Enclosure

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

ATOMIC SAFETY AND LICENSING BOARD

Before Administrative Judges:

James L. Kelley, Chairman
Dr. James H. Carpenter, Member
Glenn O. Bright, Member
Dr. Harry Foreman, Alternate Member

In the Matter of CAROLINA POWER & LIGHT COMPANY and NORTH CAROLINA EASTERN MUNICIPAL POWER AGENCY (Shearon Harris Nuclear Power Plant)	Docket Nos. 50-400-OL (ASLBP No. 82-472-03 OL)

PARTIAL INITIAL DECISION
ON ENVIRONMENTAL CONTENTIONS

Appearances

Thomas A. Baxter and Deborah B. Bauser, Washington, D.C., and Richard E. Jones, Samantha Francis Flynn and H. Hill Carrow, Raleigh, North Carolina, for the Applicants Carolina Power & Light Company., et al.

Wells Eddleman, Durham, North Carolina, pro se.

John Runkle, Chapel Hill, North Carolina, for Conservation Council of North Carolina.

Charles A. Barth and Janice E. Moore for the Nuclear Regulatory Commission Staff.

February 20, 1985

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I. INTRODUCTION

Carolina Power & Light Company ("CP&L") and North Carolina Eastern Municipal Power Agency (collectively "Applicants") are the joint owners and applicants for an operating license for the Shearon Harris Nuclear Power Plant. CP&L is the lead applicant and is responsible for the construction and operation of the facility.

This proceeding is contested with respect to numerous contentions which, however, can be grouped in three general categories -- environmental, safety and emergency planning. The Licensing Board and parties decided at an early stage that the case would be best managed by addressing the three categories of contentions sequentially, with separate milestones for discovery, hearings, and separate partial initial decisions in each category. Order of March 10, 1983. The Board now decides the environmental contentions that went to hearing in June 1984 in the Applicants' favor. This decision also has the effect of making other dispositive Board rulings on environmental contentions -- i.e., rulings granting summary disposition motions or rejecting proposed contentions -- ripe for appellate review.

Hearings were held on safety contentions in Fall 1984, and a Partial Initial Decision on safety issues is anticipated in Spring 1985. A hearing on emergency planning contentions is scheduled for June 1985, with the final Partial Initial Decision to follow.

II. FACTUAL AND PROCEDURAL BACKGROUND

The Shearon Harris facility is located in Wake and Chatham Counties, North Carolina, about sixteen miles southwest of Raleigh. The

facility contains one pressurized water reactor,[1] designed to operate at core power levels up to 2,785 megawatts (MW) thermal, with a net electrical output of about 950 MW. Final Environmental Statement, Staff Ex. 1 at v.

Permits to construct the facility were issued, following hearings, in 1978. In January 1982, the Commission published in the Federal Register (37 Fed. Reg. 3898) a notice of receipt of an application for an operating license for the Harris facility. In response to that notice, nine separate petitions to intervene were filed by different individuals and organizations. Two individuals, Mr. Wells Eddleman and Dr. Richard Wilson, were admitted and have since participated as parties. Three organizations, Conservation Council of North Carolina ("CCNC"), Chapel Hill Anti-Nuclear Group Effort ("CHANGE") and Kudzu Alliance ("Kudzu") were also admitted as parties and have since participated jointly with Mr. Eddleman in support of certain contentions. The remaining petitions to intervene were either consolidated with admitted parties, withdrawn, or denied. See 16 NRC 2070; Order of May 3, 1983, Tr. 945.

The initial petitions for intervention proposed over three hundred contentions for litigation. In addition, the parties have proposed over

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1 As originally proposed and authorized for construction, the facility was to contain four reactors. See Carolina Power & Light Co. (Shearon Harris Nuclear Power Plant, Units 1, 2, 3 and 4), 7 NRC 92 (1978). Units 2, 3 and 4 have since been canceled.

two hundred "late" contentions assertedly based on information not previously available (particularly off-site emergency plans), subject to the "five factors" balancing test. See Duke Power Co. (Catawba Nuclear Station), 17 NRC 1041 (1983). To date, the Board has admitted some sixty contentions (in whole or in part) for discovery purposes, with the remainder being withdrawn or rejected. Numerous contentions that were initially admitted were later withdrawn following negotiations, or dismissed on motions for summary disposition. In the environmental area, the subject of this Decision, the following three contentions are being determined following an evidentiary hearing:

- Environmental effects of Table S-3 coal particulates (Eddleman 8F(1));
- Environmental effects of radionuclides associated with fly ash from coal plants (Joint Contention II (e)); and
- Duration of radiological dose calculations (Joint Contention II (c)).

Hearings on the environmental contentions were conducted in Raleigh, North Carolina for four days in June 1984.[2] Mr. Eddleman

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2 Because of Administrative Judge Carpenter's temporary unavailability, Administrative Judge Harry Foreman served as a member of the Board, in place of Judge Carpenter, during the hearing and in the decision on Eddleman Contention 8F(1). Judge Foreman served as a technical interrogator and informal assistant to the Board under 10 CFR § 2.722 for the balance of the hearing. Order of June 4, 1984; Tr. 1599-1600.

appeared and represented himself. In his dual capacity as one of the Joint Intervenors, Mr. Eddleman also represented that group, along with Mr. John Runkle, counsel for CCNC, another Joint Intervenor. The Applicants and the NRC Staff were represented by counsel. The Board heard testimony from eight witnesses, four called by the Applicants and four by the Staff. The Intervenors did not call witnesses, but sought to make their case through cross-examination. Following the hearing, each party submitted proposed findings of fact and conclusions of law.

III. SUMMARY OF FINDINGS

This section summarizes the detailed findings of fact in the following section on the three environmental contentions. It provides a brief narrative description, essentially an overview, of how those contentions have been decided, and why.

A. Joint Contention II(c) -- Appropriate Time Periods for Considering Health Effects

Joint Contention II(c) has as its general thrust the concern that the time periods over which exposures to radioactivity were calculated were too short. The FES generally presents an "annualized" dose to various individuals and groups rather than a total dose calculated over the length of time that the radioactivity caused by operation of the plant would last. Joint Intervenors contend that this method of presenting exposure calculations does not reveal the true magnitude of radiation exposures to the public.

In accepting this contention the Board set forth three issues which could be litigated: (1) whether a period of time subsequent to the operation of the plant should be included in exposure analyses[3], (2) whether the FES should include the total risk of exposure from operation of the plant for forty years, and (3) whether the FES should take into account the cumulative exposure to individuals who live near the plant for many years.

As to the first issue, Applicants calculated the exposure to the population within 50 miles of the plant during plant operations, and then calculated the additional exposure which would be received over the 100 years following cessation of plant operations. The incremental exposure would add only 1.3% to the total exposure during plant operations, an amount which the Board finds to be insignificant. Applicant also presented similar calculations of the dose and incremental dose to the population of the entire United States. The incremental dose in this case would add some 40% to the risk. However, the computed risk from operation of the plant is 1×10^{-9}. For this type of calculation the Board sees little difference between 1 and 1.4×10^{-9} and, considering the conservatisms in the calculation, finds the effect insignificant.

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3 The Board allowed only a reasonable amount of time to be considered rather than the Joint Intervenors' argument that the analysis should extend to some eleven million years.

As to the second and third issues, Staff presented a calculation which was based on taking the maximum allowable dose under the appropriate regulations and multiplying it by 40, the number of years assumed for operation of the plant. The result compares favorably with Applicants' calculations of risk to the maximally exposed individual, which were made using different assumptions. We see little difference between the Applicants' calculated risk of 2×10^{-5} and Staff's 3×10^{-5}.[4] The Board finds that Staff's annualized results, while not explicitly presenting the total dose over the life of the plant, require only a simple calculation to reveal such a result, and are therefore adequate for the purpose intended.

Joint Intervenors had further reservations in their findings on a number of subjects which are not found in the FES, such as effects on fetuses, genetic effects, birth defects and fetal losses. The record shows that these effects are insignificant. They further argued that radiation effects should be compared with a "no-plant" condition rather than naturally-occurring background radiation, which seemingly implies a misunderstanding of what the calculations show; that absolute risk was used instead of relative risk, blinking the fact that use of absolute risk factors is recommended by the BEIR Committee; and, that the effect

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4 Both calculations were made using the BIER Committee recommended methods and estimators, but the original assumptions made to obtain dose figures were made independently.

on world population should be presented, an argument in which the Board finds no merit.

B. Joint Contention II(e) -- Effects of Attachment of Radionuclides to Fly Ash Particles

Joint Contention II(e) expressed the Intervenors concern that radiological doses from the anticipated routine gaseous emissions from the Harris plant have been underestimated because attachment of radionuclides to fly ash particles and subsequent deposition in the lung had not been explicitly considered by the Applicants or the NRC Staff. Joint Intervenors did not support their view with testimony, so that the record consists of testimony and cross-examination of the Applicants and Staff witnesses.

The inhalation dose would come primarily from the deposition of tritium in the form of tritiated water, which makes up over 98% of the estimated whole body dose from inhalation. Since ordinary air contains about 80,000 times more water vapor than particles, only an extremely small portion of the tritium can become associated with particles. Further, particle-associated water would be expected to commingle with other water at the point of lung deposition. For these reasons, tritiated water, the major dose contributor, is not significantly affected by airborne particles.

The second largest component of the estimated inhalation dose would come from the noble gases. Expected association of noble gases with fly ash particles was shown to be quite small, and possible dose

underestimation of these radionuclides was found to be insignificant, particularly since the calculated doses amount to a few percent of the Appendix I design objectives.

