

OAK RIDGE NATIONAL LABORATORY

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NUCLEAR DIVISION



POST OFFICE BOX X  
OAK RIDGE, TENNESSEE 37830

May 8, 1979

Dr. Richard C. DeYoung, Director  
Division of Site Safety and  
Environmental Analysis  
Office of Nuclear Reactor Regulation  
U.S. Nuclear Regulatory Commission  
Washington, D. C. 20555

Dear Dick:

After checking with my staff, I feel the need for a formal reply to your letter of April 19 concerning the "economics of early operation," Section 8.5.2 of the DES on New England Power. I enclose a memo from the economist on the case, James Dick, explaining our rationale for doing the analysis as we chose to do it. Dr. Dick's arguments seem reasonable to me. I might add that until very recently we had been led to believe that Dick's work was acceptable to NRC. For that reason, your letter came as a bit of a surprise.

As you know, our preliminary draft of Section 8 was sent to the EPM (P. C. Cota) on October 19, 1978. A partial review of the PDES with NRC personnel was held at ORNL on December 19. Section 8 was not discussed at that time. A final review of the PDES ("green cover review") was held at ORNL on March 15 & 16, 1979 with BC (Ballard), EPM (Cota), and OELD attorney (Cutchin). At this time, it was indicated that there was no need to discuss Section 8 since it was satisfactory. During the interim (October to March), the responsible ORNL staff member (J. W. Dick) was in contact with personnel in the Cost Benefit Branch and Section 8 underwent several revisions in response to these discussions. Subsequent to March 16, when it was indicated that Section 8 was satisfactory, further discussions were held with NRC personnel and a further revision was made and Telefaxed to the NRC on April 13. During all of this process, our analyst, J. W. Dick, was attempting conscientiously to respond to comments by NRC personnel and to produce a professionally defensible analysis. Prior to your letter, the comments from NRC personnel were couched as suggestions, some of which we accepted and some we did not.

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5-11  
ADD: LR ENCL  
P. COTA  
M. CUTCHIN  
V. MOORE

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May 9, 1979

As Bud Zittel indicated in a phone conversation with Voss Moore on April 20 and by a subsequent letter dated April 23, we would have been willing to revise the New England analysis to comply with the suggestions put forth in your letter, but we could not do so on the time schedule you required. Nevertheless, I reiterate that we do not view our analysis as being unrealistic or faulty, and we do not view the alternative approaches suggested in your letter as being better than ours. They are just different.

The central issue, as you have indicated, concerns the consistency within the DES and with other NRC statements. I feel it is important in this regard to recognize that the sections in question (Section 8.5.2 and Section 9.1.3.2 and Appendix D) have clearly different purposes. Section 8.5.2 addresses the economics of beginning Unit 1 and Unit 2 operation in 1986 and 1988, respectively, as compared to beginning operation in 1990 and 1992, a four year delay. The focus here is on the initial few years of operation of the proposed nuclear plant. Section 9.1.3.2 addresses the economic comparison of the proposed nuclear plant with a coal-fired plant. In this case, the focus is on a comparison over the life of the plant. In this latter analysis, it is important that the nuclear and coal plants be considered on a consistent basis. This is not the case in the economic analysis of early operation. Since the foci of the two comparisons are different, we do not feel that the assumptions for the comparisons need to be consistent on a one-to-one basis.

I am sorry that this technical disagreement happened, but I guess that is inevitable from time to time.

Sincerely,

William Fulkerson  
Director  
Energy Division

WF:sbw

cc: F. R. Mynatt  
T. H. Row  
R. M. Rush  
H. E. Zittel

5. The fifth outstanding issue relates to the capacity factor assumptions used in the Oak Ridge analysis. Capacity factor assumptions were estimated from a regression analysis of Westinghouse PWRs. An equation was estimated from historical data which predicts the capacity factor by size of the reactor and the age of the reactor. The analysis also accounts for a learning curve based on the reactor's date of commercial operation. In the analysis of economics of oil substitution, the capacity factors in the first several years of a reactor's life (during the delay) are more important than the overall average capacity factor of the reactor. Therefore, estimating year by year capacity factors seems inherently superior to the generic approach suggested by NRC and used in Appendix D. At the same time, assumptions used in Appendix D may be valid because the type of analysis is different.

The capacity factor assumptions which were developed for the analysis have an additional advantage over the alternative assumption of 50%, 60%, and 70%. Because they were estimated from historical data, the range used in the sensitivity analysis could be described in terms of statistical probability.

JWD:lc

cc: T. H. Row  
R. M. Rush  
H. E. Zittel

# INTRA-LABORATORY CORRESPONDENCE

OAK RIDGE NATIONAL LABORATORY

April 30, 1979

To: W. Fulkerson  
T. Takayama  
R. C. Tepel

From: J. W. Dick

Subject: Letter From NRC Concerning Assumptions Used in Chapter 8 of the  
New England Power (NEP) DES

This memo is in response to a letter from Richard C. DeYoung, Director, Division of Site Safety and Environmental Analysis of NRC. That letter expressed several concerns with the underlying assumptions used in the part of Chapter 8 (ORNL analysis) of the New England Power (NEP) DES addressing the economics of early operation. This memo addresses the outstanding issues raised in the letter and the attachment.

