REVIEW OF NUREG-0529

NEED FOR THE PLANT (Chapter 8)

BENEFIT-COST SUMMARY (Sections 10.4, 10.5)

Arthur C. Mead
Assistant Professor

Glenworth A. Ramsay
Associate Professor

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The central elements in the NRC's assessment of both the need for and the benefits associated with the construction and operation of New England Power Units 1 and 2 are projections of electricity consumption and generating capacity. To generate their forecasts of electricity demand, both the NRC staff and the applicant have relied heavily upon econometric models which represent a significant improvement over the simple extrapolation methods used in previous impact studies. A careful review of the analysis, however, reveals some potential problems with both the supply and demand sections.

Supply Analysis

The NRC staff has presented what would be considered the supply side of the analysis in two sections. In Section 8.4 the staff presents an inventory of existing capacity and proposed plant expansions through the year 1990 while in Section 8.5.2, calculations of the cost savings associated with the early completion of the plant are discussed. In neither section is there any discussion of the potential use of alternative energy sources (solar, wind, hydro...). A reading of these two sections leaves one with the impression that at present electric energy production capacity is fixed and that any future expansion is heavily dependent upon the construction of NEP 1 and 2. This position can be justified if the alternative technologies do not presently exist and are not expected to be operational in the near future (prior to 1990) or if the costs of electricity from these sources will be higher than the costs of electricity from NEP 1 and 2.

This analysis of potential supply appears inadequate, however, in light of some recent developments. First, there is no mention of the possible importation of power from Canada. Recent information released

by the New England governors suggests there is a possibility of large-scale purchases of power from the hydro system in Quebec. There is also no mention made of the recommendations made by the New England Energy Congress regarding potential alternative sources. In their final report, they discuss the notion of an optimal supply mix that includes alternatives to nuclear and fossil fuel that could supply up to 25% of the region's energy needs by the year 2000.

Demand Analysis

The NRC's analysis of demand unquestionably represents an ambitious undertaking. Within Chapter 8, Sections 8.2 and 8.3, the staff attempts to simultaneously develop its own forecast of demand, summarize the applicant's forecast of demand, briefly describe the outlines of the staff and applicant's econometric models, describe the exogenous factors that drive these models, and compare the models' structure and forecasts. Unfortunately, the demands of a project of this dimension are incompatible with the externally imposed constraints of limited space and an audience of widely varying technical backgrounds. In attempting to satisfy these constraints, the staff has produced a document that is often confusing and difficult to evaluate. By avoiding any explicit presentation of the econometric models, either in the text or an appendix, the authors have made it virtually impossible to compare the NERA, ORNL and staff models that are central to the demand forecasts.

The projections of future demand that appear in Table 8.11 indicate that there exists a considerable discrepancy between the forecasts of the various models. The Table also suggests that the staff model's projections are very sensitive to the forecasts of certain exogenous

variables. Neither of these results is surprising, however, since econometric forecasting is often extremely sensitive to the underlying assumptions. The difficulty inherent in this report is that, as presented, it is impossible to separate the impact of the differing forecasts for the exogenous variables on the forecasts of electricity demand from that of the differences in model structure.

Two potentially more serious problems involve the appropriateness of the structure of both the applicant's and staff's econometric forecasting models and the disregard of those factors that are not easily incorporated into the models. There is some evidence presented in the chapter that suggests the data sets utilized in the estimation of models were inappropriate. Also, despite some evidence that conservation could reduce the growth rate of electricity demand by 97%, the impact of conservation and rate restructuring are completely ignored.

Benefit-Cost Analysis

The benefit-cost analysis presented in Sections 10.4 and 10.5 represents more of a summary of the entire reports findings than a true benefit-cost analysis. This section suffers from a lack of careful consideration of alternatives - a problem characterisitc of the analysis in Chapter 8. There also appears to be some confusion as to the selection of factors that represent benefits and costs in the analysis and a lack of any attempt to quantify the indirect and environmental costs of the project. The reader is left with the impression that the socio-political and environmental impacts are insignificant. The reviewers of Sections 2, 4, and 5 must determine if this is an appropriate characterization of the situation.

