December 28, 1984

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 No. 50-400 OL
MUNICIPAL POWER AGENCY	)	
	)	
(Shearon Harris Nuclear Power Plant)	)	
	)	

AFFIDAVIT OF ROBERT D. KLIMM IN SUPPORT OF APPLICANTS' MOTION FOR SUMMARY DISPOSITION OF EDDLEMAN CONTENTION 224

County of Middlesex	)	
	)	SS:
Commonwealth of Massachusetts	)	

Robert D. Klimm, being duly sworn, deposes and says as follows:

1. I am an Associate of HMM Associates, Inc. My business address is 336 Baker Avenue, Concord, Massachusetts 01742. A summary of my professional qualifications and experience is attached hereto as Attachment A.

2. My responsibilities at HMM Associates include the management and supervision of evacuation time studies. I have served as either Project Manager or Principal Transportation Engineer for many of the more than twenty evacuation time analyses conducted by HMM Associates in connection with emergency planning for nuclear power plants. I was Principal Transportation Engineer for the evacuation time estimate study prepared by HMM Associates for the Shearon Harris plume exposure Emergency Planning Zone (EPZ). This study is entitled "Evacuation Time Estimates for the Plume Exposure Pathway Emergency Planning Zone of the Shearon Harris Nuclear Power Plant" (October 1983) (hereinafter referred to as "ETE"). I am also responsible for all

transportation-related computer analyses conducted by HMM Associates. I was involved in the system development of the NETVAC evacuation model, which is a state of the art computer evacuation simulation model. The NETVAC model has been used to estimate evacuation times for approximately 20 nuclear power plant sites. I co-authored the NETVAC model users manual. In addition, I have provided training to various groups on the use of the NETVAC model.

3. I have personal knowledge of the matters stated herein and believe them to be true and correct. I make this Affidavit in response to Eddleman Contention 224. I have reviewed this contention and am familiar with the substance of the allegations contained therein. I am aware that the Licensing Board admitted Eddleman Contention 224 into this proceeding insofar as it alleges that the Harris ETE does not identify the adverse weather frequency used and therefore allegedly violates the requirements of 10 C.F.R. § 50.47(a)(1) and (2), and (b)(10).

4. Detailed criteria for the content of evacuation time analyses for nuclear power plants are contained in Appendix 4 to the joint Nuclear Regulatory Commission/Federal Emergency Management Agency criteria document on preparation of radiological emergency response plans, NUREG-0654/FEMA-REP-1, Rev. 1 (November 1980). Appendix 4 to NUREG-0654 requires that an evacuation time analysis be prepared considering adverse weather conditions, as well as normal weather conditions. Thus, it states as follows:

> Two [weather] conditions — normal and adverse — are considered in the analyses. Adverse conditions would depend on the characteristics of the specific site and could include flooding, snow, ice, fog or rain. The adverse weather frequency used in this analysis shall be identified and shall be severe enough to define the sensitivity of the analysis to the selected events. These conditions will affect both travel times and capacity.

NUREG-0654 at 4-6.

5. With respect to the portion of Appendix 4 quoted in paragraph 4 above, it is my understanding, based on my experience with conducting evacuation time analyses pursuant to NUREG-0654 since 1980, that the intent of the language quoted is to ensure that the adverse weather condition occurs often enough and is severe enough to warrant the assessment of its effect on evacuation times. For example, the evacuation time analysis should not be based on a three-foot snowfall in a locale where that may only occur once every one hundred years. It is intended that the adverse weather condition modeled be realistic so that it can provide practical information to decisionmakers regarding protective actions in the event of an accident at a nuclear plant. The precise percentage of the time that the adverse weather condition occurs does not matter so long as it occurs frequently enough to be realistic and, thereby, useful. It should be noted that there are no ranges of acceptable quantitative frequencies for adverse weather conditions specified in Appendix 4 to NUREG 0654 and no requirement that the choice of a scenario be based on its frequency (e.g., that the most frequent adverse condition be used in the time study).

