UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

In the Matter of	)	
	)	
DUKE POWER COMPANY, ET AL.	)	Docket Nos. 50-413
	)	50-414
(Catawba Nuclear Station, Units 1 and 2)	)	

AFFIDAVIT OF JOCELYN A. MITCHELL AND L.G. HULMAN
IN SUPPORT OF SUMMARY
DISPOSITION OF DES CONTENTION 11

1. I, Jocelyn A. Mitchell, being duly sworn, do depose and state: I am an employee of the U.S. Nuclear Regulatory Commission. My present position is Nuclear Engineer, Accident Evaluation Branch of the Division of Systems Integration in the Office of Nuclear Reactory Regulation. I am responsible for the analysis of accidents for safety and environmental reviews, and have coordinated the environmental review of accidents for the Catawba plant. My professional and education qualifications are attached to this statement. I certify that I have personal knowledge of the matters set forth herein with respect to the above areas for which I am responsible, and that the statements made are true and correct to the best of my knowledge.

2. I, L.G. Hulman, being duly sworn, do depose and state: I am Chief of the Accident Evaluation Branch, Division of Systems Integration within the Office of Nuclear Reactor Regulation. A copy of my professional qualifications is attached. I certify that I have personal

knowledge of the matters set forth herein, and that the statements made are true and correct to the best of my knowledge.

3. As originally proffered, DES Contention 11 stated:

> A substantial part of the population placed at risk by nuclear operations at and relating to Catawba are also placed at risk by similar operations at McGuire. A realistic assessment of Catawba impacts will take into consideration McGuire risks. The summing of probabilities is practiced in the DES in regard to providing an estimate of the probability of the consequences of severe accidents, "If the probability of sustaining a total loss of the original facility is taken as the sum of the occurrence of a core-melt accident (the sum of the probabiliites for ten categories in Table 5.10), then..." There is no corresponding concept in the CP FES.

4. The Staff addressed the proffered contention as comment #11 in the Catawba FES. Three points were raised in the Board Order admitting a part of the proffered contention. The points were related to the Staff's answers to the comment and they raise issues that require clarification.

5. In its answer to the comment, the staff discussed the method by which the effects of operations at more than one site could be determined for a particular population. An example was given of individual risk at a single location, one taken to be "Charlotte." It was concluded (based on the factors that "Charlotte" was farther from McGuire than from Catawba, and that the probability of the wind blowing from McGuire to "Charlotte" was lower than the probability of the wind blowing from Catawba to "Charlotte") that the risk to an individual at "Charlotte" of early fatality and of latent cancer fatality considering operations at both plants was only slightly greater than considering Catawba alone. It was noted that this increase was well within the uncertainty in the calculation of risks from Catawba alone.

6. The first point raised in the Board Order concerned lack of a detailed risk calculation for McGuire of the kind made for Catawba, necessitating the assumption that the McGuire risks were comparable to those of at comparable distances. Because of the similarities discussed below, the staff concludes that the approximation that the calculations performed for Catawba apply to McGuire is acceptable.

7. The power levels for Catawba and McGuire plants are the same, and both plants have Westinghouse-designed reactors with ice condenser containments, providing a similarity of plant design that would probably lead to similar assessments for severe releases.

8. Catawba and McGuire are in the same climatic region. The staff has compared the measured gross occurrences of slow wind speeds, stable air conditions and precipitation at both sites and found them to be comparable. The wind rose values used in the example were based on measured data from the two sites. There is a strong bimodal wind rose at Catawba that gives a high probability of the wind blowing toward "Charlotte" (the effect of which can be seen in Figure 5.9 in the FES). The same bimodal wind rose is also present at McGuire, but to a lesser extent and leads to a lower probability of the wind blowing toward "Charlotte." The emergency plans for both sites support similar evaluations of evacuation parameters (delay time and effective evacuation speed) and these parameters were used in the calculations for Catawba. Therefore, some of the principal parameters of importance in calculations of risks (power level, plant design, meteorological environment, and protective actions) are similar, and are adequately considered in the FES. This leaves distance and wind direction likelihood differences as the principal

factors to be taken into account explicitly in the evaluation of individual risks in the example.

