



**System
Energy**

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April 18, 1990

U.S. Nuclear Regulatory Commission
Mail Station P1-137
Washington, D.C. 20555

Attention: Document Control Desk

Gentlemen:

SUBJECT: Grand Gulf Nuclear Station
Unit 1
Docket No. 50-416
License No. NPF-29
Update on Design
Deficiency That Could Affect
Long Term Post-LOCA Core
Spray
LER 90-003-01
AECM-90/0065

Attached is Licensee Event Report (LER) 90-003-01 which is a final report.

Yours truly,

WTC:cg
Attachment

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LER90301/SCMPFLR

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LICENSEE EVENT REPORT (LER)

APPROVED OMS NO. 3100-0104

EXPIRES 8/31/00

FACILITY NAME (1) Grand Gulf Nuclear Station - Unit 1										DOCKET NUMBER (2) 0 5 0 0 0 4 1 6 1 OF 0 5									
TITLE (4) Update on Design Deficiency That Could Affect Long Term Post-LOCA Core Spray																			
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 NA					DOCKET NUMBER(S) 0 5 0 0 0 0 0 0 0 0 0 0 0 0 0 0					
0	2	1	5	9	0	9	0	0	0	3	0	1	0	4	1	8	9	0	0
OPERATING MODE (9)		THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR 5: (Check one or more of the following) (11)																	
1		20.602(b)				20.608(e)				60.73(a)(2)(iv)				73.71(b)					
POWER LEVEL (10)		20.608(a)(1)(i)				60.35(e)(1)				X 60.73(a)(2)(v)				73.71(c)					
1		20.608(a)(1)(ii)				60.35(e)(2)				60.73(a)(2)(vi)				OTHER (Specify in Abstract below and in Text, NRC Form 366A)					
0		20.603(a)(1)(iii)				60.73(a)(2)(iii)				60.73(a)(2)(viii)(A)									
		20.602(a)(1)(iv)				60.73(a)(2)(ii)				60.73(a)(2)(ix)(B)									
		20.603(a)(1)(v)				60.73(a)(2)(iii)				60.73(a)(2)(ix)									
LICENSEE CONTACT FOR THIS LER (12)																			
NAME Ronald Byrd/Licensing Engineer										TELEPHONE NUMBER 6 0 1 1 4 3 7 2 1 8 2									
COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT (13)																			
CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NRC		CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NRC									
SUPPLEMENTAL REPORT EXPECTED (14)										EXPECTED SUBMISSION DATE (15)									
YES (If yes, complete EXPECTED SUBMISSION DATE)										X NO									
ABSTRACT (Limit to 1400 words, i.e., approximately fifteen single-space typewritten lines) (16)										MONTH DAY YEAR									

On February 15, 1990, System Energy Resources, Inc. (SERI) identified a potential single failure scenario that could result in the unavailability of both core spray systems for long term post-LOCA core cooling. UFSAR Section 6.3.3.2 states that criterion 5 of 10CFR50.46 is demonstrated generically for General Electric (GE) BWRs in that the core remains covered to at least the jet pump suction elevation and the uncovered region is cooled by core spray. In a postulated LOCA scenario where the single failure is the ESF Electrical Division 1, the Low Pressure Core Spray (LPCS) system and the Standby Service Water (SSW) "A" system would not be available. This would leave the High Pressure Core Spray (HPCS) system (ESF Electrical Division 3) the only available core spray. In the GGNS design, the HPCS service water and the Division 1 service water both return via the SSW "A" spray header. The relatively small return flow of the HPCS service water, without added SSW return flow from Division 1 components, would be insufficient to provide effective spray over the SSW "A" cooling tower fill. After approximately 50 to 60 hours, HPCS service water temperature could exceed the 90 degrees F design temperature, and the availability of the HPCS system may not be assured. GE has performed an evaluation which demonstrated ECCS criteria are met assuming no credit for spray cooling after the initial 50 hours of HPCS operation. SERI considers this evaluation adequate for interim operation. SERI will implement system modifications to attain adequate long term HPCS service water cooling prior to startup from the next refueling outage.

LER90301/SCMPFLR

NRC Form 820A
(9-89)

LICENSEE EVENT REPORT (LER) TEXT CONTINUATION

U.S. NUCLEAR REGULATORY COMMISSION

APPROVED ONS NO. 3185-0104

EXPIRES: 6/31/93

FACILITY NAME (1)

DOCKET NUMBER (2)

LER NUMBER (3)

PAGE (3)

Grand Gulf Nuclear Station

0 8 0 0 0 4 1 6 9 0 - 0 0 3 - 0 1 0 2 OF 0 5

TEXT OF FORM 820A IS REQUIRED, AND ADDITIONAL NRC FORM 820A's (17)

A. Reportable Occurrence:

On February 15, 1990, System Energy Resources, Inc. (SERI) identified a condition that could affect the availability of the High Pressure Core Spray (HPCS) system (EIS code: BG) for long term post-LOCA core cooling. This condition is reported pursuant to 10CFR50.73(a)(2)(v).