6. The adverse weather condition modeled in the Harris ETE is a heavy rainstorm which results in a 25 percent reduction in roadway capacity and travel speeds within the Harris EPZ. ETE at 1-3, 1-4, 2-3. This scenario was selected from a number of potential adverse weather scenarios (including snow, rain and fog) based upon a review of weather frequency and severity data presented in the Shearon Harris Final Safety Analysis Report (at section 2.3) and on discussions with state and local emergency preparedness officials. Section 2.3 of the Harris FSAR contains detailed quantitative information on the meteorology of the Harris site—gathered on-site and from weather reporting stations in the same geographical area. For example, data on the frequency of thunderstorms are contained in section 2.3.1.2.2 and data on precipitation extremes are in section 2.3.1.2.8. Based on information obtained from these sources, it was concluded that the selected scenario represents a condition which is severe enough and occurs often

enough to provide a reasonable frame of reference for protective action decisionmaking during adverse weather conditions. The ETE reveals that evacuation times during this adverse weather condition will be greater than during normal conditions because the methodology for the ETE is sensitive to the reductions in roadway capacity and travel speeds associated with the adverse condition. The adverse weather scenario selected is generally representative of other adverse conditions (such as light snow and fog) where visibility is impaired, roadway capacity is reduced, and normal traffic operations impeded, compared to normal fair weather conditions.

7. In order to confirm that the choice of the adverse weather scenario modeled in the ETE (heavy rain) is appropriate from the standpoint of frequency, more quantitative data on the historical frequency of rainfall and precipitation in the area of the Harris Plant have been collected by Carolina Power & Light Company and are shown in Attachment B to this Affidavit. Attachment B contains rainfall and precipitation frequency information for the Raleigh-Durham Airport, which is located approximately nineteen miles from the Harris Plant; thus, the information can be considered representative of that for the Harris plume EPZ. As Attachment B shows, rainfall occurs on an average of 148 days per year. However, not all of this can be considered in the category of adverse weather (that is, heavy rainfall) modeled in the ETE. Heavy rainfall can reasonably be defined in one of two ways: (1) thunderstorms, or (2) periods in which the rate of rainfall exceeds approximately one-half inch per hour. As shown in Attachment B, thunderstorms occur during forty-five days per year on the average. Attachment B also shows that there are 102 hours per year on the average in which the rate of precipitation exceeds one-half inch per hour. This compares with a total of 8,766 hours in a year.

8. The Harris ETE will be amended to reflect this quantitative frequency data. A new subsection will be added to section 6 of the ETE which pertains to the methodology of the study and Attachment B to my Affidavit will be added as a table in the ETE. The

proposed text of the new subsection is attached hereto as Attachment C. With this amendment, the ETE will fully conform with Appendix 4 to NUREG-0654 by identifying on a more quantitative basis the frequency of the adverse weather condition used.

Robert D. Klimm
ROBERT D. KLIMM

Subscribed and sworn to before me
this 28TH day of December 1984.

Carol J. Morris
Notary Public

(SEAL)

My Commission Expires: _____
"My Commission Expires April 12, 1985"

ROBERT D. KLIMM

Education

M.S.	Civil Engineering (Transportation), Northeastern University, 1979
B.S.	Civil Engineering, Worcester Polytechnic Institute, 1975

Summary of Experience

Mr. Klimm specializes in transportation engineering and emergency preparedness/evacuation planning. He has served as Project Manager or Technical Advisor on most of the evacuation time estimate analyses conducted by HMM. He also has been responsible for numerous emergency preparedness tasks for nuclear power plants including: the development of school facility evacuation plans and procedures; the development of evacuation and population data for CRAC2 and CRACIT consequence modeling; and the development of evacuation routings and time estimates for special facilities.

Mr. Klimm was involved in the system development of the NETVAC evacuation simulation model, which has been used at 20 nuclear power plant sites throughout the country. He has provided training to groups that have been licensed to use the NETVAC model, and was responsible for conducting an Evacuation Time Estimate Workshop for Public Service Electric and Gas Company of New Jersey.

Professional Experience

1980 - Present — HMM Associates. Mr. Klimm serves as Project Manager and/or Principal Engineer for projects involving emergency preparedness planning and emergency evacuation. Recent experience includes the following:

- Principal Engineer for the development of evacuation time estimates for the Susquehanna Steam Electric Station (Luzerne County, Pennsylvania, 1981).
- Project Manager for the preparation of supplemental evacuation time estimates for the Midland Nuclear Power Plant (Midland, Michigan, 1983).
- Project Manager for the development of evacuation time estimates for the D.C. Cook Nuclear Plant (Berrien County, Michigan, 1984).

- Project Manager for the development of an Evacuation Traffic Management Plan for the Midland Nuclear Power Plant Plume Exposure EPZ (Midland, Michigan, 1983).

- Principal Engineer for the preparation of evacuation time estimates for the Shearon Harris Nuclear Power Plant (Wake County, North Carolina, 1983).

- Project Manager for the development of an Evacuation Traffic Management Plan for the primary Plymouth Station Evacuation Relocation Center (Hanover, Massachusetts, 1983).

- Principal Engineer for the development of population and evacuation data for CRACIT radiological consequence modeling within the Seabrook Station EPZ (Seabrook, New Hampshire, 1983).

