Factors Affecting the Choice of Supply- and Demand-Side Programs by Electric Utilities

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Twenty-four US electric utilities were surveyed concerning their operating environments, organizational characteristics, and the mix of resources selected for their integrated resource plans. This article describes the responding utilities in terms of a number of important characteristics, identifies relationships between these characteristics and utility resource mix, and offers recommendations for ways to ensure that cost-effective Demand-Side Management (DSM) programs are fully considered by utilities. Key findings include the following: (1) utilities that include greater amounts of DSM in their plans will not need new capacity as soon as will other utilities; (2) utilities that attribute substantial importance to collaborative planning with non-utility interests emphasize DSM more than utilities that do not favour collaboration as highly; and (3) utilities that attribute greater importance to cost when choosing options for the integrated plan select less DSM than do other utilities, while those that ascribe greater importance to environmental concerns select more DSM.

Vingt-quatre entreprises productrices d'électricité aux États-Unis ont fait l'objet d'une enquête portant sur leur cadre d'exploitation, leurs caractéristiques organisationnelles et la composition des ressources qui entrent dans leur plan intégré de gestion des ressources. L'article décrit les entreprises enquêtées en fonction d'un certain nombre de caractéristiques importantes, fait ressortir les rapports entre ces caractéristiques et la composition des ressources de l'entreprise et recommande des moyens pour faire en sorte que des programmes rentables de gestion axée sur la demande (GAD) soient envisagés sérieusement par les entreprises. Les principales conclusions de l'étude sont les suivantes: 1) les entreprises productrices qui ont davantage recours à la GAD dans leur planification auront besoin d'accroître leur capacité de production moins vite que les autres entreprises; 2) les entreprises qui accordent une grande importance à la planification concertée avec des intervenants de l'extérieur utilisent plus la GAD que les entreprises qui ne prêtent pas la même importance à la concertation; 3) les entreprises qui insistent sur les coûts dans le choix des options pour leur plan intégré ont moins recours à la GAD que les autres entreprises, tandis que celles qui attribuent une plus grande importance aux questions environnementales y ont davantage recours.

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Introduction

In recent years, the practice of integrated resource planning has been adopted by a growing number of electric utilities. Integrated planning techniques differ from traditional utility planning practices primarily in their increased attention to demand-side management (DSM) programs[1] and their integration of supply- and demand-side resources into a combined resource portfolio. This article presents key findings from a survey of 24 utilities throughout the United States with a reputation for competent integrated resource planning. It describes key characteristics of these utilities and their operating environments and presents findings from tests of hypothesized relationships between these characteristics and the mix of resources selected for the integrated plan. Features of the operating environment that are addressed include utility need for additional capacity, dependence on oil and gas, and state regulatory requirements. Important organizational character-

1/ DSM programs include efforts to reduce a utility's capacity requirement during times of peak demand ("load control") as well as efforts to reduce the total amount of electricity that must be generated ("conservation" or "efficiency").

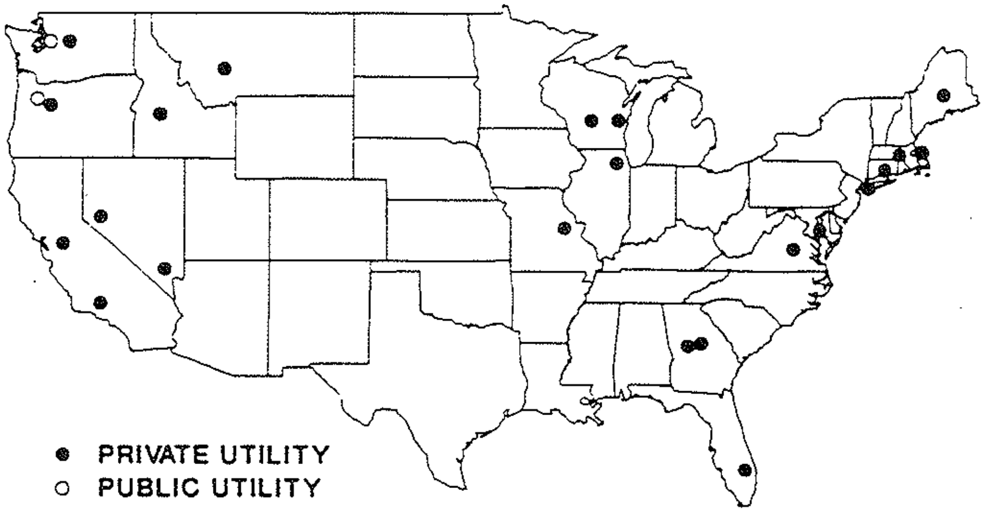

Figure 1: Location of Utilities Responding to ORNL Survey

istics of the surveyed utilities include the techniques used to screen potential DSM resources, the methods used to integrate supply- and demand-side resources into a long-term plan, and the procedures employed in the final selection of an appropriate mix of resources to meet projected needs.[2]