9. The second point expressed concern that estimates of latent cancer fatality risk contained in the answer to the comment do "not match that of Figure 5.9 on page 5-66."[1/] The staff concludes that what appears to be a discrepancy follows directly from the assumptions in the calculation concerning protective actions, which cause a discontinuity in calculated does at the 10 mile emergency planning zone (EPZ) boundary. As discussed in Section 5.9.4.5(2) and Appendix F of the DES, the assumptions made are that persons within the EPZ, after a one hour delay, are presumed to move in a downwind direction at a speed of 6.7 miles per hour. On the other hand, persons outside of the EPZ were presumed to continue their normal activity for seven days, unless the seven day projected bone marrow dose from ground shine would exceed 200 rem (roughly the dose level at which hospitalization would be indicated), in which case they would be relocated after one day. It then follows that the people inside the EPZ, by virtue of the evacuation assumption, would have lower predicted doses (and hence lower risk of latent cancer fatality) than those outside. The staff's calculation gives a factor of 3×10^4 higher risk of latent cancer fatality just outside the EPZ compared to just inside.

10. Similarly, for early fatality calculations, one can expect a discontinuity in individual risk due to the same assumptions. The staff's calculation predicts a near zero early fatality risk within the

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1/ March 24, 1983 Memorandum and Order

entire 10 mile EPZ, but a jump to 9×10^{-10} ($6.8 \times 10^{-9} \times .13$) per reactor year just outside the EPZ in the Charlotte direction.

11. The third point concerned the observation that "the percentage increase in cancer risk attributed to McGuire (10% more than Catawba) ... appears at odds with the risk data given previously." The Commission's Policy Statement on Safety Goals was cited as suggesting that significant risk of cancer fatility extended to the population within 50 miles. In its answer to the comment on the DES, the staff made no judgment as to the significance of either Catawba or the McGuire risks, but only assessed the individual risks relative to each other and in comparison with the uncertainty in the calculations. Therefore, the staff concludes that there is no inconsistency between the policy statement and the answer in the FES.

12. As admitted, DES Contention 11 now states:

> A substantial part of the population placed at risk by nuclear operations at and relating to Catawba are also placed at risk by similar operations at McGuire. A realistic assessment of Catawba will take into consideration McGuire risks.

The two risks of primary concern to the health of the public from accidents at nuclear power plants are early fatality and latent cancer fatality risks.

13. Early fatality risk is an accident phenomenon of very close-in distances. Indeed, the FES on page 5-40 stated that for Catawba all the early fatalities were predicted to be within 20 miles of the site. This is because there is a threshold dose to the bone marrow for the prediction of early fatality to a fraction of the population exposed (320 rem with supportive medical treatment). The fraction of the population

that could suffer early fatality rises as the dose increases. Radioactive decay and plume spread serve to reduce calculated individual bone marrow doses while wet (washout) and dry (fallout) deposition of material serve to increase doses by raising the dose due to ground shine but, by reducing the content of the plume, serve to reduce doses due to cloud exposure.

14. Because of all these factors, average predicted early fatalities drop rapidly with distance for constant occupancy assumptions. (There is, however, variability depending on meteorological conditions.) This conclusion is supported by the values quoted in the FES at page 9-9 which show a predicted drop in risk of over two decades (6.8×10^{-9} to 4.5×10^{-11}) for 10 to 12.5 miles compared to 15 to 17.5 miles.

15. As discussed previously, Catawba results can be used as an approximation of McGuire results by considering specifically distances and wind roses. Therefore, we conclude that early fatality risks from McGuire are also confined to the area outside the EPZ but inside 20 miles from the site.

16. Since the crow-flight distance between the two sites is about 30 miles with the bulk of the population in the area not on this flight path, and considering all the factors discussed above, the staff has concluded that the population at risk of early fatality from operations at Catawba is not the same as the population at risk of early fatality from operations at McGuire.

17. The situation with respect to latent cancer fatalities is somewhat different. In the FES, the staff presents calculations which extend to 2000 miles and indicated a total latent cancer fatality risk of 0.012 per reactor year in Table 5.13. On this very large scale, the

populations at risk from operations at McGuire and at Catawba are much the same. Therefore, considering four reactors, the total societal accident risk is 0.05 per year, an extremely small risk compared to the cancer fatality risk already experienced by the population within 2000 miles of both sites from other causes. It is estimated that the average cancer fatality risk in the general population is 1.9×10^{-3} per year.[2/] Assuming that the population within 2000 miles is about 10^8 (about half of the population of the US), the societal cancer fatality risk is about 2×10^5 per year, a factor of more than 10^7 higher than the accident risk due to the two sites.

