Part 21 (PAR) Event # 48380

Rep Org: MITSUBISHI NUCLEAR ENERGY SYSTEMS		**Notification Date / Time:** 10/05/2012 07:17 (EDT)	
Supplier: MITSUBISHI HEAVY INDUSTRIES, LTD.		**Event Date / Time:** 02/21/2012 (EDT)	
		Last Modification: 10/05/2012	
Region: 1	**Docket #:**		
City: ARLINGTON	**Agreement State:**	Yes	
County:	**License #:**		
State: VA			
NRC Notified by: JOSEPH TAPIA	**Notifications:**	DALE POWERS	R4DO
HQ Ops Officer: DONG HWA PARK		PART 21 GROUP	EMAIL
Emergency Class: NON EMERGENCY			
10 CFR Section:			
21.21(d)(3)(i) DEFECTS AND NONCOMPLIANCE			

STEAM GENERATOR TUBE TO TUBE WEAR

The following information was received via email:

"Mitsubishi Heavy Industries, LTD (MHI) has identified steam generator tube wear for San Onofre Nuclear Generating Station.

"Steam Generator tube wear has been identified in areas of the U-bend between anti-vibration bars, where the tube is not supported by the anti-vibration bars. This tube wear occurred due to the contact of a tube with an adjacent tube, and resulted in a leak from a Unit 3 tube. The cause of the tube leak was determined to be the in-plane direction fluid elastic instability under high localized thermal-hydraulic conditions (steam quality (void fraction), flow velocity and hydro-dynamic pressure), and insufficient contact force of the tube to anti-vibration bar. This type tube wear could have an adverse effect on the structural integrity of the tubes, which are part of the pressure boundary.

"The plugging of the tubes that have the possibility of the fluid elastic instability and thermal power output reductions were identified as potential corrective actions. SCE [Southern California Edison] will run Unit 2 at 70% power for a short duration as a corrective action. In addition, SCE and MHI will continue a detailed analysis and investigation to this problem. Additional corrective actions may be required as the analysis and investigation continue. MHI has recommended to the purchaser that it perform eddy current inspection of tubes after Unit 2 operation resumes."

****

IE19
NRR

MITSUBISHI HEAVY INDUSTRIES, LTD.
16-5, KONAN 2-CHOME, MINATO-KU

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

Ref: UET-20120218 Rev.0
Date: October 5, 2012

Subject: Notification of the written report pursuant to 10 CFR 21.21(d)(4)
(Title: Steam Generator tube to tube wear)

1. The written report

Mitsubishi Heavy Industries, LTD (MHI) has identified steam generator tube wear for San Onofre Nuclear Generating Station. MHI had generated the following written report for tube wear and submits it to U.S. Nuclear Regulatory Commission (NRC).

The written report (Related to MHI Doc. No.U21-019-IR Revision 1)
Title: Steam Generator tube to tube wear
Document No.: U21-019-WR Revision 0

Yours very truly,

Fumiki Kono

for Ei Kadokami
Senior Vice President
Deputy Head of Nuclear Energy Systems
Head of Kobe shipyard & Machinery Works
Mitsubishi Heavy Industries, Ltd.

Part 21 Written Report of Tube to Tube Wear

(i) Name and address of the individual or individuals informing the Commission.

Ei Kadokami
Mitsubishi Heavy Industries, Ltd.
Senior Vice President
Deputy Head of Nuclear Energy Systems
Head of Kobe Shipyard & Machinery Works

(ii) Identification of the facility, the activity, or the basic component supplied for such facility or such activity within the United States which fails to comply or contains a defect.

Facility : San Onofre Nuclear Generating Station
Basic Component : Unit 2 Steam Generator (B-SGP-104) and Unit-3 Steam Generators (B-SGP-112, B-SGP-113)

(iii) Identification of the firm constructing the facility or supplying the basic component which fails to comply or contains a defect.

Mitsubishi Heavy Industries, Ltd.

(iv) Nature of the defect or failure to comply and the safety hazard which is created or could be created by such defect or failure to comply.

Steam Generator tube wear has been identified in areas of the U-bend between anti-vibration bars, where the tube is not supported by the anti-vibration bars. This tube wear occurred due to the contact of a tube with an adjacent tube, and resulted in a leak from a Unit 3 tube. The cause of the tube leak was determined to be the in-plane direction fluid elastic instability under high localized thermal-hydraulic conditions (steam quality (void fraction), flow velocity and hydro-dynamic pressure), and insufficient contact force of the tube to anti-vibration bar. This type tube wear could have an adverse effect on the structural integrity of the tubes, which are part of the pressure boundary.

(v) The date on which the information of such defect or failure to comply was obtained.

February 21, 2012

(vi) In the case of a basic component which contains a defect or fails to comply, the number and location of these components in use at, supplied for, being supplied for, or may be supplied for, manufactured, or being manufactured for one or more facilities or activities subject to the regulations in this part.

The basic components in use which contain a defect are provided below.

MHI's Serial number	Location
B-SGP-104	San Onofre Nuclear Generating Station Unit-2
B-SGP-107	
B-SGP-112	San Onofre Nuclear Generating Station Unit-3
B-SGP-113	

See attachment 1 for other units' potential defect evaluations.

(vii) 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.

The plugging of the tubes that have the possibility of the fluid elastic instability and thermal power output reductions were identified as potential corrective actions. SCE will run Unit 2 at 70% power for a short duration as a corrective action. In addition, SCE and MHI will continue a detailed analysis and investigation to this problem. Additional corrective actions may be required as the analysis and investigation continue.

(viii) Any advice related to the defect or failure to comply about the facility, activity, or basic component that has been, is being, or will be given to purchasers or licensees.

MHI has recommended to the purchaser that it perform eddy current inspection of tubes after Unit 2 operation resumes.

(ix) In the case of an early site permit, the entities to whom an early site permit was transferred.

Not applicable.

Attachment-1 : Information of extent of condition

(1) Steam generators in use

MHI has provided steam generators which tubes similar to those at San Onofre (see table below).

MHI's Serial number	Location
B-SGP-97	Fort Calhoun Nuclear Generating Station
B-SGP-98	

In the replacement steam generators at San Onofre, some tubes vibrate in the in-plane direction due to high localized thermal-hydraulic conditions (steam quality (void fraction), flow velocity and hydro-dynamic pressure), and insufficient contact force of the tube to anti-vibration bar. On the other hand, the replacement steam generators of Fort Calhoun do not have the high fluid velocity and high void fraction like those at San Onofre. In addition, tube-to-tube wear has not been identified in Fort Calhoun after 2 cycle operations. Therefore, the replacement steam generators of Fort Calhoun are judged not to be affected by tube-to-tube wear.

(2) US-APWR Design Certification Document (DCD) Applicability

Since the current DCD does not include detailed information about the design of anti-vibration bars to prevent tube vibration, there is no effect on the technical information contained in US-APWR DCD.

At the detail design stage, MHI may introduce a countermeasure against the tube-to-tube wear in the US-APWR design if necessary.