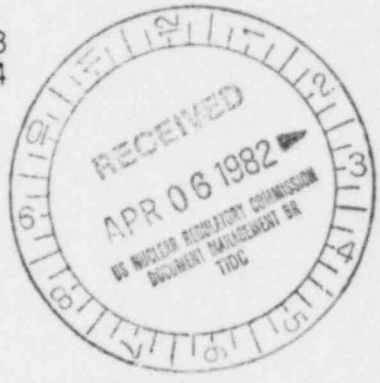
STAFF 4/5/82

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

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



NRC STAFF RESPONSES TO CMEC "DISCOVERY #1 -- ROUTINE TRITIUM RELEASES FROM CATAWBA" AND TO QUESTIONS OF FEBRUARY 8, 1982, FROM HENRY PRESSLER

The NRC Staff has received a document entitled "Discovery #1 -- Routine Tritium Releases from Catawba", dated March 15, 1982 from the Charlotte-Mecklenburg Environmental Coalition (CMEC) which, although not served in accordance with 10 CFR Section 2.740b(a), has been treated by the Staff as if properly served by mail on that date.

The Staff also received a letter dated February 8, 198[illegible] from Henry Pressler of CMEC requesting certain information regarding fuel-rod cladding failure and radionuclide buildup in the primary system. At that time, CMEC's petition to intervene was still under consideration by the Licensing Board, and the information request, which pertained to at least one of CMEC's proffered contentions, constituted discovery not permitted under 10 CFR Section 2.740(b)(1). Nevertheless, to avoid delay in proceeding with the discovery process commenced by the Licensing Board's Memorandum and Order (Reflecting Decisions Made Following Prehearing Conference), dated March 5, 1982, the Staff has treated this request as if it had been served along with CMEC's "Discovery #1".

DESIGNATED ORIGINAL

Certified By DSO 7/2

5/1

Under the provisions of 10 CFR Section 2.720(h)(2)(ii), written interrogatories to be answered by the NRC Staff must be filed with the presiding officer. Upon making the necessary finding under that provision, the presiding officer may require the Staff to answer the interrogatories. However, the Staff, in the interest of expediting the conduct of this proceeding, but without waiving the provisions of Section 2.720(h)(2)(ii) with respect to any other interrogatories which may be addressed to the Staff, herewith voluntarily provides the Staff's answers to the questions posed by CMEC together with supporting affidavits and statements of qualifications of those NRC Staff personnel who prepared the responses. For ease of future reference, the February 8, 1982 letter inquiries are treated as CMEC Interrogatories 1 and 2, and "Discovery #1" has been treated as Interrogatory 3, with nine subparts a through i. A three-part Attachment 1 has been included with the Response to Interrogatory 2.

Respectfully submitted,

George E. Johnson
Counsel for NRC Staff

Dated at Bethesda, Maryland
this 5th day of April, 1982

NRC STAFF'S RESPONSES TO HENRY PRESLER
(Charlotte-Mecklenburg Environmental Coalition)

Letter dated February 8, 1982

CMEC Interrogatory 1

Are there any independent or NRC studies that confirm that in actual PWR operation fuel-rod cladding failure occurs at the 0.12% value that is used by Duke Power Company in projecting radionuclide buildup in the primary cooling systems of the McGuire and Catawba plants?

Response

A value of 0.12% fuel cladding defects is used in the calculation of releases of radioactive materials in gaseous and liquid effluents from pressurized water reactors, as described in an NRC report on the PWR-GALE code (NUREG-0017). As indicated on page 2-18 of NUREG-0017, the 0.12% fuel cladding defect value is the average of fuel performance data weighted for burnup. The 0.12% defect value was considered by the ANS 18.1 Working Group to be "representative of expected operation" based on data available in the early-to-mid 1970's. However, as a result of design improvements, the average failure rate has declined such that during 1979, for example, Westinghouse estimated from coolant activity that there were approximately 100 failed rods in 23 Westinghouse reactors, corresponding to an overall defect level of about 0.017% (see NUREG/CR-1818, "Fuel Performance Annual Report for 1979").

Because the size and type of fuel rod cladding defects vary, (i.e., there is no "standard defect"), the actual release rates associated with fuel rod failures may vary significantly. However, estimates of the approximate number of fuel failures in an operating PWR are customarily obtained from the coolant activity based on radioiodine levels. Those activity values are reported

regularly, and yearly summaries of operational experience with Westinghouse cores are provided in a series of non-proprietary Westinghouse reports (see Revision 10 of WCAP-8183 for experience up to December 31, 1980). For example, Table 5-2 of WCAP-8183, Revision 10, provides coolant activities for 30 domestic and foreign Westinghouse plants as a percentage of design basis activity for the fourth quarter 1980. The reported coolant activities are typically well below the levels associated with 0.12% cladding defects.

