September 1, 1983

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

In the Matter of	)	
	)	
CAROLINA POWER & LIGHT COMPANY	)	
AND NORTH CAROLINA EASTERN	)	Docket Nos. 50-400 OL
MUNICIPAL POWER AGENCY	)	50-401 OL
	)	
(Shearon Harris Nuclear Power	)	
Plant, Units 1 and 2)	)	

APPLICANTS' MOTION FOR SUMMARY DISPOSITION OF INTERVENOR WELLS EDDLEMAN'S CONTENTION 80 (ATMOSPHERIC DISPERSION MODEL)

Carolina Power & Light Company and North Carolina Eastern Municipal Power Agency ("Applicants") hereby move the Atomic Safety and Licensing Board, pursuant to 10 C.F.R. § 2.749, for summary disposition in Applicants' favor of Eddleman Contention 80. For the reasons set forth herein, Applicants respectfully submit that there is no genuine issue as to any fact material to Contention 80, and that Applicants are entitled to a decision in their favor on Contention 80 as a matter of law.

This motion is supported by:

1. "Applicants' Statement of Material Facts As To Which There Is No Genuine Issue To Be Heard On Eddleman Contention 80";

2. "Applicants' Memorandum Of Law In Support Of Motions For Summary Disposition On Intervenor

Eddleman's Contentions 64(b), 75, 80 and 83/84," all filed simultaneously herewith, as well as the pleadings and other papers filed by the parties in this proceeding;

3. "Affidavit of Brian D. McFeaters" and Exhibits A and B attached thereto; and

4. "Affidavit of Wayne Lei" and Exhibit A attached thereto.

I. STATEMENT OF FACTS AND PROCEDURAL BACKGROUND

Eddleman Contention 80 alleges that the mixing and dispersion models for radiological releases from the Shearon Harris Nuclear Power Plant ("SHNPP") assume more complete dispersion than actually takes place because they do not take into account various meteorological conditions that could affect such dispersion. The wording of Eddleman Contention 80 accepted by the Board is stated as follows:

Eddleman Contention 80

> The mixing models and dispersion models for radioactive gas, liquid and other radiological releases from SHNPP under 10 C.F.R. part 20 are deficient in that they assume more complete mixing and dispersion of such radionuclides released than will actually take place, take insufficient account of rainout of such a release plume in a small area (rain precipitating the radionuclides in the plume) and thus do not assure that releases comply with 10 C.F.R. 20.106 and the protection of the public health and safety, including holding individual doses below 24 rem whole body and thyroid doses below 300 rem in an accident, and below 10-3 of these values in normal operation.

On January 31, 1983, Applicants served interrogatories on Mr. Eddleman to discover what aspects of the models were alleged to be inadequate and the basis for this allegation. "Applicants' Interrogatories and Request for Production of Documents to Intervenor Wells Eddleman (First Set)," dated January 31, 1983, at 37 - 39. The NRC staff also addressed interrogatories to Mr. Eddleman. "NRC Staff Interrogatories to Wells Eddleman," dated March 18, 1983, at 6 - 7.1/

Mr. Eddleman's responses to the interrogatories propounded by Applicants and the Staff demonstrate that he has no documentary or other factual evidence to support his claim. When asked to detail facts that support the allegation that the mixing and dispersion models are deficient, Mr. Eddleman responded "I cannot as yet locate the materials used to prepare Eddleman 80." Wells Eddleman's Response to Applicants' First

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1/ Mr. Eddleman has had the opportunity to pursue discovery since September 22, 1982. Since that time he has propounded two sets of discovery requests to Applicants relating to Contention 80 and has received detailed, extensive responses to his questions." "Applicants' Answers to Wells Eddleman's General Interrogatories and Interrogatories on Contentions 22A, 22B, 75, 80, 83-84 and 132 (First Set)," dated April 28, 1983, at 22 - 33; "Applicants' Answers to Wells Eddleman's General Interrogatories and Interrogatories on Contentions 64(f), 67 and 80 (Third Set)," dated July 29, 1983, at 18 - 23. Applicants have produced hundreds of documents for Mr. Eddleman's inspection and Mr. Eddleman has copied thousands of pages of the documents for his own use.

