KEY FACTORS RESPONSIBLE FOR CHANGES IN ELECTRIC-UTILITY DSM USAGE

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ACRONYMS

DSM	demand-side management
ECAR	East Central Area Reliability Coordination Agreement
EIA	Energy Information Administration
ERCOT	Electric Reliability Council of Texas
IRP	integrated resource planning
MAAC	Mid-Atlantic Area Council
NERC	North American Electric Reliability Council
NPCC	Northeast Power Coordinating Council
NUGs	non-utility generators
PUC	public utility commission

EXECUTIVE SUMMARY

INTRODUCTION

In light of recent and ongoing changes in the electric-utility industry, considerable attention has been focused on the question of how utility-sponsored demand-side management (DSM) programs will fare in a more competitive environment. Researchers at Oak Ridge National Laboratory and the American Council for an Energy-Efficient Economy surveyed staff at 37 electric utilities and 22 state regulatory commissions for the purpose of identifying recent and projected changes in utilities' use of DSM resources and the key factors responsible for this. In addition, we obtained and examined the latest responses to the Energy Information Administration's (EIA) annual census of electric utilities (Form EIA-861). Based on the EIA data, we intentionally chose a collection of states and utilities that provided a mix of those whose DSM use was increasing most rapidly and those whose reliance on DSM resources was declining most precipitously or growing most slowly, to help us discover the most important factors responsible for changing patterns of DSM usage. This work was sponsored by the Competitive Resources Strategy Program, Office of Utility Technologies, Office of Energy Efficiency and Renewable Energy, U.S. Department of Energy.

We developed and tested seventeen hypotheses describing possible relationships between many different explanatory variables and changes in the use of DSM resources. Key factors that we examined included general motives for DSM usage, competition for customers, concern with rates, provision of services, utility characteristics, and state regulations. Recent changes in DSM usage were measured in terms of how DSM expenditures, cumulative energy savings, and cumulative peak demand reduction had grown (or declined) from 1992 to 1994, while changes for the near-term future were measured by how these same items were projected to change from 1994 to 1998.

KEY FINDINGS

Between 1992 and 1994, the median annual growth rate for utility DSM expenditures was 16% for the utilities studied and 11% for the states. In contrast, the median utility projected an annual *decline* in DSM expenditures of 3% for 1994–1998, while the median state growth rate was projected to be 1.5% annually. The growth rate in cumulative energy savings also is expected to be substantially less in the near-term future than it was in the recent past, but the decline in growth will not be as dramatic as for DSM expenditures. In contrast, the projected growth rate in cumulative peak demand reductions will come much closer to matching the recent historical record than will either DSM expenditures or energy savings. These changes are shown graphically in Fig. ES.1.

In general, utilities reported that their programs will change over the next few years in ways designed to make them more cost-effective and service-oriented.

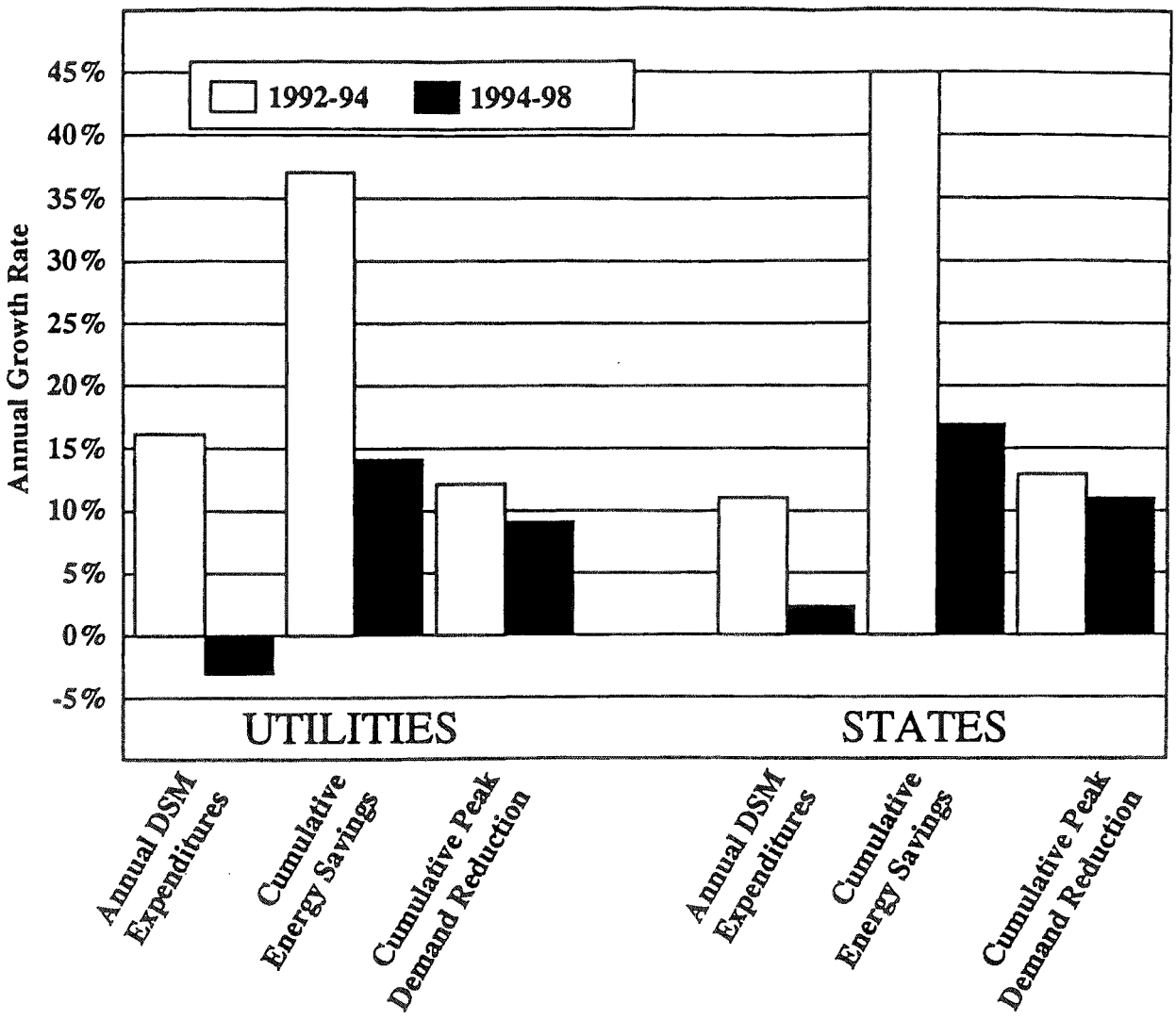

Fig. ES.1. Annualized median changes in DSM usage.

Specifically, utilities will put less emphasis on rebates and direct installation of DSM measures and more emphasis on a variety of other approaches, including: recovering program costs from participants, providing financing, shared savings programs, and market transformation. Very small increases are projected in the emphasis on commercial and industrial DSM programs, and the emphasis on residential programs is expected to decrease.

A strong utility emphasis on providing DSM program financing and shared savings programs was associated with lower levels of DSM spending growth in the recent past. For the near-term future, an increasing emphasis on rebates as well as on commercial and industrial programs is associated with greater projected growth in DSM expenditures.

In addition, higher rates of growth in the use of DSM resources are likely to be found among those utilities attributing greater importance to the results of their integrated resource planning efforts, while utilities whose DSM decisions are more heavily influenced by considerations of their financial gain will tend to have slower growth in the use of DSM resources.

Utilities and states anticipating minimal growth in the use of DSM resources very frequently attributed this to their anticipation of increased competition, and we found that the actual or threatened loss of customers to a variety of competitive pressures frequently was related to lower rates of growth in DSM usage. However, it appears that the loss of customers could, in some instances, stimulate utilities to spend *more* on DSM in order to induce remaining customers to stay on the system. This study did not establish a clear or consistent relationship between changes in the use of DSM resources and the desire to avoid rate increases, but we did find that utilities whose retail rates were high relative to those of nearby utilities generally projected greater near-term increases in their DSM usage than did other utilities. Likely reasons for this are that utilities with high rates offered more DSM programs in order to allow their customers to reduce their electric bills and that more DSM measures would be cost-effective for high cost utilities.

A number of respondents reported that avoided costs had dropped substantially in recent years, making fewer DSM measures cost-effective and leading to less investment in demand-side resources. We were also told that DSM usage became less attractive where excess capacity existed. The latter was supported to some extent by our statistical analysis, which found greater growth in DSM expenditures in those states where there was a near-term need for new peaking resources.

Utilities with a history of aggressive DSM usage tended to have less growth in their use of DSM resources in the recent past and near-term future than did later entrants into the DSM arena, indicating that utilities with well-established DSM portfolios may be "peaking out" in their use of these resources. We also found that some state regulations—like financial incentives for utilities and integrated resource planning requirements—continue to be associated with increased use of DSM resources, while the effects of others—most notably lost revenue recovery requirements and environmental externality regulations—appear to be changing over time. This could indicate that many of the utilities governed by the latter regulations had aggressively pursued DSM resources for a number of years and now have less capacity for DSM growth than do other utilities, but it also could reflect lessening support for DSM as a result of increasing competitive pressures.

Based on the findings presented in this report and recommendations made by utility and state respondents, we recommend a number of actions to ensure that future DSM services provided by utilities are beneficial to all parties involved. DOE, state regulators, and public interest groups should identify and disseminate information on successful and proven programs of the kinds (e.g., financing, shared savings) that utilities

are most interested in today. The same parties should track promising innovative programs that are still in the pilot phase or just beginning full-scale operation and subsequently publicize and promote program designs that prove successful. To ensure that the benefits of the DSM programs provided by utilities are equitably spread among customer classes, state regulators should encourage utilities to provide a mix of programs that does not emphasize commercial and industrial customers at the expense of the residential sector. And each state regulatory agency should examine its commitment to the use of energy-efficiency and load management programs, decide how this fits into today's more competitive electric industry environment, and take regulatory actions that are consistent with their DSM-related objectives. Finally, state regulators should focus substantial attention on utilities that continue to have room to add energy-efficiency and load management programs that are cost-effective according to the test(s) favored by the regulatory agency, while continuing to support the efforts of utilities that are leaders in the DSM field.

1. INTRODUCTION

BACKGROUND

The electric utility industry is in the midst of substantial changes, many of which are still not fully understood. While competition for customers is becoming a more immediate concern for many utilities, the consequences of such competition are uncertain. One question that has commanded considerable attention is how utility-sponsored demand-side management (DSM) programs[1] will fare in a more competitive environment (Hirst 1994; Chamberlin, Collins, and Shaffer 1995; Faruqui, Wikler, and Chamberlin 1995; Geller, Nadel, and Pye 1995; Hadley and Hirst 1995; Ignelzi and Mast 1995; Messenger and Shapiro 1995). There has been speculation that the heightened concern with competition and with keeping electricity rates low will lead—or perhaps already has led—utilities to back away from the aggressive pursuit of DSM resources. To shed more light on recent and likely changes in the DSM arena, researchers at Oak Ridge National Laboratory and the American Council for an Energy-Efficient Economy conducted a study using the most current information available to identify changing patterns of DSM usage in the electric-utility industry and the factors responsible for those changes. This work was sponsored by the Competitive Resources Strategy Program, Office of Utility Technologies, Office of Energy Efficiency and Renewable Energy, U.S. Department of Energy.

In early 1995, we surveyed staff at 37 electric utilities and 22 state regulatory commissions for the purpose of identifying recent and projected use of DSM resources by electric utilities and the reasons for any changes in their reliance on DSM. The focus of the study was on *utility* actions and the factors responsible for it, but both utility and state sources were used in order to get utility *and* state perspectives on this topic. We conducted interviews with knowledgeable personnel at the participating organizations, and the same respondents also completed written surveys covering this subject area in more detail.[2] In addition, we obtained and examined the latest responses to the Energy Information Administration's (EIA) annual census of electric utilities (Form EIA-861). We intentionally chose a collection of states and utilities that provided a mix of those whose DSM use was increasing most rapidly and those whose reliance on DSM resources was declining most precipitously or growing most slowly. The utilities and states that we studied are listed in Table 1.1 and their locations are shown in Fig. 1.1.

RESEARCH METHODS

The 37 utilities that we studied were selected from those having 1993 DSM expenditures of at least $5 million, in order to focus on those utilities putting substantial

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[1] DSM, as used in this report, refers to utilities' energy efficiency and load management programs, but does not include their load building efforts.

[2] Of the 37 utilities studied, 35 of them participated in the personal interviews *and* completed written surveys. One utility only participated in the personal interview, and another returned the written survey but was not interviewed. For all 22 states, interviews were conducted *and* completed surveys were received.

Table 1.1. Utilities and states studied

Utilities	States
Baltimore Gas and Electric Company	California
Bonneville Power Administration	Colorado
Boston Edison Company	Connecticut
Carolina Power and Light Company	Georgia
Central Maine Power Company	Hawaii
Central Power and Light Company	Indiana
Consolidated Edison Company of New York	Iowa
Dayton Power and Light Company	Maine
Duke Power Company	Maryland
Eastern Edison Company	Massachusetts
Georgia Power Company	Michigan
Idaho Power Company	Montana
Iowa Electric Light and Power Company	New Hampshire
Midwest Power Systems, Inc.	New York
Montana Power Company	North Carolina
New York State Electric and Gas Corporation	Ohio
Niagara Mohawk Power Corporation	Oklahoma
Northern States Power Company	Oregon
Ohio Edison Company	Texas
Orange and Rockland Utilities, Inc.	Virginia
Pacific Gas and Electric Company	Washington
PacifiCorp	Wisconsin
Potomac Electric Power Company	
PUD Number 1 of Snohomish County	
Puget Sound Power and Light Company	
Sacramento Municipal Utility District	
Seattle City Light	
South Carolina Public Service Authority	
Southern Indiana Gas and Electric Company	
City of Tacoma	
Tampa Electric Company	
Texas Utilities Electric Company	
United Illuminating Company	
United Power Association	
Wisconsin Electric Power Company	
Wisconsin Power and Light Company	
Wisconsin Public Service Company	

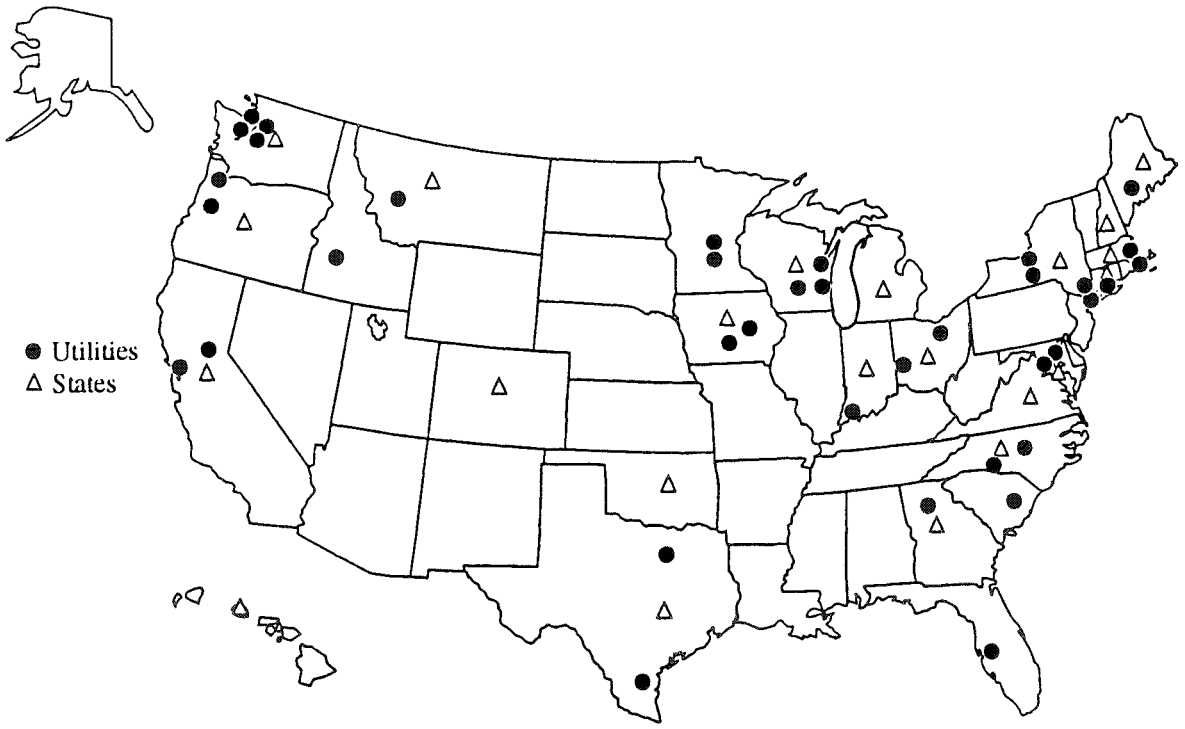

Fig. 1.1. Location of utilities and states studied.

emphasis on the use of DSM resources. As shown in Fig. 1.1, these utilities primarily were located along the east and west coasts and in the industrial midwest. The states that we examined were selected from *all* states, primarily because nearly all states had aggregated DSM expenditures of $5 million or more. Taken together, the 1993 DSM expenditures of the 37 utilities accounted for 51.9% of all DSM expenditures made by U.S. utilities in 1993 and the retail sales of these utilities represented 27.6% of total retail sales. The 22 states accounted for 71.3% of the money spent on DSM by U.S. utilities and 57.3% of total retail sales.

The utilities and states that we studied are *not* representative of all U.S. utilities and states, or even those with the greatest commitment to the use of DSM resources, because the entities selected come from both extremes of the continuum describing growth in DSM usage. Roughly half were taken from those utilities and states having the most rapid growth in the use of DSM resources and roughly half from those whose DSM efforts are declining most rapidly or growing most slowly.[3] However, our description of changing patterns of DSM usage, while not strictly representative, is drawn from those utilities and states that—between them—are responsible for a majority of this country's

[3]A number of different measures calculated from Form EIA-861 were used to characterize utilities and states as to their rate of DSM growth. These factors were: the change in actual DSM expenditures from 1992 to 1993 and the projected change in DSM expenditures from 1993 to 1998; recent and projected changes in DSM-induced energy savings; and recent and projected changes in peak demand reduction. Together, these measures gave a holistic picture of the growth in DSM usage for each utility and state considered for this study.

DSM expenditures. And, more importantly, an analysis of the utilities and states that we studied does a good job of revealing relationships between changing patterns of DSM usage and the factors influencing this, because we examined those utilities and states displaying the greatest amounts of DSM growth and decline.

We conducted brief personal interviews with utility and state personnel, focusing on the nature of recent and projected changes in utility DSM usage and the factors that account for these changes. We also asked the respondents to identify any new and innovative programs with which they were involved and to suggest possible actions that could be taken to encourage continued utility use of cost-effective DSM. Most of these interviews were conducted by telephone, but we did conduct face-to-face interviews during site visits to four utilities and three state regulatory agencies. The oral protocol used to structure the personal interviews with utilities—which is basically the same as the protocol used in the state interviews—is shown in Appendix A.

We elicited more detailed information from the utilities and states through the use of a *written* data collection protocol. The form that we sent to all subjects asked for information on recent and planned changes in DSM program types and on a number of possible reasons for changes in utility use of DSM resources. In addition, the written protocol sent to utilities (Appendix B) asked for updated data on recent and projected DSM usage, addressing the same topics covered by Form EIA-861 (EIA 1993). We did not request detailed information of the states concerning the aggregated DSM usage of all their jurisdictional utilities because the states typically do not have more recent data than that provided by EIA. Instead, we used the most recent EIA-861 data to calculate aggregated state level DSM usage for the participating states.[4] These data, which were provided by utilities in Spring 1994, are approximately nine months less current than the information provided directly to us by the surveyed utilities regarding their use of DSM resources, a fact which almost certainly contributes to differences between the utility and state data sets.

We developed seventeen hypotheses describing possible relationships between various explanatory factors and changes in the use of DSM resources (Appendix C), and tested all of them for the utility and state data sets separately, using regression analysis. We also ran correlation analyses to look for correlations between changes in DSM program types and the use of DSM resources. In all our analyses, we used a number of different measures to represent change in the use of DSM resources. Recent changes in DSM usage were measured in terms of how DSM expenditures, cumulative energy savings, and cumulative peak demand reduction had grown (or declined) from 1992 to 1994. Changes for the near-term future were measured by how the same three items were projected to change from 1994 to 1998. Appendix D presents a detailed discussion of *all* findings from our statistical analysis. It should be noted that a relationship between

[4]In those instances where a single utility sold electricity in multiple states, we assumed that the distribution of DSM expenditures by state was the same as the distribution of retail electricity sales reported on Form EIA-861.

a given explanatory factor and a measure of change in DSM usage does not prove that the former *caused* the latter, although that could be the case.

