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Vol. 10, No. 3

Report to Congress on Abnormal Occurrences

July - September 1987

U.S. Nuclear Regulatory Commission

Office for Analysis and Evaluation of Operational Data

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ABSTRACT

Section 208 of the Energy Reorganization Act of 1974 identifies an abnormal occurrence as an unscheduled incident or event which the Nuclear Regulatory Commission determines to be significant from the standpoint of public health or safety and requires a quarterly report of such events to be made to Congress. This report covers the period from July 1 to September 30, 1987.

The report states that for this reporting period, there were two abnormal occurrences at the nuclear power plants licensed to operate. The first involved significant degradation of plant safety at Oyster Creek; and the second involved a steam generator tube rupture at North Anna Unit 1. There were four abnormal occurrences at the other NRC licensees. The first involved a therapeutic medical misadministration; the second involved a failure to report diagnostic medical misadministrations; the third involved the suspension of a well logging company's license; and the fourth involved the suspension of an industrial radiography company's license. There were two abnormal occurrences reported by an Agreement State (New York). The first involved a hospital contamination incident and the second involved therapeutic medical misadministrations.

The report also contains information updating some previously reported abnormal occurrences.

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PREFACE

INTRODUCTION

The Nuclear Regulatory Commission reports to the Congress each quarter under provisions of Section 208 of the Energy Reorganization Act of 1974 on any abnormal occurrences involving facilities and activities regulated by the NRC. An abnormal occurrence is defined in Section 208 as an unscheduled incident or event which the Commission determines is significant from the standpoint of public health or safety.

Events are currently identified as abnormal occurrences for this report by the NRC using the criteria delineated in Appendix A. These criteria were promulgated in an NRC policy statement which was published in the Federal Register on February 24, 1977 (Vol. 42, No. 37, pages 10950-10952). In order to provide wide dissemination of information to the public, a Federal Register notice is issued on each abnormal occurrence with copies distributed to the NRC Public Document Room and all Local Public Document Rooms. At a minimum, each such notice contains the date and place of the occurrence and describes its nature and probable consequences.

The NRC has reviewed Licensee Event Reports, licensing and enforcement actions (e.g., notices of violations, civil penalties, license modifications, etc.), generic issues, significant inventory differences involving special nuclear material, and other categories of information available to the NRC. The NRC has determined that only those events, including those submitted by the Agreement States, described in this report meet the criteria for abnormal occurrence reporting. This report covers the period from July 1 to September 30, 1987.

Information reported on each event includes: date and place; nature and probable consequences; cause or causes; and actions taken to prevent recurrence.

THE REGULATORY SYSTEM

The system of licensing and regulation by which NRC carries out its responsibilities is implemented through rules and regulations in Title 10 of the Code of Federal Regulations. To accomplish its objectives, NRC regularly conducts licensing proceedings, inspection and enforcement activities, evaluation of operating experience and confirmatory research, while maintaining programs for establishing standards and issuing technical reviews and studies. The NRC's role in regulating represents a complete cycle, with the NRC establishing standards and rules; issuing licenses and permits; inspecting for compliance; enforcing license requirements; and carrying on continuing evaluations, studies and research projects to improve both the regulatory process and the protection of the public health and safety. Public participation is an element of the regulatory process.

In the licensing and regulation of nuclear power plants, the NRC follows the philosophy that the health and safety of the public are best assured through the establishment of multiple levels of protection. These multiple levels can be achieved and maintained through regulations which specify requirements which will assure the safe use of nuclear materials. The regulations include design and quality assurance criteria appropriate for the various activities licensed by NRC. An inspection and enforcement program helps assure compliance with the regulations.

Most NRC licensee employees who work with or in the vicinity of radioactive materials are required to utilize personnel monitoring devices such as film badges or TLD (thermoluminescent dosimeter) badges. These badges are processed periodically and the exposure results normally serve as the official and legal record of the extent of personnel exposure to radiation during the period the badge was worn. If an individual's past exposure history is known and has been sufficiently low, NRC regulations permit an individual in a restricted area to receive up to three rems of whole body exposure in a calendar quarter. Higher values are permitted to the extremities or skin of the whole body. For unrestricted areas, permissible levels of radiation are considerably smaller. Permissible doses for restricted areas and unrestricted areas are stated in 10 CFR Part 20. In any case, the NRC's policy is to maintain radiation exposures to levels as low as reasonably achievable.

REPORTABLE OCCURRENCES

Actual operating experience is an essential input to the regulatory process for assuring that licensed activities are conducted safely. Reporting requirements exist which require that licensees report certain incidents or events to the NRC. This reporting helps to identify deficiencies early and to assure that corrective actions are taken to prevent recurrence.

For nuclear power plants, dedicated groups have been formed both by the NRC and by the nuclear power industry for the detailed review of operating experience to help identify safety concerns early, to improve dissemination of such information, and to feed back the experience into licensing, regulations, and operations.

In addition, the NRC and the nuclear power industry have ongoing efforts to improve the operational data system which include not only the type, and quality, of reports required to be submitted, but also the method used to analyze the data. Two primary sources of operational data are reports submitted by the licensees under the Licensee Event Report (LER) system, and under the Nuclear Plant Reliability Data (NPRD) system. The former system is under the control of the NRC while the latter system is a voluntary, industry-supported system operated by the Institute of Nuclear Power Operations (INPO), a nuclear utility organization.

Some form of LER reporting system has been in existence since the first nuclear power plant was licensed. Reporting requirements were delineated in the Code of Federal Regulations (10 CFR), in the licensees' technical specifications, and/or in license provisions. In order to more effectively collect, collate, store, retrieve, and evaluate the information concerning reportable events, the Atomic Energy Commission (the predecessor of the NRC) established in 1973 a computer-based data file, with data extracted from licensee reports dating from 1969. Periodically, changes were made to improve both the effectiveness of data processing and the quality of reports required to be submitted by the licensees.

Effective January 1, 1984, major changes were made to the requirements to report to the NRC. A revised Licensee Event Report System (10 CFR § 50.73) was established by Commission rulemaking which modified and codified the former LER system. The purpose was to standardize the reporting requirements for all nuclear power plant licensees and eliminate reporting of events which were of low individual significance, while requiring more thorough documentation and analyses by the licensees of any events required to be reported. All such reports are to be submitted within 30 days of discovery. The revised system also permits licensees to use the LER procedures for various other reports required under specific sections of 10 CFR Part 20 and Part 50. The amendment to the Commission's regulations was published in the Federal Register (48 FR 33850) on July 26, 1983, and is described in NUREG-1022, "Licensee Event Report System," and Supplements 1 and 2 to NUREG-1022.

Also effective January 1, 1984, the NRC amended its immediate notification requirements of significant events at operating nuclear power reactors (10 CFR § 50.72). This was published in the Federal Register (48 FR 39039) on August 29, 1983, with corrections (48 FR 40882) published on September 12, 1983. Among the changes made were the use of terminology, phrasing, and reporting thresholds that are similar to those of 10 CFR § 50.73. Therefore, most events reported under 10 CFR § 50.72 will also require an in-depth follow-up report under 10 CFR § 50.73.

The NPRD system is a voluntary program for the reporting of reliability data by nuclear power plant licensees. Both engineering and failure data are to be submitted by licensees for specified plant components and systems. In the past, industry participation in the NPRD system was limited and, as a result, the Commission considered it may be necessary to make participating mandatory in order to make the system a viable tool in analyzing operating experience. However, on July 8, 1981, INPO announced that because of its role as an active user to NPRD system data, it would assume responsibility for management and funding of the NPRD system. INPO reports that significant improvements in licensee participation have been made. The Commission considers the NPRD system to be a vital adjunct to the LER system for the collection, review, and feedback of operational experience; therefore, the Commission periodically monitors the progress made on improving the NPRD system.

Information concerning reportable occurrences at facilities licensed or otherwise regulated by the NRC is routinely disseminated by the NRC to the nuclear industry, the public, and other interested groups as these events occur.

Dissemination includes special notifications to licensees and other affected or interested groups, and public announcements. In addition, information on reportable events is routinely sent to the NRC's more than 100 local public document rooms throughout the United States and to the NRC Public Document Room in Washington, DC.

The Congress is routinely kept informed of reportable events occurring in licensed facilities.

AGREEMENT STATES

Section 274 of the Atomic Energy Act, as amended, authorizes the Commission to enter into agreements with States whereby the Commission relinquishes and the States assume regulatory authority over byproduct, source and special nuclear materials (in quantities not capable of sustaining a chain reaction). Comparable and compatible programs are the basis for agreements.

Presently, information on reportable occurrences in Agreement State licensed activities is publicly available at the State level. Certain information is also provided to the NRC under exchange of information provisions in the agreements.

In early 1977, the Commission determined that abnormal occurrences happening at facilities of Agreement State licensees should be included in the quarterly reports to Congress. The abnormal occurrence criteria included in Appendix A are applied uniformly to events at NRC and Agreement State licensee facilities. Procedures have been developed and implemented and abnormal occurrences reported by the Agreement States to the NRC are included in these quarterly reports to Congress.

FOREIGN INFORMATION

The NRC participates in an exchange of information with various foreign governments which have nuclear facilities. This foreign information is reviewed and considered in the NRC's assessment of operating experience and in its research and regulatory activities. Reference to foreign information may occasionally be made in these quarterly abnormal occurrence reports to Congress; however, only domestic abnormal occurrences are reported.

REPORT TO CONGRESS ON ABNORMAL OCCURRENCES
JULY-SEPTEMBER 1987

NUCLEAR POWER PLANTS

The NRC is reviewing events reported at the nuclear power plants licensed to operate during the third calendar quarter of 1987. As of the date of this report, the NRC had determined that the following events were abnormal occurrences.

