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BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

OFFICE OF SECRETARY
DOCKETING & SERVICE
BRANCH

In the Matter of	)	
	)	
GEORGIA INSTITUTE OF TECHNOLOGY	)	Docket No. 50-160-Ren
	)	
(Georgia Tech Research Reactor)	)	
	)	
(Renewal of License No. R-97)	)	

NRC STAFF (PANEL A) TESTIMONY OF
DOUGLAS M. COLLINS, PAUL E. FREDRICKSON,
ALBERT F. GIBSON, AND GEORGE B. KUZO
CONCERNING GANE CONTENTION 9 (MANAGEMENT)

Q1. Please state your names, occupations and by whom you are employed.

A1(a). (DMC) My name is Douglas M. Collins. I am employed by the U.S. Nuclear Regulatory Commission as the Deputy Director, Division of Nuclear Materials Safety (DNMS), NRC Region II. I have held this position since August 1995. A statement of my professional qualifications is attached hereto.

A1(b). (PEF) My name is Paul E. Fredrickson. I am employed by the U.S. Nuclear Regulatory Commission as the Chief, Special Inspection Branch (SIB) in the Division of Reactor Safety (DRS), NRC Region II. I have held this position since October 1995. A statement of my professional qualifications is attached hereto.

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A1(c). (AFG) My name is Albert F. Gibson. I am employed by the U.S. Nuclear Regulatory Commission as the Director, Division of Reactor Safety, NRC Region II. I have held this position since September 1985. A statement of my professional qualifications is attached hereto.

A1(d). (GBK) My name is George B. Kuzo. I am employed by the U.S. Nuclear Regulatory Commission as a Senior Radiation Specialist in the Plant Support Branch, Division of Reactor Safety, NRC Region II. I have held this position since December 1995. A statement of my professional qualifications is attached hereto.

Q2. Please describe your current responsibilities.

A2(a). (DMC) I am currently responsible for management of the implementation of the inspection program for non-power reactors, fuel facilities, and materials licensees in NRC Region II, as part of the NRC Staff's inspection and enforcement of licensee compliance with NRC regulations and license requirements. This includes non-power reactors at the Georgia Institute of Technology, North Carolina State University, the University of Florida, and the University of Virginia.

A2(b). (PEF) I currently serve as the NRC Region II branch chief in charge of managing most new and specialized nuclear power reactor inspection initiatives, and also the following regular inspection activities: physical security, fire protection, reactor physics and motor operated valves.

A2(c). (AFG) As the Director of the Division of Reactor Safety, I am responsible for managing the implementation of inspection and operator licensing

programs at power reactors in NRC Region II. I also have some responsibility for the NRC Staff's inspection of research reactors, such as the reactor at Georgia Tech, which is limited to providing occasional inspection assistance to other Divisions (such as the Division of Nuclear Materials Safety, which has principal responsibility for inspection of research reactors) when specialized expertise available in the Division of Reactor Safety is needed. In addition, prior to December 26, 1990, the Division of Reactor Safety was responsible for administering the operator licensing program for research reactors; these duties were transferred to the Office of Nuclear Reactor Regulation (NRR) on that date.

A2(d). (GBK) I currently serve as a Senior Radiation Specialist in the Plant Support Branch, Division of Reactor Safety, NRC Region II. I am responsible for the inspection of radiation protection activities as part of the NRC Staff's inspection and enforcement of licensee compliance with NRC regulations and license requirements by commercial power reactors. My specific inspection responsibilities include review and evaluation of various licensees' environmental monitoring, radiation protection and chemistry programs.

Q3. What is the purpose of this testimony?

A3. (All) The purpose of this testimony is to describe the NRC inspection and enforcement history pertaining to the Georgia Tech Research Reactor (GTRR) during the period 1987-1988, and to provide the NRC Staff's views concerning the importance of those events with respect to the adequacy of the Licensee's management of the GTRR.

Q4. Please describe the extent to which you have been involved with the NRC Staff's inspection and oversight of the management and operation, by the Georgia Institute of Technology ("Georgia Tech" or "the Licensee") of the Georgia Tech Research Reactor (GTRR).

A4(a). (DMC) From February 1984 to April 1984, I was Chief of the Emergency Preparedness and Materials Safety Branch, Division of Emergency Preparedness and Materials Safety Programs. During this period, I was responsible for the management of emergency preparedness inspections and related enforcement at non-power reactors in Region II, including the GTRR. From April 1984 to September 1991, I was Chief of the Emergency Preparedness and Radiological Protection Branch, Division of Radiation Safety and Safeguards, in NRC Region II; in that capacity, until April 1989, I was responsible for the management of emergency preparedness and radiological protection inspections and related enforcement at non-power reactors in NRC Region II, including the GTRR. As part of my responsibilities during that period, I participated in NRC management's oversight of the inspection efforts concerning the GTRR, including the NRC's determination to issue enforcement Orders to the Licensee in January and March 1988, and a Civil Penalty against the Licensee in November 1988, and the decision, in November 1988, to allow restart of the reactor.

From April 1989 until October 1991, I was responsible for managing implementation of the emergency preparedness inspection program at non-power reactors in NRC Region II, including the GTRR. Since October 1991, I have been responsible for the management of inspections at all non-power reactors in NRC Region II either as

Chief of the Nuclear Materials Safety and Safeguards Branch, or as Deputy Director, Division of Nuclear Materials Safety. During these assignments, I became familiar with, and was responsible for management of various aspects of the NRC Staff's inspection and enforcement efforts concerning Georgia Tech's operation of its GTRR facility. In addition, during portions of the period from February 1983 to the present, I have been responsible, at various times, for management of the NRC Staff's emergency preparedness, security, and radiological protection inspections at non-power and power reactors, fuel facilities, and materials licensees in NRC Region II.

A4(b). (PEF) I was assigned to serve as a Section Chief in the Division of Reactor Projects in March 1985. During this assignment, until January 1989, I became familiar with, and was partially responsible for the NRC Staff's inspection and enforcement efforts concerning Georgia Tech's operation of its GTRR facility. In particular, in January 1988, I served as team leader of the NRC Staff's special inspection team that reviewed the 1987 Cadmium-115 spill event and, commencing in August 1988, I also served as the team leader for the special inspection that reviewed the areas addressed in the January and March Orders to determine whether Georgia Tech had complied with the terms of these Orders. I also participated in the decision-making process to determine what, if any, further enforcement action should be taken and if the Licensee should be allowed to restart the reactor.

In addition, I was responsible for managing the NRC Staff's inspection and enforcement of licensee compliance with NRC regulations and license requirements by other non-power reactors in NRC Region II, including the University of Virginia, North

Carolina State University and the University of Florida. Since being reassigned to another position in January 1989, I have not had any further responsibilities involving non-power reactors including the GTRR.

A4(c). (AFG) I have held various management positions in NRC Region II from 1974 to the present. During this time, a number of the inspectors who worked for me performed inspections of the Georgia Tech Research Reactor, in the areas of Health Physics and Operations. In addition, I was tasked with the responsibility for inquiring into and resolving issues raised by one of our inspectors (Anne Rebecca Long) concerning NRC Region II's disposition of certain findings reported in Inspection Report No. 87-01.

A4(d). (GBK) I was assigned to the Facilities Radiation Protection Section, Emergency Preparedness and Radiological Protection Branch, Division of Radiation Safety and Safeguards from January 1987 through April 1992. In this position, I was assigned to inspect and evaluate environmental monitoring, radiation protection and chemistry programs of many NRC licensees, including research reactors, and to participate in other inspections and technical phases of investigations as assigned. During this assignment I became familiar with, and was responsible for certain inspection and enforcement efforts concerning the GTRR facility. In particular, as is described more fully below, I was assigned the task of inspecting the Licensee's actions related to the 1987 Cadmium-115 spill and the adequacy of its related health physics efforts, and I was a member of the NRC's special inspection team headed by Paul Fredrickson (described above).