Set of Interrogatories and Request for Production of Documents, dated March 21, 1983, at 41 (responding to Interrogatory 80-1(a) of Applicants' January 31, 1983 Interrogatories to Eddleman, supra). To this date, Mr. Eddleman has not supplemented his response. When asked if he contended that Applicants' models do not comply with the guidance of Regulatory Guides 1.109 and 1.113, Mr. Eddleman stated that "I don't know what these Reg Guides state." Id. at 43 (responding to Interrogatory 80-5(a) of Applicants' January 31, 1983 Interrogatories to Eddleman, supra).

Mr. Eddleman did state he is most concerned about unusual dispersion patterns that could be caused by "rainout" of radioactive materials. See id. at 42. Yet when questioned by the NRC Staff about the methodology used to reach the conclusion that "rainout" would cause doses of radioactivity to exceed 10 C.F.R. Part 20 limits, Mr. Eddleman responded "I have not laid out a model and parameters to conclude this." "Wells Eddleman's Response to NRC Staff Interrogatories (First Round)," dated May 6, 1983, at 14 (responding to Interrogatory No. 41 of "NRC Staff Interrogatories to Wells Eddleman," dated March 18, 1983).

Furthermore, the few responses to interrogatories which do express some factual assertions on Contention 80 suggest that

Mr. Eddleman has basic misconceptions about the modeling techniques themselves and about the effect that various conditions could have on the accuracy of the models. Mr. Eddleman's answers to Applicants' discovery contain references to the alleged "wake effect" of the Harris facility, the possibility of turbulent conditions, and, repeatedly, to the hazard alleged to be created by "rainout" of radioactive particles. "Wells Eddleman's Response to Applicants' First Set of Interrogatories and Request for Production of Documents," dated March 21, 1983, at 41-43; "Wells Eddleman's Response to NRC Staff Interrogatories (First Round)," dated May 6, 1983, at 12-14. As the attached McFeaters Affidavit demonstrates, Applicants' model measures these effects where appropriate, but only to the extent consistent with the overriding goal of using conservative assumptions and ensuring compliance with the standards set forth in 10 C.F.R. Part 20. With respect to Mr. Eddleman's concern about "raincut," the attached Lei Affidavit demonstrates that any deposition of radioactive particulates from a gaseous effluent plume - by rainout or otherwise - will reduce the possible dose to man. Mr. Eddleman has not pointed to a single fact to support his contention that failure to measure these meteorological conditions is a violation of the regulations or could in any way be deleterious to the health of residents in the vicinity of SHNPP.

Applicants, on the other hand, have demonstrated that the models used for measuring dispersion of radioactive releases are consistent with applicable Regulatory Guides, apply state-of-the-art techniques and incorporate conservative assumptions that result in predictions which empirical studies have shown are far in excess of the doses which would actually be measured. This ensures that exposure can never exceed the 10 C.F.R. Part 20 standards or result in a hazard to public health and safety. The NRC Staff approved Applicants' accidental and routine release diffusion estimates in its Draft Safety Evaluation Report. D.S.E.R. §2.34-2.35.2/ Accordingly, Contention 80 is ripe for summary disposition.