87-14 Significant Degradation of Plant Safety at Oyster Creek

The following information pertaining to this event is also being reported concurrently in the Federal Register. Appendix A (see Example 5 of "For Commercial Nuclear Power Plants") of this report notes that personnel error or procedural deficiencies which result in loss of the plant's capability to perform an essential safety function can be considered an abnormal occurrence. In addition, Example 11 of "For All Licenses" notes that a major deficiency in management or procedural controls in major areas can be considered an abnormal occurrence.

Date and Place - On April 24, 1987, while the reactor was being shut down, personnel errors resulted in a condition which could have resulted in containment failure had a loss of coolant accident (LOCA) occurred. Oyster Creek is a General Electric-designed boiling water reactor operated by General Public Utilities (the licensee) and located in Ocean County, New Jersey.

Nature and Probable Consequences - The plant was being shut down for maintenance with the mode switch in the RUN position; reactor power was approximately 23% at the time of the event. The licensee planned to enter the drywell to repair an acoustic monitor. In order to enter the drywell safely, the containment atmosphere must first be purged to displace the nitrogen atmosphere to ensure proper oxygen levels are present to aid personnel entry. The deinerting commenced on April 23, 1987 at 10:00 p.m. At 3:30 a.m. on April 24, 1987, the group shift supervisor (GSS) authorized the blocking open of the torus-to-drywell vacuum breaker valves to assist the containment deinerting. The GSS believed the deinerting was not progressing as rapidly as it had in the past and elected to initiate a mechanical temporary variation. A safety review for the temporary variation was completed by the operations shift supervisor and reviewed by the shift technical advisor; however, the review did not identify the potential adverse effect on plant safety or the technical specification non-compliance that would exist. (Technical specifications require that all torus-to-drywell vacuum breakers be operable when primary containment integrity is required.)

At approximately 7:00 a.m. on April 24, 1987, operations management questioned plant conditions with the torus-to-drywell vacuum breakers open. The GSS investigated the concern, recognized the mistake, and closed the valves. The plant was at approximately 400 psig and still shutting down when the vacuum breaker valves were finally shut. Primary containment was still required by technical specifications under these plant conditions.

The allowable suppression pool bypass area for the Oyster Creek containment has been established at 10.5 square inches to maintain its capability to mitigate the full spectrum of LOCAs. A bypass area of 500 square inches (with the valves open) rendered the containment vulnerable to steam bypass of the suppression chamber, potentially resulting in containment over-pressurization for small, intermediate, and large LOCAs. Furthermore, blocking open of the suppression chamber-drywell vacuum breakers resulted in the plant being in an unanalyzed condition.

As a result of a special NRC team inspection on April 24 - May 6, violations of NRC requirements were identified, and a $205,000 fine was proposed on August 24, 1987 (Ref. 1). $80,000 of this fine was for the violation described above, which was classified as Severity Level II (where Levels I and V are considered the most and least significant, respectively). In addition, the NRC inspection also determined that since some time in 1977, some of the vacuum breakers between the suppression pool and the reactor building located outside containment had been periodically tied open during certain plant shutdowns. A $75,000 fine was proposed for this violation. Finally, a $50,000 fine was proposed for the failure to properly implement the procedures for performing safety reviews and making temporary variations to the normal configuration of plant equipment. In the August 24, 1987 letter, the NRC noted that the April 24, 1987 event was not an isolated occurrence, demonstrating that management review and oversight of the program for making temporary variations were inadequate, resulting in numerous violations of procedural requirements.

Cause or Causes - The cause of the April 24 event has been determined to be personnel error, due to deficiencies in management and procedural controls. The operations shift supervisor and the shift technical advisor who reviewed the temporary variation should have been cognizant of the technical specification requirement specifying that the torus to drywell vacuum breaker valves must be operable when primary containment is required. A written safety evaluation was not performed.

The cause of the previous blocking of vacuum breaker events and violations of procedural requirements governing safety reviews of temporary variations were caused by inadequate management review and oversight of the program.

Actions Taken to Prevent Recurrence

Licensee - All outstanding temporary variations were reviewed to assure acceptability. Plant procedures have been changed as appropriate and all site individuals have completed a retraining program on safety reviews. All shift technical advisors and group shift supervisors have been reinstructed in proper organizational relationship and the need for independence in overview functions. An incident investigation task force has been established, and the utility's Nuclear Assurance Division will institute increased oversight of temporary variations and safety reviews.

On September 22, 1987, the licensee responded to the NRC enforcement action concurring with the violations and paying the civil penalty in full (Ref. 2).

NRC - As previously discussed, a special team inspection was conducted on April 24 - May 6, 1987, which identified the violations of NRC requirements. An Enforcement Conference between licensee and NRC personnel was held at the NRC Region I office on June 10, 1987.

The NRC will continue surveillance of licensee operations to assure that the corrective actions have been properly implemented.

This item is considered closed for the purposes of this report.

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87-15 Steam Generator Tube Rupture at North Anna Unit 1

The following information pertaining to this event is also being reported concurrently in the Federal Register. Appendix A (Example 2 of "For Commercial Nuclear Power Plants") of this report notes that major degradation of the primary coolant pressure boundary can be considered an abnormal occurrence.

Date and Place - At approximately 6:35 a.m. on July 15, 1987, North Anna Unit 1 was manually tripped from 100 percent power due to indications of a steam generator tube rupture. North Anna Units 1 and 2 are Westinghouse-designed pressurized water reactors and are located in Louisa County, Virginia. The units are operated by Virginia Electric and Power Company.

Nature and Probable Consequences - Steam generator (S/G) tubes in a pressurized water reactor are an integral part of the reactor coolant pressure boundary. The loss of integrity of S/G tubes results in a breach of the primary-to-secondary system boundary. Steam generator tube rupture is one of the design basis accidents considered in the NRC safety review of nuclear power plants.

Safety-margins are maintained through conservative design, inservice inspections, and administrative controls during operation such that if a steam generator tube leaks, the leakage can be detected rapidly and the reactor can be shut down safely. Nevertheless, the rupture of a S/G tube can happen, as it did at North Anna 1, and previously at Ginna, Point Beach Unit 1, Surry Unit 2 and Prairie Island Unit 1. Of these, the Ginna event which occurred on January 25, 1982 was the most severe and was consequently evaluated in depth. The Ginna event was reported as abnormal occurrence 82-4 in NUREG-0090, Vol. 5, No. 1 ("Report to Congress on Abnormal Occurrences: January - March 1982").

Pressurized water reactor nuclear power plant licensees are required to have operational plans (including procedures, trained operation and support personnel, and other capabilities) to cope with a complete rupture of a S/G tube and mitigate any radiological consequences. The North Anna 1 operating and support staff mitigated the consequences of the July 15, 1987 event such that the radiological consequences were insignificant in terms of risk from any resultant on-site or off-site exposures.

The sequence of events for the S/G tube rupture incident and the associated response actions during the incident are described below.

North Anna 1 returned from a refueling outage on June 29, 1987 and reached 100% power on July 14. Reactor coolant leak rate measurements taken on July 13 indicated less than 0.25 gallons per minute unidentified leakage. Steam jet air ejector radiation monitor 1-RM-SV-121 was inoperable on July 13, became operable on July 14, but operated erratically and was declared inoperable again at 10:28 p.m. on July 14. No other safety-related equipment was out of service.

At approximately 6:30 a.m. on July 15, 1987, with Unit 1 at 100 percent power and Unit 2 at 81 percent power in an end of cycle power coastdown, a high radiation alarm was received on the Unit 1 "C" S/G main steam line rad monitor. At the same time, pressurizer level and pressure began to decrease rapidly.

At 6:35 a.m. with pressurizer level at approximately 45 percent (for 100% power, program level is 65%) and pressurizer pressure at 2100 psig (normal operating pressure is 2235 psig), Unit 1 was manually tripped. Approximately 20 seconds later, an automatic actuation of the safety injection system occurred due to a low-low pressurizer pressure (less than 1765 psig on 2 out of 3 channels). By 6:48 a.m., the "C" S/G had been identified as having positive indication of a tube rupture and had been isolated.

A Notification of Unusual Event was declared at 6:39 a.m. and the initial notifications to State and local governments were completed by 6:51 a.m. The event was upgraded to an Alert at 6:54 a.m. and the notifications to all off-site agencies and NRC were completed by 7:02 a.m. An orderly cooldown and depressurization of the reactor coolant system to cold shutdown conditions was initiated at 7:18 a.m. and the emergency was terminated at 1:36 p.m.

Several radiological release paths to the environment were present during this event. The condenser air ejector discharged to atmosphere until it was manually diverted to the containment building at 7:56 a.m. The steam driven auxiliary feedwater pump, started on the safety injection signal and its steam supply from the "C" S/G was isolated to the turbine driven auxiliary pump at approximately 6:48 a.m. A minor relief path existed when two relief valves, the "B" main feedwater pump suction and the 2A feedwater heater tube side, lifted and did not reseat when pressure had returned to normal. An operator manually adjusted the relief valve setpoints to allow them to close, and this was completed approximately 30 minutes into the event.

Analysis of the radiological data indicated that a total of 1.59×10^{-1} curies was released, which consisted primarily of radiogases. There was no detectable increase in normal background levels of radioactivity at the site boundary in the affected sector(s). The release was less than 1% of Technical Specification limits.

The primary-to-secondary leak in this event was estimated to be between 550 to 637 gallons per minute (gpm). The North Anna Updated Final Safety Analysis Report estimated that a double-ended rupture of a single tube at full power would result in a flow rate of 710 gpm. The highest flow rate in the 1982 S/G tube rupture at Ginna was estimated to be 760 gpm.

Cause of Causes - The licensee performed a remote visual examination of the ruptured tube using an endoscope electronic imaging probe and observed that the tube had failed over 360 degrees of the circumference, and the fractured ends were displaced in the axial direction approximately one-half inch. The cold leg side of the tube was removed, and based upon detailed evaluation of the failed tube fracture face, the cause of the failure has been firmly established to be fatigue. The fatigue was induced by fluid elastic excitation mechanism which provided sufficient loadings or alternating stresses to initiate and propagate the crack.

