

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 (IT-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.
<h2 style="margin: 0;">LICENSEE EVENT REPORT (LER)</h2> <p style="margin: 0;">(See reverse for required number of digits/characters for each block)</p>		

FACILITY NAME (1) WATERFORD STEAM ELECTRIC STATION UNIT 3	DOCKET NUMBER(2) 05000 382	PAGE (3) 1 OF 6
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TITLE (4) REFUELING MACHINE FAILED TO MEET TECHNICAL SPECIFICATION REQUIREMENTS

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
04	07	97	97	013	00	05	07	97	N/A	05000
									FACILITY NAME	DOCKET NUMBER
									N/A	05000

OPERATING MODE (9)	1	THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR 5: (Check one or more) (11)								
POWER LEVEL (10)	100	20.2201(b)			20.2203(a)(2)(v)			<input checked="" type="checkbox"/>	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 TIM GAUDET, LICENSING MANAGER	TELEPHONE NUMBER (include Area Code) (504)739-6666

COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT (13)									
CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NPKDS	CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NPKDS

SUPPLEMENTAL REPORT EXPECTED (14)				EXPECTED SUBMISSION DATE (15)		
YES (If yes, complete EXPECTED SUBMISSION DATE).		<input checked="" type="checkbox"/>	NO			

ABSTRACT (Limit to 1400 spaces, i.e., approximately 15 single-spaced typewritten lines) (16) <p>On April 7, 1997, engineering personnel determined the Refueling machine's fuel mast and Control Element Assembly (CEA) mast have elevation zones during extension and retraction of their hoist assemblies which do not have overload protection provided. This condition is contrary to Technical Specification 3/4.9.6 which requires both the fuel mast and the CEA mast to have operable overload protection features prior to use. The zones where no overload protection was provided are associated with the areas where load transitions occur during extension and retraction of the mast assemblies. The zones were engineered into the design to prevent erroneous readings during the load transitions. Additionally, the Surveillance Procedure which validates the minimum lift capacity of the CEA hoist was inadequate. The procedure required a load test be performed by raising the CEA hoist to the upper limit and then using a hand wheel to generate a load of 1600 pounds, which does not ensure that the hoist motor can lift it's minimum load capacity. The corrective action for these two conditions consists of a modification to the refueling machine overload protection software to eliminate the bypass feature for the load transition zones, and a revision to the Surveillance Procedure which requires test weights to be used when testing the lifting capacity of the CEA hoist. These conditions did not compromise the health and safety of the public.</p>

**REQUIRED NUMBER OF DIGITS/CHARACTERS
FOR EACH BLOCK**

BLOCK NUMBER	NUMBER OF DIGITS/CHARACTERS	TITLE
1	UP TO 46	FACILITY NAME
2	8 TOTAL 3 IN ADDITION TO 05000	DOCKET NUMBER
3	VARIES	PAGE NUMBER
4	UP TO 76	TITLE
5	6 TOTAL 2 PER BLOCK	EVENT DATE
6	7 TOTAL 2 FOR YEAR 3 FOR SEQUENTIAL NUMBER 2 FOR REVISION NUMBER	LER NUMBER
7	6 TOTAL 2 PER BLOCK	REPORT DATE
8	UP TO 18 -- FACILITY NAME 8 TOTAL -- DOCKET NUMBER 3 IN ADDITION TO 05000	OTHER FACILITIES INVOLVED
9	1	OPERATING MODE
10	3	POWER LEVEL
11	1 CHECK BOX THAT APPLIES	REQUIREMENTS OF 10 CFR
12	UP TO 50 FOR NAME 14 FOR TELEPHONE	LICENSEE CONTACT
13	CAUSE VARIES 2 FOR SYSTEM 4 FOR COMPONENT 4 FOR MANUFACTURER NPRDS VARIES	EACH COMPONENT FAILURE
14	1 CHECK BOX THAT APPLIES	SUPPLEMENTAL REPORT EXPECTED
15	6 TOTAL 2 PER BLOCK	EXPECTED SUBMISSION DATE

