CONNECTICUT YANKEE ATOMIC POWER COMPANY

HADDAM NECK PLANT

RR#1 • BOX 127E • EAST HAMPTON, CT 06424-9341

December 15, 1989
Re: 10CFR50.73(a)(2)(ii)

U. S. Nuclear Regulatory Commission
Document Control Desk
Washington, D. C. 20555

Reference: Facility Operating License No. DPR-61
Docket No. 50-213
Reportable Occurrence LER 50-213/89-020-00

Gentlemen:

This letter forwards the Licensee Event Report 89-020-00, required to be submitted, pursuant to the requirements of Connecticut Yankee Technical Specifications.

Very truly yours,

Donald B. Miller, Jr.
Station Superintendent

DBM:/mlg

Attachment: LER 50-213/89-020-00

cc: Mr. William T. Russell
Regional Administrator, Region I
475 Alienable Road
King of Prussia, PA 19406

J. T. Shedlosky
Sr. Resident Inspector
Haddam Neck

IE22
1/1

NRC Form 366
(9-83)

U.S. NUCLEAR REGULATORY COMMISSION
APPROVED OMB NO. 3150-0104
EXPIRES: 8/31/88

LICENSEE EVENT REPORT (LER)

FACILITY NAME (1)	DOCKET NUMBER (2)	PAGE (3)
Haddam Neck	0 5 0 0 0 2 1 3	1 OF 0 5

TITLE (4)

Significant Fuel Damage Identified During Testing of Fuel Assemblies

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 NAMES	DOCKET NUMBER(S)
										0 5 0 0 0
1 1	1 7	8 9	8 9	— 0 2 0	— 0 0	1 2	1 5	8 9		0 5 0 0 0

OPERATING MODE (9)	THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check one or more of the following) (11)			
6	20.402(b)	20.405(c)	50.73(a)(2)(iv)	73.71(b)
POWER LEVEL (10) 0 0 0	20.405(a)(1)(i)	50.36(c)(1)	50.73(a)(2)(v)	73.71(c)
	20.405(a)(1)(ii)	50.36(c)(2)	50.73(a)(2)(vii)	OTHER (Specify in Abstract below and in Text, NRC Form 366A)
	20.405(a)(1)(iii)	50.73(a)(2)(i)	50.73(a)(2)(viii)(A)	
	20.405(a)(1)(iv)	X 50.73(a)(2)(ii)	50.73(a)(2)(viii)(B)	
	20.405(a)(1)(v)	50.73(a)(2)(iii)	50.73(a)(2)(x)	

LICENSEE CONTACT FOR THIS LER (12)

NAME	TELEPHONE NUMBER
J. Stanford, Reactor Engineer	AREA CODE 2 0 3 2 6 7 - 2 5 5 6

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

CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NPRDS		CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NPRDS	

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

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

ABSTRACT

On November 17, 1989, at 1255 hours, with the plant in Mode 6 (refueling), ultrasonic testing revealed a significant number of failed fuel rods. Approximately 233 failed fuel rods were identified in 88 of 109 fuel assemblies scheduled for reinsertion. The failures were caused by debris which became lodged between the lower fuel assembly nozzle and the first spacer grid. Although the source of the debris has not been confirmed, it appears to be a machining by-product from the thermal shield support system repairs which were carried out during the last refueling outage. The affected reinsert fuel assemblies will be reconstituted to remove the failed fuel rods. A root cause evaluation will be performed and the results will be used to make programmatic changes as necessary. This event is being reported per 10CFR50.73(a)(2)(ii) since a principal safety barrier was seriously degraded.

BACKGROUND INFORMATION

The Haddam Neck Plant has a 10 foot core consisting of 157 fuel assemblies (EIIS code: AC). Each assembly is made up of a 15 by 15 array containing 204 fuel rods, 20 control rod thimbles and one incore instrument sheath. The stainless steel fuel clad is 16.5 mils thick with an outer diameter of 0.422 inches.

A limited number of fuel failures were observed during Cycle 14 operation. The end of cycle reactor coolant system (RCS) Iodine-131 activity averaged 0.006 microcuries per milliliter. No additional spike was noted during RCS depressurization. Subsequent ultrasonic fuel inspection indicated that four fuel rods were failed.

Cycle 15 radio-chemistry data indicated that a limited number of fuel rods had failed during the first few months of operation. Projections ranged from six to 12 failed rods. The end of cycle RCS Iodine-131 activity averaged 0.025 microcuries per milliliter. The reactor was shutdown for the current refueling outage on September 3, 1989. This marked the end of 461 days of continuous operation. Special precautions were taken during the latter part of the operating cycle to minimize the potential for burnup related fuel failures (e.g., five percent per day power ascension ramp following long term reduced power operation).

Following the reactor shutdown, Iodine-131 spiked to 0.794 microcuries per milliliter. During the subsequent cooldown and depressurization Iodine-131 spiked to 11.45 microcuries per milliliter.

