital expenditures -- a key variable affecting rates. Since recovery of lost revenues must also be factored into DSM rate impacts, relative capital expenditures do not translate directly into relative impacts; these data are presented to give a sense of perspective.

Rate and bill impacts will be less if deficit utilities can fulfill energy service needs through less expensive DSM rather than by building new power plants, and in the long-run most utilities will be in a deficit position. *Public Utilities Fortnightly* (1993 b) reports that utilities have commenced the planning of 60 fossil-fired power plants for startup between 2001 and 2011.

Furthermore, rate impacts from DSM gain perspective when one considers environmental benefits. The quantification of these benefits is difficult; however, with increasing clean air requirements, the value of conserving energy will rise. Both participants and non-participants benefit from reduced pollution and avoided environmental costs. Although some may argue that new gas-fired capacity which in part replaces older, dirty plants will have significant environmental benefits, using less energy will always have greater environmental benefits.

REDUCING RATE IMPACTS

While experience to date indicates that the rate impacts of DSM are generally modest, in situations with above-average rate impacts, or in cases of customer classes who are particularly sensitive to rate impacts, no matter how mild, steps can be taken to reduce rate impacts. A full discussion of strategies for reducing rate impacts is beyond the scope of this paper. Instead, we briefly summarize some of the major strategies that can be considered.

Where DSM costs are treated as an expense, utilities and regulators should consider spreading the costs over several years, just as the cost of power plant investments are spread over the expected life of the plant. Probably the most common approach for doing this is to capitalize DSM expenses, just as power plant investments are capitalized. Alternatively, utilities can follow the approach used by PSI Energy and spread expenses over a series of years by deferring a portion of DSM expenses to future years. These steps do not reduce the long-term rate impact; instead they spread rate increases over a series of years.

Where one class of customers is concerned that they are subsidizing DSM expenses by other customer classes, utilities and regulators can consider allocating costs by customer class or sub-class. Such a step transfers a portion of rate impacts from classes that receive only limited DSM services to classes that receive more extensive DSM services. Reallocation will have little effect on class rate impacts in situations where all classes receive approximately the same proportion of DSM services relative to their contribution towards peak demand (or whichever other variable is used to allocate cost of service to different customer classes).

Where rate impacts are still considered excessive, utilities could be given encouragement and/or financial incentive to reduce DSM expenditures per unit of energy savings, while maintaining aggregate savings levels. Utilities could then pursue a variety of strategies for improving the amount of energy saved per dollar invested such as increasing the emphasis placed on programs with the highest benefit-cost ratios or increasing the proportion of DSM costs borne by program participants (although increasing participant payments must be done with great care lest increased participant payments substantially reduce program participation levels).

Utilities and regulators can also consider placing caps on DSM-caused rate increases. Rate increases for DSM could be limited to some aggregate amount (e.g. 5% of gross revenues) or rate increases could be limited to no more than a specified portion each year -- e.g. 1-2% per year. For example, Public Service Company of Colorado has proposed a DSM-related rate impact cap of 3% (PSCC 1993). As long as the limits were reasonable, DSM programs would not be constrained significantly. The results of this study indicate that an aggregate rate impact cap of 3-5% should not unduly hinder DSM. Such rate caps should only be set prospectively and not retrospectively. Retrospective caps would be unfair to utilities and their shareholders who have implemented DSM programs in good faith.

CONCLUSIONS

Data indicate that rate impacts from DSM programs are not so dramatic as some may claim, with a median impact of 1.7% and an impact of 5.1% or less for 90% of our sample. The concern over rate impacts may be a case of "fear of the unknown," given the limited amount of real-life data available. The collection of more data should quell the controversy over rate impact and enhance DSM decision-making.

Rate impacts from DSM also need to be kept in perspective. As compared to the alternative of building new power plants, DSM is generally a financially attractive alternative, offering less expensive energy services and potential customer bill reductions. DSM is also attractive from the viewpoint of environmental benefits, the monetary value of which is increasing with stricter clean air requirements.

