

December 19, 1996

EA 96-496

Mr. Ted C. Feigenbaum
Executive Vice President and Chief Nuclear Officer
Northeast Utilities Service Company
c/o Mr. Terry L. Harpster
P.O. Box 270
Hartford, CT 06141-0270

SUBJECT: NRC INSPECTION REPORT 50-213/96-12

Dear Mr. Feigenbaum:

A special reactive safety inspection was conducted by personnel from the NRC Region I Office during the period November 2-27, 1996, at the Haddam Neck Power Station, Haddam, Connecticut. The purpose of the inspection was to review the circumstances, licensee evaluations, and corrective action associated with an airborne radioactive material event that occurred in the fuel transfer canal and reactor cavity on November 2, 1996. As part of this review, the Senior Resident Inspector evaluated your staff's response to delays in the resumption of core offload preparations associated with the event. A preliminary summary of the inspection results was provided by Messrs. W. Raymond and R. Nimitz, of this office, to Mr. G. Bouchard and others of your organization on November 8, 1996, and to Mr. J. Haseltine, also of your organization, on November 22, 1996. Additionally, Messrs. Raymond, White and Nimitz of our office informed Mr. J. LaPlatney of your staff of our preliminary assessment in a telephone discussion on November 27, 1996.

The NRC inspection identified significant deficiencies in the oversight and control of licensed activities, including programmatic breakdown in radiological controls and poor work planning, control, and practices relative to defueling activities on November 2, 1996. As a result, personnel were exposed to high concentrations of airborne radioactive material and handled highly radioactive debris, resulting in a substantial potential for an occupational exposure in excess of NRC regulatory limits. We are particularly concerned about your organization's failure to: (1) adhere to fundamental radiological safety requirements (such as effective communication and understanding of work scope, knowledge of actual radiological conditions and potential safety consequence, and conduct of appropriate radiological surveys or evaluations); (2) recognize the potential health and safety consequence of the emergent situation and respond appropriately; and (3) recognize and effectively communicate to management, a situation which delayed defueling activities and resulted in maintaining the reactor in a heightened shutdown risk condition for an

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extended period. Further, we are concerned that your staff failed to recognize that a substantial potential existed for personnel exposure to airborne radioactivity containing alpha emitters and consequently failed to initiate timely and appropriate personnel exposure evaluation.

Based on the results of this inspection, five apparent violations, some with multiple examples of non-compliance, were identified. These include failure to implement corrective actions for conditions adverse to quality, failure to adequately instruct workers in precautions and procedures to minimize exposures, failure to perform adequate radiological surveys to characterize and evaluate radiological conditions and potential personnel exposures, failure to adhere to Technical Specification High Radiation Area control requirements, and failure to adhere to radiation protection procedures. These apparent violations are summarized in Enclosure 1 to this letter and are further detailed in the inspection report, Enclosure 2. These violations are being considered for escalated enforcement action in accordance with the "General Statement of Policy and Procedure for NRC Enforcement Actions" (Enforcement Policy), NUREG-1600.

As discussed in a telephone conversation on December 16, 1996, between you and Mr. Rogge of this office, the circumstances surrounding these apparent violations are well understood by our staff. We believe that the root causes of these latest deficiencies are similar in nature to the weaknesses in conduct of operations, corrective action effectiveness, and management oversight and control that led to the previously identified apparent violations that were discussed in the Predecisional Enforcement Conference on December 4, 1996. At that conference, you acknowledged that the findings relative to this unplanned exposure event reflected the same global issues that were apparent in the previous performance deficiencies. Further, we reviewed and evaluated your interim short term corrective actions as described in your letter dated December 9, 1996; the results of your "Independent Review Team on the November 2, 1996 Radiological Incident and Reactor Disassembly Delay at the Haddam Neck Plant," dated December 5, 1996; and your assessment as reported in Licensee Event Report No. 50-213/96-030-00, dated December 6, 1996. Accordingly, we believe that we have sufficient understanding and information to enable our staff to make an enforcement decision. Based on the telephone discussion with Mr. Rogge, we understand that you do not require a predecisional enforcement conference for these matters. Notwithstanding, we are concerned about the adequacy and effectiveness of your corrective actions as they relate to your staff's ability to safely progress with decommissioning activities. Consequently, we plan to meet with your organization in early February to discuss corrective actions taken or planned, and planned staffing and activities relative to the future decommissioning of the Haddam Neck Plant. If our understanding is incorrect, please notify Mr. John Rogge, of our office, within 7 days, at 610-337-5146.