The Joint Intervenors' concern would apply to the estimated doses from radioisotopes of iodine, cobalt, iron, and manganese. The Applicants and Staff assumed 75% deposition in estimating inhalation doses for these radionuclides. Applicants' testimony showed that this assumption has been borne out by recent research results. Staff points out that the dose from these radionuclides amounts to only 0.2 millirems per year and, even if one were to assume 100% lung deposition, the dose would be less than 0.3 millirems per year. The Joint Intervenors' cross-examination makes it clear that this part of the dose estimate is not exact. However, the uncertainty is less than one-tenth of one millirem per year. We conclude that the uncertainty is acceptably small.

C. Eddleman Contention 8F(1) -- Effects of Coal Particulates Associated with the Fuel Cycle

Eddleman Contention 8F(1) alleges that the FES underestimates the health effects of the coal particulates -- 1,154 MT per year--associated with the uranium fuel cycle for the Harris facility. The generic quantification of the environmental impacts of the uranium fuel cycle is included in Table S-3. Table S-3 values are not subject to challenge in individual licensing proceedings. However, the health effects

attributable to these values are not part of the Table; consequently, they are litigable in NRC adjudications.

The health effects of Table S-3 coal particles are addressed in the Final Environmental Statement in Appendix C. The effects of the nonradiological particulate effluents associated with fuel-cycle processes are grouped together with other effluents and the following statement is provided:

> The quantities of chemical, gaseous and particulate effluents associated with fuel cycle processes are given in Table S-3. The principal species are sulfur oxides, nitrogen oxides, and particulates. On the basis of the data in a Council on Environmental Quality report (CEQ, 1976), the Staff finds that these emissions constitute an extremely small additional atmospheric loading in comparison with the same emissions from the stationary fuel-combustion and transportation sectors in the U.S.: that is, about 0.02% of the annual national releases for each of these species. The staff believes that such small increases in releases of these pollutants are acceptable.

Mr. Eddleman's Contention 8F(1) is a challenge to the adequacy of the Staff summary position on the health effects of coal particulates. When he first proposed Contention 8F(1), Mr. Eddleman contended that this quantity of emissions (1,154 metric tons a year of coal particles, the S-3 value) may cause up to ten deaths a year. On the basis of the hearing record and certain of his assumptions, he asks us to find that these coal particulates could, under varying hypotheses, cause from 32 to 800 deaths during the life of the plant. Hence he claims the Table S-3 coal particulate health effects have not been properly considered by the NRC Staff.

The particulate emission rate of 1,154 MT/yr is a hypothetical attribution. It is used in Table S-3 in order to calculate a conservative estimate of the particulate emissions that might be associated with the electrical energy produced by the equivalent of a hypothetical 45 MWe coal-fired power plant operating for one year. This is the estimated energy needed to support the uranium fuel cycle for one year of the Harris Plant's operation. Most of this energy is used in the uranium enrichment process at gaseous diffusion plants.

The three gaseous diffusion facilities used in the uranium enrichment process are supplied with electricity primarily from power grids. Thus, the particulates released from coal plants supporting the uranium fuel cycle for the Harris facility in fact are distributed in small amounts over large areas. In order to estimate an upper limit of health risks, the Applicant and Staff experts used much more conservative assumptions in their calculations, namely, that the coal particles were generated from specific plant sites in the power grid.

To calculate health effects, it was necessary to estimate the particulate concentration levels attributable to 1,154 MT/yr. The Applicants' testimony made a number of assumptions about the coal particulate emissions attributable to the uranium fuel cycle, whereas the NRC Staff's experts utilized actual data and a complex model to derive the atmospheric concentration of coal particles. The Applicants' witness estimated an average daytime particulate concentration level of 0.036 to 0.042 ug/m^3. The staff calculated the maximum incremental 24 hour concentration to which the average individual in the area is

exposed to be 0.105 ug/m^3. This is remarkably good agreement, considering the disparate methods of analysis.

Utilizing the particulate concentration levels thus calculated the health effects attributed to 1,154 MT/yr coal particulates were assessed. Both comparative and quantitative methods were used.

The size of coal particulates that are of concern to health are the so-called respirable or Thoracic Particles (T.P.). Large particles tend to be deposited in the nose or pharynx and do not reach the lung. The Environmental Protection Agency ("EPA") Staff has found that based on long term epidemiological data, the range of annual T.P. levels of interest in health assessment is 55 to 110 micrograms per cubic meter, i.e, that the lowest level risk of health effects is approximately 55 ug/m^3. The calculation of T.P. concentrations associated with prototype S-3 plant particulate emissions was 0.014-0.017 ug/m^3, namely a concentration approximately 3,000 times smaller than the minimum concentration expected to result in symptomatic effects.

A standard reference for evaluation of health effects of air pollution is the "1983 Harvard Report" prepared by the Health and Environmental Risk Analysis Program of the U.S. Department of Energy. The parameter for deleterious health effects used in the Harvard Report is a so-called "Fine Particle (F.P.) Damage Function," which is viewed as a surrogate for health effects of all air pollution. The F.P. Damage Function is determined as 1.3 ± 0.6 deaths/year/10^5 persons per ug/m^3 F.P. Using this parameter, the estimated excess deaths from population exposure to 1,154 MT/year total coal particulate emissions range from

0.001 to 0.13. This risk is indistinguishable from zero against the background of expected deaths from all causes, which ranges from 2,400 to 11,000 at the five areas studied. The upper limit of estimated expected deaths from particulate exposure corresponds to about one-thousandth of one percent of the mortality rate.

Conservative calculations of the upper limit of health risk which may be associated with the 1,154 MT/yr figure indicate that atmospheric concentrations of the amount of particles attributable to a 45 MWe coal-fired plant reasonably distributed over a 50-mile radius would be 3,000 times smaller than the minimum concentration determined by the EPA to present some health risk. Conservative calculations of the upper limits of risk of those particles distributed among the populations around the five fossil plants supplying the uranium enrichment facilities indicate that, at most, a tiny fraction of a death each year those plants are in operation, could be attributed to the particulate emissions. This risk is extremely small, particularly when compared to the deaths one would expect in those same populations from all causes. These calculations assume that exposure from particles is long standing. In summary, it is the Board's opinion that the Staff succinctly and correctly concludes in the FES that there is a miniscule incremental environmental impact from the coal particles identified in Table S-3.

IV. FINDINGS OF FACT

A. Appropriate Time Periods for Considering Health Effects.

1. Joint Contention II(c) as originally admitted stated that:

> The long term somatic and genetic health effects of radiation releases from the facility during normal operations, even where such releases are within existing guidelines, have been seriously underestimated for the following reasons:
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> . . . .
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> (c) the work of Gofman and Caldicott shows that the NRC has erroneously estimated the health effects of low-level radiation by examining effects over an arbitrarily short period of time compared to the length of time the radionuclides actually will be causing health and genetic damage.

2. The Final Environmental Statement expresses the health risks represented by normal operation of the Harris facility on an annual basis -- e.g., the U.S. population dose is 56 person-rems per year. FES at 5-35. In denying Applicants' motion for summary disposition of Joint Contention II(c), the Board identified the issues to be litigated as: (1) whether the environmental impact statement should describe the total risk associated with exposure to radioactive effluents from normal operations for the 40-year life of the plant and (2) whether the environmental impact statement should take into account the incremental impact on people who live near the plant for many years. The Board left the door open for litigation of similar issues, but barred litigation of speculative impacts over geologic time periods. See 19 NRC 432, 440-441.

3. Applicants submitted testimony by Dr. John J. Mauro and Mr. Stephen F. Marschke who are employed in the Envirosphere Division of Ebasco Services, Inc., the architect-engineer for the Harris plant, ff. Tr. 1971. Dr. Edward F. Branagan, Jr. testified on behalf of the NRC Staff, ff. Tr. 2058.[5] Intervenors did not present witnesses on this contention.

4. The Applicants' witnesses presented testimony describing calculations of (1) the estimated doses and risks both to the human population within a 50 mile (80 km) radius of the Harris plant and to the total U.S. population and (2) the estimated dose and risk to the hypothetical maximally exposed individual. These two different estimates were developed in order that the risk to the population might be calculated and that compliance with regulatory limits, which are designed to protect the individual, could be assessed. The calculations included consideration of residual exposures from releases during the life of the plant (40 years) and for a period of 100 years after cessation of the plant operation. Mauro - Marschke, ff. Tr. 1971 at 3.

5. The radiation dose to the population within 50 miles of the plant during a 100 year period following plant operation was computed by

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5 In some transcripts Dr. Branagan's prepared testimony on Contentions II -(c) and II-(e) were transposed. In these cases Dr. Branagan's testimony on II-(c) follows Tr. p. 1865.

Applicants to be about 8 person-rems. This estimate may be compared to the computed dose of 624 person-rems for the same population during the 40 years of plant operation. Mauro-Marschke, ff. Tr. 1971 at 6. The post-operation dose was thus found to be only 1.3 per cent of the dose during the 40 year operation of the plant.

6. The radiation dose to the U.S. population during a 100 year period following plant operation was computed by the Applicants to be 706 person-rems. The computed dose to the U.S. population during the 40 years of plant operation was 1740 person-rems. Mauro-Marschke, ff. Tr. 1971 at 6. As pointed out by the Joint Intervenors in proposed finding 17, the post-operation dose estimate is 40 per cent of the dose estimate for the operational period. The Applicants testified that "this residual dose is relatively small" and, therefore, not significant. Applicants provide further perspective in their testimony by computing that the average individual dose to the U.S. population for 40 years operation of the Harris plant would be 7×10^{-6} rems and the associated risk would be 1×10^{-9}. Applicants testified further that the estimated doses are not significant in light of the conservatisms in the calculations. Mauro-Marschke, ff. Tr. 1971, Attachment 4. The Board agrees that adding 40% of a very small number to a very small number, particularly when the unknowns in these analyses are considered, would not constitute a significant change.

