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Route 9 South
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Forked River, NJ 08731

10 CFR 50.73

RA-11-052

July 1, 2011

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

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

Subject: Licensee Event Report (LER) 2011-001-00, MAPLHGR Correction

Enclosed is LER 2011-001-00, Changes and Errors in the Methodology used by General Electric-Hitachi to Demonstrate Compliance with 10 CFR 50.46 Acceptance Criteria. 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 regulatory commitments made in this LER submittal.

Should you have any questions concerning this letter, please contact Jeff Chrisley, Regulatory Assurance, at (609) 971-4469.

Respectfully,



Michael J. Massaro
Vice President
Oyster Creek Nuclear Generating Station

Enclosure: NRC Form 366, LER 2011-001-00

cc: Administrator, NRC Region 1
NRC Senior Resident Inspector - Oyster Creek Nuclear Generating Station
NRC Senior Project Manager - Oyster Creek Nuclear Generating Station

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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 collection request: 80 hours. Reported lessons learned are incorporated into the licensing process and fed back to industry. Send comments regarding burden estimate to the FOIA/Privacy Section (T-5 F53), U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001, or by internet e-mail to infocollects.resource@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 an 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
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4. TITLE Changes and Errors in the Methodology used by General Electric-Hitachi to Demonstrate Compliance with 10 CFR 50.46 Acceptance Criteria

5. EVENT DATE			6. LER NUMBER			7. REPORT DATE			8. OTHER FACILITIES INVOLVED	
MONTH	DAY	YEAR	YEAR	SEQUENTIAL NUMBER	REV. NO.	MONTH	DAY	YEAR	FACILITY NAME	DOCKET NUMBER
05	04	2011	2011	- 001 -	00	07	01	2011	N/A	N/A
									N/A	N/A

9. OPERATING MODE: N

10. POWER LEVEL: 0

11. THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check all that apply)

<input type="checkbox"/> 20.2201(b)	<input type="checkbox"/> 20.2203(a)(3)(i)	<input type="checkbox"/> 50.73(a)(2)(i)(C)	<input type="checkbox"/> 50.73(a)(2)(vii)
<input type="checkbox"/> 20.2201(d)	<input type="checkbox"/> 20.2203(a)(3)(ii)	<input type="checkbox"/> 50.73(a)(2)(ii)(A)	<input type="checkbox"/> 50.73(a)(2)(viii)(A)
<input type="checkbox"/> 20.2203(a)(1)	<input type="checkbox"/> 20.2203(a)(4)	<input type="checkbox"/> 50.73(a)(2)(ii)(B)	<input type="checkbox"/> 50.73(a)(2)(viii)(B)
<input type="checkbox"/> 20.2203(a)(2)(i)	<input type="checkbox"/> 50.36(c)(1)(i)(A)	<input type="checkbox"/> 50.73(a)(2)(iii)	<input type="checkbox"/> 50.73(a)(2)(ix)(A)
<input type="checkbox"/> 20.2203(a)(2)(ii)	<input type="checkbox"/> 50.36(c)(1)(ii)(A)	<input type="checkbox"/> 50.73(a)(2)(iv)(A)	<input type="checkbox"/> 50.73(a)(2)(x)
<input type="checkbox"/> 20.2203(a)(2)(iii)	<input type="checkbox"/> 50.36(c)(2)	<input type="checkbox"/> 50.73(a)(2)(v)(A)	<input type="checkbox"/> 73.71(a)(4)
<input type="checkbox"/> 20.2203(a)(2)(iv)	<input checked="" type="checkbox"/> 50.46(a)(3)(ii)	<input type="checkbox"/> 50.73(a)(2)(v)(B)	<input type="checkbox"/> 73.71(a)(5)
<input type="checkbox"/> 20.2203(a)(2)(v)	<input type="checkbox"/> 50.73(a)(2)(i)(A)	<input type="checkbox"/> 50.73(a)(2)(v)(C)	<input type="checkbox"/> OTHER
<input type="checkbox"/> 20.2203(a)(2)(vi)	<input type="checkbox"/> 50.73(a)(2)(i)(B)	<input type="checkbox"/> 50.73(a)(2)(v)(D)	Specify in Abstract below or in NRC Form 366A

12. LICENSEE CONTACT FOR THIS LER
FACILITY NAME: Jeffrey Chrisley, Sr. Regulatory Assurance Specialist
TELEPHONE NUMBER (Include Area Code): (609) 971-4469