The range in rate impacts is affected by a number of variables:

* Expensing DSM program costs raises electricity rates in the short term while capitalizing these costs spreads the rate increase out over several years.

* Allocating costs only to customer classes eligible for a program tends to increase rate impacts to those classes and decrease impacts to other classes. Non-eligible classes may also experience rate increases due to a shift in peak demand relationships.

* The recovery of lost base revenues increases rate impact.

* DSM program type may affect rate impact. The reduction in peak demand usage resulting from load management programs often mitigates rate increases and in some cases lowers rates.

* DSM rate impacts are generally less for utilities in a power deficit situation (i.e., utilities with relatively low reserve margins). Utilities with current power surpluses, however, should see impacts decline in the future when new power plants are needed.

The issue of rate impact is a complex one, not only in regard to DSM program costs, but also in trying to isolate the contribution of any one cost component towards electricity rates. Efforts to refine this analysis process and provide more data and more accurate data should be encouraged. Better data will enhance DSM decision-making and the utility planning process.

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Table A-1: Database of Rate Impact Information Study	Years of DSM Exp.	# Recovery Years	Financial Treatment	Cust. Class	Cost Allocation	Avg./Midpt Rate Impact (mills/kwh)	Base for Comparison Rate($/kwh)	Avg./Midpt. Rate Impact as % CR	DSM Expense ($million)	Gross Revenues ($million)	DSM Expense as % GR
Faruqui & Chamberlin											
	10-15	measure life	levelized	all	all classes	0.10	$0.0680	0.1%			
	10-15	measure life	levelized	all	all classes	0.55	$0.0680	0.8%			
	10-15	measure life	levelized	all	all classes	0.60	$0.0680	0.9%			
	10-15	measure life	levelized	all	all classes	0.70	$0.0680	1.0%			
	10-15	measure life	levelized	all	all classes	0.70	$0.0680	1.0%			
	10-15	measure life	levelized	all	all classes	0.95	$0.0680	1.4%			
	10-15	measure life	levelized	all	all classes	1.00	$0.0680	1.5%			
	10-15	measure life	levelized	all	all classes	1.10	$0.0680	1.6%			
	10-15	measure life	levelized	all	all classes	2.90	$0.0680	4.3%			
New York State Department of Public Service - 1993/94 programs											
Central Hudson G&E											
	2	measure life	levelized	res	eligible classes	0.2	$0.1098	0.2%	$0.8	$159	0.5%
	1	1	expensed	res	eligible classes	0.8	$0.1098	0.7%	$0.8	$159	0.5%
	2	measure life	levelized	c/i	eligible classes	0.4	$0.0662	0.6%	$5.3	$202	2.6%
	1	1	expensed	c/i	eligible classes	1.8	$0.0662	2.7%	$5.3	$202	2.6%
Con Ed											
	2	measure life	levelized	res	all classes	2.3	$0.1499	1.5%	$14.1	$1,523	0.9%
	1	1	expensed	res	all classes	5.0	$0.1499	3.3%	$14.1	$1,523	0.9%
	2	measure life	levelized	c/i	all classes	2.0	$0.1197	1.7%	$102.1	$2,978	3.4%
	1	1	expensed	c/i	all classes	4.5	$0.1197	3.7%	$102.1	$2,978	3.4%
LILCo											
	2	measure life	levelized	res	eligible classes	1.0	$0.1541	0.6%	$9.4	$1,048	0.9%
	1	1	expensed	res	eligible classes	2.1	$0.1541	1.4%	$9.4	$1,048	0.9%
	2	measure life	levelized	c/i	eligible classes	2.2	$0.1320	1.7%	$20.8	$1,070	1.9%
	1	1	expensed	c/i	eligible classes	4.1	$0.1320	3.1%	$20.8	$1,070	1.9%
Niagara Mohawk											
	2	measure life	levelized	res	eligible classes	1.2	$0.1061	1.1%	$7.0	$979	0.7%
	1	1	expensed	res	eligible classes	1.2	$0.1061	1.2%	$7.0	$979	0.7%
	2	measure life	levelized	c/i	eligible classes	2.9	$0.0782	3.7%	$28.1	$1,594	1.8%
	1	1	expensed	c/i	eligible classes	4.9	$0.0782	6.2%	$28.1	$1,594	1.8%
NYS Electric & Gas											
	2	measure life	levelized	res	eligible classes	2.7	$0.1093	2.5%	$13.1	$570	2.3%
	1	1	expensed	res	eligible classes	4.4	$0.1093	4.0%	$13.1	$570	2.3%
	2	measure life	levelized	c/i	eligible classes	1.8	$0.0847	2.1%	$24.1	$516	4.7%
	1	1	expensed	c/i	eligible classes	4.0	$0.0847	4.7%	$24.1	$516	4.7%