18. For the closer-in distance of 50 miles, the approximation of identical populations at risk from McGuire and Catawba is not so good as for the larger scale, since the 50 miles circles about the two sites do not entirely overlap and wind rose considerations are more important. However, the majority of the population residing within 50 miles of each of the sites is probably concentrated in Charlotte and its environs and we will assume identical populations, and a magnitude for that population of 1.7×10^6 (FES Appendix D). Although not presented numerically (but included graphically in Figure 5.5) in the FES, the calculations give a total latent cancer fatality risk within 50 miles of Catawba of 0.005 per reactor year. Using the same factor as above for background cancer fatality risk in the general population, the background societal risk from all

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2/ NUREG-0880, Rev. 1, pg. 31, quoting from "Cancer Facts and Figures," American Cancer Society, 1981.

causes is about 3 x 10^3 per year compared to 2 x 10^{-2} for four reactors, again an extremely small fraction.

Conclusion

19. In the FES the staff presented several conclusions based on its accident assessment for Catawba alone. Among these are that the environmental cost of accidents is "small;" that there are no special or unique circumstances about the Catawba site and environs that would warrant special mitigation features for Catawba; that risks of early fatality are small in comparison with risks of early fatality from other human activities; and that population exposures and latent cancer fatality risks are comparable to those from normal operation. None of these conclusions would be changed with or without consideration of McGuire risks in addition to the risks of Catawba. Therefore, the presentation of accident risks in the FES is a reasonable one and cost-benefit considerations remain the same.

Jocelyn A. Mitchell

Jocelyn A. Mitchell

Lewis G. Hulman

L.G. Hulman

Sworn and subscribed to before me this 1st day of aug., 1983

Edythe E. Becker

Notary Public

My Commission Expires: 7/1/86

JOCELYN A. MITCHELL

PROFESSIONAL QUALIFICATIONS

ACCIDENT EVALUATION BRANCH
DIVISION OF SYSTEMS INTEGRATION

I am employed as a nuclear engineer in the Accident Evaluation Branch, Division of Systems Integration, U. S. Nuclear Regulatory Commission, Washington, D. C. My duties include accident analyses for safety and environmental reviews, evaluation of extended burnup in power reactors as it impacts radiological consequences of accidents, and evaluation of other safety-related studies for power and nonpower reactor facilities.

In 1955, I joined the Westinghouse Electric Corporation at the Bettis Atomic Power Laboratory in West Mifflin, PA. During the time until 1980, I was involved in reactor physics evaluations of naval plants and the Shippingport Atomic Power Station. I was a reactor operator. I also participated in safety reviews of critical facility operations, storage areas, fuel shipments and manufacturing facilities as a member of various Safety Committees. I was involved with the design, conduct, and evaluation of reactor physics experiments and cross section measurements. I was the manager of a group which was responsible for the development of a nondestructive assay device for spent fuel rods and for the maintenance of an inactive critical facility. I was the co-author of 16 technical publications covering physics measurements and calculations. These were published in Nuclear Science and Engineering, in the Bettis Technical Memoranda Series, or in the American Nuclear Society Transactions.

In 1980, I joined the Nuclear Regulatory Commission in the Reactor Safety Branch. During the few months before I joined the Accident Evaluation Branch, I was involved in the safety evaluation of nonpower reactor facilities. In the Accident Evaluation Branch, I have completed severe accident assessments for Environmental Statements for seven sites. I have also reviewed accident calculations for older plants as part of the Systematic Evaluation Program, and have reviewed license amendments for operating reactors.

My formal education consists of an A.B. degree in chemistry from Connecticut College. In addition, I have taken post-graduate courses in chemistry at Carnegie Institute of Technology (presently Carnegie-Mellon University). I have also studied Computer Science at the University of Pittsburgh and Nuclear Physics at the Bettis Reactor Engineering School.

LEWIS G. HULMAN
PROFESSIONAL QUALIFICATIONS

I am presently Chief of the Accident Evaluation Branch, Division of Systems Integration, in the Office of Nuclear Reactor Regulation. I was formerly the Chief of Systems Interaction Branch and Chief of the Hydrology-Meteorology Branch, both in the Office of Nuclear Reactor Regulation.

My formal education consists of study in Engineering at the University of Iowa where I received a BS in 1958, and an MS in Engineering Mechanics and Hydraulics in 1967. In addition, I have taken post-graduate courses at the University of Nebraska, MIT, Colorado State University, and the University of California, and numerous management, technical and computer utilization courses sponsored by the government.

My employment with NRC (formerly AEC) dates from February 1971 with both the Office of Nuclear Reactor Regulation and the former Office of Reactor Standards, and for consultation on siting of materials utilization facilities. Assignments were made on both safety and environmental matters. My responsibilities in the licensing review of nuclear facilities were in the areas of site analysis, flood vulnerability, water supply, surface and groundwater acceptability of effluents, severe meteorologic events and diffusion analyses. In addition, I participated in the development of the technical bases for safety guides and standards, and research identification and analysis in these areas of interest.

