GE Energy

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August 21, 2006
MFN 06-292

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

Subject: **Update to Part 21 Interim Report Notification:**
Failure Analysis of Core Shroud Repair Tie Rod Upper Support Crack

Reference:

1. NRC Event Notification Report 42372 (Retracted), Degraded Condition of Shroud Tie Rods, NRC Event Notification Report for April 24, 2006
2. GE Part 21 60-Day Interim Report Notification: Core Shroud Repair Tie Rod Upper Support Cracking, MFN 06-133, May 12, 2006

GE Energy, Nuclear (GE) has completed the failure evaluation of the cracking discovered in the Hatch Unit 1 core shroud repair tie rod upper supports as committed in Reference 2. A preliminary cause evaluation had concluded that the apparent cause of the cracking is Intergranular Stress Corrosion Cracking (IGSCC). A material sample was shipped to the GE Vallecitos Nuclear Center for examination to confirm the apparent cause. GE committed to report the results of the examination by August 21, 2006.

The fracture was examined by metallographic and scanning electron microscope (SEM) techniques including an analysis of the fracture surface. The examinations revealed the cracking mechanism to be IGSCC. Scanning electron microscopy (SEM) showed the fracture surface had a "rock candy" like appearance, consistent with an IGSCC mechanism. Images of the cross-section of the fracture surface further verified the IGSCC mechanism by showing the path of the crack following the grain boundaries. No hardness or microstructural anomalies were observed.

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GE continues to work on the other action items that were committed in Reference 2. If you have any questions, on this information, please call me at (910) 675-6608.

Sincerely,

Jason. S. Post
Safety Evaluation Program Manager

cc: S. B. Alexander (NRC-NRR/DISP/PSIM) Mail Stop 6 F2
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PRC File

General Information or Other (PAR) Event # 42573

Rep Org: GENERAL ELECTRIC COMPANY		**Notification Date / Time:** 05/12/2006 22:36 (EDT)	
Supplier: GENERAL ELECTRIC COMPANY		**Event Date / Time:** 04/24/2006 (EDT)	
		Last Modification: 08/21/2006	
Region: 1		**Docket #:**	
City: WILMINGTON		**Agreement State:** Yes	
County:		**License #:**	
State: NC			
NRC Notified by: JASON POST		**Notifications:** ANTHONY DIMITRIADIS	R1
HQ Ops Officer: MIKE RIPLEY		JAMES MOORMAN	R2
Emergency Class: NON EMERGENCY		RICHARD SKOKOWSKI	R3
10 CFR Section:		OMID TABATABAI-EMAIL	NRR
21.21 UNSPECIFIED PARAGRAPH		JACK FOSTER (EMAIL)	NRR

PART 21 NOTIFICATION - BWR CORE SHROUD TIE ROD UPPER SUPPORT CRACKING

"Summary:
GE Energy, Nuclear (GE) has provided core shroud repairs using tie rods to the US BWR plants identified in Attachment 1 [of the Part 21 notification]. Recently it was discovered during an in-vessel visual inspection (IVVI) that tie rod upper supports at Hatch Unit 1 experienced cracking. The apparent root cause is Intergranular Stress Corrosion Cracking (IGSCC) in the Alloy X-750 tie rod upper support material. Alloy X-750 material is susceptible to IGSCC if subjected to sustained, large peak stress conditions. GE opened an internal evaluation to determine if the potential IGSCC in the X-750 tie rod structural components of other BWR shroud repairs designed by GE could be a reportable condition under 10CFR21.

"GE used the criterion provided in the BWR Vessels & Internals Project (BWRVIP-84) for the IGSCC susceptibility assessment of the X-750 components in the tie rod vertical load path. GE has concluded that it is not a reportable condition for the plants that were found to be within or not significantly exceed the BWRVIP-84 criterion. These US plants are identified as 'NR' in Attachment 2 [of the Part 21 notification]. GE determined that two US plants exceed the BWRVIP-84 criterion for the upper supports (in addition to the Hatch Unit 1 as-found condition). GE has not completed the evaluation for these plants to assess if a substantial safety hazard (SSH) exists. These plants have been provided a 60-Day Interim Report Notification under §21.21(a)(2) and are identified as '60-Day' in Attachment 2 [of the Part 21 notification].

"Safety Basis:
Cracking in the tie rod components made of X-750 may render the tie rod ineffective in maintaining core shroud configuration integrity during postulated accident conditions. Loss of core shroud integrity could impact the ability to maintain adequate core cooling for postulated design basis accident conditions. This condition would be reportable under 10 CFR 21 as a substantial safety hazard.

General Information or Other (PAR) Event # 42573

"Corrective Action:
The corrective action which has been, is being, or will be taken; the name of the individual or organization responsible for the action; and the length of time that has been or will be taken to complete the action (note, these are actions specifically associated with the identified deviation or failure to comply):
1. A preliminary cause evaluation has been performed. The apparent cause of the cracking is Intergranular Stress Corrosion Cracking (IGSCC). A material sample is being shipped to the GE Vallecitos Nuclear Center for examination to confirm the apparent cause. GE will report the results of the examination by August 21, 2006.
2. The issue has been communicated to the industry through the BWR Owners' Group and the Electric Power Research Institute (EPRI)/BWR Vessel and Internals Project (BWRVIP). The NRC was informed in a NRC management meeting with EPRI and the BWRVIP Executive Oversight Committee at the NRC offices, Rockville, on March 15, 2006.
3. GE has completed an evaluation of the susceptibility to IGSCC using the BWRVIP-84 criterion. Determination of whether any possible cracking could lead to a substantial safety hazard (i.e., loss of core shroud configuration integrity during a design basis accident condition) depends upon many factors, including the actual extent of cracking in the repair components. Until inspections are completed, the actual extent of cracking is not known. GE is developing a model to predict the postulated extent of tie rod upper support cracking for tie rods with upper supports made of Alloy X-750. For upper supports that exceed the BWRVIP-84 criteria significantly, the model will be used to postulate the extent of cracking. This prediction will be used to determine if a substantial safety hazard could exist. GE will report the results of the evaluation by October 9, 2006.
4. The original design basis stress reports will be reviewed to assess the available margin in the primary membrane + bending stress intensities of the upper supports with respect to ASME code allowable values. Where reasonable margin exists in the original design basis code evaluation (an existing margin of approximately 25 % will be considered as reasonable margin), the existing margin is deemed adequate to offset any engineering assumptions or judgments used in the original analysis. Where the original margin is less than 25%, further review will be performed (including finite element analysis, if necessary) to confirm that the upper support remains qualified. This review will be completed by October 9, 2006."

Affected US Plants per Attachments 1 and 2 of the Part 21 notification: Clinton, Nine Mile Point 1, Pilgrim, Dresden 2 & 3, Quad Cities 1 & 2, Hatch 1 & 2.

***** UPDATE ON 8/21/06 AT 1614 ET VIA E-MAIL FROM JASON POST TO MACKINNON ****

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R2DO (Mark Lesser) notified. E-mailed to Omid Tabastabai & Jack Foster.

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