

**LICENSEE EVENT REPORT (LER)**

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

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FACILITY NAME (1)  
**Waterford Steam Electric Station, Unit 3**

DOCKET NUMBER (2)  
**05000-382**

PAGE (3)  
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TITLE (4)  
**An Appendix R Non-Compliance Condition Involving Inadequate Separation of Safe Shutdown Cables**

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
7	27	99	99	- 009	-- 00	08	26	99	N/A	N/A
OPERATING			THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check one or more) (11)							
1			20.2201(b)				20.2203(a)(2)(v)	50.73(a)(2)(i)		50.73(a)(2)(viii)
POWER LEVEL (10)			20.2203(a)(1)				20.2203(a)(3)(i)	X	50.73(a)(2)(ii)	50.73(a)(2)(x)
100			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: **O.P. Pipkins, Sr. Licensing Engineer** TELEPHONE NUMBER (Include Area Code): **(504) 739-6707**

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)  
YES (If yes, complete EXPECTED SUBMISSION DATE):  NO   
EXPECTED MONTH: \_\_\_\_\_ DAY: \_\_\_\_\_ YEAR: \_\_\_\_\_

ABSTRACT (Limit to 1400 spaces, i.e., approximately 15 single-spaced typewritten lines) (16)  
On July 27, 1999, with the plant in Mode 1 at 100% Reactor Power, it was determined that electric cables serving redundant trains of equipment required for safe shutdown (Fire Area RAB-30) were not routed in full compliance with 10CFR50 Appendix R requirements. However, existing suppression, detection and spacial separation would have ensured one train available for safe shutdown. The separation of the cables ranged from 8 feet to 120 feet. Appendix R requires a three hour barrier or a one hour barrier + detection + sprinklers or 20 feet free space between trains with no intervening combustibles +detection + sprinklers. The existing condition does not fully meet one of these options. Equipment affected includes Charging Pumps "A", "B" and "A/B"; Emergency Feedwater Pumps "A" and "B"; Low Pressure Safety Injection Pumps "A" and "B"; Shutdown Cooling Heat Exchanger "A" and "B" Component Cooling Water Flow Control Valves; and High Pressure Safety Injection Pumps "A" and "B". Compensatory measures (continuous fire watches) were implemented immediately. There was no actual fire event associated with this condition. Corrective measures are being determined under the plant Corrective Action Program. The condition did not compromise the health and safety of the general public.

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**REPORTABLE OCCURRENCE**

On August 6, 1999, during further evaluation of a condition (Appendix R fire barrier, suppression and detection non-compliance) that was originally observed on July 27, 1999, it was determined that an unmitigated fire in Fire Area RAB-30 could have impacted both trains of systems, required for safe shutdown of the plant. On the date of original observation (July 27, 1999), based on information available at that time, it was apparent that the plant could still have achieved safe shutdown. However, further evaluation determined that additional equipment, that was initially thought to be available to help achieve safe shutdown (HPSI Pumps for adding to inventory in absence of charging), was also vulnerable to damage by fire in that area. At this point (on August 6, 1999) it was determined that the plant had operated with a condition that was not safety significant, but outside the design basis of the plant. The condition was reported to the NRC Operations Center via ENS within one hour of that determination under the requirements of 10CFR50.72(b)(1)(ii)(B). The condition is hereby being reported within 30 days of discovery under the requirements of 10CFR50.73(a)(2)(ii)(B) as a condition outside the design basis of the plant.

**INITIAL CONDITIONS**

At the time of initial discovery on July 27, 1999, Waterford 3 was operating in Mode 1 at approximately 100% Reactor Power. At the time of determination of reportability, August 6, 1999, the plant was in Mode 5. The plant had been shut down, prior to the reportability determination, due to loss of Reactor Coolant Pump 2B seal bleed-off flow. No major systems, structures or components were out of service specific to the Appendix R fire barrier, suppression and detection noncompliance condition. No Technical Specification Limiting Conditions for Operation action statements were in effect specific to the condition.

