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The Northeast Utilities System

March 30, 2001
B18365

U.S. Nuclear Regulatory Commission
Attention: Document Control Desk
Washington, DC 20555-0001

Subject: Millstone Nuclear Power Station, Unit No. 1, Docket No. 50-245
Licensee Event Report (LER) 2000-002-01

This letter forwards supplemental Licensee Event Report (LER) 2000-002-01 (Attachment 1). This supplemental LER provides an update of the progress made in the ongoing investigation into determining the location of two full-length irradiated fuel rods. This LER is an interim update on progress. Additional information will be provided in accordance with the requirements of 10 CFR 20.2201(d).

If you have any questions regarding this letter, please contact Mr. David W. Dodson Team Lead-Compliance, at (860) 447-1791 extension 2346.

Very truly yours,

NORTHEAST NUCLEAR ENERGY COMPANY

Bryan S. Ford
Director Decommissioning

cc: H. J. Miller, Region I Administrator
J. B. Hickman, NRC Senior Project Manager, Millstone Unit No. 1
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IE22

cc: (continued)

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Attachment 1 to B18365

Millstone Nuclear Power Station, Unit No. 1, Docket No. 50-245

Licensee Event Report (LER) 2000-02-01

NRC FORM 366 (6-1998) U.S. NUCLEAR REGULATORY COMMISSION

APPROVED BY OMB NO. 3150-0104
EXPIRES 06/30/2001

Estimated burden per response to comply with this mandatory information collection request: 50 hrs. Reported lessons learned are incorporated into the licensing process and fed back to industry. Forward comments regarding burden estimate to the Records Management Branch (T-6 F33), U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001, and to the Paperwork Reduction Project (3150-0104), Office of Management and Budget, Washington, DC 20503. If an information collection does not display a currently valid OMB control number, the NRC may not conduct or sponsor, and a person is not required to respond to, the information collection.

LICENSEE EVENT REPORT (LER)

(See reverse for required number of digits/characters for each block)

FACILITY NAME (1)	DOCKET NUMBER (2)	PAGE (3)
Millstone Nuclear Power Station Unit 1	05000245	1 OF 7

TITLE (4)

Fuel Rod Accountability

EVENT DATE (5)			LER NUMBER (6)			REPORT DATE (7)			OTHER FACILITIES INVOLVED (8)	
MONTH	DAY	YEAR	YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	MONTH	DAY	YEAR	FACILITY NAME	DOCKET NUMBER
11	16	2000	2000	-- 002 --	01	03	30	2001	FACILITY NAME	DOCKET NUMBER

OPERATING MODE (9)	N/A	THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check one or more) (11)			
POWER LEVEL (10)	0	X 20.2201(b)	20.2203(a)(2)(v)	50.73(a)(2)(i)	50.73(a)(2)(viii)
		20.2203(a)(1)	20.2203(a)(3)(i)	50.73(a)(2)(ii)	50.73(a)(2)(x)
		20.2203(a)(2)(i)	20.2203(a)(3)(ii)	50.73(a)(2)(iii)	73.71
		20.2203(a)(2)(ii)	20.2203(a)(4)	50.73(a)(2)(iv)	OTHER
		20.2203(a)(2)(iii)	50.36(c)(1)	50.73(a)(2)(v)	Specify in Abstract below or in NRC Form 366A
		20.2203(a)(2)(iv)	50.36(c)(2)	50.73(a)(2)(vii)	

LICENSEE CONTACT FOR THIS LER (12)

NAME	TELEPHONE NUMBER (Include Area Code)
Dave Dodson Team Lead-Compliance	(860) 447-1791 ext.2346

COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT (13)

CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO EPIX		CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO EPIX

SUPPLEMENTAL REPORT EXPECTED (14)		EXPECTED SUBMISSION DATE (15)	MONTH	DAY	YEAR
X YES (If yes, complete EXPECTED SUBMISSION DATE).	NO		7	30	01

ABSTRACT (Limit to 1400 spaces, i.e., approximately 15 single-spaced typewritten lines) (16)

During a reconciliation and verification of the Millstone Unit 1 spent nuclear fuel records, Unit 1 personnel concluded that the location of two full-length irradiated fuel rods could not be determined, and that these fuel rods were not properly tracked in the Special Nuclear Material (SNM) records. The records reconciliation and verification effort is part of ongoing decommissioning activities at Millstone Unit 1.