SCOPE OF REPORT

In the remainder of this report, we present detailed information on changing patterns of utility DSM usage and on the factors that potentially influence it. Chapter 2 describes recent (1992–1994) and projected (1994–1998) changes in DSM expenditures, energy savings, and peak demand, and depicts the changing emphasis on various program types and customer classes as reported by the utilities and states studied. Chapter 3 discusses a number of important factors that could help explain the observed changes: general motives for DSM usage; competition for customers; concern with rates; provision of services; utility characteristics; and state regulations. This chapter also identifies the key relationships that we found between these factors and changes in DSM usage. Finally, Chapter 4 condenses and interprets the key findings presented in the preceding chapters and concludes with recommendations for actions that state and federal governments and other interested groups can take to ensure that utility-sponsored DSM programs are beneficial to all parties involved.

2. CHANGING PATTERNS OF UTILITY DSM USAGE

The past year has been admittedly turbulent for utilities; however, reports of the death of DSM have been greatly exaggerated (Hirst and Hadley 1994). To illustrate how utilities' DSM plans have changed over the last year, we compared utilities' responses to our survey (early 1995) with projections they made nearly a year earlier when completing Form EIA-861 (Spring of 1994). Over this period, the median utility scaled back its DSM spending intentions by 5.6% for 1994 and 14.4% for 1998. Despite lower DSM spending, the median utility did not scale back its energy savings for either 1994 or 1998. The median value for demand reductions, however, shows that most utilities adjusted their expected effects downward, especially for 1994. Table 2.1 details both the mean and median values of the percent change in utilities' DSM intentions between Spring 1994 and early 1995. Where the mean value is substantially higher (or lower) than the median, it indicates the presence of unusually large (or small) outlying values. For this reason, we believe that the median provides a better measure of central tendency for these variables.

Table 2.1. Percent Change in DSM Intentions: Early 1995 vs. Spring 1994

DSM Variable	Median	Mean
1994 Expenditures/Budget	-5.6%	-3.0%
1998 Expenditures/Budget	-14.4%	-12.1%
1994 Energy Savings	0.0%	+5.7%
1998 Energy Savings	0.0%	+0.7%
1994 Demand Reduction	-5.2%	+0.7%
1998 Demand Reduction	-1.0%	-8.7%

Since we initiated our study, the utility industry has continued to experience substantial changes. Several utilities, for example, have gained widespread attention due to their dramatic reductions in DSM expenditures. Two of these utilities—Bonneville Power Administration and Consolidated Edison Company of New York—were included in this study, although the large spending cuts that drew national attention were made *after* we collected data from them. Two other utilities—Detroit Edison Company and Consumers Power—also recently reported substantial cuts in their DSM programs, but we did not include them in this study because the reductions were announced well after our work was underway.

DSM EXPENDITURES[5]

Recent Trends: 1992–1994

In 1992, the 37 utilities that we studied spent between 0.2% and 8.3% of their revenues on DSM, with the median utility spending 2.3% of its revenues on DSM[6]. From 1992 to 1994, utilities indicated a median increase in DSM spending of 16% per year. Except for one utility whose DSM expenditures grew at an annual rate of 182% during this period, the utilities showed annual changes in DSM expenditures ranging from a 54% decline to a 78% increase. For perspective, out of the 31 utilities providing usable data on this item, 21 increased their annual DSM expenditures and 10 decreased expenditures between 1992 and 1994. We found no statistically significant correlation between 1992–1994 growth in DSM expenditures and the growth during this same period of either energy savings or peak reduction.

The 22 states that we studied indicated that in 1992, DSM spending represented 1.4% of their state's median utility revenues, ranging from 0.1% to 7.1%. In the next two years, states indicated an annual median increase of 11% in DSM spending. Except for one state whose spending grew 169% per year, the states' annual change in DSM spending ranged from a decline of 20% to an increase of 106%. Thirteen states indicated increasing DSM spending, and nine indicated decreasing spending during this two-year period. As with the utilities, growth in 1992–1994 DSM expenditures by the states was *not* found to be significantly correlated with the growth in energy savings or peak demand reduction during this period.

Projections: 1994–1998

As compared to the significant growth in DSM spending observed over the last two years, both utilities and states projected a scaling back of DSM expenditures (Fig. 2.1). Between 1994 and 1998, the median utility that we studied anticipated a decline in DSM spending of three percent per year. Projected annual changes in spending ranged between a 22% decline and a 16% increase. Twenty utilities provided projected spending data, and 14 of them anticipated declining DSM expenditures while six projected rising DSM expenditures. We found that projected growth in DSM expenditures was *not* significantly correlated with growth in energy savings or peak reduction during the same time frame.

The states that we studied projected a median annual increase in DSM spending of 1.5% during this four-year period. Annual changes in spending ranged between a 10%

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[5]Throughout this report, percent change in DSM spending, energy savings, and peak reduction reflect our survey data (early 1995) for utilities and EIA data (Spring 1994) for states, since these are the most current data available for each.

[6]For nearly all the utilities and for all the states, "revenues" refers to *retail* revenues. However, *total* revenue is used when calculating normalized expenditures for three utilities that make the majority of their sales to wholesale customers.

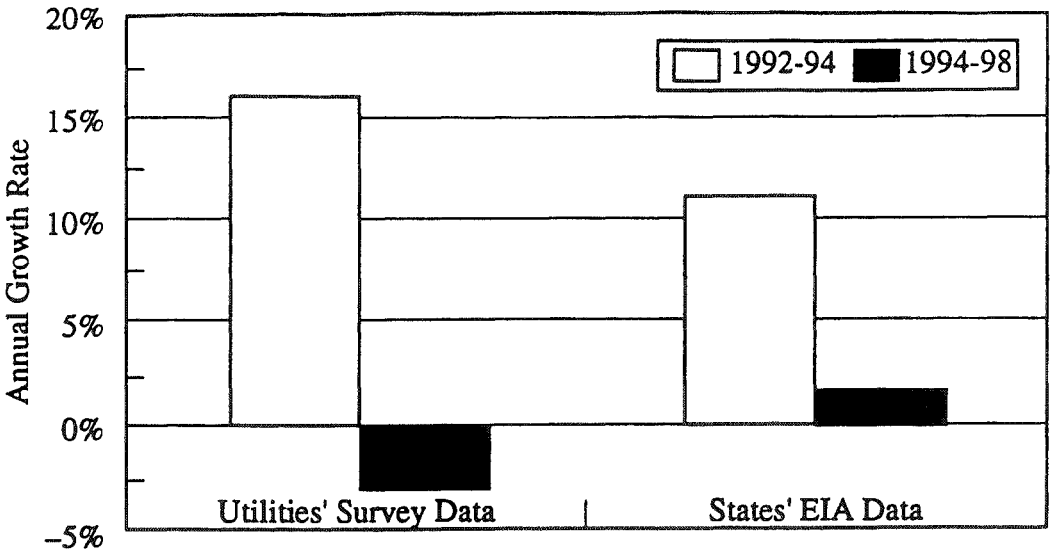

Fig. 2.1. Annualized median change in DSM spending.

decrease and a 20% increase for all but one state. The outlier, which projected a 140% annual increase in DSM spending, is in the initial growth phase of DSM. Of the 22 states studied, eight projected decreases in DSM spending over the next four years and 14 projected increases in spending. It is important to note, however, that the state data were provided in Spring 1994, and that information provided nine months later by our utilities indicates a downward adjustment in actual and projected expenditures. It is highly probable that this nine-month lag contributes substantially to the fact that the states, on average, projected higher rates of growth on almost every measure of change in DSM usage than did the utilities.

We found that, for the states, growth in projected DSM expenditures was positively correlated with projected growth in peak reduction for that same period. This means that states whose utilities projected relatively high growth in DSM expenditures from 1994 to 1998 also tended to anticipate relatively high rates of growth in peak demand reduction.

ENERGY SAVINGS

Recent Trends: 1992–1994

From 1992 to 1994, the median increase in annual energy savings from cumulative DSM measures grew at the rate of 37% per year. Only one utility indicated a decline in cumulative energy savings, with the balance of utilities ranging up to a 169% annual savings increase. We found a substantial positive correlation between recent growth in energy savings and growth in peak demand reduction for that same time period, meaning that utilities with relatively high growth in one of these DSM-related effects tended to have relatively high growth in the other.

In comparing spending and savings figures, one should keep in mind that spending figures reflect *annual* spending and savings figures reflect *annual savings from cumulative DSM measures*—as opposed to incremental savings related directly to that year's spending. In other words, as long as there is some productive DSM activity and there is no degradation of savings from prior years' DSM investments, one would expect annual energy savings from cumulative measures to increase. Also, as utilities' DSM efforts mature, they accumulate a larger base of savings from prior years' DSM (making the denominator larger when calculating percent increase in cumulative savings), making it more difficult to sustain progressively larger increases in annual savings from cumulative measures.

The states that we examined reported a 45% median annual increase in cumulative energy savings between 1992 and 1994. All states showed an increase in cumulative energy savings, ranging between 7% and 89%, except for one outlier that indicated a 147% annual increase in cumulative savings. We found no statistically significant correlation between 1992–1994 growth in energy savings and the growth during this same period of DSM-induced peak demand reduction.

Projections: 1994–1998

Projected annual growth in energy savings from 1994 to 1998 was less than two-fifths the growth rate during the robust 1992–1994 period (Fig. 2.2). For the period 1994 to 1998, 22 of the 37 utilities that we studied provided projections of annual energy savings from cumulative DSM measures. The median growth rate was 14% per year over this four-year period, far below the 37% reported for 1992–1994. All utilities reporting these data indicated growth in cumulative energy savings, ranging from 2% to 38% per year. We found that growth in projected energy savings was strongly correlated with projected growth in peak demand reduction.

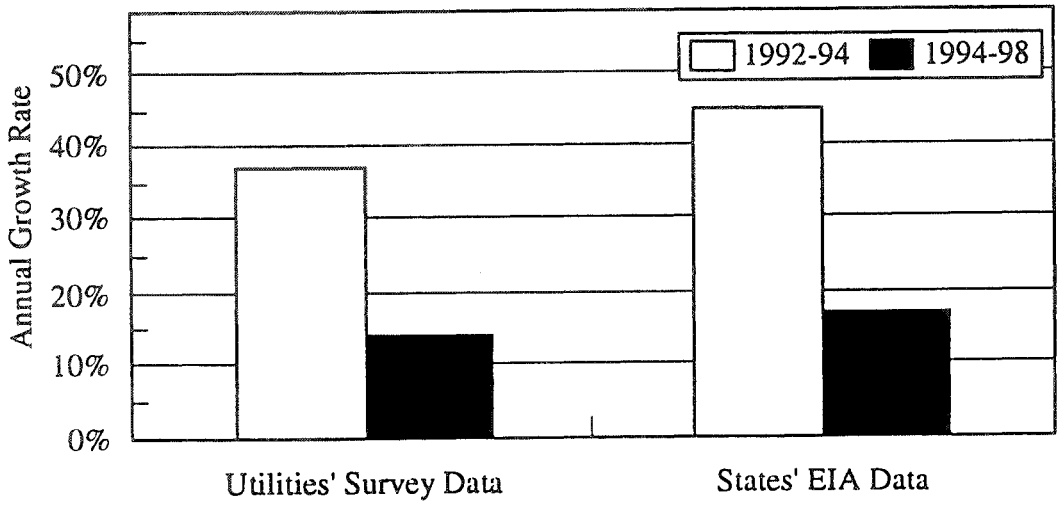

Fig. 2.2. Annualized median change in energy savings.

All but one state of the 22 indicated growth in cumulative energy savings. The median annual growth rate was 17%. Growth rates ranged from negative 3% to 41% for all but one state, which projected that cumulative energy savings would almost double each year during this four-year period. As with the utilities, a positive correlation was found between growth in projected state energy savings and projected growth in peak demand reduction.

PEAK DEMAND REDUCTIONS

Recent Trends: 1992–1994

The utilities that we studied reported that median cumulative peak reductions grew 12% per year between 1992 and 1994. Of the 29 utilities for which these data were available, only six reported a decline in peak reductions. All but one utility fell within a range between a 30% annual decrease and a 75% annual increase in peak reductions. The outlier reported a 190% annual increase in peak reductions. Again, it is important to keep in mind that when comparing spending and peak reduction figures, spending figures reflect *annual* spending and peak reduction figures reflect *annual reductions from cumulative DSM measures* as opposed to incremental savings related directly to that year's spending.

Between 1992 and 1994, the median annual growth rate in cumulative peak reductions for the states that we examined was 13%. Except for one state that reported 73% annual growth in cumulative peak reductions, the change in peak reductions ranged from negative 11% per year to positive 39% per year. All but four states showed an increase in peak reductions.

Projections: 1994–1998

Although projected growth in peak reduction was scaled back from the 1992–1994 period, it was scaled back much less than were spending and energy savings projections (Fig. 2.3). Projected annual growth in peak reduction was down 25% for utilities and 15% for states as compared to the prior two years. Twenty-one utilities provided projections of cumulative peak reductions, ranging from zero to 20% annual growth. The median annual growth rate for peak reductions was nine percent during this four-year period.

For the period 1994–1998, the median annual growth rate in cumulative peak reductions for the states was 11%. All but one state projected growth in peak reductions from DSM. Annual change in peak reductions ranged from negative 2% to positive 33%.

PROGRAM TYPES

In our survey, we asked how utility emphasis on various program types had changed since 1992 on a scale of one to five (1 = large decrease, 2 = moderate decrease, 3 = no

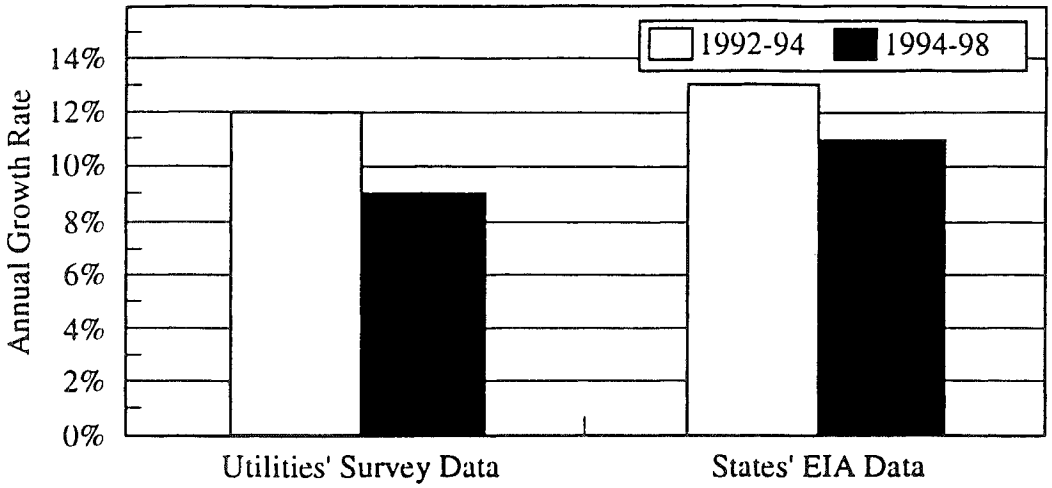

Fig. 2.3. Annualized median change in peak demand reduction.

change, 4 = moderate increase, and 5 = large increase). We looked at change in emphasis on 11 factors:

- Rebates
- Direct installation of DSM measures
- Leasing equipment
- Providing financing
- Shared savings
- Recovery of program costs from participants
- Market transformation
- Rate discounts
- Energy efficiency
- Load management
- Load building

On this and all other five-point questions, we report the mean response rather than the median, which we emphasized previously. This is because the median response typically is an integer while the mean is not, allowing us to more clearly identify differences among the various items. Also, we are not in danger of getting a skewed mean due to the presence of extreme outliers, as we were on the variables described earlier, where the possible responses were open-ended rather than scaled.

Recent Trends: 1992–1994

The average ranking by both utilities and state commissions for all of these factors fell within a narrow range (2.8–3.6) indicating no strong differences in how program type preferences had changed between 1992 and 1994. Only rebate programs fell below the "no change" ranking, indicating a slight decrease in emphasis on rebate programs in the recent past. On average, direct installation programs showed "no change" for this period by both utilities and states. Overall, emphasis on all other DSM program types increased slightly in the recent past, with the greatest increase in importance occurring in financing programs for utilities (3.6) and market transformation programs for states (3.6).

For the utilities studied, we found a significant negative correlation between the 1992–1994 change in emphasis on providing DSM program financing and growth in DSM expenditures during that same period. This means that utilities with a growing emphasis on providing DSM financing for their customers tended to have less growth (or greater decline) in their DSM spending than did other utilities; this makes sense because the provision of loans to customers typically costs less than do many other DSM program approaches. Similarly, we found that recent change in emphasis on shared savings programs was negatively correlated with 1992–1994 growth in DSM expenditures. Once again, this is not surprising because such programs tend to be less expensive than some of the others that are available to utilities.

For the states, the 1992–1994 change in emphasis on shared savings programs was negatively correlated with recent growth in energy savings. Also, those states that recently increased their emphasis on market transformation programs tended to have less growth in peak demand reduction than did other states. A possible explanation of the latter relationship is that an emphasis on transforming the market so that it provides more energy-efficient products tends—to some extent—to replace utility efforts to directly provide DSM services to their customers.

Projections: 1994–1998

When utilities and state commissions were asked how they anticipated the emphasis on these program types to change over the next five years, preferences became apparent; the average ranking of program types spanned a much wider range (1.7–4.3). Both utilities and states projected that, on average, the emphasis on rebates, direct installation, and energy-efficient programs would decrease as compared to the recent past. We observed an increase in emphasis on program types involving recovery of program costs from participants, load building, providing financing, market transformation, rate discounts, leasing equipment, shared savings, and load management. Many of these same changes have been noted or suggested by other electric-industry observers (Cleveland and Rose 1995; Meagher and Blevins 1995; Geller, Nadel, and Pye 1995; Nadel 1995). Figures 2.4 and 2.5 compare the change in importance of program type as reported by utilities and states, respectively.

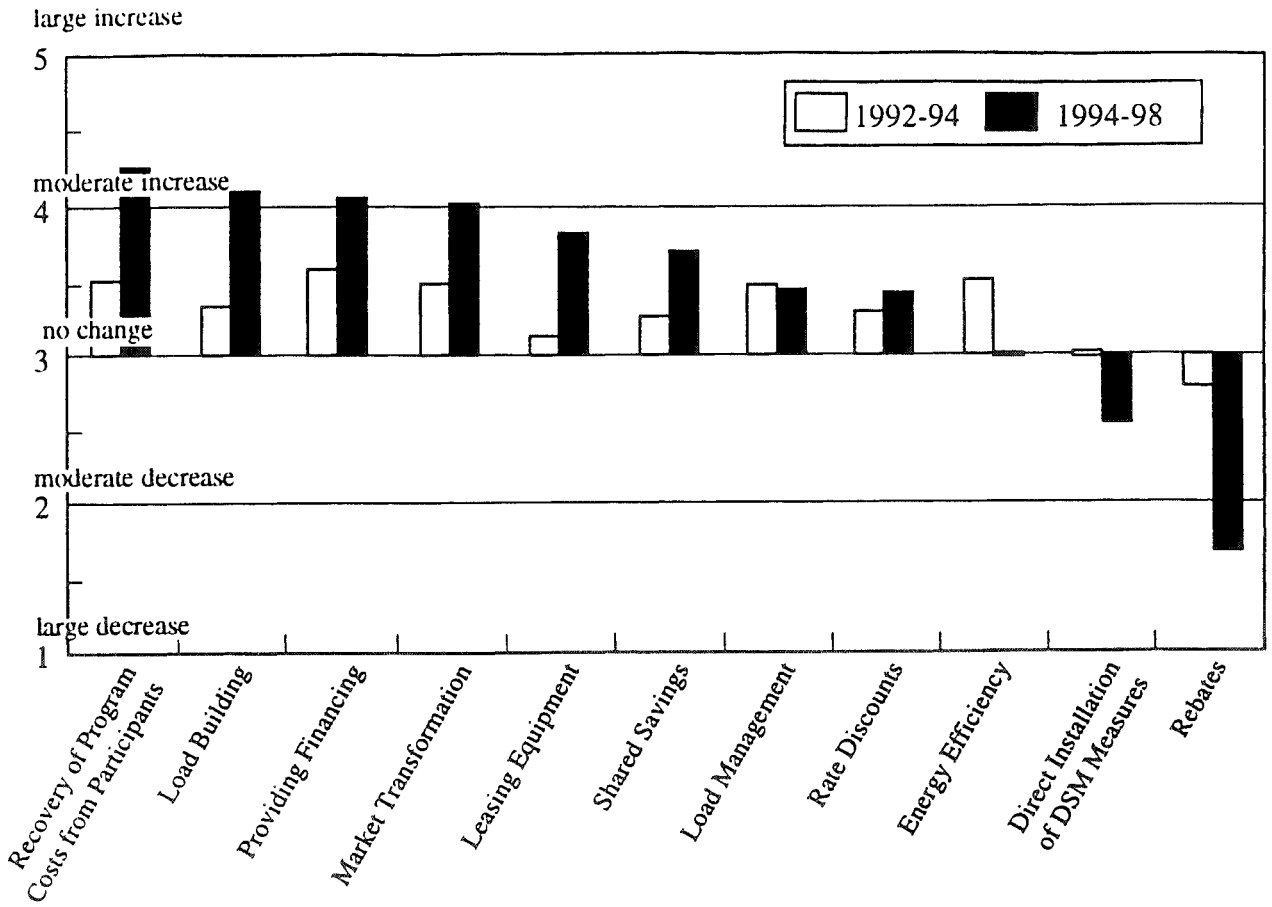

Fig. 2.4. Change in importance of program type for utilities.

