NRC FORM 366 (4-95) U.S. NUCLEAR REGULATORY COMMISSION

APPROVED BY OMB NO. 3150-0104
EXPIRES 04/30/98

ESTIMATED BURDEN PER RESPONSE TO COMPLY WITH THIS MANDATORY INFORMATION COLLECTION REQUEST: 50.0 HRS. REPORTED LESSONS LEARNED ARE INCORPORATED INTO THE LICENSING PROCESS AND FED BACK TO INDUSTRY. FORWARD COMMENTS REGARDING BURDEN ESTIMATE TO THE INFORMATION AND 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.

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 3	05000423	1 of 4

TITLE (4)
Westinghouse Fuel May Exceed 10 CFR 50.46 Maximum Cladding Oxidation Design Criteria

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
10	29	97	97	-- 054 --	00	11	26	97	FACILITY NAME	DOCKET NUMBER

OPERATING MODE (9)	5	THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check one or more) (11)							
			20.2201(b)		20.2203(a)(2)(v)		50.73(a)(2)(i)		50.73(a)(2)(viii)
POWER LEVEL (10)	000		20.2203(a)(1)		20.2203(a)(3)(i)	X	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)
David A. Smith, MP3 Nuclear Licensing Manager	(860)437-5840

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 15 single-spaced typewritten lines) (16)

On October 29, 1997, with the unit in Mode 5, Westinghouse Electric Corporation informed Northeast Utilities (NU) - Millstone Unit 3 that a developmental fuel rod performance modeling computer code (PAD 8.0.1) indicated that in very limiting cases for high-power, high-burnup Integral Fuel Burnable Absorber (IFBA) fuel rods, that the calculated pressures within the rod are in excess of the fuel rod design criterion that the fuel rod pellet-to-clad gap shall not re-open. Gap re-opening could result in the 17 percent maximum cladding oxidation limit defined in 10 CFR 50.46, following a postulated Loss of Coolant Accident, potentially being exceeded. On October 29, 1997, this condition was reported as an event or condition outside the design basis of the unit pursuant to 10 CFR 50.72(b)(1)(ii)(B).

This condition was identified by Westinghouse. Reviews revealed that the modeling criteria/assumptions may be potentially non-conservative regarding fuel rod internal pressures, cladding corrosion rates, and gap reopening limits for certain combinations of fuel design features and operating conditions. Precise identification of the root cause for this condition will not be possible until completion of the internal root cause investigation by the fuel vendor.

There were no adverse safety consequences as a result of this condition. Westinghouse has analyzed a hypothetical limiting case scenario to generically determine potential effects and provide an evaluation to potentially affected utilities. NU has reviewed this information and concluded that none of the fuel assemblies in the Cycle 6 core have the combinations of Zircaloy-4 cladding and IFBA fuel considered susceptible to the gap re-opening scenario. The current core design is more conservative than that assumed by Westinghouse in development of their hypothetical limiting case scenario. A Millstone Unit 3 specific evaluation will be performed by Westinghouse prior to startup.

FACILITY NAME (1)	DOCKET NUMBER (2)	LER NUMBER (6)			PAGE (3)
		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	
Millstone Nuclear Power Station Unit 3	05000423	97	-- 054 --	00	2 of 4

TEXT *(If more space is required, use additional copies of NRC Form 366A)* (17)

I. Description of Event

On October 29, 1997, with the unit in Mode 5, Westinghouse Electric Corporation informed Northeast Utilities - Millstone Unit 3 that a developmental fuel rod performance modeling computer code (PAD 8.0.1) indicated reduced fuel rod internal pressure margins for certain fuel designs when compared to results obtained with the current licensing basis fuel rod performance computer code (PAD 3.4). Westinghouse determined that in very limiting cases for high-power, high-burnup Integral Fuel Burnable Absorber (IFBA) fuel rods, that the calculated pressures within the fuel rod are in excess of the fuel rod design criterion that the fuel rod pellet-to-clad gap shall not re-open. Gap re-opening is defined to occur when the creep-out (radial expansion) rate of the fuel cladding exceeds the solid fission product swelling rate of the fuel pellets to the extent that the fuel pellet-to-clad gap reopens, if previously closed. The developmental PAD computer code model indicates that for high burnup IFBA fuel rods, where fuel cladding corrosion increases cladding temperatures, that the fuel rod pellet-to-clad gap may re-open based upon certain design and operational characteristics. If gap re-opening should occur, the 17 percent maximum cladding oxidation limit following a postulated Loss of Coolant Accident (LOCA), as defined in 10 CFR 50.46, "Acceptance criteria for emergency core cooling systems for light-water nuclear power reactors," could potentially be exceeded. On October 29, 1997, this condition was reported as an event or condition that may be outside the design basis of the unit pursuant to 10 CFR 50.72(b)(1)(ii)(B).

This problem was discovered by Westinghouse during their efforts to revise a fuel rod performance modeling computer code (PAD) by implementing a new corrosion model. Westinghouse discovered through measurement data and code enhancements that higher internal gas pressure buildup within the fuel rods with the IFBA fuel design and higher corrosion accumulation for fuel with Zircaloy-4 cladding may significantly reduce margin to the gap reopening limit. This issue potentially affects the majority of plants with IFBA fuel rods at high burnup (second cycle of operation). Based upon best estimate calculations, gap re-opening may not necessarily occur, even for the most limiting fuel rod in the most limiting plant. However, because the Nuclear Regulatory Commission approved Westinghouse analysis methodology requires consideration of uncertainties at the 95 percent probability level, it was concluded that a large number of the limiting IFBA fuel rods could exceed the gap re-opening limit when the effects of uncertainty in the calculations are included. Once the fuel pellet-to-cladding gap has been potentially re-opened, Westinghouse can no longer preclude that the LOCA 17 percent maximum local oxidation criterion would not be exceeded as well.

