ENCLOSURE 2

MFN 08-355

Marathon Control Rod Assembly Surveillance Program Update

Non-Proprietary Version

IMPORTANT NOTICE

This is a non-proprietary version of Enclosure 1 to MFN 08-355, which has the proprietary information removed. Portions of the document that have been removed are indicated by white space with an open and closed bracket as shown here [[ ]].

Subject: Updated Marathon Control Rod Surveillance Program Status

References:

6. NEDE-31758P-A, "GE Marathon Control Rod Assembly", October 1991.
7. NEDE-33243P Rev. 1, "Licensing Topical Report: ESBWR Marathon Control Rod – Nuclear Design Report", November 2007.
8. NEDE-33244P Rev. 1, "Licensing Topical Report: ESBWR Marathon Control Rod – Mechanical Design Report", November 2007.
9. NEDE-33284P, Rev. 1 "Licensing Topical Report: Marathon-5S Control Rod Assembly", November 2007.
10. MFN 07-138, "Marathon Control Rod Surveillance Program Status", February 2007.

Introduction

The approved Safety Evaluation Report (SER) for the Marathon control rod (Ref. 1) contains a surveillance program requiring GEH to perform visual inspections of installed control rods. A summary of the status of this surveillance program was forwarded to NRC via MFN 07-138 (Ref. 5). This report updates the Reference 5 letter, including:

- New inspection results
- A listing of planned, future inspections
- A discussion of a design change to the original D/S lattice Marathon design.
- A summary of root cause analyses and 10CFR Part 21 analyses relating to the observance of crack indications.

GEH will continue to provide updates of the Marathon control rod surveillance program on an annual basis, at minimum.

Inspection Results

Table 1 contains a summary of [[ ]] visual inspections of Marathon control rods that GEH has performed or reviewed to date. Since MFN 07-138 (Ref. 5), seven additional inspections of high depletion, D/S lattice Marathon control rods have been performed, with no crack indications noted. New inspection results since MFN 07-138 are from plants J and L, and are noted in bold in Table 1. Further, the depletion values for the Plant K inspection have been reduced, based on revised data provided by the plant.

Table 1: Marathon Control Rod Inspection Data

Plant	Square Tube Type*	Inspection Date	Number of CRBs Inspected	Approx. Fluence Range (snvts)	Peak Local Depletion (%)	Results
Plant A (domestic BWR/4)	D/S	[[				
Plant B (international BWR)	C					
Plant C (international BWR)	C					
Plant D (international BWR)	D/S					
Plant E (domestic BWR/2)	D/S					
Plant F (domestic BWR/4)	C					
Plant G (international BWR/4)	C					
Plant J (international BWR)	D/S					
Plant K (international BWR)	D/S					
Plant L (domestic BWR/6)	D/S					]]

* "D/S" square tubes are used for GEH D lattice (BWR/2-4) and S lattice (BWR/6) applications. "C" square tubes are used for GEH C lattice (BWR/4,5) applications.

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From paragraph C on page xxiv of the Marathon control rod SER (Ref. 1), GEH is responsible for the following action if a material integrity problem should arise:

"(1) arrangements will be made to inspect additional Marathon control rods to the extent necessary to identify the root cause"

Accordingly, GEH is taking the following actions.

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- GEH is pursuing additional inspections of high depletion Marathon control rods. A listing of planned control rod inspections is contained later in this letter.

In paragraph C on page xxiv of the Marathon control rod SER (Ref. 1), GEH is also responsible for the following action if a material integrity problem should arise:

"(2) if appropriate, GE shall recommend a revised lifetime limit to the NRC based on the inspections and other applicable information available."

The available inspection data does not suggest a generic design or material issue with the Marathon control rod, which would require a reduced lifetime recommendation. As noted, GEH is **[[**
]] and is actively pursuing additional visual inspections of high-depletion Marathon control rods.