Actions Taken to Prevent Recurrence

Licensee - Corrective actions included modification of the S/Gs (i.e., performing eddy current inspection of all S/Gs; mechanically plugging all required tubes and preventively plugging susceptible tubes; and installing downcomer flow restrictors). In addition, surveillance of primary to secondary leakage was increased by installing new radiation monitors and increasing the surveillance frequency. Procedures were changed for actions to take if a leak rate exceeds certain criteria, for adjusting alarm setpoints, and for handling inoperable leakage monitoring equipment. The licensee is developing a Technical Specification change at the request of NRC.

NRC - An NRC Augmented Inspection Team (AIT) was sent to the site on July 15, 1987 to determine whether the licensee's action in response to the S/G tube failure was adequate to protect the health and safety of the public. In addition, the AIT evaluated the licensee's action associated with determining the cause of the event and their corrective actions to prevent recurrence. (Ref. 3).

The AIT concluded that the overall results achieved were outstanding in that the operator tripped the plant, isolated the leak and brought the plant to cold shutdown in seven hours without using the S/G power operated relief valves. This contributed to a negligible release to the environment. Therefore, there was no effect on public health and safety.

Four violations of NRC requirements were identified, all classified as Severity Level IV (on a scale in which Severity Levels I and V are considered the most significant and least significant, respectively). These were forwarded to the licensee on October 5, 1987 (Ref. 4). No civil penalty was imposed.

On October 9, 1987, NRC authorized startup of Unit 1 with operation limited to 50 percent power. On November 5, 1987, NRC authorized operation up to 100 percent power.

This item is considered closed for the purposes of this report.

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FUEL CYCLE FACILITIES

(Other Than Nuclear Power Plants)

The NRC is reviewing events reported by these licensees during the third calendar quarter of 1987. As of the date of this report, the NRC had not determined that any events were abnormal occurrences for that period.

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OTHER NRC LICENSEES

(Industrial Radiographers, Medical Institutions, Industrial Users, etc.)

There are currently about 9,000 NRC nuclear material licenses in effect in the United States, principally for use of radioisotopes in the medical, industrial, and academic fields. Incidents were reported in this category from licensees such as radiographers, medical institutions, and byproduct material users.

The NRC is reviewing events reported by these licensees during the third calendar quarter of 1987. As of the date of this report, the NRC had determined that the following events were abnormal occurrences.

87-16 Therapeutic Medical Misadministration

The following information pertaining to this event is also being reported concurrently in the Federal Register. Appendix A (see the general criterion) of this report notes that an event involving a moderate or more severe impact on public health or safety can be considered an abnormal occurrence.

Date and Place - On August 24, 1987, the NRC was notified that a 75-year-old patient at Parkview Memorial Hospital, Fort Wayne, Indiana, received two therapeutic radiation exposures to the wrong part of the body.

Nature and Probable Consequences - The patient was scheduled to receive radiation therapy exposures of 250 rads per exposure to the right hip. The treatments were to continue for 12 days for a total of 3000 rads.

During the pretreatment planning, a technologist placed treatment marks on the patient's left hip in error. The patient was then taken to the treatment room where another technologist noted the markings on the left hip and treated the left hip. A second 250 rad exposure was administered on the next day, but prior to the third exposure, the patient informed the technologist that the wrong hip was being treated. The treatments were halted when the error was discovered.

The patient has been examined by a physician and no medical side effects have been noted as a result of the misadministration.

Cause or Causes - The misadministration was caused by the technologist's error in mismarking the treatment area. The second technologist, who administered the radiation therapy, also failed to verify the treatment area by checking the patient's records.

Actions Taken to Prevent Recurrence

Licensee - The hospital agreed to institute a quality assurance program for cobalt-60 teletherapy procedures that included the independent determination of dose calculations by two qualified individuals and other aspects of treatment procedures and planning.

The hospital subsequently decided to terminate its radiation therapy program using a cobalt-60 teletherapy unit. It will continue to utilize a high energy linear accelerator which is not subject to NRC jurisdiction.

NRC - On August 25, 1987, the NRC issued a Confirmatory Action Letter (Ref. 5) to the hospital documenting its agreement to institute a quality assurance program for cobalt-60 teletherapy procedures. The NRC also retained a medical consultant to evaluate the circumstances and possible effects of the misadministration. The medical consultant concluded that the misadministration would not cause a significant long term bilogical effect on the patient and would not require modification of the patient's follow-up medical care.

This item is considered closed for the purposes of this report.

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87-17 Failure to Report Diagnostic Medical Misadministrations

The following information pertaining to this event is also being reported concurrently in the Federal Register. Appendix A (see Example 11 of "For All Licensees") of this report notes that serious deficiency in management or procedural controls in major areas can be considered an abnormal occurrence.

Date and Place - On August 24, 1987, the NRC issued an Order to Show Cause Why the License Should Not Be Modified (Ref. 6) to the Edward Hines, Jr., Veterans Administration Hospital directing that a hospital staff member be removed from NRC-licensed activities and that the hospital take certain steps to improve its control over its nuclear medicine program. The hospital is located in Hines, Illinois, near Chicago.

Nature and Probable Consequences - An NRC investigation between December 16, 1986, and June 30, 1987, determined that the Assistant Chief Physician of the Hospital's Nuclear Medicine Service failed to ensure that two diagnostic misadministrations of radioactive pharmaceuticals were reported to the NRC, as required. The investigation also determined that the physician made a false statement to a Veterans Administration Investigatory Board and to NRC investigators, destroyed evidence, and attempted to impede the NRC investigation by influencing the testimony of a witness.

The investigation was made after an August 14, 1986 anonymous allegation was made to the NRC that three misadministrations had occurred at the facility during the week of August 4-8, 1986, and which had not been reported to the NRC.

The investigation showed that while all three misadministrations had taken place, as alleged, one of them was not required to be reported to the NRC since it involved a radioactive material not subject to NRC jurisdiction. The two which were not reported to the NRC, as required, were:

1. On August 4, 1986, a patient who was scheduled for a bone scan was injected with a different radioactive pharmaceutical, which is used for a brain scan.

2. On August 6, 1986, a patient scheduled for a gallium-67 scan, received a different NRC-licensed radiopharmaceutical that was scheduled for another patient.

Because of the small quantities of the radioactive pharmaceuticals involved, no adverse medical reactions would be expected in the patients, although they did receive some unnecessary radiation exposure.

Cause or Causes - The misadministrations were attributed to a lack of communication among the staff members of the Nuclear Medicine Service and the medical staff of the hospital.

The NRC investigation and previous inspections at the hospital determined that the licensee's management and staff had failed to adequately control its program for administration of radiopharmaceuticals to patients. These failures included not properly controlling dose administration records, inadequate training, and not verifying procedure orders.

Actions Taken to Prevent Recurrence

Licensee - The licensee has implemented the terms of the NRC Order and has selected, with NRC concurrence, the outside auditor for its nuclear medicine program. The Assistant Chief Physician has been reassigned to duties that do not involve the use or supervision of the use of NRC-licensed materials.

The Assistant Chief Physician has requested a hearing on the order as it affects him. The proceeding is pending.

NRC - The NRC Order, which was effective immediately, removed the authority of the Assistant Chief Physician in the Nuclear Medicine Service to use or supervise the use of NRC-licensed radioactive materials. In addition, the hospital was directed to undertake further training for its Nuclear Medicine Service staff; to assure that all prescriptions for nuclear medicine procedures are in writing, reviewed by a nuclear medicine physician, and verified by the technologist; and to maintain a record of dosage measurement and administration. In addition, the hospital was directed to retain an independent organization to perform quarterly audits of the nuclear medicine department.

This item is considered closed for the purposes of this report.

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87-18 Suspension of a Well Logging Company's License

The following information pertaining to this event is also being reported concurrently in the Federal Register. Appendix A (see Example 11 of "For All Licensees") of this report notes that serious deficiency in management or procedural controls in major areas can be considered an abnormal occurrence.

Date and Place - On September 8, 1987, the NRC issued an immediately effective order (Ref. 7) to Log-Tec of Cleveland, Oklahoma, that suspended the NRC license, ordered all byproduct material be placed in locked storage, and ordered the licensee to show cause why the license should not be revoked.

Nature and Probable Consequences - The license, which had been issued on June 14, 1984, authorized the use and possession of sealed radioactive sources to perform well logging. During a routine NRC inspection at Log-Tec facilities on August 19, 1987, eleven apparent violations of NRC requirements were identified. These apparent violations included failure to (a) store radioactive material at an authorized location, (b) survey storage facilities, (c) provide personnel monitoring, (d) maintain utilization records, (e) properly label radioactive shipping packages, (f) perform leak tests on sealed sources, and (g) calibrate survey instruments (h) perform job site contamination surveys, (i) perform radiation surveys of vehicles transporting radioactive material, (j) use authorized method of storing radioactive material, and (k) maintain complete personnel monitoring records. When these violations were discussed with the company's sole proprietor, the NRC inspector was told that the sources had not been used since about June of 1986.

However, on August 21, 1987, the President of Inland Oil Corporation (IOC) provided a sworn statement that the licensee had conducted well logging operations for IOC on July 9, 1987. According to the President, he and another person witnessed a Log-Tec representative conducting the logging process. IOC also provided NRC with written documentation (i.e., neutron log) received from the licensee that verified the results of the logging process.

