



Entergy

Entergy Operations, Inc.
P.O. Box B
Killona, LA 70066-0751
Tel 504 464 3120

T.R. "Ted" Leonard
General Manager
Plant Operations
Waterford 3

W3F1-97-0157
A4.05
PR

July 3, 1997

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

Subject: Waterford 3 SES
Docket No. 50-382
License No. NPF-38
Reporting of Licensee Event Report

Gentlemen:

Attached is Licensee Event Report (LER) Number 97-020-00 for Waterford Steam Electric Station Unit 3. This report provides details of an identified plant condition wherein a fire in certain plant areas could potentially result in a momentary shutdown or current limiting of safety related Static Uninterruptible Power Supplies via cable faults. This condition is being reported pursuant to 10CFR50.73(a)(2)(v).

Very truly yours,

T.R. Leonard
General Manager
Plant Operations

TRL/OPP/ssf
Attachment

cc: E.W. Merschoff (NRC Region IV), C.P. Patel (NRC-NRR),
A.L. Garibaldi, J.T. Wheelock - INPO Records Center,
J. Smith, N.S. Reynolds, NRC Resident Inspectors Office,
Administrator - LRPD

JE221

9707090194 970703
PDR ADOCK 05000382
S PDR



LICENSEE EVENT REPORT (LER)

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

FACILITY NAME (1)

Waterford Steam Electric Station
Unit 3

DOCKET NUMBER (2)

05000 382

PAGE (3)

1 OF 5

TITLE (4)

Potential Safety Related Static Uninterruptible Power Supply (SUPS)
Common Mode Failure

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
06	04	97	97	020	00	07	03	97		05000
OPERATING MODE (9)			THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check one or more) (11)							
6			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)		50.73(a)(2)(ii)		50.73(a)(2)(x)	
0			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)		<input checked="" type="checkbox"/> 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

T.J. 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 NPRDS	CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NPRDS

SUPPLEMENTAL REPORT EXPECTED (14)

YES (If yes, complete EXPECTED SUBMISSION DATE).	X	NO	EXPECTED SUBMISSION DATE (15)	MONTH	DAY	YEAR
---	---	----	-------------------------------------	-------	-----	------

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

On June 4, 1997, during Refueling Outage eight (shutdown), while evaluating a plant condition, it was determined that a fire in the switchgear room could potentially result in the momentary loss of both trains of safety related Static Uninterruptible Power Supplies (SUPS). The plant established hourly fire watches in that area in accordance with Fire Protection Program requirements. The apparent cause of the condition was determined to be a combination of 1) the inherent design of the SUPS units which results in a race between the SUPS and the individual load breakers to clear a fault and 2) unwrapped non-safe shutdown SUPS load cables (associated circuits of concern) routed within 20'. Reviews were conducted identifying other plant areas affected by the condition. Other potential common failure modes have been reviewed. Results of reviews indicate (in addition to fire) low probability vulnerability to tornado missile damage in one plant area. Design changes to correct the problem are currently being evaluated. Compensatory measures in place will continue in the interim. No actual loss of both trains of SUPS units occurred. This condition did not compromise the health and safety of the general public.

**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

LICENSEE EVENT REPORT (LER)
TEXT CONTINUATION

FACILITY NAME (1)	DOCKET	LER NUMBER (6)			PAGE (3)
		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	
Waterford Steam Electric Station Unit 3	05000 382	97	-- 020	-- 00	2 OF 5

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

REPORTABLE OCCURRENCE

Waterford 3 discovered that a single fire event could potentially result in the momentary shutdown or current limiting of both trains of safety related Static Uninterruptible Power Supplies (SUPS). The condition is reportable in accordance with 10CFR50.73(a)(2)(v) wherein a single event (fire) could cause inoperability of two independent trains and channels of safe shutdown systems. A four hour call was made to the NRC Operations Center reporting the condition on June 4, 1997 at 1624 (Central Standard Time) in accordance with 10CFR50.72(b)(2)(iii)(A) as a condition that alone could have prevented fulfillment of safety function of systems needed for safe shutdown.

INITIAL CONDITIONS

At the time of discovery, Waterford 3 was in operational mode 6 (refueling).

EVENT DESCRIPTION

Waterford 3 has six safety related SUPS units, two of which were procured from Elgar Corporation (SA & SB) and the other four (MA, MB, MC, and MD) were procured from Solidstate Controls, Inc. (SCI). The Elgar and SCI SUPS units are designed with 10KVA (83 amp @ 120 VAC) and 20KVA (167 amp @ 120VAC) output, respectively. The SUPS units are designed with internal protective features. The SA and SB (Elgar) SUPS units were designed with a fast acting "fault" circuit that shuts off the inverter very rapidly when a fault draws current exceeding 165% of its full load. The Elgar SUPS units will restart approximately 30 cycles after every shutdown until the fault clears. The MA, MB, MC, and MD SUPS units maximum outputs are 120% of the full load. Therefore, any fault that exceeds the 120% limit will cause the SCI SUPS units to go into current limiting mode. The subject SUPS units are Class 1E components that supply low noise, uninterruptible regulated power to Class 1E loads (safety related and safe shutdown).

