

February 14, 1986
USNRC

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

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BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

OFFICE OF SECRETARY
DOCKETING & SERVICE
BRANCH

In the Matter of)
)
GEORGIA POWER COMPANY, et al.) Docket Nos. 50-424
) 50-425
(Vogtle Electric Generating Plant,)
Units 1 and 2))

AFFIDAVIT OF DAVID N. KEAST
ON CONTENTION EP-2/EP-2(c)

COUNTY OF MIDDLESEX)
)
COMMONWEALTH OF MASSACHUSETTS)

I, David N. Keast, being duly sworn according to law, depose and say as follows:

1. My name is David N. Keast. I am a Vice President and Senior Project Manager with HMM Associates, Inc., where I specialize in public warning system studies. HMM Associates has been retained by Georgia Power Company to design the public alerting system for the Vogtle plume exposure pathway Emergency Planning Zone ("EPZ"). I graduated in 1954 from a combined educational program between Amherst College and the Massachusetts Institute of Technology. At that time, I received a Bachelor of Arts degree from Amherst and a Bachelor of Science and a Masters of Science in Electrical Engineering from MIT. My professional career has been almost entirely in the field of

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acoustics, and during that career I have been involved in almost all aspects of the field. My recent experience includes the design of public alert and notification systems for the Susquehanna, Millstone, Connecticut Yankee, Perry and Seabrook Nuclear Power Plants. In addition, I have prepared reports in response to FEMA-43, "Standard Guide for the Evaluation of Alert and Notification Systems for Nuclear Power Plants", for the public alerting systems at Turkey Point, St. Lucie, Crystal River, Hatch, Perry, Seabrook and Pilgrim. For Battelle Northwest Laboratories, I supervised the development of an analytical method of estimating the effectiveness of siren systems. My business address is HMM Associates, Inc., 336 Baker Avenue, Concord, Massachusetts 01742. A more detailed summary of my professional qualifications is attached to this affidavit as Exhibit A.

2. The purpose of this affidavit is to support "Applicants' Motion For Summary Disposition of Joint Intervenor's Contentions EP-2/EP-2(c)," which concerns the use of NOAA tone alert radios (in lieu of some other type of radio alerting system) for public alerting within the Vogtle EPZ. I have personal knowledge of the matters set forth herein and believe them to be true and correct.

3. The National Oceanographic and Atmospheric Administration ("NOAA") of the United States Department of Commerce operates the National Weather Radio Network, providing

continuous broadcasts of the latest weather information directly from National Weather Service offices. Taped weather messages are repeated every four to six minutes and are routinely revised every one to three hours, or more frequently if needed. In severe weather, the routine weather information is interrupted for broadcast of special warning messages, and a signal can be transmitted to automatically activate NOAA weather radio receivers within the broadcast area so that the warning message is disseminated to all NOAA weather radio receivers in that area.

4. The NOAA weather radio system has been well-received across the country. As of 1983, 46 million weather radio receivers had been sold since 1978 and were in use, and NOAA continues to report very high levels of public support for the program. This support reflects the system's usefulness to all areas of the nation in providing both routine weather forecasts and warnings of severe weather. These routine and severe weather forecasts provide valuable -- and sometimes lifesaving -- information to government officials and members of the public involved in agriculture, recreation, transportation, energy conservation, marine travel and emergency management. Thus, unlike other radio alerting systems (which lack day-to-day utility and therefore may not be as widely used by members of the public), the NOAA weather radio system has utility to the public on a routine, daily basis. This is a unique feature of

the NOAA weather radio system as opposed to other radio alerting systems for the public. Because the NOAA weather radio broadcasts have proven to be a widely-accepted, highly valuable public service elsewhere across the nation, it can be expected that the broadcasts will enjoy similar popularity within the Vogtle plume exposure pathway Emergency Planning Zone ("EPZ"), particularly considering the predominance of agricultural and recreational activities within the EPZ.

5. Moreover, the NOAA weather radio system has been in use across the country for about a decade, and is a proven technology. No other radio alerting system for the public has been applied on such a large scale. Thus, there is much more operating experience with the NOAA weather radio system than with any other radio alerting system for the public. In short, there is no other radio alerting system for the general public that is as proven in its reliability and effectiveness as the NOAA system.

6. The extensive operating experience with NOAA weather radios demonstrates that they do not "go off frequently without reason". As with any type of public alert and notification system, isolated cases of spurious activation may sometimes occur during installation testing and system "shakedown". Such problems -- should they occur -- are quite temporary in nature

and readily resolved. Thus, they do not affect the long-term utility and reliability of the NOAA weather radio system.