The selection of DSM resources is emphasized because the authors believe that DSM is underutilized in many instances where its use could benefit both utilities and their customers. By identifying those utility characteristics that are associated with greater use of DSM programs, it is hoped that other utilities will consider adopting similar procedures (where appropriate) to ensure that cost-effective DSM options are not overlooked in their plan development process.

Research Methods

A questionnaire was mailed to all 29 of the utilities examined in an earlier study by Oak Ridge National Laboratory (ORNL) of integrated resource plans and planning processes (Schweitzer, 1990), and completed survey forms were received from 24 of them. The location of each responding utility is shown in Figure 1. Twenty-two of these utilities are privately owned, one is a municipal utility, and one is a federal power marketing agency. In combination, the responding utilities represent approximately one-third of total capacity and electricity generation for all US electric utilities (Edison, 1990).

Thirteen hypotheses were developed, describing possible relationships between a utility's resource mix and key aspects of its operating environment and planning procedures. These hypotheses were based on experience gained through previous studies of utility planning performed at ORNL (Schweitzer, 1990; Hirst, 1990) and elsewhere (Eto, 1988; Gellings, 1987; Nadel 1990; Northwest Power, 1986).

Four different measures of the importance of DSM, purchased power, and new utility-owned generation were used as dependent variables in testing the research hypotheses. They are: (1) the percent of a utility's total capacity requirement projected for the year 2000 that is provided by each resource; (2) the percent of a utility's total electricity generation projected for the year 2000 that is accounted for by each resource; (3) the percent of a utility's **additional**[3] capacity re-

2/ See Schweitzer, Hirst, and Hill (1991) for a detailed discussion of **all** study findings.

3/ **Additional** capacity requirement (or electricity generation) is that portion of total capacity requirement (or electricity generation) that exceeds capacity (or generation) in existence at the time the most recent resource plan was prepared.

quirement projected for the year 2000 that is provided by each resource; and (4) the percent of a utility's **additional** electricity generation projected for the year 2000 that is accounted for by each resource. While most of these measures are interrelated, they are **not** identical.

The hypotheses were tested primarily with multiple regression analysis. Where the independent variables were categorical, analysis-of-variance techniques were used. When interpreting the results of multiple regression, it is important to note that the relationship identified between a given independent variable and the dependent variable exists **in the presence of all other independent variables in the equation.**[4] Detailed findings from the multiple regression analyses are shown in an Appendix at the end of the paper.

The statistical tests that were used to test hypotheses allow inferences to be made about all US utilities. The p-values that are reported for each significant relationship discussed in the remainder of this article represent the probability that a relationship that was found for the sample utilities is a chance occurrence, and would not be duplicated in the larger population of **all** utilities.[5] However, because only 24 utilities were studied and these utilities were **not** selected randomly, the inferences made in this report (and the associated p-values) may not be valid for the entire population of US utilities. While the authors believe that the responding utilities are in many ways representative of all utilities nationwide, the fact that they were selected non-randomly requires that caution be used when accepting generalizations for the entire utility industry.

Utility Environment

For any given utility, key characteristics of its internal and external environment include the following: (1) the urgency of its need for additional capacity; (2) its dependence on oil and gas; and (3) the regulatory requirements applied by the Public Utility Commission(s) (PUCs) in the state(s) in which it does business. The attributes of the surveyed utilities in each of these key categories is discussed below, along with the relationships identified between these environmental characteristics and utilities' projected resource mix for the year 2000.

Need for Additional Capacity

The average utility responding to the survey anticipated needing additional capacity in 5.7 years. However, the distribution is skewed toward the lower end of the scale with two-thirds of the responding utilities reporting that they will need additional capacity in five years or less.

