A NONALGORITHMIC REVIEW OF UNCERTAINTY IN ELECTRIC-UTILITY RESOURCE PLANNING AND DECISION MAKING

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A Nonalgorithmic Review of Uncertainty in Electric-Utility Resource Planning and Decision Making

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ABSTRACT

Uncertainty is a critical factor that pervades all aspects of electric-utility planning. Uncertainties about future load growth; about the continued performance of existing supply and demand resources; and about the costs, construction times, and operations of new resources greatly complicate utility resource acquisition. This paper discusses the integrated-resource planning process that many utilities now use to address uncertainty, reviews the methods that utilities use in planning and in acquiring resources, and suggests future research to help deal with uncertainties. This review is based on assessments of the long-term resource plans prepared by ten utilities and one Public Service Commission, telephone interviews with staff at these 11 organizations and with staff at three consulting firms, and reviews of other related publications.

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1. INTRODUCTION

Uncertainty is an increasingly important element of the planning environment for electric utilities. Utilities face uncertainties about future load growth; about the continued performance and cost of existing supply and demand resources; and about the costs, construction times, and operations of new resources. These uncertainties greatly complicate the acquisition of resources to meet the future electric-energy service needs of customers.

Adequately treating uncertainty requires several ingredients:

1. Data and assumptions on resource alternatives and on external factors;
2. Analytical methods to simulate the operation of the electric-power system;
3. Techniques to combine data, assumptions and analytical methods to analyze uncertainties and to select suitable resource portfolios;
4. Communications between analysts and executives within the utility, and between the utility and its regulatory commission on the resources to acquire; and
5. Feedback from utility actions and its external environment, and subsequent modification of plans and actions.

Hirst and Schweitzer (1988) discuss the first topic and the second topic is amply covered in other papers presented at the Stanford Workshop. This paper focuses on the third and fourth topics, techniques used by utilities to analyze uncertainties and to acquire resources. The remainder of this section discusses integrated resource planning (IRP), a new and evolving process used by utilities and state Public Service Commissions (PSCs) to consistently assess a variety of resources to cost-effectively meet customer energy-service needs. Sections 2 and 3 discuss the approaches that utilities use to treat uncertainty in planning and in decision making. Section 4 suggests additional work to improve our understanding of these uncertainties. A key finding of this work (Section 5) is that the algorithms used in production-costing and capacity-expansion models to optimize utility systems represent only one of many important ingredients to successful treatment of uncertainty.

IRP is important to utilities, their customers, and PSCs (Cavanagh 1986; Energy Conservation Coalition 1987; Hirst 1988a). Typically, the process begins with a situation analysis (top part of Fig. 1). The utility develops alternative forecasts of future electric loads, assesses the costs and remaining

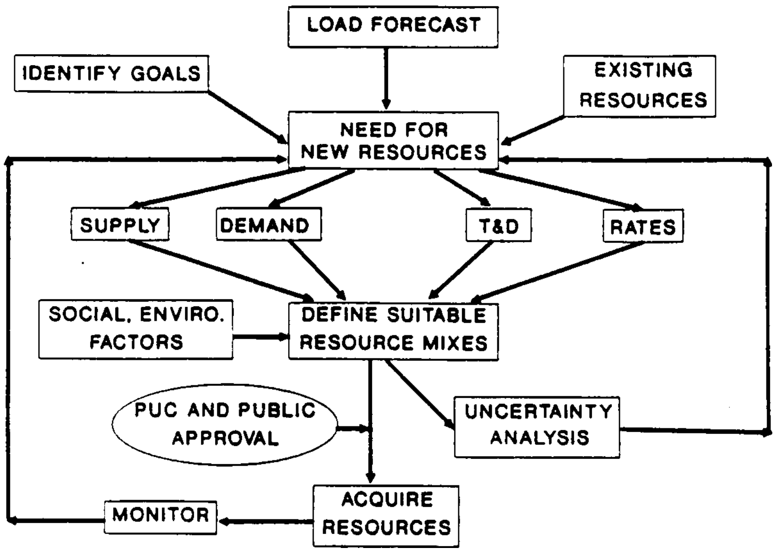

Fig. 1. Schematic showing the basic elements of integrated resource planning for electric utilities.

lifetimes of its existing resources, and identifies the need for additional resources consistent with corporate goals.