Q5. Have you reviewed the assertions made by Georgians Against Nuclear Energy (GANE) in or concerning GANE Contention 9, that the Licensee's management of the GTRR is inadequate?

A5. (All) Yes. As we understand GANE's assertions, GANE has asserted that the Licensee's management fails to provide reasonable assurance of the continued protection of the public health and safety, based upon GANE's contention that:

> Safety concerns at the Georgia Tech reactor are the sole responsibility of Dr. R.A. Karam. Dr. Karam is the director who withheld information about a serious accident from the NRC (1987 cadmium-115 accident). The NRC was advised of the 1987 cadmium-115 accident by the safety officer at that time, who was later demoted, and left the GTRR operation claiming harassment. Since the incident, management has been restructured giving the director (Dr. Karam) increased authority, including increased authority over the Manager of the Office of Radiation Safety. Although the safety officer has line to higher-ups than the director, since he/she works for the director on a day-to-day basis, the threat of reprisal would be a huge disincentive to defying the director. The Nuclear Safeguards Committee which has theoretical oversight of the GTRR operations has a distinct flaw in having no concern with health issues. The Office of Radiation Safety Manager is sought for its knowledge of law more than its knowledge of health physics.

We understand that, in support of these assertions, GANE refers to a number of NRC Staff inspection reports, the Licensee's NRC enforcement history, and a number of other documents and events.

Q6. Based upon your knowledge of the events which led to the NRC Staff's determination to take enforcement actions against Georgia Tech (the Licensee) in 1988,

and the events which led to the NRC Staff's subsequent determination to allow a restart of the reactor, do you agree with GANE's assertion that those events demonstrate that Georgia Tech's management of the GTRR facility presently fails to provide reasonable assurance of adequate protection of the public health and safety?

A6. (All) No. Based upon our knowledge of the facts and events which led to the Staff's determination to take enforcement actions against the Licensee in 1988, the Licensee's corrective actions, various enforcement conferences which were held with the Licensee, and the NRC Staff's subsequent inspection efforts, we believe the events in 1987-1988 were appropriately dispositioned by the Licensee and that the management problems which had been identified prior to restart were satisfactorily resolved. Accordingly, at the time the NRC Staff determined to allow restart of the GTRR in November 1988, the Staff was satisfied that the Licensee's management of the facility provided reasonable assurance that the public health and safety would be adequately protected in the future. The bases for this conclusion are largely reflected in the NRC inspection and enforcement history of the GTRR during 1988, which documents the NRC Staff's review, assessment, and conclusions regarding the Licensee's actions to meet the requirements of the January and March 1988 Orders. A summary of these matters, including management and organizational changes under the revised Technical Specifications, is included in the letter of November 15, 1988, authorizing the Licensee to resume operations and experiments at the GTRR.

Q7. Please discuss the NRC Staff's initial inspection efforts and enforcement actions in 1987 pertaining to the GTRR, which relate to the management issue raised by GANE.

A7. (AFG) The first NRC inspection conducted in 1987 resulted in a finding of six violations (Severity Level IV) with numerous examples of those violations. This was documented in Inspection Report 50-160/87-01, involving an inspection that was conducted on February 9-23, 1987, by two inspectors assigned to the Division of Reactor Safety, of which I was then the Division Director. These violations involved:

1. Failure to provide or utilize procedures (seven examples);

2. Failure to control experiments as required by the Technical Specifications (TS) (four examples);

3. Failure to perform a weekly heat balance surveillance;

4. Failure to receive prior NRC approval for a change made to the facility, involving changes to the Technical Specifications;

5. Failure to comply with the requalification program for annually documenting performance of operators under simulated emergency conditions for 1984, 1985, and 1986; and

6. Failure of the Nuclear Safeguards Committee (NSC) to perform its review and audit functions as required (four examples).

The Licensee responded to this inspection report and notice of violation in a letter dated May 25, 1987. NRC Region II personnel performed an initial review of the Licensee's explanation and view of the violations and the Licensee's corrective actions,

and then requested a supplemental response by the Licensee to provide a more thorough discussion of each issue. The Licensee provided this supplemental response in a letter dated July 15, 1987.

The first violation involved deficiencies in written procedures for the operation of the reactor and identified specific instances where the reactor operators failed to follow instructions. There were three examples where procedures were not written to address license requirements, two examples of procedures being out of date, one example where the Licensee failed to record data in accordance with its established guidance and failed to run water through the cooling tower as required by procedures. Of the seven examples, the Licensee admitted six of these, attributing the cause to simple oversight, the limited number of licensed operators, or to some undetermined reason. The Licensee's corrective actions included revision to the procedures and increasing the licensed operator staff. For the example which the Licensee contested, it argued that the procedures were adequate and met regulatory requirements. NRC Region II's disposition of this contested example was to accept the Licensee's denial of the example on the basis of the argument provided, and to delete reference to this example from the records; however, the overall violation was upheld. Subsequent inspections by NRC Region II verified that the Licensee's corrective actions with respect to the remaining matters in this violation had been completed.

The second violation, with four examples, related to the Licensee's administrative controls for conducting experiments. Specifically, deficiencies in those controls included inadequate documentation of minor experiment approvals, inadequate

records of experiments conducted, incomplete files of experimenter's checklists, and incomplete Control Room Logs of radiation dose rates from the experiments. The Licensee admitted three of the cited examples and attributed the cause of this violation to the complexity of its procedures for tracking required documentation. The Licensee's corrective action was to consolidate and streamline the system for maintaining required records. One example was denied by the Licensee, and the NRC accepted this denial based upon the Licensee's argument that the documentation for minor experiment approvals met regulatory requirements. NRC Region II reviewed the revised and new procedures, as described in Inspection Report 90-03, and closed this item.

The third violation involved the Licensee's failure to compare the actual thermal output from the reactor with the indicated power level as required by the license. The Licensee admitted that the violation had occurred on April 7, 1986. The Licensee committed to audit this requirement. NRC Region II inspected the Licensee's records for the period of January 26, 1987 to July 13, 1989, and did not identify any discrepancies.

The fourth violation involved a change to the facility without prior NRC approval, *i.e.*, the cover gas for the reactor vessel was changed from helium to nitrogen, but the technical specification only made reference to helium, and the Licensee had not obtained a license amendment to authorize this change. The Licensee denied the violation and stated that the type of gas was incidental to the requirement. The NRC did not accept this denial. The Licensee submitted a request to change the wording of the TS requirement; the NRC approved the Licensee's request in License Amendment No. 7, and closed this issue in Inspection Report 50-160/89-02.

The fifth violation concerned the Licensee's failure to document operator requalification training as required by 10 C.F.R. Part 55. The Licensee denied the violation based on its view that it maintained the required records. After reviewing the Licensee's response, NRC Region II withdrew the violation on the basis that annual summaries of control manipulations were available and performance could be inferred from the records.

The sixth violation involved the requirement for the Nuclear Safeguards Committee to approve procedure changes, and to audit reactor operations and records, and equipment performance. This violation was challenged by the Licensee as inaccurately stating the Committee's functions. After review of the Licensee's response, NRC Region II agreed with the Licensee that the functions of the Committee needed to be clarified, and the violation was withdrawn.