From March 1980 through mid-April 1981 I was employed in private industry as a Vice President with Tetra Tech, Inc. in Pasadena, California. During this period I was responsible for business development, and for managing several contracts involving various engineering studies in water, including several contracts for government and industry. Of note were studies of a nuclear power plant in Yugoslavia for the International Atomic Energy Agency, flood protection in the Dominican Republic, a refinery intake design in Indonesia, and hurricane risk assessments in Texas, North Carolina, Florida, and New Jersey.

From 1968 to 1971, I was a Hydraulic Engineer with the Corps of Engineers' Hydrologic Engineering Center in Davis, California. I worked in special hydrologic engineering projects with most Corps' offices, participated as an instructor in training courses, and conducted research. Special projects work included water supply systems analysis for the Panama Canal, planning hydrologic engineering studies for water resource development near Fairbanks, Alaska, regional water supply and flood control studies for the northeastern U.S., hydropower and water supply studies for a dam in the northeast, and flood control studies in Mississippi.

From 1963 to 1968, I was a Supervisory Hydraulic Engineer with the Philadelphia District, Corps of Engineers. As Assistant Chief of the Hydraulics Branch, I was responsible for design aspects of multi-purpose dams, navigation projects, coastal engineering development and special studies on modeling of dams, inlets, water supply, and shoaling, salt water intrusion, and the effects of dredging. I acted as advisor to the District Engineer, Philadelphia, on drought problems in the 1960's and represented him in technical meetings of the Delaware River Basin Commission - chaired interagency committee which evaluated the effects of the drought.

From 1958 to 1963, I was a Hydraulic Engineer with the Omaha District of the Corps of Engineers. I was responsible for the hydraulic design of flood control channels, hydraulic design of structures for large dams and several flood control projects. I also received training in hydrologic engineering, structural engineering, sedimentation, river training studies and design, and water resource project formulation.

I have published in journals of the American Society of Civil Engineers, the American Water Works Association, the Journal of Marine Geodesy, the National Society of Professional Engineers, the American Geophysical Union, and in internal technical papers and seminar proceedings of the Corps of Engineers, the AEC, and the NRC.

I am a registered Professional Engineer in the States of Nebraska and California. I am a member of the American Society of Civil Engineers, the American Meteorological Society, and the American Geophysical Union.

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CERTIFICATE OF SERVICE

I hereby certify that copies of "NRC STAFF MOTION FOR SUMMARY DISPOSITION OF DES CONTENTION 11" in the above-captioned proceeding have been served on the following by deposit in the United States mail, first class, or, as indicated by an asterisk, by deposit in the Nuclear Regulatory Commission's internal mail system, this 1st day of August, 1983:

*James L. Kelley, Chairman
Administrative Judge
Atomic Safety and Licensing Board
U.S. Nuclear Regulatory Commission
Washington, DC 20555

Dr. A. Dixon Callihan
Administrative Judge
Union Carbide Corporation
P. O. Box Y
Oak Ridge, TN 37830

Dr. Richard F. Foster
Administrative Judge
P. O. Box 4263
Sunriver, Oregon 97702

Richard P. Wilson, Esq.
Assistant Attorney General
P. O. Box 11549
Columbia, South Carolina 29211

Jesse L. Riley
Carolina Environmental Study Group
854 Henley Place
Charlotte, North Carolina 28207

Robert Guild, Esq.
Attorney for the Palmetto Alliance
P. O. Box 12097
Charleston, South Carolina 29412

Palmetto Alliance
2135½ Devine Street
Columbia, South Carolina 29205

J. Michael McGarry, III, Esq.
Debevoise and Liberman
1200 17th Street, NW
Washington, DC 20036

William L. Porter, Esq.
Albert V. Carr, Esq.
Ellen T. Ruff, Esq.
Duke Power Company
P. O. Box 33189
Charlotte, NC 28242

*Carole F. Kagan, Attorney
Atomic Safety and Licensing Board Panel
U.S. Nuclear Regulatory Commission
Washington, DC 20555

*Atomic Safety and Licensing Board Panel
U.S. Nuclear Regulatory Commission
Washington, DC 20555

*Atomic Safety and Licensing Appeal
Board Panel
U.S. Nuclear Regulatory Commission
Washington, DC 20555

*Docketing & Service Section
Office of the Secretary
U.S. Nuclear Regulatory Commission
Washington, DC 20555

George E. Johnson

George E. Johnson
Counsel for NRC Staff