The second phase assesses alternatives that could satisfy the need for new resources (middle of Fig. 1). IRP involves a much broader array of resources than the central-station power plants traditionally used by utilities. These alternatives are typically assessed using sophisticated computer models. Several integrated models have been developed during the past few years (Fig. 2). These new models encompass the functions of previously separate load-forecasting, capacity-expansion, production-costing, and financial-planning models.

Next, these analyses are repeated using (1) different assumptions about the external environment (e.g., local economic growth and fossil-fuel prices) and about the costs and performance of different resources, and/or (2) different combinations of resources. Such uncertainty analysis, the focus of this Stanford Workshop, helps to identify a mix of resource options that meets the growing demand for electricity, is consistent with the utility's corporate goals, avoids exposure to undue risks, and satisfies other environmental and social criteria.

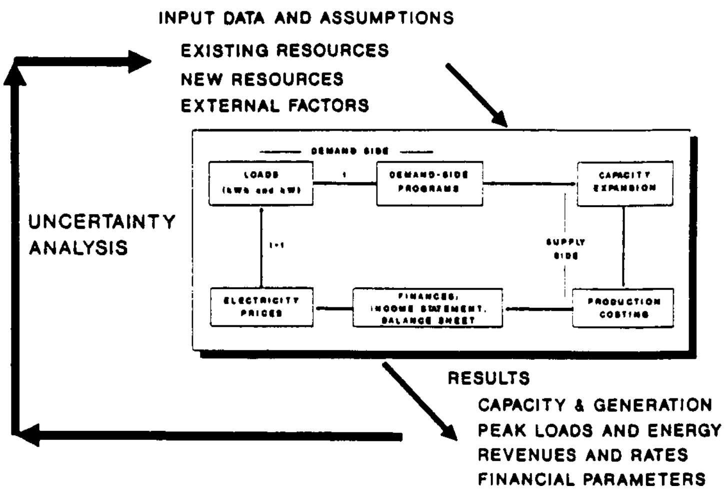

Fig. 2. Schematic of a typical integrated planning model showing the different submodels, the input data and assumptions, and the outputs of such a model. Different methods of varying the input data and assumptions (i.e., the uncertainty-analysis feedback loop) are discussed in Section 2. The model is run recursively from year to year; t refers to time.

After approval by the PSC, the plan is implemented (i.e., resources are acquired; bottom of Fig. 1). The utility monitors changes in its environment and its implementation of the resource plan. The plan is then modified as events and opportunities change over time.

2. TREATMENT OF UNCERTAINTY IN UTILITY PLANS

Information was collected from 14 organizations that use innovative methods for treating uncertainty (Hirst and Schweitzer 1988). Ten of these organizations are utilities (Boston Edison, Central Maine Power, New England Electric System, Northeast Utilities, Potomac Electric Power, Sierra

Pacific Power, Southern California Edison, Southern Company, Tennessee Valley Authority, Wisconsin Power and Light), one is the Michigan PSC, and three are consulting firms.

Information on each respondent was collected by reviewing documents describing their methods for planning under uncertainty. Subsequently, a telephone interview was conducted with each organization to elicit additional information on their uncertainty-analysis techniques and planning process.

Uncertainties, both internal and external to the utility, were explicitly considered in the 11 plans (Table 1). All the plans addressed future loads and nearly all were concerned with fuel prices and with the type, availability, and/or costs of new generating plants, but few dealt with uncertainties about DSM resources.