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A Notice of Violation is not presently being issued for these inspection findings, consequently no response to this letter is required. You will be advised by separate correspondence of the results of our deliberations in this matter. The number and characterization of apparent violations describe in the enclosed report may change as the result of further NRC review. In accordance with 10 CFR 2.790 of the NRC's "Rules of Practice," a copy of this letter and enclosures will be placed in the NRC Public Document Room (PDR).

Sincerely,

Original Signed By:
James T. Wiggins
Director, DRS

James T. Wiggins, Director
Division of Reactor Safety

Docket No. 50-213

Enclosures:

1. Executive Summary and List of NRC Concerns and Apparent Violations
2. NRC Inspection Report No. 50-213/96-12

cc w/encls:

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D. Goebel, Vice President - Nuclear Oversight
J. Thayer, Vice President - Nuclear Engineering and Support Recovery Office
F. C. Rothen, Vice President - Work Services
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ENCLOSURE 1

EXECUTIVE SUMMARY

Haddam Neck Station
NRC Inspection Report No. 50-213/96-12

Background

This inspection was a special reactive safety inspection to review an airborne radioactivity event that occurred in the fuel transfer canal and reactor cavity at the Haddam Neck Plant on November 2, 1996. The inspection included aspects of licensee operations, maintenance, and plant support, and the licensee's recovery from a significant radiological event. The report covers the period November 2-27, 1996.

Plant Operations:

Operators and plant staff showed poor sensitivity to the control of shutdown risk during the November 2, 1996, reactor cavity/fuel transfer canal airborne radioactivity event. For approximately 12 hours, control room operators were not sensitive to the significant delay in being able to complete work in the reactor cavity to support reactor cavity flood up. Control room personnel did not exhibit questioning attitudes or seek to ameliorate the conditions or circumstances even though the reactor was in an elevated risk state.

Maintenance:

Maintenance support for monitoring and tracking outage delays was poor and maintenance personnel did not effectively track and evaluate delays in the outage activities that affected shutdown risk potential. Further, these conditions were adverse to quality, and there was no effective management control of outage delay that could affect shutdown risk potential. These deficiencies resulted in the reactor remaining in a state of elevated risk, relative to other shutdown conditions, on November 2 and 3, 1996, for about an additional fifteen hours. These performance deficiencies were considered adverse to quality, were not identified, and were not corrected until pointed out by an NRC inspector. This is considered a significant lack of attention to safety. In addition, these observations were considered an apparent violation of 10 CFR Part 50, Appendix B, Criterion XVI.

Plant Support:

Plant management and staff failed to effectively plan and control radiological work activities (inspection of the fuel transfer system in the transfer canal) on November 2, 1996. As a result, personnel were exposed to high concentrations of airborne radioactive material and handled highly radioactive debris resulting in a substantial potential for an occupational radiation exposure in excess of NRC limits. The event revealed deficiencies in planning and control of outage work activities and ineffective organizational communications. The licensee's staff failed to recognize that a potential significant exposure of personnel to airborne alpha emitters may have occurred until it was identified by an NRC inspector five days after the event. Quality Assurance and

supervisory personnel did not detect program weaknesses in calibration and use of equipment and air sampling. Further, recent organizational changes within the radiological controls organization appeared to have adversely affected the overall effectiveness of the organization.

A number of apparent violations of NRC requirements were identified including failure to adequately instruct workers in precautions and procedures to minimize exposures, failure to perform adequate radiological surveys to characterize and evaluate radiological conditions and potential personnel exposures, failure to adhere to Technical Specification High Radiation Area control requirements, and failure to adhere to radiation protection procedures.

Safety Assessment & Quality Verification:

The plant management and staff failed to appreciate the significance of the delay in resuming work activities in the reactor cavity to remove the reactor from its elevated risk state. There were deficiencies in the quality of information and the integration of plant resources and support activities to effectively respond to degraded plant conditions.

Apparent Violations:

1. Operations and Outage Control

10 CFR 50, Appendix B, Criterion XVI (Corrective Action), requires in part, that measures shall be established to assure that significant conditions adverse to quality are promptly identified and corrected.