The number of years until additional capacity will be needed was found to be significantly related to the percent of additional capacity requirement to be met by DSM ($p=.02$) (see Appendix for Table A1). The importance of DSM was found to be greatest for utilities whose need for additional capacity was furthest in the future. This finding contradicted the relationship originally hypothesized by the authors. That hypothesis was based on the assumption that a pressing need for new capacity would stimulate utilities to concentrate on DSM options as a way to minimize the additional resources to be acquired. In other words, a utility's need for capacity was taken as a precondition for its decision of whether or not to use DSM. The observed findings suggest, however, that a utility's need for capacity can be seen as **following**, rather than

4/ The hypotheses concerning certain key characteristics of a utility's internal environment (i.e., size; need for capacity; growth rate; dependence on oil and gas) were tested by a single multiple regression analysis because the independent variables describe the same broad subject area. All other hypotheses were tested separately because each involves related sets of variables (e.g., the nature of state regulatory requirements; the methods used by utilities to identify potential DSM resources) that are qualitatively different from the variables associated with all other hypotheses, either in terms of the ways in which they affect the planning process or the time period during which the effects take place.

5/ Another way of explaining this is that each reported p-value shows the boundary significance level at which the null hypothesis would be rejected, representing the probability of Type I error (rejection of the null hypothesis when it is true).

leading, the selection of DSM for a long-term plan. Utilities that plan to rely substantially on DSM resources in the year 2000 are likely to begin ramping up these programs in the near-term. Savings from these early programs, in turn, will postpone the date when new capacity will be needed. Several of the respondent utilities were contacted by telephone and asked to comment on this interpretation. All confirmed that new capacity would be needed sooner in the absence of their DSM programs, although several pointed out that other factors (such as slow economic growth) also were important in postponing the need for new capacity.

Utility Dependence on Oil and Gas

Data on the importance of oil- and gas-fired electric generating facilities for the sample utilities was obtained from Energy Information Administration reports for 1988 (EIA, 1988a and b, 1989a and b). Use of oil and gas was considered important because of the greater uncertainty, relative to other fuels, concerning the cost and supply of these resources.[6] For half of the responding utilities, oil- and gas-fired generating plants accounted for less than 10% of their total energy use. Most of the remaining utilities got less than half of their energy from oil- and gas-fired units. At the high end of the scale, one utility met over 80% of its energy requirements with oil- and gas-fired generating units. Overall, however, utility dependence on these fuels was minor.

Regression analysis revealed a relationship between a utility's current dependence on oil and gas for generating electricity and its planned reliance on DSM, as hypothesized. As a utility's dependence on oil and gas increased, so did the percent of its projected total capacity requirement to be met by DSM ($p=.003$). This suggests that a reliance on expensive, and potentially scarce, fossil fuels provides an incentive for utilities to focus on reducing peak generating requirements.

State Regulatory Requirements

The survey asked utilities whether or not the state(s) in which they operate require them to prepare integrated resource plans, whether or not such plans must be formally approved by state regulators, and whether or not state permission for proposed utility resource acquisitions depends on inclusion of those activities in the integrated plan. Based on their responses, each utility was placed into one of four categories, depending on the most stringent requirement placed on them by at least one of the states in which they operate (Figure 2).

The regulatory requirements placed on a utility by its PUC were found to be related to the share of additional capacity requirement in the year 2000 to be provided by DSM programs. Most notably, those utilities required by legislation or administrative order to prepare long-term integrated resource plans were found (through an analysis of variance procedure) to rely more heavily on DSM to meet additional required capacity than those utilities that were not required to plan ($p=.006$). This suggests that utilities are encouraged by a clear PUC interest in integrated planning to add more DSM options to their traditional mix of supply-side resources.

Screening of Potential DSM Resources

Early in the planning process, utilities "screen" potential DSM resources to determine which are suitable for more detailed consideration and which do not warrant further assessment. The screening process generally has three parts: (1) identification of potential DSM resources; (2) assessment of the various DSM options that are identified; and (3) selection of the most suitable DSM options for further consideration at subsequent stages of the planning process (Hill, 1991). This section describes the importance attributed by utilities to various information sources and

6/ The Energy Information Administration (1990) estimates that, during the 1990s, oil and gas prices will increase much more rapidly than will coal prices.