These data were supported by information gathered in our oral interviews, in which the majority of respondents indicated that program types will change in ways that will make them more cost effective. More cost-effective approaches mentioned included: reducing rebates and subsidies; and increasing shared savings, cost responsibility of the customer, financing/leasing approaches, market transformation, and education and information programs. Another overriding theme regarding the direction in which DSM is heading is the indication that DSM will become more service oriented rather than resource oriented. Even those utilities that anticipate increases in DSM plan to do it more cost effectively and have heightened interest in customer service.

We found that responding utilities' projected 1994–1998 change in emphasis on recovery of program costs from participants was positively correlated with growth in energy savings for that same period. This could indicate that utilities that choose to minimize their costs by having the participating customers pay for the program are more willing to provide extensive energy savings programs than are utilities whose direct costs would be greater.

For the states, the projected change in emphasis on rebates for 1994–1998 was positively correlated with projected growth in DSM expenditures for that same period. This

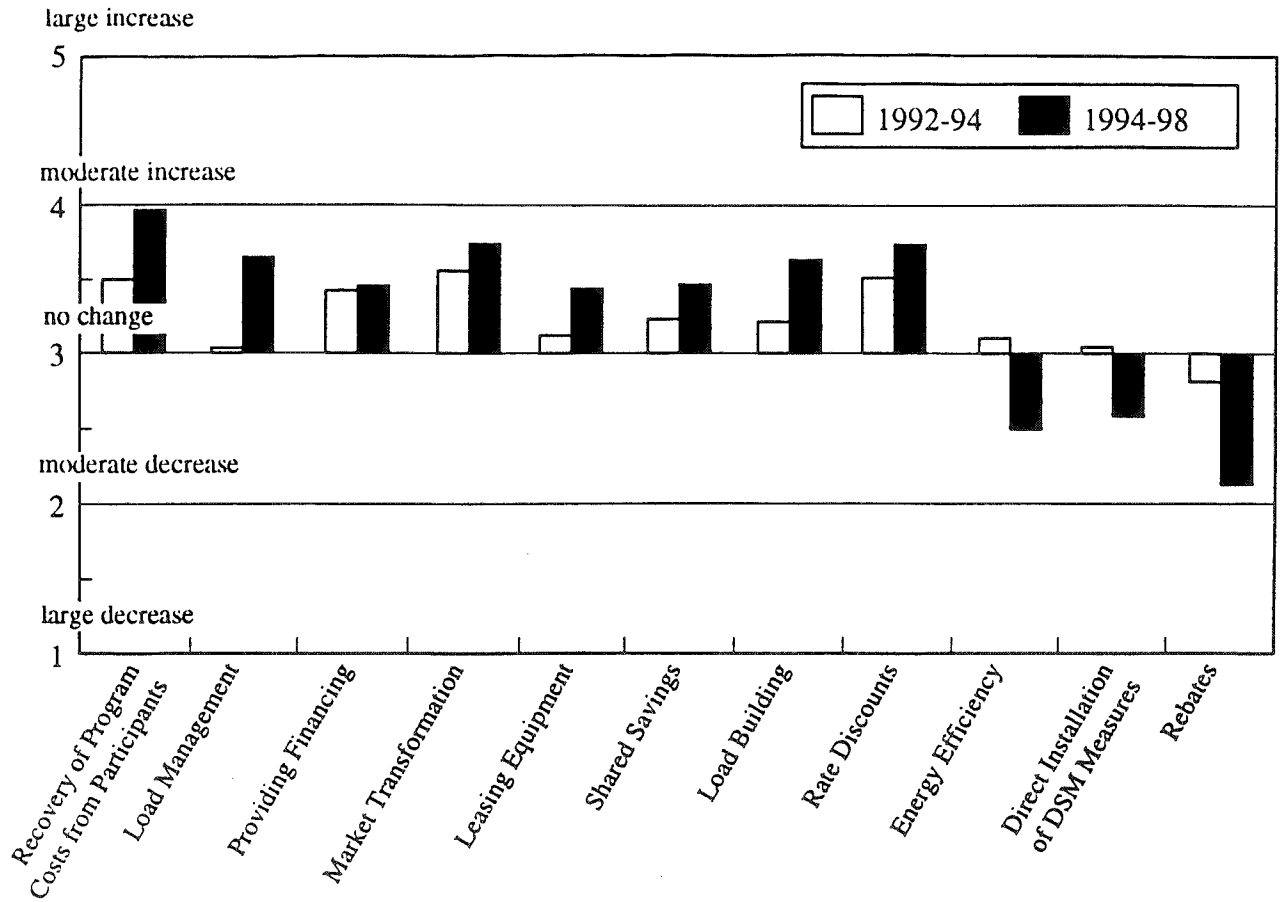

Fig. 2.5. Change in importance of program type for states.

means that states that anticipated a greater future emphasis on rebates also expected to experience greater growth in their DSM spending, and that makes sense in light of the relative costliness of rebate programs. Greater projected emphasis on rate discounts in the coming years was negatively correlated with projected state growth in DSM expenditures and energy savings during that same time frame. This could mean that utilities that intend to use rate discounts are doing so for the purpose of maintaining or increasing sales, and that these desired outcomes are not seen as compatible with the aggressive pursuit of conservation-oriented DSM programs. The projected change in emphasis on energy efficiency in general was positively correlated with future growth in peak reduction. Apparently, the states' energy-efficiency efforts are expected to spill over into the peak reduction area.

Innovative Programs

In our oral interviews we also asked utilities and state commissions to describe any innovative DSM programs designed to respond to competitive pressures. Most innovative programs or program types mentioned focused on minimizing costs and/or providing customer service. Many indicated that these types of programs are not done so much in

response to competition as just to keep costs down as a part of good business practices. Programs that focus on peak reduction and minimizing transmission and distribution costs are especially important to those utilities facing an impending need for capital outlays to accommodate growth in demand. Utilities also hope to retain customers by helping them cut costs—offering programs that are so valuable to the customer that the customer will pay for the services. This overriding attitude/direction of programs encompasses most of the program types that showed an increase in emphasis in the written surveys, including: recovery of program costs from participants, providing financing, market transformation, leasing equipment, and shared savings.

Several respondents mentioned an increased interest in innovative rate programs (e.g., real-time pricing, time-of-use, interruptible rates). These types of programs allow the utility to price electricity on the margin, keeping rates low for large industrial customers to the extent that they can shift their load or be flexible about when they can take power. Respondents believe that these programs are cost-effective, have a much greater effect on load reduction than other types of DSM, and could ultimately lower rates by working to level demand peaks and valleys.

Many respondents indicated that they could not discuss details of their programs because they are proprietary. Highlights of innovative programs mentioned include:

- In the "Fast Track Financing" program, the utility sets up an agreement with banks in advance so that financing agreements with customers can go into effect very quickly.

- In a customized energy management program, customers propose energy-efficiency plans, the utility studies them and they share implementation costs.

- The "Whole house program" is implemented through local heating and cooling contractors who provide energy-efficient services to customers. They are trained and certified by the utility to do audits and then provide some of those services; costs are subsidized to some extent by the utility. It is a business for the contractor, who is paid by the customer, but the utility still gets exposure from this and builds loyalty from local small businesses and customers.

- One utility is leasing small (2-10 megawatt) backup generators, which allows the utility to offer a lower, interruptible rate. In a "generator-assistance program," customers with back-up generators will be given a credit if they use their generator when notified by the utility. At these times, the customer is using its back-up power instead of the utility's power, therefore reducing the utility's peak demand at critical moments.

- Several respondents mentioned commercial and industrial programs that take advantage of otherwise lost opportunities, such as new construction efficiency installations and customized retrofits that coincide with customers' scheduled

equipment replacement. These programs are not designed specifically in reaction to competition, but they take advantage of the most cost-effective DSM opportunities.

- A state energy center is helping fund the "Total Assessment Audit," whereby the utility does an audit for a customer in terms of waste stream, production, and energy efficiency and identifies measures that can improve the customer's situation.

CUSTOMER CLASSES

In our written survey, we asked utilities and state commissions how the emphasis on DSM programs for residential, commercial, and industrial customer classes had changed since 1992 and what changes are anticipated over the next five years. Again, we asked respondents to use the five-point scale described earlier.

Recent Trends: 1992–1994

Since 1992, both utilities and states indicated a slight increase in emphasis on DSM programs for commercial and industrial customers; utilities also indicated a small increase in emphasis on residential customers, whereas states indicated a small decrease in emphasis on that sector.

Projections: 1994–1998

Over the next several years, both utilities and states anticipate very small increases in the emphasis put on commercial and industrial programs, and the emphasis on residential programs is expected to decrease. Figure 2.6 shows how the emphasis on commercial and industrial programs has grown faster than the emphasis on residential programs in the recent past, and how this trend is expected to continue in the years ahead, as the emphasis on the residential sector declines. The figure also illustrates that growth in the emphasis placed on DSM programs for *all* sectors is expected to grow more slowly (or to decrease more quickly) in the near-term future than it did in the recent past.

For the responding utilities, we found that projected growth in DSM expenditures was positively correlated with the projected change in emphasis on both commercial and industrial programs. This means that utilities planning to increase their emphasis on programs for the commercial and industrial sectors over the next few years tended to project higher levels of growth in their DSM spending than did other utilities. This finding could indicate that commercial and industrial programs are more expensive than those aimed at the residential sector or that commercial and industrial programs will be added to the existing portfolio of residential programs, increasing the overall level of DSM effort. It also is possible that, since utilities traditionally have put more emphasis on residential programs, increasing the emphasis on programs for the other major customer classes will require additional expenses in order to "come up to speed" in those areas.

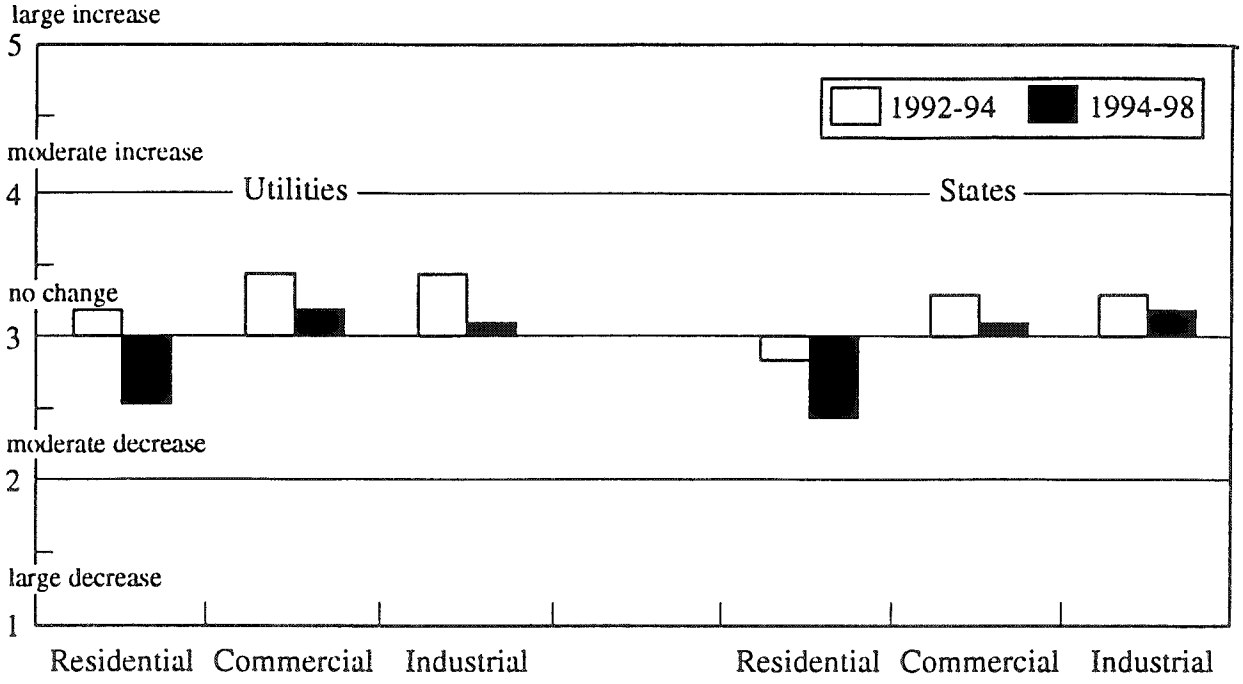

Fig. 2.6. Change in emphasis on customer class.

3. POSSIBLE EXPLANATORY FACTORS FOR CHANGING PATTERNS IN DSM USAGE

In this chapter, we explore possible relationships between changes in DSM usage and a variety of factors that fall into six basic categories: (1) general motives for DSM usage; (2) competition for customers; (3) concern with rates; (4) provision of services; (5) utility characteristics; and (6) state regulations. For many items, we asked respondents to answer using five-point scales[7] to indicate the current importance of various items and how that importance has changed since 1992. The specifics of these scales are as follows:

- The "current importance" scale: 1 = very slight; 2 = slight; 3 = moderate; 4 = great; 5 = very great.

- The "change in importance since 1992" scale: 1 = currently much less important than before; 2 = currently less important than before; 3 = currently about as important as before; 4 = currently more important than before; 5 = currently much more important than before.

In addition to describing information provided directly by the utility and state respondents, we also discuss the key findings from our statistical tests of hypothesized relationships between the various factors studied and observed changes in DSM usage. In the following sections, we focus on those explanatory factors that we found to have the most convincing relationships with changes in the use of DSM, either by virtue of explaining a considerable amount of the variance in a single measure of DSM change (e.g., recent change in DSM expenditures) or having a statistically significant association with multiple measures of DSM change (e.g., projected changes in DSM-induced energy savings and peak demand reduction). It is important to note that several of the significant relationships that we found ran counter to our hypotheses and that a number of the relationships we identified were not as strong as we would have preferred. Accordingly, it would be safest to consider the results of our statistical analysis as a set of probable—rather than proven—relationships between various factors and changing patterns of DSM usage.

GENERAL MOTIVES FOR DSM USAGE

In our written survey, we asked utilities and states to rank the current importance of a variety of possible reasons for offering DSM programs and to report how the importance

[7]For all five-point questions, we will report the mean rather than the median response for reasons explained in the previous chapter.

of each of these reasons had changed since 1992. The possible motives for utility DSM usage about which we asked are as follows:

- financial gains for utility
- providing increased services to customers
- requirements of federal government
- requirements of state public utility commission (PUC)
- results of integrated resource planning (IRP)
- environmental benefits
- pressure from public interest groups

Utilities, on average, ranked providing increased services to customers as the most important current[8] reason for offering DSM, ranking it as having "great" importance (mean of 4.0). This reason was the only one that utilities considered to be somewhat more important now than in 1992; all other reasons were considered to be slightly less important currently than they were in 1992 (Fig. 3.1). On average, utilities rated requirements of the state PUC as being the second most important reason (mean of 3.4) for offering DSM. Utilities considered requirements of the federal government to be the least important reason for offering DSM programs, giving this an average ranking of 1.7, or less than slight importance.

In the personal interviews we conducted, we asked respondents what important factors account for recent and projected changes in DSM usage. Increased customer service was a recurring theme among the utilities. Several utilities said that regardless of what happens, they will continue some type of conservation efforts because of the benefits to the environment and customers. The importance of providing DSM services that are highly valued by customers and tailoring these programs to customer needs has been noted in a number of recent articles on the future of DSM (Birnbaum, Prindle, and Collins 1995; Bradshaw 1995; LeBlanc 1994; McDonald 1995).

Through our statistical analysis of utility survey responses, we found that the growth in DSM-induced energy savings from 1992 to 1994 generally was greater for utilities that increased the importance they attributed to the requirements developed by their PUCs, and that the increase in cumulative peak demand reduction during that same time period was higher for utilities for whom the importance of federal requirements had increased. As for effects on projected 1994–1998 changes in DSM usage, our analysis shows that utilities whose DSM decisions were more heavily influenced by considerations of financial gain anticipated lower levels of growth in DSM expenditures than did other utilities, perhaps indicating that utilities that are focusing on financial gain are reluctant to incur DSM costs and potentially add to DSM-related stranded investments. In contrast, those utilities that were more heavily influenced by IRP results planned to experience greater growth in their DSM investments and energy savings.

[8]This and all other "current" ratings are those reported as current by our respondents in early 1995.

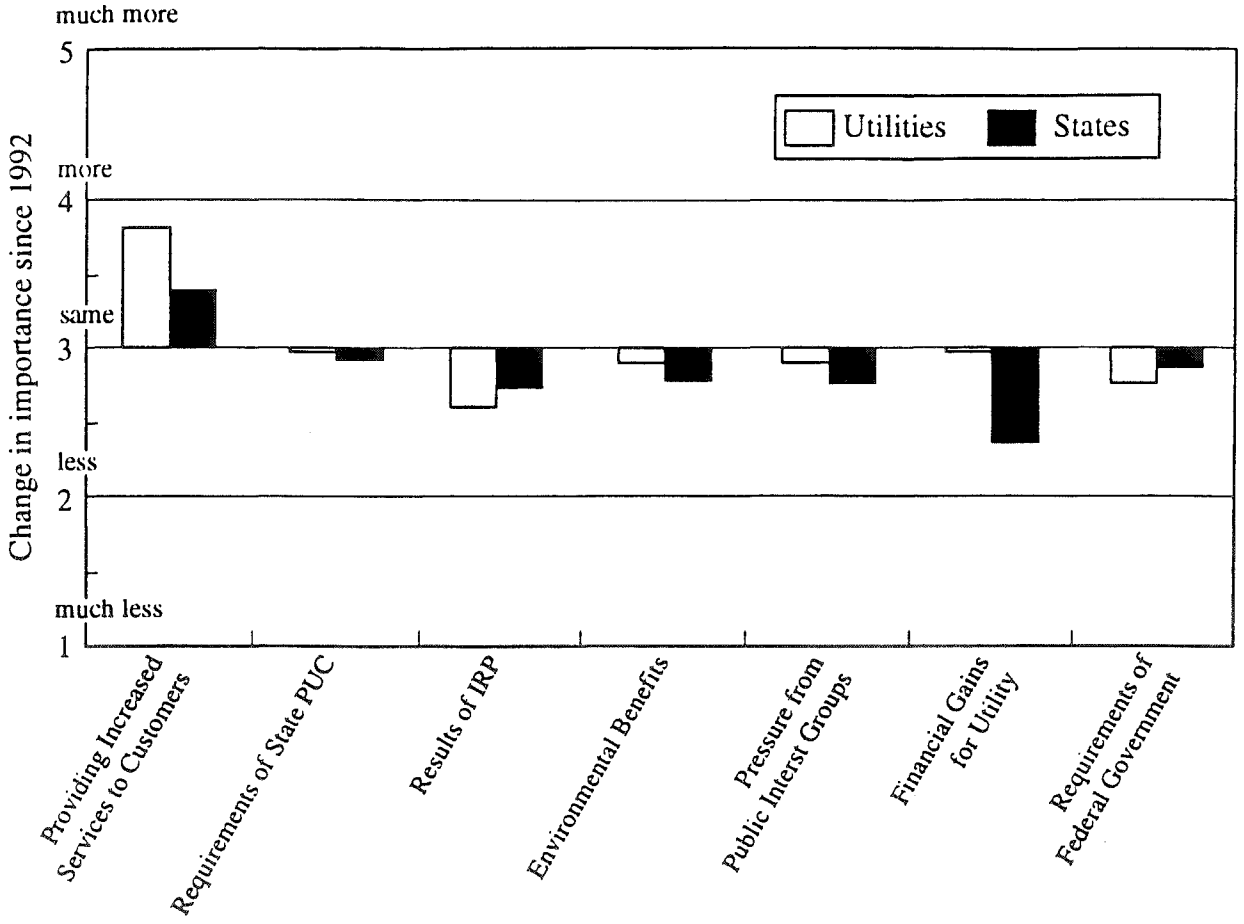

Fig. 3.1 Mean change in importance since 1992 of reasons for offering DSM programs.

