

Part 21 (PAR)

Event # 48379

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County:	License #:		
State: VA			
NRC Notified by: JOSEPH TAPIA		Notifications: DALE POWERS	
HQ Ops Officer: DONG HWA PARK		PART 21 GROUP	
Emergency Class: NON EMERGENCY		R4DO	
10 CFR Section:		EMAIL	
21.21(d)(3)(i) DEFECTS AND NONCOMPLIANCE			

PART 21 - STEAM GENERATOR TUBE WEAR ADJACENT TO RETAINER BARS

The following information was received via email:

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

"The Steam Generator tube wear adjacent to the retainer bars was identified as creating a potential safety hazard. The maximum wear depth is 90% of the tube thickness. The cause of the tube wear has been determined to be the retainer bars' random flow-induced vibration caused by the secondary fluid exiting the tube bundle. Since the retainer bar has a low natural frequency, the bar vibrates with a large amplitude. 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 are adjacent to the retainer bars was performed. MHI has recommended to the purchaser to remove the retainer bars that would have the possibility of vibration with large amplitude or to perform the plugging and stabilizing for the associated tubes."

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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-20120217 Rev.0
Date: October 5, 2012

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

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. U21-018-IR Revision 1)

Title: Steam Generator tube wear adjacent to retainer bars

Document No.: U21-018-WR Revision 0

Yours very truly,

for *Fumiko Kono*
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 Wear adjacent to Retainer Bars

(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 Generators (B-SGP-104, B-SGP-107) 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.

The Steam Generator tube wear adjacent to the retainer bars was identified as creating a potential safety hazard. The maximum wear depth is 90% of the tube thickness. The cause of the tube wear has been determined to be the retainer bars' random flow-induced vibration caused by the secondary fluid exiting the tube bundle. Since the retainer bar has a low natural frequency, the bar vibrates with a large amplitude. 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 13, 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 are adjacent to the retainer bars was performed.

(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 to remove the retainer bars that would have the possibility of vibration with large amplitude or to perform the plugging and stabilizing for the associated tubes.

(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 in use which have similar retainer bars (see below table).

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

In the replacement steam generators for San Onofre, the retainer bars that have the low natural frequency vibrate with large amplitude. On the other hand, the retainer bars of the replacement steam generators at Fort Calhoun have a higher natural frequency, it is concluded that the retainer bars at Fort Calhoun will not have large amplitude vibrations. Therefore, the replacement steam generators of Fort Calhoun are not affected by wear in tubes adjacent to retainer bars.

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

Since the current DCD does not include the design of the retainer bars, there is no effect on the technical information contained in US-APWR DCD.

At the detail design stage, MHI may incorporate a countermeasure against the retainer bar vibration in the US-APWR design if necessary.