7. In rare situations, a NOAA transmitter is remote from the weather observation station that controls the transmitter, and is subject to different weather patterns -- on the opposite side of a mountain range, for example. In such cases, the routine weather broadcasts and severe weather "watches" and "warnings", although relevant to the area around the weather station, are inapplicable to the area around the NOAA transmitter. This will not be a problem at Plant Vogtle. The NOAA weather radio system will include a new transmitter at the Vogtle site, which will be controlled by the National Weather Service observation station at Bush Field, only about 15 miles from the transmitter. Moreover, the automatic activation of the NOAA weather radios within the Vogtle EPZ due to weather conditions will be limited to those storm "watches" and storm "warnings" directly applicable to the four counties in the EPZ, as well as the Georgia counties of Screven and Jenkins.

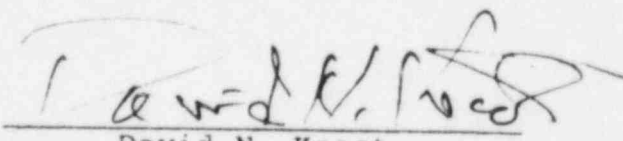
8. National Weather Service data have been analyzed to determine the expected frequency of activation of NOAA weather radios in the Vogtle EPZ due to severe weather watches and warnings. Data for the survey period January 1, 1980 through September 30, 1985 (69 months) indicate an average of approximately 25 storm watches and warnings per year for the area (described above) to be covered by the Vogtle system. However,

the activation of the NOAA weather radios for certain events (e.g., winter storm warnings, high wind warnings, freeze/frost warnings and flood warnings) is actually at the discretion of the local National Weather Service. The actual number of weather-related activations per year is therefore likely to be lower than the number of watches and warnings issued. Thus, the NOAA weather radios within the Vogtle EPZ would be activated a maximum of 25 times per year (on average) due to severe weather.

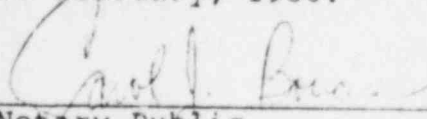
9. It is also important to recognize that storm watches and storm warnings are not evenly distributed throughout the year. Rather, about 87% of the storm watches and warnings in the Vogtle area occur between March and July, when public awareness of "storm season" is high and public acceptance of safety information can be expected to be at its peak. Similarly, storm watches and storm warnings are not evenly distributed over a 24-hour period. Instead, approximately 93% of the storm watches and warnings occur between 6:00 a.m. and midnight, when any disruptive effect of a severe weather message not applicable to an individual listener would be minimized. There is no indication that the predicted automatic activation pattern for the NOAA weather radios in the Vogtle EPZ will be likely to cause any significant number of households to disable their radios, particularly considering the usefulness of the

up-to-date weather information broadcast over the radios on a daily basis. Nor is there any reason to believe that members of the public would be more likely to retain and use some other type of radio alerting system having no utility on a day-to-day basis.

10. In addition to the primary public alerting system of NOAA weather radios, Georgia Power Company is also installing a system of fixed sirens throughout the Vogtle EPZ. This siren system has been designed to provide a minimum of 60 dBC coverage to all residences within the EPZ, in accordance with the guidance of Appendix 3 of NUREG-0654/FEMA-REP-1 (Rev. 1), "Criteria for Preparation and Evaluation of Radiological Emergency Response Plans and Preparedness in Support of Nuclear Power Plants." The siren system can be relied upon to alert any EPZ residents who have disabled their NOAA weather radios. No other nuclear power plant in the country has installed a public alert/notification system which provides both tone alert radio and fixed siren coverage to all residences within the EPZ.


David N. Keast

Sworn to and subscribed
before me this 10th day
of February, 1986.


Notary Public

My Commission Expires:

My Commission Expires:

DAVID N. KEAST

Education

B.A.	Amherst College, 1952
B.S., M.S.	Electrical Engineering, Massachusetts Institute of Technology, 1954

Summary of Experience

Mr. Keast is a specialist in acoustics, and brings over 30 years of experience in the field to HMM. His work has included research on the propagation of sound out-of-doors; study of the acoustic and vibration environment of silo-launched missiles; design, development and analyses of advanced instrumentation; computer programming for acoustic applications; and environmental noise control. In the last 5 years, Mr. Keast has been extensively involved with the design and analyses of public warning systems using sirens.