The two irradiated fuel rods are from fuel assembly MS 557, which was disassembled in 1972 for inspection. The two rods were displaced during the re-assembly of assembly MS 557 in 1974. Records indicate that in 1979 and 1980, the displaced rods were physically verified to be stored in a canister in the Spent Fuel Pool (SFP). The rods and canister are no longer shown in the SFP location documented in 1979 and 1980. Records retrieved to date do not document their current location or disposition.

Due to the radiation levels associated with the fuel rods, it is only considered credible that they either remain stored in the SFP or they were shipped in a shielded cask to a facility licensed to accept radioactive material. Due to the controls in place at both Millstone and the facilities licensed to accept radioactive material, there is no undue risk to the health and safety of the public or plant and licensed facility workers.

The investigation into the location of the two fuel rods is ongoing.

I. Description of Event

During a reconciliation and verification of the Millstone Unit 1 spent nuclear fuel records, it was concluded that the location of two full-length irradiated fuel rods was not properly tracked in the Special Nuclear Material (SNM) records. The records reconciliation and verification effort is part of ongoing decommissioning activities at Millstone Unit 1. A condition report (CR) M1-00-0548 was written on November 16, 2000, documenting the issue. Table 1 provides a description of the fuel rods.

The two irradiated fuel rods are from fuel assembly MS 557, which was disassembled in 1972 for inspection. The two rods were displaced during the re-assembly of assembly MS 557 in 1974. Records indicate that in 1979 and 1980, the displaced rods were physically verified to be stored in a canister in the Spent Fuel Pool (SFP). The rods and canister are no longer in the SFP location documented in 1979 and 1980. Records retrieved to date do not document their current location, or disposition.

On December 14, 2000, Northeast Nuclear Energy Company (NNECO) notified the Nuclear Regulatory Commission (NRC) of the fuel rod accountability issue via telephone pursuant to the requirements of 10CFR20.2201(a)(ii) and 10CFR50.72(b)(2)(vi). Concurrently, NNECO notified the State of Connecticut.

II. Chronology

October 1972	Assembly MS 557 was disassembled by the fuel vendor to provide assembly components for analysis and testing.
May 1974	Assembly MS 557 was reassembled by the fuel vendor. Two rods were not replaced into the assembly.
1974 through 1984	The fuel vendor conducted a Segmented Test Rod (STR) Program that included shipping of irradiated, segmented (partial length) test fuel rods in a shielded cask to the vendor for analysis and evaluation. This program also resulted in the construction of a separate assembly (canister), SRP-2D to hold discharged segmented test rods as needed.
1978 through 1985	Work was performed in the SFP to process, consolidate and store miscellaneous irradiated components and instruments in cask liners.
March 1979	An SFP map dated March 13, 1979 identifies two rods in a canister located in the SFP.
May 1979	A reactor engineer requests that the onsite fuel vendor representative visually inspect the canister in the SFP and identify the two fuel rods utilizing the serial numbers. The vendor responds that their visual inspection of the rods and applicable fuel assembly records indicates that the two fuel rods are from assembly MS 557. The reactor engineer begins tracking these two rods on an inventory card in the Fuel Card Index.
April 1980	The fuel rods are noted on the SFP map of April 30, 1980 as located in a storage canister in the SFP.
September 1980	An SFP map dated September 18, 1980 no longer identifies the location of the fuel rods and canister.
1980 through 1990	Numerous shipments of miscellaneous irradiated components from the SFP occurred.

1990	An inventory list was completed in early 1990 and there was no indication of the canister or the two fuel rods.
November 16, 2000	The records reconciliation and verification effort identifies that the location of two full-length irradiated fuel rods was not properly reflected in Special Nuclear Material (SNM) records. Condition Report M1-00-0548 was initiated.
December 14, 2000	NNECO notified the Nuclear Regulatory Commission (NRC) of the fuel rod accountability issue via telephone pursuant to 10CFR20.2201(a)(ii) and 10CFR50.72(b)(2)(vi). Concurrently, NNECO notified the State of Connecticut.
December 20, 2000	The licensed facilities in South Carolina and Washington that receive radioactive waste material shipments from Millstone were contacted and informed about the fuel rod accountability issue.