State commissions, on average, ranked requirements of the state PUC as the most important reason (mean of 3.7) that utilities have for offering DSM programs, followed in importance by providing increased services to customers (mean of 3.5). As with utilities, states considered providing increased services to customers as the only reason to be somewhat more important now than in 1992; all other reasons were considered to be slightly less important now than they were in the recent past. States also were in agreement with utilities in ranking requirements of the federal government as the least important reason for offering DSM programs, giving this reason an average ranking of 1.7 (less than slight importance). Figure 3.2 shows how the importance of all factors has changed since 1992. Our statistical analysis revealed no convincing relationships between any of our measures of changing DSM usage and the motives for offering DSM programs discussed above.

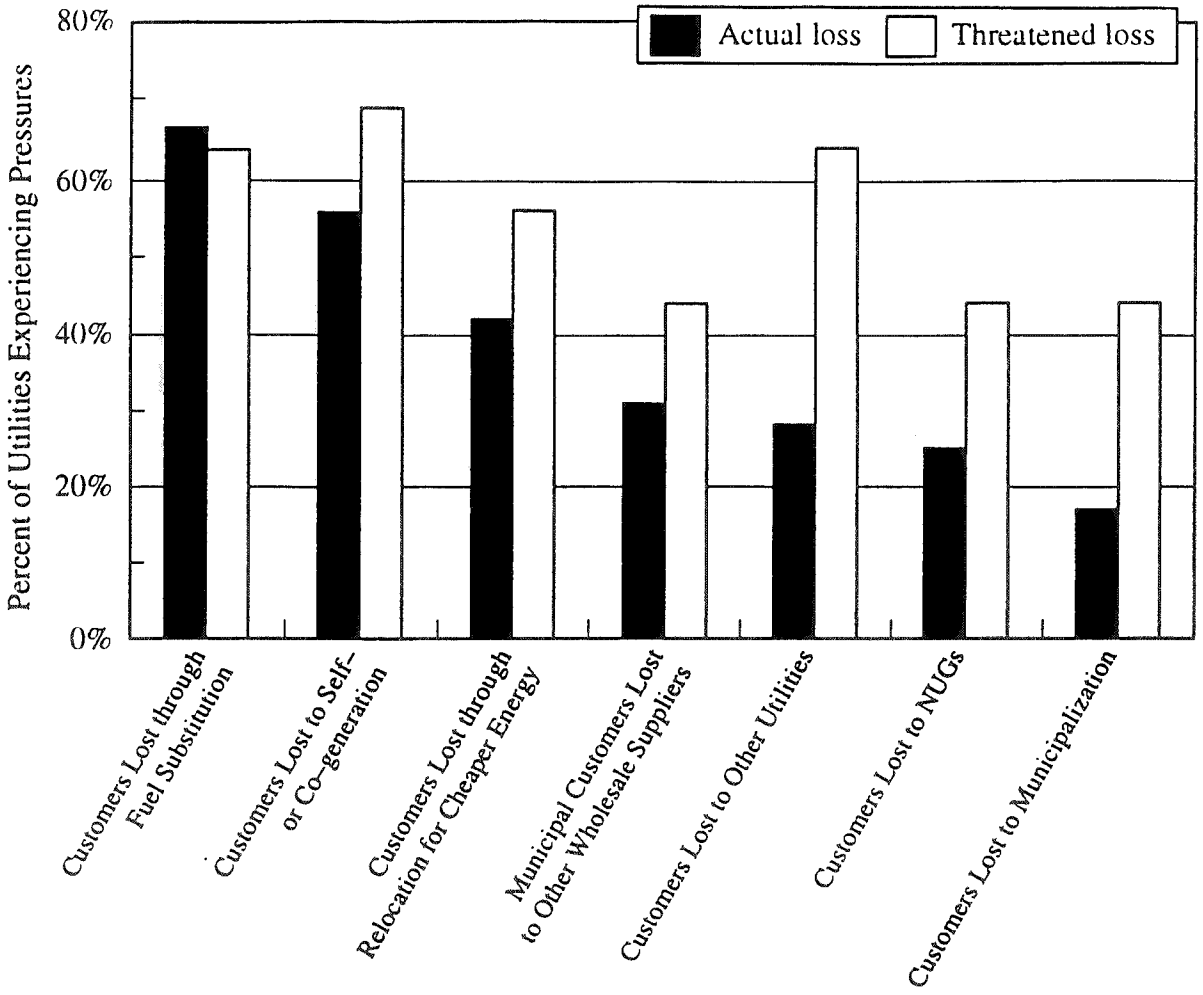

Fig. 3.2. Percent of utilities experiencing various competitive pressures since 1992.

COMPETITION FOR CUSTOMERS

On average, utilities in our survey said that competition for customers is of great importance (mean of 4.0) in influencing DSM usage, and that this factor is considerably more important (mean of 4.3) now than it was in 1992. States ranked competition for customers as being moderate to great in importance (mean of 3.4), and indicated that this factor is more important (mean of 3.9) now than it was in 1992.

We also asked respondents which of the following competitive pressures they have experienced since 1992, in terms of actual and *threatened* loss of customers:

- loss of customers to other utilities
- loss of customers to non-utility generators (NUGs)
- loss of customers to self- or co-generation

- relocation of customers to take advantage of lower energy costs outside the service area
- loss of customers to municipalization
- loss of municipal customers to other wholesale suppliers
- loss of customers through fuel substitution

Fuel substitution was the factor mentioned most often by utilities as causing actual loss of customers, followed in importance by self- or co-generation. Municipalization was indicated by the fewest utilities as causing actual loss of customers. *Threatened* loss of customers was indicated as being felt by more utilities than *actual* loss of customers for all factors except fuel substitution. Pressures that threaten the most utilities include loss of customers to self- or co-generation, loss of customers to other utilities, and loss of customers through fuel substitution. These data are depicted in Fig. 3.2.

Our statistical analysis of the utility data set revealed no strong relationships between competitive pressures and changes in DSM usage for 1992-1994. For the period 1994 to 1998, however, we found that the actual or threatened loss of customers to other utilities or to self- or co-generation is associated with lower rates of growth in the use of DSM resources. In contrast, it appears that the actual loss of customers through municipalization could stimulate utilities to spend *more* on DSM in the near-term future as a way of inducing remaining customers to stay on the system.

State regulators, like the responding utilities, indicated that actual loss of customers was most frequently due to self- or co-generation (55% of those studied) and fuel substitution (53%). Loss of customers to NUGs was noted by the fewest state commissions (20%) as causing actual loss of customers. *Threatened* loss of customers was indicated as being experienced by more states than *actual* loss of customers for all factors. Self- or co-generation and fuel substitution were indicated by the most states (80% and 79%, respectively) as threatening customer losses.

We found that, for the states, the actual loss of customers to NUGs or through fuel-substitution was associated with lower rates of growth in DSM expenditures in the recent past. Similarly, actual or threatened loss of customers to NUGs, through relocation, or through fuel-substitution is associated with lower projected rates of growth in DSM usage for the near-term future.

When asked if competitive pressure has been manifested through negotiation of lower rates with large customers since 1992, 74% of the responding utilities and 80% of the states responded affirmatively. For those that did negotiate lower rates, however, only a small proportion of total sales was affected; the median utility reported that approximately five percent of sales were made at the new, lower rates, and the median state reported that only two percent of sales were affected. Our statistical analysis showed that utilities that made a greater share of their sales at new, lower rates tended to increase their recent spending on DSM programs and their projected growth in energy savings more than did

other utilities. A possible explanation for this is that high rates tended to stimulate the negotiation of lower rates *and* the development of DSM programs, both of which can have the effect of lowering total bills for utility customers.

CONCERN WITH RATES

The utilities that we studied rated their desire to avoid increasing rates as great for all customer classes, but they indicated that this is most important for industrial and commercial customers (means of 4.5 and 4.2, respectively) and least important for residential customers (mean of 3.8). Utilities consider the avoidance of rate increases for all customer classes to be more important now than it was in 1992, indicating that the importance of avoiding rate increases has grown most for industrial customers and least for residential customers (Fig. 3.3). Our statistical analysis revealed no clear or consistent causal relationship between the desire to avoid rate increases and DSM usage. A strong utility desire to avoid increasing rates for commercial customers was associated with slower growth in the use of DSM resources, but the opposite relationship applied to the desire to avoid residential and industrial rate increases.

Responses from the states showed the same general pattern as responses from the utilities, but states generally saw concern with avoiding rate increases as being less important in influencing DSM usage than the utilities did. Through our statistical analysis, we found that projected growth in DSM expenditures tended to be less in states whose utilities attributed greater importance to avoiding rate increases for their commercial customers.

In our written survey, we also asked "If avoiding rate increases is important, which of the following actions have been taken since 1992—and will be taken in the next five years—toward this end?" We asked utilities and states to check those actions applicable from the following list:

- changes in amount and type of supply-side resources used
- changes in amount and type of DSM used
- changes in DSM cost-recovery approaches
- increased emphasis on RIM test
- staff reductions

Between 1992 and 1994, almost 70% of the utilities that we studied changed the amount or type of DSM used or reduced staff in order to avoid rate increases. Approximately 50% of respondents changed the amount or type of their supply-side resources, while less interest was shown in changing DSM cost-recovery approaches (about 35%) and increasing emphasis on the RIM test (about 30%). The responding utilities projected increase usage of *all* of the possible actions listed above for the next five years. Changes in the amount and type of DSM used was selected by 94% of utilities as an action they plan to take to avoid rate increases. Approximately 70% of utilities projected changes

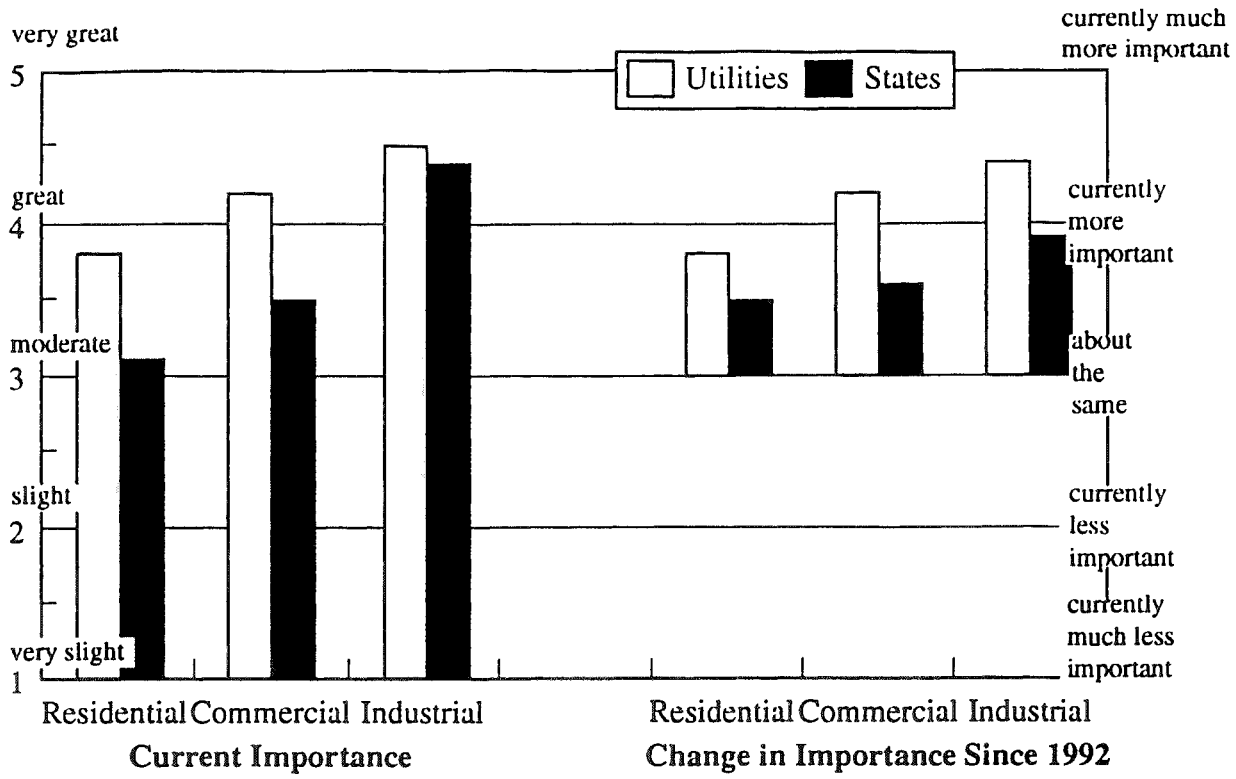

Fig. 3.3. Importance of avoiding rate increases for various customer classes.

in amount and type of supply-side resources, staff reductions, and changes in DSM cost-recovery approaches. The fewest utilities (50%) indicated an interest in increased emphasis on the RIM test in the next five years as a means of avoiding rate increases. But the projected use of this approach to avoiding rate increases is substantially greater than it was in the recent past. Change in DSM cost-recovery approaches is expected to increase in popularity more than any of the other options considered.

Both utility and state respondents indicated in the personal interviews that changes in the amount and type of DSM used could be important means to avoid rate increases. As we discussed in Chapter 2 under Program Types, there is a strong trend—especially among utilities and states that project levelling off or declining DSM usage—toward doing DSM more cost-effectively, not just in reaction to the threat of deregulation, but as a part of doing good business. By changing the type of DSM programs used (moving away from rebate and subsidy DSM programs and replacing them with programs that increase shared savings and cost responsibility of the customer), utilities decrease their investment in DSM and reduce rate impact while attempting to retain DSM benefits.

Through our statistical analysis, we found that utilities reporting recent or planned staff reductions had lower rates of growth in DSM usage in the recent past and projected lower growth rates for the near-term future. This could indicate that the loss of staff members has an adverse effect on DSM program productivity and allows utilities to undertake fewer new programs.

Between 1992 and 1994, the states in this study most frequently utilized staff reductions and change in amount and type of DSM used (68 and 64% of respondents, respectively) as ways to avoid rate increases. States put considerably less emphasis on changing DSM cost-recovery approaches (36%), increasing emphasis on RIM (27%), and changing the amount or type of supply-side resources (27%). As with utilities, changes in the amount and type of DSM used also was the most popular (76%) future action for avoiding rate increases indicated by state regulators, followed closely by changes in DSM cost-recovery approaches (75%). In the next five years, more states anticipated utilizing *all* of the possible actions except staff reductions, for which usage dropped from 68% to 55%. The greatest increase in intended actions over the next five years was reported for changes in DSM cost-recovery approaches and increased emphasis on the RIM test.

PROVISION OF SERVICES

In our written survey, we asked "toward the end of providing services to customers, which of the following actions have been taken since 1992, and which will be taken in the next five years?" We asked respondents to check the applicable actions from the following list:

- expand number of DSM programs offered
- expand customer classes served by DSM programs
- expand programs to special-needs groups
- provide equipment sales and maintenance
- provide innovative pricing
- ensure/protect reliability
- provide energy audits
- provide technical assistance

Between 1992 and 1994, approximately 75% of the utilities that we studied indicated that they had provided technical service and energy audits as part of their customer service. Almost 60% indicated that they had expanded DSM as a customer service, while providing equipment sales and maintenance ranked the lowest in popularity, with only about 10% of respondents having taken that customer service action. Figure 3.4 details utilities' responses on customer service actions, past and future.

Approximately 70% of the utilities indicated that in the next five years they plan to provide technical service, innovative pricing, and energy audits, and to ensure/protect reliability. Expanding the customer classes served by DSM programs and the number of DSM programs offered were the two least popular future customer service actions, and their popularity dropped more than any other activity. The greatest increase in popularity of customer service actions was seen for providing equipment sales and service and for innovative pricing.

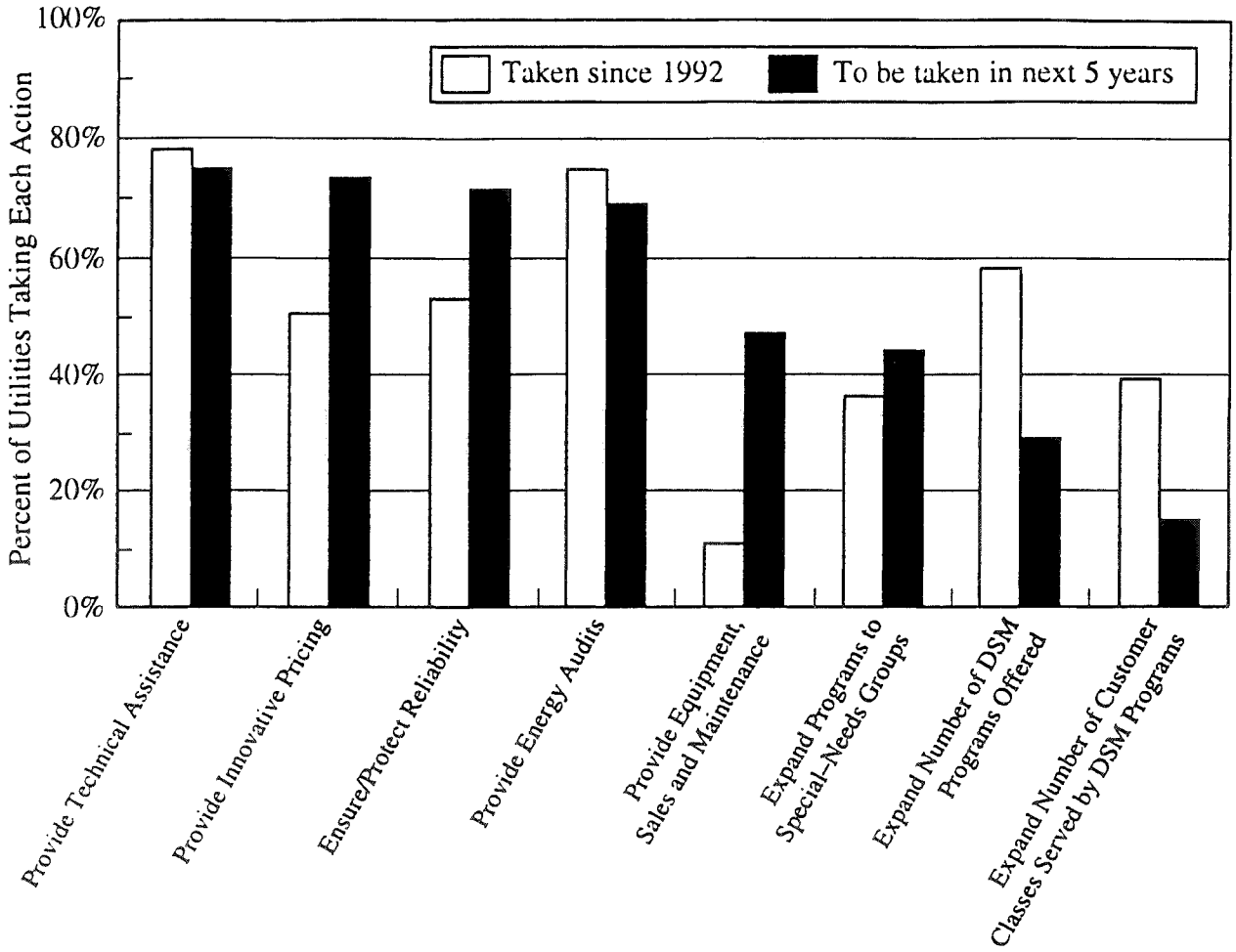

Fig. 3.4. Percent of utilities taking or planning various customer service actions.