While no two utilities conduct their uncertainty analyses in exactly the same way, many similarities were identified among the methods reviewed. In fact, all the techniques used or developed by the 14 organizations fit into

Table 1. Key uncertainties addressed in 11 long-range plans

	Number of plans
Internal uncertainties	
Type, availability, and/or costs of new generating facilities	10
Availability and/or costs of existing generating facilities	4
Availability and/or costs of extension projects	3
Demand-side management (DSM) capability	3
Availability of renewable energy resources	2
External uncertainties	
Load growth	11
Fuel prices	10
Availability and/or costs of purchased power	4
Actual savings from DSM and related efforts	4
Regulatory policies	4
Inflation and interest rates	3
Environmental constraints	1

Table 2. Analytical techniques used to treat uncertainty

Scenario	Alternative, internally consistent, futures are first constructed and then resource options are identified to meet each future. Best options can then be combined into a unified plan.
Sensitivity	Preferred plan (combination of options) is first identified. Key factors are then varied to see how the plan responds to these variations.
Portfolio	Multiple plans are developed, each of which meets different corporate goals. Often, these plans are then subjected to sensitivity analysis.
Probabilistic	Probabilities are assigned to different values of key uncertain variables, and outcomes are identified that are associated with the different values of the key factors in combination. Results include the expected value and cumulative probability distribution for key outcomes, such as electricity price and revenue requirements.

one of four major categories: scenario analysis, sensitivity analysis, portfolio analysis, and probabilistic analysis (Table 2). Many methods used by these utilities for analyzing uncertainty combine the four techniques described here.

SCENARIO ANALYSIS

With this approach, alternative futures are posited, each containing internally consistent combinations of key uncertain factors, such as fuel prices, availability of new and existing generating facilities, environmental regulations, and load growth. Once plausible scenarios are constructed, suitable combinations of supply- and demand-side resources are identified for each one. From the various options identified in the different scenarios, a utility must choose which actions to initiate in the immediate future. Promising items would be those that are appropriate under several scenarios or that lend themselves to easy (i.e., prompt and low-cost) expansion or contraction in the event that very different scenarios occur.

The distinguishing feature of scenario analysis is that alternative visions of the future are created first, and then appropriate combinations of resources are identified that best fit each future. This method allows its users to anticipate a broad range of plausible and internally consistent futures and to understand the nature of the underlying factors that determine which future will actually occur. Scenario analysis relies less on computer models and requires more brainstorming and interdepartmental discussions than do the other uncertainty-analysis methods. Scenario-analysis results, because of their emphasis on the larger picture, are easier to communicate to management than the detailed results of the other methods.

Southern California Edison (1988), for example, developed a base case scenario, assuming the continuation of present trends, and 11 alternative futures. These alternative scenarios include Economic Bust, High Fuel Cost, and Expanded Environmentalism, all resulting in lower-than-baseline resource requirements, and Economic Boom, Electrification, and Generation Shutdown, all requiring substantial new resources. The company selected five key elements (existing oil and gas units, transmission network, purchased power, energy management, and new generating resources), arranged like building blocks to accommodate any scenario that might develop. Under current conditions, the combination of these resources designed to meet base-case assumptions will be pursued. However, the appropriate combination of these building blocks for each alternative scenario also was identified, to allow the utility to adjust rapidly to changing conditions.

SENSITIVITY ANALYSIS

With this approach, a preferred combination of options, often referred to as a plan, is developed. Then, different values are assumed for potentially important factors (e.g., natural gas prices and economic growth), and the performance of the original plan is examined in the face of these changed conditions. This procedure allows the analyst to see which factors trigger the largest changes in plan performance and which options are most sensitive to change. As with scenario analysis, supply- and demand-side options that perform well under different conditions or that allow easy scaling-up or scaling-down are attractive.

The Southern Company (1986) plan provides a good example of sensitivity analysis. This case also contains an element of portfolio analysis, discussed below, in that more than one resource plan was examined. A computer model was used to create an optimum expansion plan using base-case assumptions about future load growth and other key items. Once the preferred mix of resource options was identified, an alternative mix of resources was developed in recognition of the volatility of oil and gas prices. The alternative mix eliminated all new generators using these fuels. Sensitivity analysis was then conducted to compare the two resource plans under four different circumstances: base-case conditions, high oil and gas prices, high load growth, and lower-than-expected availability of generating units (Table 3). In each case, the relevant assumptions were input to their model, and construction and operating costs were calculated. Additional sensitivity cases were run, which assumed the substitution of coal or combined-cycle units for some combustion turbines and different costs of capital.