Table A-1: Database of Rate Impact Information

Study	Years of DSM Exp.	# Recovery Years	Financial Treatment	Cust. Class	Cost Allocation	Avg./Midpt Rate Impact (mills/kwh)	Base for Comparison Rate($/kwh)	Avg./Midpt. Rate Impact as % CR	DSM Expense ($million)	Gross Revenues ($million)	DSM Expense as % GR
NYSDPS continued											
Orange & Rockland											
	2	measure life	levelized	res	all classes	1.7	$0.1331	1.3%	$5.2	$137	3.8%
	1	1	expensed	res	all classes	7.4	$0.1331	5.6%	$5.2	$137	3.8%
	2	measure life	levelized	c/i	all classes	1.0	$0.0958	1.0%	$5.8	$168	3.4%
	1	1	expensed	c/i	all classes	4.9	$0.0958	5.1%	$5.8	$168	3.4%
Rochester G&E											
	2	measure life	levelized	res	eligible classes	0.2	$0.1062	0.2%	$3.0	$213	1.4%
	1	1	expensed	res	eligible classes	0.7	$0.1062	0.7%	$3.0	$213	1.4%
	2	measure life	levelized	c/i	eligible classes	0.2	$0.0846	0.2%	$10.4	$325	3.2%
	1	1	expensed	c/i	eligible classes	1.8	$0.0846	2.2%	$10.4	$325	3.2%
New York State Energy Office Projections											
CONED (avg)	9	1	expensed	all	all classes			6.2%			3.2%
	18	measure life	levelized	all	all classes			6.9%			3.2%
LILCO	9	1	expensed	all	all classes			4.1%			1.2%
	18	measure life	levelized	all	all classes			4.2%			1.2%
NMPC	9	1	expensed	all	all classes			4.2%			2.7%
	18	measure life	levelized	all	all classes			3.7%			2.7%
Statewide Extrapolation	9	1	expensed	all	all classes			4.8%			2.8%
	18	measure life	levelized	all	all classes			4.8%			2.8%
Florida P&L	28	1	expensed	all	all classes			-0.8%			3-5%
	28	measure life	levelized	all	all classes			-0.3%			3-5%
Massachusetts Dept of Public Utilities - 1993 Conservation Charges											
Boston Edison	1*	~1	95% expensed	res	eligible classes	3.4	$0.1078	3.2% \	$54.0	$1,315	4.1%
	1*	~1	95% expensed	c/i	eligible classes	4.5	$0.0888	5.1% /			
Cambridge Electric	1*	~1	95% expensed	res	eligible classes	1.5	$0.1107	1.4% \	$7.0	$115	6.1%
	1*	~1	95% expensed	c/i	eligible classes	3.2	$0.0744	4.3% /			
Commonwealth Elec.	1*	~1	95% expensed	res	eligible classes	0.9	$0.1303	0.7% \	$14.0	$403	3.5%
	1*	~1	95% expensed	c/i	eligible classes	4.4	$0.1047	4.2% /			
Eastern Edison	1*	~1	95% expensed	res	eligible classes	2.0	$0.1082	1.8% \	$8.0	$255	3.1%
	1*	~1	95% expensed	c/i	eligible classes	4.2	$0.0952	4.4% /			
Fitchburg Gas & Elec.	1*	~1	95% expensed	c/i	eligible classes	4.6	$0.0955	4.8%	$0.5	$38	1.3%
Mass. Electric	1*	~1	95% expensed	res	eligible classes	2.6	$0.0974	2.7% \	$66.9	$1,364	4.9%
	1*	~1	95% expensed	c/i	eligible classes	3.5	$0.0868	4.0% /			
Western Mass. Elec.	1*	~1	95% expensed	res	eligible classes	6.6	$0.1214	5.4% \	$17.0	$410	4.1%
	1*	~1	95% expensed	c/i	eligible classes	9.1	$0.0970	9.4% /			