In summary, failed fuel estimates are routinely made from coolant activities that are regularly reported for all Westinghouse plants. Based on the most recent information, typical failed fuel levels are about an order of magnitude less than the 0.12% value assumed in the PWR-GALE code calculations. While the NRC does not routinely perform fuel examinations of its own, the staff monitors performance information of various kinds and has issued annual reports since 1978 on fuel performance in US LWRs (NUREG/CR-2410 is the latest in the series).

CMEC Interrogatory 2

Are there any independent or NRC studies that confirm any values for radionuclide buildups in the primary system?

Response

A multitude of NRC and independent studies have been performed to predict, analyze, and measure primary system radionuclide buildup. All gaseous and liquid source terms have been evaluated to include origin, transport, buildup, and removal of radioactive materials. Predictive models have been developed which reflect the experience of operating reactors, tests and experiments, and established principles. A listing of several such studies is provided along with a general discussion.

The scope of NRC and independent studies on radionuclide buildup in the primary system of PWR reactors ranges from predictive (e.g., based on materials, operating coditions, and experience) through experimental (e.g., based on testing at power reactors and test reactors) and empirical (e.g.,

based on observations made under varying operating conditions over full reactor life and decommissioning). These studies dwell primarily on mechanisms which may affect fission product release and corrosion product formation and buildup in all phases of an anticipated 40 year life cycle followed by decommissioning. For example, the PWR-GALE code (NUREG-0017) is used to evaluate radionuclide concentrations from primary system sources and to establish the bases for these values. All significant values of radionuclide concentrations are listed in Chapter 2 of NUREG-0017. Various decontamination and decommissioning studies (e.g., NUREG/CR-1915) reference measurements and technical evaluations of primary system radionuclide buildup. Fuel performance studies are used to assess fission product release and transport. The NRC is presently funding directly related studies at Battelle Pacific Northwest Laboratories: "Corrosion Product Buildup" (FIN No.: B2414) and "Decontamination Effectiveness and its Impact on Occupational Exposure Reduction (FIN No.: B2412). Selected objectives of these studies are to (a) develop a method to predict occupational exposures caused by deposition of radioactive corrosion products; (b) review and use newly developed and existing data from power reactor experience to update information related to occupational doses and corrosion product buildup; (c) quantitatively relate working dose rates and occupational exposure to corrosion product buildup and location; (d) evaluate means of reducing exposure rates; and (e) develop a predictive model for the transport and buildup of corrosion products, evaluate decontamination of fuel surfaces, and develop a dose assessment model based on radionuclide inventory and tasks to be performed.

For both primary coolant and primary system surfaces, the isotopic composition, buildup and deposition rates, and factors affecting equilibrium and transient radionuclide composition and concentration appear to be well known. Extensive NRC and industry efforts are in progress to use this information in achieving ALARA (As Low As is Reasonably Achievable) doses at nuclear power reactors. A selected listing of NRC, NRC sponsored, or independently performed assessments (chosen for emphasis on PWR's) of radionuclide buildup in the primary system is provided in an attachment, and those references in turn contain further references to yet more basic information sources.

Additionally, license dose rate and radiochemistry measurements are verified by the NRC's Inspection and Enforcement Office's own field measurements. However, these are not now collated for more generic evaluation.

In summary, anticipated values of radionuclides in the primary system, and the factors which influence their buildup, are generally well-known and in acceptable agreement with measured values. Extensive studies of fuel performance, release and transport of fission products, and development and buildup of corrosion products have been and continue to be performed.

ATTACHMENT 1

NRC Contracted/Generated Reports:

NUREG-0017	Calculations of Releases of Radioactive Materials in Gaseous and Liquid Effluents for Pressurized Water Reactors (PWR-GALE Code).
NUREG-0032	Fuel Performance of Licensed Nuclear Power Plants Through 1974.
NUREG-0401	Fuel Failure Detection in Operating Reactors
NUREG-0418	Fission Gas Release from Fuel at High Burnup
NUREG-0581	Summary of NRC LWR Safety Research Programs on Fuel Behavior, Metallurgy and Materials and Operational Safety
NUREG/CR-0141	The Use of Filtration to Treat Radioactive Liquids in Light Water Cooled Nuclear Reactor Power Plants
NUREG/CR-0413	The Use of Ion Exchange to Treat Radioactive Liquids in Light Water Cooled Nuclear Reactor Power Plants
NUREG/CR-0202,	GRASS-SST: A Comprehensive Mechanistic Program for the Prediction of Fission Gas Behavior in UO_2 Based Fuel During Steady State and Transient Conditions.
NUREG/CR-0274	Fission Product Release From Simulated LWR Fuel
NUREG/CR-0417	Quarterly Progress Report on Fission Product Behavior in LWRs for the Period January to March 1979.