On August 21, 1987, an NRC investigator and an NRC inspector interviewed Log-Tec's sole proprietor about his use of radioactive sources. Again, he reiterated that he had done no logging using radioactive sources since June 1986. However, when confronted with the copy of the neutron log received from IOC, the sole proprietor admitted that he had performed this work and had used a radioactive source to do so. Also, he stated that he had no records of his work at IOC. He further stated that he told the NRC inspector that he had not used radioactive sources because he knew his records were not up to date and he was afraid to admit this. He stated that he had none of the records required by NRC and never thought about keeping such records. He stated that his survey equipment was out of calibration because he did not have the money for such maintenance. He also admitted that he had not used film badges in a long time because he could not afford such associated expenses. Also, he admitted that he, doing business as Log-Tec, had conducted licensed well logging activities for other companies (i.e., Continental Oil; JGW Exploration, Inc.; and Covenant Oil) since June 1986 besides that done for IOC. NRC contacted and subsequently obtained from the Covenant Oil Company gamma ray logs that documented Log-Tec's use of radioactive sources for logging operations on September 9, 1986, December 10, 1986, and June 30, 1987.

The action of the sole proprietor of Log-Tec in deceiving the NRC inspector demonstrated that he was not trustworthy and not committed to complying with Commission requirements. Therefore, the NRC did not have the requisite reasonable assurance that the sole proprietor, doing business as Log-Tec, would comply with Commission requirements in the future. Consequently, the license was suspended.

Cause or Causes - The root cause can be attributed to a serious breakdown in the licensee's management controls.

Actions Taken to Prevent Recurrence

Licensee - The licensee has requested that the license be terminated. The licensee has transferred all sealed sources to an authorized recipient.

NRC - The NRC is terminating the license.

This item is considered closed for the purposes of this report.

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87-19 Suspension of an Industrial Radiography Company's License

The following information pertaining to this event is also being reported in the Federal Register. Appendix A (see Example 11 of "For All Licensees") notes that a major deficiency in management or procedural controls in major areas can be considered an abnormal occurrence.

Date and Place - On September 21, 1987, the NRC issued an Order Suspending License (effective immediately) to Finlay Testing Laboratories, Inc., Aiea, Hawaii (Ref. 8). The Order required the licensee to suspend all activities authorized by the license and to place all byproduct material in the licensee's possession in locked storage.

Nature and Probable Consequences - During inspections and investigations conducted in September 1987 in the state of Hawaii, it was determined that licensee employees had caused the shipment of radiographic exposure devices containing radioactive sources on passenger-carrying aircraft by concealing the nature of the material being offered for transport. NRC and Department of Transportation (DOT) regulations specifically prohibit industrial radiographic sources from being transported aboard passenger carrying aircraft. It was further noted that licensee personnel failed to make surveys to assure the sources were in their shielded positions, and failed to prepare and use required shipping papers and labels for these shipments.

It was also ascertained by NRC inspectors and investigators that licensee representatives (including the Radiation Safety Officer) had failed to maintain required records of licensed activities.

Cause or Causes - The causes contributing to the violations appear to be a disregard for licensee operating procedures and the NRC license conditions and regulations. However, the case remains under investigation by the NRC Office of Investigations, and a complete understanding of all contributing causes awaits their report.

Actions Taken to Prevent Recurrence

Licensee - The licensee has complied with the Order and has forwarded a written request for an enforcement hearing.

NRC - The NRC Order continues in effect and a decision by the NRC on whether to allow the licensee to resume licensed activities has not been made. The NRC staff is reviewing the licensee's response to the Order at this time.

Future reports will be made as appropriate.

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AGREEMENT STATE LICENSEES

Procedures have been developed for the Agreement States to screen unscheduled incidents or events using the same criteria as the NRC (See Appendix A) and report the events to the NRC for inclusion in this report. During the third calendar quarter of 1987, the Agreement States reported the following abnormal occurrences to the NRC.

AS87-4 Hospital Contamination Incident

Appendix A (see Example 11 of "For All Licensees") of this report notes that serious deficiency in management or procedural controls in major areas can be considered an abnormal occurrence. In addition, one of the general criteria notes that moderate exposure to, or release of, radioactive material can be considered an abnormal occurrence.

Date and Place - On June 3, 1987, a contamination incident occurred at Buffalo General Hospital, Buffalo, New York, during resuscitation efforts on a patient.

Nature and Probable Consequences - On the morning of June 2, 1987, an 87 year old patient at the hospital was administered a 200-millicurie therapy dose of iodine-131 in the hope of relieving esophageal compression caused by metastatic thyroid carcinoma. The patient had had a total thyroidectomy in April, 1987, and had a gastrostomy tube and a foley catheter in place. On the evening of June 3, 1987, approximately 34 hours after receiving the dose, the patient had a cardiopulmonary arrest and expired. During an attempt at resuscitation in the patient's room by sixteen staff members, which included insertion of a pacemaker, contaminated blood and urine were spilled and no surveys of the clothing of those present were done. The hospital is part of an unusual broad license which includes several different hospitals.

The patient was disoriented and was known to have dislodged the foley catheter before the radioiodine dose was administered, yet no special precautions were taken to prevent contamination and no special instructions were given to nursing staff. Room preparation was minimal with most surfaces left uncovered and no shielding was provided for the catheter bag. It was later determined that the patient had removed the foley catheter at least twice after receiving the dose and leaked urine onto the floor. The staff, apparently not aware of the amounts of iodine contained in the urine, cleaned it up and apparently did not inform anyone that this had occurred.

When the patient went into cardiac arrest, the physician who had administered the radioiodine dose was called and gave no instructions relating to the possibility of contamination. The physician in turn called the health physicist for the broad license, but did not call the site radiation safety officer. The health physicist gave no instructions relating to the spread of contamination except to secure the patient's room. Neither the physician nor the physicist responded to the scene until the following day.

Contamination was eventually found on almost all the furniture in the patient's room, on the floor of the room and surrounding hallways, on the shoes of several staff and on equipment such as a blood pressure cuff and stethoscope used in the resuscitation attempt. However, subsequent thyroid bioassay showed no uptakes by involved staff, and the highest personnel monitoring badge reading was 30 millirem for one of the nurses.

Cause or Causes - The hospital's procedures for preparing for such a therapy, especially when the patient could not cooperate, were severely deficient. In addition, instruction of personnel was totally inadequate and procedures for responding to emergencies were disorganized. Management control over this program was judged to be inadequate.

Actions Taken to Prevent Recurrence

Licensee - The hospital has revised its procedures for preparing for radioiodine therapy treatments, and its criteria for patient selection.

State Agency - The Agency is in the process of making changes in the structure of this license to clarify responsibilities.

This item is considered closed for the purposes of this report.

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AS87-5 Therapeutic Medical Misadministrations

Appendix A (see the general criterion) of this report notes that an event involving a moderate or more severe impact on public health or safety can be considered an abnormal occurrence.

Date and Place - On August 5, 1987, the New York State Department of Health, Bureau of Environmental Radiation Protection (State Agency) was notified of a series of therapeutic medical misadministrations to patients at Northern Westchester Medical Center, Westchester County, New York.

Nature and Probable Consequences - The hospital had contracted with a consulting group (Radiological Physics Associates of Elmsford, New York) to provide health physics services; a dosimetrist from the group normally prepared the cobalt teletherapy treatment plans. While the dosimetrist was on vacation, a physicist from the group was called by the hospital to make a change in a treatment plan for a patient. In making the change the physicist discovered a serious error in the treatment times calculated by the dosimetrist, and reported this to the radiotherapy physician. The physicist then reviewed other plans and found more errors.

Independent physicists were retained by the hospital to do a complete review of all treatment plans since their program began in 1982, and eventually found 22 cases in which the therapy doses delivered to patients differed from the prescribed doses by more than 10% (this included overtreatments as well as undertreatments). The largest error found was an administered dose that was about 204 times the prescribed dose. All the plans containing errors involved computer generated data and all were prepared by the same dosimetrist.

As soon as the first misadministrations were verified, the Agency contacted by telephone the two other hospitals (Columbia Memorial in Hudson, New York; and Samaritan Hospital in Troy, New York) where the dosimetrist did treatment planning and instructed them to have an independent physicist review their patient treatment plans with emphasis on plans involving computer generated data. Two misadministrations were found at Columbia Hospital and many other treatment plans contained the same types of errors; however, the administered dose did not differ from the prescribed dose by greater than 10%. Samaritan Hospital utilizes a computer system which computes the treatment time; therefore, the mathematical operations had been correctly done by the computer.

To date, the latter two hospitals report no observable physical effects in the affected patients attributable to the treatment errors.

All available data on the 22 patients affected at Northern Westchester Medical Center were provided by the hospital to the State Agency and are under review by its Radiological Health Advisory Committee. At this hospital, some patients receiving overtreatments had exhibited physical symptoms apparently due to the exposures.

<u>Cause or Causes</u> - The errors which resulted in the misadministrations were due to mistakes in calculations made by the dosimetrist utilizing computer generated data. They were of several different kinds, were not made consistently and seem to demonstrate a lack of understanding of the computer systems used.

<u>Actions Taken to Prevent Recurrence</u>

<u>Licensees</u> - The licensees have instituted quality assurance measures which include a second check of all treatment plan calculations. The dosimetrist who made the errors will no longer be doing computerized therapy treatment planning.

<u>State Agency</u> - The Agency is drafting therapy misadministration reporting requirements and quality assurance requirements for providers of radiation therapy services.

This item is considered closed for the purposes of this report.