Planned Inspections

In accordance with the Marathon SER (Ref. 1), GEH is continuing to pursue visual inspections of high depletion Marathon control rods. Table 2 shows a listing of planned inspections.

Table 2: Planned Marathon Control Rod Inspections

Plant	Square Tube Type*	Planned Inspection Date	Number of CRBs to be Inspected	Approx. Fluence Range (snvts)	Peak Local Depletion (%)
Plant M (domestic BWR/4)	D/S	Fall 2008/Spring 2009	[[		
Plant N (international BWR)	D/S	Summer 2008			
Plant F (domestic BWR/4)	C	Spring 2010			
Plant O (International BWR/6)	D/S	2010			]]

* "D/S" square tubes are used for GE D lattice (BWR/2-4) and S lattice (BWR/6) applications. "C" square tubes are used for GE C lattice (BWR/4,5) applications.

Notes for Table 2

- Plant M will discharge two Marathon control rods for inspection during their Fall 2008 refueling outage. Plant M has agreed to allow GEH to visually inspect the control rods after the outage, either in late 2008 or early 2009.
- Plant F has agreed to inspect 2 Marathon control rods during or after their Spring 2010 refueling outage.
- Plant N is inspecting one Marathon control rod during their 2008 outage, and has agreed to share the inspection data with GEH.
- Plant O is discharging four Marathon control rods in 2010. GEH has requested an opportunity to perform visual inspections.

Marathon Absorber Tube Design Change

Figure 1 shows a design change that has been made to the geometry of the Marathon 'square' absorber tube. **[[**

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Figure 1: D/S Lattice Square Absorber Tube Geometry Change

Finite element analysis is used to demonstrate that the new geometry meets all design requirements for maximum outer diameter strain due to capsule swelling, internal pressure, and maximum stress from loads imposed by channel bow. The new geometry is demonstrated to meet stuck rod requirements, and all control rod welds affected by the new absorber tube geometry are demonstrated to withstand loads from scram, seismic events and channel bow.

The new D/S lattice square tube geometry began implementation in 2006. All 2008 and future deliveries will use the new square absorber tube geometry. No changes have been made to the C lattice square tube design.

Root Cause Analyses

Root cause analyses were performed following the discovery of crack indications at Plant A, and at Plant E. Relevant observations of these root cause analyses are summarized as follows.

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The conclusion of the root causes analyses is that the available data does not suggest a generic design flaw.

Further root cause analysis is in progress, in terms of additional inspections, and the completion of a destructive examination of one of the Plant A control rods, as detailed above.

10CFR Part 21 Evaluations

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New Designs

GEH is currently pursuing approval of two new Marathon control rod designs: one is the original equipment for ESBWR (Ref. 2,3), the other is a new replacement control rod design for BWR/2-6, called the Marathon-5S (Ref. 4). Licensing topical reports for these two new designs have been submitted for review with the NRC (Ref. 2,3,4).

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Table 3: Marathon Capsule to Absorber Tube Gap Comparison

Marathon Design	Licensing Topical Report(s)	Local Depletion at Capsule Contact with Absorber Tube Inside Diameter (Nominal)
Marathon – D/S Lattice	NEDE-31758P-A (Ref. 1)	[[
Marathon – C Lattice	NEDE-31758P-A (Ref. 1)	
ESBWR Marathon	NEDE-33243P Rev. 1 (Ref. 2) NEDE-33244P Rev. 1 (Ref. 3)	
Marathon-5S – D/S Lattice	NEDE-33284P Rev. 1 (Ref. 4)	
Marathon-5S – C Lattice	NEDE-33284P Rev. 1 (Ref. 4)	]]

*Nominal depletion at contact based on original square absorber tube geometry. Nominal depletion at contact for the modified D/S lattice square tube geometry is [[ ]].

The ESBWR Marathon and Marathon-5S control rods use the same capsule cross-sectional geometry and outer absorber tube inside diameter. As discussed in Section 3.6 of Reference 3 and Section 3.6 of Reference 4, both control rods are designed such that [[

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