Individually, the above violations (each of which was classified as Severity Level IV) were not of sufficient safety significance to warrant regulatory concern. In this regard, the NRC Enforcement Policy in effect at the time categorized violations in Severity Levels I - V, with Level V being the least significant. It stated, in part:

> Severity Level I and II violations are of very significant regulatory concern. In general, violations that are included in these severity categories involve actual or high potential impact on the public. Severity Level III violations are cause for significant concern. Severity Level IV violations are less serious but are of more than minor concern; i.e., if left uncorrected, they could lead to a more serious concern. Severity Level V violations are of minor safety or environmental concern.

10 C.F.R. Part 2, Appendix C (revised as of January 1, 1988).

Although these violations were not individually significant, collectively, the violations provided substantial evidence of a lack of management oversight. Indeed, the cover letter which transmitted the NRC Staff's inspection report expressed concern about apparent programmatic weaknesses and the failure of the Licensee to complete certain corrective actions to which it had previously committed. To further emphasize the level of concern, the letter was signed by the Director, Division of Reactor Projects, one level of management higher than normal.

Q8. In this proceeding, GANE has identified an NRC inspector, Anne Rebecca Long, as having been dissatisfied with NRC Region II's handling of Inspection Report 87-01. Please provide your understanding of the concerns expressed by Ms. Long, the actions taken by NRC Region II management in addressing those concerns, and your views in this regard.

A8. (AFG) Several months after NRC Region II dispositioned the inspection findings listed in Inspection Report 87-01 (pursuant to which two of the six violations and parts of two others were withdrawn), the lead inspector, Anne Rebecca Long, sent an undated memorandum to me, on or about January 27, 1988, and met with me in early February 1988 to express concern regarding the NRC's withdrawal of these violations. I evaluated her concerns and found that the two violations should not have been withdrawn. While these violations had been withdrawn due to the view that there was an insufficient legal basis to support the citations, my judgment, made with the benefit of subsequent inspection findings and hindsight, was different. I presented a summary

of my findings concerning the issues raised by Ms. Long over the handling of her inspection findings, in a memorandum to the Deputy Regional Administrator, NRC Region II, in a memorandum dated February 12, 1988.

At the time Ms. Long raised her concerns, other significant inspection and enforcement events involving the GTRR were already well underway, which rendered further action with respect to these violations unnecessary -- *i.e.*, additional inspections had been conducted, an order modifying the license had been issued and an enforcement conference with Georgia Tech had already been scheduled. Thus, reissuance of these February 1987 violations was not necessary to achieve corrective action. No basis was found by NRC Region II management to take further action with respect to Ms. Long's concerns.

I understand that Ms. Long made various allegations of wrongdoing by NRC Region II, related to its handling of her inspection findings, which were investigated by the Office of Inspector and Auditor (OIA.) I further understand that no basis was found by OIA or its successor (the Office of the Inspector General (OIG)), to warrant further action with respect to the issues raised by Ms. Long. In this regard, The OIG "closing memorandum" of March 29, 1990 (File 88-08), concluded as follows:

> The documents in the case file also indicate that Region II management followed regional procedures during the review of GT's response and preparation of a reply. Although Region II management apparently did not accept the recommendations of the inspectors, there was no indication of NRC employee misconduct to warrant an Office of the Inspector General investigation. Decisions on the close-out of the Region II GT inspection report were based on the judgement of Region II management. Reviewing the validity of decisions of this nature is a

> matter more appropriately handled by the NRC technical staff and management. This is also true of information received during OIA's review of this matter that questioned the effectiveness of Region II's actions with respect to its regulation of GT.
>
> [T]he inspection in question occurred three years ago and since that time appropriate corrective actions as determined by Region II management has been taken by GT. Additionally, there was no indication that Region II management acted improperly in its handling of GT's response to the inspection. Consequently, there is no reason to conduct further investigation into this matter. This case is closed in the files of this office.

Q9. Please describe the next inspection, conducted subsequent to the inspection documented in Inspection Report 87-01.

A9. (DMC, GBK) The next inspection conducted at the GTRR, documented in Inspection Report No. 50-160/87-02, was an inspection of radiation controls and environmental protection. Two violations (Severity Level IV and V) were identified: (1) A failure to follow health physics and surveillance procedures for securing the primary coolant sample line and for counting liquid scintillation samples, and (2) a failure to have an approved procedure for sampling liquid waste tanks. The Licensee proposed acceptable corrective actions, which included retraining of personnel regarding procedural adherence, development of liquid waste sampling procedures and guidance for implementing procedural changes. In addition, the Licensee committed to report the violation for failure to secure the primary coolant sample line to the Nuclear Safeguards Committee so that the issue could be addressed during subsequent audits of GTRR operations.

Q10. Please describe the next inspection which involved or appeared to present any significant issues involving the Licensee's management of the GTRR.

A10. (DMC) During the period of April 7 to April 10, 1987, a Radiation Specialist in the Emergency Preparedness and Radiological Protection Branch conducted a radiation protection inspection of the GTRR, documented in Inspection Report 87-03. During the inspection, numerous apparent violations of NRC requirements were identified, including a failure to label a container of radioactive material, failure to perform radiological surveys (two examples), failure to wear protective clothing as required by procedure (two examples), failure to wear required dosimetry, failure to implement Health Physics monitoring as required by a Radiation Work Permit, failure to obtain review and approval of experiments (two examples), failure to complete the Experimenter's Checklist as required by procedure (two examples), failure to respond to a criticality alarm, and failure to survey radiation levels during handling of a pneumatic transfer device containing an irradiated sample. Several of these failures had been self-identified by the Licensee, but adequate corrective actions had not been taken.

The findings in this inspection report were considered for escalated enforcement action. Accordingly, an enforcement conference was held with Licensee management on May 4, 1987, to discuss the inspection findings. At the enforcement conference, the Licensee outlined actions to improve management oversight and self-identification of problems, including a possible reorganization to place the radiation protection function under the authority and responsibility of the Director of the Neely Nuclear Research

Center (NNRC) and the possible merger of the campus-wide Radiation Safety Committee with the Nuclear Safeguards Committee.

Following the enforcement conference, NRC Region II issued five Severity Level IV violations based on the findings of this inspection. In addition, the NRC Staff requested that the Licensee, in responding to the violations, address the root cause of the violations and indicate the actions planned to correct programmatic deficiencies. The NRC Staff further noted that the violations, and those that had been described in the Notices of Violation accompanying Inspection Reports 50-160/87-01 and 50-160/87-02, raised concerns about the Licensee's management control and involvement in implementation of the Licensee's programs for radiation protection, reactor operations, and control of experiments. The NRC Staff further specifically asked the Licensee to describe how it planned to improve the working relations between the health physics and reactor operations groups.

In a reply to the Notice of Violation (NOV) dated June 15, 1987, the Licensee identified difficulties in communications and coordination of work activities between the reactor operations and health physics groups at the GTRR, and continuing quarrels between the two groups, as the cause for several of the violations. The Licensee also noted that the health physics group had identified problems and violations of NRC requirements, but had not communicated them to the Director of the NNRC. The Licensee stated that a proposed corrective action for these difficulties was a reorganization, that had been under consideration for about a year, which would require the Manager of the Office of Radiation Safety (MORS) to report to the NNRC Director.

The NRC Staff later learned, as discussed in IR 87-08 and in the testimony of NRC Staff Panel C, that the Licensee had implemented a management reorganization without receiving a license amendment or NRC authorization to do so.

The Licensee took appropriate corrective actions for the specific violations as documented in IR 50-160/89-01. The Licensee's actions regarding its proposed reorganization, and the NRC Staff's disapproval of the reorganization and its ultimate approval of a revised reorganization, are discussed in response to Question 13 below and in the NRC Staff's Panel C testimony.