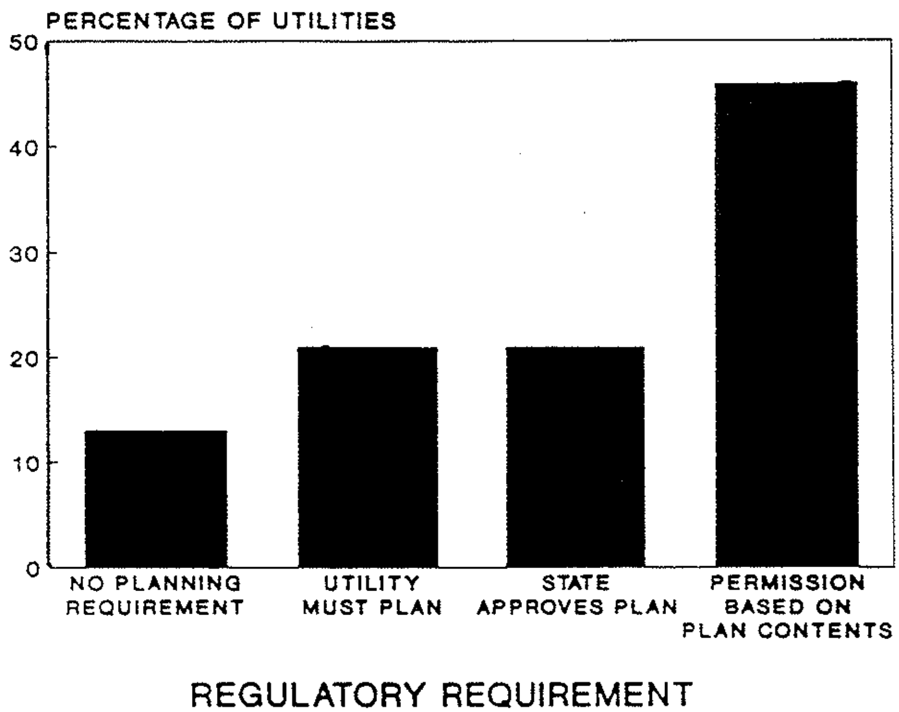

Figure 2: Distribution of Utilities on State Requirements for Integrated Resource Planning

selection criteria and discusses relationships between these factors and the mix of resources chosen for integrated resource plans.

Identification and Initial Assessment of Potential DSM Resources

In the survey, utilities were asked to rate the importance of many possible sources of information (e.g., utility DSM planners, state PUCs) that could be used to help identify and assess potential DSM resources during the screening stage of the integrated planning process. Utility DSM planners were the most important source of information for identifying and assessing potential DSM options. Utility marketing staff also received high ratings for its importance in the identification and assessment of options. A third important information source for option assessment, which was not used during the identification stage, was evaluations of prior DSM programs performed by the utility itself. Outside consultants and outside publications were rated, on average, as being slightly less than moderately important for both identification and assessment of options. These were joined by state PUCs during the identification stage and by DSM program evaluations performed by other utilities during the assessment stage. The least important or least-used sources during one or both of these stages were advisory groups, other utility staff, and formal DSM planning networks.

The responses described above indicate that utilities rely most heavily on in-house expertise to identify and assess potential DSM options. It is likely that those sources that are used the least or assigned the least importance are considered difficult to access, adversarial, or incapable of providing information that is new or useful.

The results of multiple regression analysis suggest that, in the presence of the other key sources used to identify DSM options, only the importance placed on the use of advisory groups is significantly related to the amount of DSM included in the long-term plan ($p=.05$) (see Table A2). Even this factor was found to be related to

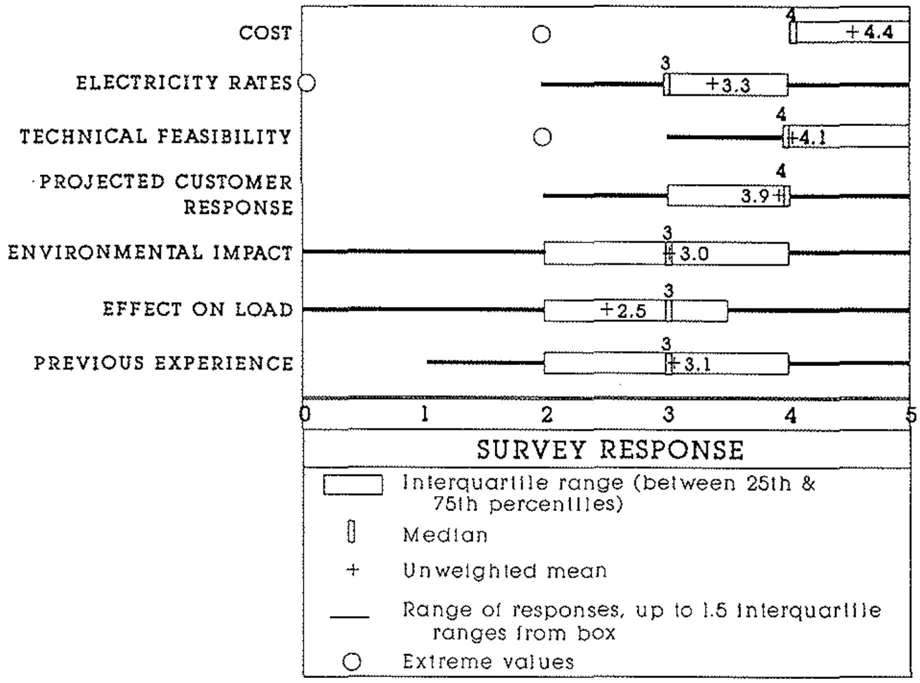

Figure 3: Range of Importance of Criteria Used to Select DSM Options During Screening