Prior to the September 3 shutdown, plans were made to perform ultrasonic testing of all 157 offloaded fuel assemblies. Additionally, preparations were made to reconstitute a limited number of fuel assemblies, replacing failed rods with solid stainless steel rods. The job scope was based on a comparison of Cycle 14 and 15 radio-chemistry and the post Cycle 14 fuel inspection results.

EVENT DESCRIPTION

On November 17, 1989, at 1255 hours, with the plant in Mode 6 (refueling), detailed fuel inspections revealed a significant number of failed fuel rods. Approximately 233 failed fuel rods were identified in 88 of the 109 fuel assemblies scheduled for reinsertion. Additionally, as many as 48 fuel rods are failed in the discharge assemblies. These damage estimates were based on the ultrasonic fuel test data.

CAUSE OF THE EVENT

Detailed visual examination of the 109 re-insert fuel assemblies has revealed that the failures were caused by debris lodged in the region between the fuel assembly lower nozzle and the first spacer grid. Long term fretting between the debris and the adjacent fuel rods resulted in penetration of the fuel cladding. Although the source of the debris has not been confirmed, it is suspected that it is a machining by-product from the thermal shield support system repairs which were carried out during the last refueling outage. A comprehensive root cause evaluation will be performed prior to plant startup.

SAFETY ASSESSMENT

The event is reportable per 10CFR50.73(a)(2)(ii) since a principal safety barrier was seriously degraded. The safety significance of this event is small. Although almost 300 fuel rods had through wall penetration, the defects were very small. This conclusion was reached based on the limited increase in radio-chemistry indicators during operation and post irradiation inspection results, both eddy current and visual.

Three FSAR Chapter 15 accidents were reviewed as part of the safety assessment; Steam Generator Tube Rupture, Loss of Load and the Large Break Loss of Coolant Accident. No safety significance of the failed fuel was noted during this review.

During a Steam Generator Tube Rupture, the pressure in the fuel rods is much smaller than the pressure in the RCS up to the time when the affected generator is isolated. Thus, there is no mechanism for the fission gases in the failed rods to be released into the primary coolant while release to the environment is in progress. Thus, the Steam Generator Tube Rupture transient is not a concern.

If a loss of Load occurred, the subsequent increase in RCS pressure could fail fuel rods with partial wall penetration. The pressure increase could also increase the size of the 281 known through wall failures. The subsequent increase in RCS activity would not have an impact on safety since during Cycle 15 there was no significant leakage from the primary to the secondary sides of the steam generators, thus no path to the environment.

FACILITY NAME (1)	DOCKET NUMBER (2)	LER NUMBER (6)			PAGE (3)
		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	
	0 5 0 0 0 2 1 3	8 9	— 0 2 0	— 0 0	0 4 OF 0 5

TEXT (If more space is required, use additional NRC Form 366A's) (17)

Accidents such as the Loss of Coolant Accident would not be affected as the radiological calculations include non-mechanistic assumptions about releases which result in significantly more fission product release than would be released from these failed fuel rods.

CORRECTIVE ACTION

Specialized equipment for detailed visual fuel inspection and debris removal was mobilized. All 109 of the re-insert fuel assemblies have been inspected. Approximately 500 pieces of debris have been removed.

All re-insert assemblies containing failed rods are being reconstituted. The present plan is to replace failed rods with rods of similar burnup from 12 donor fuel assemblies from the Cycle 16 reload. Eight of the donor assemblies are first burn, the other four are second burn. These twelve assemblies will be replaced with eight new assemblies and four third burned assemblies which were discharged at the end of Cycle 14 operation. Additionally, a once burned assembly which was not part of the Cycle 16 reload has been used to supply donor rods. Prior to plant startup, the modified core will be re-evaluated to verify that safety analysis inputs remain valid. The reload design parameters used in plant operation will also be verified/ recalculated. The reload analysis is performed for Haddam Neck by NUSCo.

A root cause evaluation will be performed prior to plant startup. The results of this investigation will be used as input for programmatic changes, as necessary. Haddam Neck does have a comprehensive foreign material exclusion program in place. Efforts were made to limit the amount of debris introduced into the reactor vessel during the thermal shield repairs. Additionally, three days were spent conducting a clean-up following the completion of the repair.

The reactor vessel will be vacuumed prior to core reload. A process to clean up remaining debris which may be in the RCS and other connected primary systems will be developed and implemented prior to core reload.

FACILITY NAME (1)	DOCKET NUMBER (2)	LER NUMBER (6)			PAGE (3)
		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	
	0 5 0 0 0 2 1 3	8 9	— 0 2 0	— 0 0	0 5 OF 0 5

TEXT (If more space is required, use additional NRC Form 366A's) (17)

ADDITIONAL INFORMATION

None

SIMILAR EVENTS

Significant fuel failures were experienced during Cycle 8 operation (1979). The cause of these failures was pellet/clad interaction, not debris. No previous event of this type and significance has occurred at Haddam Neck.