Table 3. Comparison of optimum (base mix) expansion plan and alternative plan from Southern Company's 1986 plan

	Base mix		Alternative mix	
	PWRR[a]	% difference from baseline	PWRR[a]	% difference from baseline
Baseline	85,600	-	96,090	-
High Oil/Gas	89,520	4.6	96,090	0.0
High Loads	96,170	12.3	103,150	7.3
Low Availabilities	86,830	1.4	96,350	0.3

[a]Present worth of revenue requirements for each scenario, expressed in millions of 1996 dollars, for the 20-year study period.

PORTFOLIO ANALYSIS

Here, two or more plans are identified, each keyed to a different set of objectives. In all cases studied, the different plans were subjected to sensitivity analysis and/or probabilistic analysis, and the performance of each was compared to the others. The most robust plans or elements of plans could then be selected.

Northeast Utilities (1985) identified several different, sometimes incompatible, corporate objectives and developed resource portfolios matched to each one. The objectives were:

Minimize dependence on oil;

Minimize electricity cost over the long run;

Smooth construction expenditures over time;

Emphasize conservation and load-management programs;

Emphasize life extension and repowering of existing fossil steam plants;

Use small generation alternatives, such as renewable resources, cogeneration plants, and small power production facilities.

The resource-mix portfolios developed in response to each objective were then tested against each other using sensitivity analysis.

The plan developed by the Michigan Public Service Commission (1987) provides a good example of the development and comparison of resource portfolios designed to lead utilities along distinctly different paths. The specific technologies selected in each case were chosen to implement a particular electricity future. The first portfolio, called Broad Options, was designed to use most of the supply- and demand-side options currently available. In contrast, the Central Station Power portfolio emphasized large, traditional utility supply options and excluded conservation options (although it did include load management). The Small Diversified portfolio primarily used smaller supply facilities and also relied heavily on non-utility supply options and DSM programs. Finally, the Reduced Environmental Impact portfolio was aimed at reducing sulfur dioxide emissions by 25% by the year 2000. For all four portfolios, sensitivity analyses were conducted to examine the effects of different levels of load growth, fuel prices, option performance, and other important factors.

PROBABILISTIC ANALYSIS

With this technique, probabilities are assigned to different values of key variables, either by assigning probabilities to specific points - such as high, medium, and low - or by drawing a continuous probability distribution. These probabilities are based on the judgment of utility staff, on the judgment of outside experts, or on extrapolations of historical data. Outcomes are then identified that are associated with the different combinations of values for the key factors. This method is similar to sensitivity analysis, in that the effect on important outcomes that results from varying specific parameters can be observed. The most striking differences from sensitivity analysis are that the probabilities associated with the various outcomes are identified and that the correlations among these uncertainties are explicitly considered.

Different approaches are used to make sense out of the often large set of outcomes developed through probabilistic analysis. A single "expected value" can be calculated that is the weighted mean of all the individual outcomes. Cumulative probability curves (also known as risk profiles) are also developed. Such curves are compiled by taking the probability of each outcome and adding this probability to that of all the events below it.

Probabilities were used in an interesting way by the New England Electric System (1988). In-house experts estimated the probabilities of achieving targeted levels of system performance in all major areas (e.g., alternative-energy development, availability of new generating facilities). These estimates were expressed as cumulative probability curves, so utility decision-makers could see how likely they were to meet various levels of power production. This information was then used to develop a realistic plan for meeting customer demand. To ensure adequate capacity, the utility plans to an 80% confidence level, meaning that projected demand will be met by that level of power which the utility is 80% sure of providing with the options specified in its long-range plan.