Through our statistical analysis, we found that planned expansion in the number of DSM programs offered is strongly associated with higher projected rates of growth in DSM expenditures for the near-term future. Conversely, the recent or planned provision of energy audits is associated with lower projected growth in DSM spending. This finding is easily explained by the fact that audits are less expensive to provide than are many other types of DSM program. We also found that utilities that recently took actions to ensure reliability anticipated less growth (or greater decline) in their DSM expenditures than did other utilities. The reasons for this are less clear, but it could be that utilities that took proactive steps to ensure system reliability felt less need to use DSM programs to avoid capacity shortfalls.

As with utilities, states ranked energy audits, technical assistance and expanding DSM as the three most popular customer service actions (86, 77, and 77%, respectively) for the 1992-1994 period. During that same time, providing equipment sales and maintenance were least popular, with only 9% of respondents taking the latter action. States' responses also indicated moderate popularity for expanding the customer classes and special-needs groups served by DSM programs (64 and 55%, respectively).

According to state regulators, providing energy audits, technical assistance, and innovative pricing were the three most popular customer service actions that utilities expect to take in the next five years. Expanding customer classes served by DSM, programs to special-needs groups, and the number of DSM programs offered will be the least popular future customer service actions, and these three actions also exhibited the greatest drop in popularity as compared to the 1992–1994 period. As with utilities, the greatest increase in popularity of customer service actions was seen for providing equipment sales and service and for innovative pricing.

For the states, DSM expenditures and effects are projected to grow in conjunction with recent and planned expansions in the number of DSM programs offered. Recent expansion of programs to special-needs groups, recent action to ensure/protect reliability, and the planned provision of technical assistance also are associated with projected growth in the use of DSM resources. The relationship described here between DSM usage and actions to ensure reliability is opposite to—but substantially weaker than—the relationship we found in our analysis of the utility data set. We also found that the recent provision of innovative pricing, the planned provision of energy audits, and the planned expansion of customer classes served are associated with lower projected growth rates in the use of DSM resources. The last finding, which is counter-intuitive, could indicate that states in which there is still room to expand the customer classes served have a lower level of commitment to the aggressive use of DSM resources.

UTILITY CHARACTERISTICS

Approximately two-thirds of the utilities and states that we studied indicated that they expect to need new peaking resources in five years or less, and about one-tenth indicated an immediate need for such resources. Utilities' median number of years to peaking was four. All but three of the utilities studied believed that they would need new peaking resources in ten years or less. States indicated a somewhat lower median value for "years to peaking"—3.5 years. All states believed that their utilities would need new peaking resources within 11 years. Several respondents mentioned capacity shortages or low capacity reserves as important reasons for using DSM resources. And utilities and states that indicated a need for capacity acknowledged that DSM was a cost-effective alternative to investing in new peak capacity. Others described DSM as a way to defer transmission and

distribution expenditures. Figure 3.5 illustrates the distribution of utilities' and states' expectations regarding the number of years until new peaking resources will be needed.

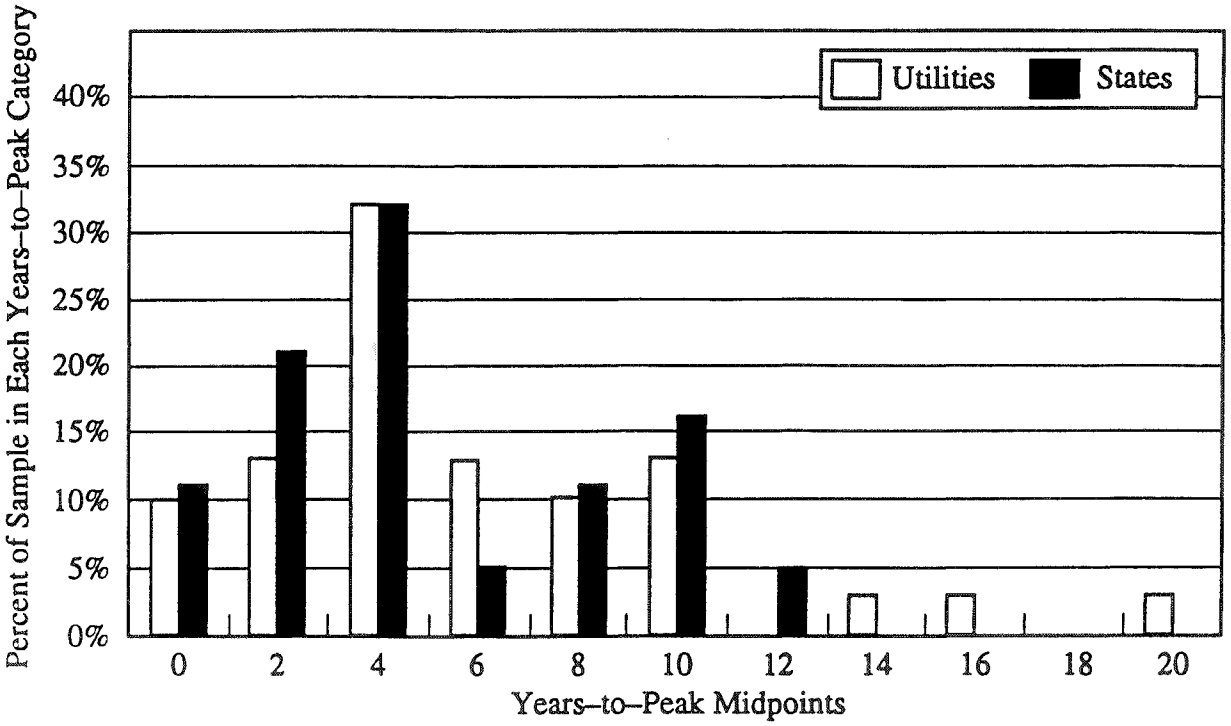

Fig. 3.5. Number of years[a] until new peaking resources will be needed.

[a]Each years-to-peak midpoint represents the middle of a two-year category (e.g., 12 represents 11 to 13).

Utilities and states both estimated a longer time until new baseload resources would be needed. Sixty-two percent of utilities estimated that it would be ten years or less before they needed new baseload resources (median value = ten years). There was a wide range of utilities' estimates of years until new baseload resources will be required, with values ranging from zero (indicating an immediate need) to 25 years. States indicated a narrower range of estimated years until new baseload resources will be needed: 1-15 years. More than 80% of the states believed that their utilities would need new baseload resources in ten years or less (median value = eight years).

In our written survey, we asked respondents how their retail rates compared to other nearby utilities/states and found that substantial numbers of utility and state respondents believed their rates to be about the same as their neighbors. As for retail revenues, which we used as a measure of size, the median utility took in just under a billion dollars in 1992. Not surprisingly, retail revenues were higher for the states—with a 1992 median of $3.4 billion—because they typically are home to multiple utilities.

To represent the magnitude of recent DSM efforts, we used the EIA-861 data to calculate 1992 DSM expenditures as a percentage of retail revenue for that same year. For the utilities studied, the median DSM expenditure represented 2.3% of retail revenues. The minimum expenditure was 0.2% and the maximum was 8.3%. The middle 50% of the utilities spent between 1.6% and 4.5% of their revenues on DSM. For the states that were studied, the median 1992 DSM expenditure was somewhat less than for our utilities, amounting to 1.4% of retail revenues; the range extended from 0.1% to 7.1%. Half of the states had expenditures representing between 0.5% and 2.6% of their retail revenues.

A statistical analysis of the utility data set combining all the above-mentioned characteristics revealed very little effect on changes in DSM usage. We found only that utilities that had spent more on DSM at the start of the period in question tended to experience *less* growth in DSM spending over the following years than did other utilities. This indicates that utilities with a history of aggressive pursuit of DSM resources have tended to slow the growth of these efforts in recent years, a finding that is supported by a recent study of a dozen utilities with a history of substantial DSM efforts (Nadel, Geller, and Pye 1995). At the same time, utilities that made a slower start in this area generally experienced more growth recently in their DSM activities. Several state respondents supported this finding by observing in the personal interviews that some of their utilities were just getting their DSM programs started and therefore were in a growth stage of development.

Our examination of the state data uncovered more relationships between utility characteristics and changes in DSM usage than were evident from the utility analysis. As expected, we found that utilities needing resources in fewer years tended to experience more rapid growth in their DSM investments. We also found that utilities with higher relative rates generally increased their projected spending on DSM resources *more* than other utilities. A plausible explanation for this unexpected finding is that utilities responded to high rates by developing more DSM opportunities for customers, in order to better serve them by providing ways to reduce their electricity bills. Also, to the extent that higher rates reflect higher avoided costs, more DSM measures would be cost-effective for utilities with relatively high rates than for lower-cost utilities. An inverse relationship was found between retail revenues and projected savings, meaning that larger utilities tended to anticipate lower growth in their DSM-induced savings than did smaller utilities. One possible explanation for this is that larger utilities got an earlier start in the DSM business than their smaller cohorts, and therefore do not have as much room—or need—to grow as do utilities that got a later start in this area.

Each of the subject utilities and states was classified according to its geographic location by identifying the North American Electric Reliability Council (NERC) region in which it lies. There are nine such regions, covering the 48 contiguous states, and our utilities were located in all but one of them. The western and northeastern regions were the most heavily represented, but we also had utilities scattered throughout the rest of the country. For the states, all nine NERC regions were represented but the pattern was pretty much

the same as for the utilities, with the northeast and west contributing more states to this study than any of the other regions.

Our statistical analysis revealed that utilities located in the East Central Area Reliability Coordination Agreement (ECAR) region tended to have greater growth in DSM usage in the recent past and to project more rapid growth for the near-term future than did utilities in other parts of the country. The ECAR region contains Indiana, Ohio, Kentucky, West Virginia, nearly all of Michigan, and portions of western Virginia, western Maryland, and western Pennsylvania. Relatively high levels of growth in DSM usage also were found in Texas and the mid-Atlantic states. In general, the observed relationships between geographic location and changes in DSM usage seem to be due to the slowing of DSM program growth in those regions—particularly the west and northeast—where DSM has historically been strong and the adoption of DSM programs in regions that have more recently shown an interest in this resource.

Our analysis of changes in state DSM usage by NERC region revealed that, as with the utilities, recent and projected growth tended to be strongest in the ECAR region. We also found an inverse relationship between projected growth in DSM expenditures and location in the Northeast Power Coordinating Council (NPCC) region, meaning that the NPCC states tended to project less growth in future DSM spending than did other states. The NPCC region contains New York and all the New England states, an area that has historically been a leader in the use of DSM resources. For 1994–1998, however, nearly all of the surveyed NPCC states anticipated reducing their DSM expenditures more rapidly than did almost every other state studied.

STATE REGULATIONS

In regard to state regulations, we asked the utilities and regulators which of the following topics are addressed by state regulations:

- retail wheeling
- wholesale wheeling
- financial incentives to utility for DSM usage
- DSM-related lost revenue recovery
- environmental externalities
- DSM program cost recovery
- DSM-related cost-effectiveness testing
- IRP

Approximately 70–90% of the responding utilities indicated that state regulations addressed all noted topics except retail wheeling and wholesale wheeling; about 40% reported that state regulations addressed these wheeling issues. State commissions also reported that state regulations addressed retail and wholesale wheeling issues less often than they addressed all other issues. Figure 3.6 shows detailed responses for this question.

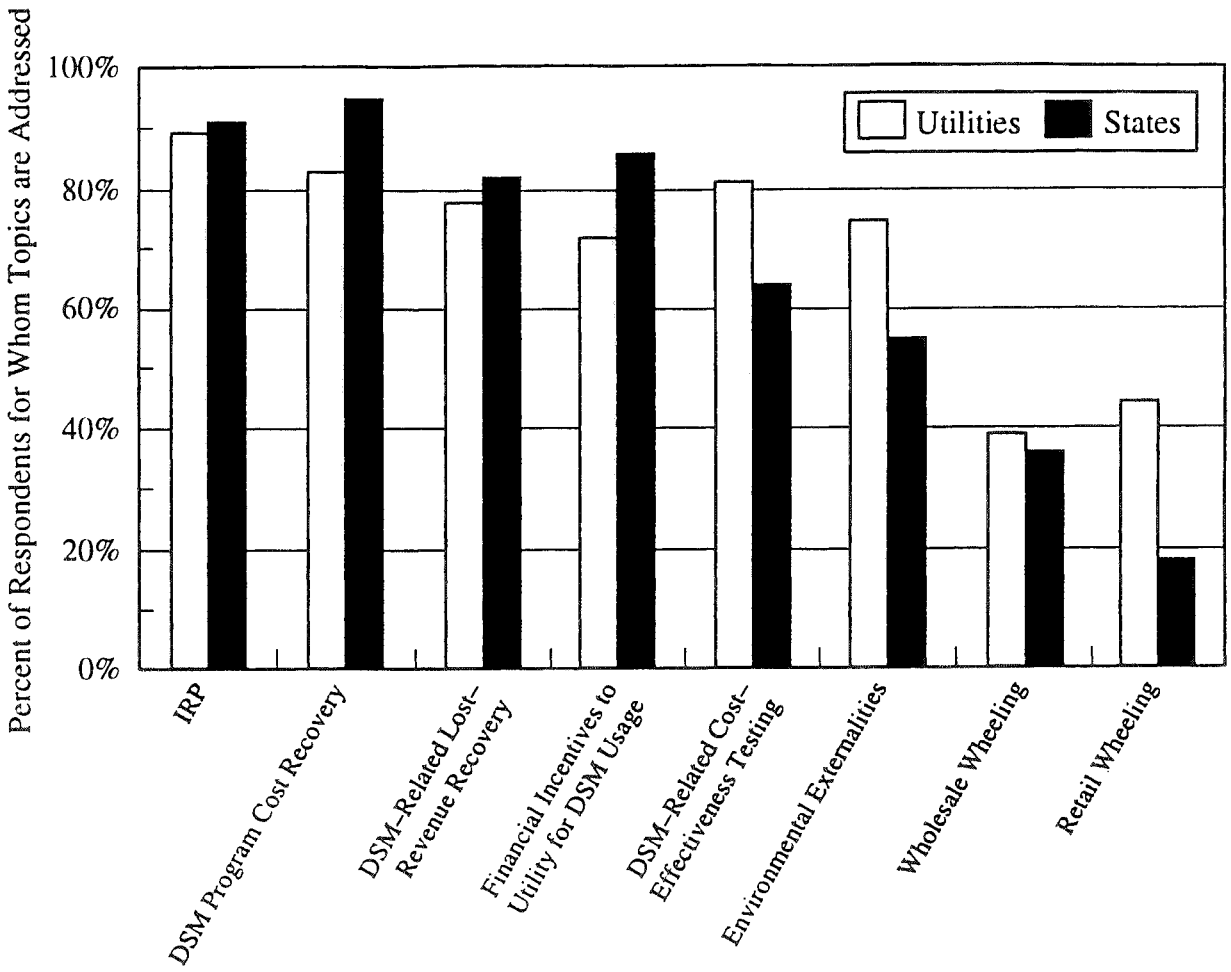

Fig. 3.6. Percent of respondents for whom topics are addressed by state regulations.

In addition to asking about the *existence* of state regulations on various topics, we asked respondents how important those regulations were to their DSM decisions, using the same five-point scale used in previous questions. Both utilities and states, on average, ranked retail wheeling and DSM program cost recovery regulations as being most important to DSM decision making (mean of 3.7–4.0). Most other regulatory topics fell into the moderate to somewhat more than moderate range (3.0–3.6). One exception was found for the states, which ranked financial incentives to utilities for DSM usage as having less than moderate importance. Environmental externalities was the only topic that both utilities and states considered to have less than moderate importance to DSM decision making (mean of 2.6 and 2.7, respectively).

We hypothesized that the presence and importance of state regulations addressing IRP, environmental externalities, DSM program cost recovery, DSM-related lost revenue recovery, and financial incentives for utility DSM usage all would be positively related to growth in the use of DSM resources. The reasoning for this was that such regulations can

stimulate utilities to consider DSM resources more seriously and make DSM more fiscally attractive relative to other available options. Our findings, however, were mixed. The analysis of the utility data set showed that, as expected, utilities receiving financial incentives for DSM usage and attaching greater importance to such regulations tended to project higher growth in DSM usage than did other utilities. Also as expected, utilities attaching greater importance to IRP regulations tended to have greater growth in both their recent and projected use of DSM resources. In addition, the existence of regulations governing DSM program cost recovery was related to higher projected DSM expenditures in the near-term future. Having lost-revenue recovery regulations and attaching greater importance to them were associated with higher growth in recent DSM usage but tended to be associated with *lower* rates of growth in projected use of DSM resources. A likely explanation for this is that many of the utilities governed by lost-revenue recovery requirements and attaching considerable importance to them began their active pursuit of DSM resources a number of years ago and, consequently, have less need— and room—for future growth than do those utilities that entered the DSM arena more recently. This finding also could reflect a decision by utilities governed by lost-revenue recovery regulations to avoid adverse rate impacts by putting less emphasis on DSM. Finally, we found that, both for the recent past and the near-term future, having environmental externality regulations and attaching greater importance to them were related to lower rates of growth in DSM usage. Again, this could indicate that many of the utilities governed by these regulations and considering them important had aggressively pursued DSM for many years and were closer to their "peak" usage of DSM resources than were other utilities. Historically, the presence of state regulations governing environmental externalities and lost revenue recovery have been linked to higher levels of utility DSM usage (Schweitzer and Young 1994; Baxter 1995). The reversal of this trend with respect to DSM growth could indicate—in addition to a "peaking-out" effect—that regulators are responding to competitive pressures in their states by reducing their support for utility DSM programs.

As with the utility data set, our analysis of the state responses indicated that the presence and importance of state regulations on financial incentives for utilities were positively related to growth in DSM usage and that the importance given to lost revenue recovery regulations was inversely related to future spending. In addition, the state data suggested that states whose utilities attributed greater importance to regulations on wholesale wheeling had greater projected growth in DSM expenditures.

4. CONCLUSIONS

In the preceding chapters, we detailed how DSM usage has changed in recent years, how it is expected to change in the near-term future for the utilities and states studied, and the factors that are responsible for those changes. It is important to remember that all of the utilities that we studied spent at least $5 million on DSM in 1993, making them among the leaders in DSM usage nationwide. Also, the utilities and states examined in this study represent both extremes of the continuum describing growth in DSM usage; we selected roughly half of the utilities and states from among those exhibiting the most rapid growth in the use of DSM resources and roughly half from those whose DSM efforts are declining most rapidly or growing most slowly according to 1993 EIA data. Therefore, our utilities and states are *not* representative of all U.S. utilities and states, or even those with the greatest commitment to the use of DSM resources, but they do account for a large portion of all DSM expenditures made by U.S. utilities. Between them, the 37 utilities included in this study represented slightly over half of all 1993 DSM expenditures, while the 22 states accounted for nearly three-quarters of the money spent on DSM by U.S. utilities. Accordingly, our description of changing patterns of DSM usage, while not strictly representative, applies to those utilities and states responsible for a majority of this country's DSM expenditures. And since our collection of states and utilities contains those displaying the greatest amounts of DSM growth and decline, we believe that it is well suited to reveal relationships between changing patterns of DSM usage and the factors influencing this.

The following sections discuss the key changes identified through this study, the most important factors responsible for those changes, and recommendations for actions that can be taken to ensure the continuation of beneficial DSM activities. To the extent possible, this chapter combines the findings from the utility and state analyses, since utility actions were the primary focus of both. We do, however, differentiate past and projected DSM usage and the key factors associated with each.

IMPORTANT CHANGES IN UTILITY USE OF DSM RESOURCES

Over the next several years, the use of DSM resources will probably depart from the pattern of substantial growth established in recent times. Between 1992 and 1994, the median annual growth rate for utility DSM expenditures was 16% for the utilities studied and 11% for the states. In contrast, the median utility projected an annual *decline* in DSM expenditures of 3% for 1994–1998, while the median state growth rate was projected at 1.5% annually. The growth rate in cumulative energy savings also is expected to be substantially less in the near-term future than it was in the recent past, but the decline in growth will not be as dramatic as for DSM expenditures. In contrast, the projected growth rate in cumulative peak demand reductions will come much closer to matching the recent historical record than will either DSM expenditures or energy savings.