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

REPORTABLE OCCURRENCE

Technical Specification (TS) 3.9.6 establishes overload cutoff limits for the Refueling machine's fuel mast hoist and Control Element Assembly (CEA) mast hoist (DF, EHS Identifier FHM) which must be demonstrated operable prior to movement of fuel or the CEAs. Historically, Waterford 3 had determined that the Refueling machine was operable even though both hoists had design features which bypassed the overload cutoff limits at certain elevation zones when lifting and lowering fuel and control element assemblies. Additionally, the Surveillance Procedure for demonstrating that the CEA hoist is operable did not require the use of an actual test load to demonstrate operability. The lifting capacity of the CEA hoist motor was not being properly demonstrated. These conditions are reportable pursuant to 10 CFR 73(a)(2)(i)(B) as conditions prohibited by TS.

INITIAL CONDITIONS

At the time this concern was identified, Waterford 3 was operating in Mode 1 at approximately 100% power. There were no inoperable structures, systems or components that contributed to this event. In addition, no TS Limiting Conditions for Operation were in effect specific to this event.

EVENT DESCRIPTION

Communications with Programmed and Remote Systems Corporation (PAR), the vendor for the Waterford 3 Refueling machine, revealed Calvert Cliffs Nuclear Power Plant (CCNPP) staff personnel had identified their Refueling machine's overload interlocks (the engineered features) do not fully implement CCNPP TS 3/4.9.6. Communications with the vendor, along with contacting CCNPP personnel, led the Waterford 3 engineering staff to evaluate whether the same condition existed at Waterford 3.

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On April 7, 1997, engineering concluded that both the fuel mast and the CEA mast have elevation zones during extension and retraction of the hoist assembly which do not have overload protection provided. The zones where no overload protection was provided are associated with the areas where load transitions occur during extension and retraction of the mast assembly. The zones were engineered into the design to prevent expected load transients from exceeding overload interlock values. During evaluation of this condition, another TS related deficiency was identified regarding the adequacy of the Surveillance Procedure which implements the load testing requirement for the CEA mast.

The purpose of the Refueling machine, which consists of a fuel handling mast and a CEA handling mast, is to provide a means of handling fuel bundles and CEAs which prevents damage to the fuel, the CEAs, and the reactor core internals and pressure vessel. The fuel mast and the CEA mast are stainless steel cylinders approximately 34 feet long and 22 inches in diameter that house and guide the fuel and CEA hoisting assemblies. The hoist assemblies are telescopically extended and retracted for removal, replacement, and relocation of the fuel assemblies and CEAs. The hoist assemblies consist of an open box which includes a hoist cable connected to a grappling device. The grappling device is lowered and engages the top of the fuel assembly or CEA to be lifted. The fuel assembly or the CEA is then raised into the associated mast. The Refueling machine can then transport the selected assembly to another location.

As the fuel assembly or CEA is being lifted out of or inserted into the core, the load on the hoist cable is monitored at the refueling machine control console to ensure fuel assembly movement is not being restricted. The hoist load is measured by a weighing system(s) which electronically measures the load on the hoist cable and provides input for the overload protection features. These overload protection features are provided by interlock functions which suspend movement of the selected assembly when an overload condition is detected.

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The weighing system operates in two load zones, when raising or lowering fuel only and when raising or lowering fuel plus the fuel hoist box. Initially as a fuel bundle is being withdrawn from the core, the Reactor Building Storage Racks, or the fuel carrier, the load on the grapple is the weight of the fuel bundle only. When the fuel bundle is being removed from a core location and is fully raised into the fuel hoist box the weight of the fuel hoist is added to the grapple. The overload interlocks are momentarily bypassed at this load transition point. The reverse sequence occurs during the lowering operation.