3. UTILITY ACTIONS TO DEAL WITH UNCERTAINTY

There are several ways a utility can deal with uncertainty in choosing among resource alternatives (Table 4). Surely the simplest way to make decisions is to ignore the uncertainties associated with the external conditions and the resources themselves. This approach can follow one of two paths. In the first such path, a utility might pursue its base-case plan in the belief that this is the most likely course of events that the future will take. Such a utility might find the cost of planning for unlikely events too high and might focus its efforts on implementing its base-case strategy in a cost-effective fashion. In the second uncertainty-ignoring path, a utility, rather than worry about electricity demands and resources twenty years in

Table 4. Alternative ways to deal with uncertainty in utility decision making

Ignore uncertainty
Follow base-case plan
Focus on short-term strategies, assume that long-term issues will resolve themselves
Defer decisions
Wait until additional information is available to reduce uncertainties
Purchase additional information to reduce uncertainties
Sell risks to other parties
Conduct auctions for supply and demand resources
Negotiate long-term fuel-supply and purchase-power contracts
Plan very carefully for all reasonable contingencies so that future decisions are unnecessary
Adopt flexible strategy that allows easy and inexpensive changes (e.g., obtain resources with short lead times, low capital costs, small unit sizes)

the future, might focus on the actions it should take during the next few years to balance demands and resources. Such a short-term orientation may be justified by the increasing competition that electric utilities face (which serves to increase greatly uncertainty about the loads they will face in the long term) and by the recent disallowances by PSCs of some of the investments made in long-lived, baseload power plants. Another way to deal with uncertainty is to delay decisions as long as possible. These delays might allow enough time to elapse for additional information to become available to the utility. Such new information might reduce the uncertainties associated with certain decisions and give the utility more confidence about its preferred resource strategy. For example, a utility contemplating construction of a new coal-fired power plant might wait a couple of years (assuming that resource deficits are not imminent) in the hopes of learning more about the costs of compliance with possible new federal clean-air requirements.

Purchasing additional information can enhance the value of delaying decisions. For example, a utility uncertain about the future price of natural gas and therefore unsure whether to build a combustion turbine might explore long-term contracts with natural-gas suppliers. These negotiations should give the utility a much clearer view of the future costs of natural gas and thereby reduce the uncertainty about the decision to build a combustion turbine.

In some situations, it might be prudent to sell certain risks to other parties that are better able to manage them. One of the attractions of utility auctions for supply and demand resources is that the risks associated with nonperformance are shifted largely to the (nonutility) supplier. For example, a utility that contracts with an independent power producer (IPP) to purchase the output of the IPP's power plant might include in the contract penalties if the IPP plant is brought online late or if the plant's forced outage rate is higher than anticipated. The utility would still need to obtain electricity to meet customer needs, but it would not have to pay for the IPP's unused facility.

Another approach to decision-making under uncertainty involves preparation of many alternative plans. These plans are available for use if certain contingencies evolve. By assessing alternative future conditions beforehand, decisions are predetermined, and the need for future planning is reduced. Such a strategy will not work well if the plans include long-term commitments that preclude alternative actions.

A final strategy is one that many utilities are now pursuing - flexibility. The primary goal of this approach is to obtain options that allow changes to be made incrementally with little difficulty and at low cost. Thus, utilities today eschew construction of large baseload plants because of their long construction times and high capital costs. On the other hand, utilities favor combustion turbines because they take only a few years to build, are inexpensive and small, and can be easily converted to combined-cycle units (to increase capacity and improve performance).

This last approach, with its emphasis on diversity and flexibility, is very attractive for many utilities. Its attractiveness stems from all the uncertainties facing utilities and their resultant reluctance to commit their customers and shareholders to major, long-term investments. However, this emphasis on flexibility may lead to resource portfolios that have higher than necessary, lifecycle costs. A major unresolved issue with this approach concerns identification of the extra costs (i.e., the risk premium or insurance policy) associated with a diverse and flexible resource strategy, and agreement on how these costs are to be shared between customers and shareholders.