NUREG/CR-0682	Fission Product Behavior in LWRs
NUREG/CR-0697 NUREG/CR-0698	Fission Product Transport Analysis Quarterly Programs Reports.
NUREG/CR-0722	Fission Product Release from Highly Irradiated LWR Fuel
NUREG/CR-1344	Embrittlement Criteria for Zircaloy Fuel Cladding Applicable to Accident Situations in Light Water actors: Summary Report
NUREG/CR-1386	Fission Product Release From Highly Irradiated LWR Fuel Heated 1300-1600°C in Steam.
NUREG/CR-1471	An Assessment of LWR Fuel Failure Propagation Potential: Literature Survey.
NUREG/CR-1674	Fission Product Release from LWR Failed Fuel During PCM and RIA Transients.
NUREG/CR-1844	Analyses of Surface Displacement of Zircaloy Fuel Cladding in the Hobbie Creepdown Irradiation Experiments
NUREG/CR-1915	Decontamination Processes for Restorative Operations and as a Precurrsor to Decommissioning: A Literiature Review.
NUREG/CR-1992	In Plant Source Terms Measurements at Four PWR's

ATTACHMENT 1

ELECTRIC POWER RESEARCH INSTITUTE
CHEMISTRY & RADIATION CONTROL
PROGRAM REPORTS

Document Number	Date	Title	Contract/Author Project Number
EPRI 404-2	12/75	Primary System Shutdown Radiation Levels at Nuclear Power Generating Stations	Nuclear Waste and Waste Technology RP404-2
EPRI NP340	4/77	Oconee Nuclear Station Unit One Cycle Two Refueling Shutdown Primary System Radiation Level	Babcock & Wilcox TPS76-634
None	3/76	Proceedings of the System Contamination Workshop, March 15-17, 1976	
BNSA 703	8/77	Investigation of Alternate Methods of Chemical Decontamination	Battelle Northwest Laboratories RP828
WCAP 7708	5/71	Revision of CORA — A Computer Code for Calculating the Activation of Corrosion Products in Reactor Systems	Westinghouse
NEDC 12646-1 NEDC 12646-2 NEDC 12646-3	5/77 5/77 5/77	Radioisotope Activities on BWR Primary System Piping — 3 Volumes	General Electric
NEDC 13461	3/77	Contribution of Fuel Rod Deposits to the Build-up of Radiation on Out-of-Core Surfaces of the Nine Mile Point 1 BWR	General Electric
NEDC 21550	6/77	Summary Report Water Chemistry Program Extension	General Electric
NEDM 23647-1	7/77	Water Quality Performance of a BWR/4 with Forward-Pumped Heater Drains — Interim Report	General Electric RP819
NEDM 23647-2	8/77	Corrosion Product Sample Results from Brunswick-2	General Electric RP819
NEDC 12688	12/77	BWR Radiation Level Surveillance	General Electric RP819
BN-SA-703-2	6/78	Investigation of Alternate Methods of Chemical Decontamination, Second Progress Report	Battelle Northwest Laboratories RP828
None	2/78	First Progress Report on Properties of Colloidal Corrosion Products and Their Effects on Nuclear Power Plants	Clarkson College RP966
EPRI NP-692	4/78	Effects of Hydrogen Peroxide Additions on Shutdown Chemistry Transients at Pressurized Water Reactors	Nuclear Waste and Water Technology RP821
EPRI NP-514	5/78	Study of Magnetic Filtration Applications to the Primary and Secondary Systems of PWR Plants	Westinghouse TPS76-665
EPRI NP-333	8/78	A Study of Preoperational Practices in Nuclear Power Plants	NUS TPS76-643

