January 24, 1996

Mr. Paul Gunter, Director
Reactor Watchdog Project
Oyster Creek Nuclear Watch
Nuclear Information and Resource Service
1424 16th Street, NW, Suite 601
Washington, DC 20036

Mr. William deCamp, Jr.
Founding Trustee
Oyster Creek Nuclear Watch
P.O. Box 243
Island Heights, NJ 08732

Dear Messrs. Gunter and deCamp:

The purpose of this letter is to provide you with an update on the status of your Section 2.206 petition dated September 19, 1995, and the staff's "Task Action Plan for Spent Fuel Storage Pool Safety." Since my last letter dated December 19, 1995, the staff is proceeding with consolidation of the findings from those four assessments. As you may also be aware, considerable NRC activity has occurred recently regarding spent fuel pool cooling issues at the Millstone Unit 1 facility. These issues have to do with the design and licensing basis of various refueling outage core offload practices vis-a-vis the heat rejection capability of installed spent fuel pool decay heat removal systems. As a result of this recent activity regarding Millstone Unit 1 the staff is projecting that development of conclusions and recommendations for the existing Task Action Plan activities are tentatively scheduled to be completed by May 1, 1996.

With regard to the recent Millstone 1 Unit spent fuel pool cooling activities, the staff issued an Information Notice, IN 95-54, "Decay Heat Management Practices During Refueling Outages," on December 1, 1995. A copy of IN 95-54 is enclosed for your information.

If you have any additional comments or questions, please do not hesitate to call me at 301-415-3473.

Sincerely,
Original signed by:
Alexander W. Dromerick, Sr. Project Manager
Project Directorate I-3
Division of Reactor Projects - I/II
Office of Nuclear Reactor Regulation

Enclosure: NRC Information Notice 95-54
DISTRIBUTION:
Docket File 50-219
PDI-3 Plant
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DOCUMENT NAME: G:\DROMERICK\UPDATE.LAG

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OFFICIAL RECORD COPY

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

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Division of Reactor Projects - I/II
Office of Nuclear Reactor Regulation

Enclosure: NRC Information Notice 95-54

UNITED STATES
NUCLEAR REGULATORY COMMISSION
OFFICE OF NUCLEAR REACTOR REGULATION
WASHINGTON, D.C. 20555-0001

December 1, 1995

NRC INFORMATION NOTICE 95-54: DECAY HEAT MANAGEMENT PRACTICES DURING REFUELING OUTAGES

## Addressees

All holders of operating licenses or construction permits for nuclear power reactors.

## Purpose

The U.S. Nuclear Regulatory Commission (NRC) is issuing this information notice to alert addressees to recent NRC assessments of licensee control of refueling operations and the methods for removing decay heat produced from the irradiated fuel stored in the spent fuel pool. It is expected that recipients will review the information for applicability to their facilities and consider actions, as appropriate, to avoid similar problems. However, suggestions contained in this information notice are not NRC requirements; therefore, no specific action or written response is required.

## Background

The staff recently reviewed a design change and associated procedural controls regarding spent fuel pool decay heat removal systems at Millstone Nuclear Power Station, Unit 1, and full-core offloading controls at Cooper Nuclear Station. The staff evaluated overall controls on irradiated fuel movement and the control of irradiated fuel decay heat removal during refueling operations, including adequate adherence to final safety analysis report commitments, implementation of procedures, procedural adequacy, and effectiveness of training.

## Description of Circumstances

Millstone Unit 1

On October 18, 1993, the licensee for Millstone Unit 1 submitted Licensee Event Report (LER) 93-11, in which it reported that it had determined through engineering analysis that conditions may have existed during which the spent fuel pool cooling system may have been incapable of maintaining spent fuel pool temperature below the licensee's criteria of 66°C [150°F] design limit for continued operation. Specifically, the LER stated that (1) the licensee had made inappropriate assumptions in the analysis performed in support of a 1988 spent fuel pool re-rack project, (2) the "normal" refueling sequence described in the Millstone Unit 1 Updated Final Safety Analysis Report assumed offload of only one third of a core, (3) a full-core offload considered in the safety analysis report as an "emergency" (or abnormal discharge) offload was normally performed at Millstone Unit 1, and (4) under certain circumstances

Millstone Unit 1 may have operated outside its design basis for the spent fuel pool.