Professional Experience

1983 - Present	HMM Associates, Vice President and Project Manager. Mr. Keast directs environmental noise and public warning-system studies at HMM Associates. Recent experience includes the following: <ul style="list-style-type: none">° Preparation of FEMA-43 Reports for the Turkey Point, St. Lucie, Crystal River, Hatch, Pilgrim, Seabrook and Perry nuclear plants.° Design of the public alerting system for New Hampshire Yankee's Seabrook Station.° Background noise studies for the Maine Yankee nuclear plant.° Instructor for Battelle Pacific Northwest Laboratories' Emergency Planning Workshop.
1973-1983	Bolt Beranek and Newman, Inc. Manager, Environmental Technologies Department. For the Defense Civil Preparedness Agency (a FEMA predecessor), Mr. Keast prepared BBN Report 4100 and CPG 1-17, both referenced in Appendix 3 of NUREG-0654/FEMA REP-1. He is the principal author of NUREG/CR-2654 "Procedures for Analyzing the Effectiveness

of Siren Systems for Alerting the Public." He supervised the design of the public alerting systems for the Susquehanna, Millstone, Connecticut Yankee and Perry Power plant sites. For Battelle Laboratories, he evaluated the systems at Trojan, Zion, TMI and Indian Point.

While consulting for Northeast Utilities, Mr. Keast assisted in EEI's review and commentary on FEMA's Draft "Guide for the Evaluation of Alert and Notification Systems for Nuclear Power Plants."

Mr. Keast's other activities involved management of major projects evaluating the environmental impacts of industrial and power plants, and of high-voltage power transmission lines. He has also been active in applications of acoustics to building energy conservation.

1971-1973 M.F.E. Corporation, Salem, NH. Vice President of Engineering.
At M.F.E. Corporation, Mr. Keast was responsible for design, engineering, manufacturing and marketing of instrumentation.

1954-1971 Bolt Beranek and Newman, Inc. Acoustical Consultant.
Mr. Keast spent his first 17 years at BBN working on projects related to acoustics, noise control, and the measurement of sound and vibration.

Professional Registrations/Affiliations

Acoustical Society of America (Fellow)
Institute of Electrical and Electronic Engineers (Senior Member)
Affiliate Member of the Institute of Noise Control Engineering

Books

Measurements in Mechanical Dynamics, McGraw-Hill Book Company, Inc., New York, NY (1967).

"Basic Sound Measuring System," Chapter 5 of Noise Reduction, L.L. Beranek, McGraw-Hill Book Company, Inc., New York, NY (1960).

Brief articles on Sound Measurement Apparatus, Encyclopedia of Science, McGraw-Hill Book Company, Inc., New York, NY (1960, 1965, 1980).

Technical Papers and Selected Reports:

"On the Prediction of the Attenuation of Sound Propagated Over Ground," (with F.M. Wiener), J. Acoust. Soc. Am. 29 1953 (1957) (A).

"Instrumentation for the Study of the Propagation of Sound Over Ground," (with F.M. Wiener and K.N. Goff), J. Acoust. Soc. Am. 30, pp. 860-966 (1958).

"An Empirical Method for Estimating Wind Profiles Over Open Level Ground," (with F.M. Wiener), Trans. Am. Geophys. Union 39, pp. 858-864 (1958).

"Equipment and Procedures for Field Measurements of Aircraft Noise and Flight Paths," (with W.E. Clark and W.J. Galloway), J. Acoust. Soc. Am. 30, p. 693 (1958) (A).

"Experimental Study of the Propagation of Sound Over Ground," (with F.M. Wiener), J. Acoust. Soc. Am. 31, pp. 724-733 (1959).

"Calibration of Accelerometers in a Simulated Space Environment," J. Acoust. Soc. Am. 31, pp. 584-587 (1959).

"Acoustic Instrumentation for Measurements in the Minuteman Missile Silo," (G.W. Kamperman), J. Audio Eng. Soc., pp. 180-184 (1960).

"Measurement of Rocket Engine Noise," Noise Control 7, pp. 25-36 (1961). (Invited paper at the 60th Meeting of the Acoustical Society of America).

"Acoustical Measurements in the 1/3-Scale Minuteman Missile Silo," 29th Symposium on Shock, Vibration and Associated Environments (November 1960).

"An Analog System for the Analysis of Random Data Signals Up to 10 Kilocycles," IRE Transactions on Instrumentation, I-II, pp. 52-57 (September 1962).