ATTACHMENT 1

ELECTRIC POWER RESEARCH INSTITUTE
CHEMISTRY & RADIATION CONTROL
PROGRAM REPORTS

Document Number	Date	Title	Contract/Author Project Number
None	9 78	A Method for Trace Analysis of Cobalt and Its Application to Synthetic Reactor – Crud Solubility Measurements	Westinghouse RP825-2
WCAP 9407	11 78	Some Observations on the Possible Relationship of Reactor Coolant Chemistry and Radiation Level Build-up	Westinghouse RP825-2
NP-949	12 78	Characterization of Corrosion Products on Recirculation and Bypass Lines at Millstone-1	General Electric RP819
NP-332	5 79	Evaluation of Operational Techniques that Can Reduce Radiation Fields	Nuclear Services Corporation RP820
NP-1033	5 79	Literature Review of Dilute Chemical Decontamination Processes for Light Water Cooled Nuclear Power Plants	Battelle Northwest Laboratories RP828
NP-522	5 79	A Survey of Corrosion Product Generation, Transport, and Deposition	Battelle Columbus Laboratories TPS-76-663
To be published		The Effect of Thermal and Hydraulic Disturbances on PWR Radiation Fields	Babcock & Wilcox RP825-1
		A Study of the Effects of Once-Through Steam Generator External Heating on Radiation Fields	Babcock & Wilcox RP825-1
		First Progress Report on Radiation Control in PWR Plants	Babcock & Wilcox RP825-1
		Radiation Field Monitoring at PWR Plants	Westinghouse RP825-2
		Shutdown Operational Techniques for Radiation Control in PWR Plants	Westinghouse RP825-2
		First Progress Report on BWR Radiation Assessment and Control	General Electric
		First Progress Report on Radiation Control in PWR Plants	Westinghouse RP825-2

ATTACHMENT 1

ADDITIONAL NRC AND INDEPENDENT STUDIES

1. "Calculation of Releases of Radioactive Materials in Gaseous and Liquid Effluents from Pressurized Water Reactors (PWR-GALE Code)," Office of Standards Development, U. S. Nuclear Regulatory Commission, NUREG-0017, April 1976. *

2. N. C. Dyer, J. H. Keller, et al., "In-Plant Source Term Measurements at Fort Calhoun Station - Unit 1," Idaho National Engineering Laboratory, EG&G Idaho, Allied Chemical Corp., NUREG/CR-0140, July 1978. *

3. N. C. Dyer, J. H. Keller, et al., "In-Plant Source Term Measurements at Zion Station," Idaho National Engineering Laboratory, EG&G Idaho, Allied Chemical Corp., NUREG/CR-0715, February 1979.*

4. J. W. Mandler, B. G. Motes, et al., "In-Plant Source Term Measurements at Turkey Point Station - Units 3 and 4," Idaho National Engineering Laboratory, EG&G Idaho, Allied Chemical Corp., In Press.

5. J. W. Mandler, B. G. Motes, et al., "In-Plant Source Term Measurements at Rancho Seco Station," Idaho National Engineering Laboratory, EG&G Idaho, Exxon Nuclear Idaho Co., In Press.

6. N. C. Dyer, J. H. Keller, et al., "Procedures, Source Term Measurement Program," Idaho National Engineering Laboratory, EG&G Idaho, Allied Chemical Corp., NUREG-0384, December 1977. *

7. S. W. Duce, J. H. Keller, and J. L. Thompson, "An Atmospheric Tritium and Carbon-14 Monitoring System," Idaho National Engineering Laboratory, Allied Chemical Corp., NUREG/CR-0386, September 1978. *

8. "American National Standard, Source Term Specification," American Nuclear Society, ANS-18.1, ANSI N237-1976, May 1976.

9. P. Cohen and G. R. Taylor, "Ion Exchange with Equilibrium and Decay," WCAP-1700 (January 1961).

10. A. S. Kesten, "Mathematical Description of the Transient Behavior of a Fixed Bed Ion-Exchange System fo Removal of Radioactive Material," Bettis Technical Review, Reactor Technology, WAPD-BT-20, September, 19 p. 83 ff.

11. W. D. Fletcher, "Ion Exchange in Boric Acid Solutions with Radioactive Decay," WCAP-3716 (November 1962).

12. G. Frejaville, M. Lott, A. Marchal, "Corrosion Product Activity in the Primary Coolant Water of the CHOOZ Reactor," CEA-CONF-2219.

13. J. W. Kormuth, "The Control of ^{58}Co Dissolution During Refueling Shutdowns of PWRs Using Hydrogen Peroxide Addition," Trans. Am. Nucl. Society, Vol. 26, p. 426, June 1977.

14. G. P. Simon, C. S. Abrams, and W. R. Lindsay, Jr., "The Performance of Base-Form Ion Exchangers for pH Control and Removal of Fission Products from Pressurized Water Reactors," WAPD-CDA(AD)-528 (1959).

15. C. A. Pelletier et al., "Sources of Radioiodine at Pressurized Water Reactors," Science Applications, Inc., EPRI Report NP-939, November 1978.

16. C. A. Pelletier et al., "Sources of Radioiodine at Boiling Water Reactors," Science Applications, Inc., EPRI Report NP-495, February 1978.

17. C. Pelletier et al., "Evaluation of Radioiodine Measurements at Pilgrim Nuclear Power Plant," Science Applications, Inc., NUREG/CR-0395, October 1978. *

18. C. A. Pelletier et al., "Sources of Radioiodine at Boiling Water Reactors," Science Applications, Inc., EPRI Report NP-45, February 1978.