Q11. Please describe the NRC Staff's inspection efforts and findings following the inspection documented in Inspection Report (IR) 87-03, as documented in IRs 50-160/87-04, 87-05, 87-06, and 87-07.

A11. (DMC) Following the inspection documented in Inspection Report 50-160/87-03, additional inspections were conducted at the GTRR in 1987 and documented in NRC Inspection Reports 50-160/87-04 and 87-05. The inspection documented in Inspection Report No. 50-160/87-04 included a review of the emergency preparedness program. A deviation was issued because the Licensee did not develop a notification procedure as committed to in a letter dated January 22, 1986. The inspection documented in Inspection Report No. 50-160/87-05 was a security inspection, which found no violations. In addition, Inspection Report 50-160/87-06 documented the enforcement conference held on May 4, 1987, discussed in response to Question 10 above. Inspection Report No. 50-160/87-07 described the NRC Staff's review of a report

and explanation by the Licensee that it was unable to account for a fission plate containing 29.49 grams of uranium-235. These four inspection reports did not disclose significant issues concerning the Licensee's management of the GTRR.

Q12. Please describe the events which led to the inspection documented in Inspection Report No. 50-160/87-08.

A12. (GBK) On December 16, 1987, I was sent to the Georgia Tech Research Reactor to review and evaluate allegations received by NRC Region II regarding a recent management reorganization and other matters. During this inspection, I was informed of an August 1987 Cadmium-115 (Cd-115) contamination event. At that time, detailed descriptions and evaluations of the event were not available. During a later portion of this inspection conducted January 4-5, 1988, I reviewed and evaluated GTRR Operations and Health Physics technical radiation protection activities directly related to the Cd-115 contamination incident, as a result of which I identified significant reactor operations and radiation protection safety issues, that required further NRC attention.

Q13. Please discuss the additional NRC Staff inspection efforts which resulted from this inspection, and the findings documented in NRC Inspection Report No. 50-160/87-08.

A13. (DMC, PEF, GBK) Based upon the inspections referred to in response to Question 12 above, and the past poor performance of the Licensee, NRC Region II management expanded the inspection effort and dispatched a special inspection team to

review selected GTRR program areas during the period January 14-22, 1988. The expanded inspection reviewed operations, health physics and management issues. The inspection team found numerous examples of failures to follow or to have adequate procedures to implement the Technical Specifications (TS) or violations of 10 C.F.R. Part 20 health physics requirements associated with the August 1987 irradiation experiment and the resulting Cd-115 contamination event.

In general, the inspection findings identified continuing poor performance of Licensee personnel regarding routine operations and health physics activities. Specific technical findings included a failure to have adequate procedures and to follow procedures for handling and manipulating experiment material and for surveying and evaluating potential radiological hazards; a failure to conduct adequate radiation surveys of the reactor building, and of personnel and their property potentially exposed to radioactive contamination; a failure to conduct adequate air sampling and bioassay analyses to evaluate personnel exposure to airborne radioactive contamination during experiment manipulation and decontamination activities in the reactor containment building; and a failure to document and maintain records of the radiological contamination and personnel surveys which were conducted. At the time of the inspection (December 1987 and January 1988), a complete and thorough evaluation of the August 1987 contamination incident had not been completed by the Licensee, nor had corrective measures been implemented to prevent recurrence during future experiments. The Licensee's failure to evaluate the incident and its failure to implement corrective actions by the time of the

inspection were indications of a lack of management involvement and control of operations and health physics activities.

This inspection also raised concerns over a proposed TS change, involving the Licensee's revised organizational structure, which had been implemented by the Licensee on July 1, 1987, without the prior issuance of a license amendment by the NRC. The organizational change would require the Radiation Safety Officer (RSO) (whose title was changed to Manager, Office of Radiation Safety) and the Nuclear Safeguards Committee (NSC) to report to the Director of the Neely Nuclear Research Center (NNRC); and the RSO title was transferred to the Chairman of the NSC. This reorganization was subsequently disapproved in part, and approved in part (with other modifications), by the NRC, as discussed in the testimony of NRC Staff Panel C.

Interviews conducted during this inspection revealed that all Licensee personnel appeared to be conscientious, but working attitudes between health physics and operations had continued to deteriorate, and informal training rather than procedures were used for many routine tasks. Operations personnel appeared satisfied with the NNRC Director's management efforts, but health physics personnel indicated that the Director was involved too much in day-to-day health physics activities to the detriment of those activities. At the same time, the Licensee added an NNRC Deputy Director, which was viewed by NRC Region II staff as a positive change to the facility. In conclusion, the inspection report stated that there had been no significant improvement in the GTRR since the May 1987 enforcement conference.

Q14. Please explain in detail your views concerning the surveys and bioassay performed by Licensee health physics (HP) personnel in response to the August 1987 cadmium-115 contamination event.

A14. (GBK) In the course of the inspection documented in Inspection Report No. 50-160/87-08, I identified numerous concerns regarding a lack of adequate health physics procedures and improper radiation protection practices associated with the HP staff's surveys and bioassays conducted in response to the August 1987 cadmium-115 contamination event. These identified issues formed the bases for the majority of violations issued for failure to have adequate procedures and failure to follow procedures for surveying and evaluating potential radiological hazards associated with the event and subsequent decontamination activities.

To properly evaluate the hazards present as a result of the Cd-115 contamination event, the extent and levels of contamination within the reactor building needed to be accurately determined. However, the documented surveys conducted and used by the Licensee to determine general area contamination and personnel exposure from the actual event and subsequent decontamination activities were limited and qualitative. In general, initial results were for limited masslin wipe surveys taken within the reactor building. Any additional surveys that may have been conducted were not documented. The survey results reviewed by the NRC were documented in memoranda to Dr. R. Karam dated August 20, and August 24, 1987, from Robert M. Boyd, Manager of the Office of Radiation Safety (MORS), and from Paul B. Sharpe, Decontamination Supervisor, respectively. The memoranda indicated that cadmium used in the irradiation experiment

was highly contaminated and that smearable (loose) contamination became somewhat airborne, and that decontamination activities were conducted successfully for the reactor top, catwalk, control room and main floor areas of the reactor building. Discussions by the NRC inspector with both Health Physics and Operations staff corroborated the information regarding the extent of the contamination provided in the memoranda. Only two contamination wipe surveys associated with the event were documented. Such limited and qualitative surveys would not allow adequate evaluations of the hazards within the reactor building which resulted from the contamination event, as is required by the applicable sections of 10 C.F.R. Part 20. Further, this lack of detailed survey data and the failure to conduct air sampling to evaluate the potential hazards to personnel from the potential re-suspension of loose contamination during the cleanup efforts were identified as additional examples of improper radiation protection program practices and activities which did not meet 10 C.F.R. Part 20 requirements.

Technical inadequacies also were identified in this inspection regarding personal contamination surveys and bioassays performed for the operator involved in the contamination event. The August 20, 1987, HP memorandum documented that a chest (*in vivo*) survey of the operator was conducted with a slight positive response indicated. A follow-up chest survey conducted the next day was negative with no additional evaluation conducted. In addition to issues regarding the lack of procedural guidance for conducting and evaluating these *in vivo* survey results, concerns were identified in this inspection that no attempt was made to determine if the initial *in vivo* positive response resulted from contamination deposited on the operator's clothing or skin. Following the

identification of a positive *in vivo* analysis, a standard HP practice is to evaluate if the identified positive response resulted from contamination of the clothing or skin prior to the individual's release from the facility; this was not done by the Licensee's personnel following identification of the positive response for the operator.