The types of DSM programs implemented by utilities changed little in the recent past but more dramatic change is expected in the future. Between 1994 and 1998, the emphasis placed by utilities on rebates, direct installation of DSM measures, and—to a lesser extent—energy-efficiency programs is expected to decrease. At the same time, the emphasis on recovering program costs from participants, providing financing, load building, market transformation, rate discounts, leasing equipment to customers, shared savings programs, and load management will rise. In general, utilities reported that their programs will change in ways designed to make them more cost-effective and service-oriented. A frequently-expressed intention was to retain customers by offering DSM programs that are valuable enough to help keep them on the system. Over the next few years, very small increases are projected in the emphasis on commercial and industrial programs, while the emphasis on residential programs is expected to decrease.

EXPLANATION OF OBSERVED CHANGES

The types of DSM programs favored by utilities clearly were related to their DSM expenditures. Utilities whose emphasis on providing DSM program financing and shared savings programs grew in the recent past tended to have lower levels of growth in DSM expenditures than did other utilities, probably because these program types typically cost less than many other options available to utilities. In the years ahead, utilities that place an increasing emphasis on commercial and industrial programs will tend to experience greater growth in DSM expenditures, as will those few utilities with a growing emphasis on rebates. Conversely, greater projected emphasis on rate discounts is associated with lower growth in future DSM spending and savings.

The general motives affecting changes in DSM usage were different in the recent past than they are likely to be in the future. Utilities for whom the importance of state and federal requirements increased between 1992 and 1994 tended to have more growth in DSM usage than did other utilities. In the years ahead, higher levels of growth in the use of DSM resources are likely to be found among those utilities attributing greater importance to the results of their IRP efforts, while utilities whose DSM decisions are more heavily influenced by considerations of their financial gain will tend to have slower-growing DSM efforts.

Utilities and states anticipating minimal growth in the use of DSM resources very frequently attributed this to their anticipation of increased competition. The analysis of a wide variety of competitive pressures revealed that the actual or threatened loss of customers as a result of fuel substitution or obtaining power from NUGs was related to lower rates of growth in DSM usage in the recent past. For the near-term future, the actual or threatened loss of customers to other utilities, to self- or co-generation, or through relocation is clearly associated with lower rates of growth in the use of DSM resources. The effects of other competitive pressures are less clear-cut, but there is some reason to believe that the actual or threatened loss of customers to NUGs or through fuel-substitution is related to lower levels of growth in future DSM usage, just as it was in the recent past. It

also appears that the loss of customers could, in some instances, stimulate utilities to spend *more* on DSM in order to induce remaining customers to stay on the system.

While utilities and state regulators frequently reported that the desire to avoid rate increases was an important factor leading to slower growth in the use of DSM resources, our statistical analysis did not clearly support that conclusion. A strong desire to avoid increasing rates for commercial customers tended to be associated with slower growth in DSM usage, but the opposite relationship applied to the desire to avoid rate increases for the industrial and residential classes. In other words, this study established no clear or consistent relationship between changes in the use of DSM resources and the desire to avoid rate increases. However, we did find that utilities whose retail rates were high relative to those of nearby utilities generally projected *greater* near-term increases in their DSM usage than did other utilities. Likely reasons for this are that utilities with high rates offered more DSM programs in order to allow customers to reduce their electric bills and that more DSM measures would be cost-effective for high cost utilities.

Utilities that recently had expanded the number of DSM programs offered to customers or that planned such expansions projected greater growth in DSM expenditures and effects than did other utilities. Another customer service that is associated with projected increases in DSM activity is the expansion of programs to special-needs groups. In contrast, the provision of energy audits, which tend to be relatively inexpensive, is associated with lower levels of projected future growth in DSM expenditures, as is the provision of innovative pricing.

Utilities with a history of aggressive DSM usage tended to have less growth in their use of DSM resources in the recent past and near-term future than did later entrants into the DSM arena. For example, projected growth in DSM usage tended to be significantly lower in New York and the New England states, which have traditionally been leaders in the DSM field. Conversely, recent and projected growth in the use of DSM resources tended to be greatest in regions of the country whose utilities were not pioneers in the aggressive pursuit of DSM resources. In general, utilities whose 1992 normalized DSM expenditures were relatively high tended to experience *less* growth in DSM activity in recent years than did other utilities.

Utilities' avoided costs and need for new capacity were tied to their use of DSM resources. Respondents from several utilities and regulatory agencies reported that avoided costs had dropped substantially in recent years, making fewer DSM measures cost-effective and leading to less investment in demand-side resources. Similarly, we were told that, where excess capacity existed, DSM usage became less attractive. This finding was supported to some extent by our statistical analysis, which found that growth in DSM investments tended to be greatest in those states where there was a near-term need for new peaking resources.

Some state regulations continue to have the expected effect on DSM usage while the impact of others is changing over time. Past studies showed that financial incentives for utilities and the presence of regulations addressing topics such as environmental externalities

and lost-revenue recovery were linked to more aggressive pursuit of DSM resources by utilities. Consistent with these findings, utilities attaching greater importance to regulations on IRP tended to show greater growth in their recent DSM usage and in their projected use of DSM resources in the near-term future. Also consistent with past research is the finding that the presence and importance of financial incentives for utilities was positively related to *projected* growth in DSM usage. The presence and importance of lost-revenue recovery regulations were positively related to recent growth in DSM usage but, counter to our expectations, tended to be inversely related to *projected* DSM growth. This could indicate that many of the utilities governed by lost-revenue recovery requirements and considering them important had aggressively pursued DSM resources for a number of years and now have less capacity for DSM growth than do other utilities that began seriously pursuing DSM more recently. It also could mean that utilities governed by such regulations are putting less emphasis on DSM to avoid adverse rate impacts. Our finding that regulations addressing environmental externalities were associated with lower levels of growth in DSM usage is consistent with the "life cycle" or "peaking out" effect identified above. But this and other findings about regulations also could indicate a lessening of the intensity of regulator support for DSM as a result of increasing competitive pressures.

RECOMMENDATIONS

There appear to be a number of valid reasons why DSM efforts should continue, even in a more competitive and less regulated utility environment. There are environmental benefits for society as a whole and economic benefits for utility customers, especially those lacking the means to finance the energy-efficiency measures that could help reduce their electric bill. Of course, there are alternatives to traditional utility-sponsored DSM efforts, such as government-funded energy-efficiency and load management programs, government-mandated codes and standards that require the use of more energy-efficient structures and appliances, market place energy service companies, and market transformation approaches that encourage manufacturers to develop more energy-efficient products and help emplace the infrastructure required to ensure the adoption of these new technologies. However, utilities can play a complementary role in many of these alternatives to traditional DSM.

There are a number of reasons why utilities are likely to remain interested in implementing their own DSM programs, most notably to utilize their least-cost portfolio of resources, to defer transmission and distribution expenditures, and to keep existing customers on the system and possibly attract new ones by offering services and bill-reduction opportunities that are highly valued and build customer loyalty. Assuming that utilities do continue to provide DSM services—and we expect they will—there are a number of actions that state and federal governments and other interested groups can take to ensure that the DSM efforts that are pursued are beneficial to all parties involved. Based

on the findings presented in this report and recommendations made by the utility and state respondents, we recommend the following:

- DOE, state regulators, and public interest groups should identify and disseminate information on successful and proven programs of the kinds that utilities are most interested in today. Such programs—which include shared savings, financing, and market transformation efforts—tend to be favored because they promise results at lower costs than more traditional programs such as those that employ rebates and direct installation of DSM measures.

- DOE, state regulators, and public interest groups should gather and disseminate information on innovative and experimental programs of the kinds identified through this study. Promising programs that are still in the pilot phase or just beginning full-scale operation should be closely tracked and program designs that prove successful should be publicized and promoted.

- To ensure that the benefits of the DSM programs provided by utilities are equitably spread among customer classes, state regulators should encourage utilities to provide a mix of programs that does not emphasize commercial and industrial customers at the expense of the residential sector.

- Each state regulatory agency should examine its commitment to the use of energy-efficiency and load management programs and decide how this fits into today's more competitive electric industry environment. Then, these agencies should take regulatory actions that are consistent with their DSM-related objectives. For those states that decide to actively encourage utility use of energy-efficiency and load management programs, options that should be considered include financial incentives for utilities, DSM cost-recovery approaches that allow more immediate reimbursement for program costs, and mechanisms (such as exit fees) to protect potential stranded investments by utilities that continue to aggressively pursue the use of DSM resources.

- State regulators should focus substantial attention on utilities that continue to have room to add energy-efficiency and load management programs that are cost-effective according to the test(s) favored by the regulatory agency. At the same time, these state agencies should not forget the important role played by utilities that are leaders in the DSM field and should continue to support their efforts. Interested state regulators also should target utilities that will need additional capacity in the near-term future and that have high avoided costs.

While the growth of utility-sponsored DSM efforts appears to be slowing, the type and amount of change that is occurring varies substantially from utility to utility and from state to state. By identifying the key factors driving the observed changes and suggesting

ways in which government agencies and other interested parties can address the issues at hand, we hope that we have contributed to the ongoing discussion of the rapidly changing landscape in which utilities, regulators, and consumers must all interact.

REFERENCES

Baxter, L. 1995, *Assessment of Net Cost Revenue Adjustment Mechanisms for Utility DSM Programs*, ORNL/CON-408, Oak Ridge National Laboratory, Oak Ridge, Tennessee, January.

Birnbaum, I., B. Prindle, and G. Collins 1995, "Reinventing DSM: Program Design for Competitive Markets," *Proceedings: Delivering Customer Value*, Seventh National Demand-Side Management Conference, 171–176, Electric Power Research Institute, Palo Alto, Calif., June.

Bradshaw, D. 1995, "What Services for Which Customers: A Value-Based Framework for Utility Managers to Target Customers and Select Services in a Competitive Market," *Proceedings: Delivering Customer Value*, Seventh National Demand-Side Management Conference, 7–17, Electric Power Research Institute, Palo Alto, Calif., June.

Chamberlin, J., G. Collins, and S. Shaffer 1995, "The Effects of Competition and Deregulation on IRP and DSM," *Proceedings: Delivering Customer Value*, Seventh National Demand-Side Management Conference, 1–6, Electric Power Research Institute, Palo Alto, Calif., June.

Cleveland, P. and M. Rose 1995, "The New Reality in Program Design," *Proceedings: Delivering Customer Value*, Seventh National Demand-Side Management Conference, 181–184, Electric Power Research Institute, Palo Alto, Calif., June.

Energy Information Administration 1993, *Annual Electric Utility Report for the Reporting Period 1993*, Form EIA-861, 1993, OMB No. 1905-0129.

Geller, H., S. Nadel, M. Pye, 1995, *Demand-Side Management at a Crossroads*, American Council from Energy-Efficient Economy, Washington, D.C. June.

Hadley, S. and E. Hirst 1995, *Utility DSM Programs from 1989 Through 1998: Continuation or Cross Roads?*, ORNL/CON-405, Oak Ridge National Laboratory, Oak Ridge, Tenn., February.

Hirst, E. 1994, *Electric-Utility DSM Programs in a Competitive Market*, ORNL/CON-384, Oak Ridge National Laboratory, Oak Ridge, Tenn., April.

Hirst, E. and S. Hadley 1994, "The DSM Sky Hasn't Fallen Yet," *The Electricity Journal* 7(10), 77–79, December.

Ignelzi, P. and B. Mast 1995, "Dismantling DSM: Baby Out with the Bathwater?" *Proceedings: Delivering Customer Value*, Seventh National Demand-Side Management Conference, 165–168, Electric Power Research Institute, Palo Alto, Calif., June.

LeBlanc, W. 1994, "Thomas A. Edison Will Finally Smile: The Pricing of Energy Services, Not Kilowatt-Hours," *ACEEE 1994 Summer Study or Energy-Efficiency in Buildings*, 6.127-6.137, American Council for an Energy-Efficient Economy, Washington, D.C.

McDonald, C. 1995, "Competitive Market Segmentation: Designing DSM to Provide the Most Value," *Proceedings: Delivering Customer Value*, Seventh National Demand-Side Management Conference, 168–170, Electric Power Research Institute, Palo Alto, Calif., June.

Meagher, P. and R. Blevins 1995, "Tracking the Transformation: The New Crop of Demand-Side Programs and Services," *Proceedings: Delivering Customer Value*, Seventh National Demand-Side Management Conference, 17–21, Electric Power Research Institute, Palo Alto, Calif., June.

Messenger, M. and R. Shapiro 1995, *The Potential Effect of Electric Industry Restructure and Regulatory Choices on Utility DSM Programs*, California Energy Commission, Sacramento, Calif., January.

Nadel, S. 1995, *DSM Programs in an Era of Tight Budgets: Maximizing Long-Term Energy Savings While Minimizing Utility Costs*, American Council for an Energy-Efficient Economy, Washington, DC, Forthcoming.

Nadel, S., H. Geller, and M. Pye 1995, *DSM Under Attack: Are Utilities Overreacting to the Threat of Retail Wheeling?*, American Council for an Energy-Efficient Economy, Washington, DC, March.

Schweitzer, M., and T. Young 1994, *State Regulation and Its Effects on Electric-Utility Use of DSM Resources*, ORNL/CON-391, Oak Ridge National Laboratory, Oak Ridge, Tennessee, August.

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APPENDIX A. ORAL DATA COLLECTION PROTOCOL FOR UTILITIES

Respondent Information

Name and Job Title:_____
Organization:_____
Address:_____
Phone Number:_____
Fax Number:_____

I. Nature of Changes in Utility DSM Usage
As used here, the term DSM does not include load-building efforts.

1. How would you characterize recent changes in DSM usage — in terms of expenditures, program type, and effects on energy use and peak demand — by your utility?

2. How do you expect your utility's DSM usage to change over the next five years?

II. Possible Reasons for Changes in Utility DSM Usage

1. What important factors account for recent and projected changes in DSM usage by your utility? Explain.

2. If there are any written materials that are highly relevant to the issues that we have discussed, please send them.

III. New and Innovative Programs

1. Describe any innovative DSM programs designed by your utility to respond to competitive pressures (e.g., customer-financed DSM, community-based DSM, customer-retention DSM).

2. How do the above programs address your concerns with competition?

3. Does your utility have any recent or planned programs aimed at switching customers to energy-efficient equipment to perform functions (e.g., space heating via heat pump, transportation via electric vehicles) for which the targeted customers did not formerly use electricity? Explain.

IV. Possible Actions to Encourage Continued Utility Use of Cost-Effective DSM

1. What changes in federal law or policy could be helpful to encourage continued utility use of cost-effective DSM resources?

2. What changes in state law or regulatory policy could be helpful to encourage continued utility use of cost-effective DSM resources?

3. What non-regulatory, non-legislative actions could be helpful to encourage continued utility use of cost-effective DSM resources?

APPENDIX B. WRITTEN DATA COLLECTION PROTOCOL FOR UTILITIES

Note: As used here, the term DSM does not include load-building efforts.

I. Nature of Changes in Utility DSM Usage

DSM Effects

Please check the accuracy of the 1993 data given below and provide the same information for subsequent years for your utility (if available):

	1993 [from EIA-861]	1994 [Actual numbers or updated estimates]	1995 [Budgeted expenditures and estimated effects]	1998 [updated projections]	1999 [new projections]
DSM expenditures (*Excluding* load-building)					
Annual energy savings from DSM programs					
Annual potential peak reduction from DSM programs					
Load-building expenditures					
Annual energy effects from load-building					
Annual actual peak growth from load-building					
Retail revenue					

DSM Program Types

1. How has your emphasis on the following factors changed since 1992 and what changes do you anticipate over the next 5 years?
Use the following 5-point scale to indicate the change in emphasis:
1=Large decrease 2=Moderate decrease 3=No change 4=Moderate increase
5=Large increase

Change in emphasis on:	Since 1992	Over next five years
Rebates		
Direct installation of DSM measures		
Leasing equipment		
Providing financing		
Shared savings		
Recovery of program costs from participants		
Market transformation		
Rate discounts		
Energy efficiency		
Load management		
Load building		

2. How has your emphasis on DSM programs for the following customer classes changed since 1992 and what changes do you anticipate over the next 5 years?
Use the following 5-point scale:
1=Large decrease 2=Moderate decrease 3=No change 4=Moderate increase
5=Large increase

Change in emphasis on DSM programs for:	Since 1992	Over next five years
Residential sector		
Commercial sector		
Industrial sector		

II. Possible Reasons for Changes in Utility DSM Usage

General Motives for DSM Usage

1a. What is the current importance to your utility of each of the following possible reasons for offering DSM programs?
Use the following 5-point scale to indicate importance:
1=Very slight 2=Slight 3=Moderate 4=Great 5=Very great

Possible reasons for offering DSM programs	Current importance [Question 1a]	Change since 1992 [Question 1b]
Financial gains for utility		
Providing increased services to customers		
Requirements of federal government		
Requirements of state PUC		
Results of IRP		
Environmental benefits		
Pressure from public interest groups		

1b. In the preceding table, indicate how the importance of the various reasons for offering DSM programs has changed since 1992.
Use the following 5-point scale:
1=Currently much less important than before 2=Currently less important than before
3=Currently about as important as before 4=Currently more important than before
5=Currently much more important than before

Competition for Customers

2a. How important a factor is competition for customers in influencing DSM usage by your utility? _____
Use the following 5-point scale to indicate importance:
1=Very slight 2=Slight 3=Moderate 4=Great 5=Very great

2b. How does the current importance of competition in influencing DSM usage (indicated above) compare to the importance of the same factor in 1992? _____
Use the following 5-point scale:
1=Currently much less important than before 2=Currently less important than before
3=Currently about as important as before 4=Currently more important than before
5=Currently much more important than before

2c. Which of the following competitive pressures has your utility experienced since 1992?
Please check those applicable.

Competitive pressure	Actual loss of customers	Threatened loss of customers
Loss of customers to other utilities		
Loss of customers to non-utility generators		
Loss of customers to self- or co-generation		
Relocation of customers to take advantage of lower energy costs outside service area		
Loss of customers to municipalization		
Loss of municipal customers to other wholesale suppliers		
Loss of customers through fuel substitution		

2d. Has competitive pressure been manifested through negotiation of lower rates with large customers since 1992? _____ If "yes", approximately what proportion of your total sales does this represent? Approximately _____ %

Concern with Rates

3a. How important is the desire to avoid increasing rates charged to each of the following customer classes in influencing DSM usage by your utility?
Use the following 5-point scale to indicate importance:
1=Very slight 2=Slight 3=Moderate 4=Great 5=Very great

Residential Class _____
Commercial Class _____
Industrial Class _____

3b. How does the current importance of the desire to avoid increasing rates charged to the various customer classes (indicated above) compare to the importance of the same factor in 1992?
Use the following 5-point scale:
1=Currently much less important than before 2=Currently less important than before
3=Currently about as important as before 4=Currently more important than before
5=Currently much more important than before

Residential Class _____
Commercial Class _____
Industrial Class _____

3c. If avoiding rate increases is important, which of the following actions have been taken since 1992—and will be taken in the next five years—toward this end?
Please check those applicable.

Action	Taken since 1992	To be taken within next five years
Changes in amount and type of supply-side resources used		
Changes in amount and type of DSM used		
Changes in DSM cost-recovery approaches		
Increased emphasis on RIM test		
Staff reductions		

Provision of Services

4. Toward the end of providing services to customers, which of the following actions have been taken since 1992, and which will be taken in the next five years? *Please check those applicable.*

Action	Taken since 1992	To be taken within next five years
Expand number of DSM programs offered		
Expand customer classes served by DSM programs		
Expand programs to special-needs groups		
Provide equipment sales and maintenance		
Provide innovative pricing		
Ensure/protect reliability		
Provide energy audits		
Provide technical assistance		

Utility Characteristics

5. Describe your utility in terms of the following factors:
   - Number of years until new peaking _____ and baseload _____ resources will be needed.
   - Retail rates relative to those of other nearby utilities. _____

   Use the following 5-point scale to indicate if your rates are:

1=Much lower 2=Somewhat lower 3=About the same 4=Somewhat higher 5=Much higher

State Regulations

6. Which of the following topics are addressed by current state regulations and how important are these regulations to your DSM decisions?
Please check those applicable, and use the following 5-point scale to indicate importance:
1=Very slight 2=Slight 3=Moderate 4=Great 5=Very great

Topic	Addressed by state regulations	Importance
Retail wheeling		
Wholesale wheeling		
Financial incentives to utility for DSM usage		
DSM-related lost revenue recovery		
Environmental externalities		
DSM program cost recovery		
DSM-related cost-effectiveness testing		
Integrated resource planning		

Respondent Information

Name and Job Title: _____

Organization: _____

Address: _____

Phone Number: _____

Fax Number: _____

APPENDIX C. HYPOTHESIZED RELATIONSHIPS

I. General Motives for DSM Usage

1. The importance of providing increased services to customers, environmental benefits, and pressure from public interest groups are positively related to growth in DSM expenditures, energy savings, and peak reduction.