19. A. C. Chamberlain, et al., "Behavior of Iodine Vapour in Air," Disc. Faraday Soc. (no. 30), 162 (1960).

20. W. J. Megaw and F. G. May, "The Behavior of Iodine Released in Reactor Containers," J. Nucl. Energy (Parts A/B), 16, 427 (1962).

21. R. T. Hemphill and C. A. Pelletier, "Surface Effects in the Transport of Airborne Radioiodine at Light Water Nuclear Power Plants," Science Applications, Inc., EPRI Report NP-876, (September 1978).

22. C. A. Pelletier, et al., "Long Term Performance of Charcoal Adsorbers Removing Radioiodine in Ventilation Exhaust Air," Science Applications, Inc., EPRI Report NP-534, July 1978.

23. V. R. Dietz, "Effects of Weathering on Impregnated Charcoal Performance," NUREG/CR-0771, May, 1979. *

24. Y. Ben-Haim, "Design Against Weathering of Iodine Filters," Nuclear Technology, 47, January, 1980.

25. J. G. Wilhelm, et al., "Testing of Iodine Filter Systems Under Normal and Post-Accident Conditions," 12th AEC Air Cleaning Conference, CONF-720823, 1972.

26. V. R. Dietz, et al., New Charcoal Impregnants for Trapping Methyl Iodide, 14th ERDA Air Cleaning Conference, CONF-760822, 1976.

NRC STAFF RESPONSES TO CMEC "DISCOVERY #1--
ROUTINE TRITIUM RELEASES FROM CATAWBA"

Interrogatory 3

Table 3.10 in the December 1973 FES for Catawba estimates an annual release of 350 Ci per unit of tritium in liquid effluent.

Table 3.4 in the April 1976 FES for McGuire (NUREG-0063 estimates an annual release of tritium per reactor of 960 Ci.

Table 3.13 in the October 1972 FES for McGuire estimates an annual release of 1000 Ci tritium per reactor. In support of this figure, the FES cites "detailed evaluation of similar reactors." (page 3-42).

Inasmuch as the design of McGuire and Catawba are essentially similar, and inasmuch as there is a large difference between a 350 Ci per unit p.a. release and a 1000 Ci per unit p.a. release, Intervenor requests both Applicant and Staff to account for this three-fold discrepancy, asking specifically:

a. On what facts are these tritium release estimates based?

b. If the discrepancy in the estimates is based on design differences in the two plants, what are these design differences?

c. If the discrepancy arises from improved tritium control in the Catawba design, specifically what are the improvements?

In respect to the problem of gaseous releases of tritium from Catawba, Intervenor requests the following information:

d. How many curies of tritium do Applicant and Staff anticipate will be released from Catawba?

e. What is the basis of Applicant's and Staff's projections of gaseous tritium releases?

f. What percentage of gaseous tritium release does Applicant and Staff project as being returned to the Catawba River through 'rain-out' or other means? Intervenor requests that this information be given for the Catawba River at two points; the Charlotte Water Intake and the dam at Lake Wylie.

Intervenor requests the following information about tritium release procedures at Catawba:

g. How frequently will tritium be released at Catawba in the liquid effluent?

h. How frequently will tritium be released as gaseous effluent i.e., as tritiated water vapor and how will its radioactivity be monitored?

Intervenor requests the following information about somatic and genetic effects of ingested tritiated water:

i. Inasmuch as, owing to the established fact of tritium--hydrogen exchange, tritium will replace normal hydrogen throughout the body fluids and cellular tissue until the tritium/hydrogen ratio in body fluid and cellular tissue is in equilibrium with the tritium/hydrogen ration in the drinking water, on what studies do Applicant and Staff base their contention that further tritiating the drinking water of communities along the Catawba River will result in no adverse genetic and health effects?

Responses:

a. The Staff estimated the tritium releases in liquid effluents from pressurized water reactors based on measured releases from operating plants. For McGuire, in 1972, the average annual liquid release of tritium was based on data from seven PWRs that averaged 1000 Ci/year/reactor. For Catawba, in 1973, the average annual liquid release of tritium was based on data from three PWRs with experience using zircaloy clad fuel (replacing the older stainless steel clad fuel) having an average of 350 Ci/year/reactor. For McGuire, in 1976, the method of calculating tritium releases was updated (1) to account for tritium production due to reactor power level (2) to account for tritium inventory and decay due to reuse of tritiated water, and (3) to account for tritium in gaseous

releases due to mechanisms such as evaporation. The Staff methodology and bases was provided in NUREG-0017, "Calculation of Releases of Radioactive Materials in Gaseous and Liquid Effluents from PWRs", April 1976. The liquid releases of tritium for McGuire were re-calculated to be 470 Ci/year/reactor in Table 3.3 of the FES (NUREG-0063), and was based on measured releases from nine PWRs that used zircaloy clad fuel and started commercial operation before mid-1973. The apparent difference in the estimated tritium release in liquid effluents at McGuire is due to improved methods for calculating these releases based on additional historical data from operating reactors. The Staff has not yet completed its re-calculation of tritium releases in liquid effluents from Catawba using the methodology of NUREG-0017.

