

10 CFR 50.73

December 12, 2007
RA-07-039

U. S. Nuclear Regulatory Commission
Attn: Document Control Desk
Washington, DC 20555 - 0001

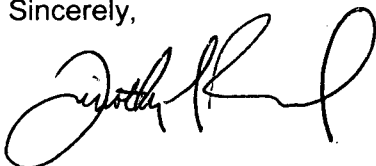
Oyster Creek Generating Station
Facility Operating License No. DPR-16
NRC Docket No. 50-219

Subject: Licensee Event Report 2004-002-01, Change in Methodology Used by General Electric and Global Nuclear Fuel to Demonstrate Compliance with Emergency Core Cooling System Performance Requirements, Revision 1

Enclosed is Licensee Event Report 2004-002-01, Change in Methodology Used by General Electric and Global Nuclear Fuel to Demonstrate Compliance with Emergency Core Cooling System Performance Requirements, Revision 1. The original LER was revised to provide additional information based on a subsequent General Electric evaluation. This event did not affect the health and safety of the public or plant personnel. This event did not result in a safety system functional failure. There are no new regulatory commitments made in this revised LER submittal.

If any further information or assistance is needed, please contact Rich Milos, Regulatory Assurance at 609-971-4973 or Mark Laris, Reactor Engineering at 609-971-2590.

Sincerely,



Timothy S. Rausch, Vice President
Oyster Creek Generating Station

Enclosure: NRC Form 366, LER 2004-002-01

cc: Administrator, USNRC Region I
USNRC Project Manager, Oyster Creek
USNRC Senior Resident Inspector, Oyster Creek
File No. 07051

TE22
NRR

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 hours. Reported lessons learned are incorporated into the licensing process and fed back to industry. Send comments regarding burden estimate to the Records Management Branch (T-6 E6), U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001, or by internet e-mail to bjs1@nrc.gov, and to the Desk Officer, Office of Information and Regulatory Affairs, NEOB-10202 (3150-0104), Office of Management and Budget, Washington, DC 20503. If a means used to impose information collection does not display a currently valid OMB control number, the NRC may not conduct or sponsor, and a person is not required to respond to, the information collection.

1. FACILITY NAME Oyster Creek, Unit 1	2. DOCKET NUMBER 05000219	3. PAGE 1 OF 4
---	-------------------------------------	--------------------------

4. TITLE
Change in the Methodology Used by General Electric and Global Nuclear Fuel to Demonstrate Compliance with Emergency Core Cooling System Performance Requirements

5. EVENT DATE			6. LER NUMBER			7. REPORT DATE			8. OTHER FACILITIES INVOLVED	
MO	DAY	YEAR	YEAR	SEQUENTIAL NUMBER	REV NO	MO	DAY	YEAR	FACILITY NAME	DOCKET NUMBER
05	14	2004	2004	002	01	12	12	2007		05000
									FACILITY NAME	DOCKET NUMBER
										05000

9. OPERATING MODE N	11. THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check all that apply)			
10. POWER LEVEL 100	20.2201(b)	20.2203(a)(3)(ii)	50.73(a)(2)(ii)(B)	50.73(a)(2)(ix)(A)
	20.2201(d)	20.2203(a)(4)	50.73(a)(2)(iii)	50.73(a)(2)(x)
	20.2203(a)(1)	50.36(c)(1)(i)(A)	50.73(a)(2)(iv)(A)	73.71(a)(4)
	20.2203(a)(2)(i)	50.36(c)(1)(ii)(A)	50.73(a)(2)(v)(A)	73.71(a)(5)
	20.2203(a)(2)(ii)	50.36(c)(2)	50.73(a)(2)(v)(B)	X OTHER
	20.2203(a)(2)(iii)	50.46(a)(3)(ii)	50.73(a)(2)(v)(C)	Voluntary Report
	20.2203(a)(2)(iv)	50.73(a)(2)(i)(A)	50.73(a)(2)(v)(D)	
	20.2203(a)(2)(v)	50.73(a)(2)(i)(B)	50.73(a)(2)(vii)	
20.2203(a)(2)(vi)	50.73(a)(2)(i)(C)	50.73(a)(2)(viii)(A)		
20.2203(a)(3)(i)	50.73(a)(2)(ii)(A)	50.73(a)(2)(viii)(B)		

12. LICENSEE CONTACT FOR THIS LER

NAME Mark Laris, Manager - Reactor Engineering	TELEPHONE NUMBER (Include Area Code) (609) 971-2590
---	--

13. COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT

CAUSE	SYSTEM	COMPONENT	MANU-FACTURER	REPORTABLE TO EPIX	CAUSE	SYSTEM	COMPONENT	MANU-FACTURER	REPORTABLE TO EPIX

14. SUPPLEMENTAL REPORT EXPECTED				15. EXPECTED SUBMISSION DATE		
No	(If yes, complete EXPECTED SUBMISSION DATE)			MONTH	DAY	YEAR

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

On May 14, 2004, at approximately 0813 hours with the plant operating in the RUN Mode at 100% power, General Electric (GE) informed Oyster Creek Generating Station (OCGS) of a change in the calculation of Peak Cladding Temperature (PCT) and maximum local cladding oxidation. A new heat source has been postulated during the Loss of Coolant Accident (LOCA) event that involves the recombination of hydrogen and oxygen within the fuel bundles during core heatup. This event was initially reported to the NRC on May 14, 2004 in a voluntary notification as a result of the 10 CFR 50.46(a)(3)(ii) requirement to report this issue in accordance with 10 CFR50.72 and 10 CFR50.73.