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

CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO EPIX	CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO EPIX
N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

14. SUPPLEMENTAL REPORT EXPECTED: YES (If yes, complete 15. EXPECTED SUBMISSION DATE) NO

15. EXPECTED SUBMISSION DATE: MONTH: _____ DAY: _____ YEAR: _____

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

On May 3, 2011, General Electric Hitachi (GEH) informed Oyster Creek Nuclear Generating Station (OCNGS) of a change in the calculation of Peak Cladding Temperature (PCT) and the Maximum Local Oxidation (MLO) that was based on corrections to errors in the previous calculation of record that were identified by the fuel vendor. On May 4, 2011, OCNGS determined that the multiple 10 CFR 50.46 Notifications resulted in a cumulative increase in analyzed PCT that exceeded the 10 CFR 50.46 PCT acceptance criterion of 2200°F. Also, the identified effect of the model change resulted in an increase in the calculated MLO above the 10 CFR 50.46 acceptance criteria. Further review of 10 CFR 50.46(a)(3)(ii) determined that an 8-hour notification report to the NRC was required under 10 CFR 50.72(b)(3)(ii)(B). The notification was completed as required.

The combined impact on PCT of the errors/changes described above is 115°F for the GE11 fuel and 145°F for the GNF2 fuel. These increases in PCT result in the licensing basis PCT exceeding the 10 CFR 50.46 acceptance criterion of 2200°F. Therefore, the PCT and MLO impact of these notifications has been offset by the calculation and implementation of revised Maximum Average Planar Linear Heat Generation Rate (MAPLHGR) values such that the maximum PCT and MLO values for both the GE11 and GNF2 fuel designs are returned to their original values of 2150°F and 16.5% respectively as documented in the vendor 10 CFR 50.46 notifications. Accordingly, this reanalysis meets the requirements of 10 CFR 50.46.

As a result of the MAPLHGR limit adjustment the current LOCA analysis of record remains applicable and therefore, the offsite dose is still bounded by our current safety analysis. Therefore this event is not significant with respect to the health and safety of the public.

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Plant Conditions Prior To Event

Event Date: May 04, 2011
Unit 1 Mode: Shutdown

Event Time: 1613 EDT
Power Level: 0%

Description of Event

On May 3, 2011, at approximately 1258 hours, GEH issued 10 CFR 50.46 Notification Letter 2011-01, dated April 29, 2011, informing OCNCS of multiple 10 CFR 50.46 notifications that resulted in a cumulative increase in analyzed PCT that exceeded the 10 CFR 50.46 PCT acceptance criterion of 2200°F.

5/4/2011 - On May 4, 2011 at approximately 1258 hours, based on the information provided by GEH, OCNCS determined that multiple 10 CFR 50.46 Notifications resulted in a cumulative increase in analyzed PCT that exceeded the 10 CFR 50.46 PCT acceptance criterion of 2200°F. Also, the identified effect of the model change resulted in an increase in the calculated MLO above the 10 CFR 50.46 acceptance criteria. Condition Report IR1211900 was generated. Further review of 10 CFR 50.46(a)(3)(ii) determined that an 8-hour notification report to the NRC was required under 10 CFR 50.72(b)(3)(ii)(B). The notification was completed as required.

5/27/2011 - In accordance with 10 CFR 50.46(a)(3)(ii), OCNCS provided a 30-day notification letter to the NRC describing a significant change to and errors in the OCNCS ECCS evaluation model.

Notification 2011-01: Impact of CORCL Bundle Power Correction-Part-length Rods:

An option in the CORCL code distributes power in a manner considering part-length rods in the bundle. It has been found this modeling technique is non-conservative, slightly under predicting the total power generated in the hot bundle. PCT results, as well as resulting fuel cladding oxidation in calculations employing that option would be non conservative. This error impacted the GE11 fuel PCT by 50°F and Oxidation by 3%. This error did not impact the GNF2 fuel PCT or Oxidation.

Notification 2011-02: Impact of database error for heat deposition on the PCT for 10x10 fuel bundles:

A discovery was made regarding input coefficients used to direct the deposition of gamma radiation energy produced by fuel. These input coefficients determine whether the gamma radiation would heat the fuel rod, cladding, channel, or control rod structure materials. The input caused the heat deposited in the fuel channel (post scram) to be over-predicted and the corresponding heat to the fuel to be under-predicted. This effect was seen to be non-conservative. The error only applies to 10x10 fuel. This error impacted the GNF2 fuel PCT by 65°F and Oxidation by 13%. This error did not impact the GE11 fuel PCT or Oxidation.