* Conservation charges reflect one year's direct DSM expenditures plus, where applicable, lost revenues from installations over several years and incentives from previous

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Rhode Island -- 1993 & 1994 DSM											
Narragansett - '94	1	1	expensed	all	all classes	2.6	$0.1011	2.6%	$13.2	$454	2.9%
Newport Elec. - '93	1	1	expensed	all	all classes	2.0	$0.1107	1.8%	$1.9	$60	3.2%
'9	1	1	expensed	all	all classes	2.0	$0.1127	1.8%	$1.6	$60	2.7%
Blackstone - '93	1	1	expensed	all	all classes	1.6	$0.1078	1.5%	$3.4	$134	2.5%
'94	1	1	expensed	all	all classes	2.0	$0.1094	1.8%	$3.4	$134	2.5%
PSI (range: 1993-2012)	20	4	deferred expense	all	all classes	1.3	$0.0457	2.8%	$31.0	$1,120	2.8%
Detroit Edison - Locher & Toulson - '93 EPRI - Hypothetical scenarios @ Detroit Edison. ranges for 1996 - 2006											
large manufacturing	4-5	1	expensed	c/i	eligible classes	0.5	$0.0668	0.7%	$14.4	$3,561	0.4%
large manufacturing	4-5	1	expensed	c/i	eligible classes	0.2	$0.0668	0.2%	$15.0	$3,561	0.4%
large manufacturing	4-5	1	expensed	c/i	eligible classes	0.4	$0.0668	0.6%	$15.8	$3,561	0.4%
large manufacturing	4-5	1	expensed	c/i	eligible classes	0.3	$0.0668	0.4%	$33.8	$3,561	0.9%
large manufacturing	4-5	1	expensed	c/i	eligible classes	1.9	$0.0668	2.8%	$90.0	$3,561	2.5%
small mfg/ non mfg	4-5	5	capitalized*	c/i	eligible classes	5.7	$0.0787	7.2%	$90.0	$3,561	2.5%
small mfg/ non mfg	4-5	5	capitalized*	c/i	all classes	6.2	$0.0787	7.9%	$90.0	$3,561	2.5%
large mfg	4-5	5	capitalized*	c/i	eligible classes	1.8	$0.0668	2.7%	$90.0	$3,561	2.5%
large mfg	4-5	5	capitalized*	c/i	all classes	1.1	$0.0668	1.6%	$90.0	$3,561	2.5%
*only incentive cap'd; admin & incentive w/ effective life of 1 yr are exp'd											
Chamberlin, Herman & Wikler - The Electricity Journal, Nov '93 - Hypothetical scenarios											
I. Flat Rate Structure											
All TRC-Passing											
	30	measure life	levelized	res	eligible classes	4.7	$0.0530	8.8%			
	30	measure life	levelized	c/i	eligible classes	1.2	$0.0400	3.1%			
	30	measure life	levelized	all	all classes	2.6	$0.0460	5.7%			
Only RIM-Passing											
	30	measure life	levelized	res	eligible classes	1.0	$0.0530	1.9%			
	30	measure life	levelized	c/i	eligible classes	(0.9)	$0.0400	-2.2%			
	30	measure life	levelized	all	all classes	(0.0)	$0.0460	-0.1%			
RIM-Passing Pkg											
	30	measure life	levelized	res	eligible classes	1.0	$0.0530	1.8%			
	30	measure life	levelized	c/i	eligible classes	(0.8)	$0.0400	-2.0%			
	30	measure life	levelized	all	all classes	0.0	$0.0460	0.0%			
DSM Res. & C/I Strategy											
	30	measure life	levelized	res	eligible classes	4.0	$0.0530	7.6%			
	30	measure life	levelized	c/i	eligible classes	(0.6)	$0.0400	-1.4%			