**EVENT DESCRIPTION**

On July 27, 1999, an Appendix R fire barrier, suppression and detection noncompliance condition was discovered during evaluations associated with a design bases reconstitution effort for plant sprinkler

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systems and revision of sprinkler system specifications. Engineering observed that FSAR Amendment 31 indicated that no essential equipment was located in Fire Area RAB-30. The current FSAR indicates (and walkdowns and/or reviews substantiate) that essential cables are in that area, including cables for "A", "B" and "A/B" Charging Pumps [CB-P], "A" and "B" Emergency Feedwater pumps [BA-P], "A" and "B" Low Pressure Safety injection (LPSI) Pumps [BP] and cables for CC963A and CC963B for Shutdown Heat Exchangers "A" and "B" Component Cooling Water (CCW) Flow Control Valves [CC-V]. The separation of these cables range from 8 feet to 120 feet. Appendix R requires protection in the form of:

- a) a three hour fire barrier or
- b) a one hour fire barrier + detection + sprinklers or
- c) 20 feet of free space between redundant trains with no intervening combustibles + detection + sprinklers.

The existing condition does not fully meet any of the above options for compliance. The sprinkler system and detection system, in Fire Area RAB-30, does not provide coverage for the entire fire area. Also there are intervening combustibles in the area. Subsequent reviews, on August 6, 1999, indicated that High Pressure Safety Injection Pump (HPSI) Pump [BQ] cables also run through the fire area.

The specific point in time that the condition originated has not been determined. However, it is believed that the condition has existed for more than 15 years, from the time of implementation of Appendix R requirements to the time of discovery.

### CAUSAL FACTORS

The root cause for the condition has been determined to be design configuration and analysis: design analysis deficiency. Over emphasis and focus may have been placed on the term "equipment" during performance of early safe shutdown analysis for that area, since there is no essential "equipment" (pumps, valves, motors, etc.). The existence of only essential electric cable runs through that area and a possible failure (in this isolated case) to consider the cable as equipment, may have resulted in the

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inadvertent failure to adequately consider Appendix R requirements.

**CORRECTIVE ACTIONS**

Upon discovery of the condition, compensatory measures were established (continuous fire watches) in the fire area. Since the area includes both radiation control areas (RCA) and non-RCA areas, two continuous fire watches were required. The area was walked down and identification of essential and associated cables in the area was completed on 8/6/99. Final determination of long-term corrective measures is being evaluated through the plant Corrective Action Program and is not complete at this time.

**SAFETY SIGNIFICANCE**

No actual fire event was associated with this condition. There was no actual impact on nuclear safety as a result of the condition. The safety significance of this condition resided in the potential for inability to achieve safe shutdown if there had been an unmitigated fire in the subject fire area (RAB-30). However, a review of the actual configuration (described below) of essential equipment (cable) and fire protection features in the fire area supports the conclusion that at least one train of essential equipment would have been available for safe shutdown, if a fire had occurred in the area.

The subject fire area consists of approximately 8,000 square feet of floor area. The entire area, with the exception of rooms B118, B119B, B120, B121, B122 and B126 (corridors, showers and toilet areas) are provided with fire detection. Fire Suppression is provided over approximately 50% of the area. The area is arranged such that, for the most part, spatial separation is provided between essential cables of concern, however there are intervening combustibles existing between trains. The level of defense in depth required by Appendix R is not fully provided between redundant safe shutdown trains.

Redundant essential cables in the area include cables for Charging Pumps "A", "B" and "A/B"; Emergency Feedwater Pumps "A" and "B"; and LPSI Pumps "A" and "B". The Train "B" cables for these system components are located at the north end of the fire area in a room (B124) provided with

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automatic sprinkler protection and fire detection. Train "A" cables for these system components are located at the south end of the fire area (Room B136), approximately 120 feet from the "B" Train cables. Room B136 is provided with fire detection but has no sprinkler protection. Train "A/B" cables are located approximately in the middle of the fire area, along the east wall in Room B132, which is provided with fire detection only. An exception to this general arrangement of spatial separation is the cables contained in a cable chase located at the east wall of Rooms B133 and B134. This chase is provided with both fire detection and sprinkler protection. The chase contains cables to the Shutdown Heat Exchanger "A" and "B" CCW Flow Control Valves (CC963A and CC963B). These redundant train cables are separated by less than 8 feet.