7. Applicants' witnesses further testified that the total risk to both the 50-mile and U.S. populations is less than one cancer fatality. Mauro-Marschke, ff. Tr. 1971, p. 8. They compared this figure with the expected number of cancer fatalities in the U.S. population over a 40-year period of over 10 million, and with the expected number within a 50-mile radius, which is over 100,000. Mauro-Marschke at 8, 9.

8. Applicants calculated the maximum whole body dose to an individual resulting from operation of the Harris plant. The methods used were 1) age-specific doses were calculated, 2) these doses were multiplied by the length of time the individual was in the specific age group during plant operation, and 3) the resulting doses were summed over the life of the plant. They then added the residual dose that the individual would receive from age 46 to 70. The maximum dose to the individual was determined to be 130 mrem. Mauro-Marschke, pp. 12-13.

9. The risk of cancer mortality from this exposure was calculated as 2×10^{-5} or 1 chance in 50,000. The calculation was made by use of the methodology presented in the report of the Advisory Committee on Biological Effects of Ionizing Radiation (BEIR I) using age-specific cancer risk coefficients. Mauro-Marschke at 13.

10. The Staff witnesses' testimony presented calculations which, while not as detailed as those made by Applicants, provide a useful check upon whether there is a substantive difference between doses assessed over

the life of the plant, rather than on an annualized basis. The method basically assumes that the dose estimate to a maximally exposed individual is the dose design objective contained in Appendix I of 10 CFR Part 50. Branagan, testimony ff. Tr. 2058 (Branagan II-(c) at 4, 5.

11. The results of Staff's calculation showed that the maximally exposed individual would receive 200 mrem over the 40-year life of the plant. (Branagan at 5). The resulting risk, calculated by the BEIR-I method for determination of absolute risk, is about 3×10^{-5}. Branagan II-(c) at 7, 8.

12. Findings 8 through 11 above satisfy the Board's request for estimates of effects on people who live in the vicinity of the plant for many years. The Board finds that there is no undue risk to such maximally exposed individuals.

13. Intervenors raised several points in their proposed findings which the Board considered. The first point is that the effect of plant operation on fetuses from conception to birth is not considered in Applicants' analysis. Applicants agreed that this was true, but testified that further analysis had shown that such consideration would have little effect on the final conclusions. Although the risk to the fetus is 5 times higher than that to an adult, the risk occurs in only 9 months out of an assumed 70 year life span. The Applicants conclude that the addition of this risk would not have a significant effect on

the sum of the risks over all age groups. Mauro, Tr. 1978, 1982. The Board agrees.

14. Intervenors consider that a proper comparison of plant effects would be to a "no-plant" condition, rather than to normal background radiation. The Board disagrees. Firstly, when the analysis results in a level of risk, the comparison with a "no-plant" or zero-radiation condition is already made. Secondly, we find that it is useful to compare with background radiation as a means of putting the added risk into perspective.

15. Intervenors maintain effects such as fetal losses, genetic effects, birth defects, etc. occasioned by radioactive plant effluents are not considered. Staff argues that such effects are very low and thus are insignificant. To illustrate, Staff calculated the number of potential genetic disorders which could result from operation of the plant over 40 years. They used the genetic risk estimator recommended by BEIR-I, which is based on all genetic effects that would cause some serious handicap during a individual's lifetime. The result showed that about 0.16 of a potential genetic disorder might occur in the population within a 50-mile radius of the plant, some 1.75 million people at the present time. This is compared with the normally occurring statistical value of about 11% of the population. The Board agrees with Staff that the occurrence of genetic effects from plant operation are indeed insignificant. Branagan at 9; Tr. 2135.

16. Intervenors further aver that the effects of operating the plant upon the population of the world should be included in the FES. Intervenors refer us to no statute, rule, or other legal authority that requires us to extend the FES analysis beyond United States borders. This is not a case where a significant environmental impact should be anticipated outside U.S. territory, such as a power reactor sited on the Mexican or Canadian borders. On the present record, involving a reactor sited in North Carolina, there is no reason to believe normal reactor operation will have any measurable impact outside the United States. We therefore reject Intervenor's proposal for a worldwide analysis of environmental impacts.

17. Another concern of Intervenors was the use of "absolute risk" rather than "relative risk" coefficients, as use of "relative risk" would result in values some four times higher. Applicants' witness testified that while the BEIR Committee discussed both forms of coefficients it recommended that the "absolute risk" coefficients be used because the data available on cancer incidence are more consistent with the use of "absolute risk" than "relative risk". Mauro, Tr. 2051. The Board finds that use of the "absolute risk" coefficients, as recommended by the BEIR Committee, is acceptable.

18. As noted previously, in the FES Staff presents risks of the facility on an annualized basis, rather than over the total life of the plant, as the Intervenors would have it. This is done principally

because applicable regulations and design objectives are set forth in annual terms. The benefits of the facility are also set forth in annual terms for direct comparison in the cost-benefit analysis. Branagan at 3. The Staff calculation of dose to the maximally exposed individual, which is obtained by multiplying the annual dose by 40 years, the assumed life of the plant (Branagan at 3, 4), yields results which are consistent with the Applicants' results using a different, more detailed method. Compare Findings 8, 9, 11, supra.

19. Intervenors would have us require the Applicants and Staff to rework their risk analyses in the ER and FES to reflect all of the factors discussed in the findings above. The Board declines to require such an analysis. We have found that for all practical purposes the annualized results that are presented in the ER and FES are adequate to describe the risks associated with the facility. We do not find that the results shown are misleading. We believe that arguments presented by Staff and Applicants for discounting certain factors are well taken. The Board observes, however, that in future assessments of environmental impact it might be well to include life-of-the-plant risk assessments as well as annualized assessments to provide the reader with a fuller appreciation of the overall risks involved. If that were done litigation of these points might be avoided.

B. Joint Contention IV(e) -- Effects of Attachment of Radionuclides to Fly Ash Particles

Introduction

1. Joint Contention II(e) states:

> The long term somatic and genetic health effects of radiation releases from the facility during normal operations, even where such releases are within existing guidelines, have been underestimated for the following reasons:
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> . . . .
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> e) the radionuclide concentration models used by the Applicants and the NRC are inadequate because they underestimate or exclude the following means of concentrating radionuclides in the environment . . . radionuclides absorbed in or attached to fly ash from coal plants which are in the air around the SHNPP site . . . .

2. Applicants submitted testimony by Drs. John J. Mauro and Steven A. Schaffer, who are employed by the Envirosphere Company, a Division of Ebasco Services, Inc., the architect-engineer for the Harris plant, ff. Tr. 1605. Dr. Edward F. Branagan, Jr. testified on behalf of the NRC Staff, ff. Tr. 1865. Intervenors did not present witnesses on this contention.

3. The Applicants' witnesses testified on various facets of the question whether doses they calculated for the inhalation route are underestimated because radionuclide attachment onto respirable fly ash in the ambient atmosphere was not taken into account. Joint Intervenors contend that such particle absorption and adsorption would cause more of the radionuclides in the gaseous effluent from

the Harris facility to penetrate deeper into the lung and be retained for longer periods of time. This part of Contention II(e) constitutes a challenge to the inhalation dose conversion factors tabulated in Regulatory Guide 1.109. [6]

Significance of Tritiated Water

4. Applicants' witnesses testified that tritium in the form of tritiated water makes up over 98 percent of the estimated whole body dose from inhalation. However, they point out that the principal concern in this contention relates to radionuclides attaching to fly ash in the atmosphere and then lodging in the lung. This hypothesized phenomenon would only be applicable to radionuclides that can take particulate form. Their view is that radionuclides that cannot take particulate form will not stay in the lung, but will be immediately exhaled or absorbed into the body fluids. They assert that tritium is not in particulate form and that it is inhaled almost exclusively as water vapor. Therefore, tritium would not be significantly involved in the concerns of this contention. Mauro-Schaffer, ff. Tr. 1605 at 4 and 5.

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6 See Regulatory Guide 1.109, Calculation of annual doses to man from routine releases of reactor effluents for the purpose of evaluating compliance with 10 C.F.R. Part 50, Appendix I, Rev. 1, U.S. Nuclear Regulatory Commission (1977).

5. Cross-examination by the Intervenors brought out the fact that only a minuscule fraction of the tritiated water emitted from the Harris plant could become associated with fly ash particles. This is evident from consideration of the relative masses of water vapor and particles in ordinary air; i.e., 8 grams of water vapor per cubic meter of air versus approximately 100 micrograms (1/10,000 of one gram) of particles per cubic meter of air, Mauro, Tr. 1716. Stated another way, a volume of ordinary air contains about 80,000 times more water vapor than particles. Further, the tiny portion of the tritiated water that might become associated with fly ash particles would be expected to commingle with other water at the point of lung deposition. After that point, the tritium would be taken up by the body and behave like any other water droplet -- i.e., it would commingle with other body fluids and soon be excreted. Mauro, Tr. 1682.

6. Joint Intervenors proposed finding 7 complains that "Applicants did not squarely address tritium in its conclusions." This misses the point of the Applicants' statement that "the phenomenon of radionuclides attaching to fly ash impacts only a small fraction of the inhaled dose . . . ." As the Applicants' testimony showed (paragraphs 4 and 5 above), tritiated water, the major dose contributor, is not significantly affected by airborne particles.