only one of the DSM measures (the percent of additional capacity requirement provided by DSM). This finding could mean that, after controlling for the effects of all other sources used to identify possible DSM options, input from technical advisory groups or consumer panels can encourage utilities to place more emphasis on DSM options.

Selection of DSM Resources for Further Study

The most important criterion used in the selection of DSM options for further consideration at later stages of the planning process was cost, followed by technical feasibility and projected customer response (Figure 3). Only one item (effect on load) had a mean rating of less than three (moderate importance). This indicates that, on average, nearly every criterion suggested in the survey played at least a moderately important role in influencing the selection of DSM options during the screening stage. This is in marked contrast to the identification and assessment of resources during screening, where a number of possible information sources had relatively little importance. The implication of this finding is that, when selecting resources, utilities are likely to take the broadest approach possible, attaching substantial importance to a wide range of factors.

Three of the criteria used to select DSM resources during the screening stage were found, in the presence of all other criteria, to be significantly related to the percent of total electricity generation avoided through the use of DSM. The importance placed on projected customer response was negatively related ($p=.003$) to this measure of DSM importance, while environmental impact ($p=.01$) and previous experience with DSM programs ($p=.05$) both were positively related to the amount of DSM contained in a utility's plan (see Table A3). These findings indicate that utilities that are most concerned with how customers will respond to potential DSM programs are least likely to select these programs for further consideration for their integrated plan. In contrast, utilities that attribute substantial importance to potential environmental effects during the screening process are more likely to select DSM options, as are utilities that rely more heavily on their own previous experience with DSM programs.

Integration and Analysis

The long-term resource planning process performed by electric utilities involves the collection and analysis of a great deal of information pertaining to potential supply- and demand-side options, their prospective benefits, and their costs. This section focuses on two important elements of the analytical process: (1) the acquisition of input from non-utility interests; and (2) the techniques used to combine supply-side and DSM resources into an integrated plan.

Public Involvement Mechanisms

The survey asked utilities to rate the importance of six different mechanisms for obtaining input into the planning process from non-utility interests. These mechanisms are: collaborative planning with legally binding results; collaborative planning without legally binding results; use of an advisory group or task force; use of focus groups; use of workshops; and use of customer surveys (Ellis, 1989; Cohen, 1990; Prahl, 1990).

On average, the responding utilities rated the use of an advisory group or task force as their most important source of public input. This was followed closely by the non-binding collaborative planning process, whereby representatives of various governmental agencies and non-governmental interest groups meet with utility representatives to jointly design a mutually acceptable plan. Because the results are non-binding, the final decision concerning the appropriate resource mix rests with the utility itself. Customer surveys, focus groups, and workshops were considered somewhat less important, and **binding** collaborative planning (where the utility is obligated to accept the resulting plan) was rarely used.

The importance attributed to advisory groups and non-binding collaborative planning efforts indicates that utilities are interested in obtaining the active involvement of non-utility interests in their plan development process. Focus groups, workshops, and customer surveys, which generally involve substantially less two-way communication, are less favoured. However, the widespread avoidance of binding collaborative efforts indicates that utilities, while interested in active give-and-take with non-utility interests, are not prepared to share final authority concerning the contents of their long-term plans.

An analysis of variance was run to see if utilities for whom collaborative planning was important (a score of four or five on either collaborative planning item on the survey) differed from other utilities in terms of the amount of DSM, purchased power, and new utility-owned generation contained in their plans. Those utilities for whom collaboration was important were found to have a significantly higher percentage of their total capacity requirements provided by DSM ($p=.006$). This suggests that more intense interaction with non-utility interests could tend to encourage greater use of DSM.

Integration of Supply- and Demand-Side Resources

Utilities were asked to specify which of three methods were used to integrate supply-side and DSM resources into their long-term integrated plan. Possible choices were: the simultaneous consideration of both types of resources based on cost or other utility criteria; subtraction of all cost-effective DSM options from the load forecast and subsequent filling of remaining need with supply-side resources; and initial preparation of an optimal supply-only plan, followed by the substitution of more cost-effective DSM programs (Hirst, 1990).