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REFERENCES

1. Letter from William T. Russell, Regional Administrator, NRC Region I, to Mr. P. B. Fiedler, Vice President and Director, Oyster Creek Nuclear Generating Station, forwarding a Notice of Violation and Imposition of Civil Penalty, Docket No. 50-219, August 24, 1987.*

2. Letter from P. B. Fiedler, Vice President and Director, Oyster Creek, to James Lieberman, Director, Office of Enforcement, NRC, Subject: Reply to Notice of Violation, Docket No. 50-219, September 22, 1987.*

3. Letter from J. Nelson Grace, Regional Administrator Region II to Mr. W. L. Stewart, Vice President, Nuclear Operations, Virginia Electric and Power Company, forwarding Augmented Inspection Team Reports Nos. 50-338/87-24 and 50-339/87-24, August 28, 1987.*

4. Letter from J. Nelson Grace, Regional Administrator, Region II, to Mr. W. L. Stewart, Vice President, Nuclear Operations, Virginia Electric and Power Company, forwarding a Notice of Violation, Docket No. 50-338, October 5, 1987.*

5. Confirmatory Action Letter from A. Bert Davis, Regional Administrator, NRC Region III, to Mr John Agnew, Parkview Memorial Hospital, Fort Wayne, Indiana, License No. 13-01284-03, Docket No. 30-00190, August 25, 1987.*

6. Letter from James M. Taylor, Deputy Executive Director for Regional Operations, to Mr. John Fears, Director, Edward Hines, Jr., Medical Center (Veterans Administration), forwarding an Order to Show Cause (Effective Immediately) Docket No. 30-01391, August 24, 1987.*

7. Letter from James M. Taylor, NRC Deputy Executive Director for Regional Operations, to Roger Couffer, Owner, Log Tec, forwarding an Order Suspending License (Effective Immediately) and Order to Show Cause, License No. 35-23134-01, Docket No. 30-20294, September 8, 1987.*

8. Letter from James M. Taylor, NRC Deputy Executive Director for Regional Operations, to Finlay Testing Laboratories, Inc., forwarding an Order Suspending License (Effective Immediately), dated September 21, 1987.*

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*Available in NRC Public Document Room, 1717 H Street, NW, Washington, DC 20555, for public inspection and/or copying.

APPENDIX A

ABNORMAL OCCURRENCE CRITERIA

The following criteria for this report's abnormal occurrence determinations were set forth in an NRC policy statement published in the Federal Register on February 24, 1977 (Vol. 42, No. 37, pages 10950-10952).

An event will be considered an abnormal occurrence if it involves a major reduction in the degree of protection of the public health or safety. Such an event would involve a moderate or more severe impact on the public health or safety and could include but need not be limited to:

1. Moderate exposure to, or release of, radioactive material licensed by or otherwise regulated by the Commission;

2. Major degradation of essential safety-related equipment; or

3. Major deficiencies in design, construction, use of, or management controls for licensed facilities or material.

Examples of the types of events that are evaluated in detail using these criteria are:

For All Licensees

1. Exposure of the whole body of any individual to 25 rems or more of radiation; exposure of the skin of the whole body of any individual to 150 rems or more of radiation; or exposure of the feet, ankles, hands or forearms of any individual to 375 rems or more of radiation (10 CFR § 20.403 (a)(1)), or equivalent exposures from internal sources.

2. An exposure to an individual in an unrestricted area such that the whole-body dose received exceeds 0.5 rem in one calendar year (10 CFR § 20.105 (a)).

3. The release of radioactive material to an unrestricted area in concentrations which, if averaged over a period of 24 hours, exceed 500 times the regulatory limit of Appendix B, Table II, 10 CFR Part 20 (10 CFR § 20.403 (b)).

4. Radiation or contamination levels in excess of design values on packages, or loss of confinement of radioactive material such as (a) a radiation dose rate of 1,000 mrem per hour three feet from the surface of a package containing the radioactive material, or (b) release of radioactive material from a package in amounts greater than the regulatory limit.

5. Any loss of licensed material in such quantities and under such circumstances that substantial hazard may result to persons in unrestricted areas.

6. A substantiated case of actual or attempted theft or diversion of licensed material or sabotage of a facility.

7. Any substantiated loss of special nuclear material or any substantiated inventory discrepancy which is judged to be significant relative to normally expected performance and which is judged to be caused by theft or diversion or by substantial breakdown of the accountability system.

8. Any substantial breakdown of physical security or material control (i.e., access control, containment, or accountability systems) that significantly weakened the protection against theft, diversion, or sabotage.

9. An accidental criticality (10 CFR § 70.52(a)).

10. A major deficiency in design, construction, or operation having safety implications requiring immediate remedial action.

11. Serious deficiency in management or procedural controls in major areas.

12. Series of events (where individual events are not of major importance), recurring incidents, and incidents with implications for similar facilities (generic incidents), which create major safety concern.

<u>For Commercial Nuclear Power Plants</u>

1. Exceeding a safety limit of license technical specifications (10 CFR § 50.36(c)).

2. Major degradation of fuel integrity, primary coolant pressure boundary, or primary containment boundary.

3. Loss of plant capability to perform essential safety functions such that a potential release of radioactivity in excess of 10 CFR Part 100 guidelines could result from a postulated transient or accident (e.g., loss of emergency core cooling system, loss of control rod system).

4. Discovery of a major condition not specifically considered in the safety analysis report (SAR) or technical specifications that requires immediate remedial action.

5. Personnel error or procedural deficiencies which result in loss of plant capability to perform essential safety functions such that a potential release of radioactivity in excess of 10 CFR Part 100 guidelines could result from a postulated transient or accident (e.g., loss of emergency core cooling system, loss of control rod system).

<u>For Fuel Cycle Licensees</u>

1. A safety limit of license technical specifications is exceeded and a plant shutdown is required (10 CFR § 50.36(c)).

2. A major condition not specifically considered in the safety analysis report or technical specifications that requires immediate remedial action.

3. An event which seriously compromised the ability of a confinement system to perform its designated function.

APPENDIX B

UPDATE OF PREVIOUSLY REPORTED ABNORMAL OCCURRENCES

During the July through September 1987 period, the NRC, NRC licensees, Agreement States, Agreement State Licensees, and other involved parties, such as reactor vendors and architects and engineers, continued with the implementation of actions necessary to prevent recurrence of previously reported abnormal occurrences. The referenced Congressional abnormal occurrence reports below provide the initial and any updating information on the abnormal occurrences discussed. The updating provided generally covers events which took place during the report period, thus some information is not current. Some updating, however, is more current as indicated by the associated event dates. Open items will be discussed in subsequent reports in the series.

NUCLEAR POWER PLANTS

79-3 Nuclear Accident at Three Mile Island

This abnormal occurrence was originally reported in NUREG-0090, Vol. 2, No. 1, "Report to Congress on Abnormal Occurrences: January-March 1979," and updated in each subsequent report in this series, i.e., NUREG-0090, Vol. 2, No. 2 through Vol. 10, No. 2. It is planned to continue these updates until defueling activities at the site are completed. The update of activities for this report period is as follows.

Reactor Building Activities

During the third calendar quarter of 1987, 88 entries were made into the TMI-2 reactor building, bringing the total number of entries since the March 1979 accident to 1410. Reactor building activities during this period centered on the continuing defueling operation, including: data acquisition; video inspection; bulk defueling; debris vacuuming and removal of standing fuel assemblies. Accessible areas of the reactor building basement were flushed and basement sediment was removed and solidified in containers for disposal.

Reactor Vessel Defueling Operations

During the period July through September 1987, 51,020 pounds of debris were removed from the reactor vessel, the largest quantity removed in any quarter to date. This was accomplished utilizing the core debris digger, the air lift tool, the fuel assembly puller, and two new tools: the fuel assembly puller/spike tool and the two-fingered, gripping fuel assembly handling tool. The latter two tools greatly enhanced the efficiency of fuel assembly stub-end removal.

Partial length fuel assembly removal accounted for virtually all of the core debris mass removed from the reactor vessel during the period, although smaller items of debris were removed by pick and place processes and by the use of the air lift tool.

At the close of the reporting period, 125 of 177 fuel assemblies had been removed and loaded into defueling canisters. The total mass removed was approximately 160,000 lbs out of a total of approximately 300,000 lbs (53 percent) of core debris and other materials. The total mass to be removed includes: the mass of the core, 207,000 lbs; structural and absorber materials, 78,000 lbs; and mass added by oxidation of core and structural material, 8,500 lbs. Additionally, portions of the baffle plates, core formers, and other components may become commingled with core debris during cutting operations. An estimate of 6,500 lbs was used for this material to bring the total to 300,000 lbs.

Completion of removal of partial length fuel assemblies is expected by December 1987. This will complete defueling of the core region. The next two regions to be defueled are the lower internals interstices and the lower head region (below the normal core region). The lower internals are in the region between the lower grid top rib section and the elliptical flow distributor head. This region contains a mixture of loose material and re-solidified, once molten material in the spaces between the horizontal structural components and in the flow holes of the structural components. The bulk of the material in this region is likely to be re-solidified, once molten material. The lower head region is immediately above the hemispherical bottom of the reactor vessel and also contains a mixture of loose material and solidified once-molten material. The bulk of the mass in this region is likely to be loose and vacuumable. Defueling of the region between the baffle plates (radially outside the normal core region) and the core barrel will follow.

Ex-vessel defueling activities concentrated on defueling of the steam generators and preparations for defueling of the pressurizer. The decay heat drop line contains a significant quantity of fuel and will probably be defueled with the remainder of the reactor coolant system piping and the pressurizer.

Cask and Liner Shipments

Offsite shipments of TMI-2 core debris to INEL continued during the third calendar quarter of 1987. Four shipping cask loads of seven defueling canisters each were transferred by rail during the reporting period. Through September 1987, approximately 118,000 lbs. of core debris (39 percent of the total estimated quantity) had been shipped. Seven EPICOR liners were also shipped offsite during the reporting period.

EPICOR II/Submerged Demineralizer System (SDS) Processing

Through September 1987, a total of 4,505,022 gallons of water have been processed through the SDS and a total of 3,697,327 gallons have been processed through the EPICOR II system. For the reporting period, approximately 217,000 gallons were processed by the EPICOR II system. SDS remained shut down.

Auxiliary and Fuel Handling Building (AFHB) Activities

Decontamination activities continued in the TMI-2 AFHB during the third quarter of 1987. These activities centered around steam vacuum cleaning, scabbling and hands-on decontamination of AFHB cubicles. The robot, Louie-2, was again used to scabble additional areas of the highly contaminated seal injection valve room. Also, auxiliary building sump sediment removal was completed, the reactor building basement sediment was moved to the auxiliary building and solidified, and the cleanup demineralizer resins were removed and solidified.