Notification 2011-03: Impact of updated formulation for gamma heat deposition to channel wall for 9x9 and 10x10 fuel bundles:

In the input formulation for SAFER, input coefficients are used to direct the deposition of gamma and neutron radiation energy produced by fuel fissions and decay heat. These input coefficients determine whether the gamma and neutron radiation energy would heat the fuel rod, cladding, channel, or control rod structural materials. While investigating an input anomaly regarding energy deposition, the formulation of these terms was examined. The contribution of heat from gamma ray absorption by the channel was found to have been minimized. The method had been simplified such that initially all the energy was assumed to be deposited in the fuel rods prior to the Loss of Coolant Accident (LOCA) and then adjusted such that the correct heat deposition was applied after the scram. This modeling was concluded to be potentially non-conservative, as not accounting for this small fraction of total

Description of Event Continued

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power generation outside the fuel rod would tend to suppress the hot bundle power required to meet the initial operating Peak Linear Heat Generation Rate (PLHGR). Further, there is a small effect on the initial conditions for the balance of the core as these are set in relation to the hot bundle condition. This error impacted the GE11 fuel PCT by -20°F and Oxidation by -1% and the GNF2 fuel PCT by 30°F and Oxidation by 9.5%.

Notification 2011-04: Impact of Droplet Flow Distribution Array Alignment to Rod Groupings Error:
Programmed enhancements to the CORCL code allowed an increased number of rod groupings to be defined so as to more accurately represent bundle configuration in the ECCS-LOCA analysis. It was noted that an array in the model, which describes distribution of droplets and film cooling from core spray across the several groupings of rods and the channel was not populated with corresponding additional elements. This had the effect of denying the channel and peripheral groupings of this core spray distribution, preferentially distributing liquid film and droplets with cooling effect to represented rod groupings. This condition is potentially non-conservative for calculating temperatures in the rod groups where the PCT might occur. This error impacted the GE11 fuel PCT by 55°F and Oxidation by 3% and the GNF2 fuel PCT by 40°F and Oxidation by 10%.

Notification 2011-05: Impact of Update in CORCL Code Version:
Notification of a change in the CORCL code is conveyed by this letter. CORCL has been updated to Version CORCL07E3 for the purpose of addressing acknowledged errors which have been discovered in modeling (subject of prior notification letters as described in the attachments), as well as to provide added functionality of the code with respect to power distribution, increasing the number of rod groups that can be modeled, inclusion of PRIME-based properties on fuel, correction on film cooling credited, and to provide other updates by way of code maintenance. The effect of these changes on the licensing basis PCT has been seen to have minor sensitivity according to the fuel bundle analyzed, as would be expected. The Version CORCL07E3 is documented as the default version of CORCL for pending and future analyses using this code going forward. This change impacted the GE11 fuel PCT by 30°F and Oxidation by 11% and the GNF2 fuel PCT by 10°F and Oxidation by 0.5%.

The combined impact on PCT of the errors/changes described above is 115°F for the GE11 fuel and 145°F for the GNF2 fuel. These increases in PCT result in the licensing basis PCT exceeding the 10 CFR 50.46 acceptance criterion of 2200°F. Therefore, the PCT and MLO impact of these notifications has been offset by the calculation and implementation of revised MAPLHGR values such that the maximum PCT and MLO values for both the GE11 and GNF2 fuel designs are returned to their original values of 2150°F and 16.5% respectively as documented in the vendor 10 CFR 50.46 notifications. Accordingly, this reanalysis meets the requirements of 10 CFR 50.46.

Cause of Event

The apparent causes of the subject errors, and the description of the model change, are identified below. The CORCL errors are generally legacy errors created when the CORCL code was being developed and updated for application to 9x9 and 10x10 fuel designs with part length fuel rods.

Notification Letter 2011-01:

An option in the CORCL code distributes power in a manner considering part-length rods in the bundle. It has been found this modeling technique is non-conservative, slightly under predicting the total power generated in the hot bundle.

Cause of Event Continued

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Notification Letter 2011-02:

SAFER input coefficients used to direct the deposition of gamma radiation energy produced by fuel (used to determine whether it would heat the fuel rod, cladding, channel, or control rod structure materials) were determined to be incorrect. The cause of the incorrect input coefficients was a database error for 10x10 fuel bundles. The input caused the heat deposited in the fuel channel (post scram) to be over-predicted and the corresponding heat to the fuel to be under-predicted. This effect was seen to be non-conservative.