Table A-1: Database of Rate Impact Information

Study	Years of DSM Exp.	# Recovery Years	Financial Treatment	Cust. Class	Cost Allocation	Avg./Midpt Rate Impact (mills/kwh)	Base for Comparison Rate($/kwh)	Avg./Midpt. Rate Impact as % CR	DSM Expense ($million)	Gross Revenues ($million)	DSM Expense as % GR
Chamberlin, Herman & Wikler continued											
II. Declining-Block Rate Structure											
All TRC-Passing											
	30	measure life	levelized	res	eligible classes	2.2	$0.0530	4.1%			
	30	measure life	levelized	c/i	eligible classes	(0.4)	$0.0400	-0.9%			
	30	measure life	levelized	all	all classes	0.7	$0.0460	1.5%			
Only RIM-Passing											
	30	measure life	levelized	res	eligible classes	1.1	$0.0530	2.0%			
	30	measure life	levelized	c/i	eligible classes	(1.1)	$0.0400	-2.8%			
	30	measure life	levelized	all	all classes	(0.1)	$0.0460	-0.3%			
RIM-Passing Pkg											
	30	measure life	levelized	res	eligible classes	1.4	$0.0530	2.6%			
	30	measure life	levelized	c/i	eligible classes	(1.1)	$0.0400	-2.8%			
	30	measure life	levelized	all	all classes	0.0	$0.0460	0.1%			
DSM Res. & C/I Strategy											
	30	measure life	levelized	res	eligible classes	1.6	$0.0530	3.1%			
	30	measure life	levelized	c/i	eligible classes	(0.8)	$0.0400	-2.1%			
Hirst - Nov '91- ORNL/CON-340 - Hypothetical scenarios -- utility pays 100% of DSM expenses											
Base Utility:											
DSM @ $.05/kWh	20	15	capitalized	all	all classes	0.8	$0.0650	1.3%			
DSM @ $.045/kWh	20	15	capitalized	all	all classes	0.5	$0.0650	0.7%			
DSM @ $.045/kWh	20	1	expensed	all	all classes	0.7	$0.0650	1.1%			
DSM @ $.04/kWh	20	15	capitalized	all	all classes	0.1	$0.0650	0.2%			
DSM @ $.03/kWh	20	15	capitalized	all	all classes	(0.5)	$0.0650	-0.7%			
Surplus Utility:											
DSM @ $.05/kWh	20	15	capitalized	all	all classes	3.3	$0.0650	5.0%			
DSM @ $.045/kWh	20	15	capitalized	all	all classes	2.5	$0.0650	3.8%			
DSM @ $.04/kWh	20	15	capitalized	all	all classes	1.6	$0.0650	2.5%			
DSM @ $.03/kWh	20	15	capitalized	all	all classes	0.6	$0.0650	0.9%			
Deficit Utility:											
DSM @ $.05/kWh	20	15	capitalized	all	all classes	0.9	$0.0650	1.4%			
DSM @ $.045/kWh	20	15	capitalized	all	all classes	0.4	$0.0650	0.6%			
DSM @ $.04/kWh	20	15	capitalized	all	all classes	(0.1)	$0.0650	-0.2%			
DSM @ $.03/kWh	20	15	capitalized	all	all classes	(0.7)	$0.0650	-1.1%			