Inadequacies also were noted for the Licensee HP staff's collection and analysis of the operator's urine (*in vitro*) sample for Cd-115 used to evaluate potential internal deposition of the radioactive contamination. The use of liquid scintillation counting methods without specific sample preparation and analysis techniques was inadequate to quantify any radionuclides present in the sample. Further, to monitor potential uptake of an insoluble isotope (such as the Cd-115 produced in this experiment) which is not readily excreted through the kidneys, the collection and analysis of a urine sample is inappropriate. Based on the lack of quantitative bioassay results, the Licensee HP staff's attempt to evaluate the hazards present did not meet the requirements of 10 C.F.R. Part 20.

From the limited data available, definite conclusions regarding the reportability of the actual hazards present could not be made by the NRC inspectors. However, based on estimated personnel exposures, follow-up surveys of the reactor facility, personnel involved and their property, the NRC staff determined that the event was not reportable under the Licensee's Technical Specifications or under 10 C.F.R. Part 20 requirements.

Q15. Please discuss any additional actions taken by the NRC with respect to the Licensee after Inspection Report 50-160/87-08 was issued.

A15. (DMC, PEF, GBK) On January 20, 1988, NRC issued an Order Modifying License, which suspended all further irradiation experiments. The Order stated that the Licensee's actions after the May 1987 enforcement conference had not been sufficient to address the management control problems, which continued. The Order described the specific operations and health physics violations pertaining to the August 1987 contamination event and stated that the Licensee had failed to complete a thorough review of the event regarding its cause or causes, nor had any corrective measures been implemented as of January 5, 1988, to prevent recurrence during future experiments. The Order required the Licensee to cease utilization of the reactor facility for any irradiation experiments until the following seven requirements were met:

> (1) assessment of management controls over facility operations;
>
> (2) review of records for similar occurrences and identification of root causes;
>
> (3) assessment of personnel exposures during the contamination and decontamination;
>
> (4) review of facility health physics and operating procedures for inadequacies;
>
> (5) identification and scheduling of corrective actions;
>
> (6) development and implementation of a training program; and
>
> (7) submission of the results of these assessments and reviews to the NRC for review.

An enforcement conference was held with the Licensee on February 23, 1988, at which we and other NRC representatives were present, along with members of the

Licensee's management. During the conference, the NRC Staff presented its view that a serious management problem existed at the NNRC which was not limited to the facility's health physics organization. The NRC representatives expressed concern regarding whether certain recent changes made at the facility, involving the replacement of health physics personnel and the addition of an operator, would really solve the Licensee's principal problems, and also stated that the Licensee's management needed to provide an expectation of excellence by direction and example. The NRC representatives also expressed the view that, although there were several health physics violations during and after the August 1987 event, the failure to coordinate survey data collection, to thoroughly investigate the incident, and to evaluate its seriousness, indicated a lack of effectiveness of the Licensee management. Further, the NRC representatives advised the Licensee's representatives that Georgia Tech's lack of regulatory sensitivity and inadequate communication with the NRC did not compare favorably with other major research reactors located in NRC Region II.

During the course of this enforcement conference, the Licensee's President stated that he had decided that the reactor would not restart until the Licensee and the NRC were both convinced that operations and health physics activities could be safely conducted. In addition, the Licensee presented an NNRC Action Plan to the NRC.

Following the enforcement conference, and based on the Licensee-initiated shutdown of the facility and its commitment to conduct an independent evaluation of the nuclear reactor program, a Confirmatory Order Modifying License was issued on March 17, 1988. This Order set out additional conditions that had to be met prior to

restart of the reactor. These conditions were: (a) the Licensee was to submit a written identification of the root causes of problems that could impact safe operations of the reactor and (b) the President of Georgia Tech was to submit to the NRC a written description of the corrective actions taken to resolve the problems, as well as the reasons he believed the facility should be allowed to restart.

On March 21, 1988, a meeting was held between members of the NRC and Licensee management, to discuss the status of the NNRC Action Plan. One issue discussed was the potential benefit for the Licensee to begin to participate in the Test, Research and Training Reactors (TRTR) organization. This organization provides a forum for personnel associated with research reactors throughout the United States to share and discuss research, educational and regulatory issues, and to work together on problems common to all the facilities. Prior to that time, representatives of all the research reactor facilities in Region II except the Licensee had participated in the TRTR.

Another management-level meeting was held between NRC and Georgia Tech representatives on May 16, 1988, to discuss the NNRC Action Plan, at which we were present. At this meeting, the Licensee's Vice President of Research continued to express the view that the Licensee's primary problem was not necessarily an NNRC management problem, but rather, a long-term health physics management problem which had since been remedied. The NRC representatives disagreed with this position and reiterated their views that the root cause was a lack of upper management attention to NNRC operations, and that the problems with health physics personnel, lack of experiment control, failure

to follow operating procedures, and other issues were all manifestations of a basic management problem.

On May 20, 1988, an enforcement conference was held with William Downs, the reactor operator who was involved in the August 1987 contamination event. This enforcement conference was conducted due to the NRC Staff's concerns over his apparent lack of adherence to procedures, his apparent lack of diligence in recording information in operating logs and experiment forms, and the casual attitude he appeared to display during and after the August 1987 contamination incident. No enforcement action was taken against Mr. Downs following this conference; rather, the NRC Staff concluded that the principal cause of his marginal performance was ineffective Licensee management, including a lack of adequate procedures, standards and expectations.

In addition, several significant written communications took place between the Licensee and the NRC Staff during this period. On May 13, 1988, the NNRC Director sent the NRC an interim progress report on the Licensee's efforts to resolve the NRC Staff's concerns regarding renewed GTRR operation; and on June 13, 1988, he also sent the NRC a letter questioning the content of Inspection Report 50-160/87-08. NRC Region II management responded to both letters in a letter dated July 18, 1988, in which the NRC pointed out that it appeared that NNRC management was still inappropriately focusing its attention on specific issues and individuals involved with the August 1987 contamination event, rather than evaluating the Licensee's program and management controls over that program which had allowed the specific event to occur, and identifying the root cause of weakness in its programs and management controls. The NRC's letter

further stated that this raised a question of the long-term effectiveness of any corrective actions that might be taken. The NRC letter also indicated that the NNRC Director's questions about IR 87-08 demonstrated that the Licensee had failed to conduct adequate investigations into the contamination incident, had failed to fully discuss the issues with facility staff, and had performed an inadequate assessment of the consequences of the contamination event.

Q16. Are you familiar with the investigation conducted by the NRC's Office of Investigations (OI) in 1988 concerning the GTRR?

A16. (DMC, PEF, GBK) Yes. Although this investigation was conducted by OI, OI personnel consulted with NRC Region II personnel concerning the issues and facts involved in that investigation. In addition, George Kuzo participated in the investigation, and sat in on various investigative interviews that were conducted by OI as part of this investigation. The findings and conclusions of the OI investigation were subsequently factored into the NRC Staff's determination as to whether to authorize restart of the GTRR.

Q17. Please describe your understanding of the basis for and the results of OI's investigation of issues, in 1988, involving the GTRR.

A17. (DMC, PEF, GBK) OI initiated this investigation at the request of the Regional Administrator of NRC Region II, to inquire into allegations which had been received concerning the harassment and intimidation of GTRR health physics (HP)

employees for reporting to, or discussing with, NRC officials apparent health and safety problems at the GTRR facility. In addition, OI was asked to determine if the Licensee had engaged in a willful misrepresentation of facts concerning the August 1987 cadmium contamination event; to investigate other allegations of possible Licensee violations of the regulations, license conditions, or technical specifications; and to determine the nature and extent of acts of sabotage which the facility's Director alleged had occurred.