b. The design of the two plants is similar. Therefore, the tritium releases will be similar for McGuire and Catawba.

c. There are no "improved tritium controls" in the Catawba design. Therefore, the tritium releases will be similar for McGuire and Catawba.

d. At this time, the Staff has not yet completed its re-calculation of tritium releases from Catawba. This information will be provided in the DES (OL) for Catawba.

e. The bases for the Staff estimate of tritium releases in gaseous effluents is provided in NUREG-0017, page 2-29.

f. Approximations of the percentage deposition of gaseous tritium in any area can be made by examining the estimated tritium deposition rate at a site and the area over which the deposition occurs. For deposition through atmospheric processes directly into the Catawba River at Lake Wylie Dam located approximately 4 miles from the plant in the ESE sector, the deposition of tritium is expected to be less than 1% of the gaseous tritium releases. Similarly, for deposition through atmospheric processes directly into the Catawba River at the Charlotte Water Intake located approximately 7 miles from the plant in the NNE sector, the tritium deposition is expected to be less than 1% of the gaseous tritium releases.

g. Tritium releases in liquid effluents during normal operation will be a batch basis, from monitoring tanks, into a continuous dilution/effluent stream. The frequency of batch releases will depend on plant operating conditions, but were assumed in the FES (CP) for Catawba to be approximately weekly.

h. Tritium releases in gaseous effluents are expected to be continuous during normal operation. Tritiated water vapor in gaseous effluents will be continuously sampled and analyzed monthly by laboratory instrumentation.

i. The staff has not completed its calculations of the radiological impacts from the Catawba Nuclear Station. The staff will address the potential health effects (i.e., somatic and genetic) from exposure to radioactive effluents released from Catawba in the Draft Environmental Statement.

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
(Catawba Nuclear Station, Units 1 and 2)	)	50-414

Affidavit of Michael Tokar

Michael Tokar deposes and states under oath as follows:

1. I am a Reactor Engineer, Reactor Fuels Section, Core Performance Branch, Division of Systems Integration, U.S. Nuclear Regulatory Commission. I am responsible for analyzing and evaluating reactor fuel system design practices as submitted by applicants and licensees of nuclear reactors. I have specialized skill in the area of ceramics, metallurgy, and fuel rod design, and the interpretation of the chemical and metallurgical behavior of the fuel system. In evidence of that specialized skill, I hold a Ph.D degree in ceramic engineering, an M. S. degree in metallurgy, a B. S. degree in metallurgical engineering, and approximately 15 years experience in reactor fuels research and development and performance evaluation.

2. The response to Charlotte-Mecklenburg Environmental Coalition Interrogatory 1 as presented by letter, dated February 8, 1982, from Henry Presler, was prepared by me. I am duly authorized to participate in responding to this interrogatory, and I hereby cerify that the answer given by me is true and accurate to the best of my knowledge.

Michael Tokar

Michael Tokar
Reactor Fuels Section
Core Performance Branch

Subscribed and sworn to before me
this 2nd day of April 1982.

Judy L Suttle
Notary Public

My Commission Expires: July 1, 1982

UNITED STATES OF AMERICA

NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING APPEAL BOARD

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

AFFIDAVIT OF RICHARD JOHN SERBU

I Richard John Serbu being duly sworn, depose and state that:

1. I am an employee of the U. S. Nuclear Regulatory Commission (NRC). My present position is Radiological Engineer, Radiological Assessment Branch, Division of Systems Integration within the Office of Nuclear Reactor Regulation. A copy of my professional qualifications is attached.

2. I am duly authorized to respond to the Charlotte-Mecklenburg Environmental Coalition question 2 as presented by letter, dated February 8, 1982, from Henry Presler, and I hereby certify that the statements and opinions given are true and correct to the best of my personal knowledge and belief.

Richard John Serbu

Subscribed and sworn to before me
this 2nd day of April 1982.

Patricia J. Noonan Notary Public

My Commission Expires: July 1, 1982

UNITED STATES OF AMERICA

NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

RICHARD JOHN SERBU

PROFESSIONAL QUALIFICATIONS

I am presently assigned as a Radiological Engineer with the Radiation Protection Section of the Radiological Assessment Branch, Division of Systems Integration, Office of Nuclear Reactor Regulation, U. S. Nuclear Regulatory Commission.