An unmitigated fire in fire area RAB-30, without the benefit of fire detection and manual response or automatic sprinkler protection, could have challenged having of at least one credited safe shutdown train available to achieve safe shutdown.

However, the most credible, worse case fire scenario does not result in fire spreading throughout the fire area. The combustible loading calculations for the fire area reflects a fire severity of approximately 15 minutes. This fire severity represents relatively low combustible loading. Assuming a significant introduction of transient combustibles or moderate amounts of flammable liquids in the area (in addition to the existing in situ combustibles), fire would be controlled by the existing combination of physical separation and automatic sprinkler protection. Assuming a severe fire were to occur in the immediate vicinity of the "A" cables (an area with fire detection only) and assuming the detection system was inoperable (and associated TRM fire watch action statements were not implemented) a fire could grow and spread northward toward the redundant "B" train cables. However, upon approaching column line "H" (approximately 90 feet from the "B" train cables) the fire would enter an area provided with automatic sprinkler protection. The corridor area is not provided with sprinkler protection. The corridor is not expected to contain the continuity of combustibles to support fire spread. The sprinkler system in the area would provide a much higher water discharge density than the calculated value. This is due to the hydraulic calculations being based on a calculated sprinkler demand. The actual water pressure

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available would provide a much higher water discharge density. The sprinkler system should be able to control and prevent the spread of fire from one end to the other end of the fire area. Water damage due to sprinkler actuation is not a concern since the essential components in the area are cables.

The false ceiling in portions of the area does not create a concern since at least one essential train is in an area without a false ceiling, with sprinklers located at the ceiling. Other portions of the area with a false ceiling have no combustibles above the ceiling other than the cables themselves. There are no cable trays routed from the north to the south end of the area. A cable tray could not act as a path for fire to spread between redundant "A" and "B" Trains.

Ductwork throughout the area could act as a path for smoke spread, but the length and routing of the duct is such that high temperature smoke or products of combustion could not travel between redundant "A" and "B" Train cables. Ductwork is designed, installed and tested to be leak-tight and is constructed of minimum 16-gage steel. All supply and return ducts routed above false ceilings are provided with fire resistant vapor barrier facing.

The area essentially consists of various concrete block enclosed rooms with metal doors that present an arduous path for fire spread. This arduous path would also inhibit the ignition of area combustibles due to the absence of a path for direct or radiant heat transfer.

A fire that could have occurred in those parts of the fire area provided with fire detection and suppression would have been held in check by the fire being detected and a manual fire brigade response or by the automatic fire suppression system. Fires in those locations within the fire area could have been controlled while in the incipient stage, with little to no fire spread.

The concern for the cables in the chase (Shutdown Heat Exchanger "A" and "B" CCW Flow Control Valves) is further mitigated because the valves are associated with placing shutdown cooling in service and can be manually bypassed in a separate fire area. Spurious actuation of these valves, post fire,

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can be mitigated manually. The valves can be appropriately positioned to achieve their required function. The manual bypassing of these valves is an adequate response and the absence of separation between these redundant cables is not safety significant.

Therefore, the above discussion demonstrates that the safety significance of the condition is minimal, since at least one train of equipment would have been available for shutdown post fire.

**SIMILAR EVENTS**

Another condition involving the potential for a single fire event impacting multiple trains of redundant equipment required for safe shutdown of the plant was reported in LER 97-020. In the case of that condition, a fire in certain plant areas could potentially have resulted in a momentary shutdown or current limiting of safety related Static Uninterruptible Power Supplies via cable faults.

**ADDITIONAL INFORMATION**

Energy Industry Identification System (EIIIS) codes are identified in the text within brackets [ ].