On August 11, 1988, OI issued an extensive report summarizing the findings and conclusions of its March 1988 investigation of these matters (Report of Investigation, OI Case No. 2-88-003). The OI Report reached the following conclusions:

> [T]he investigation revealed evidence to indicate that a severe state of disharmony and conflict exists between the Operations and HP staffs at the GTRR facility. This condition appears to have escalated and intensified since July 1, 1987, when all staff personnel, including HP employees, were placed under the same management structure. The involuntary dismissal of two HP employees in February 1988, was explained by management as a necessary action to "upgrade the HP program" but was viewed by the HP staff as retaliation for reporting and discussing safety concerns with the NRC. There appears to be sufficient indications to support the perception of these individuals and to properly conclude that one of the reasons for the involuntary separation of the two HP technicians is specifically related to discussing or reporting potential health and safety concerns with NRC inspection officials. Although the investigation failed to disclose intentional, contrived violations of regulations and license requirements, there was overwhelming evidence to support severe mismanagement, negligence, and carelessness by an Operations employee and a haphazard and unorganized approach concerning the performance and completion of some GTRR activities.

(OI Report, at 6).

On September 19, 1988, another enforcement conference was held at the NRC Region II office to discuss the OI report with Georgia Tech's management. At that meeting, the NRC representatives expressed particular concern that the Licensee's decision to dismiss the health physics staff could be construed as reprisal, and seemed to show that Georgia Tech had not adequately evaluated the performance of NNRC management in this and other matters.

During the enforcement conference, the Licensee's President stated that the driving force to replace the health physics staff primarily was to upgrade the quality of this organization; another reason was to defuse the hostility that had developed over the 1987 NNRC reorganization. He stated that he was not aware of any safety-related intimidation or harassment by management, but he did have indication that harassment may have existed between NNRC operations and health physics personnel. He stated that the decision to replace the health physics personnel was made in December 1987, before the August 1987 event became an issue. He said initially a decision was made to wait until after the January 1988 inspection to make the change, but after the implication of a degraded health physics staff, the decision on the replacement was expedited. He stated that he believed the present NNRC organization was working well, with a close working relationship among the Radiation Safety Officer, the Acting Vice President of Research, and the NNRC management and staff. He also discussed a February 1988 memorandum in which he informed the Georgia Tech staff that safety violations should not only be reported to the line management but also to the Nuclear Safeguards Committee.

Q18. Please describe the NRC Staff's inspection efforts in 1988, pertaining to the Licensee's actions to correct the management problems which had been identified in the NRC Staff's inspection reports and related correspondence.

A18. (DMC, PEF, GBK) On March 17 and 18, and April 6 and 11, 1988, an inspection was conducted to review the corrective action program at the facility and also the mechanisms for addressing and correcting personnel errors. The results of this inspection were documented in Inspection Report 50-160/88-01, issued on June 15, 1988. No violations were observed in this inspection report. The inspection resulted in a finding that the Licensee did not have a documented corrective action program until July 1987. The previous informal, undocumented system which was in use prior to July 1987 resulted in a slow resolution of problems, and prevented controversial matters from being raised to the proper level of management for resolution. The inspection further showed that Licensee personnel appeared to be slow in using the new documented program, but that the new system of documentation had somewhat improved the corrective action program at the NNRC.

Further, the inspection determined that GTRR management had not effectively established performance standards and used the full complement of personnel actions available to maintain continued satisfactory personnel performance. The personnel action effort at the NNRC appeared to consist mainly of informal counseling sessions, at most, and even that was not done routinely. Further, the inspection indicated that the Licensee's management appeared to be able to recognize major personnel errors at the

facility, but did not have a threshold for taking action in the case of a serious personnel error or a pattern of less significant errors.

On August 19, 1988, the Licensee's President sent the NRC a letter which stated that progress had been made on the NNRC Action Plan to the extent that he concluded the Licensee had addressed and resolved the issues raised in the Order Modifying License. He therefore requested that resumption of reactor operation and irradiation experiments be approved.

In response to the Licensee's letter of August 18, 1988, NRC Region II sent an inspection team to Georgia Tech to determine whether the Licensee had adequately addressed and resolved the previously identified deficiencies in the reactor program, and to assess the Licensee's technical readiness to resume reactor operation and irradiation experiments. This inspection was conducted during the period of August 29 - September 9, 1988, and is identified as the "Phase 1" inspection in Inspection Report 50-160/88-02 issued on December 29, 1988. While the inspection found that the Licensee had added experienced staff at the GTRR, had upgraded operating procedures, and had retrained facility operators, all the actions directed by the two Orders had not been completed. This inspection also identified additional issues which needed to be addressed prior to restart. Accordingly, by letter dated September 13, 1988, the NRC Staff outlined eight issues that remained to be resolved before restart authorization could be given. Five of the eight issues were identified in the inspection, as follows:

- Revise or develop adequate procedures for the calibration and operation of all radiation monitors used to monitor the release of radioactive effluents from the GTRR facility.

- Revise or develop adequate sampling methods and procedures that ensure that effluent samples are properly collected and are representative of the radioactivity concentrations actually being released.

- Revise or develop adequate procedures for the calibration and operation of the gamma spectroscopy system for the sample geometries used to quantify radioactive liquid and gaseous releases at the GTRR.

- Train GTRR operations and health physics personnel, as appropriate, on the new procedures developed to sample, analyze, and document releases of radioactive effluents from the facility, including the procedure for calibration and operation of radiation monitors and laboratory instruments.

- Implement all of the above procedures.

The remaining three issues related directly to the Order issued on January 20, 1988:

- Assess and document the skin, whole body, and extremity doses to personnel involved in the August, 1987 incident and/or decontamination activities.

- Revise or develop, as appropriate, health physics procedures such that they are technically adequate to ensure safe operation of the GTRR facility.

- Develop and implement a training program for the entire GTRR staff addressing the new health physics procedures and practices.

These issues were reviewed and resolved during "Phase 2" of the inspection discussed in response to Question 23 below.

Q19. Were any further inspection reports issued by the NRC Staff prior to November 15, 1988?

A19. (DMC) Yes. In September 1988, an inspection was conducted of the Licensee's emergency preparedness (EP) program, as documented in IR 50-160/88-03,

issued on October 19, 1988. This inspection found that the Licensee, in response to a Deviation, had developed a procedure for off-site notifications, but the procedure did not specify how quickly such notifications were to be made; this matter was later resolved satisfactorily. The inspection identified one violation (Severity Level V) for failure to train a member of the emergency organization in accordance with the facility Emergency Plan. The inspection also found that members of the Atlanta Fire Department who might respond to an emergency had not attended radiation safety training since 1986; that there was a lack of a procedure to ensure that changes to the Emergency Plan were distributed and received; that there was a lack of implementing details in the emergency procedures; and that other issues, related to frisking skills and the inclusion of off-site observers in drill critiques required resolution. The Licensee subsequently took appropriate corrective actions for each of these matters, as documented in Inspection Reports 50-160/89-04, 50-160/90-04, 50-160/91-04, 50-160/92-04, and 50-160/93-03.

Q20. Please describe the remaining enforcement actions taken by the NRC against Georgia Tech in 1988.

A20. (DMC, PEF, GBK) On November 15, 1988, the NRC issued a Notice of Violation and Proposed Civil Penalty to the Licensee. Four violations were evaluated collectively as Severity Level III. The violations were issued for failure of the Licensee to implement adequate management controls and programs necessary to assure that licensed activities were conducted in a safe manner in accordance with NRC and facility requirements. Based on this determination, a $5,000 civil penalty was imposed. The

civil penalty was escalated 100 percent because of the Licensee's prior poor performance in adherence to procedures and radiological controls, and because of the Licensee's failure to take prompt corrective action to deal with management control problems.