Pacific Gas & Electric Company (as reported in California Energy Commission 1988) discusses flexibility in terms of

> shortening lead times, decreasing unit sizes, postponing commitments, and specifying operating flexibility (as opposed to planning flexibility) to adapt to system needs and economics even after construction is completed. But flexibility generally comes at increased cost. Lead times can be shortened by more intense scheduling or by performance siting, licensing and design before making the commitment to begin construction. But both alternatives would increase the cost of the project. Economies of scale might be sacrificed with smaller unit sizes. Flexibility is like insurance: one pays a premium in order to mitigate the high costs that would otherwise occur in particular scenarios.

The Northwest Power Planning Council (1986) proposed a two-stage option-and-build approach to resource acquisition to provide flexibility. The first stage

> would allow a resource to move through the time-consuming but inexpensive siting, design and licensing stages, after which it can be placed in a "ready condition." In that condition, the project could be scheduled, placed on hold, constructed or terminated, depending on the demand for electricity.

The Council derived a decision rule from its analysis of resource selection and timing given load-growth uncertainties. The rule suggests obtaining resource options to meet a high load growth (that has only a 10% chance of being exceeded) and constructing resources to meet the base-case (median) load-growth forecast.

4. SUGGESTIONS FOR ADDITIONAL RESEARCH

Assessment of Current Planning Methods

The primary purpose of this review of planning methods is to assess alternative approaches to treatment of uncertainty. A more comprehensive review of additional plans would be valuable, covering such topics as:

Conformance of the plan with PSC rules,

Methods used to treat uncertainty,

Data sources on resources analyzed,

Modeling tools used in analysis of resource alternatives, Usefulness of plan as decision aid to the utility and the PSC,

Relationship between the long-term resource plan and short-term action plan, and

Frequency of plan preparation and revision.

In addition to reviewing each plan in its own right, this review would compare the strengths and limitations of different plans and planning approaches. Results of this review would yield information on the state-of-the-art and state-of-the-practice in planning methods, data sources, resource selection, and treatment of uncertainty. The review would serve as a valuable technology-transfer mechanism to help disseminate information and ideas from more active utilities to other utilities.

Organizational Decision Making

Many questions remain concerning how long-term resource decisions are made by utilities in the face of uncertainty. These questions involve the roles of different types of personnel (e.g., planners, executives, and consultants), of different sources and types of information, and of different organizational structures in making decisions.

Further study is needed to understand better how planners and executives interact to develop and adopt plans. How uncertainties are communicated by planners to top management and what role executives take in identifying which uncertainties are most important is of particular interest. It is also important to learn how organizations decide whether, and how much, to diverge from the course of action preferred under baseline conditions but not under alternative futures.

How utility plans are monitored and modified also bears further examination. How can the adoption of contingency actions, once these are identified in a long-range plan, be facilitated should changing conditions call for their implementation?

Development of New Analytical Approach

Most of the models currently used for long-term resource planning are derivatives of large single-purpose models. These earlier models focused on production costing, capacity expansion, or financial planning. They are typically large, data intensive, mainframe models. And they are difficult to learn and time consuming to use. These models are intended for detailed analyses of specific options and not for strategic (e.g., screening or uncertainty) analysis. Kahn (1988) notes:

> The inherent difficulty of testing probabilistic models "against reality" has made the tendency toward complexity pronounced in electricity production simulation modelling, exacerbating the irresistible tendency for simulation models to grow increasingly complex. ... a case can be made for some degree of simplification. Models should be usable, flexible and understandable. They are often needed to help probe uncertain or unknown conditions rather than to produce estimates that are precise to seven digits.
>
> [Simpler models are required] where strategic planning questions are concerned, or analysis of uncertainty is important. These applications require analysis of many scenarios which differ substantially. The large, complex models are not well adapted to examining broad ranges of variation.

A new type of simulation model is needed, one that emphasizes simplicity of use and that emulates the decision process itself. Such an approach would emphasize the inputs important to decision making, the uncertainties associated with these inputs, the effects of frequent (e.g., annual) decision making, the effects of permitting decisions to be modified over time, and the iterations over time between decisions and subsequent results (Hirst 1988b).

