**MITSUBISHI HEAVY INDUSTRIES, LTD.**
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TOKYO, JAPAN

October 17, 2013

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

Docket No. 99901030
MHI Ref: UEQ-20130773

**Subject: Reply to A Notice of Nonconformance (99901030/2013-201-01)**

Reference: NUCLEAR REGULATORY COMMISSION INSPECTION REPORT NO. 99901030/2013-201 and NOTICE OF NONCONFORMANCE, dated September 20, 2013

Enclosed is Mitsubishi Heavy Industries, Ltd.'s (Mitsubishi) reply to the Notice of Nonconformance issued to Mitsubishi on September 20, 2013. Corrective actions associated with the Notice of Nonconformance have been accomplished and no commitments are contained in this letter or the enclosed reply.

Should you have any questions regarding this reply, please contact the undersigned.

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Enclosures:

1. Reply to Notice of Nonconformance

CC: E.H. Roach, Chief,
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Division of Construction Inspection and Operational Programs,
Office of New Reactors



IE09
NRO

## REPLY TO NOTICE OF NONCONFORMANCE

### 1. Nonconformance

Nonconformance 99901030/2013-201-01 states as follows:

Criterion III of Appendix B to Title 10 of the *Code of Federal Regulations* (10 CFR) Part 50, states, in part, that, "measures shall be established to assure that applicable regulatory requirements and the design basis...are correctly translated into specifications, drawings, procedures, and instructions. It also states, in part, that, "measures shall be established for the identification and control of design interfaces and for coordination among participating design organizations. These measures shall include the establishment of procedures among participating design organizations for the review, approval, release, distribution, and revision of documents involving design interfaces."

Contrary to the above, during the design of replacement steam generators for Southern California Edison, from approximately 2004 to 2008, MHI did not establish measures for control of design interfaces between the MHI Steam Generator Design Section and the MHI Takasago Research and Development Center, related to the thermal hydraulic and vibration analyses used for aspects of the San Onofre Nuclear Generating Station, Unit 2 and Unit 3 replacement steam generator design. Specifically, the output of the FIT-III thermal-hydraulic code and input to the flow induced vibration analysis software (FIVATS) vibration code were not verified to be in accordance with MHI design requirements. MHI failed to convert the wide gap flow velocity output results from the FIT-III analysis to narrow gap flow velocities needed as input for the FIVATS vibration analysis code.

### 2. Reason for the noncompliance, or, if contested, the basis for disputing the noncompliance

MHI does not contest the asserted noncompliance. The noncompliance was self-reported. Upon discovery of the noncompliance, MHI issued a Corrective Action Request (CAR: CAR-12-028) and identified the reasons for the noncompliance as "inadequate design interface control between the MHI Steam Generator Designing Section (MHI SGDS) and the MHI Takasago Research & Development Center (MHI Takasago R&D) related to the thermal-hydraulic and vibration analyses used for aspects of the San Onofre Nuclear Generating Station, Unit 2 and Unit 3 replacement steam generator (SONGS-2/3 RSG) design." The details of the noncompliance were as follows:

(1) FIT-III, the thermal and hydraulic analysis code developed by MHI Takasago R&D, provides a gap velocity output based on the wide gap, which is different from the gap velocity defined in the ASME code. Additional processing of the FIT-III gap velocity output is necessary in order to obtain a gap velocity based on the narrow gap defined in the ASME code. However, that necessary step was not documented in the program manual.

(2) The program manual of FIT-III did not specify the definition of the gap velocity (whether it was based on the wide or narrow gap).

(3) MHI SGDS did not specify to MHI Takasago R&D the requirement to transform the FIT-III output to a gap velocity based on the narrow gap defined in the ASME code.

(4) MHI SGDS failed to identify the absence of a gap velocity definition at the acceptance inspection when they received the FIT-III user's documentation.

## 3. Corrective steps that have been taken and the result achieved

The following corrective actions have all been completed:

(1) MHI re-performed the fluid elastic vibration analysis for SONGS-2/3 RSG by using the gap velocity based on the narrow gap defined in the ASME code. The stability ratio against the onset of out-of-plane FEI was confirmed to be acceptable. Therefore, the SONGS-2/3 RSG design remained acceptable under the standards specified in the ASME code despite the failure to convert the wide gap flow velocity output results from the FIT-III analysis to the narrow gap flow velocities needed as input for the FIVATS vibration analysis code.

## 4. Corrective steps taken to avoid further noncompliance

The following preventive actions were taken to avoid future non-compliances:

(1) The FIT-III program manual was revised to add the following descriptions:
   (i) The appropriate gap velocity definition that should be used to generate the output of the FIT-Ⅲ program.
   (ii) For the triangular pitch arrangement, a statement that the fluid elastic vibration analysis shall be performed after the gap velocity transformation from wide gap to narrow gap has been made.
   (iii) The MHI SGDS engineers have been indoctrinated on the use of the revised program manual.

(2) In the future construction of US export RSGs, MHI intends to use the ATHOS program that provides the gap velocity defined by ASME code directly.

(3) MHI SGDS engineers were re-indoctrinated on the necessity to specify the analysis requirements clearly in the software procurement specification.

(4) A section standard was revised to include the following requirements:
   (i) When MHI SGDS procures new software, the parameters used in the analyses using the software shall be specified.
   (ii) At the acceptance test of the software, the exact definition of all relevant parameters shall be checked.

   Also MHI SGDS engineers were indoctrinated with the revised standard.

**5. Date when the corrective action will be completed**

All the corrective actions mentioned above have been accomplished.