Post-Defueling Monitored Storage

The NRC is evaluating the licensee's plans for Post-Defueling Monitored Storage and expects to issue a draft environmental statement in February of 1988.

Proposal to Dispose of Accident-Generated Water

On December 29, 1986, the NRC staff issued for comment a draft Supplement No. 2 to the Programmatic Environmental Impact Statement (PEIS) on the issue of the disposal of accident-generated water. Following the close of the public comment period and consideration of public comment on draft Supplement No. 2, the NRC staff completed its review of the licensee's proposal resulting in the publication on June 30, 1987 of the PEIS Final Supplement No. 2, NUREG-0683 (Ref. B-1), dealing with disposal of accident-generated water. In Supplement 2, the staff concluded that the licensee's proposal to dispose of the water by forced evaporation to the atmosphere, followed by onsite solidification of the remaining solids and disposal of the solids at a licensed low-level radioactive waste disposal facility is an acceptable plan. The staff evaluated this proposal, together with eight alternatives, relative to the risk from radiation exposure to workers and to the general public, the probability and consequences of accidents, the commitment of resources (including costs) and regulatory constraints. The staff concluded that no alternative was clearly preferable to the GPUNC proposal. An opportunity for a prior hearing on the staff's proposal to lift the current prohibition on the disposal of the contaminated water was offered to GPUNC and to other persons who may be affected. Requests for a hearing are currently before a panel of NRC administrative law judges.

TMI 2 Advisory Panel Meeting

The Advisory Panel for the Decontamination of Three Mile Island Unit 2 met once during the reporting period on August 12, 1987. The panel received status reports from both the NRC staff and GPUN on the cleanup. The NRC staff also gave a presentation on the Final Report of Supplement No. 2 to the Programmatic Environmental Impact Statement dealing with the disposal of accident-generated water. A representative from the NRC's Office of the General Counsel gave a presentation on the Notice of Opportunity for a prior hearing regarding the licensee's proposal to dispose of the accident-generated water.

Future reports will be made as appropriate.

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83-3 Failure of Automatic Reactor Trip System

This abnormal occurrence was originally reported in NUREG-0090, Vol. 6, No. 1, "Report to Congress on Abnormal Occurrences: January-March 1983." It was updated, and closed out, in NUREG-0090, Vol. 6, No. 3. It is being reopened, and reclosed to report the following new information.

As described in the above reports, on February 22 and again on February 25, 1983, the Salem Unit 1 reactor trip breakers (RTBs) failed to trip automatically (and hence, the reactor failed to automatically shut down) upon receipt of a valid reactor trip signal. On both occasions, the plant was manually tripped a short time after the automatic trip system failed and no fuel damage or release occurred. Generic corrective actions were implemented by all licensees as required by NRC Generic Letter 83-28.

During the evening of July 2, 1987, reactor control rod drop timing tests were being conducted on McGuire Unit 2 as part of startup testing following the refueling outage. After several rod banks had been successfully tested, the "B" RTB failed to open during a manually initiated trip from the main control panel. The coil of the shunt trip attachment (STA) had overheated, shorted, and opened; and the fuse to the STA circuitry had opened. An Augmented Inspection Team arrived on site on July 7 and began a cooperative evaluation of the failed breaker with the licensee (Duke Power Company) and the RTB vendor (Westinghouse Electric Corporation). McGuire uses Westinghouse model DS-416 RTBs.

It appears that the breaker had mechanically bound, leading to the STA electrical failure. A broken weld was found between the pole shaft and center pole lever which resulted in unsymmetrical forces at several points of the RTB mechanism including the interfaces between the closing cam and the main drive link roller. These unsymmetrical forces occurred during both the closing and tripping of the RTB, causing uneven wearing of the parts and loosening at the various pivot points. Manufacturing tolerances for this pre-1984 vintage DS-416 breaker, and normal wear resulting from the 3000 cycles of operation (estimated by the licensee) undoubtedly also contributed to the twisting and lateral play observed in the mechanism. It is possible that this permitted the roller to shift sufficiently off center of the closing cam to cause it to bind against the frame, or for the trip latch to bind against other parts. Since the inspection team was not able to observe such a binding, it was not possible to determine the location or cause of binding. Inspections of all DS-416 breakers at the McGuire and at the Catawba stations were conducted. Cracks were found in two pole shaft welds of a breaker at Catawba. This pole shaft was given to the NRC and is being evaluated by a contract laboratory. Additional evaluation of the failed breaker is in progress at a Westinghouse laboratory with NRC overview.

NRC Information Notice No. 87-35 was issued on July 30, 1987, providing guidelines for visual inspection of RTBs (Ref. B-2). On December 16, 1987, Supplement 1 to the Notice was issued which discusses (a) the cuase of the mechanical binding and (b) other concerns which arose during investigation of the failure (Ref. B-3). An NRC Bulletin is being considered which would address more detailed inspection requirements for RTBs and other applications of this type of breaker.

This item is considered closed for the purposes of this report.

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87-1 NRC Order Suspends Power Operations of Peach Bottom Facility Due to Inattentiveness of the Control Room Staff

This abnormal occurrence was originally reported in NUREG 0090, Vol. 10, No. 1, "Report to Congress on Abnormal Occurrences: January - March 1987." It was updated through early August 1987 in NUREG 0090, Vol. 10, No. 2. It is further updated through October 1987 as follows:

On August 11, 1987, an NRC staff panel composed of Region I and NRR representatives was formed to coordinate the review of the recovery plan which had been submitted by Philadelphia Electric Company (PECo) on August 7, 1987 in response to the March 31, 1987 order (Ref. B-4) shutting down the plants for licensed operator inattentiveness and management failure to identify and correct the situation. On August 26, 1987, the panel met with PECo management and requested additional information about the completeness of the root causes identifying the plan, the connection between the root causes and the tasks intended to correct them, and the need to complete tasks prior to restart.

The Commission met with the staff and the licensee on September 14, 1987, and emphasized that the problems were not confined to the Peach Bottom site, and that PECo also needed to address the inability of corporate management to identify problems at the site and get them corrected. During this period the NRC also solicited comments on the PECo plan from Pennsylvania and Maryland, and held public meetings near the plant in York and Lancaster Counties, Pennsylvania and Harford County, Maryland, to receive public comments on the PECo plan.

On September 28, 1987, PECo submitted a revision to their plan noting that further information relative to the corporate organization would be submitted later. The NRC staff responded in a letter dated October 8, 1987, by indicating that the NRC staff review would be deferred until PECo responded to the fundamental concern about the inability of corporate management to identify and address problems at the site and to evaluate the effects of the corrective actions.

On October 9, 1987, PECo announced a corporate reorganization removing all non-nuclear responsibilities from the Senior Vice President, Nuclear and establishing an onsite Vice President level position. The reorganization also elevated the reporting level of the offsite review committee and announced the intent to include in its membership senior nuclear executives from outside the company.

In late September, an NRC team also reviewed the licensed operator attitude training program being administered to those licensed operators who were performing licensed duties at the time of the shutdown and whom PECo plans to have continue to perform licensed duties during restart of the plants. Portions of the Shift Manager training for those degreed licensed engineers whom PECo plans to have replace the former non-degreed Shift Superintendents were also observed.

Future reports will be made as appropriate.

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86-3 Rupture of Uranium Hexafluoride Cylinder and Release of Gases

This abnormal occurrence, involving Sequoyah Fuels Corporation (SFC), Gore, Oklahoma, was originally reported in NUREG-0090, Vol. 9, No. 1, "Report to Congress on Abnormal Occurrences: January - March 1986," and updated in subsequent reports in this series, i.e., NUREG-0090, Vol. 9, Nos. 2, 3, and 4. It was closed out in Vol. 9, No. 4, and is being reopened to report the following new information.

During 1987, no significant safety concerns have been noted, and Sequoyah Fuels Corporation (SFC) continued to operate without significant incident. The Independent Oversight Team (IOT) has been in place at the facility since November 5, 1986. In letters dated February 24, April 6, and May 7, 1987, SFC requested a phased reduction of IOT coverage. These requests were supported by reports from the IOT which indicated good operational performance and that IOT objectives had been achieved.

On September 1, 1987, the NRC issued an Order to Show Cause and Notice of Violation and Proposed Imposition of Civil Penalty (Ref. B-5). The order addressed the matter of IOT coverage and concluded that the coverage could be reduced to one shift per day, seven days per week, with shift coverage to be random during the 24-hour period. In addition, the order concluded that several supervisors were aware of improper practices at the facility and did not fully disclose their knowledge of these practices to NRC investigators. The Order to Show Cause asked why SFC should be allowed to continue to operate while certain supervisors are permitted to conduct licensed activities. The order also listed various management actions that should be addressed to provide the NRC with the necessary confidence in these supervisors.

The Notice of Violation and Proposed Imposition of Civil Penalty also addressed an apparent false statement made by the licensee in a letter dated January 29, 1986. In January 1986, the NRC had requested assistance from SFC in answering certain questions asked by members of Congress. One question sought information as to supervisory or management knowledge of the heating of overfilled cylinders. The licensee's response indicated that management did not have that knowledge but was silent as to supervisory personnel. The NRC proposed a civil penalty of $8,000 for this material false statement.

On September 25, 1987 (Ref. B-6), SFC responded to the NRC concerning the Notice of Violation. SFC believes that their response to the NRC's questions was accurate and therefore denies the violation. On October 1, 1987, SFC responded to the NRC concerning the Order to Show Cause (Ref. B-7). The licensee described the changes and improvements in plant equipment, operating procedures, employee training, management oversight and emergency preparedness since March of 1986, and the behavior of the four named supervisors. SFC further requested that the NRC vacate the Order to Show Cause.