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The section is also somewhat misleading in its conclusion that this power-generating capacity is needed at least by 1990. Previously mentioned reservations regarding the use of an inappropriate data base, the lack of any consideration of conservation's impact on energy demand, and the absence of any discussion of the potential generating capacity of alternative fuel sources, suggest that there may be an upward bias in both the NERA and staff estimates of excess demand. To the extent that this is true, the calculations of comparative cost become increasinly important since the benefits of the nuclear power will now be determined primarily by the cost savings. If nuclear power costs, after disallowing any potential government subsidies in the form of lower insurance, disposal, and land purchase costs, is found to be lower than the costs associated with alternative fuel sources, the plant may be justified on its economic merits. The determination of the cost effectiveness of nuclear relative to other power sources is the task of the reviewer of Chapter 9.

SPECIFIC COMMENTS

8.2 Factors Affecting the Growth of Electricity Use

8.2.1 In this section the NRC staff lists and briefly explains the basis for the projections of the economic and demographic variables that are deemed "important" in explaining electric energy consumption. This is the key section in the demand analysis and is deficient on a number of counts. The first difficulty involves the NRC's selection of "important variables." It is hard to discern from the text the selection criterion used to classify the exogenous variables as important or

unimportant. Does important mean contribution to the explanation of variation in electricity demand or quantitative effect on demand? Some of this ambiguity would be answered if the model's equations were specified, but in any event a complete account of the determinant's of demand is in order.

This section also suffers from a lack of any of the model's tracking record. There is no direct evidence in the text regarding the explanatory power of the econometric forecasting models. Does the model explain 99% or 50% of the variation in electricity consumption for the period in which it was estimated? There is an indication that some sectors of the model perform better than others. In NERA's estimation of the saturation of electrical heat, the econometric model proved so poor that it was completely abandoned. As a substitute, NERA made the assumption that 50% of new customers utilized electric heat - a figure much higher than justified by the data in Table 8.7. Given the importance of space heating in the residential sector's energy demand, this would tend to bias upwards NERA's estimates of energy consumption growth. The staff suggests that the NERA estimte is high but gives no indication of how they dealt with the problem.

An additional issue not addressed in this section involves the projections of the exogenous variables. It is unclear how the values of the economic and demographic variables inputted to the model were obtained. I would find it unlikely that the review of regional, state, and substate analysis would provide one best estimate of future growth rates for these variables as suggested in the report. A very useful extension of the analysis, especially in light of the lack of any de-

tailed treatment of the model, would involve simulations of the model for a range of projections for these exogenous variables. This would give some indication of how sensitive the results are to forecast errors in the exogenous variables. It would also be considerably more informative if scenarios were developed that changed a variety of assumptions simultaneously. A difficulty with this report is that it treats assumptions individually. For example, a "worst case" might be a combination of successful conservation high electricity prices and slow regional growth. It would also be useful and interesting to see what set of assumptions (if any) will make the ORNL model reproduce the NERA forecasts.

A final question not addressed in this section involves the exogeneity of the exogenous variables. The selection of population growth and industrial activity as exogenous variables may prove to be inappropriate. The rise in the relative price of energy experienced in the recent years, which NERA projects to continue into the future, may slow down the growth of population and economic activity in the region as people and industry relocate out of the Northeast which is very energy intensive. In Section 8.1.3, the authors suggest that the slow growth in energy consumption in New England after 1974 can be attributed to the slow growth in population. It may very well be possible that the slow population growth was a result of the increase in the price of energy. The impact of this would be impossible to predict in a simultaneous equation model that is unspecified, but the expectation would be for lower rates of growth in this expanded system with the two-way causal relationship between economic growth and electricity demand.

3.2.4 and 8.2.5 These sections on rate-structuring and conservation as determinants of electricity consumption are inadequate. With regards to peak-load pricing, which theoretically can reduce peak-load without altering overall energy consumption, the staff makes no attempt to quanify the potential impact of such a program. At the very least, some mention should be made of the results in other regions which have adopted such a program.