II. ARGUMENT

The basis for Contention 80 is that Applicants' mixing and dispersion models are inadequate because they underestimate potential exposure from radioactivity contained in releases

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2/ In "Wells Eddleman's Response to Staff DEIS", dated June 20, 1983, at 10, Mr. Eddleman asserted that the Draft Environmental Impact Statement contained language supporting Contention 80. The Staff's response to Mr. Eddleman's statement about Contention 80 explicitly rejected that claim and pointed out that the language from the DEIS quoted by Mr. Eddleman was "irrelevant to the allegations in Eddleman 80." "NRC Staff Response to Wells Eddleman's Response to the Staff's Draft Environmental Impact Statement," dated July 8, 1983, at 10.

from SHNPP. Yet, as the foregoing statement of facts demonstrates, Mr. Eddleman has made no attempt whatsoever to quantify the effect of alleged modeling deficiencies or to show that they could result in increased exposure to the public. The paper prepared by Mr. McFeaters explains in detail the methodology employed in Applicants' modeling techniques and demonstrates conclusively that the Gaussian dispersion model utilized by Applicants predicts exposure far in excess of that observed in field tests. Therefore, applying the standards governing summary disposition to Contention 80, it is clear that Applicants' motion should be granted.

Mathematical models are commonly used to provide estimates of dispersion and mixing of releases of radioactive materials from commercial power plants. Exhibit B to McFeaters Affidavit at 3 (hereinafter "Exhibit B"). The Gaussian plume model utilized by Applicants has been adopted by the NRC for use in estimating relative concentrations of radionuclides due to accidental and routine releases. Exhibit B at 7. In using this approved modeling technique, Applicants have followed the guidelines set forth in various regulatory guides, including Regulatory Guides 1.4, 1.24, 1.25, 1.77, 1.09, 1.111 and 1.145. Exhibit B at 8.

The Gaussian model is used for nuclear applications because, in its generic form, it incorporates many conservative assumptions that ensure that the concentrations estimated by the model will exceed those that could actually be observed in real situations. Exhibit B at 8-16. As Exhibit B demonstrates, there is no question that the Gaussian model utilized by Applicants is generally accepted and has been approved in regulatory guides issued by the NRC Staff for use by applicants for operating licenses. Thus, the only genuine question that can be raised with respect to Contention 80 is whether the specific form of the Gaussian model used by Applicants is deficient and fails to comply with applicable regulations or ensure the public health and safety.3/

Mr. Eddleman alleges that Applicants' model is deficient because it does not take into account various factors such as "rainout" and turbulent weather conditions. Ironically, however, the meteorological conditions that Mr. Eddleman claims should have been included in the model actually would result in greater mixing and dispersion and lower modelled concentrations of radioactivity in the plume. For this reason, those

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3/ It should be noted that the Staff has approved Applicants' short-term (accidental) and long-term (routine) dispersion estimates based on its own independent calculations. D.S.E.R. §2.3.4-2.3.5.

variables intentionally were omitted from Applicants' model in order to make the model more conservative - i.e., to overestimate the plume radioactivity. Thus, Mr. Eddleman's expressed concerns indicate a serious misunderstanding about the effect that inclusion of such variables would have on the accuracy of the model.

With regard to "rainout," the sole deficiency claimed with particularity in the contention at issue, the paper prepared by Mr. McFeaters on the basis of ten years experience in the field demonstrates that Applicants have elected not to account for rainout because rainout actually decreases the hazard of exposure from inhalation of radioactive pollutants. Exhibit B at 25 - 26. Where rainout occurs, concentrations less than those predicted by Applicants' model would actually be observed in the atmosphere. Id. at 26. In a severe thunderstorm, such as that mentioned in Mr. Eddleman's "most limiting circumstance," the concentration in a plume would be reduced by a factor of two-three. Id.

When materials are leached out of the atmosphere, the exposure hazard is greatly reduced because natural barriers exist to protect individuals from uptake from soil, water or vegetation. Lei Affidavit at paragraph 4. As the affidavit of Mr. Lei, a radiological health specialist, demonstrates, time

delays are associated with every potential pathway by which materials scavenged by "rainout" can reach the human population. Id. at paragraph 6. With radioactive iodine, this time delay is particularly significant because of the short half-life of the isotope. Additional barriers are associated with other forms of radioactivity. With regard to radionuclides with longer half-lifes, other environmental barriers such as binding to soil inhibit the transfer of the radionuclide through food chains. Id. at paragraph 7. Thus, it is clear that potential uptake from soil, water or vegetation would be substantially less than that expected from direct inhalation.