The inspector noted that from 10:00 a.m. November 2 until 1:00 a.m. on November 3, a contamination event inside the refueling cavity transfer canal interrupted the reactor disassembly sequence for about 15 hours at a time when the reactor was in a condition of high shutdown risk, relative to other shutdown conditions, with water level drained to the refueling reference level (10 inches below the vessel flange). Licensee management controls of outage activities were inadequate to 1) promptly identify significant delays in outage activities that could impact the duration of the reactor in an elevated state of risk, and 2) were inadequate to take prompt corrective actions to ameliorate conditions that affected shutdown risk potential. The inadequacies in management control of outage activities was considered a significant condition adverse to quality. This is an apparent violation of 10 CFR 50, Appendix B, Criterion XVI.

2. Radiological Controls

- a. The licensee did not make adequate radiological surveys, as required by 10 CFR 20.1501, as may be necessary to comply with the occupational exposure limits of 10 CFR 20.1201. 10 CFR 20.1003 defines a survey as an evaluation of the radiological conditions and potential hazards incident to, among other matters, the

presence of radioactive material or other sources of radiation. When appropriate, such an evaluation includes a physical survey of the location of radioactive material and measurements or calculations of levels of radiation or concentrations or quantities of radioactive material present.

Radiological surveys made in the reactor cavity and fuel transfer cavity, as necessary to comply with the occupational exposure limits outlined in 10 CFR 20.1201, were not adequate as follows:

1. On November 2, 1996, two workers in the fuel transfer canal unknowingly collected, handled, and transported radioactive material (debris) with contact radiation levels ranging from 20 R/hr to 60 R/hr. The debris was not surveyed as it was collected, handled or transported. Such surveys were necessary and reasonable to ensure conformance with the occupational dose limits.
 2. On November 2, 1996, airborne radioactivity surveys were not adequate to detect high concentrations of airborne radioactivity within the fuel transfer canal as workers collected highly radioactive dry dirt like debris therein. Such surveys were reasonable in that areas traversed and worked in by the workers exhibited loose surface contamination levels measuring up to 80 mrad/hr (beta) contamination and up to 30,000 disintegrations per minute/100 square centimeters alpha contamination (dpm/100 cm²).
 3. On November 2, 1996, airborne radioactivity surveys were not adequate to detect high concentrations of airborne radioactivity within the reactor cavity to support reactor stud hole cleaning. As a result, two workers were permitted to enter the reactor cavity notwithstanding the presence of high levels of airborne radioactivity.
 4. As of November 7, 1996, the licensee had not effectively evaluated the potential exposure of two workers, known to have been exposed to high levels of airborne radioactivity, sufficient to make the determination that the workers had substantial potential to exceed applicable regulatory limits relative to intake of alpha emitting isotopes on November 2, 1996.
- b. 10 CFR 19.12(a) requires that all individuals who, in the course of their employment, are likely to receive in a year an occupational dose of 100 mrem, be kept informed of the storage, transfer, or use of radiation and/or radioactive materials and be informed of precautions or procedures to minimize exposure.
1. On November 2, 1996, two individuals entered the reactor cavity and fuel transfer canal to perform inspections and housekeeping, received a dose in excess of 100 mrem and the individuals were not adequately informed of the presence of high levels of removable radioactive contamination and radiation within the fuel transfer canal and were not adequately informed as to the precautions or procedures to minimize their occupational exposure. Specifically, the workers were lead to believe that the fuel transfer canal was

relatively clean as a result of its decontamination; the workers were not informed of high levels of removable radioactive surface contamination (up to about 80 mrad/hr (beta) and up to about 30,000 dpm/100 cm² of removable alpha radioactive contamination), and the workers were not informed of an isolated hot spot on the floor of the transfer canal measuring up to 25 R/hr on contact (about 8 R/hr at waist level).

2. On November 2, 1996, as a result of inadequate radiological surveys, two individuals, likely to receive 100 millirem in a year, entered the reactor cavity at about 9:30 a.m. to perform stud hole cleaning of two stud holes on the reactor and were not informed of high levels of airborne radioactivity within the reactor cavity.

The above examples of failure to adequately inform the workers of the radiological conditions within the fuel transfer canal and reactor cavity and of precautions or procedures to minimize their exposure were an apparent violation of 10 CFR 19.12.