III. Investigation

An Investigation Team was formed to perform a detailed investigation, determine causal factors, and determine the disposition of the two fuel rods. An Independent Review Team (IRT) was formed to provide oversight and ongoing review of Investigation Team activities. The IRT maintains independence from the line function of the Investigation Team.

The following specific actions have been completed or are ongoing:

1. The visual inspection of assembly MS 557 indicates that it contains a dummy spacer capture rod and an empty hole in one tie rod location.
2. Two specific possible locations for the rods were identified and visually inspected: assembly (canister) SRP-2D and the fuel canister containing fuel assembly MS 508.
3. A visual inspection of accessible spent fuel pool locations was made with special camera equipment. Selected visual inspections of the SFP assumed four possible scenarios: (1) the rods are still in their original canister, (2) the rods have been removed from the original canister and have been placed in a different canister, (3) the rods have been placed in a fuel assembly, or (4) the rods are stored in other available locations; e.g., empty fuel storage locations, control rod storage tubes, etc.
4. A review of selected vendor and licensee fuel records has been performed.
5. A review of selected vendor and licensee fuel shipment records has been performed.
6. Personnel interviews have been performed.
7. An Investigation Team was formed to perform detailed investigation, determine causal factors, and determine the disposition of the two fuel rods.
8. An Independent Review Team (IRT) was formed to provide oversight and ongoing review of activities relative to the SNM accountability issue.
9. The Investigation Team has been augmented with additional experienced industry personnel including an individual with root cause expertise.
10. Fuel assemblies in the spent fuel pool continue to be inspected and videotaped. The videotaped record will assist in verifying the current location of spent fuel rods within the SFP.
11. A visit to the fuel vendor's Morris, Illinois facility was performed on February 27, 2001 to review shipping records relative to the subject fuel rods. The results of this review confirmed that the fuel rods were not shipped to this facility.
12. A radiological and criticality assessment of the two fuel rods was performed. The result of these assessments demonstrate that there is no undue threat to the health and safety of the public.
13. Hard copy file and electronic file searches continue to be performed.
14. Potential scenarios are being developed and investigated to locate the two fuel rods.

15. Key Performance Indicators (KPI) addressing record reviews, physical inspections, and interviews conducted have been developed.
16. Project status updates are being provided to the NRC, State of South Carolina, State of Washington, and State of Connecticut.

This investigation is currently scheduled to be completed by June 30, 2001.

IV. Health and Safety

An assessment of the contact radiation levels of the two fuel rods has been performed. Contact radiation levels were initially estimated to have been on the order of 8000R/hr in the early 1980's and approximately 1000R/hr today. Results of the detailed calculations revealed that contact levels were on the order of 1600R/hr in 1980 and 850R/hr in 2000. Given these contact radiation levels, removal from the SFP, other than in a shielded cask would have triggered multiple plant radiation alarms. The possibility of theft of the two fuel rods is highly improbable due to the estimated contact radiation levels.

Two possible scenarios have been analyzed for health and safety:

1. Fuel rods remain on site.

   A criticality calculation has shown that even with the rods inadvertently located next to the most reactive fuel assembly in the spent fuel pool, the geometric configuration is such that the local fuel assembly array, as well as the pool would remain below 0.90 K_{eff} sub-critical. If the rods remain in the SFP, they are stored safely with the other spent fuel and there is no undue threat to the health and safety of the public or plant workers. Further visual inspections of the SFP are planned.

2. Fuel rods were shipped off site.

   If a shielded cask shipment occurred, it was shipped to a licensed facility, either as irradiated fuel to the fuel vendor or as irradiated waste to a licensed facility.

   (a) Irradiated fuel to the fuel vendor;

   If the fuel rods have been sent to a licensed irradiated fuel vendor, they are being stored in accordance with the vendor's license requirements which are established to ensure that there is no undue risk to the health and safety of the public, environment and the worker. Further records review is ongoing.