A strategic model would sacrifice the details of hour-by-hour production costing and the details on revenues, cash flows, expenses, income, assets, and liabilities of financial planning models. In return, a strategic model would focus on the utility's decision process, and would permit frequent modification of prior decisions (e.g., accelerate, continue as originally planned, slow down, or cancel projects). It would also be useful to embed in such a strategic model the utility's uncertainties about forecasts (e.g., of fossil fuel prices, economic growth, and construction times). Thus, decisions within the model would reflect historical information and uncertain forecasts of these factors. Such a model could be used to quantify the benefits and costs of increased flexibility and would simplify analysis of different resources relative to various uncertainties.

Regulatory Mechanisms to Recognize Uncertainties

The Massachusetts Executive Office of Energy Resources (1988) proposed regulations on least-cost planning that ordered each utility to:

> ... consider the risks and uncertainties associated with its resource plans. Any plan which poses unacceptable risks or uncertainties

> shall be rejected by the utility or modified to reduce such risks or uncertainties. A detailed explanation for any such rejection shall be provided by the utility.

Although this language sounds impressive, the terms "risk," "uncertainty," and "unacceptable" are not defined. This rule provides no guidance to utilities on what they should do about uncertainty. It also offers no rewards for careful planning and resource acquisition.

During the past several years, many PSCs have disallowed some or all of the capital costs of constructing new generating units. Partly because of these disallowances, most current utility plans call for risk-averse construction programs (in particular, no construction of large baseload plants, as noted in Section 3). While such a strategy protects shareholders from short-term financial loss, it may not provide low-cost electricity in the long term. Indeed, the possible long-term costs associated with utility risk-avoidance should be examined.

Thus, current utility plans and actions suggest that modifications may be needed in PSC regulation. In particular, changes in the ways that commissions review utility actions after the fact (e.g., prudency reviews and application of the used and useful test) may be appropriate. The goals of such changes would be to encourage utilities to adopt a flexible approach to resource acquisition, to identify how much "insurance" to pay for this flexibility, and to determine how this insurance should be shared between customers and stockholders. For example, a utility's approved plan might call for construction of a coal-fired power plant. Three years later, after construction has begun, new clean-air requirements may render the plant uneconomical, leading to its cancellation. Utilities and their regulators need agreement, before construction starts, on how the costs of this abandoned plant will be shared between customers and investors. These costs can be viewed as the insurance premium associated with the purchase of an option on a coal plant.

Essentially, PSCs need to establish rules that will guide utilities in their selection of resources, given uncertainties about these resources and the external environment. Ways should be sought to encourage utilities to acquire a balanced portfolio of resources that address both short- and long-term needs. In addition, further attention is needed to the ways utilities and commissions communicate about uncertainties and the associated risks.

5. CONCLUSIONS

Uncertainty now pervades all aspects of utility operations. Thus, uncertainty is a critical factor that must be considered explicitly in utility planning and decision making. Planning only for the base case is too risky!

Because of these uncertainties, many utilities have developed and applied improved methods to treat uncertainty in their planning and, to a lesser extent, their decision making. A review of ten long-term plans prepared by utilities and one plan prepared by the Michigan Public Service Commission, as well as many other publications, showed four common approaches to analyzing uncertainties: sensitivity analysis, scenario analysis, portfolio analysis, and a diversity of methods identified here as probabilistic analysis. Most of the plans combined these techniques in different ways. No one analytical method is always best for treating uncertainty in resource planning. Utilities should use a variety of methods and data sources in their planning and analysis.

Decisions can be made in different ways in the face of uncertainty. Interpretation of the plans' recommendations and discussions with staff in the ten utilities studied suggest that most of these utilities adopt flexible plans that permit them to make changes as unfolding circumstances dictate. This review uncovered discrepancies between the analytical methods used to assess uncertainties (Section 2) and the way decisions are actually made (Section 3); the models focus more on simulation of the electric-power system and not enough on the iterative, incremental and partially reversible nature of decision making (Section 4).

Because the environment in which utilities operate is changing rapidly, planning should be ongoing. Formal plans should be revised and published regularly (e.g., every two years). In addition, utilities need to monitor changes in their external environment and the costs and performance of their energy resources. This information must be quickly integrated into their plans and decisions.

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