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The Competitive Economics of Nuclear and Coal Power, Richard Hellman and Caroline J. C. Hellman

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THE COMPETITIVE ECONOMICS OF NUCLEAR AND COAL POWER

RICHARD HELLMAN & CAROLINE J. C. HELLMAN
Lexington: D. C. Heath and Company. 1983. Pp. 208. $23.95.

Richard Hellman and Caroline J. C. Hellman have made a valuable contribution to the coal-nuclear cost controversy. They present principal assumptions and results of four major cost-comparison studies,[1] adjust the figures to reflect perceived deficiencies, and conclude that nuclear power is substantially more expensive than coal. An excellent discussion of many factors contributing to total economic cost of power plants is included.

The authors separate total cost into components: capital cost, depending on such factors as input prices, interest, employed technology, and construction length; and operating and performance factors, including operating and maintenance (O&M) cost, capacity factor, fuel price (including sulphur content and pollution equipment), and plant life. They discuss reasonable assumptions for each factor, based primarily on recent experience with large nuclear and coal facilities. The derived numbers are compared to those used in the case studies, with corresponding cost factors inflated or deflated as appropriate. The authors also discuss, but do not quantify, factors such as decommissioning and waste disposal.

The study suffers from several simplifications and omissions that leave the conclusions in some doubt. I discuss here problems arising from techniques: first, adjusting cost estimates using figures based on average experience with nuclear facilities; and second, adjusting cost components so as to compare base-load plants (nuclear) with intermediate-load plants (coal). I also touch on several other assumptions that tend to bias the results of the study.

The authors reject econometric analyses of nuclear power plant costs because the data base is inadequate and because the past may be a poor basis for estimating future costs. However, they use average historical experience as the basis for adjusting cost figures without adjustments for learning potential, uncertainty resolution, or any special circumstances

1. Atomic Energy Commission, *The Nuclear Industry 1974*, WASH 1174-74; Energy Research and Development Administration, *Comparing New Technologies for the Electric Utilities, Draft Final Report*, December 9, 1976, ERDA 76-141; Nuclear Regulatory Commission, *Draft Environmental Statement, New England Power Units 1 and 2*, May 1979, NUREG-0529; and Exxon Research and Engineering Company, *An Outline for a Discussion on the Economics of Nuclear Power with Dr. Richard Hellman of the University of Rhode Island*, November 18, 1977 (unpublished).

surrounding particular facilities. Nuclear plants show large variance in construction time, licensing experience, construction cost and operational performance. Moreover, the sample size is still small, and mean experiences are greatly influenced by a few bad performances. The O&M Table 7-1 (p. 81) demonstrates this point: while average mills/kwh is 3.85, the median is 2.90. Use of small-sample averages which are greatly affected by a few special cases limits the predictive usefulness of the study.

An immediate problem in comparing nuclear and coal economics is that the former are base-loaded, while coal plants are used to meet demand remaining after the nuclear and ROS hydro facility capacity is exhausted. Clearly capacity figures are not directly comparable. The authors correctly observe that load factors for coal plants are lower than they would be were the plants base loaded; however, they ignore other effects. Coal plants have lower O&M costs, depreciate less rapidly, and show different thermal efficiency because they are not base-loaded.

A potentially greater bias arises from the authors' use of unadjusted average length of the construction period to calculate the effects of interest and inflation. The poor competitive showing of nuclear plants is partly because they have taken much longer to build; however, the construction period is in part chosen by the utility. If electricity demand is less than projected, utilities are more likely to delay capital-intensive base-loaded facilities. Moreover, because of tax advantages and regulatory rules allowing CWIP into the rate base, utilities have even more reason to stretch out construction. The effect is apparent cost overruns that would not be present given different demand and regulatory conditions, and that do not reflect innate characteristics of nuclear power plants.

The authors also examine the consequence of an economic life of plants that is shorter than expected. They do not use discounting. With any reasonable discount rate, a foreshortened life of a thirty-year plant has minor relevance to current investment decisions. The authors also make questionable adjustments for future fuel prices. Given the current dearth of nuclear power orders, uranium prices are likely to remain low while coal increases; the reverse assumption is employed in this study. Finally, because nuclear plants are unreliable, the price of replacement power affects their attractiveness. The authors assume that it will rise, but this is not justified. The price any utility faces depends on regional factors and regulatory rules, and is subject to considerable uncertainty.

In conclusion, useful predictive costs vary with a wide range of factors, some of which depend on specific characteristics of each utility. In order to derive such costs a model incorporating the factors is necessary. Hellman and Hellman's study is of value in that it specifies and clarifies

assumptions in the referenced case studies and in their own analysis. While this invites specific criticism, it also enables a reasonable debate.

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