The responding utilities were fairly evenly distributed in their use of the three specified methods of integrating resources, indicating that there is no predominant method of choice among electric utilities for combining supply- and demand-side resources into an integrated plan. The simultaneous consideration of both types of resources was favoured slightly over the other two standard approaches, while several utilities used tailor-made approaches that differed from the three standard methods.

Multiple regression analysis showed that those utilities that simultaneously considered both supply-side and DSM resources had a significantly higher percent of additional capacity requirements provided by DSM (p=.02) (see Table A4). A much different resource mix was found for those utilities that begin by reducing projected load through the selection of DSM options and then meet all remaining need with supply-side resources. These utilities meet a significantly greater portion of their total capacity requirements (p=.0003), total electricity generation (p=.005), and additional electricity generation (p=.05) with new utility-owned generation.

The findings presented above could mean that simultaneous and equal treatment of all types of resources leads to greater use of DSM, while the treatment of DSM options only at the time of the load forecast leads to more reliance on new utility-owned generating facilities. The first approach might encourage more emphasis on DSM by focusing attention on it throughout the planning process, while the second approach might favour the selection of new generation by limiting the time and attention paid to the DSM alternative.

Resource Selection

The final stage of the integrated planning process involves the selection of a mix of supply- and demand-side resources to meet projected needs for energy and peak capacity. Utilities were asked to rate the importance of six different criteria in selecting options for their long-term resource plan. These criteria are: (1) cost; (2) environmental concerns; (3) flexibility; (4) reliability; (5) electric rates; and (6) capacity equivalence. The first five apply to the utility's assessment of **all** potential options, while the last one applies only to DSM resources.

Cost stands out as being the most important criterion for resource selection, with a mean response of 4.7 and no score below 4 (great importance). Nearly all the other items had mean scores between 3.6 and 4, with most responses clustered around the mean. The one exception is capacity equivalence, which is used for DSM resources only and which had a mean of only 2.5 and an extremely broad range. Almost 30% of the respondents did **not** consider capacity equivalence, in contrast to all the other criteria which were used by all responding utilities.

The responses discussed above indicate that there is a great deal of similarity among utilities in the importance they attach to those criteria that are suitable for the selection of both supply- and demand-side resources. And the importance attached to **all** those selection criteria is substantial. The clear implication is that, while cost is the single most important concern, utilities consider a broad range of factors when selecting options for their integrated resource plans. This is consistent with the finding that a similarly broad approach is taken when selecting DSM resources during the screening stage.

Through the use of multiple regression analysis, it was found that utilities that assign greater importance to cost as a resource selection criterion had a significantly lower percentage of total capacity requirements (p=.02), total electricity generation (p=.05), and additional capacity requirements (p=.02) provided by DSM (see Table A5). In contrast, utilities that assign greater importance to environmental concerns had a significantly **higher** percentage of their additional capacity requirements (p=.002) and additional electricity generation (p=.04) avoided through the use of DSM.

The findings described above suggest that the resource selection criteria used have an effect on the amount of DSM chosen and that an emphasis on cost lessens the amount of DSM selected while an emphasis on environmental concerns increases it. It is possible to infer from this that utilities that currently base their resource acquisition decisions heavily on costs might increase their future reliance on DSM if they were to expand their definition of costs to include environmental externalities.

Summary and Conclusions

The relationships identified in the preceding sections between utility characteristics and resource

Table 1: Summary of Key Relationships Between Utility Characteristics and Resource Mix

- The number of years until new capacity will be needed is positively related to the amount of DSM selected.
- Utility dependence on oil and gas as a fuel for generating electricity is positively related to the amount of DSM selected.
- Utilities that are required to prepare integrated resource plans select more DSM than do other utilities.
- The importance attributed by utilities to input from technical advisory groups or consumer panels when identifying potential DSM options during screening is positively related to the amount of DSM selected.
- The importance attributed by utilities to potential environmental effects and to their **own** experience with DSM programs when selecting DSM options for further consideration is positively related to the amount of DSM selected.
- The importance attributed by utilities to collaborative planning with non-utility interests is positively related to the amount of DSM selected.
- Utilities that give simultaneous and equal treatment to both supply- and demand-side resources when developing an integrated plan select more DSM than do other utilities.
- Utilities that subtract projected DSM savings from the load forecast and meet remaining needs only with supply options when developing an integrated plan rely more on utility-owned generation than do other utilities.
- The importance attributed by utilities to cost when choosing options for the integrated plan is negatively related to the amount of DSM selected.
- The importance attributed by utilities to environmental concerns when choosing options for the integrated plan is positively related to the amount of DSM selected.

mix are summarized in Table 1. Based on these findings, the authors offer recommendations for ways to ensure that cost-effective DSM technologies and programs receive full and fair consideration by utilities.