The licensee recently implemented a modification to the shutdown cooling system to provide additional spent fuel pool decay heat removal capability. In a July 28, 1995 submittal, the licensee stated that the modification would enable Millstone Unit 1 to perform a full core discharge as a normal offload practice. Coincident with the development of the modification, the licensee proposed a license amendment to impose technical specification controls on shutdown cooling system operability, spent fuel pool temperature and decay time prior to beginning offload activities. In response to staff questions, the licensee stated it had concluded during a review pursuant to 10 CFR 50.59, that the proposed modification did not represent an unreviewed safety question and as such did not require prior NRC approval, and that the license amendment was not required but was being submitted to remove ambiguity regarding the full core offload refueling practice.

During its review of the procedural controls for the shutdown cooling-spent fuel pool cooling cross-connect, the staff found that the administrative procedures for the cross-connect, including controls for the cross-connect valves and the spent fuel pool-reactor vessel weir gate were not sufficiently explicit. The licensee addressed these concerns. Because the requested specifications did not meet the criteria of 10 CFR 50.36 for inclusion as limiting conditions of operation in the technical specifications, the staff issued a license condition. The license condition specifies that refueling operations that include full core offload be conducted in accordance with the revised controls proposed by the licensee.

Cooper Nuclear Station

On October 20, 1995, the operators of the Cooper nuclear station halted movement of fuel from the reactor vessel to the spent fuel pool to perform a review of the design and licensing basis and administrative controls associated with the removal of decay heat from the spent fuel pool. The licensee concluded that no licensing restrictions regarding the practice of conducting a full-core offload existed with regard to decay heat removal. The licensee further concluded that the installed spent fuel pool cooling system and backup fuel pool cooling inter-tie from the residual heat removal system had sufficient capacity to remove the decay heat from the irradiated spent fuel and reactor cavity for postulated heat loads up to and including those associated with a full-core offload.

However, the licensee acknowledged that the description of the spent fuel pool cooling system in the Cooper Updated Safety Analysis Report was confusing and ambiguous. Consequently, the licensee proposed revisions to that document to clarify ambiguous language and performed a 10 CFR 50.59 analysis, which documented the evaluation of the plant's licensing basis for the design and operation of the spent fuel pool cooling system. Upon approval of the changes by the Station Operations Review Committee, the licensee updated its refueling procedures to be consistent with the revised safety analysis report, and proceeded with the full-core offload.

Discussion

The functional capability to protect irradiated fuel from damage due to inadequate decay heat removal is an important safety attribute. Maintaining spent fuel pool water temperature below boiling temperature provides adequate cooling for stored irradiated fuel. However, prolonged operation at elevated spent fuel pool temperatures may impair the capability of the purification system to remove contaminants from the spent fuel pool coolant and increase the rate of heat addition to the fuel storage area atmosphere to a value above that assumed in the ventilation system design. In addition, high spent fuel pool temperatures may exceed the temperature used for thermal stress computation in the structural analysis of the spent fuel pool liner and the spent fuel pool structure itself.

Shutdown cooling systems, which are aligned to directly cool the reactor vessel or reactor coolant system, are designed to remove the residual and decay heat associated with the irradiated fuel in the reactor vessel in order to bring the reactor coolant system to the cold shutdown condition. Licensees typically have procedures to maintain the removal of decay heat from the vessel at all times while irradiated fuel is in the reactor vessel.

Similarly, systems are also installed in nuclear power plants to remove from the spent fuel pool, decay heat generated by the stored irradiated fuel. However, these spent fuel pool cooling systems are designed with a lower heat removal capacity relative to the shutdown cooling system based on the decrease in decay heat generation within the irradiated fuel as the time after reactor shutdown increases. At some facilities, including most boiling water reactors and some pressurized water reactors, the spent fuel pool cooling system is not designed to remove the decay heat associated with a full core immediately after shutdown and still maintain a bulk spent fuel pool temperature below design-basis limits. However, these facilities are designed with backup spent fuel pool cooling systems, which are generally alternative operating modes of the residual heat removal or shutdown cooling systems, that supplement the spent fuel pool cooling system during periods shortly after reactor shutdown when the decay heat load of a full core may exceed the heat removal capacity of the normal spent fuel pool cooling system.