B. Initial Condition:

The plant was operating at 100 percent power at the time of discovery.

C. Description of Occurrence:

Criterion 5 of the acceptance criteria for ECCS Systems in 10CFR50.46 states, "After any calculated successfully initial operation of the ECCS, the calculated core thermal temperature shall be maintained at an acceptably low value and decay heat shall be removed for the extended period of time required by the long-lived radioactivity remaining in the core." UFSAR Section 6.3.3.2 states that conformance to this criterion is demonstrated generically for General Electric (GE) BWRs in that the core remains covered to at least the jet pump suction elevation and the uncovered region is cooled by spray cooling.

During a special review conducted as part of the Technical Specification Improvement Program, SERI design engineers identified a situation in which the HPCS system could become unavailable after about 50 to 60 hours of post-LOCA operation. In a postulated LOCA scenario where a failure of ESF Electrical Division 1 occurs, the Division 1 Emergency Core Cooling (ECC) systems and support systems (Low Pressure Core Spray, Low Pressure Coolant Injection "A", and Standby Service Water "A") would not be available for long term core cooling. HPCS, which is powered from ESF Electrical Division 3, would be the only available core spray.

NRC FORM 820A
(9-89)

LER90301/SCMPFLR

LICENSEE EVENT REPORT (LER) TEXT CONTINUATION

FACILITY NAME (1)	DOCKET NUMBER (2)	LER NUMBER (3)			PAGE (3)		
		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER			
Grand Gulf Nuclear Station	0 5 0 0 0 4 1 6	90	0 0 3	0 1	0 3	OF	0 5

TEXT (if more space is required, use additional NRC Form 250A's) (17)

By design, the HPCS service water system (EIIIS code: BS) circulates cooling water from the SSW "A" basin through Division 3 components for heat removal and then discharges back into the SSW "A" basin. In the event that a loss of ESF Electrical Division 1 occurs, the relatively small return flow of the HPCS service water, without the added SSW return flow from Division 1 components, would be insufficient to provide effective spray over the SSW cooling tower fill. After a period of time (approximately 50 to 60 hours) the HPCS Service Water temperature could exceed the 90 degrees F design temperature. Thus, long-term cooling of the HPCS service water and consequently the availability of the HPCS system may not be assured.

SERI conferred with General Electric after identifying this situation. GE performed an initial evaluation on February 15, 1990, which concluded that long term cooling could be ensured after 48 hours without a core spray system based on the availability of the Division 2 Low Pressure Coolant Injection (LPCI) systems.

As GE continued with more specific evaluations to validate the conclusion, SERI developed compensatory plans for the aforementioned scenario. Alternatives included in the compensatory plans were 1) to align the Division 3 Diesel Generator to the Division 1 distribution system, if available, and utilize LPCS for core spray or 2) transfer water between the two SSW basins in an attempt to maintain the Division 1 SSW basin as cool as possible. These plans were developed as an interim and immediate response to the issue until the GE evaluation could be completed. The GE evaluation has been completed and is described in the Safety Assessment that follows in Section F.

To provide additional assurance, SERI will continue with interim compensatory plans until system modifications to resolve the issue can be implemented during the next refueling outage. SERI has reassessed the immediate compensatory plans previously established and determined that the most appropriate response to the scenario would be to utilize temporary pumps with capacities that exceed the HPCS service water flow rate to transfer water between the two SSW basins. The alignment of the LPCS pump to the Division 3 Diesel Generator is not considered appropriate and is not included in the present compensatory plans. The details of accomplishing the SSW basin water transfer have been incorporated into plant temporary procedures which will remain in effect until RF04.