The Noble Gases

7. Joint Intervenors allege in proposed finding 9 that "there was no study done of adsorption or absorption of noble gases onto coal particulates." This statement does not reflect the record accurately. The Applicants' testimony included a calculation showing that only a very small fraction of the released noble gases could become associated with fly ash, under the very conservative assumption that fly ash might be as efficacious in taking up noble gases as activated charcoal. Mauro-Schaffer, ff. Tr. 1605, Attachment 2 at 2-4.

8. The Board notes parenthetically that the noble gases are so called because they have very little chemical reactivity. One conceivable concern would exist if the noble gas radionuclides could decay into charged daughters that might have an affinity for fly ash. However, Applicants' witness testified that the noble gas daughters would be ionized for time periods of less than seconds. Mauro, Tr. 1952. Therefore, the record, in our view, fully supports Applicants' and Staff's estimation of small doses from noble gases as presented in the FES (Shearon Harris FES, page D-10). Those calculated doses are limited to a few percent of the Appendix I design objectives. 10 C.F.R. Part 50, Appendix I, Section II.B.

Method of Calculating Doses

9. The calculational method used by both Applicants and the NRC Staff is in accord with Regulatory Guide 1.109. The calculation requires four pieces of information: (1) the source term; (2) the atmospheric dispersion factor at the location of the maximally exposed individual; (3) the inhalation rate of the maximally exposed individual; and (4) the inhalation dose conversion factor. The product of these four factors, with appropriate unit conversion, yields the inhalation dose, as presented in the ER and the FES. Mauro & Schaffer, ff. Tr. 1605 at 5-6.

10. The inhalation dose conversion factors in Regulatory Guide 1.109 include consideration of radionuclide lung deposition and clearance. Applicants testified that these dose conversion factors were derived using a two-compartment lung model that was first described in ICRP-2, 1959.[7] This model assumes that 75 percent of the inhaled particulate radionuclides are deposited in the lung and 25 percent are immediately exhaled. Of the 75 percent deposited, it is assumed that 50 percent is deposited in the upper respiratory

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7 ICPR-2, 1959. Recommendations of the International Commission on Radiological Protection. Report of Committee 2 on Permissible Dose for Internal Radiation. ICRP Publication 2, Pergamon Press, London.

tract and 25 percent is deposited in the deep lung. Mauro-Schaffer, ff. Tr. 1605 at 7.

11. Several recent studies using human subjects have reported measurements of particle deposition in the lung as a function of particle aerodynamic diameter. Respirable fly ash particles in ambient atmospheres have a median aerodynamic diameter of 2 micrometers. A recent EPA review[8] states that the deposition fraction for particles in the size range of fly ash ranges from 30 percent to 60 percent. Comparison of these experimental results with the 75 percent deposition assumed in the ICRP model shows the model to have a conservative assumption regarding deposition in the lung. Mauro-Schaffer, ff. Tr. 1605 at 8.

Lymph Node Concerns

12. Cross-examination by Intervenors raised the issue whether the dose to the lymph nodes resulting from transfer of particles from the lung to the lymph nodes had been taken into account. Eddleman, Tr. 1701. Applicants' witness testified that the dose to the lung calculated using the ICRP-2, 1959 approach is higher than the dose

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8 EPA 1982. Air quality criteria for particulate matter and sulfur oxides, Vol. II and III. NTIS-PB84-120419.

to the lymph nodes or the lungs that would be obtained using the more recent models. Mauro, Tr. 1724. The basis for this view was stated to be a publication in Health Physics, 1966[9] in which an analysis was done on the significance of not separately treating lymph nodes. The conclusion was that the dose to the lung was more important or comparable to the dose and risk to the lymph nodes. Mauro, Tr. 1709.

13. The hypothetical concern with the dose to the lymph nodes would involve particulate material deposited in the lung which was not rapidly cleared by other mechanisms, but cleared by phagocytisis to the lymph nodes. Mauro, Tr. 1709. The insoluble radionuclides that might be involved are isotopes of manganese, iron, cobalt and strontium. Mauro-Schaffer, ff. Tr. 1605, Table 1 and page 10. The dose to the lung from these radionuclides had been computed to be approximately 0.005 millirems. Thus, even if some increase were to be postulated as a result of retention of particulates in the lymph nodes, rather than the lungs, the magnitude of the dose would be small compared to the regulatory guidance for dose design objectives -- 15 millirems, as specified in 10 C.F.R. Part 50, Appendix I, II.C.

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9. ICRP 1966. Deposition and retention model for internal dosimetry of the human respiratory tract. Health Physics, 12:173-207.

Staff Calculation of Thyroid Dose

14. The NRC Staff witness testified that the dose to the critical organ (i.e., the thyroid) of the maximally exposed individual was estimated to be 0.2 millirems per year from inhalation of iodines and particulates in gaseous effluents. Branagan, ff. Tr. 1865 at 3. The thyroid was designated as the critical organ because the doses to all other organs were found to be less than the calculated dose to the thyroid. Branagan, Tr. 1905. The dose calculations by the Staff follow the 1959 ICRP report and assume that 75 percent of the particles that were inhaled would be deposited in the respiratory tract. Branagan, ff. Tr. 1865, at 4.

15. Staff points out that even if it is assumed that fly ash and the iodines and particulates formed particles of an optimal size such that all of the inhaled particles were deposited in the respiratory tract, the dose estimates would increase only by a factor of one-third. Under this assumption, the dose to the thyroid of the maximally exposed individual from inhalation of iodines and particulates would be increased from 0.2 millirems per year to about 0.3 millirems per year. Branagan, ff. Tr. 1865 at 4.

16. The Board finds that less than 100 percent lung deposition has been observed in several observational studies cited by the Applicants. Mauro-Schaffer, ff. Tr. 1605, Figure 1. The Joint Intervenors

hypothesis of radionuclide association with fly ash, even with complete deposition in the lungs, would result in increased dose estimates of some hundredths of a millirem per year. The Board finds that the dose estimates in the FES associated with the normal operation of the Harris facility have not been significantly underestimated, and Joint Contention II(e) is resolved in favor of the Applicants and Staff.

17. The Joint Intervenors proposed finding 8 asserts that the assumptions used in the Applicants dose estimates "were found deficient upon cross-examination." The Board agrees with Joint Intervenors that 1) the exact concentration and size distribution of atmospheric particulate matter at the Harris site has not been determined and 2) the degree to which radioactive particulate isotopes to be emitted from the Harris plant may become associated with the atmospheric particulate matter has not been determined. Further, the Board agrees with the Joint Intervenors proposed finding 12 that the exact extent of lung deposition has not been established and that it can not be estimated with great exactitude since it varies with "mouth vs. nose breathing, shallow vs. deep, rapid vs. slow and whether one is awake or asleep."

18. However, the Board observes that these facts produce a possible

uncertainty in the dose estimate of less than one tenth of one millirem per year. Comparison of this value with the 500 millirem per year dose limit specified in 10 C.F.R. § 20.105 and the dose design objective of 15 millirems per year specified in 10 C.F.R. 50, Appendix I, Section II C to meet the "As low as is Reasonably Achievable" criterion leads the Board to conclude that the uncertainty is acceptably small.

Doses Via the Crop-Foodchain Pathway

19. Applicants' witnesses also testified with regard to whether the hypothesized phenomenon of radionuclides attaching to fly ash could impact the calculations for the food pathway dose for the Harris plant. Their calculations were made in accordance with Regulatory Guide 1.111.[10] The particle deposition velocities in Regulatory Guide 1.111 range from 0.12 cm/sec. to 1.81 cm/sec. The median size of fly ash is about 2 micrometers which is expected to have a deposition velocity of approximately 0.2 cm/sec. The deposition velocities used in the calculations appear to be appropriate for fly ash particles and such particles are appropriately accounted

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10 See Regulatory Guide 1.111, Methods for estimating atmospheric transport and dispersion of gaseous effluents in routine releases from light-water-cooled reactors, Rev. 1, U.S. Nuclear Regulatory Commission (1977).

for in the calculation of doses from the crop-foodchain pathway. Applicants' testimony on the food pathway dose estimates for the Harris plant were not controverted by the Joint Intervenors during cross-examination, nor did the Joint Intervenors file any proposed findings on this question. This aspect of the contention is also resolved in favor of the Applicants.

C. Contention 8F(1)--Effects of Coal Particulates Associated with the Fuel Cycle.[11]

1. Eddleman Contention 8F(1) states that:

> Appendix C of the FES underestimates the environmental impact of the effluents in Table S-3 for the following reasons:
>
> (1) health effects of the coal particulates 1,154 MT per year, are not analyzed nor given sufficient weight.

The generic quantification of the environmental impacts of the uranium fuel cycle is presented in Table S-3. Table S-3 values are not subject to challenge in individual licensing proceedings. Baltimore Gas and Electric Co. v. NRDC, 103 S. Ct. 2246 (1983). However, the health effects attributable to these values are not part of the Table; consequently, they are litigable in NRC adjudications. See 10 C.F.R. Part 51, Table S-3 at n.1. One of the values in Table S-3 is 1,154 metric tons a year (MT/yr) of coal particles.

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11 The Board drew extensively on the Findings of Fact presented by the Applicants on this contention.

2. The health effects of Table S-3 coal particles are briefly addressed in Appendix C of the FES. In that Appendix C, the effects of the nonradiological particulate effluents associated with fuel-cycle processes are grouped together with other effluents and the following statement is provided:

> The quantities of chemical, gaseous and particulate effluents associated with fuel-cycle processes are given in Table S-3. The principal species are sulfur oxides, nitrogen oxides, and particulates. On the basis of the data in a Council on Environmental Quality report (CEQ, 1976), the staff finds that these emissions constitute an extremely small additional atmospheric loading in comparison with the same emissions from the stationary fuel-combustion and transportation sectors in the U.S.; that is, about 0.02% of the annual national releases for each of these species. The staff believes that such small increases in releases of these pollutants are acceptable.