Notification Letter 2011-03:

SAFER input coefficients used to direct the deposition of gamma and neutron radiation energy produced by fuel fissions and decay heat were determined to be incorrect. The contribution of heat from gamma ray absorption by the channel was found to have been minimized. The method had been simplified such that initially all the energy was assumed to be deposited in the fuel rods prior to the LOCA and then adjusted such that the correct heat deposition was applied after the scram. This simplified modeling was concluded to be potentially non-conservative.

Notification Letter 2011-04:

The CORCL model was enhanced to allow an increased number of rod groupings to be defined so as to more accurately represent bundle configuration in the ECCS-LOCA analysis. An associated array in the model was not changed/updated consistent with the new rod groupings. This condition is potentially non-conservative for calculating temperatures in the rod groups where the Peak Cladding Temperature (PCT) might occur.

Notification Letter 2011-05:

The CORCL code has been updated for the purpose of addressing acknowledged errors which have been discovered in modeling (subject of prior notification letters as described in the attachments), as well as to provide added functionality of the code with respect to power distribution, increasing the number of rod groups that can be modeled, inclusion of PRIME-based properties on fuel, correction on film cooling credited, and to provide other updates by way of code maintenance.

The apparent causes stated above are based upon the specific identified errors and changes within the ECCS/LOCA model. These apparent causes do not address the human performance factors that may have contributed to how these errors occurred. GEH is performing a root cause analysis to address all the factors that may have contributed to the above errors. If the results of the root cause analysis substantially alter the conclusions and/or corrective actions, a supplement to this LER will be submitted. This root cause analysis is expected to be completed before the end of July, 2011. The details of this root cause will be transmitted in a supplemental report. This information will be documented within OCNCS Condition Report IR 1211900.

Analysis of Event

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As reported by GEH in 10 CFR 50.46 Notification Letters 2011-01, 2011-02, 2011-03, 2011-04 and 2011-05, the effect of each error is listed in Table 1:

Table 1

Notification Letter	Bundle Type	PCT Effect (F)	Oxidation Effect (%)
2011-01	GE11	50	3.0
	GNF2	N/A	N/A
2011-02	GE11	N/A	N/A
	GNF2	65	13
2011-03	GE11	-20	-1.0
	GNF2	30	9.5
2011-04	GE11	55	3.0
	GNF2	40	10
2011-05	GE11	30	11
	GNF2	10	0.5

The combined impact on PCT of the errors/changes described above is 115°F for the GE11 fuel and 145°F for the GNF2 fuel. These increases in PCT result in the licensing basis PCT exceeding the 10 CFR 50.46 acceptance criterion of 2200°F. Therefore, the PCT and MLO impact of these notifications has been offset by the calculation and implementation of revised MAPLHGR values such that the maximum PCT and MLO values for both the GE11 and GNF2 fuel designs are returned to their original values of 2150°F and 16.5% respectively as documented in the vendor 10 CFR 50.46 notifications. Accordingly, this reanalysis meets the requirements of 10 CFR 50.46.

Corrective Actions

An 8% administrative Maximum Average Planar Ratio (MAPRAT) penalty was preemptively applied to all OCNCS fuel to ensure that the operating MAPRAT bounded the non-conservative MAPLHGR meeting the 10 CFR 50.46 acceptance criterion of 2200°F. Revised MAPLHGR limits have been provided by the fuel vendor and have been implemented into the plant monitoring system, followed by removal of the administrative adjustments to the MAPLHGR. An evaluation has been completed to determine the impact of the non-conservatism in the MAPRAT caused by the GEH 10 CFR 50.46 errors on all OCNCS cycles that operated since April 29th, 2008. Actual on-line MAPRAT results for the core monitoring system (POWERPLEX-III and 3D MONICORE, as appropriate) as well as relevant penalties not included in the on-line MAPRAT calculation were evaluated. It was concluded that for the 10 CFR 50.46 errors, the actual operating MAPRAT for all OCNCS cycles that operated since April 29th, 2008 continued to provide margin to the MAPLHGR limits required by Technical Specifications. This historical review of plant operation has shown that OCNCS did not operate in an unanalyzed condition.

Previous Occurrences

There have been no similar Licensee Event Reports submitted at OCNCS in the last three years.