The cause of this event is that the potential oxygen source and subsequent heating effects of the hydrogen-oxygen recombination phenomenon were not properly considered during the original development of the LOCA evaluation methodology.

An evaluation performed by GE based on a corrective action from Revision 0 of this LER has determined that there is sufficient conservatism in the Appendix K analysis such that it bounds the nominal Upper Bound PCT and maximum oxidation values (including the hydrogen-oxygen recombination phenomenon) at all exposures. Therefore, the original SAFER/CORCL application methodology for conformance of the Appendix K analysis 10 CFR50.46 limits remains applicable. The hydrogen-oxygen recombination phenomenon does not need to be considered in the Appendix K analysis. This evaluation applies to the normal inerted containment condition.

As an Interim Corrective Action, an 8% Peak Linear Heat Generation Rate (PLHGR) reduction is applied when the containment is allowed to be deinerted above 25% power. This constraint is currently being maintained, however, based on the above GE analysis, this reduction may be reduced or, if further evaluations relative to the basis for deinerted operation allow, may be eliminated.

LICENSEE EVENT REPORT (LER)

1. FACILITY NAME	2. DOCKET	6. LER NUMBER			3. PAGE
Oyster Creek, Unit 1	05000219	YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	2 OF 4
		2004	-- 002 --	01	

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

Description of Event

On May 14, 2004, at approximately 0813 hours with the plant operating in the RUN Mode at 100% power, General Electric (GE) issued 10 CFR 50.46 Notification Letter 2003-05, dated May 13, 2004, informing OCGS of a change in the calculation of Peak Cladding Temperature (PCT) and maximum local cladding oxidation. A new heat source has been postulated during the LOCA event that involves the recombination of hydrogen and oxygen within the fuel bundles during core heatup. The additional heat will raise the temperature of the steam heat sink in the bundle, resulting in a potential increase in the PCT and local oxidation. This recombination is spontaneous at temperatures above approximately 900 degrees F. The hydrogen is generated by the steam-zirconium reaction during fuel cladding heatup. The oxygen enters the vessel either as a dissolved gas in the ECCS water or through the break when the vessel fully depressurizes and draws the containment non-condensable gases back into the vessel. Based on a preliminary bounding analysis with conservative 10 CFR 50, Appendix K inputs and assumptions, the additional heat generated resulted in an estimated 25 degree F increase in PCT and a 1.73% increase in maximum local oxidation. The LOCA evaluation models, that were used by GE and Global Nuclear Fuel (GNF) to demonstrate compliance with 10 CFR 50.46, did not include the effects of this new heat source. Consequently, the previous LOCA analysis was non-conservative relative to PCT and maximum local cladding oxidation, the calculated increase in cladding oxidation exceeded the 17% limit of 10 CFR 50.46(b)(2) by 1.23%. This event was initially reported to the NRC on May 14, 2004 in a voluntary notification as a result of the 10 CFR 50.46(a)(3)(ii) requirement to report this issue in accordance with 10 CFR50.72 and 10 CFR50.73.

The MAPLHGR fuel thermal limits ensure that the ECCS acceptance criteria of 10 CFR 50.46 will not be exceeded during a design-basis LOCA event. To ensure the fuel cladding remains intact during a LOCA, 10 CFR 50.46 requires that the calculated fuel element PCT not exceed 2200 degrees F and the calculated total oxidation limit not exceed 0.17 times the total cladding thickness before oxidation.

As a compensatory measure, GE determined that a 1% reduction in Peak Linear Heat Generation Rate (PLHGR) will produce a 13 degree F reduction in PCT and a 0.68% reduction in the maximum local oxidation. The compensatory 1% PLHGR reduction was determined for the bounding 5 loop operating condition and assuming a Containment oxygen concentration of 4% by volume as required by the Technical Specifications for an inerted Containment.

Based on the preliminary evaluation results, calculations were performed for each fuel lattice MAPLHGR limit curve and, using the above MAPLHGR to local oxidation correlation, appropriate adjustments were made to each curve as required to return the peak local oxidations to 16.5%. These new MAPLHGR limit curves were then updated in the COLR and installed in the on-line core monitor.

Subsequently, a detailed revised evaluation has determined that there is sufficient conservatism in the Appendix K analysis such that it bounds the nominal Upper Bound PCT and maximum oxidation values (including the hydrogen-oxygen recombination phenomenon) at all exposures. Therefore, the original SAFER/CORCL application methodology for conformance of the Appendix K analysis 10 CFR50.46 limits remains applicable. The hydrogen-oxygen recombination phenomenon does not need to be considered in the Appendix K analysis and the previously determined MAPLHGR adjustments were eliminated.