- c. Technical Specification 6.11 requires that procedures for personnel radiation protection be prepared consistent with the requirements of 10 CFR 20 and be approved, maintained, and adhered to for all operations involving personnel radiation exposure. On November 2, 1996, the licensee did not adhere to the following radiation protection procedures.

1. Radiation Protection Procedure RPM 2.1-2 requires in Step 3.1 that health physics supervision determine whether a new RWP/Jobstep must be initiated or if an existing RWP/Jobstep is adequate to provide the proper radiological protection, exposure tracking, and ALARA controls.

On November 2, 1996, health physics supervision authorized workers to enter the fuel transfer canal to perform inspections of the fuel transfer mechanism and perform housekeeping. The RWP and Jobstep used for this task were not adequate to provide proper radiological protection, exposure tracking, and ALARA controls. The RWP failed to provide adequate external and internal exposure controls as well as ALARA controls. Further, the RWP and Job Step (RWP No. 411, Job Step 13) were not valid for entries into the fuel transfer canal.

2. Radiation Protection Procedure RPM 2.5-4, requires in Step 3.2 that radiological controls personnel shall, during the course of the job, check conditions at the job site to ensure instructions are being properly followed.

On November 2, 1996, radiological controls personnel did not provide health physics job coverage for personnel working in the fuel transfer canal in accordance with procedure RPM 2.5-4, Step 3.2. Specifically, checks of workers were inadequate to ensure conformance with the understood work scope. Consequently, workers were exposed to high concentrations of airborne radioactivity and handled debris measuring between 20 R/hr and 60 R/hr on contact.

3. Radiation Protection Procedure RPM 2.1-1, requires in Step 3.1.6 that the job supervisor provide a description of the work to be performed.

On November 2, 1996, the job supervisor, responsible for inspection and housekeeping within the fuel transfer canal, did not provide health physics an adequate description of the work to be performed. Specifically, the job supervisor did not inform the health physics department that 1) excess grease found in the transfer canal would be used to grease dry bevel gears, 2) paint chips and associated metal rust would be peeled off the coffer dam walls, and 3) dry dirt like loose debris would be grabbed with the hand from the canal floor and deposited into a plastic bag.

4. Radiation Protection Procedure RPM 2.7-4, requires in Step 2.1 that clothing contamination reports be completed.

On November 2, 1996, clothing contamination reports were not completed for contaminated workers who exited the fuel transfer canal on November 2, 1996.

5. Radiation Protection Procedure RPM 1.2-1, requires in Step 3.1, that Attachment A, Resume Validation and Position Assignments, be completed to document the actual experience of contractor health physics technicians in various work activities, including determination of maximum experience credit permitted for each work category (e.g., job coverage experience).

The licensee did not complete Attachment A for the contractor radiation protection personnel involved in the November 2, 1996, airborne radioactivity event.

6. Radiation Protection Procedure RPM 1.6-5, requires in Step 3.1 that the health physics manager/designee issue a memo announcing the upgrade and expected duration of the upgrade of union personnel.

In January 1996, a senior radiation protection technician, a union individual, was upgraded to the position of acting Assistant Radiation Protection Supervisor following departure of the incumbent and, as of November 8, 1996, a memo announcing the upgrade was not issued.

The licensee did not adhere to radiation protection procedures as described above, and this represents four examples, of failure to adhere to Technical Specification 6.11.

- d. Technical Specification 6.12.2 requires, in part, that in addition to the requirements of Specification 6.12.1, areas accessible to personnel with radiation levels greater than 1000 mR/hr at 45 cm from the radiation source shall be provided with lock

doors to prevent unauthorized entry and doors shall remain locked except during periods of access by personnel under an approved RWP which shall specify the dose rate levels in the immediate work areas and the maximum allowable stay time for individuals in that area.

The licensee did not establish and implement radiation work permits (RWPs) in accordance with Technical Specification 6.12.2, in that on the morning of November 2, 1996, personnel entered a locked High Radiation Area (reactor cavity and fuel transfer canal) with accessible dose rates greater than 1000 mR/hr at 45 cm and the RWPs used for the entry did not specify the dose rate levels in the immediate work areas and the maximum allowable stay time for individuals in that area. Further, the RWPs were not valid for entry into the fuel transfer canal.

This is an apparent violation of Technical Specification 6.12.2.