LICENSEE EVENT REPORT (LER)
TEXT CONTINUATION

FACILITY NAME (1)	DOCKET	LER NUMBER (6)			PAGE (3)
		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	
Waterford Steam Electric Station Unit 3	05000 382	97	-- 020	-- 00	3 OF 5

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

On June 4, 1997, while conducting Refueling Outage eight (RF08), it was determined that a fire in the switchgear room could potentially result in the momentary loss of both trains of safety related SUPS units [EF]. The initial review of the condition indicated that the momentary loss of the SUPS units would only affect one train of SUPS. After subsequent Engineering discussions with the SUPS vendors and further reviews, Waterford 3 concluded on June 4, 1997 that the potential existed for a common mode failure (momentary shutdown or current limiting) of both trains of safety SUPS units. Although the potential SUPS failures would be momentary, the perturbation could be enough to require Operations to manually reset safety loads on multiple SUPS units/trains. Perturbations could result if a fire were to start in plant areas that have unprotected (non-safe shutdown associated circuits of concern) cables from various safety SUPS units, routed less than 20' apart or if the cables were in a plant area susceptible to tornado strike damage. The scenario assumes the cables would fault and the applicable, individual load breakers would trip after cycling the SUPS units several times. The SUPS units shut down/limit current when the resulting fault current and load current exceed the SUPS units capacity to supply power. The SUPS would restart, then shut down and repeat this action in rapid succession until the applicable, individual load breaker trips (due to fault current).

CAUSAL FACTORS

The apparent root cause of the condition is a combination of:

- 1) the lack of recognition of the inherent design of the SUPS units (fast acting) which results in the potential for SUPS units shutting down or shifting to current limiting mode before individual (faulted circuit) load breakers can trip, and
- 2) not subsequently treating the non-safe shutdown cables connected to the SUPS units as associated circuits.

CORRECTIVE MEASURES

Upon identifying the condition, the plant established fire watches in accordance with the Fire Protection Program in the affected areas. Reviews were conducted to identify the

LICENSEE EVENT REPORT (LER)
TEXT CONTINUATION

FACILITY NAME (1)	DOCKET	LER NUMBER (6)			PAGE (3)
		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	
Waterford Steam Electric Station Unit 3	05000 382	97	-- 020	-- 00	4 OF 5

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

areas where the SUPS load cables are routed. Fire watches were established in all of those areas. Hourly fire watches were applicable in all of the areas except the 'Q' deck area, which required a continuous fire watch, since there is no fire detection in that area.

As an interim compensatory measure, continuous fire watches will be required any time transient combustibles are in affected risk significant areas. Continuous fire watches are required, in accordance with the Fire Protection Program for any hot work performed in the affected areas.

Waterford 3 has performed a review of potential safety SUPS vulnerabilities to common mode failure. Consideration was given to potential common mode failures due to fire, flood, moderate energy line break (MELB), high energy line break (HELB), seismic and tornado in applicable plant areas. Results of the reviews indicate that the safety SUPS units are not vulnerable to common mode failure due to flood, seismic, HELB and MELB. Reviews further indicated that, while there is some potential for common mode failure due to tornado (cables in the 'Q' deck area), engineering calculations demonstrate that the overall probability of damage to the conduits by tornado is very low (1.76×10^{-7}) and is within acceptable limits.

More details of the review and assessment are provided under separate cover letter (W3F1-97-0172).

The following design changes are being considered:

- 1) providing capability to clear faults on the affected circuits without causing unnecessary circuit interruptions for safe shutdown loads through use of appropriate fusing.
- 2) meeting the requirements of 10CFR50, Appendix R, Section III.G.2.c for the affected circuits in one or more fire areas by enclosing the circuits in a fire barrier having a 1-hour rating, with fire detection and automatic suppression provided in the fire area.
- 3) upgrading at least one train of safety related SUPS.

LICENSEE EVENT REPORT (LER)
TEXT CONTINUATION

FACILITY NAME (1)	DOCKET	LER NUMBER (6)			PAGE (3)
		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	
Waterford Steam Electric Station Unit 3	05000 382	97	-- 020	-- 00	5 OF 5

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

SAFETY SIGNIFICANCE

The condition does not introduce new failure modes. The impact of the condition is that it could require the Operator to perform additional realignments of some safe shutdown loads that are sensitive to momentary interruptions/dips in voltage. As the fire progresses, unprotected non-safe shutdown cables, fed from the protected train SUPS unit could become involved in the fire. This could result in recurring instances of the race between the individual load breakers and the SUPS units momentarily shutting down (or entering current limiting mode) to clear the faults. Since the unprotected non-safe shutdown cables remain connected to the SUPS buses after transfer of control to the remote shutdown panel, the potential realignments could continue after control has been transferred. Engineering and Operations have reviewed the safe shutdown loads against wiring diagrams and off-normal procedures to assess the potential impact on safe shutdown and determined that the condition is manageable. The condition would not prevent safe shutdown of the plant. The review was conducted assuming a Control Room / Cable Vault fire which would be the bounding scenario.

There were no actual safety consequences and implications associated with the condition since no actual fire event was involved. No actual Waterford 3 events have occurred involving a common mode failure of multiple trains of safety related SUPS units. The potential for common mode failure associated with this condition has existed from initial plant startup. The condition did not compromise the health and safety of the general public.

SIMILAR EVENTS

No similar events were identified.

ADDITIONAL INFORMATION

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