On October 19, 1987, the NRC responded to the answers supplied by SFC to the Notice of Violation and Order to Show Cause (Ref. B-8). The NRC also forwarded to the licensee a copy of the sanitized OI investigation report and requested that they review the report and submit further information in response. The

NRC also stated that the licensee's procedures and protocols lacked a requirement that information being provided be complete and accurate and requested an explanation as to what is meant by concurrence. An additional response was requested.

On November 13, 1987, SFC responded with further information regarding the supervisors named in the Order to Show Cause. The licensee also submitted changes that were made to its procedures and protocols in response to the NRC letter of October 19, 1987. The NRC staff is reviewing the licensee's additional response.

Future reports will be made as appropriate.

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APPENDIX C

OTHER EVENTS OF INTEREST

The following items are described below because they may possibly be perceived by the public to be of public health significance. The items did not involve a major reduction in the level of protection provided for public health or safety; therefore, they are not reportable as abnormal occurrences.

Occasionally, this Appendix may include events involving exposures to very small areas of the skin (one square centimeter or less) which technically exceed the exposures shown in Appendix A (see Example 1 of "For All Licensees") of this report. The radiobiological literature indicates that an overexposure to a small area of skin (less than one square centimeter) would have much less health significance than a similar dose to larger areas of the body; consequently, such exposures would generally not be considered a major reduction in public health or safety (the general abnormal occurrence criterion) and therefore not reportable as abnormal occurrences. However, all such events, together with the circumstances associated with the events, are reviewed individually to determined their relative significance, and if warranted, will be reported as abnormal occurrences.

1. <u>Contamination of a Scrap Steel Smelting Facility</u>

On June 2, 1987, it was reported that a truck-trailer loaded with "bag house" dust activated the radiation detection system alarm as it was leaving Florida Steel Company of Jackson, Tennessee (an Agreement State). The bag house is used to trap and remove airborne particles from the facility. The truck was taking the dust to a hazardous waste disposal site in another state.

On May 26, 1987, as the truck was leaving the facility's weigh station, the radiation monitors alarmed. (All truck shipments into and out of the facility must pass the monitors.) The monitors were set to alarm at about 8 microrem/hr (about 4 microrem/hr above background). The load was detained and parked on site. Company personnel monitored the truck and found a maximum radiation level of 1.5 mr/hr in an area underneath the trailer. Product (metal billets and construction re-bar) was also monitored but no significant levels were detected. The Tennessee Division of Radiological Health responded to the event and asked assistance from the NRC on June 3, 1987.

The Agencies monitored both the contaminated load, as well as the subsequent load which did not activate the alarm. Also the site was monitored for direct radiation readings, including product and slag. Samples were also taken and analyzed for identity of radioactive isotope and concentration. Cesium-137 was identified as the isotope and concentrations of bag house dust were found that ranged between approximately 5 and 725 picocuries/gm. Direct radiation readings confirmed those made by the company. No contamination was found in samples of product or in slag.

There was no evidence of worker contamination or exposures. The facility has been released for use. The company employed a consultant to assist in determining the final disposition of the material on the highly contaminated trailer because it is considered mixed (radioactive, as well as non-radioactive) hazardous waste. Since the most significant hazard is radiation, efforts are underway to delist the truck load from the Environmental Protection Agency's hazardous waste listings; this process is expected to take a minimum of 18 months.

The source, which has been estimated to be about 20-25 millicuries of cesium-137, could have entered the furnace area by rail (which is not monitored by radiation detectors), or even by truck since a shielded small source of this activity would not activate the monitors at the truck entrance.

Since the company had already installed monitors as recommended by the Tennessee agency several years ago, very little, other than heightened awareness, is available to avoid shielded sources of this small estimated activity from entering the facility. However, the company has installed an additional monitor in the flue dust loading area to receive an earlier warning of a source which has been melted in the furnace.

The effect on public health or safety, including plant workers, was minimal for this event. However, had the source been of a much higher activity, the consequences could have been significant, not only to public health or safety, but also the costs associated with decontamination of the facility. The most significant aspect of this event is that some unknown licensee, contrary to its license requirements, had lost control of licensed material.

The event at Florida Steel Company is not unique. Other steel facilities have experienced a source, comingled in incoming scrap steel, being undetected until after the source has been melted in the steel furnace. Two such events, which were considerably more significant than the Florida Steel event, have been reported as abnormal occurrences. The first event, which was discovered on February 21, 1983 at Auburn Steel Company of Auburn, New York, was reported as AS83-6 in NUREG-0090, Vol. 6, No. 1 ("Report to Congress on Abnormal Occurrences: January-March 1983"). The second event, which was discovered on May 24, 1985 at Tamco Steel Company of Ontario, California, was reported as AS86-2 in NUREG-0090, Vol. 9, No. 1 ("Report to Congress on Abnormal Occurrences: January-March 1986").

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2. Significant Unexpected Main Feedwater Pipe Wall Erosion/Corrosion at Trojan

During the 1987 refueling outage in June at Trojan, wall thickness discrepancies were observed by the licensee in the main feedwater piping. As a result of this observation, the licensee determined that erosion/corrosion had apparently contributed to the pipe wall thinning. Trojan had experienced erosion/corrosion of secondary system piping (i.e., extraction steam piping and heater drain piping) before the recent discovery of a similar problem in the main feedwater system. Trojan is a pressurized water reactor, designed by Westinghouse, operated by Portland General Electric and located in Columbia County, Oregon.

Based on the June 1987 finding, the licensee instituted an expanded inspection and monitoring program of the main feedwater system, a portion of which provides the flow path for the safety-related auxiliary feedwater system. The licensee found a total of 19 elbows and two runs of piping in the safety-related portion of the feedwater line with wall thickness below the code allowable or that was projected to be below the code allowable value before the end of the next operating cycle. In the non-safety related portion of the feedwater line, over 35 components, including elbows and pipe sections, showed evidence of such pipe wall thinning.

At the present time, the licensee has replaced all components having wall thickness below the code allowable or with the potential to go below code allowable in the next operating cycle. The determination to replace pipe was based upon detailed monitoring of the feedwater system piping, and conservative predictions of the rate of wall thinning. The replaced components amounted to approximately 55% of the safety-related portion of the feedwater system and a lesser fraction of the non-safety related portion of the system. These actions by the licensee were examined by NRC onsite inspections, which verified the acceptability of the licensee's monitoring and pipe/component replacement programs for the current operating cycle.

The licensee is conducting analyses aimed at determining the cause(s) of observed conditions. Results from the licensee's analyses and those from a staff/consultant independent verification will be used to evaluate the long term operability of feedwater piping systems at the Trojan Plant. On August 4, 1987 the NRC issued Information Notice No. 87-36 (Ref. C-1) to alert the industry to the wall thinning problems on safety-related portions of the feedwater system at the Trojan plant. This Information Notice supplements information relating to the Surry main feedwater line failure reported as abnormal occurrence 86-22 in NUREG-0090, Vol. 9, No. 4 ("Report to Congress on Abnormal Occurrences: October-December 1986").

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3. Diagnostic Medical Misadministrations Caused by Mislabeled Doses

On September 2, 1987, NRC received telephone notification from Syncor, Inc., Pittsburgh, Pennsylvania that 33 doses of technetium-99m (Tc-99m) had been mislabeled and subsequently distributed to various authorized users. Of the 33 doses delivered to the users, 26 were administered to patients, resulting in 26 diagnostic misadministrations.

On September 1, 1987, a Syncor staff pharmacist mislabled a box of DTPA (an agent used for renal and brain imaging) vials as MDP (an agent used for bone imaging) using incorrect color-coded stickers. It had been the licensee's practice to affix a color coded label with the agent's identification to each vial. On September 2, 1987, at approximately 2:00 am, the pharmacist working the first shift filled the mislabelled DTPA vials with Tc-99m, and proceeded to dispense syringes filled from these vials as the ordered MDP doses for that day. The pharmacist failed to see that the vials mislabelled as MDP were actually DTPA vials.

At 10:00 am, one of Syncor's clients notified the pharmacy that there was a problem with a dose of MDP that they had administered that day. The client believed that the MDP dose was not tagged properly with Tc-99m since it appeared that free Tc-99m was accumulating in the patient's kidneys and bladder. The pharmacy manager proceeded to check the Q.C. test for the MDP that was dispensed that morning to see if there was a problem, and verified the amount of unbound Tc-99m was acceptable. The manager then checked the vials that the doses were drawn from and found that the vials had been mislabeled. Subsequently, it was then recognized that DTPA doses had been dispensed instead of MDP. When Syncor discovered the error, they provided notification to the customers.

As a consequence of this incident 26 patients received a pharmaceutical other than the one prescribed. Accordingly, the Tc-99m was directed toward the bladder and kidneys instead of the bone tissue, as was planned. Consequently, the patients treated were subject to unnecessary exposure to the bladder and kidneys. The referring physicians and the patients involved were immediately notified.

The primary cause of this misadministration appears to be personnel error on the part of both staff pharmacists in applying the wrong vial labels and failing to recognize the mismatch between the product label and the misapplied color coded stickers.

The licensee's corrective actions include: the immediate establishment, implementation and maintenance of procedures requiring personnel who prepare the radiopharmaceutical to record the manufacturers' lot number and product expiration date to verify product type; and personnel who dispense the prepared doses to verify and validate the recorded information. Both efforts require certification by the personnel performing the activity.

Region I conducted a routine inspection of the licensee and reviewed the circumstances leading to the misadministration. Some minor violations were identified.

The unnecessary exposures received by the 26 patients were small and no health effects were noted.

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4. Violation of a Safety Limit and Subsequent Damage/Destruction of Records at Oyster Creek

On September 11, 1987, an NRC Augmented Inspection Team (AIT) was sent to Oyster Creek. The licensee reported closing recirculation loop valves for a short period of time which violated a safety limit. In addition, certain records associated with the violation had been damaged or destroyed. Oyster Creek is a General Electric-designed boiling water reactor operated by General Public Utilities (the licensee) and located in Ocean County, New Jersey.