2. The importance of utility financial gains, requirements of federal and state governments, and IRP results are related to changes in DSM expenditures, energy savings, and peak reduction.

II. Competition for Customers

3. The importance of competition for customers is inversely related to growth in DSM expenditures, energy savings, and peak reduction.

4. The actual or threatened loss of customers due to competitive pressures is inversely related to growth in DSM expenditures, energy savings, and peak reduction.

5. The negotiation of lower rates with large customers is inversely related to growth in DSM expenditures, energy savings, and peak reduction.

III. Concern with Rates

6. The importance of the desire to avoid rate increases is inversely related to growth in DSM expenditures, energy savings, and peak reduction.

7. Actions taken to avoid rate increases are related to changes in DSM expenditures, energy savings, and peak reduction.

IV. Provision of Services

8. DSM program expansions made in the interest of providing services to customers are positively related to growth in DSM expenditures, energy savings, and peak reduction.

9. Other actions taken to provide services to customers are related to changes in DSM expenditures, energy savings, and peak reduction.

V. Utility Characteristics

10. The number of years until new peaking and baseload resources will be needed is inversely related to growth in DSM expenditures, energy savings, and peak reduction.

11. The magnitude of retail rates relative to those of other nearby utilities is inversely related to growth in DSM expenditures, energy savings, and peak reduction.

12. The size of a utility is related to changes in DSM expenditures, energy savings, and peak reduction.

13. The magnitude of a utility's recent DSM expenditures is related to changes in DSM expenditures, energy savings, and peak reduction.

14. Geographic location is related to changes in DSM expenditures, energy savings, and peak reduction.

VI. State Regulations

15. The existence of state regulations addressing utility financial incentives, lost-revenue recovery, environmental externalities, DSM program cost recovery, and integrated resource planning is positively related to growth in DSM expenditures, energy savings, and peak reduction.

16. The importance attributed to state regulations addressing the above-mentioned topics is positively related to growth in DSM expenditures, energy savings, and peak reduction.

17. The existence and importance attributed to state regulations on other topics are related to changes in DSM expenditures, energy savings, and peak reduction.

APPENDIX D. DETAILED DISCUSSION OF FINDINGS FROM STATISTICAL TESTS OF HYPOTHESIZED RELATIONSHIPS

In this appendix, we provide more detail on the methods used to test the hypothesized relationships described in Appendix C and present a detailed discussion of *all* the statistically significant relationships identified through our analysis.

RESEARCH METHODS

In our statistical analysis of the state data set, we used the data reported in response to Form EIA-861 to represent DSM changes because that was the most current data we had. For the utilities, however, we used the more up-to-date information provided in response to our survey, because analyses conducted with these data generally yielded more—and more believable—relationships than did analyses utilizing the older EIA-861 numbers. We ran separate analyses for the utility and state data sets in order to avoid diluting the findings generated from the more up-to-date utility data on DSM usage and to avoid double-counting the activities of some utilities, because a number of the subject utilities were located in states that also were studied. For both the utility and state data sets, we generally found stronger relationships between the various explanatory variables and DSM expenditures[1]—especially projected expenditures—than between the same explanatory factors and any of the other measures of DSM usage.

In a small number of cases, we performed linear regression analysis, which uses only one explanatory variable in conjunction with a single measure of change in DSM usage. In nearly all cases, however, we used multiple regression, which examines the relationship (or lack thereof) between a single measure of DSM change and a set of potential explanatory variables. The state of Hawaii was dropped from all analyses using projected DSM expenditures and energy savings as measures of DSM usage because the state was an *extreme* outlier on these two items and its inclusion in the analysis led to spurious results.

For most of the hypotheses tested, the possible explanatory variables were associated with each other in some way (e.g, eight possible actions that could be taken toward the end of providing services to customers). Therefore, we ran a correlation analysis for each such set of variables to identify any that might be highly correlated with each other and whose coexistence might mask the relationship of each to the measure of change in DSM usage being studied. Where a strong relationship was found between two or more variables, we dropped one of the factors from the regression equation and ran the analysis without it. Then, that variable was put back in the equation and one or more of the related variables was dropped. We also ran reduced models (i.e., using fewer

[1]All DSM expenditures from past and future years were converted to 1994 dollars, and the same was done for retail revenues.

explanatory variables) in those cases where a closer examination of the data indicated that a variable (or variables) might become significant if another factor (or factors) were dropped. If new variables became significant as a result of these adjustments or the significance of the remaining variables increased, we substituted reduced models for the larger equation. In all cases where multiple regression analysis was used, the relationships we report between a given explanatory factor and a specified measure of change in DSM usage exist in the presence of all other independent variables used in the equation.

In discussing the findings of our statistical analyses, we focus on the R-Square value, although we also show p-values in our tables. The R-Square value represents the proportion of the variance in a given measure that is explained by one or more explanatory variables. In this study, it tells us how much of the difference among the utilities or states in their change in the use of a particular measure of DSM usage (e.g., recent change in DSM expenditures) is accounted for by a particular factor or related set of factors. In this appendix, we report our findings from each statistical test regarding the total R-Square value associated with all significant variables. The p-value represents the probability that a relationship found for a given sample is a chance occurrence, and would not be duplicated in the larger population of which that sample is a part. Technically, p-values do not really apply to our study, because the utilities and states that we studied were not selected to be representative of a larger population of utilities and states. Instead, they were chosen because they are themselves a very important group: namely, those utilities and states exhibiting the greatest and least growth in DSM usage. Still, we will report only those relationships where the p-value is .05 or less,[2] because the amount of variance explained when p is greater then .05 generally is too minor to be of interest. The tables of findings presented in subsequent sections, therefore, only show those relationships that meet this threshold of statistical significance.[3] Due to the previously-mentioned correlations among many of the variables studied, the reader is cautioned that the amount of variance in DSM usage explained by different sets of independent variables is not strictly cumulative.

GENERAL MOTIVES FOR DSM USAGE

Through our statistical analysis of utility survey responses, we found that recent change in the importance given to state regulatory requirements was positively related to growth in energy savings and that change in the importance of federal requirements was positively related to recent growth in peak reduction (Table D.1). This means that the growth in DSM-induced energy savings from 1992 to 1994 generally was greater for utilities that increased the importance they attributed to the requirements developed by their PUCs, and that the increase in cumulative peak demand reduction during that same time period was higher for utilities that were increasingly influenced by federal

[2]The .05 level frequently is used as a threshold for determining statistical significance.

[3]This explains why most of the tables in this appendix do not show relationships for all six measures of change in DSM usage that are used in this study.

Table D.1. Statistically significant relationships between general motives for offering DSM programs and changes in DSM usage: utilities

Explanatory variables	Measures of DSM Usage			
	Recent growth in energy savings, 1992–94	Recent growth in peak reduction, 1992–94	Projected growth in DSM expenditures, 1994–98	Projected growth in energy savings, 1994–98
Change in importance of state requirements	Positive (p=.05)			
Change in importance of federal requirements		Positive (p=.01)		
Current importance of financial gain for utility			Inverse (p=.009)	
Current importance of IRP results			Positive (p=.04)	Positive (p=.03)
R-Square[a]	0.23	0.40	0.42	0.11

[a]The R-Square value describes the proportion of the variance in the designated measure of DSM usage that is explained by the significant independent variable(s)

requirements. The change in importance of state requirements accounted for 23% of the total variance in how energy savings had grown (R-Square=0.23), while change in the influence of federal requirements accounted for 40% of observed variance in recent growth in peak reduction (R-Square=0.40). These findings indicate that, in general, federal and state requirements have tended to encourage greater utility use of DSM resources.

As for effects on projected 1994–1998 changes in DSM usage, we found that the current importance attributed to financial gains for the utility was inversely related to projected growth in DSM expenditures and the importance given to the results of the utility's IRP was positively related to the same measure of DSM usage. In other words, utilities whose DSM decisions were more heavily influenced by considerations of financial gain anticipated lower levels of growth in DSM expenditures than other utilities,

indicating that utilities that are focusing on financial gain are reluctant to incur DSM costs and potentially add to DSM-related stranded investments. And those utilities that were more heavily influenced by IRP results planned to experience greater growth in their DSM investments. Between them, the importance attributed to utility financial gain and to IRP results accounted for 42% of the observed variance in how utilities' 1994–1998 DSM expenditures were expected to change (R-Square=0.42). The importance attributed to IRP results also was positively related to projected growth in energy savings, but this factor only accounted for 11% of the total variance (R-Square=0.11).

For the states, we found a weak inverse relationship between the growth in DSM expenditures from 1992 to 1994 and both the reported change in the importance of providing increased services to customers and the change in importance of utilities' IRP results during that period. This means that, as the importance of providing greater customer services and acting on IRP results declined, DSM expenditures grew more rapidly. These results are counter-intuitive and should not be taken too seriously because, between them, the two significant variables account for only 3% of the observed variance in recent changes in DSM expenditures (R-Square=0.03). As for future DSM activity, we found no statistically significant relationship between any of our measures of changing DSM usage and the ways in which state regulators characterized the current importance given by their utilities to the various possible motives for offering DSM programs.

COMPETITION FOR CUSTOMERS

We hypothesized that the actual or threatened loss of customers would be inversely related to growth in DSM usage, based on the assumption that utilities would respond to customer losses by attempting to avoid any future increases in electricity rates and that DSM programs would suffer as a result. In fact, we did find an inverse relationship between 1992–1994 growth in DSM expenditures by the utilities studied and the actual loss of customers in recent years to take advantage of lower energy costs outside the service area, meaning that utilities that lost customers in this manner were likely to increase their DSM expenditures less than other utilities (or to cut their expenditures more). However, this factor accounted for only 16% of the variance in how DSM expenditures changed between 1992 and 1994 (R-Square=0.16). As shown in Table D.2, we found stronger relationships between *projected* DSM usage and the actual loss of customers to several other competitive factors. The loss of customers to self- or co-generation accounted for 30% of the variance in projected growth in peak reduction from 1994 to 1998 (R-Square=0.30). Once again, we found an inverse relationship, meaning that utilities that lost customers in the above manner were likely to experience less growth than other utilities in their DSM-related reduction of peak demand. And 45% of the variance in projected growth in DSM expenditures was accounted for by two factors in combination: the loss of customers to NUGs and the loss of customers to municipalization. Counter to our hypothesis, the relationship between spending changes and the loss of customers to municipalization was *positive*, meaning that spending

Table D.2. Statistically significant relationships between competitive pressures and changes in DSM usage: utilities

Explanatory variables	Measures of DSM Usage			
	Recent growth in DSM expenditures, 1992–94	Projected growth in DSM expenditures, 1994–98	Projected growth in energy savings, 1994–98	Projected growth in peak reduction, 1994–98
Actual loss of customers through relocation	Inverse (p=.02)			
Actual loss of customers to non-utility generators		Inverse (p=.05)		
Actual loss of customers to municipalization		Positive (p=.03)		
Actual loss of customers to self- or co-generation				Inverse (p=.02)
R-Square	0.16	0.45		0.30
Threatened loss of customers to municipalization	Inverse (p=.005)			
Threatened loss of customers to other utilities		Inverse (p=.005)	Inverse (p=.03)	
Threatened loss of customers to self- or co-generation		Inverse (p=.001)		
Threatened loss of customers to non-utility generators			Positive (p=.01)	
Threatened loss of customers through fuel substitution				Positive (p=.05)
R-Square	0.15	0.48	0.41	0.18

increases were projected to be greater for utilities that had experienced the loss of customers to new municipal utilities. It is possible that the DSM spending increases

preceded, and stimulated, the municipalization process. It also is possible that both the formation of municipal utilities and projected changes in DSM expenditures were caused by some unidentified third factor, and that the two are not causally related to each other. Another possible explanation of the observed findings is that utilities chose to respond to the formation of municipal utilities by increasing their DSM expenditures in order to provide better services to their remaining customers, thereby inducing them to stay on the system.

We found an inverse relationship between the threatened loss of customers to municipalization and recent growth in DSM expenditures (R-Square=0.15). There was a much stronger relationship between *projected* growth in DSM expenditures and two key factors: the threatened loss of customers to other utilities and to self- or co-generation. Between them, these factors accounted for nearly half the variance in projected DSM expenditure changes (R-Square=0.48). As hypothesized, both these competitive threats were inversely related to growth in spending, meaning that utilities faced with these threats were likely to experience less growth (or more decline) in DSM expenditures than other utilities. Projected growth in energy savings was inversely related to the threatened loss of customers to other utilities and positively related to the threatened loss of customers to NUGs (R-Square=0.41). The second part of this finding indicates that, if several utilities face the same set of competitive threats, those that also are threatened with loss of customers to NUGs will experience greater growth in DSM-induced energy savings than those that do not face the same threat. This could mean that utilities try to forestall the threatened switch to NUGs by offering more productive DSM programs, or it could indicate a hidden causal factor or a spurious result. We also found a positive relationship between projected growth in peak reduction and the threatened loss of customers through fuel substitution (R-Square=0.18). This counter-hypothetical finding can probably be explained by one of the possible explanations offered above.

Table D.3 shows that nearly half of the variance among the states in recent growth in DSM expenditures was explained by the actual loss of customers to NUGs, through fuel switching, and to self- or co-generation (R-Square=0.49). As hypothesized, there was an inverse relationship for the first two of these factors, meaning that the loss of customers to NUGs or as the result of fuel-switching was associated with lower statewide rates of growth (or greater rates of decline) in DSM expenditures from 1992 to 1994. However, the relationship between recent growth in DSM expenditures and the loss of customers to self- or co-generation—in the presence of all other possible competitive factors—was positive. In other words, states whose utilities had experienced the same competitive pressures as utilities in other states but had, in addition, also lost customers to self- or co-generation tended to increase their 1992–1994 DSM expenditures *more* than their cohorts. It is possible that recent DSM spending increases led to customers' decisions to generate their own electricity or that some unidentified factor is responsible for the observed result. It also is possible that utilities chose to respond to the loss of customers by increasing their DSM programs, thereby possibly winning back their old customers and preventing remaining customers from leaving the

Table D.3. Statistically significant relationships between competitive pressures and changes in DSM usage: states

Explanatory variables	Measures of DSM Usage				
	Recent growth in DSM expenditures, 1992–94	Recent growth in energy savings, 1992–94	Projected growth in DSM expenditures, 1994–98	Projected growth in energy savings, 1994–98	Projected growth in peak reduction, 1994–98
Actual loss of customers to non-utility generators	Inverse (p=.05)				
Actual loss of customers to self- or co-generation	Positive (p=.004)				
Actual loss of customers through fuel substitution	Inverse (p=.004)				
Actual loss of customers to other wholesale suppliers					
Actual loss of customers through relocation			Inverse (p=.02)		
R-Square	0.49		0.14		
Threatened loss of customers to self- or co-generation	Inverse (p=.005)				
Threatened loss of customers through relocation		Inverse (p=.03)		Inverse (p=.04)	Inverse (p=.03)
Threatened loss of customers to non-utility generators			Inverse (p=.02)		
Threatened loss of customers through fuel substitution			Inverse (p=.05)		
R-Square	0.30	0.15	0.39	0.15	0.24

system. As expected, the loss of customers through relocation to areas with lower energy costs was inversely related to projected growth in 1994–1998 DSM expenditures; however, this relationship was relatively weak, explaining only 14% of the variance in projected expenditures (R-Square=0.14).

In all instances, the *threatened* loss of customers was associated with lower growth in DSM usage, as hypothesized. States whose utilities had faced the threatened loss of customers to self- or co-generation tended to experience less growth (or greater decline) in recent DSM expenditures (R-Square=0.30), while states whose utilities were threatened with customer relocation experienced lower growth in DSM-induced energy savings (R-Square=0.15) between 1992 and 1994 than did other states. Projected DSM expenditures tended to be lower in states that were threatened with losing customers to NUGs and through fuel substitution (R-Square=0.39). Similarly, lower future energy savings and peak demand reduction were anticipated in states whose utilities faced the threat of losing customers through relocation (R-Square=0.15 and 0.24, respectively).

For the responding utilities, we found a strong positive relationship between 1992–1994 growth in DSM expenditures and the proportion of total sales made to large customers at newly-negotiated lower rates. In other words, utilities that made a greater share of their sales at new, lower rates tended to increase their spending on DSM programs more than did other utilities. Well over 50% of the variance in DSM expenditures was explained by this single variable (R-Square=0.57), but the strength of this relationship was due to a single utility that had recently increased its DSM programs extremely rapidly. We also found a positive relationship between the proportion of total sales made by utilities to large customers at lower rates and *projected* growth in energy savings (R-Square=0.19). These findings contradict our hypothesis, which held that utilities faced with the need to offer lower rates in order to keep their large customers would respond by spending less on their DSM programs, in order to avoid any upward pressure on rates. A possible explanation for our findings is that high rates tended to stimulate the negotiation of lower rates *and* the development of DSM programs, both of which can have the effect of lowering total bills for utility customers.

CONCERN WITH RATES

We hypothesized that the desire to avoid rate increases for all customer classes would be inversely related to growth in DSM usage, meaning that DSM usage would tend to decline as the importance of avoiding rate increases grew. This hypothesis was based on the assumption that greater concern with keeping rates down would result in less reliance on DSM programs in order to avoid the rate increases that sometimes are associated with the use of DSM resources. Our findings, however, did not clearly support this hypothesis (see Table D.4). Recent change in the importance of the desire to avoid increasing industrial rates was positively related to 1992–1994 growth in DSM-induced energy savings, while the changing importance of commercial rates was inversely related to the same measure of DSM usage; between them, these two factors accounted for 37% of the observed variance (R-Square=0.37). Similarly, growth in projected peak reduction was positively related to the changing importance of industrial rates and inversely related to change in the importance of commercial rates (R-Square=0.29). As for future DSM usage, the growth in projected expenditures was positively related to the current importance of the desire to avoid increasing residential rates and inversely related to the

Table D.4. Statistically significant relationships between desire to avoid rate increases for various customer classes and changes in DSM usage: utilities

Explanatory variables	Measures of DSM Usage		
	Recent growth in energy savings, 1992–94	Recent growth in peak reduction, 1992–94	Projected growth in DSM expenditures, 1994–98
Change in importance of desire to avoid rate increases for commercial customers	Inverse (p=.005)	Inverse (p=.04)	
Change in importance of desire to avoid rate increases for industrial customers	Positive (p=.001)	Positive (p=.006)	
Current importance of desire to avoid rate increases for residential customers			Positive (p=.006)
Current importance of desire to avoid rate increases for commercial customers			Inverse (p=.002)
R-Square	0.37	0.29	0.27

importance attributed to avoiding commercial rate increases (R-Square=0.27). These findings could indicate that the desire to avoid commercial rate increases leads to lower DSM usage, while the desire to avoid rate increases to the other two major customer classes encourages greater reliance on DSM. It is safer, however, to say that our statistical analysis showed no clear or consistent causal relationship between DSM usage and the desire to avoid rate increases.

Responses from the states that we examined showed the same general pattern as responses from the utilities, but states generally saw concern with avoiding rate increases as being less important than the utilities did. We found an inverse relationship for the states between the current importance of the desire to avoid commercial rate increases and projected growth in DSM expenditures (R-Square=0.18). This means that projected

growth in DSM expenditures tended to be less in states whose utilities attributed greater importance to avoiding rate increases for their commercial customers.

Through our statistical analysis of the responding utilities, we found that recent changes in the amount and type of supply-side resources used was positively related to the growth in energy savings from 1992 to 1994 and that recent staff reductions were inversely related to the same measure of DSM usage (Table D.5). Between them, these two factors accounted for 21% (R-Square=0.21) of the variance in recent growth in energy savings. The observed relationships mean that utilities that had experienced recent changes in their supply-side portfolio tended to have greater growth in DSM-induced energy savings, while those that had downsized between 1992 and 1994 tended to have lower growth in energy savings. The association between supply-side modifications and greater growth in DSM-related savings could indicate that utilities compensated for a reduced emphasis on supply-side resources by more vigorously pursuing DSM, or that utilities faced with rapid growth pursued both supply- and demand-side options. The finding about staff reductions could indicate that the loss of staff members had an

Table D.5. Statistically significant relationships between actions taken to avoid rate increases and changes in DSM usage: utilities

	Measures of DSM Usage		
Explanatory variables	Recent growth in energy savings, 1992–94	Projected growth in energy savings, 1994–98	Projected growth in DSM expenditures, 1994–98
Recent changes in amount and type of supply-side resources used	Positive (p=.05)		
Recent staff reductions	Inverse (p=.04)	Inverse (p=.02)	
R-Square	0.21	0.05	
Planned staff reductions			Inverse (p=.02)
Planned increase in emphasis on RIM test		Positive (p=.04)	
R-Square		0.17	0.30

adverse effect on DSM program productivity. Our analysis also revealed a weak inverse relationship between staff reductions and projected growth in energy savings (R-Square=0.05).