   (b) Irradiated waste to a licensed facility.

   An initial review of shipping records indicates that the only facilities considered credible for receiving these rods as irradiated waste are the licensed radioactive waste disposal sites in the States of Washington and South Carolina.

   During shipment of these rods in a shielded cask, the general radiation profiles for the two fuel rods would have been within the limits established for transportation to these licensed facilities under existing Department of Transportation (DOT), NRC and States of Washington and South Carolina regulations.

Therefore, due to the controls in place during the shipping of radioactive material to these licensed facilities, there is no undue threat to the health and safety of the public resulting from the possible shipment of these fuel rods.

An initial review of these facilities has indicated that although these facilities are not licensed to accept spent nuclear fuel, they are authorized to receive and possess source material and special nuclear material. This review also indicated that the total activity and volume associated with the rods is a small fraction of the total activity and volume accepted at these sites. In addition, a criticality evaluation of the two fuel rods was performed. In the optimum (or worst case scenario) configuration, the criticality evaluation of the two rods with an enrichment of 2.44 w/o % at zero burn-up, with a water reflector, indicates that the fuel would be substantially-sub-critical. Therefore, due to the controls in place at these facilities licensed to accept radioactive material, there is no undue threat to the health and safety of the public, or workers at these facilities, resulting from the possible shipment and receipt of these fuel rods.

V. Cause of Event

NNECO can not provide the apparent cause for this event at this time. The investigation is on-going.

VI. Independent Assessment

The IRT has determined that:

- The Investigation Team has an adequate basis to support the conclusion that there is no undue risk to the health and safety of the public, plant workers or licensed facility workers.
- The evidence does not strongly support one scenario over the other; i.e., that the fuel rods are in the SFP or have been shipped to a licensed facility.

IRT activities include:

- Review and concurrence with programmatic and procedural guidelines governing Investigation Team efforts.
- Effectiveness assessment of Investigation Team communications with stakeholders (e.g., federal regulators; licensed facilities that potentially have received the two rods, and State representatives).
- Oversight of Investigation Team member training activities.
- Ongoing oversight of Investigation Team physical inspections, document search, and potential scenario development activities.

VII. Ongoing Actions

The investigation and the following actions are ongoing:

1. The performance of additional physical inspections in the SFP.
2. The continuation of records retrieval and review of relevant documentation (e.g., SFP maps, control room logs, vendor fuel reconstitution records, radiation work permits, waste shipment records, and material transfer forms).
3. The conduct and documentation of additional personnel interviews.
4. Development, documentation, and disposition of scenarios.
5. Development of potential causal factors and root cause analysis.

6. Continued IRT oversight.
7. Continued schedule and KPI updates.
8. Ongoing communications and notifications to the NRC, the State of Connecticut, the licensed facility located on the Hanford Reservation in the State of Washington, and the licensed facility located at Barnwell in the State of South Carolina.
9. Continued briefings to MP1 Decommissioning Advisory Committee.

VIII. Future Reports

In accordance with 10CFR20.2201(d), subsequent to this written report, additional substantive information will be reported within 30 days of discovery of such information.

Table 1 – Fuel Rods Description

Type of Special Nuclear Material:	One GE 7D Tie rod and One GE 7D Spacer Capture Rod
Material:	Uranium dioxide initially enriched to 2.44% in Zircaloy 2 cladding
Length of Fuel Rods:	158 inches
Fuel Rod Diameter:	0.570 inches
Total Uranium in the 2 Fuel Rods:	7732.0 grams (year 2000)
Total Uranium$_{235}$ in the 2 Fuel Rods:	101.4 grams (year 2000)
Total Plutonium in the 2 Fuel Rods:	40.2 grams (year 2000)
Total Fissile Plutonium in the 2 Fuel Rods:	32.8 grams (year 2000)
Activity Level:	2.591 X 10^2 Ci (year 2000)
Average Burnup of Assembly MS 557	9011 MWD/MTU
Effective Full Power Days (EFPD):	508 EFPD