The momentary bypassing of the interlocks does not appear to be allowed by the wording of the TS. TS 3.9.6 does not provide for any exceptions to the specified overload protection. Therefore, the operational characteristics created by the design features of the hoist assemblies results in a condition prohibited by TS.

Additional reviews by engineering in preparation for the RFO8 Refueling Outage identified potential inadequacies in Surveillance Procedure OP-903-073 regarding full compliance with the intent of TS surveillance 4.9.6.2. This TS surveillance states, "The CEA mast used for movement of CEAs shall be demonstrated OPERABLE within 72 hours prior to the start of such operations by performing a load test of at least 1600 pounds and demonstrating an automatic load cut off when the CEA mast exceeds 1700 pounds." Engineering review revealed that the CEA mast is not tested using an actual test load that creates a load of 1600 pounds. Instead the load test is performed by raising the hoist to the upper limit and then using the hand wheel to generate a load of 1600 pounds. This method of testing the minimum lifting capacity is inconsistent with the testing practice for the fuel mast and has been determined to be inconsistent with common industry practice. Performing the test requirement in this manner, in lieu of using a test load, does not ensure that the hoist motor can lift a load of 1600 pounds. This testing deficiency regarding the CEA hoist is considered to be a condition prohibited by TS. Engineering review found that the fuel hoist was being tested properly.

The Waterford 3 licensing staff has reviewed the Calvert Cliffs, Unit 2, and St. Lucie, Unit 1, response to this similar condition regarding the operability of their refueling

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machine versus compliance with TS requirements. The root cause of this LER condition is the same at all three plants. The overload bypass circuitry was included in the original design of the refueling machines at all three facilities. The discrepancy between the design of the refueling machine and the TS was not identified during the original plant licensing and had existed since that time.

CAUSAL FACTORS

Root cause analysis and investigation into the overload bypass issue have identified a failure to assure the refueling machine's circuitry design complied with the TS. The overload bypass circuitry design has been a part of the refueling machine design since initial procurement. A contributing factor was that the bypass feature was included in the original fuel handling system design. Due to a lack of attention to detail, the TS review and acceptance process during original plant licensing, did not identify the discrepancy between the design and the TS.

Root cause analysis and investigation into the surveillance procedure deficiency identified the preparation of the procedure was inadequate. The procedure preparation was inadequate due to (1) the lack of a weighted test assembly to perform the lift test, and (2), the administrative requirements for preparation and approval of the procedure failed to ensure that the lift capacity of the hoist motor was tested.

CORRECTIVE MEASURES

Immediate corrective actions consisted of contacting PAR to obtain additional details of the similar overload bypass issue at CCNPP. The software which controls the overload protection features has been upgraded. Waterford 3 developed and implemented a revision to the control software to accommodate an overload limit in conformance with TS 4/3.9.6. The software modification will establish a overload limit of 3350 pounds for the full travel of the fuel and fuel hoist box assembly and a overload limit of 1700 pounds for the full travel of the CEA and CEA hoist box assembly.

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In response to the inadequate procedure a change was issued to the Surveillance Procedure to add procedure steps for live load testing of the CEA hoist assembly. In preparation for the RFO 8 Refueling Outage, the CEA hoist assembly was satisfactorily tested and subsequently declared operable in support of CEA movements during the outage.

SAFETY SIGNIFICANCE

Failure to comply with Technical Specification 3/4.9.6 was not a safety significant issue at Waterford 3. The potential for inadvertent criticality and offsite release as a result of refueling machine interlock failures are bounded by existing analyses. The results of the FSAR Chapter 15 safety analysis demonstrate that applicable dose limits are not exceeded as a result of the worst postulated fuel assembly drop. No credit is taken for instrumentation or interlocks on the fuel handling equipment to either prevent or mitigate the consequences of the fuel assembly drop. Therefore, the design feature of the refueling machine which permitted certain elevation zones to be bypassed during fuel movement is not safety related. This event did not compromise the health and safety of the public.

SIMILAR EVENTS

There have been no similar events reported as LERs at Waterford 3.