A more important issue is the staff's omission of any consideration of conservation's impact on demand. The staff indicates that significant reductions in energy growth can be obtained through conservation techniques and their associated energy savings. In light of recent developments, it seems likely that the government will enact programs that will promote conservation either through direct legislation of standards or through subsidies. If conservation could reduce the growth rate of energy to 1%, 10 times higher than the projection referred in the text, then the reserve margin for NEPCO without NEP 1 and 2 in 1990 would be 43% - considerably more than the 21% needed by the company.

8.3 Load Forecasts

This section contains a brief, incomplete outline of the NERA and staff econometric models and a summary of the forecasts. Despite the staff's attempt to compare the NERA, ORNL and staff models, the lack of any knowledge of the model's structure makes it impossible to compare and evaluate the three models. It is virtually impossible to explain the significant discrepancies in the forecasts presented in Table 8.10 and 8.11 with the information presented in the Chapter.

A potentially more damaging problem, however, involves the data base

for the econometric analysis. In their development of at least some parts of the forecasting model, NERA employed cross-section data for New England in 1972. The ORNL model meanwhile was estimated with 1955-1974 time series data. Given the data presented in Table 8.2, it is difficult to accept the implicit assumption in their analyses that there has not been a structural shift in energy consumption since 1973. Table 8.2 contain data which suggests the growth rate in energy consumption has slowed down considerably in the 1974-77 from what it was in the early 1970's.

To the extent that these figures represent a true change in the pattern of electricity consumption for both the residential and business customers, the econometric model is inappropriate for forecasting purposes. The problem is that it is impossible to estimate a model on the data for the 1974-77 period and, at best, extremely difficult to formulate hypothesis regarding changes in parameters of the existing econometric models.

This section also lacks an discussion of the factors responsible for the differences between the growth in electricity consumption in the 1970's and the projections for the 1980's. This deficiency is most noticeable in the NERA estimates of a 5% growth rate through 1985 which is considerably higher than the 3.8% growth rate in the 1970-77 period and the .7% rate from 1973-77.

8.5 Staff Assessment of Need

This section examines the need for NEP 1 and 2 from the viewpoint of the New England Power Pool where need is evaluated in terms of reliability and cost. In many respects, section 8.5.1 involves a duplication of the work in Sections 8.2-8.4 and therefore is subject to the same reservations as mentioned previously.

Section 8.5.2 contains an assessment of the cost effectiveness of nuclear energy. Table 8.18 which contains the staff's comparison of the base case and delay case is confusing at best. The totals for the nuclear columns bear no relationship to the numbers appearing in the column.

For the cost calculations, the capital costs are well-defined, but there is little detail on the operating and maintenance. In examining Section 10.4 which summarizes these calculations, two questions emerge. One is the appropriateness of assuming an inflation rate equal to the interest rate in the calculations of the decomissioning costs. Historically, interest rates have been higher than inflation rates and this is unlikely to change in the future although at certain points in time this may not be true because of some institutitonal regulation in the interest rate.

A second question involves the fuel storage and disposal costs. The DOE is now in the process of assuming responsibility for spent nuclear fuel. There is no indication in this report whether or not DOE will change a price sufficient to cover all the costs of this service. To the extent that it does not cover these costs, the cost calculations for the nuclear plant will be biased downward. A similar problem involves insurance costs. Due to the Federally mandated upper limit on power plant liability, the insurance costs do not adequately reflect the risks involved with nuclear power generation. This liability limitation is in effect operating as a subsidy to nuclear power and it should be ignored in any cost comparisons.

Paragraph 1, pp. 8-23 should read $24/bbl not 24¢/bbl.

10.4 Benefit-Cost Summary

The section on benefits of the plant are presented in such a way as to leave the reader with an inflated view of the benefits. The $150 million spent on construction related equipment, the $640 million on construction wages, the $132 million spent on operating payroll, and the unspecified property tax commitments represent costs of the power and should not necessarily be considered benefits. To the extent that the material and labor is bid away from other potential projects in the state there would be no benefit associated with the construction and operation of the plant. Only in the case where this expansion of economic activity in the state resulted in the utilization of currently unemployed resources within the state would this growth be an unqualified benefit.

The calculation of decomissioning cost in Section 10.4.2.3 is to be questioned. In the calculation it appears as though the calculations are based on two separate inflation rates in different portions of the calculations. There is mention of a 7% escalation rate of a 10% inflation rate.

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