Utility Environment

Where utilities and other key parties find it desirable to postpone the need for additional capacity, the findings suggest that this can be accomplished by increasing the use of cost-effective DSM resources. One possible way in which DSM usage could be increased is for regulators to require utilities to prepare integrated resource plans. It also might be fruitful for state and federal agencies to offer information and/or assistance on DSM opportunities to those utilities that rely heavily on oil- and gas-fired generation, in light of the predisposition of this group to undertake DSM activities.

Screening

To ensure that cost-effective DSM resources are not overlooked, state regulators should encourage utilities to use technical advisory groups or consumer panels during their screening process and to seriously consider the input from these sources when identifying potential DSM options. Where DSM resources appear to be beneficial but underutilized, regulators also should encourage utilities to consider potential environmental effects when selecting DSM options for further consideration and to perform more evaluations of their own DSM programs so they will have more first-hand experience on which to base their resource selection decisions. Assistance in designing and performing evaluations could come from state and federal energy agencies. As utilities gain more experience with DSM programs and become more familiar with customer response to different kinds of offerings, the use of cost-effective DSM is likely to increase.

Integration and Analysis

To ensure that cost-effective DSM resources are fully considered in the planning process, state regulators should encourage utilities to use more interactive public involvement mechanisms, like collaborative planning, and to pay serious attention to the input received from non-utility interests through these interactions. Another approach that could increase the likelihood that cost-effective DSM options are selected is for utilities to consider supply- and demand-side resources simultaneously and to give equal treatment to each type of resource.

Resource Selection

Where a strong emphasis on narrowly-defined cost considerations is causing DSM options to be underutilized, state regulators should encourage utilities to attach more importance to environmental concerns when choosing resources for their integrated plans and to include environmental externalities in their cost calculations. Technical assistance from state and federal agencies concerning methods for internalizing environmental costs could prove helpful.

This study shows that electric utilities are developing and using improved planning methods. These methods consider a broad array of resources and include inputs from a variety of non-utility sources and a diverse set of criteria used in selecting individual resources and a suitable resource portfolio. Results from the survey of 24 electric utilities suggest that advances in integrated resource planning will likely lead to development of a balanced mix of demand and supply resources that satisfies customer energy-service needs at reasonable economic and social costs.

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Appendix

Table A1: Estimated Coefficients and Summary Statistics for Effects of Utility Environment on Amount of DSM Selected

	Dependent Variable	
Parameter	DSM as % of Total Capacity	DSM as % of Additional Capacity
Intercept	7.5731 t = 2.10, p=.0520[2]	28.3137 t = 1.15, p=.2670[2]
Current Peak Capacity	–0.0001 t = –0.92, p=.3735[2]	–0.0013 t = –2.05, p=.0578[2]
Number of Years Until New Capacity is Needed	0.0305 t = 0.12, p=.9052[2]	4.0820 t = 2.69, p=.0168[2]
Growth Rate of Utility Generation	–7.7122 t = –0.81, p=.4317[2]	22.2104 t = 0.37, p=.7181[2]
Percentage of Electricity Produced by Oil and Gas Combustion	0.1226 t = 3.16, p=.0031[1]	–0.0475 t = –0.22, p=.8306[2]
Model	F(df=4,16) = 3.33, p=.0365	F(df=4,15) = 3.53, p=.0320

1/ p-value was calculated with one-tailed t-test.
2/ p-value was calculated with two-tailed t-test.

Table A2: Estimated Coefficients and Summary Statistics for Effects of Sources Used to Identify DSM Options on Amount of DSM Selected[1]

	Dependent Variable
Parameter	DSM as % of Additional Capacity
Intercept	65.9218 t = 1.33, p=.2102
Importance of Utility DSM Planners	–2.6125 t = –0.25, p=.8083
Importance of Marketing Staff	1.9978 t = 0.25, p=.8041
Importance of Other Planners	–3.4023 t = –0.85, p=.4113
Importance of Outside Consultants	0.6294 t = 0.18, p=.8637
Importance of Outside Publications	–7.8591 t = –0.99, p=.3436
Importance of State PUC	–4.7304 t = –0.52, p=.6117
Importance of State Energy Office	–7.7563 t = 1.31, p=.2159
Importance of Conferences	–7.3907 t = –1.02, p=.3301
Importance of DSM Planning Network	1.0636 t = 0.24, p=.8136
Importance of Advisory Groups	9.9279 t = 2.23, p=.0472
Model	F(df=10,11) = 1.55, p=.2406

1/ All p-values were calculated with two-tailed t-test.