Q21. Please explain the significance of the two enforcement Orders issued to Georgia Tech and the NRC's subsequent issuance of an escalated penalty against Georgia Tech, in the context of NRC enforcement actions taken against other research reactor licensees.

A21. (DMC, PEF) The enforcement actions taken against Georgia Tech constituted very significant enforcement actions for a research reactor licensee. The two Orders required extensive self-examination and corrective actions by the Licensee, and prevented operation of the reactor for a lengthy period of time, approximately ten months. In addition, the amount of the civil penalty is among the highest ever imposed against a research reactor licensee by the NRC.

Q22. At some point in time, did the NRC Staff conclude that a restart of the GTRR could reliably be authorized?

A22. (DMC, PEF) Yes. Based upon the Licensee's satisfactory compliance with the requirements which the Staff had identified as necessary in its inspection of these matters, including the completion of various required corrective actions, the Staff concluded that the Licensee could and should be allowed to restart the operation of the GTRR. The Staff notified the Licensee on November 15, 1988, of this decision.

Q23. Please explain the basis for this conclusion, particularly in light of the findings and conclusions reached by the NRC Staff in its inspection and enforcement efforts, described above, and by the Office of Investigations in its investigation of related issues.

A23. (DMC, PEF, GBK) Various considerations led to this conclusion. First, the Licensee committed to taking numerous corrective actions, which were identified in the course of its various responses to the NRC's inspection and enforcement efforts. NRC Staff personnel reviewed the Licensee's proposed corrective actions, to assure that appropriate actions were identified and taken to resolve the identified concerns. In addition, the Licensee's progress in taking these actions was tracked on an item-by-item basis by NRC Region II inspection personnel, to assure that the corrective actions were in fact taken.

In a November 2, 1988 letter, the President of Georgia Tech informed the NRC that the eight items remaining for restart had been completed. The team inspection (identified as the "Phase 2 inspection" in Inspection Report 50-160/88-02) continued on November 7-10, 1988. This inspection found that appropriate actions had been taken to correct the major deficiencies that led to the issuance of the two NRC orders. Although two additional violations were identified during the inspection, the Licensee corrected these matters before the end of the inspection.

The inspection activities documented in Inspection Report 50-160/88-02 addressed all the restart evaluation areas resulting from the two enforcement Orders and the letter of September 13, 1988 (discussed in response to Question 18 above), although

certain items were identified as Inspector Followup Items (IFIs) requiring subsequent follow-up and closeout. Areas specifically addressed were: operator training, health physics training and competency, health physics procedure review, operations procedure review and control room operators, actions to prevent recurrence of past problems, review of staff exposure to radiation from material located external to or deposited within the body, review of incident reports, the role and performance of the NSC, discussions with both the RSO and the Manager of the ORS, review of three consultants' evaluations of the NNRC, regulatory sensitivity training, internal NNRC management changes, external NNRC management changes (*i.e.*, changes at the Vice President level), facility upgrade plan, internal NNRC audit system, NSC restart review, and routine NRC inspection restart issues.

Second, certain organizational changes were made which the NRC Staff determined would serve to eliminate the discord which had existed previously, and would improve the Licensee's management of the GTRR. In this regard, the Staff considered and approved a modified reorganization of the Licensee's management structure, described in License Amendment No. 7; this is discussed in the testimony of NRC Staff "Panel C."

With respect to more general management issues, the NRC Staff concluded that the added responsibility of the NSC provided sufficient depth and breadth of reviews of NNRC activities to assure adequate third party oversight. The restart authorization letter of November 15, 1988, indicates that interviews with NSC members showed their awareness of the additional functional responsibilities set out in the revised Technical

Specifications. Finally, the monitoring of operations and management of the facility was improved by the appointments of the new Vice President for Interdisciplinary Programs with direct responsibility for the GTRR, the hiring of the new Manager of the Office of Radiation Safety who was to report safety problems to the NSC, and the addition of the Associate Director to the Office of the NNRC Director.

By letter dated November 15, 1988, the NRC Staff authorized the resumption of reactor operations and experiments, based on the findings of the inspection team that the training of reactor operators and health physics personnel as well as the augmentation of the staff in these areas appeared satisfactory for the restart of the facility. In addition, the improvements in procedures in both operations and health physics appeared adequate to control the conduct of experiments and radiological assessment of operations. Also, the regulatory sensitivity training provided to the GTRR staff indicated that Licensee personnel would improve their adherence to procedures with a result of significant improvement in attention to safety at the GTRR. The NRC staff concluded, based on the progress made by GTRR and the organizational changes which had been made, that the management team at the GTRR was adequate to provide reasonable assurance that the future operation of the GTRR would not adversely affect the public health and safety.

Q24. Subsequent to authorizing restart of the GTRR, did the NRC Staff conclude that the Licensee had satisfactorily resolved the required corrective actions set out in the January and March 1988 enforcement Orders?

A24. (DMC, PEF) Yes. This was documented by letter dated September 18, 1990, in which NRC Region II notified the Licensee that the Licensee's actions required by the Orders had been reviewed and found to be adequate, as indicated in the attachment to the letter.

Q25. Does this conclude your testimony?

A25. (All) Yes.

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Division of Nuclear Materials Safety
Region II
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Education:

Spring Hill College, Mobile, AL	BS in Physics: 1969
Georgia Institute of Technology, Atlanta, GA	MS in Physics: 1970
Georgia Institute of Technology, Atlanta, GA	nuclear engineering/: 1971 postgraduate work (radiation protection specialty)

Professional Experience:

August 1995 to Present: Deputy Director, Division of Nuclear Materials Safety. Manages the implementation of the inspection program at fuel facilities and research reactors, and the inspection and licensing programs for use of radioactive materials in industry, medicine, education, and research and development.

October 1991 - August 1995: Chief, Nuclear Materials Safety and Safeguards Branch, Division of Radiation Safety and Safeguards, Region II. Managed the implementation of the inspection program at fuel facilities, for use of radioactive materials in industry, medicine, education and research and development, and the security programs at power and research reactors.

April 1984 - September 1991: Chief, Emergency Preparedness and Radiological Protection Branch, Division of Radiation Safety and Safeguards, Region II. Managed the implementation of the inspection program for radiation protection, effluent control, environmental monitoring, and emergency preparedness at power and research reactors and fuel facilities. In April 1989, the inspection of research reactors, except emergency preparedness, was transferred to another organization.

February 1983 - April 1984: Chief, Emergency Preparedness and Materials Safety Branch, Region II. Managed the implementation of inspection of emergency preparedness programs at power and research reactors and the licensing and inspection programs for the use of radioactive materials in industry, medicine, education, and research and development.

October 1979 - February 1983: Leader, Radiation Protection Section, Office of Nuclear Reactor Regulation. Supervised the evaluation of radiation protection aspects

of license applications for proposed and operating nuclear power reactors. Supervised the evaluation of radiation protection technical issues and events at nuclear power reactors.

January 1976 - October 1979: Radiation Specialist, Fuel Facility and Materials Safety Branch. Inspection and evaluation of radiation safety, effluent control, environmental monitoring, and emergency preparedness programs at fuel fabrication plants and power and research reactors.

January 1973 - January 1976: Health Physicist, Materials Branch, Office of Regulation, Atomic Energy Commission (became NRC in 1975). Reviewed applications for licenses to use radioactive materials in industry, medicine, education, and research and development, to determine if proposed activities would meet NRC requirements.