The capability of spent fuel pool cooling systems and backup spent fuel decay heat removal systems is described in the Final Safety Analysis Report, as updated for nuclear power plants. The decay heat load scenarios used to evaluate the adequacy of system heat rejection capability may be based on a series of core offloads and an associated decay time. These scenarios may be described as "normal" or "abnormal" maximum heat loads for this purpose, which is consistent with the NRC staff guidance for the review of spent fuel pool cooling system design contained in Section 9.1.3 of the Standard Review Plan (NUREG-0800).

Recent licensee reviews of refueling outage practices at Millstone Unit 1 and Cooper found that the system design bases specified in Final Safety Analysis Reports, as related to core offload practices, were ambiguous. Administrative controls on refueling outage plans and practices were inconsistent in regard

to ensuring that temperature commitments for the spent fuel pool were maintained through all phases of refueling operation. Both licensees, after clarifying and improving the design bases and administrative controls related to refueling outages, determined that a routine practice of performing full core offloads was acceptable.

The NRC has issued two information notices to alert licensees to potential risks associated with a loss of spent fuel pool cooling. NRC Information Notice 93-83, "Potential Loss of Spent Fuel Pool Cooling After a Loss-of-Coolant Accident," was issued October 7, 1993, and described concerns found at Susquehanna Steam Electric Station. NRC Information Notice 93-83, Supplement 1, was issued August 8, 1995, to inform licensees of the results of the NRC review of the concerns at Susquehanna.

The events described in this and previous information notices, and the plant reviews discussed above, illustrate the importance of:

- assuring that planned core offload evolutions, including refueling practices and irradiated decay heat removal, are consistent with the licensing basis, including the Final Safety Analysis Report, technical specifications, and license conditions;

- assuring that changes are evaluated through the application of the provisions of 10 CFR Part 50.59, as appropriate; and

- assuring that all relevant procedures associated with core offloads have been appropriately reviewed.

The staff is continuing to review this matter with respect to the need to issue additional generic communications.

This information notice requires no specific action or written response. If you have any questions about the information in this notice, please contact one of the technical contacts listed below or the appropriate Office of Nuclear Reactor Regulation (NRR) project manager.

Dennis M. Crutchfield, Director
Division of Reactor Program Management
Office of Nuclear Reactor Regulation

Technical contacts: Joseph W. Shea, NRR
(301) 415-1428

Steven R. Jones, NRR
(301) 415-2833

David L. Skeen, NRR
(301) 415-1174

Attachment: List of Recently Issued NRC Information Notices

LIST OF RECENTLY ISSUED
NRC INFORMATION NOTICES

| Information Notice No. | Subject | Date of Issuance | Issued to |
|---|---|---|---|
| 95-53 | Failures of Main Steam Isolation Valves as a Result of Sticking Solenoid Pilot Valves | 12/01/95 | All holders of OLs or CPs for nuclear power reactors. |
| 95-47, Rev. 1 | Unexpected Opening of a Safety/Relief Valve and Complications Involving Suppression Pool Cooling Strainer Blockage | 11/30/95 | All holders of OLs or CPs for nuclear power reactors. |
| 94-13, Supp. 2 | Control and Oversight of Contractors during Refueling Activities and Clarificaiton of Applicability of Section 50.120 of Title 10 of The Code of Federal Regulations to Contractor Personnel | 11/28/95 | All holders of OLs or CPs for nuclear power reactors. |
| 95-13, Supp. 1 | Potential for Data Collection Equipment to Affect Protection System Performance | 11/22/95 | All holders of OLs or CPs for nuclear power reactors. |
| 91-29, Supp. 3 | Deficiencies Identified during Electrical Distribution System Functional Inspections | 11/22/95 | All holders of OLs or CPs for nuclear power reactors. |
| 94-86, Supp. 1 | Legal Actions Against Thermal Science, Inc., Manufacturer of Thermo-Lag | 11/15/95 | All holders of OLs or CPs for nuclear power reactors. |
| 95-52 | Fire Endurance Test Results for Electrical Raceway Fire Barrier Systems Constructed from 3M Company Interam Fire Barrier Materials | 11/14/95 | All holders of OLs or CPs for nuclear power reactors. |

OL = Operating License
CP = Construction Permit