Table A-2: Components of Industrial Costs

Industry	Cost per Dollar Shipped: Electricity	Fuel	Labor	Materials
Aluminum	$0.220	$0.008	$0.093	$0.733
Steel	0.040	0.038	0.125	0.632
Primary Metals	0.037	0.020	0.114	0.639
Stone, Clay and Glass	0.027	0.030	0.147	0.463
Textile	0.022	0.008	0.131	0.590
Paper	0.022	0.021	0.104	0.548
Rubber and Plastics	0.020	0.005	0.132	0.498
Chemicals	0.017	0.015	0.051	0.472
Wood Prod.	0.014	0.008	0.135	0.616
Fabricated Metal Products	0.012	0.005	0.150	0.510
Petrol. and Coal	0.009	0.015	0.018	0.838
Electric Equip.	0.009	0.002	0.101	0.454
Furniture	0.009	0.003	0.156	0.483
Misc. Manufacturing	0.008	0.003	0.119	0.465
Ind. Machinery	0.008	0.002	0.116	0.488
Instruments	0.007	0.002	0.092	0.340
Food	0.007	0.006	0.056	0.626
Printing	0.007	0.002	0.110	0.338
Leather	0.006	0.003	0.130	0.527
Transportation Equip.	0.006	0.002	0.095	0.576
Apparel	0.006	0.002	0.154	0.489
Tobacco	0.002	0.001	0.031	0.236
U.S. Totals	**$0.012**	**$0.007**	**$0.094**	**$0.532**

(Bureau of Census 1991)

Table A-3: DSM Expenditures as % of Net Plant Additions* for Investor-Owned Utilities with the Greatest 1991 DSM Expenditures						
	($ Million)				DSM as %	
Utility	1991 DSM Expenditures	Plant Additions	Plant Retirements	Net Plant Additions	Net Plant Additions	
Connecticut Light & Power	$81.6	$180.9	$65.1	$167.4	48.7%	*
Massachusetts Electric	53.7	70.2	13.4	110.5	48.6%	*
Narragansett Electric	18.6	34.8	6.4	46.1	40.4%	*
Puget Sound Power	42.1	141.1	13.9	127.2	33.1%	
Florida Power	58.6	245.7	54.6	191.1	30.7%	
Wisconsin Electric Power Co.	40.3	193.8	49.4	144.4	27.9%	
Carolina Power & Light	52.9	229.8	32.8	197.0	26.9%	
Long Island Lighting Co.	27.9	136.9	26.9	110.0	25.4%	
San Diego Gas & Electric	36.5	205.4	18.3	187.1	19.5%	
Consolidated Edison - NY	76.6	529.0	119.2	409.8	18.7%	
Niagara Mohawk	55.3	324.8	25.0	299.8	18.4%	
NY State Electric & Gas	24.6	158.1	17.9	140.2	17.5%	
Pacific Gas & Electric	150.4	951.0	73.5	877.5	17.1%	
Boston Edison	37.0	245.6	30.3	250.5	14.8%	*
So. California Edison	107.4	839.4	110.2	729.2	14.7%	
Union Electric (MO)	18.0	177.1	28.6	148.5	12.1%	
Florida Power & Light	72.0	1,039.0	118.4	920.6	7.8%	
Potomac Electric Power Co.	26.8	450.3	43.3	407.0	6.6%	
Virginia Electric & Power	27.2	595.4	96.3	499.1	5.4%	
Texas Utilities Electric	18.1	395.5	57.3	338.2	5.4%	
Public Service Electric & Gas	24.0	599.3	123.5	475.8	5.0%	
Duke Power	48.1	1,692.4	84.8	1,607.6	3.0%	

(EIA 1993) (Hirst 1993)

* Expensed DSM costs were added to Net Plant Additions where data were readily available.