The reactor was shut down for plant maintenance on September 10, 1987. Included in this maintenance was a planned job to repack a primary containment isolation valve in the reactor building closed cooling water (RBCCW) system. The plant was in cold shutdown, reactor vessel vented, and primary coolant temperature at approximately 140°F. Recirculation pumps B and C were operating; A, D, and E were secured and their pump discharge valves closed. The shutdown cooling system attached to loop E was in operation.

On September 11, 1987, during removal of packing from the RBCCW system containment isolation valve, a leak in the valve packing occurred which required securing the RBCCW system. The RBCCW system cools recirculation pump components. Since the RBCCW system was not available, the recirculation pumps were secured. The control room operators, while in the process of shutting down the recirculation pumps, closed the first of the two open discharge valves. This is contrary to the license technical specification safety limit 2.1.E. When securing the recirculation pumps, the control room operator failed to ensure that two loops were fully open and received an alarm upon closing the discharge valve of one of the two pumps which were in service. The operator immediately corrected the error.

Subsequently, during the morning of September 11, 1987, licensee management concluded that a paper tape record for the Sequence of Alarms Recorder had been removed, and there might have been an attempt, by a member or members of the shift in the control room (Operating Shift B), to conceal or destroy the record. The record provided evidence of a safety limit violation. The licensee immediately initiated, on September 11, 1987, an internal investigation and relieved the "B" shift crew of licensed duties, pending the results of an internal investigation which is being conducted by a consultant.

The safety limit in question was placed in the Technical Specifications as a consequence of a previous event which occurred at Oyster Creek in May of 1979. [This event was reported as abnormal occurrence No. 79-5 in NUREG-0090, Vol. 2, No. 2 (Report to Congress on Abnormal Occurrences: April-June 1979).] The event involved closure of all five recirculation pump discharge valves shortly after a reactor scram and subsequent initiation of the isolation condensers. Closing of the five discharge valves caused a break in the fluid communication between the vessel annulus and the reactor core. Since the reactor vessel low and low-low level alarms are sensed from indicators that monitor water level in the annulus region, the loss of water inventory from the core region caused by the isolation condenser operation remained undetected until the low-low-low level alarm was received.

The alarm was received because the low-low-low level is sensed by a separate indicator that measures level within the core region of the vessel. As a consequence of the event, the technical specifications were amended and safety limit 2.1.E was added to ensure fluid communication between the core region and the annulus by requiring two loops to be open at all times except when the reactor head is removed.

The AIT conducted a special safety inspection from September 11-17, 1987, to review the circumstances associated with the safety limit violation. The AIT reviewed the maintenance activity which led to the leak in the cooling water system that resulted in the immediate need to secure the recirculation pumps. In addition, the team concluded that the event had minor significance from a reactor safety viewpoint for the following reasons: (1) The plant had been shut down for one day and was being cooled by the shutdown cooling system; (2) With the combination of valves being opened and closed, there was always sufficient fluid communication between the reactor core region and the annulus region of the reactor vessel to assure fluid level in the core region; and (3) A low-low-low level indicator had been added as required by the TMI action plan for all nuclear power plants. This level indicator was operable and provided a record of adequate level throughout the event.

Some of the AIT effort was spent examining similar records to ascertain whether there was any pattern of missing records. The AIT concluded that no pattern was evident. The apparent destruction of records is under investigation by the NRC and the licensee.

Violation of the safety limit and destruction of related records had implications regarding assurance of proper conduct in continued operation of the plant. Prompt and detailed actions were initiated by the licensee.

Root causes included poor adherence to procedures, poor communications, and an apparent lack of skill and knowledge by a licensed reactor operator.

The licensee has retrained personnel, made appropriate changes to procedures, and initiated an investigation into the missing records. The licensee has formed two internal task groups and engaged investigative consultants. One group investigated maintenance activities while the other performed a technical review and analysis of the event. The licensee also initiated additional training for operators and evaluation of a possible technical specification change request. Certain licensed reactor operators are being withheld from licensed duties pending results of the NRC investigation.

NRC Region I issued confirmatory action letter (CAL) No. 87-12 to the licensee on September 11, 1987 (Ref. C-2). The CAL required that all affected equipment be maintained in its as-found condition (except as necessary to maintain the plant in a safe shutdown condition) in order to preserve any evidence which would be needed to inspect or reconstruct events. The CAL also affirmed the requirement of 10CFR§50.36 to remain shut down until operation is authorized by the NRC.

The AIT findings, documented in inspection report No. 50-219/87-29, were forwarded to the licensee on September 28, 1987 (Ref. C-3).

On November 5, 1987, NRC issued a confirmatory order which confirms the licensee's commitment to remove the personnel of the operating shift on duty at the time of the safety limit violation from licensed duties and a second commitment to provide the NRC staff with a copy of the licensee's investigation into the subsequent apparent willful destruction of a portion of the documentation of the event (Ref. C-4).

On November 6, 1987, NRC permitted Oyster Creek to restart. However, the destruction of records remains under investigation.

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REFERENCES
FOR APPENDICES

B-1 U. S. Nuclear Regulatory Commission, "Programmatic Environmental Impact Statement Related to Decontamination and Disposal of Radioactive Wastes Resulting from March 28, 1979 Accident, Three Mile Island Nuclear Station, Unit 2, Docket No. 50-320," USNRC Report NUREG-0683, Supplement No. 2 (Final Supplement Dealing with Disposal of Accident-Generated Water), published June 1987.**

B-2 U. S. Nuclear Regulatory Commission, Information Notice No. 87-35, "Reactor Trip Breaker, Westinghouse Model DS-416, Failed to Open on Manual Initiation from the Control Room," July 30, 1987.*

B-3 U.S. Nuclear Regulatory Commission, Information Notice No. 87-35, Supplement 1, "Reactor Trip Breaker, Westinghouse Model DS-416, Failed to Open on Manual Initiation from the Control Room," December 16, 1987.*

B-4 Letter from Victor Stello, Jr., NRC Executive Director for Operations, to J. C. Everett, III, Chairman of the Board and Chief Executive Officer, Philadelphia Electric Company, forwarding an "Order Suspending Power Operation and Order to Show Cause (Effective Immediately)," Docket Nos. 50-277 and 50-278, March 31, 1987.*

B-5 Letter from James M. Taylor, NRC Deputy Executive Director for Regional Operations, to J. G. Randolph, President, Sequoyah Fuels Corporation, forwarding Order to Show Cause and Notice of Violation and Proposed Imposition of Civil Penalty, License No. SUB-1010, Docket No. 40-08027, September 1, 1987.*

B-6 Letter from James G. Randolph, President, Sequoyah Fuels Corporation, to James Lieberman, Director, Office of Enforcement, NRC, forwarding answer to Sequoyah Fuels Corporation to Notice of Violation, License No. SUB-1010, Docket No. 40-08027, September 25, 1987.*

B-7 Letter from James G. Randolph, President, Sequoyah Fuels Corporation, to James Lieberman, Director, Office of Enforcement, NRC, forwarding Response and Answer to Order to Show Cause, License No. SUB-1010, Docket No. 40-08027, October 1, 1987.*

B-8 Letter from James M. Taylor, NRC Deputy Executive Director for Regional Operations, to J. G. Randolph, President, Sequoyah Fuels Corporation, forwarding Response to Answers to Notice of Violation and Order to Show Cause, License No. SUB-1010, Docket No. 40-08027, October 19, 1987.*

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*Available in NRC Public Document Room, 1717 H Street, NW, Washington, DC 20555, for public inspection and/or copying.

**Available for purchase from the Superintendent of Documents, U.S. Government Printing Office, P.O. Box 37082, Washington, DC 20013-7082. Also available from the National Technical Information Service, 5285 Port Royal Road, Springfield, VA 22161. A copy is also available for public inspection and/or copying at the NRC Public Document Room, 1717 H Street, NW, Washington, DC.

C-1 U.S. Nuclear Regulatory Commission, NRC Information Notice No. 87-36, "Significant Unexpected Erosion of Feedwater Lines," August 4, 1987.*

C-2 Confirmatory Action Letter No. 87-12 from William T. Russell, Regional Administrator, NRC Region I, to Mr. P. R. Clark, President, GPU Nuclear Corporation, September 11, 1987.*

C-3 Letter from William F. Kane, Director, Division of Reactor Projects, Region I, to Mr. P. R. Clark, President, GPU Nuclear Corporation, forwarding Augmented Inspection Team Report No. 50-219/87-29, September 28, 1987.*

C-4 Letter from James M. Taylor, Deputy Executive Director for Regional Operations, to Mr. P. R. Clark, President GPU Nuclear Corporation, forwarding Confirmatory Order, Docket No. 50-219, November 5, 1987.*

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*Available in NRC Public Document Room, 1717 H Street, NW, Washington, DC 20555, for public inspection and/or copying.

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13. ABSTRACT (200 words or less)
Section 208 of the Energy Reorganization Act of 1974 identifies an abnormal occurrence as an unscheduled incident or event which the Nuclear Regulatory Commission determines to be significant from the standpoint of public health and safety and requires a quarterly report of such events to be made to Congress. This report covers the period July 1 to September 30, 1987. During the report period, there were two abnormal occurrences at the nuclear power plants licensed to operate. The first involved a significant degradation of plant safety at Oyster Creek; and the second involved a steam generator tube rupture at North Anna Unit 1. There were four abnormal occurrences at the other NRC licensees. The first involved a therapeutic medical misadministration; the second involved a failure to report diagnostic medical misadministrations; the third involved the suspension of a well logging company's license; and the fourth involved the suspension of an industrial radiography company's license. There were two abnormal occurrences reported by an Agreement State (New York). The first involved a hospital contamination incident and the second involved therapeutic medical misadministrations. The report also contains information updating some previously reported abnormal occurrences.

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