The 17 percent maximum cladding oxidation limit of 10 CFR 50.46 ensures that a coolable geometry will be maintained during a LOCA by limiting the total amount of metal wastage that can occur on any given fuel rod. Westinghouse conservatively interprets this limit as applying to both the pre-accident corrosion that may have accumulated on the fuel rod prior to the LOCA, plus the additional corrosion that accumulates during the event. With the possibility that some high burnup fuel rods could have experienced gap re-opening prior to a LOCA event, the hotter pellets in these fuel rods has the potential to drive cladding temperatures up during the event such that fuel rod burst could occur earlier. However, Westinghouse has stated that peak cladding temperatures are not expected to exceed 2200 degrees Fahrenheit. In addition, Westinghouse has also stated that gap re-opening does not lead to fuel rod failures, nor does it represent a substantial safety hazard.

This condition is reportable pursuant to 10 CFR 50.73(a)(2)(ii)(B), as an event or condition that may be outside the design basis of the unit. This condition was documented in accordance with the Millstone Corrective Action Program.

FACILITY NAME (1)	DOCKET NUMBER (2)	LER NUMBER (6)					PAGE (3)
		YEAR	SEQUENTIAL NUMBER			REVISION NUMBER	
Millstone Nuclear Power Station Unit 3	05000423	97	--	054	--	00	3 of 4

TEXT *(If more space is required, use additional copies of NRC Form 366A)* (17)

II. Cause of Event

This condition was identified by Westinghouse following internal reviews that revealed that the modeling criteria/assumptions for the fuel rod performance code may be potentially non-conservative regarding fuel rod internal pressures, cladding corrosion rate, and gap re-opening limits for certain combinations of fuel design features and operating conditions.

Precise identification of the root cause for this condition will not be possible until completion of the internal root cause investigation by the fuel vendor.

III. Analysis of Event

There were no adverse safety consequences as a result of this condition. Westinghouse has analyzed a hypothetical limiting case scenario to generically determine potential effects and provided an evaluation and other information to potentially affected utilities. Northeast Utilities has reviewed this information and concluded that none of the fuel assemblies in the Cycle 6 core have the combinations of Zircaloy-4 cladding and IFBA fuel considered susceptible to the gap re-opening scenario. The current Millstone Unit 3 Cycle 6 core design is more conservative than that assumed by Westinghouse in development of their hypothetical limiting case scenario. However, Zircaloy-4 cladding with IFBA fuel in a second cycle of operation was present during Cycles 4 and 5.

The Millstone Unit 3 Cycle 6 core configuration has what Westinghouse believes to be an unaffected fuel design. The Cycle 6 design is made up of 168 ZIRLO™ clad fuel assemblies with IFBA and 25 non-IFBA standard fuel assemblies from the Region 4 fuel. The fuel design includes ZIRLO™ cladding, annular blanket pellets, and a initial fuel rod backfill pressure considered acceptable for IFBA rods. These features help to reduce fuel rod internal pressures and provide adequate fuel performance margins without exceeding the gap re-opening and 17 percent maximum cladding (local) oxidation criteria.

Cycles 4 and 5 may have been susceptible to the postulated gap re-opening problem. The Cycle 4 core had one batch (Region 5) of Zircaloy-4 clad IFBA fuel and Cycle 5 contained one batch of Zircaloy-4 clad IFBA fuel in the core for both a second (Region 6) and third burn (Region 5). Based on the information within the Westinghouse evaluation it appears that Cycles 4 and 5 could have met the gap separation criteria. However, as those cycles are complete and the fuel discharged to the fuel pool there is no value in performing further analysis on the Cycle 4 and 5 fuel.

Westinghouse has not performed any plant specific analyses to conclude that this condition is directly applicable to Millstone Unit 3. However, they have notified licensees, on a generic basis, of the potential condition and provided a rationale for why the condition does not affect continued operation of the facility. Westinghouse has stated that this condition poses no adverse safety or reliability concerns.

IV. Corrective Action

Westinghouse has informed Northeast Utilities that it is currently planning to perform plant-specific analyses/evaluation to determine the applicability of this condition to Millstone Unit 3. However, due to the need to support currently operating units and the projected startup date of Unit 3, these analyses are not expected to be completed until the first quarter of next year.

FACILITY NAME (1)	DOCKET NUMBER (2)	LER NUMBER (6)					PAGE (3)
		YEAR	SEQUENTIAL NUMBER			REVISION NUMBER	
Millstone Nuclear Power Station Unit 3	05000423	97	--	054	--	00	4 of 4

TEXT *(If more space is required, use additional copies of NRC Form 366A)* (17)

The following corrective actions will be completed:

1. A Millstone Unit 3 specific evaluation will be performed by Westinghouse by February 17, 1998.

2. The Westinghouse Root Cause Evaluation will be reviewed upon completion. Limits and recommendations will be incorporated into the Cycle 7 core design as appropriate by August 1, 1998.

3. A supplement will be submitted by October 31, 1998, following completion of review of the Westinghouse Root Cause Evaluation.

V. Additional Information

None

Similar Events

None

Manufacturer Data

EIIS System Code

Reactor Core System.....AC

EIIS Component Code

Not Applicable