January 1972 - January 1972: Radiation Protection Supervisor, General Electric Company, San Jose, CA. Supervised the implementation of the radiation protection program, including dosimetry, bioassay, surveys, shielding, instrumentation, and effluent and environmental monitoring for a fuel fabrication and research and development facility.

Professional Societies: Health Physics Society

PAUL E. FREDRICKSON

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Region 11, U. S. Nuclear Regulatory Commission (NRC)

Education: Georgia Institute of Technology B.S./Physics, 1968

University of Virginia M.E./Nuclear Engineering, 1976

Professional Experience:

1995 to Present - NRC Region II Special Inspection Branch Chief in charge of managing most new and specialized nuclear power reactor inspection initiatives and also the following regular inspection activities: physical security, fire protection, reactor physics and motor operated valves.

1993 to 1995 - NRC Region II TVA Construction Branch Chief in charge of the construction inspection program for the TVA facilities, primarily Watts Bar.

1989 to 1993 - NRC Region II Projects Section Chief in charge of the inspection program for the Virginia Power Company facilities, Surry and North Anna.

1985 to 1989 - NRC Region II Projects Section Chief in charge of the inspection program for the Carolina Power & Light Company facilities, Harris, Robinson and Brunswick, and also the Region II research reactors.

1980 to 1985 - NRC Region II reactor inspector, conducting quality assurance activity related inspections at operating power reactors and performing project inspector duties for the operating TVA facilities.

1976 to 1980 - Nuclear Shift Test Engineer/Supervisor at the Norfolk Naval Shipyard, managing the nuclear test and overhaul of nuclear fast attack submarines.

1969 to 1975 - U.S. Army Ordnance Corps Officer, supervising maintenance activities for various military hardware from guided missiles to artillery pieces and wheeled vehicles.

1968 to 1969 - Research Test Engineer at the Pratt & Whitney Aircraft Company conducting design and testing of engine afterburner sections.

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Education: BS Nuclear Engineering, N.C. State University, 1965

Experience:

1985-Present — Director, Division of Reactor Safety, Region II

Manages implementation of NRC programs for reactor operator licensing, and inspection of reactor safety and radiation safety in the Southeast. Activities inspected include reactor construction, testing and operation as well as radiation safety, environmental monitoring and emergency preparedness.

1982-1985 — Chief, Operations Branch, Region II

Managed implementation of NRC programs for reactor operator licensing and inspection in the Southeast. Activities inspected included reactor operation, quality assurance, radiation safety, radiochemistry and environmental monitoring.

1981-1982 — Chief, Technical Inspection Branch, Region II

Responsible for implementing the NRC inspection program in the Southeast for byproduct materials licensees, nuclear fuel manufacturing facilities, and nuclear rectors in the areas of radiation safety, physical security and safeguards.

1974-1981 — Chief, Radiation Support Section, Region II

Supervised implementation of the NRC inspection program in the Southeast for inspection of nuclear reactors and fuel facilities in the areas of radiation safety, radioactive waste management emergency preparedness and environmental monitoring.

1972-1974 — Inspector, Region II

Responsible for inspecting radiation safety activities at reactors and fuel facilities in the Southeast.

1970-1972 — Head, Radiological Technical Division, Charleston Naval Shipyard

Managed the radiation safety and radioactive waste treatment programs at the Shipyard.

1965-1972 Nuclear Engineer, Charleston Naval Shipyard

Provided engineering services to support modification, testing, overhaul and refueling of nuclear powered submarines. Duties included serving as a test engineer and Assistant Refueling Director.

GEORGE B. KUZO

Senior Radiation Specialist
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Division of Reactor Safety
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Education:	Bloomsburg State College, Bloomsburg, PA	1972: BA, Biology
	Illinois State University, Normal, IL	1975: MS, Biology/Ecology
	Colorado State University, Fort Collins, CO	1976-1982: Post Graduate Research in Radiation Ecology

Professional Experience:

December 1995 to Present: Senior Radiation Specialist, Plant Support Branch, Division of Reactor Safety. Special Assignment to Watts Bar Nuclear Plant (WBNP). Responsible for inspection of NRC environmental monitoring, health physics and chemistry programs during startup and power ascension testing.

March 1994 - December 1995: Senior Radiation Specialist/Operations, Reactor Projects Section 4B, Reactor Projects Branch No. 4, Division of Reactor Projects. Rotational detail to WBNP with responsibility for inspection of environmental monitoring, health physics and chemistry programs during construction and startup activities.

June 1992 - March 1994: Senior Radiation Specialist, Radiological Effluents and Chemistry Section, Emergency Preparedness and Radiological Protection Branch, Division of Radiation Safety and Safeguards. Assigned to inspect and evaluate licensees authorized to posses, use and process nuclear materials, to determine compliance with requirements of commission and safety of license operations, to perform in other inspections and technical phases of investigations as assigned.

April - June 1992: Senior Radiation Specialist, Rotational Detail to Program Support Section, Incident Response Branch, Division of Operational Assessment, Office for Analysis and Evaluation of Operational Data, NRC Headquarters. Responsible for significant revisions to NRC Response Technical Manual-92, NUREG/BR-150, including development of uranium hexafluoride dose calculation and health consequence evaluation methodology.

January 1987 - April 1992: Senior Radiation Specialist, Facilities Radiation Protection Section, Emergency Preparedness and Radiological Protection Branch, Division of Radiation Safety and Safeguards. Assigned to inspect and evaluate

fuel fabrication, non-power and commercial power reactor licensees authorized to posses, use and process nuclear materials, to determine compliance with requirements of commission and safety of license operations.

October 1984 - January 1987: Radiation Specialist, Radiological Effluents and Chemistry Section, Emergency Preparedness and Radiological Protection Branch, Division of Radiation Safety and Safeguards. Assigned to inspect and evaluate licensees authorized to possess, use and process nuclear materials, to determine compliance with requirements of commission and safety of license operations, perform in other inspections and technical phases of investigations as assigned.

September 1982 - October 1984: Radiation Specialist, Independent Measurements and Environmental Protection Section, Operational Programs Branch, Division of Engineering and Operational Programs. Assigned to inspect and evaluate licensees authorized to posses, use and process nuclear materials, to determine compliance with requirements of commission and safety of license operations, perform in other inspections and technical phases of investigations as assigned.

January 1877 - September 1982: Graduate Research Associate at Colorado State University funding by Department of Energy, Idaho Operations Office. Conducted research on distribution and kinetics of transuranium elements in a contaminated aquatic ecosystem. Taught lecture and laboratory courses regarding liquid scintillation counting techniques.

Presentations\
Workshops: Workshop on Respiratory Tract Dosimetry: US Department of Energy (DOE), Office of Health and Environmental Research, Inhalation Toxicology Research Institute; Albuquerque, New Mexico; July 1-3, 1990.

Workshop on Environmental Research for Actinide Elements: USDOE; Hilton Head South Carolina, November 7-10, 1983.

Workshop on Environmental Research for Actinide Elements: USDOE; Lawrence Livermore National Laboratory; Livermore, California; March 17-19, 1981.

Transuranic concentrations in pelagic components of a Test Reactor Leaching Pond. Paper Presented at the 1981 Health Physics Society Annual Meeting; Louisville, Kentucky; June 22-25, 1981.

In Situ Uptake of Gamma-emitting Radionuclides by Soil Size Fractions at the Idaho National Engineering Laboratory. Presented at the 1980 Health Physics Society Annual Meeting; Seattle, Washington; July 21-25, 1980.

Transuranics in Selected Components of a Leaching Pond Ecosystem: Paper Presented at the 1979 Health Physics Society Annual Meeting, Philadelphia, Pennsylvania; July 8-13, 1979.

Professional Societies: Sigma Xi Research Society

Health Physics Society