I graduated from the State University College of New York at Potsdam with a Bachelor of Arts Degree in Chemistry. I have work in a professional capacity in the field of radiation protection/health physics in association with nuclear power reactors since June 1973.

From June 1973 to April 1980, I held positions as Project Engineer, Dosimetry and Health Physics; Manager, Radiological Monitoring; Project Engineer, Radiological Training; Radiological Controls Supervisor; and Instructor, Chemistry and Radiological Controls at Knolls Atomic Power Laboratory. My responsibilities at KAPL included development, implementation, and management of radiological training programs, operational health physics/ALARA programs, and dosimetry programs. This includes broad experience in all aspects of reactor health physics/radiation protection; familiarity with reactor systems; radiation protection aspects of reactor startup; radiation protection for maintenance and refueling/overhaul; chemistry control programs; and compliance with established requirements. Since April of 1980, I have been with the Nuclear Regulatory Commission as a radiological engineer. In this capacity, I am responsible for the review and evaluation of radiation protection/ALARA (As Low As Reasonably Achievable) aspects of nuclear power reactor facility equipment and design, planning and procedure programs, and techniques and practices which are employed by nuclear reactor licensees and license applicants in meeting the standards for protection against radiation of 10 CFR Part 20.

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 J. S. BOEGLI

I, J. S. Boegli, being sworn do depose and state that:

1. I am an employee of the U.S. Nuclear Regulatory Commission in the Effluent Treatment Systems Branch, Office of Nuclear Reactor Regulation. I am responsible for the review and evaluation of radioactive waste treatment and effluent control systems and for the calculation of effluent source terms for nuclear power reactors. My professional and education qualifications are attached to this statement.

2. I am duly authorized to participate in answering Interrogatory 3a, b, c, d, e, g and h and I hereby certify that the answers given are true to the best of my knowledge.

J S Boegli
J. S. Boegli

Subscribed and sworn to before me
this 2nd day of April, 1982

Claire G. Harwood
Notary Public

My Commission expires: July 1, 1982

J. S. Boegli
Professional Qualifications
Office of Nuclear Reactor Regulation

My name is J. S. Boegli. I am a lead nuclear engineer in the Effluent Treatment Systems Branch in the Office of Nuclear Reactor Regulation.

I attended Case Institute of Technology and was granted a B.S. in Chemical Engineering from Indiana Technical College in 1951. In 1952, I received a M.S. Degree in Chemical Engineering from Kansas State College and in 1955 to 1956 I completed advanced courses in chemical and nuclear engineering at the University of Michigan and applied Health Physics training at the Oak Ridge National Laboratory.

From 1953 to 1973 I was employed by the National Aeronautics and Space Administration and held positions as research engineer in heat and mass transfer, design engineer in nuclear reactor coolant, utilities, ventilation and radwaste systems, process systems supervisor, and technical consultant at the NASA Plum Brook Reactor in Ohio.

In July 1973, I joined the NRC (formerly AEC) as a senior nuclear engineer in the Effluent Treatment Systems Branch. I evaluate nuclear power plant systems and equipment for fission product removal, treatment of gas, liquid and solid radioactive waste, and radiation safety proposals as provided by license applicants to meet applicable NRC regulations. The duties involve development analytical models and performing calculations on the effectiveness of proposed radwaste systems, studying technological improvements and developing criteria governing radwaste processing, monitoring, shielding and handling. I evaluate the impact of radioactive effluents on the environs and prepare the radwaste section of the Environmental Statement for nuclear facilities.

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
	)	414
(Catawba Nuclear Station, Units 1&2	)	

AFFIDAVIT OF JAMES E. FAIROBENT

I James E. Fairobent being duly sworn, depose and state that:

1. I am an employee of the U. S. Nuclear Regulatory Commission (NRC). My present position is Meteorologist, Meteorology Section, Accident Evaluation Branch, Division of Systems Integration within the Office of Nuclear Reactor Regulation. A copy of my professional qualifications is attached.

2. I am duly authorized to participate in answering Interrogatory f, and I hereby certify that the answers given are true to the best of my knowledge.

James E. Fairobent

James E. Fairobent

Subscribed and sworn to before me
this 2nd day of April 1982.

Claire G. Thurston, Notary Public

My Commission Expires:
July 1, 1982

James E. Fairobent
Meteorology Section
Accident Evaluation Branch
Division of Systems Integration

Office of Nuclear Reactor Regulation

Professional Qualifications

I have been a Meteorologist with the Atomic Energy Commission, Directorate of Regulation, and subsequently the Nuclear Regulatory Commission, Office of Nuclear Reactor Regulation, since February 1973.