Table A3: Estimated Coefficients and Summary Statistics for Effects of Criteria Used to Select DSM Options During Screening on Amount of DSM Selected[1]

	Dependent Variable
Parameter	DSM as % of Total Generation
Intercept	–0.5004 t = –0.11, p=.9114
Importance of Cost	0.4555 t = 0.57, p=.5768
Importance of Electricity Rates	0.4774 t = 1.06, p=.3070
Importance of Technical Feasibility	1.1432 t = 1.36, p=.1926
Importance of Projected Customer Response	–2.8593 t = –3.53, p=.0028
Importance of Environmental Impact	0.9639 t = 2.77, p=.0137
Importance of Effect on Load	0.4440 t = 1.11, p=.2824
Importance of Previous Experience	1.0965 t = 2.12, p=.0501
Model	F(df=7,16) = 4.13, p=.0089

1/ All p-values were calculated with two-tailed t-test.

Table A4: Estimated Coefficients and Summary Statistics for Effects of Methods Used to Integrate Supply-side and DSM Resources on Amount of DSM Selected[1]

	Dependent Variable			
Parameter	DSM as % of Additional Capacity	New Utility-Owned Generation As % of Total Capacity	New Utility-Owned Generation As % of Total Generation	New Utility-Owned Generation As % of Additional Generation
Intercept	33.9584 t = 3.95, p=.0009	4.5960 t = 1.94, p=.0670	2.6508 t = 1.41, p=.1735	10.8327 t = 1.18, p=.2571
Simultaneous Consideration of Both Resource Types	26.0071 t = 2.45, p=.0247	–2.7148 t = –0.97, p=.3454	0.3356 t = 0.15, p=.8812	13.5590 t = 1.19, p=.2506
Subtraction of DSM Savings from Load Forecast	–9.8538 t = –0.95, p=.3561	12.6977 t = 4.37, p=.0003	7.1000 t = 3.15, p=.0052	24.1603 t = 2.17, p=.0456
Preparation of Supply-Side Plan, Followed by Substitution of DSM Measures	–19.4506 t = –1.71, p=.1051	3.8735 t = 1.24, p=.2319	–0.9780 t = –0.38, p=.7107	–1.0626 t = –0.08, p=.9383
Model	F(df=3,18) = 4.07, p=.0228	F(df=3,19) = 7.75, p=.0014	F(df=3,19) = 3.78, p=.0279	F(df=3,16) = 1.88, p=.1741

1/ All p-values were calculated with two-tailed t-test.

Table A5: Estimated Coefficients and Summary Statistics for Effects of Criteria Used to Select Resource Options for Long-Term Plan on Amount of DSM Selected[1]

	Dependent Variable			
Parameter	DSM as % of Total Capacity	DSM as % of Total Generation	DSM as % of Additional Capacity	DSM as % of Additional Generation
Intercept	26.9819 t = 2.79, p=.0120	13.6477 t = 2.14, p=.0464	136.3492 t = 3.07, p=.0073	28.0545 t = 0.67, p=.5109
Importance of Cost	–5.6719 t = –2.50, p=.0221	–3.1052 t = –2.08, p=.0525	–28.4317 t = –2.54, p=.0219	–7.6073 t = –0.73, p=.4772
Importance of Environmental Concerns	1.7428 t = 1.52, p=.1469	1.5055 t = 1.98, p=.0628	19.5514 t = 3.72, p=.0019	11.0348 t = 2.23, p=.0413
Importance of Flexibility	–1.7765 t = –1.49, p=.1539	–1.0495 t = –1.33, p=.1995	–5.5241 t = –0.98, p=.3423	–10.2695 t = –1.84, p=.0852
Importance of Electric Rates	2.1443 t = 2.22, p=.0391	1.1300 t = 1.78, p=.0927	–3.1831 t = –0.55, p=.5919	5.7208 t = 1.02, p=.3224
Importance of Capacity Equivalence	–0.6155 t = –1.19, p=.2488	–0.4228 t = –1.24, p=.2310	–2.7639 t = –1.13, p=.2743	0.8453 t = 0.35, p=.7297
Model	F(df=5,18) = 1.96, p=.1342	F(df=5,18) = 1.63, p=.2039	F(df=5,16) = 4.13, p=.0134	F(df=5,15) = 1.28, p=.3221

1/ All p-values were calculated with two-tailed t-test.