FES, Appendix C, Section 4 at C-2.

3. Mr. Eddleman's Contention 8F(1) is a challenge to the adequacy of the Staff summary position on the health effects of coal particulates. He initially contended that this quantity of emissions, i.e., 1,154 metric tons of coal particles, may cause up to ten deaths a year, a number which is "[n]ot trivial." See Eddleman Response to Staff DEIS, June 20, 1983, at 14.

4. Evidence on behalf of the NRC Staff was presented by a panel consisting of Dr. Loren J. Habegger, Dr. A. Haluk Ozkaynak, and Mr. Ronald L. Ballard. See Testimony of Habegger, Oskaynak and Ballard, the NRC Staff Panel, ff. Tr. 1380. Dr. Habegger is Manager of the Environment and Natural Resources Section, Energy Environmental Systems Division, Argonne National Laboratory. He has a Ph.D. in Nuclear Engineering and had published extensively in the field of air pollution.

Dr. Ozkaynak has M.S. degrees in Physics and in Air Pollution control and a Ph.D. in Mathematical Physics. He is a Research Fellow and Project Director of long term multi-disciplinary study at Harvard University investigating the health effects of population exposures to ambient particulate matter. Mr. Ballard is Chief of the Environmental and Hydrologic Engineering Branch of NRC's Division of Engineering. He oversees the NRC Staff's preparation of non-radiological environmental assessments for nuclear power plants. Mr. Ballard was responsible for developing agency guidelines for use in responding to NEPA.

5. Evidence on behalf of Applicants was presented by Dr. Leonard D. Hamilton. Dr. Hamilton is Head of the Biomedical and Environmental Assessment Division in the National Center for Analysis of Energy Systems at Brookhaven National Laboratory. He received his B.A. degree from Oxford University, a Ph.D. from Cambridge, and an M.D. degree from Oxford. Dr. Hamilton has published more than 150 scientific papers, including many reports assessing the hazards of various energy sources. Hamilton Testimony, ff. Tr. 1,178.

6. Mr. Eddleman presented no witnesses in support of his Contention 8F(1).

Particulate Concentration Levels

7. The particulate emission rate of 1,154 MT/yr is a hypothetical attribution. Hamilton at 3. It is used in Table S-3 in order to calculate a conservative estimate of the particulate emissions that

might be associated with the electrical energy produced by the equivalent of a hypothetical 45 MWe coal-fired power plant operating for one year. This is the estimated energy needed to support the uranium fuel cycle for one year of the Harris Plant's operation. Most of this energy, i.e., approximately 96%, is used in the uranium enrichment process at gaseous diffusion plants.[12]

8. The three gaseous diffusion facilities used in the uranium enrichment process are located at (1) Paducah, Kentucky; (2) Oak Ridge, Tennessee; (3) Portsmouth, Ohio. These facilities are supplied with electricity primarily from power grids. Thus, the impact of the particles released from coal plants supporting the uranium fuel cycle in fact are distributed in small amounts over large areas. Hamilton at 4; NRC Staff Panel at 5. For purposes of their respective calculations to estimate an upper limit of health risks, the Applicant and Staff experts used much more conservative assumptions, namely that the coal particles were generated by specific plant sites in the power grid.

9. Similar methods were used by the Staff's panel of experts and by the Applicants' expert to calculate the health effects attributable to the particulate emission rate of 1,154 MT/yr. To calculate health

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12 Although the FES was written in support of a two-unit facility, Applicants cancelled construction of one of these units on December 21, 1983. As a result, those environmental impacts that are not expressed in "per reactor" units in the FES must be halved to accurately reflect the impact of the Shearon Harris facility.

effects, it was necessary to estimate the particulate concentration levels attributable to 1,154 MT/yr. Dr. Hamilton made a number of assumptions about the coal particulate emissions attributable to the uranium fuel cycle, whereas the NRC Staff's experts utilized actual data and a complex model to derive the atmospheric concentration of coal particles. Tr. 1,223-24, 1,362 (Hamilton); Tr. 1,591 (Ozkaynak); Tr. 1,590-91 (Habegger); Tr. 1,591 (Ballard).

10. Specifically, from the TVA's grid system, Dr. Hamilton assumed the Bull Run Plant to be the only plant serving Oak Ridge, the Shawnee and Joppa plants to be serving Paducah, Kentucky, and the Kyger and Clifty Plants, supplying Portsmouth, Ohio. He then assigned the hypothetical 1,154 MT of particles individually to each of these five power plants on the basis of two different assumptions: first, that any one of these coal plants may be singly responsible for the electricity used to produce the entire enrichment of uranium needed to supply the Shearon Harris plant; and second, that the source of energy to support the uranium enrichment process may be divided equally among these coal plants. Hamilton at 4.

11. The Staff's point sources were limited to the three existing coal-fired power plants in utility grids that are known to serve the gaseous diffusion plants, i.e., the Joppa, Clifty and Kyger Plants. NRC Staff Panel at 4. Each of these coal-fired stations was also assumed by the Staff's experts to generate the total uranium fuel cycle electrical energy requirements, and thus to emit the entire 1,154 MT/yr of coal particles specified in Table S-3.

12. In his calculation of particulate concentration levels attributable to 1,154 MT/yr, Dr. Hamilton assumed that in the region (50-mile radius) near the coal plant supplying power for each enrichment facility, emissions are uniformly mixed in the volume of air contained in a cylinder with a radius of 50 miles and a height equal to the average height of the mixing layer of air. The concentration of particles in the 50-mile region is a function of the quantity of emissions released by the coal plants and the wind speed. Thus, the total emissions mixed in this volume are related to the time it takes for the wind to blow the particles 50 miles from the stack to the edge of the cylinder. This calculation yields a rough estimate of the long-term average coal particulate exposure over the 50-mile radius area. On an individual bases, persons closer to the plant would receive greater exposures than those farther away. Similarly, individuals living downwind from the plant would receive larger exposures than those living upwind. Hamilton at 5. Using available annual average daytime conditions for the specific vicinities in question Dr. Hamilton estimated daytime particulate concentrations for the five plants. Hamilton at 6-7 and Table 1. In summary, he found that the estimated average daytime particulate concentration varies from 0.036 to 0.042 ug/m^3 at the five sites analyzed.

13. The Staff's estimated particulate concentration levels at the three plant sites studied relied on much more site specific information than did Dr. Hamilton's analysis. Specifically, site-specific information on the ground-level dispersion in the vicinity of the

emitted particles was utilized. NRC Staff Panel at 7. Dr. Habegger also utilized site-specific meteorological conditions, i.e., hourly data on wind speed and direction, temperature, and height of the surface mixing layer. Id. at 10. This data is collected in routine measurements by the U.S. National Weather Service (NWS). The available data collected at the NWS station nearest the Joppa, Clifty, and Kyger plants were obtained for use in the analysis. In addition, because topography can affect ground-level concentrations and is an input to the air pollutant dispersion model, at each location where the atmospheric particulate concentration was estimated, the elevation relative to the power plant was obtained from area maps compiled by the U.S. Geological Survey. Id. at 11.

14. Using the Industrial Source Complex (ISC) computer model,[13] Dr. Habegger estimated ambient particulate concentration and population exposure analysis for each of the three fossil power plants which covered a circular area of a 50-mile radius with the power plant

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13 ISC is a standard model recommended by the EPA for use in air dispersion analysis for regulatory purposes. NRC Staff Panel on Contention 8F(1) at 12 (citing "Industrial Source Complex (ISC) Dispersion Model User's Guide," EPA-450/4-79-030, U.S. Environmental Protection Agency, Research Triangle Park, N.C. (1979)). The concentrations are computed at different receptor locations for each hour over the simulated time period using the input meteorological data, stack and emission parameters, and receptor elevations. The basic model assumes steady-state movement of the atmospheric pollutants in the downwind direction with Gaussian horizontal and vertical cross-wind depersion. The vertical dispersion is limited by the height of the mixing layer given as a meteorological input.

emission source at the center. The circular areas were divided into 360 grid cells. Particulate concentrations for each hour were computed with the ISC model for receptors at the geographic centroid of each of the 360 grid cells surrounding each power plant. Id. at 12. For long-term (annual) particulate concentration levels, such as those calculated here, the ISC model predictions are quite accurate. Id. at 13.

15. The results of Dr. Habegger's analysis, using both annual and maximum 24 hour averages, were as follows: For the Clifty power plant, the computed maximum increment at any of the 360 receptor points was 0.022 ug/m^3 for the annual average and 0.70 ug/m^3 for the maximum 24-hour average. For the Kyger plant, the maximum annual average was 0.013 ug/m^3, and the 24-hour maximum was 0.71 ug/m^3. For the Joppa plant, the maximum annual average was 0.038 ug/m^3, and the 24-hour maximum was 1.3 ug/m^3. These are conservative estimates since they give no credit for particle removal by deposition.

16. The health effects of atmospheric particles on exposed populations are dependent on the size distribution of the particles. In general, smaller size particles are potentially more harmful, largely because of deeper penetration into the lungs. Id. at 6. Table S-3 does not provide data on particle size distribution. However, using the data on which Table S-3 was based, and making a number of conservative assumptions about particulate emissions and controls, Dr. Habegger conservatively calculated that 790 MT/yr of the 1,154 MT/yr of particulate emissions are less than 2.5 um, and 364 MT/yr of emissions are in the 2.5 to 15 um size range. Id. at 9.