Utilities planning to reduce staff in the next few years tended to experience lower growth in projected DSM expenditures than did other utilities (R-Square=0.30). This could mean that a smaller staff allows utilities to undertake fewer DSM programs. Surprisingly, the intention to increase utility emphasis on the Rate Impact Measure (RIM) test was found to be associated with *greater* growth in projected energy savings (R-Square=0.17). This is counter-intuitive, because the RIM test tends to result in fewer DSM measures being found cost-effective than do the Total Resource Cost or Societal tests. Because the amount of variance accounted for by this factor was small and because no relationship was found between the RIM test and any other measure of DSM usage, it is very possible that this finding is spurious.

Our statistical analysis of the states revealed that recent change in the amount and type of DSM used was inversely related to projected growth in DSM expenditures from 1994–1998 (R-Square=0.27). This means that states in which such DSM program modifications took place tended to change in the direction of reduced DSM investments. We found a relatively weak positive relationship between recent changes in DSM cost-recovery approaches and projected peak reduction effects (R-Square=0.12). Apparently, those changes have tended to encourage increased use of DSM resources.

PROVISION OF SERVICES

As shown in Table D.6, we found relatively weak positive relationships between the recent provision of equipment sales and maintenance by utilities and both their 1992–1994 growth in DSM expenditures (R-Square=0.12) and their projected 1994–1998 growth in energy savings (R-Square=0.13). This means that utilities that had provided equipment sales and maintenance for their customers tended to increase their recent DSM spending and their projected energy savings more than did other utilities. One possible explanation is that such programs are somewhat more expensive and effective than other possible DSM measures. We also found that utilities that had recently provided technical assistance to customers generally experienced less growth in energy savings than did other utilities (R-Square=0.16). Possible explanations for this are that the technical assistance programs run by the responding utilities tended to be less comprehensive or aggressive than other types of programs, and that some of these programs promote electrotechnologies that increase sales. Most importantly, we found that two key factors—recent action to ensure reliability and the recent provision of energy audits—together accounted for over three-fifths of the variance in projected growth in DSM expenditures (R-Square=0.61). Both of these factors were inversely related to spending growth, meaning that utilities that had recently taken the actions in question tended to anticipate less growth (or greater decline) in their DSM spending than did other utilities. The inverse relationship between energy audits and growth in DSM

Table D.6. Statistically significant relationships between provision of services and changes in DSM usage: utilities

Explanatory variables	Measures of DSM Usage			
	Recent growth in DSM expenditures, 1992–94	Recent growth in energy savings, 1992–94	Projected growth in DSM expenditures, 1994–98	Projected growth in energy savings, 1994–98
Recent provision of equipment sales and maintenance	Positive (p=.02)			Positive (p=.04)
Recent provision of technical assistance		Inverse (p=.02)		
Recent action to ensure/protect reliability			Inverse (p=.005)	
Recent provision of energy audits			Inverse (p=.03)	
R-Square	0.12	0.16	0.61	0.13
Planned expansion in number of DSM programs offered			Positive (p=.002)	
Planned provision of energy audits			Inverse (p=.04)	
R-Square			0.56	

expenditures is easy to explain, because the provision of audits is less expensive than many other types of DSM program. The reason why actions to ensure reliability were associated with lower spending growth is less clear, but it could be that utilities that took proactive steps to ensure system reliability were less concerned with avoiding capacity shortfalls through the provision of DSM programs.

Turning our attention to the provision of services planned for the near-term future, we find that utility intentions to expand the number of DSM programs offered

and to provide energy audits, in combination, accounted for 56% of the variance in projected growth in DSM expenditures (R-Square=0.56). Not surprisingly, utilities planning to expand the number of DSM programs in their portfolio tended to project greater growth in DSM expenditures than did other utilities, while those that planned to offer energy audits tended to increase their DSM expenditures more slowly (or decrease them more quickly).

For the states, we found that recent expansion in the number of DSM programs offered was positively related to recent growth in DSM expenditures (R-Square=0.08), projected growth in energy savings (R-Square=0.37), and projected growth in peak reduction (R-Square=0.30), as illustrated in Table D.7. This means that, as hypothesized, DSM usage tended to grow as the number of DSM programs offered within a state were expanded. Our statistical analysis also revealed that recent increases in the number of DSM programs offered in conjunction with recent expansion of programs for special-needs groups accounted for 15% of the variance in recent growth in peak reduction (R-Square=0.15). And those two factors combined with recent provision of innovative pricing and recent action to ensure reliability accounted for a much larger amount of the variance in growth in projected DSM expenditures (R-Square=0.47).

By itself, plans to expand the number of DSM programs offered accounted for a tiny amount of the total variance in projected growth in state DSM expenditures (R-Square=0.0004). However, when the above factor was combined with plans to expand the number of customer classes served, to provide energy audits, and to offer technical assistance, we were able to explain 54% of the variance in projected growth in peak reduction (R-Square=0.54). Not surprisingly, planned program expansion was positively related to projected growth in peak reduction and the intention to provide audits was inversely related to this measure of DSM usage. More difficult to explain is the positive relationship found between the planned provision of technical assistance and projected growth in peak reduction. This is slightly puzzling because the recent provision of technical assistance had been inversely related to recent change in energy savings for the responding utilities. More challenging to explain is the counter-hypothetical finding that planned expansion of the customer classes served by DSM programs was associated with lower rates of projected growth in peak reduction. It is important to note that this relationship was significant only in the presence of all the other possible actions planned for the next five years in the interest of providing services to customers. Perhaps the significance of this finding is that states in which there was still room to expand the customer classes served were states having a lower level of commitment to aggressive pursuit of DSM resources, as indicated by their lower projected growth in peak demand reduction.

UTILITY CHARACTERISTICS

Our statistical analysis of the utility data set combining a number of utility characteristics—the number of years until new peaking and baseload resources will be

Table D.7. Statistically significant relationships between provision of services and changes in DSM usage: states

Explanatory variables	Measures of DSM Usage				
	Recent growth in DSM expenditures 1992–94	Recent growth in peak reduction, 1992–94	Projected growth in DSM expenditures 1994–98	Projected growth in energy savings, 1994–98	Projected growth in peak reduction, 1994–98
Recent expansion in number of DSM programs offered	Positive (p=.02)	Positive (p=.04)	Positive (p=.04)	Positive (p=.01)	Positive (p=.03)
Recent expansion of programs to special-needs groups		Positive (p=.03)	Positive (p=.04)		
Recent provision of innovative pricing			Inverse (p=.005)		
Recent action to ensure/protect reliability			Positive (p=.05)		
R-Square	0.08	0.15	0.47	0.37	0.30
Planned expansion in number of DSM programs offered			Positive (p=.02)		Positive (p=.0004)
Planned expansion of customer classes served by DSM programs					Inverse (p=.001)
Planned provision of energy audits					Inverse (p=.05)
Planned provision of technical assistance					Positive (p=.03)
R-Square			0.0004		0.54

needed, utility revenues, utility DSM expenditures as a percentage of revenue, and retail rates compared to other nearby utilities—revealed very little effect on changes in DSM usage. The only significant relationship that we found was an inverse one between utilities' 1992 DSM expenditures and their 1992–1994 DSM spending growth (R-Square=0.20). In other words, utilities that had spent more on DSM at the start of the period in question tended to experience *less* growth in DSM spending over the

following years than did other utilities. This indicates that utilities with a history of aggressive pursuit of DSM resources have tended to slow the growth of these efforts in recent years, and that utilities that made a slower start in this area generally experienced more growth recently in their DSM activities.

An examination of the state data uncovered more relationships between utility characteristics and changes in DSM usage than were evident from the utility analysis (Table D.8). Together, retail rates relative to those of other nearby states and the number of years until peak resources would be needed accounted for 41% of the observed variance in projected growth in DSM expenditures (R-Square=0.41). As expected, the amount of time until the utility would need new peaking resources was inversely related to spending increases, meaning that utilities needing resources in fewer years tended to experience more rapid growth in their DSM investments. However, we found no statistically significant relationship between the need for new peaking resources and projected growth in peak reduction. And counter to our hypothesis that utilities with high rates would respond by cutting their DSM investments, we found that utilities with higher relative rates generally increased their spending on DSM resources *more* than other utilities. A plausible explanation for the observed relationship is that utilities responded to high rates by developing more DSM opportunities for customers, in order to better serve them by providing ways to reduce their electricity bills. Also, to the extent that higher rates reflect higher avoided costs, more DSM measures would be cost-effective for utilities with relatively high rates than for lower-cost utilities. The same positive relationship identified above was found between relative rates and projected growth in peak reduction, but the association was very weak (R-Square=0.04). We also found a significant relationship between projected growth in energy savings and two utility characteristics—relative rates and retail revenues (R-Square=0.23). Once again, higher rates were associated with more growth in DSM usage. And there was an inverse relationship between retail revenues and projected savings, meaning that larger utilities tended to anticipate lower growth in their DSM-induced savings than did smaller utilities. One possible explanation for this is that larger utilities got an earlier start in the DSM business than their smaller cohorts, and therefore do not have as much room—or need—to grow as do those utilities that got a later start in this area.

Our statistical analysis revealed relationships between geographic location and several measures of change in DSM usage by the surveyed utilities (Table D.9). Location in the East Central Area Reliability Coordination Agreement (ECAR) region was very strongly positively related to recent growth in energy savings, accounting for just over three-quarters of the variance in this measure of DSM usage (R-Square=0.77). This means that utilities located in the ECAR area tended to have greater growth in energy savings from 1992-1994 than did utilities located elsewhere. ECAR utilities also tended to have greater recent growth in peak demand reduction, but the relationship was not as strong (R-Square=0.45) as for energy savings. The ECAR region contains Indiana, Ohio, Kentucky, West Virginia, nearly all of Michigan, and portions of western Virginia, western Maryland, and western Pennsylvania. Turning to *projected* DSM usage, we found that utilities located in both the ECAR and Mid-Atlantic Area Council (MAAC) regions

Table D.8. Statistically significant relationships between utility characteristics and changes in DSM usage: states

Explanatory variables	Measures of DSM Usage		
	Projected growth in DSM expenditures, 1994–98	Projected growth in energy savings, 1994–98	Projected growth in peak reduction, 1994–98
Number of years until new peaking resources are needed	Inverse (p=.005)		
Retail rates relative to those of nearby utilities	Positive (p=.03)	Positive (p=.05)	Positive (p=.03)
Retail revenues		Inverse (p=.02)	
R-Square	0.41	0.23	0.04

Table D.9. Statistically significant relationships between NERC region and changes in DSM usage: utilities

Explanatory variables	Measures of DSM Usage			
	Recent growth in energy savings, 1992–94	Recent growth in peak reduction, 1992–94	Projected growth in DSM expenditures, 1994–98	Projected growth in energy savings, 1994–98
ECAR region	Positive (p=.0001)	Positive (p=.0001)		Positive (p=.0001)
MAAC region				Positive (p=.01)
ERCOT region			Positive (p=.006)	
R-Square	0.77	0.45	0.35	0.63

anticipated greater increases in energy savings than did utilities in other parts of the country (R-Square=0.63) and that the Electric Reliability Council of Texas (ERCOT) region projected more growth in DSM expenditures than did other areas (R-Square=0.35). The MAAC region is on the eastern seaboard and contains New Jersey, Delaware, and most of Maryland and Pennsylvania. The ERCOT region includes nearly all of Texas, and the finding for this area is due to the high projected growth in DSM spending by a single utility located there. In general, the relationships between geographic location and changes in DSM usage seem to be due to the slowing of DSM program growth in those regions—particularly the west and northeast—where DSM has historically been strong and the adoption of DSM programs in regions that have more recently shown an interest in this resource.

Our analysis of changes in state DSM usage by NERC region revealed that, as with the utilities, growth tended to be strongest in the ECAR region (Table D.10). Location in the ECAR region accounted for 60% of the variance in recent growth in energy savings (R-Square=0.60), 25% of the variance in recent growth in peak demand reduction (R-Square=0.25), and 32% of the variance in *projected* growth in energy savings (R-Square=0.32). For projected growth in DSM expenditures, we found an inverse relationship between this measure and location in the Northeast Power Coordinating Council (NPCC) region (R-Square=0.27), meaning that the NPCC states tended to project less growth in future DSM spending than did states in other regions. The NPCC region contains New York and all the New England states, an area that has historically been a leader in the use of DSM resources. For 1994–1998, however, nearly all of the surveyed NPCC states anticipated reducing their DSM expenditures more rapidly than did almost every other state studied.

Table D.10. Statistically significant relationships between NERC region and changes in DSM usage: states

	Measures of DSM Usage			
Explanatory variables	Recent growth in energy savings, 1992–94	Recent growth in peak reduction, 1992–94	Projected growth in DSM expenditures, 1994–98	Projected growth in energy savings, 1994–98
ECAR region	Positive (p=.0001)	Positive (p=.02)		Positive (p=.007)
NPCC region			Inverse (p=.02)	
R-Square	0.60	0.25	0.27	0.32

STATE REGULATIONS

We hypothesized that the existence of state regulations addressing five topics—financial incentives for utility DSM usage, DSM-related lost revenue recovery, environmental externalities, DSM program cost recovery, and IRP—would be positively related to growth in all measures of DSM usage. Our reasoning was that regulations in these subject areas would stimulate utilities to consider DSM resources more seriously and would make DSM more fiscally attractive relative to other available options. Many of our findings, however, were counter-hypothetical (Table D.11). We found that the presence of regulations on environmental externalities was inversely related to recent changes in DSM expenditures, in conjunction with the existence of lost revenue recovery regulations, which was positively related to this measure of DSM usage. In other words, utilities bound by state regulations on environmental externalities had *lower* levels of recent growth in DSM expenditures than did other utilities, while utilities in states that addressed lost revenue recovery generally experienced greater growth in DSM spending. Between them, these two variables explained 30% of the variance in recent DSM spending growth (R-Square=0.30). The presence of regulations on lost revenue recovery, cost-effectiveness testing, and IRP, in combination, explained 40% of the variance in recent growth in energy savings (R-Square=0.40). Once again, lost revenue recovery regulations were associated with higher growth rates but, counter to our expectation, utilities in states that addressed IRP generally had *lower* recent growth in energy savings. Regulations governing cost-effectiveness testing also were negatively related to recent growth in DSM-induced savings.

The presence of regulations on environmental externalities and lost revenue recovery exhibited the same relationships to *future* growth in energy savings as to recent changes in DSM expenditures (positive and inverse, respectively), explaining well over half of the variance in that measure (R-Square=0.55). We also found that over two-thirds of the variance in projected growth in DSM expenditures (R-Square=0.68) was explained by the existence of regulations on financial incentives for utilities, lost revenue recovery, and the recovery of DSM program costs. As hypothesized, cost recovery regulations and incentives were positively related to expenditures, but lost-revenue recovery regulations had a very strong inverse relationship to DSM spending. In fact, the existence of lost-revenue recovery regulations, by itself, accounted for half of the observed variance in projected DSM expenditures (R-square=0.50). In other words, utilities governed by regulations on that topic tended to have lower projected growth in DSM expenditures than did other utilities. All in all, our findings indicate that the presence of several regulations that are often expected to stimulate DSM usage were actually associated with lower levels of growth in recent and projected DSM usage. The likely explanation for this is that many of the utilities governed by such regulations have been leaders in the use of DSM for many years and, accordingly, have less need—and room— to grow than do other utilities who began using DSM resources more recently. In the case of lost-revenue recovery regulations, the observed relationship also could reflect a decision by utilities governed by such regulations to avoid adverse rate impacts by putting less emphasis on DSM.

Table D.11. Statistically significant relationships between presence of state regulations and changes in DSM usage: utilities

Explanatory variables	Measures of DSM Usage			
	Recent growth in DSM expenditures, 1992–94	Recent growth in energy savings, 1992–94	Projected growth in DSM expenditures, 1994–98	Projected growth in energy savings, 1994–98
Lost revenue recovery	Positive (p=.05)	Positive (p=.002)	Inverse (p=.002)	Positive (p=.005)
Environmental externalities	Inverse (p=.004)			Inverse (p=.002)
Cost-effectiveness testing		Inverse (p=.05)		
Integrated resource planning		Inverse (p=.02)		
Financial incentives for utilities			Positive (p=.02)	
DSM program cost recovery			Positive (p=.03)	
R-Square	0.30	0.40	0.68	0.55

Our analysis of the state data revealed only a single significant relationship between the presence of state regulations and changes in DSM usage. Specifically, the existence of state regulations addressing financial incentives for utilities was associated with higher projected growth in energy savings (R-Square=0.18).

As with the presence of state regulations, we hypothesized that the importance of state regulations addressing five topics—utility financial incentives, lost revenue recovery, environmental externalities, DSM program cost recovery, and IRP—would be positively related to growth in all measures of DSM usage. And, once again, many of our findings ran counter to this hypothesis (Table D.12). Utilities that attributed greater importance to environmental externality regulations tended to have lower levels of recent growth in energy savings (R-Square=0.20) and peak demand reduction (R-Square=0.02). The importance of such regulations also was inversely related to recent growth in DSM expenditures; this factor, in combination with the importance given to IRP, explained

Table D.12. Statistically significant relationships between importance of state regulations and changes in DSM usage: utilities

Explanatory variables	Measures of DSM Usage					
	Recent growth in DSM expenditures, 1992–94	Recent growth in energy savings, 1992–94	Recent growth in peak reduction, 1992–94	Projected growth in DSM expenditures, 1994–98	Projected growth in energy savings, 1994–98	Projected growth in peak reduction, 1994–98
Environmental externalities	Inverse (p=.02)	Inverse (p=.03)	Inverse (p=.04)		Inverse (p=.002)	
Integrated resource planning	Positive (p=.05)				Positive (p=.01)	
Lost revenue recovery		Positive (p=.04)		Inverse (p=.003)		
Financial incentives for utilities					Positive (p=.01)	Positive (p=.03)
Cost-effectiveness testing					Inverse (p=.04)	Inverse (p=.02)
R-Square	0.24	0.20	0.02	0.43	0.56	0.20

24% of the observed variance in DSM spending growth (R-Square=0.24). The relationship between planning and spending was positive, meaning that utilities that attributed greater importance to IRP generally had higher recent levels of growth in DSM expenditures.

The importance attributed to lost-revenue recovery regulations explained 43% of the variance in projected growth in DSM expenditures (R-Square=0.43). The relationship was inverse, meaning that utilities whose state had such regulations generally had lower projected levels of growth in their DSM spending. In combination, the importance attributed to regulations addressing financial incentives for utilities, environmental externalities, cost-effectiveness testing, and IRP accounted for 56% of the variance in projected growth in energy savings (R-Square=0.56). The importance given to regulations on incentives and planning was positively related to savings, as hypothesized. However, utilities that attributed greater importance to regulations on environmental externalities and cost-effectiveness testing tended to have *lower* growth rates in projected energy savings. As for projected growth in peak demand reduction, 20% of the variance in this measure of DSM usage was explained by the importance given to regulations on financial incentives for utilities and cost-effectiveness testing (R-Square=0.20). These relationships were positive and inverse, respectively, as they were for projected growth in energy savings. Our findings lead us to the same conclusion we drew regarding the *presence* of various state regulations: that some regulations that are typically associated with greater reliance on DSM resources were actually related to lower levels of growth in recent and projected DSM usage. Again, this probably indicates that many of the utilities that attributed substantial importance to those DSM-related regulations had aggressively pursued DSM for many years and were closer to their "peak" usage of DSM resources than were other utilities.

For the states, we found a significant relationship between projected growth in DSM expenditures and the importance attributed to regulations addressing wholesale wheeling, financial incentives for utilities, and lost-revenue recovery. Between them, these factors accounted for nearly half the total variance in projected spending growth (R-Square=0.47). States whose utilities attributed greater importance to regulations on wholesale wheeling and incentives tended to have higher projected growth in DSM expenditures, while the importance given to lost-revenue regulations was inversely related to future spending.