- Project Manager for the development of an Evacuation Traffic Management Plan for the Seabrook Station Plume Exposure EPZ, (Seabrook, New Hampshire, 1982).

- Project Manager for the preparation of evacuation time estimates for the Grand Gulf Nuclear Station (Clairborne County, Mississippi, 1981).

1977-1980 Fay, Spofford & Thorndike, Inc. Transportation Engineer. Responsible for traffic operations analyses; traffic control design, specifications and cost estimates; transportation environmental impact analyses; highway safety analyses; truck circulation studies, and traffic circulation plans for private and public developments.

1975-1977 Central Massachusetts Regional Planning Commission. Transportation Engineer/Planner. Responsible for transportation corridor planning studies, transportation systems management, traffic operations analyses, and coordination of the regional transportation air quality control plan.

Other Professional Data

Affiliations:

Transportation Research Board: National Academy of Sciences
Institute of Transportation Engineers
American Society of Civil Engineers
Boston Society of Civil Engineers

Papers/ Publications:

- Klimm, R., "Comparison of Optional Cycle Lengths for an Urban Arterial Signal System Using Maximum Bandwidth and Minimum Vehicle Delay Criteria," Northeastern University, 1979.
- Klimm, R., "Fringe Parking and Intermodal Transportation System--Feasibility Study," CMRPC, 1976.
- Klimm, R., Sheffi, Y., Mahnassani, H., Powell, W., NETVAC2 USER MANUAL," HMM Associates, 1982.

Rainfall/Precipitation Frequency
Raleigh-Durham Airport

Month	Rain[1]	Mean Number of Days With Occurrence of Thunderstorms[1]	Number of Hours Per Year With Precipitation* of Greater Than .5 inch/hour[2]
January	13	1	3
February	10	1	0
March	13	2	0
April	13	4	6
May	15	6	11
June	13	7	11
July	16	10	28
August	14	8	29
September	10	3	7
October	10	2	5
November	10	1	1
December	12	0	1
TOTAL	148	45	102

*Total precipitation equals rain plus water equivalent of snow and ice pellets (sleet).

Sources of Data:

1 "Climatography of the United States No. 90 (1965-1974), Airport Climatological Summary, Raleigh, North Carolina, Raleigh-Durham Airport," National Oceanic and Atmospheric Administration National Climatic Center, Asheville, N.C., July, 1978.

2 "Climatography of the United States No. 82-31, Decennial Census of United States Climate--Summary of Hourly Observations 75th Meridian Time Zone--Raleigh, N.C., 1951-1960," U.S. Department of Commerce, Washington, DC, 1963.

Adverse Weather Conditions

Pursuant to NUREG-0654, Rev. 1 guidance, evacuation time estimates have been developed for an adverse weather condition. Adverse weather refers to what is defined as a severe rainstorm condition which would reduce roadway capacity and travel speeds by 25 percent. The adverse weather condition was chosen for analysis based upon a review of weather frequency and severity data contained in Shearon Harris Final Safety Analysis Report and discussions with State and local emergency preparedness officials. Heavy or severe rain was chosen because it was deemed to occur often enough and to be severe enough to provide realistic and useful guidance to be used in the protective action decision-making process. Subsequent to the completion of the October 1983 evacuation time estimate study, additional information on the frequency of various adverse weather conditions were prepared by CP&L. Information on the historical frequency of heavy rain is presented in Table _____. [referring to Attachment B of the Klimm Affidavit] These data indicate that thunderstorms occur during forty-five days per year on the average, with rainfall of any intensity occurring approximately 148 days of the year. The rate of precipitation exceeds one-half inch per hour during 102 hours per year on the average.

The use of the 25 percent reduction factor was based upon available empirical data concerning the effect of rain on traffic operations. This factor was reviewed with State and county emergency preparedness officials.

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AND NORTH CAROLINA EASTERN	)	Docket No. 50-400 OL
MUNICIPAL POWER AGENCY	)	
	)	
(Shearon Harris Nuclear Power Plant)	)	

CERTIFICATE OF SERVICE

I hereby certify that copies of "Applicants' Motion for Summary Disposition of Eddleman Contention 224," "Applicants' Statement of Material Facts As To Which There Is No Genuine Issue To Be Heard on Eddleman 224," and "Affidavit of Robert D. Klimm in Support of Applicants' Motion for Summary Disposition of Eddleman Contention 224" were served this 31st day of December, 1984 by deposit in the United States mail, first class, postage prepaid, to the parties on the attached Service List.

Dale E. Hollar

Dale E. Hollar
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Dated: December 31, 1984

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