17. Using the annual average particulate concentrations, Dr. Habegger also calculated the total computed population exposure in the coal plant vicinities. These exposures are 5,567 persons-ug/m^3 in the 50-mile vicinity of Joppa, 5,625 for Clifty, and 2,174 for Kyger. The total computed population exposure using the maximum 24-hour concentration is 100,800 persons-ug/m^3 in the 50-mile vicinity of Joppa, 103,000 for Clifty, and 47,200 for Kyger. Id. at 16-17. The population-weighted average (sum of exposures divided by population) of the incremental annual average particulate concentration is 0.011 ug/m^3 for Joppa, 0.0038 for Clifty, and 0.0025 for Kyger. The population-weighted average of maximum incremental 24-hour concentration is 0.19 ug/m^3 for Joppa, 0.071 for Clifty, and 0.054 for Kyger. Id. at 17. These figures are consistent with Dr. Hamilton's estimated average daytime particulate concentration level of 0.036 to 0.042 ug/m^3.

Health Effects of Calculated
Particulate Concentration Levels

18. Utilizing the particulate concentration levels calculated by Dr. Hamilton and by Dr. Habegger, health effects attributable to 1,154 MT/yr can be estimated. Dr. Hamilton utilized both a comparative and a quantitative method to assess health impacts. Hamilton at 8-16. Dr. Hamilton's quantitative method is a simplified version of the method used by Dr. Ozkaynak in the Staff's analysis. Tr. 1,590-91 (Habegger).

19. Characterizing the prototype pulverized coal-fired plant (the basis for the Table S-3 figure of 1,154 MT/yr) as essentially

"uncontrolled," Dr. Hamilton estimated the concentration of respirable or thoracic particles (TP) in this mass of total particles. From such an uncontrolled plant, TP constitutes only about 40 percent of the mass of the total particles. Hamilton at 8. Larger particles tend to be deposited in the nose or pharynx and do not reach the lung. Thus, only 40 percent of the particles released are potentially damaging to health. Dr. Hamilton then calculated that the concentration of TP that would penetrate the thoracic region would be about 0.014-017 ug/m^3. Id. at 8-9. For perspective, Dr. Hamilton compared this concentration of TP (0.014-0.017 ug/m^3) with the EPA's estimate of potentially injurious concentrations of TP. In a critical review of the available scientific and technical information most relevant to primary (health) National Ambient Air Quality Standards (NAAQS) for particulate matter, EPA found that, "Based on a staff assessment of the long-term epidemiological data, the range of annual TP levels of interest are 55 to 110 [micrograms per cubic meter]."

20. Thus, EPA has concluded that from both short- and long-term exposures to particles, the "bottom line" or lowest level of TP at which there may be some risk of health effects is approximately 55 ug/m^3. Hamilton at 10. As stated above, the concentration of such particles in the atmosphere, assuming a reasonable distribution of the entire 1,154 MT in a 50-mile radius around a single uncontrolled pulverized coal plant, would be 0.014-0.017 ug/m^3. This means that even if the 1,154 MT were all distributed by a single coal plant in one place, which obviously is not the case since three different gaseous diffusion plants

are used in the enrichment process, the concentration would be approximately 3,000 times smaller than the minimum concentration having some risk of symptomatic effects. While the 0.014-0.017 ug/m^3 of TP is an incremental concentration to a pre-existing background concentration of TP, there is no reason to doubt that its proportional responsibility for any biological effect is equally miniscule. See Hamilton at 10; Tr. 1,364 (Hamilton). Thus, Dr. Hamilton's comparative analysis suggests virtually no health impacts from 1,154 MT/yr of coal particles.

21. Dr. Hamilton performed a numerical assessment of health effects of coal emissions attributable to the Shearon Harris plant's uranium fuel cycle needs. This calculated risk relied upon a damage function for fine particles developed recently by the Harvard University Energy and Environmental Policy Center, i.e., the group that is headed by Dr. Ozkaynak. See "Analysis of Health Effects Resulting from Population Exposures to Ambient Particulate Matter" October 1983 ("1983 Harvard Report"), prepared for the Health and Environmental Risk Analysis Program of the U.S. Department of Energy. This fine particle damage function is a surrogate for the health effects of all air pollution. The damage function encompasses health effects that may in fact not be caused merely by coal particles but, rather, by SO_2 or other pollutants. Tr. 1,224-25, 1,233-37 (Hamilton); Tr. 1,391-95 (Ozkaynak). Thus, for example, this risk coefficient includes health effects (including unknown effects) that may be caused by trace metals in the coal particles--an issue of particular concern to Mr. Eddleman.

Tr. 1,234, 1,323, 1,326, 1,350-51 (Hamilton); Tr. 1,384-86 (Ozkaynak); Tr. 1,419-20 (Habegger).

22. In his calculation, Dr. Hamilton used a damage function for respirable particles in a linear, non-threshold way, thereby conservatively assuming that even the smallest incremental particulate dose has an incremental health effect. Tr. 1,238 (Hamilton); Hamilton at 11. This linearity assumption is particularly conservative in view of the fact that one of the two schools of thought on this subject among the scientific community believes that at ambient levels, much less the miniscule increment to ambient levels under consideration here, the health effects are zero. Tr. 1,229, 1,238 (Hamilton); Tr. 1,577-78 (Ozkaynak).

23. The 1983 Harvard Report recommends, for quantitative risk assessment, use of only a fine particles (FP) risk coefficient, or particles smaller than 2.5 micrometers. See 1983 Harvard Report (Staff Ex. 3) at page 8 and Table 1, page 5. FP represent a small portion of the thoracic particles (TP) previously described. FP are about 10 percent of the total particulate emissions from an uncontrolled pulverized coal-burning power plant. Hamilton at 12. The FP damage function, which is 1.3 ± 0.6 deaths/year/10^5 persons per ug/m^3 FP, is derived from available cross-sectional mortality analyses. Hamilton at 12 (citing 1983 Harvard Report (Staff Ex. 3) at 45-50).

24. Using this damage function and the 10 percent FP, Dr. Hamilton calculated the expected excess deaths per year from population exposure to 1,154 MT/yr total particulate emissions around each of the coal

plants. Hamilton, Table 3. These estimated excess deaths should be compared with the expected deaths from all causes in the population around each of these plants. In summary, the estimated excess deaths from population exposure to 1,154 MT/yr total particulate emissions range from 0.001 to 0.13. This risk is indistinguishable from zero against the background of expected deaths from all causes, which ranges from 2,400 to 11,000 at the same five areas studied. The upper limit of estimated expected deaths from particulate exposure corresponds to about one one-thousandth of one percent of the mortality rate. Hamilton at 12-13, Table 3.

25. Dr. Ozkaynak performed a similar but much more complex analysis. Using the results of the dispersion modeling study and the population data described above, and taking into consideration the socio-demographic information (e.g., age, race, education, etc.) available from the 1980 census, Dr. Ozkaynak calculated both mortality and morbidity health effects attributable to 1,154 MT/yr. NRC Staff Panel at 19. Chronic as well as acute effects were considered. Acute (respiratory) morbidity indicates short-term illness such as pneumonia, influenza and common coughs, while chronic (respiratory) morbidity indicates persistent, long-term illness such as chronic bronchitis, bronchial asthma or other obstructive lung disease. Id. at 19, unnumbered footnote. These calculations relied primary upon airborne particulate risk coefficients developed by the Harvard group under Dr. Ozkaynak's direction. Id. at 22-24, 27, 28-29.

26. There are a number of factors which contribute to the uncertainties of the Staff's morbidity and mortality risk estimation. The health effect calculations done by Dr. Habegger and Dr. Ozkaynak use 95% confidence limits. Tr. 1,447, 1,449 (Ozkaynak, Habegger); NRC Staff Panel at Table 3. This means that one can have 95% confidence that the actual effects of 1,154 MT/yr fall within the (large) bounds of uncertainty or error band stated in the testimony. Tr. 1,506 (Habegger). Thus, the analysis subsumes a number of issues of concern to Mr. Eddleman, such as whether the calculation adequately considers coefficient of haze (see Tr. 1,516-20 (Ozkaynak, Habegger)), the different compositions of particles in different areas (see, e.g., Tr. 1,410, 1,418-20 (Habegger)), and failure to make progress in identified areas of research (Tr. 1,506 (Habegger)). Stated another way, all uncertainties were captured in the analysis through the use of a range of results which encompasses the impact of these uncertainties. See Tr. 1,449 (Habegger).

27. In summary, for the area surrounding the Joppa and Clifty facilities, Dr. Ozkaynak estimates the incremental excess emergency room visits for respiratory disease would be about 3 cases every two years (1.4 per year). In contrast, the expected number of incremental annual acute respiratory disease incidents for the same areas are about 30 per year. In the vicinity of the Kyger facility, the projected risks are about one-third the values predicted for the areas surrounding the Joppa and Clifty plants (0.5 per year excess emergency room visits for respiratory disease and 11 acute respiratory disease incidents per

year). For all of these projections, the lower-bound estimate always includes zero or no incremental health effects. The upper-bound estimate is either twice or 1.5 times the most likely or central estimates presented. The most likely annual mortality risks associated with emissions from either the Joppa or the Clifty plants are less than 0.09 per year within the 50-mile radius of each plant. The likely mortality risks near the Kyger facility, on the other hand, can be expected to be less than 0.03. NRC Staff Panel at 31, 34 and Tables 2 and 3. These figures are consistent with Dr. Hamilton's estimated range of excess deaths of 0.001 to 0.13. See ¶ 24, supra.