The Technical Specifications include provisions that allow inerting of the Containment to be delayed for up to 24 hours following a plant startup and allow the Containment to be deinerted up to 24 hours prior to a scheduled shutdown. To accommodate these deinerted periods, GE performed an evaluation assuming an air environment (oxygen concentration of 21% by volume), which resulted in an estimated PLHGR reduction of 8% (or PLHGR/MAPLHGR multiplier of 0.92) for compliance with the 10 CFR 50.46 limits. Administrative controls have been implemented to ensure that the 8% PLHGR reduction is applied during plant startups and shutdowns when the containment is deinerted. This constraint is currently being maintained, however, based on the above GE analysis, this reduction may be reduced or, if further evaluations relative to the basis for deinerted operation allow, may be eliminated. Note that no PLHGR reduction is necessary at or below 25% power since hydrogen-oxygen recombination is not a concern at these low power levels.

LICENSEE EVENT REPORT (LER)

1. FACILITY NAME	2. DOCKET	6. LER NUMBER			3. PAGE
Oyster Creek, Unit 1	05000219	YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	3 OF 4
		2004	-- .002	-- 01	

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

Cause of Event

Based on the results of the cause evaluation performed by GE, "The mechanism and possible impact of this postulated phenomenon was not clearly known during development of LOCA methodology." Therefore, the SAFER and CORECOOL analysis models did not account for the potential oxygen source (reverse flow from containment), the heat generated by the recombination of hydrogen and oxygen near the surface of the fuel and the resulting impact on the PCT and local oxidation during a LOCA. Accordingly, the cause of this event is that the heating effects of the hydrogen-oxygen recombination phenomenon were not properly considered during the development of the LOCA evaluation methodology for 10 CFR 50.46 and 10 CFR50, Appendix K rulemaking.

Analysis of Event

The effects of the hydrogen-oxygen recombination phenomenon have been evaluated for non-jet pump plants (i.e., GE BWR/2 plants), which applies to OCGS and Nine Mile Point Unit 1, using SAFER/CORECOOL methodology by incorporating the heat of reaction due to the recombination of oxygen released from ECCS liquid and the oxygen entering the vessel from the containment. The evaluations were performed assuming that the recombination occurs within the fuel channels at the cladding surface and that the oxygen concentration in the (Primary) Containment is 4% by volume corresponding to the Technical Specification limit. The evaluation determined that there is sufficient conservatism in the Appendix K analysis such that it bounds the nominal Upper Bound PCT and maximum oxidation values (including the hydrogen-oxygen recombination phenomenon) at all exposures. Therefore, the original SAFER/CORCL application methodology for conformance of the Appendix K analysis 10 CFR50.46 limits remains applicable. The hydrogen-oxygen recombination phenomenon does not need to be considered in the Appendix K analysis. This evaluation applies to the normal inerted containment condition. The results of this evaluation were reported by General Electric (GE) in 10 CFR 50.46 Notification Letter 2003-05, Rev. 2, dated April 27, 2006.

The event is no longer reportable because the evaluation discussed above concludes that the original Oyster Creek Appendix K analysis 10 CFR50.46 limits remain applicable. Oyster Creek ECCS performance continues to meet the criteria set forth in 10CFR50.46(b).

As previously discussed, this event was initially reported to the NRC on May 14, 2004 in a voluntary report. Included in the reported corrective actions, OCGS stated, "...deinerting of the Primary Containment will be constrained to less than 25% rated power-level until more specific analyses are complete." As discussed in the event description section of this LER, the administrative controls were modified based on further evaluation to apply an 8% PLHGR reduction (or PLHGR/MAPLHGR multiplier of 0.92) during plant startups and shutdowns when above 25% power. These administrative controls are intended to address the deinerted periods (i.e., periods when the Containment oxygen concentration is >4% by volume) allowed by the Technical Specifications when inerting of the Containment is delayed for up to 24 hours following a plant startup and when the Containment is deinerted up to 24 hours prior to a scheduled shutdown.

Corrective Actions

Interim

1. Implemented administrative MAPLHGR limits to be applied when Reactor Power is greater than 25% and the primary containment is not inerted.

Long Term

1. Performed a detailed revised evaluation, which has determined that there is sufficient conservatism in the Appendix K analysis such that it bounds the nominal Upper Bound PCT and maximum oxidation values (including the hydrogen-oxygen recombination phenomenon) at all exposures.

LICENSEE EVENT REPORT (LER)

1. FACILITY NAME	2. DOCKET	6. LER NUMBER			3. PAGE
Oyster Creek, Unit 1	05000219	YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	4 OF 4
		2004	-- 002	-- 01	

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

Additional Information

A. Failed Components:

None

B. Previous similar events:

No previous similar events were identified.

C. Identification of components referred to in this Licensee Event Report:

Components	IEEE 805 System ID	IEEE 803A Function
Reactor Core	AC	RCT
ECCS	BM	P, MO
Reactor Vessel	AD	RPV
Primary Containment	NH	VSL