"Airborne Vibration Spectrum Analysis: Some Techniques and Limitations," (with J. Gibbons and W.E. Fletcher), 31st Symposium on Shock, Vibration and Related Environments (October 1962).

"Digital Computer Processing of Telemetered Vibration Data," (with W.E. Fletcher and J. Gibbons), J. Acoust. Soc. Am. 34, 1962 (A).

"Noise and Vibration Characteristics of Large Solid Rocket Motors with Thrust Vector Control," (with P.A. Franken and D.E. Newborough), J. Acoust. Soc. Am. (1964) (A).

"Some Studies of Titan II Noise and Vibration Data," (with P.A. Franken), J. Acoust. Soc. Am. (1965) (A).

"Analog Versus Digital Data Analysis: An Introduction," SAE Paper 650818 presented at the SAE National Aeronautics and Space Engineering and Manufacturing Meeting in Los Angeles (October 1965).

"A Survey of Graphic Input Devices," Machine Design (August 1967).

"The Noise Environment of the California Condor," BBN Report 1259 (October 1965).

"Summer Acoustic Environment of the Jamesport and Shoreham Sites," BBN Report 2656 (October 1973).

"Some Pitfalls of Community Noise Measurement," J. Air Pollution Control Assoc. 25(1), pp. 36-39 (January 1975).

"Ambient Noise Studies in Suburban and Rural Areas," (with E.W. Wood and J.D. Barnes); invited paper presented at InterNoise '74, Washington, DC (September 1974).

"An Instrument for Automated Community Noise Monitoring," (with B.E. Blanchard); invited paper presented at InterNoise '74, Washington, DC (September 1974).

"Development of a Procedure for Predicting Noise Environments Around Industrial Sites," BBN Report 2987 (September 1974).

"Audible Noise and Its Effects from Proposed Pannell-Volney 765 kV Transmission Line," BBN Report 3514 (March 1977).

"Regulatory Aspects of Audible Noise from EHV/UHV Transmission Lines," an invited paper before the IEEE, PEG meeting in South Bend, Indiana (September 1977).

"Attenuation of Northern Dwellings to a Linear Source of Noise," (with D.A. Driscoll and J.P. Dulin, Jr.), J. Acoust. Soc. Am. 63 Supp 1, (A) May 1978).

"Assessing the Impact of Audible Noise from AC Transmission Lines: A Proposed Method," paper F79237-9 presented at IEEE Winter Power Meeting, New York, NY (February 6, 1979).

"Energy Conservation and Noise Control in Residences," a paper presented at Noisexpo '79, Chicago, April 1979, and reprinted in S/V Sound and Vibration, p. 18-22, July 1979.

"Acoustic Location of Air-Infiltration Openings in Buildings," invited paper presented at InterNoise '79, Warsaw, September 1979.

"The Use of Sound to Locate Infiltration Openings in Buildings," Proceedings of the ASHRAE/DOE-ORNL Conference on Thermal Performance of Exterior Envelopes of Buildings, ASHRAE SP 28, pp. 85, 1981.

"Electrical Substation Design Practice in the United States and Its Influence on Transformer Noise in Surrounding Communities," Proc. InterNoise '81, pp. 627, 1981.

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

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BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

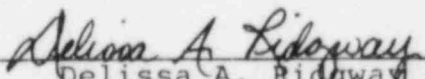
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OFFICE OF SECRETARY
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In the Matter of)
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GEORGIA POWER COMPANY, et al.) Docket Nos. 50-424
) 50-425
(Vogtle Electric Generating Plant,)
Units 1 and 2))

CERTIFICATE OF SERVICE

I hereby certify that copies of "Applicants' Motion For Summary Disposition of Joint Intervenors' Contention EP-2/EP-2(c) (Use of NOAA Tone Alert Radios)," "Applicants' Statement of Material Facts As To Which No Genuine Issue Exists To Be Heard Regarding Contention EP-2/EP-2(c) (Use of NOAA Tone Alert Radios)," and "Affidavit of David N. Keast On Contention EP-2/EP-2(c)" were served this 14th day of February, 1986, by deposit in the U.S. mail, first class, postage prepaid, upon the parties listed on the attached Service List, except that those whose names are marked by asterisk were served by hand delivery this 14th day of February, 1986.


Delissa A. Ridgway

Dated: February 14, 1986

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

Before The Atomic Safety And Licensing Board

In the Matter of)	
)	
GEORGIA POWER COMPANY, <u>et al.</u>)	Docket Nos. 50-424
)	50-425
(Vogtle Electric Generating Plant,)	
Units 1 and 2))	

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