28. Dr. Hamilton performed an alternative calculation of the health (mortality) effects of coal particulate emissions attributable to the uranium fuel cycle by assessing the health risk for the entire United States due to the long range transport of these particles. Based on the Brookhaven National Laboratory's Biomedical and Environmental Assessment Division's matrix results, Dr. Hamilton estimated that the average total U.S. exposure to fine particles from all coal power plants is 90 person-ug/m^3 per MT emissions. Using the FP damage function cited above, the calculated additional deaths in the entire U.S. population from coal particles associated with the uranium fuel cycle would be 0.13, with a 95 percent statistical range of 0.013-0.26. In the entire U.S., roughly 2 million die annually from all causes. Hamilton at 12; Tr. 1,279-81 (Hamilton).

Assessment of the Significance of the
Projected Health Effects of 1,154 MT/yr

29. The Applicant and the Staff witnesses reached the same conclusion about the significance of the health effects they determined to be attributable to the 1,154 MT/yr of coal particulates specified in Table S-3.

30. Conservative calculations of the upper limit of health risk which may be associated with the 1,154 MT/yr figure indicate that atmospheric concentrations of the amount of particles attributable to a 45 MWe coal-fired plant reasonably distributed over a 50-mile radius would be 3,000 times smaller than the minimum concentration determined by the EPA to present some health risk. Conservative calculations of the upper limits of risk of those particles distributed among the populations around the five fossil plants supplying the uranium enrichment facilities indicate that, at most, a tiny fraction of a death, each year those plants are in operation, could be attributed to the particulate emissions. This risk is extremely small, particularly when compared to the deaths one would expect in those same populations from all causes. This upper limit of risk is confirmed by an alternative calculation of the impact of the Table S-3 particulates over the population of the entire United States. Moreover, these calculations assume that exposure from particles is long standing; otherwise, the calculated impact is inapplicable. Thus, in summary, it is the Board's opinion that the Staff succinctly and correctly concludes

in the FES that there is a miniscule incremental environmental impact from the coal particles identified in Table S-3. (Hamilton).[14]

Mr. Eddleman's Proposed Findings

31. Mr. Eddleman in his Proposed Findings 10-12 contends that one can arrive at an upper limit of deaths associated with the 1,154 M/T of coal particulates resulting from operation of the Harris facility by the following equation:

> by taking the fraction of emissions of Table S-3 air pollutants nationwide, which is represented by the Harris plant fuel cycle (0.02% or 2/10,000, Staff Exhibit 1 p. C-2) and multiplying it by Dr. Hamilton's upper limit of total deaths due to air pollution (100,000 a year, see finding 7A, supra, Tr. 1309-10) times a 40 year plant operating life (as set in Staff Exhibit 1 for radioactive effluent estimates).

This equation produces a result of approximately 800 deaths. Mr. Eddleman concedes that the 800 number is "conservative" because "not all deaths are solely due to particulates." There are at least two other

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14 It appears that there is yet another conservatism included in these calculations which, if recognized, would make this "miniscule effect" even smaller. It seems likely that the Harris facility will take the place of several of the Applicants existing coal-fired plants some substantial part of the time. See pp.53-57, below. When that happens, presumably there will be a net decrease in coal particles being released into the atmosphere. This approach could be viewed as an impermissible attack on the Table S-3 rule. We need not decide that question on this record, but we think it useful to take note of what is probably going to happen in the real world.

deficiencies in Mr. Eddleman's estimate which further limit its validity. First, as Mr. Eddleman himself notes in a subsequent proposed finding (17), only about two-thirds of the coal particulates in the atmosphere are respirable. More fundamentally, there is no valid basis for relating Dr. Hamilton's offhand high estimate of 100,000 deaths, due to all kinds of air pollution and based on a sulfate damage function, to the Staff's .02% estimate of the amount by which the quantity of coal particulates in the United States from certain sources would be increased. Coal particulates are only one component of the total quantity of air pollutants nationwide. In view of these several deficiencies in the manner of its derivation, the "800 deaths" cost estimate is not useful in estimating the risk from the coal particulate exposure.

32. In his proposed finding 15, Mr. Eddleman is concerned that the calculations of health effects were limited to the populations within a fifty-mile radius of the emission sites. He suggests that health effects outside of a fifty mile radius should be considered. The Board disagrees. The fifty mile radius encompasses the area most affected by the coal particulates. Use of that radius amounts to a "worst case" analysis and places the particulate lung deposition phenomonon in perspective. Even in those limited areas, the calculated health effects are very small.

33. In his proposed findings 15-18, Mr. Eddleman uses a variation of Dr. Hamilton's particulate exposure formula along with the Harvard fine particles damage function to estimate deaths to be expected from

the 1,154 M/T of coal particulates associated with normal operation of Shearon Harris. In his use of similar formulas, Dr. Hamilton had arrived at an estimated number of deaths to be expected annually in the United States from those particulates -- i.e., 0.13, with a 95 percent statistical range of 0.013 - 0.26. For perspective, Dr. Hamilton notes that "in the entire United States roughly 2 million die annually from all causes." In other words, the risk of death from the particulates in any year is on the order of 1 in 20 million. Mr. Eddleman, in his calculations, arrived at a range of deaths from 32 to 180 over the forty-year operating life of the plant. However, Mr. Eddleman used a damage coefficient of 2.3 deaths per 10^{-5} persons per microgram/m^3 year of exposure (from Staff testimony, ff. Tr. 1380 at 33) rather than the value of 1.3 that Hamilton used. And, as Mr. Eddleman acknowledges, his estimate "may be too high" since he omits the part of the computation that reflects the fact that the gross mass emission value in Table S-3 is not appropriate for use with the damage coefficient which applies only to the concentration of "fine particles." Neglect of this factor makes Mr. Eddleman's estimate unrealistically high.

34. We recognize that consideration of the larger value for the damage coefficient and the 40 year time period might produce a statistical estimate of roughly 10 to 70 deaths, depending on what fraction of the Table S-3 value is material with diameters less than 2.5 microns. From a statistical perspective, the 80 million deaths that can be anticipated in the United States population of roughly 240 million people over the next forty years corresponds to a risk of death of 1 in

3 or 0.33. The estimate of 10 to 70 deaths over forty years corresponds to a risk increment of 0.00000004 to 0.0000003. We find that such postulated health effects do not pose an undue risk to the population of the United States, and that, in fact, Mr. Eddleman's mortality estimates are subsumed in the error bounds of the mortality calculations for the United States.

V. MR. EDDLEMAN'S PETITION SEEKING WAIVER OF THE NEED FOR POWER RULE

Introduction

In the early stages of this case, Mr. Eddleman filed numerous contentions seeking, in various ways, to challenge the Applicants' need for power projections and to show that certain alternative sources of power would be economically and environmentally preferable to the Shearon Harris facility. The Commission has adopted a rule which states that --

> "Presiding officers shall not admit contentions proffered by any party concerning need for power or alternative energy sources for the proposed plant in operating license hearings."

10 CFR 51.53(c). The Licensing Board held that Mr. Eddleman's contentions were barred by this "need for power rule", as it is commonly called, and rejected them on that basis. 16 NRC 2069, 2092, 2099; 17 NRC 971. Thereafter, Mr. Eddleman filed a petition and supporting affidavits under 10 CFR § 2.758 seeking a waiver of the need for power rule in order to permit litigation of his contentions. The Applicants and the NRC Staff filed responses in opposition to Mr. Eddleman's

petition, and we authorized a reply to the responses.[15] We announced some time ago our conclusion that the petition would have to be denied, saying that the formal order of denial, accompanied by a statement of our reasons, would be included in this Partial Initial Decision. 20 NRC 389, 424. Our basic reason for denying the petition is that it fails to make the required showing that application of the need for power rule to this case would not serve the purposes for which the rule was adopted. On the contrary, as discussed below, the purposes underlying the need for power rule fit this case precisely.

Standards and Procedures Governing Waiver of Rules

Commission rules may not be attacked in an adjudicatory proceeding involving initial licensing, such as this operating license proceeding. 10 CFR § 2.758(a). However, a party may petition the Licensing Board for waiver of a rule on the sole ground that "special circumstances . . . are such that application of the rule . . . would not serve the purposes for which the rule . . . was adopted." Section 2.758(b). The

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15 In addition, on March 7, 1984, Mr. Eddleman filed a motion to allow filing of an additional affidavit from another expert. The Applicants and Staff opposed that motion, essentially on timeliness grounds. Given our ruling on the petition, it makes no practical difference how we rule on this motion and we therefore deny it as moot. On August 16, 1984, Mr. Eddleman filed a supplemental pleading, which we had authorized, concerning the effect of canceling Unit 2. We have considered this supplement and it does not affect our conclusion.

petition must be supported by affidavits which are to "set forth with particularity the special circumstances alleged to justify the waiver . . . requested." If the Board determines that the petition and affidavits make a "prima facie" showing that the purposes of the rule would not be served under the circumstances, it is to certify to the Commission the question whether the rule should be waived. Section 2.758(d). If, on the other hand, the Board determines that no such showing has been made, it is to deny the petition. Section 2.758(c).