I received a B.S. degree with a major in meteorology from the University of Michigan in 1970. While an undergraduate, I participated in a study of precipitation scavenging by convective storms which included field research programs in Oklahoma and Illinois. My responsibilities included maintenance of a precipitation collection network, analyses of mesoscale weather systems conducive of the formation of convective storms, and neutron activation and radio-chemistry analyses of rainwater samples.

I entered the graduate program at the University of Michigan in 1971, and was awarded an M.S. degree with a major in meteorology in 1972. I continued my association with the precipitation scavenging project as a graduate student as well as becoming weather observer at the University of Michigan climatological station and a teaching fellow.

I accepted my present position in February 1973. I am responsible under the supervision of the Meteorology Section Leader, for the evaluation of the meteorological characteristics of reactor sites and their implications with respect to safety requirements of nuclear facility design and the impact of these facilities on the environment. Since 1973, I have participated in the safety and environmental reviews of about 40 nuclear power plant sites.

I worked as a meteorologist for the National Commission on Air Quality from June 1979-March 1981 evaluating the Clean Air Act.

I returned to the NRC in March 1981 and resumed my former duties.

I am a member of the American Meteorological Society, and the American Association for the Advancement of Science. I am an associate member of the Scientific Research Society of North America.

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&2)	)	

AFFIDAVIT OF EDWARD F. BRANAGAN, JR.

I, Edward F. Branagan, Jr., being duly sworn, depose and state that:

1. I am an employee of the U. S. Nuclear Regulatory Commission (NRC). My present position is Radiological Physicist in the Radiological Assessment Branch, Division of Systems Integration within the Office of Nuclear Reactor Regulation. A copy of my professional qualifications is attached.

2. I am duly authorized to participate in answering Interrogatory i, and I hereby certify that the answers given are true to the best of my knowledge.

Edward F. Branagan, Jr.

Edward F. Branagan, Jr.

Subscribed and sworn to before me
this 2nd day of April 1982.

Claire A. Harvey, Notary Public

My Commission Expires:
July 1, 1982

Professional Qualifications

My name is Edward F. Branagan, Jr. I am a Radiological Physicist with the Radiological Assessment Branch in the Office of Nuclear Reactor Regulation of the U.S. Nuclear Regulatory Commission (NRC). Presently, I am responsible for evaluating the environmental radiological impacts from nuclear power reactors. In particular, I am responsible for evaluating radioecological models and health effect models for use in reactor licensing. I have been with the Radiological Assessment Branch for about 3 years.

I received a B.A. in Physics from Catholic University in 1969, an M.A. in Science Teaching from Catholic University in 1970, and a Ph.D. in Radiation Biophysics from Kansas University in 1976. While completing my course work for my Ph.D., I was an instructor of Radiation Technology at Haskell Junior College. My research work was in the area of DNA base damage, and was supported by a U.S. Public Health Service traineeship. My dissertation was entitled "Nuclear Magnetic Resonance Spectroscopy of Gamma-Irradiated DNA Bases."

Since joining the NRC in 1976, I have been with both the Office of Nuclear Material Safety and Safeguards (NMSS), and with the Office of Nuclear Reactor Regulation (NRR). In NMSS I was involved in project management and technical work. I was the project manager for two contracts that the NRC had with Oak Ridge National Laboratory. These contracts were concerned with estimating radiation doses from radon-222 and radium-226 releases from uranium mills. As part of my work on NRC's Generic Environmental Impact Statement on Uranium Milling (GEIS), I estimated health effects from uranium mill tailings. Upon publication of the GEIS, I presented a paper entitled "Health Effects of Uranium Mining and Milling for Commercial Nuclear Power" at a Conference on Health Implications of New Energy Technologies. Since joining NRR, I have worked on several projects: (1) managed and main author of a report entitled "Staff Review of 'Radioecological Assessment of the Wyhl Nuclear Power Plant'" (NUREG-0668), (2) served as a technical contact on an NRC contract with Argonne National Laboratory involving development of a computer program to calculate health effects from radiation, (3) served as a technical monitor on an NRC contract with Idaho National Engineering Laboratory involving estimated and measured concentrations of radionuclides in the environment; (4) served as a technical monitor on an NRC contract with Lawrence Livermore Laboratory concerning a literature review of values for parameters in terrestrial radionuclide transport models; and (5) served as a technical monitor on an NRC contract with Oak Ridge National Laboratory concerning a statistical analysis of dose estimates via food pathways.

Presently, I am a member of the Health Physics Society and the American Association for the Advancement of Science.