Thus, exclusion of rainout from the model contributes to the conservatism of Applicants' estimate of potential hazard to the public. Exhibit B at 25. This approach is also consistent with the dictate of Regulatory Guide 1.111 which states that rainout may be considered at a facility with elevated releases and a distinct rainy season that corresponds to the grazing season. Regulatory Guide 1.111 at 12. Shearon Harris does not have elevated releases or a distinct rainy season, therefore it would be inappropriate to take rainout into account.

The same rationale applies to Applicants' decision to assume a very stable atmospheric condition, "G" stability, when

applying the approved model to SHNPP. Under stable conditions, concentrations of radioactivity will be higher than those observed under turbulent conditions. "G" stability is a classification introduced by the NRC for use in nuclear applications. At "G" stability the relative concentration for a given wind speed is 2.5 times greater than that observed at the most stable condition normally assumed in non-nuclear applications. Exhibit B at 20. In addition to using the unrealistic "G" stability, the SHNPP model assumes a wind speed of .335 m/sec rather than the 1.0 m/sec assumption used in Regulatory Guide 1.4. Id. This wind speed represents the wind instrument's detection threshold. Because wind speed is inversely related to concentration, this extremely low wind speed results in overestimates of concentration. The concentration at "G" stability and wind speed of .335 m/sec exceeds that at "F" stability and wind speed of 1.0 m/sec by a factor of 7.5.4/ Id. Thus, it is clear that as applied at SHNPP, assuming extremely stable atmospheric conditions and exceptionally low winds, the Gaussian dispersion model significantly overpredicts concentrations.

4/ At SHNPP the combination of "G" stability and wind speed as low as .33 m/sec occurred only 4.95% of the time on an annual basis, calculated independent of wind direction. When calculated on a wind dependent basis with wind from the north, this condition occurred only .549% of the time. FSAR at §2.3, Table 2.3.6-10.

In addition to the failure to take credit for depletion of radioactive materials from rainout and turbulence, Applicants have adopted other conservative assumptions that result in overestimation of potential doses. The building wake effect results in a prediction of greater dispersion and lower concentrations in a radioactive plume. The typical Gaussian model contains a very conservative adjustment for this effect. Exhibit B at 12-13. Applicants' model contains such a factor to account for building wake effect, but in factoring in the wake effect at SHNPP, Applicants have used the smallest cross-sectional area of the reactor building, thus substantially lessening the importance of predicted wake effect. Id. at 24. As a result, actual concentrations that might occur are significantly overpredicted. Clearly, this approach contributes to the conservatism of Applicants' model.

Mr. McFeaters has also explained various other assumptions that contribute to the overall conservatism of Applicants' model, including assuming release height to be at ground level (a worst case analysis because at ground level concentrations are highest), assuming constant wind direction during extremely stable meteorological conditions, and failing to account for the large horizontal meander of a plume under such stable conditions. Exhibit B at 18 - 23. He has demonstrated that

the basic Gaussian dispersion model used at SHNPP constitutes a state-of-the-art approach to nuclear modeling. It is clear from his paper that, when coupled with the site-specific conservative assumptions utilized at SHNPP, the Gaussian model will predict concentrations in excess of those which actually would be observed in the field. This conservative approach is intentional and ensures compliance with the regulations governing both routine and accidental releases. Mr. Eddleman has suggested no competent evidence to the contrary.

III. CONCLUSION

Based upon the foregoing and upon the facts set forth in the McFeaters Affidavit and Applicants' Statement of Material Facts, Applicants respectfully submit that their motion for summary disposition should be granted and that Eddleman Contention 80 should be decided in Applicants' favor.

Respectfully submitted,

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