Background of the Need for Power Rule

In proposing the need for power rule, the Commission recognized that a waiver under 10 CFR § 2.758 might be obtained, for example, if it were shown that an "environmentally and economically superior alternative existed." Need for Power and Alternative Energy Issues in Operating License Proceedings, 47 Fed. Reg. 12940, 12,941. However, in response to concerns that the quoted language might reopen the door to just the kind of contentions the rule was intended to exclude, the Commission emphasized that a party seeking waiver under Section 2.758 would still have to make a "prima facie showing that application of the regulation to . . . the proceeding would not serve the purpose for which the rule was adopted." Id. Our earlier order rejecting Mr. Eddleman's need for power and alternative source contentions sketched the background and purpose of the need for power rule. We repeat relevant portions below:

The NRC considers need for power and alternative energy sources (e.g., a coal plant) as part of its NEPA cost/benefit analysis at the construction permit stage for a nuclear power reactor. See Niagara Mohawk Power Corp. (Nine Mile Point Nuclear Station, Unit 2), 1 NRC 347, 352-72 (1975); Public Service Co. of New Hampshire (Seabrook Station, Units 1 and 2), CLI-77-8, 5 NRC 503, 522 (1977). If need for power is not demonstrated, or if, for example, a different type of generating plant is preferable from cost and environmental standpoints, then not building any plant, or building that different type of plant, may be a realistic alternative. Such an analysis is practical before a nuclear power plant has been built. Until about a year ago, however, need for power and alternative energy sources were also being litigated in some operating license cases, after construction of the nuclear reactor had been substantially completed.

The Commission became concerned that litigation of these issues at the operating license stage was a waste of time and resources, at least in the absence of exceptional circumstances. As the Commission had determined years earlier, once a plant is built, there is little reason to consider the environmental and economic costs associated with construction. At that point, those construction costs are so much water over the dam; in NEPA terms, they are "sunk." See Public Service Co. of New Hampshire, supra, at 530-36. The Commission accordingly initiated a rulemaking to determine whether such issues should be barred at the operating license stage. 43 Fed. Reg. 39940.

The rulemaking record, as subsequently developed, showed that a constructed nuclear plant is virtually certain to be used as a base load plant, replacing other less efficient generating capacity, if not to meet increased demand. It is also very likely to be preferable to any realistic alternative, given the nuclear plant's typically lower cost of operation compared to coal and oil. 17 NRC at 972. In April 1982, in recognition of these realities and to promote efficiency in the licensing process, the Commission adopted [the need for power rule.]

Positions of the Parties

Mr. Eddleman puts forward an alternative to the Shearon Harris plant in four affidavits accompanying his petition. He argues that an

alternative consisting of a combination of load shifting, energy storage, solar power, and conservation measures (ranging from more efficient home air conditioners to space heating by leaving water standing in the bathtub until it cools to room temperature) would be economically and environmentally superior to operating the Harris plant. These arguments are elaborated in considerable detail. Given the view we take of the question, it is unnecessary for us to do more than sketch the outlines of Mr. Eddleman's argument. What is most significant for us is what the petition does not address -- i.e., the likelihood that the Harris plant will be used to displace existing baseload fossil fuel capacity if it is not needed to meet increased demand for power.

The Applicants focus their argument on the petition's failure to show that the purpose of the need for power rule would not be served by its application here. They note that the petition does not dispute the necessity of all of their existing baseload fossil fuel capacity, with the exception of one unit. They argue that--

> "[E]ven assuming the viability of the alternative energy-saving measures proposed by Mr. Eddleman and the resulting decrease in system load projections, the premise of the Commission's regulation would dictate operation of the Harris units in order to displace existing fossil baseload generation (an alternative not even addressed in Mr. Eddleman's petition). The purpose served by the regulation would thus remain unaltered."

The Staff advances much the same argument. Response at 9. However, the Staff devotes most of its response to disputing the merits of certain of Mr. Eddleman's claims of economic and environmental superiority for his alternative. For example, it raises questions about

the petitioner's computation of cost savings and seemingly optimistic predictions about people switching to more efficient air conditioners. Response, pp. 9-10. As we next discuss, we believe that the Applicants' basic argument is not only sound but dispositive of the petition, without reference to the range of economic and environmental issues that might otherwise have to be addressed. As to those issues, we merely note that many of the Staff's points appear to be well taken and we question whether the petition would have satisfied the "prima facie" showing requirement, had we reached those issues.[16]

Discussion

Mr. Eddleman compares his alternative to operating Harris under four different scenarios, the principal variables being cancellation or

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16 10 CFR § 2.758 requires the petitioner to make a "prima facie" showing, a term it does not define. Analogies to meanings given this phrase in civil litigation, particularly in association with jury trials, are not controlling here. Cf. Consumers Power Co. (Midland Plant), 7 AEC 19, 32 (1974). In the context of section 2.758, it seems reasonable to equate "prima facie" showing with "substantial" showing. This would mean that the affidavits supporting a petition for waiver should present each element of the case for waiver in a persuasive manner and with adequate supporting facts from a qualified expert, where appropriate. Mr. Eddleman's Response of September 30, 1983, suggests his view, with which we disagree, that mere assertions in an affidavit by a putative expert are, in and of themselves, sufficient for a "prima facie" showing and binding on the Board.

postponement of Unit 2 or Unit 1. In each of these scenarios, however, operation of Harris or implementation of the alternative is considered only with reference to meeting increased demand or peak loads. These scenarios do not take account of the fact -- as Mr. Eddleman himself points out -- that about two-thirds of the Applicants' existing baseload plants (3500 of 5000 MW) are coal-fired plants. Presumably, these coal plants are of varying ages and efficiencies, both in terms of operating costs and effects on the environment. It was just this situation that the Commission had in mind when it adopted the need for power of rule. The Commission's statement bears repeating:

> [A] constructed nuclear plant is virtually certain to be used as a base load plant, replacing other less efficient generating capacity, if not to meet increased demand. It is also very likely to be preferable to any realistic alternative, given the nuclear plant's typically lower cost of operation compared to coal and oil.

Thus, the burden is on Mr. Eddleman, as the petitioner for a waiver, to show that the Harris facility would not be used to displace existing coal-fired capacity.

Mr. Eddleman's petition does not address this probable use of the Harris facility.[17] To be sure, Mr. Eddleman appears to concede that a nuclear plant would have some operating cost advantage over a coal plant. Petition at 10. And his argument suggests that the nuclear

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17 Indeed, Mr. Eddleman in his Response (at p.3) seems to question the relevance of the comparison, where he asserts that "It is illogical to combine Harris with the alternative to it . . . ."

plant might also be environmentally preferable to an older coal plant, at least with respect to emissions. Id. at 20-21.[18] At least the petition makes no attempt at "prima facie" showings to the contrary. Particularly given these cost and environmental advantages, it is apparent that Mr. Eddleman's alternative would only be considered as a substitute for meeting incremental needs for power for peak loads. In any event, such a conservation-oriented alternative cannot meet historic baseload needs to the extent that all coal-fired units of a heavily coal-dependent utility would be displaced by it.[19]

In light of the foregoing discussion, Mr. Eddleman has not shown "special circumstances . . . such that application of the [need for power] rule would not serve the purpose for which it was adopted." 10 CFR § 2.758. That new nuclear units, with their cost and environmental advantages, would be run as baseload units, possibly replacing old coal units, was a basic premise of the rule. Given that premise, the

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18 In that regard, we agree with the Staff that we may consider the FES for the facility in judging environmental effects of its operation. The FES concludes that those effects will not be significant (FES at 6-3), and there is nothing in Mr. Eddleman's petition to call that conclusion into question.

19 In this case some 3500 MW of coal-fired baseload capacity -- more than half the Applicants' baseload -- would have to be displaced by Mr. Eddleman's alternative before the purpose of the need for power rule might be deemed inapplicable. Even assuming for the sake of argument Mr. Eddleman's claim that his alternative can displace 2600 MW of electricity, and subtracting the capacity of the Harris unit it would displace, about half of the Applicants' present coal-fired capacity would still be needed.

"purpose" of the rule (within the meaning of Section 2.758) was to avoid pointless litigation about need for power projections and minor environmental effects where there was no realistic prospect of tilting the NEPA cost/benefit balance. That purpose is served by application of the rule in this case.

For the foregoing reasons, Mr. Eddleman's petition seeking waiver of the need for power rule is denied.[20]

VI. CONCLUSIONS OF LAW

The environmental matters in controversy in this proceeding are limited to those raised by the Intervenors. 10 C.F.R. § 2.760a. As reflected in the foregoing findings of fact, each of those matters has now been resolved in favor of the Staff and the Applicants and against the Intervenors. Based on those findings of fact, the Board concludes that as to all contested matters the Final Environmental Statement for the Harris facility satisfies the Staff's obligations under the National Environmental Policy Act.

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20 We reject the Applicants' alternative argument that the petition was untimely. 10 C.F.R. § 2.758 sets no time limit for filing petitioners for waiver. Mr. Eddleman met the filing limit set by the Board, which was reasonable in the circumstances of this case.

VII. APPEALS

Pursuant to 10 C.F.R. §§ 2.760(a) and 2.762, an appeal from this Partial Initial Decision or from any prior Board Order granting a motion for summary disposition, in whole or in part, of an environmental contention or excluding a proposed environmental contention from litigation may be taken by filing a notice of appeal with the Atomic Safety and Licensing Appeal Board within 10 days after service of this decision. A brief in support of an appeal must be filed within 30 days after the filing of the notice of appeal (40 days if the appellant is the NRC Staff). Within 30 days after the period for filing and service of the briefs of all appellants has expired (40 days if the appellant is the NRC Staff), any other party may file a brief in support of or in opposition to an appeal.

THE ATOMIC SAFETY AND LICENSING BOARD

James L. Kelley

James L. Kelley, Chairman
ADMINISTRATIVE JUDGE

James H. Carpenter

Dr. James H. Carpenter, Member
ADMINISTRATIVE JUDGE

Glenn O. Bright

Glenn O. Bright, Member
ADMINISTRATIVE JUDGE

Harry Foreman by JLK

Dr. Harry Foreman, Alternate Member
ADMINISTRATIVE JUDGE

Bethesda, Maryland
February 20, 1985