NRC Form 259A
(8-83)

LICENSEE EVENT REPORT (LER) TEXT CONTINUATION

U.S. NUCLEAR REGULATORY COMMISSION

APPROVED ONS NO. 3180-0104

EXPIRES: 8/2/88

FACILITY NAME (1)	DOCKET NUMBER (2)	LER NUMBER (3)			PAGE (3)	
		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER		
Grand Gulf Nuclear Station	0 5 0 0 0 4 1 1 6 90	-	0 0 3	-	0 1	0 4 OF 0 5

TEXT (if more space is required, use additional NRC Form 259A-1/ (17))

D. Apparent Cause:

Conformance to Criterion 5 of 10CFR50.46 was demonstrated generically for GE BWRs in section III.A of NEDO-20566, GE's LOCA Topical Report, submitted August 1974. The GGNS FSAR referenced this Topical Report and stated that the uncovered region of the core could be cooled by core spray and/or steam generated in the covered part of the core. GE identified concerns in 1984 that LPCI injection, inside the shroud, could subcool the water within some of the fuel bundles and thereby result in a reduction of long-term steam cooling capability. The FSAR was then revised to clarify that core spray was the only method utilized at GGNE for long-term cooling of the uncovered region of the core.

During the 1984 reviews of the GE Topical Report and concerns raised by GE over steam cooling, SERI did not recognize that the spray nozzle distribution concern could adversely affect HPCS long-term cooling availability. Thus, core spray with either LPCS or HPCS was deemed an acceptable means of long-term cooling for the uncovered area of the core.

3. Supplemental Corrective Actions:

GE completed its specific evaluation for Grand Gulf Nuclear Station on February 22, 1990. The results of the evaluation confirmed that adequate long-term post-LOCA core cooling is assured with the two Division 2 LPCI systems. The GE evaluation demonstrated compliance with all ECCS criteria using established conservative analytical techniques.

As a final resolution, SERI will implement modifications to attain the effective spray needed for long term HPCS service water cooling. These modifications will be implemented prior to startup from the next refueling outage (RF04). In the interim, the compensatory plans which have been established to transfer water between the two SSW basins will remain in effect.

F. Safety Assessment

Thermal hydraulic evaluations performed by GE demonstrate that operation of the two LPCI pumps (LPCI "B" and LPCI "C") for long-term cooling will result in substantial spill over of water into the upper plenum which then drains through the fuel bundles. This flow rate alone may provide adequate cooling to fuel bundles; however, equal distribution of the flow could not be demonstrated. A detailed heatup evaluation was performed for some high power bundles assuming no

NRC Form 202a (1-83)		U.S. NUCLEAR REGULATORY COMMISSION	
LICENSEE EVENT REPORT (LER) TEXT CONTINUATION		APPROVED OGC NO. 3150-0104 EXPIRES: 8/31/93	
FACILITY NAME (1)	DOCKET NUMBER (2)	LER NUMBER (3)	PAGE (3)
Grand Gulf Nuclear Station	0 8 0 0 0 4 1 6 9 0	YEAR	0 0 3
		SEQUENTIAL NUMBER	0 1
		REVISION NUMBER	0 5
			OF 0 5

NOTE: If more space is required, use additional NRC Form 202a's (17)

cooling water flow from the upper plenum. This evaluation showed that long-term peak cladding temperatures (PCT) and local oxidation values were acceptable under the requirements of 10CFR50.46. Additional conservatism included in the GE evaluation are: a 48 hour basin heatup time was used when a 60 hour heatup time was demonstrated by calculations; no credit was taken for basin cooling capabilities; the time limit was set by a 90 degree F HPCS Service Water temperature rather than the ultimate temperature at which equipment is expected to fail; and no credit was taken for lower than the design APLHGR conditions in the upper third of the core. Long term PCT and local oxidation values of approximately 1580 degrees F and 16 percent were obtained. Therefore, compliance with 10CFR50.46 is maintained and there are no adverse safety consequences that result from the HPCS post-LOCA long-term availability concerns.

In evaluating long-term post-LOCA core cooling without core spray, GE used the 1979 version of ANSI/ANS 5.1 for calculation of decay heat load. The 1979 ANS 5.1 Decay Heat Model differs from the previously used 1971 version by a factor of 1.2 primarily due to differences in the decay heat uncertainty factors. The use of the 1979 standard is conservative and consistent with 10CFR50.46(a)(1)(i) in that sufficient supporting justification exists to show that the analytical technique realistically describes the behavior of the system during a LOCA. 10CFR50.46 was amended in 1988 to allow licensees to use either Appendix K or a realistic evaluation model (such as the 1979 ANS 5.1 Decay Heat Model). In addition, Regulatory Guide 1.157 was issued in May, 1989 to describe alternate methods of implementing 10CFR50.46(a)(1). The Regulatory Guide endorses the 1979 edition of ANS 5.1 as a generically acceptable method of calculating fission product decay heat. SERI considers the application of the 1979 edition for determining the interim operability of the HPCS system and long-term post-LOCA core cooling capabilities to be acceptable and recognizes that the use of the standard as a licensing basis would have to be further justified to the NRC staff.