While the letter from Mr. DeYoung mentions that the ORNL analysis was not responsive to several issues, all NRC comments had been considered and the analysis was modified when the comments seemed justified. It should also be pointed out that, previous to Mr. DeYoung's letter, the NRC concerns were stated as suggestions and not demands. It is recognized that several of the assumptions incorporated in the analysis were not the same as those recommended by the NRC staff. However, previous to Mr. DeYoung's letter, NRC staff had seemingly accepted the Green Cover Review version as a reasonable analysis. Explanation and discussion of assumptions could have taken place at the Green Cover Review, but there was no discussion or questions related to Chapter 8 when NRC personnel visited Oak Ridge during this review.

Following are responses to the outstanding issues raised in Mr. DeYoung's letter:

1. The first outstanding issue relates to use of a 11% discount rate as opposed to the NRC generic rate of 10%. Use of the 11% discount rate is based on the cost of money reported in the New England Power Pool's long-range study assumptions. It is also the discount rate employed in the ER analysis. The 11% rate was formulated as the weighted average of New England utilities' interest on debt and return on preferred stock and common stock. The methodology used in determining the 11% discount rate was the same as that used to determine the NRC generic discount rate of 10%. The difference results because the 11% rate was calculated using a higher rate of return on common stock.
2. The second outstanding issue relates to the escalation rate of nuclear capital cost. The final Oak Ridge version used a 6.2% annual escalation rate of the applicant's estimated capital cost in 1980, although a 5% escalation rate had been used previously. The 6.2% escalation rate corresponds to the applicant's assumption. Based on the embedded rate of

inflation as measured by the wholesale price index forecast used in the Chern demand forecasts, 5% nominal escalation of capital is equivalent to a 2.3% real rate of escalation and is slightly less than Chern's forecast of escalation for oil; 6.2% nominal escalation is equivalent to a 3.5% real rate of increase and is slightly more than Chern's escalation of oil. Neither of these rates seemed unreasonable. While CONCEPT was mentioned as the NRC preferred alternative, there is the option to specify escalation rates by users of CONCEPT. Furthermore, it seems that CONCEPT may be more relevant for regional cost comparisons of coal-nuclear than the comparison made in Chapter 8.

3. The third outstanding issue relates to the escalation of oil prices. Oil prices were assumed to correspond to the applicant's estimate of its 1980 prices escalated at rates assumed in the Chern demand model. The average rate of real increase from 1980 to 1990 assumed in the Chern forecasting base case is about 3%. In the PIES April 1978 mid-range forecasts, residual fuel prices in the industrial sector were projected to increase in real terms at about 1.2% annually in New England from 1980 to 1990. More recent forecasts by PIES should be available in the near future. Some confusion on what escalation rate was used in the analysis may have resulted because a slightly lower rate (5.7% instead of 6.0%) was in the table of assumptions than was actually used in the calculations. This error in the table of assumptions should be corrected in the latest version.

The use of the high and low rates of oil escalation in the sensitivity analysis was the same as used in Chern's high and low fuel price cases for the demand forecast scenarios. In the high price case between 1980 and 1990 oil escalates at approximately 9% nominal or 6% real; the escalation rate in the low price was at about 3% nominal, or constant in real terms. These rates of escalation were used in this sensitivity analysis because they were consistent with rates used in a sensitivity analysis of projected demand earlier in Chapter 8. The recommendation to use a deviation from the base case of 2 to 3 times greater for the high rate of escalation than the low rate, if used in the sensitivity analysis, would seem to imply that the base case escalation was too low. Furthermore, the sensitivity analysis of high and low rates of oil escalation did not associate probabilities with the future rates of oil escalation, it only attempted to highlight the sensitivity of changes in this variable.

4. The fourth outstanding issue relates to the methodology used to determine nuclear fuel escalation. The methodology used in projecting nuclear fuel was based on assumptions of real price increases published in Science magazine. The 1977 nuclear fuel costs (Commonwealth Edison) were escalated in real terms to 7.1 mills in the late 1980s. To this real escalation, the Chern wholesale inflation rate was added resulting in a cost of nuclear fuel of 11.1 mills per kilowatt hour in 1990. The fact that this cost is somewhat lower than that in NUREG-0480 reflects the lower assumption of general inflation which is consistent with projection of fuel prices used in Chern's demand forecasting model. The higher escalation rate in the Oak Ridge version reflects a lower actual cost of fuel experienced by Commonwealth Edison in 1977 relative to the 1977 cost used in NUREG-0480.