

DESIGNATED AS ORIGINAL  
BY PM 



April 4, 2013

Mr. Sher Bahadur  
Chairman, Petition Review Board  
U.S. Nuclear Regulatory Commission  
Sixteenth Floor  
One White Flint North  
11555 Rockville Pike  
Rockville, MD 20852

**Re: Submittal of MHI Root Cause Analysis Report and Related Documents into the Record for the § 2.206 Petition Review Process**

Dear Chairman Bahadur:

On February 12, 2013, Friends of the Earth (FoE) submitted a request in this proceeding for the disclosure of the October 2012 Mitsubishi Heavy Industries (MHI) Root Cause Analysis (“RCA”) report<sup>1</sup> and other related documents following a letter from Senator Barbara Boxer and Congressman Edward Markey to Nuclear Regulatory Commission (NRC) Chairwoman Allison Macfarlane requesting public release of the RCA report.

The NRC subsequently released a redacted version of the RCA report on March 8, 2013. A second document, the March 2013 MHI Supplemental Technical Evaluation Report<sup>2</sup> (“STER”), was released by the NRC on March 8, 2013 with the RCA.

Because the contents of the RCA and STER are directly relevant to the matters raised by FoE’s June 18, 2012 Petition, which are now under review by this Board, FoE submits the RCA and STER, attached to this letter, into the record. FoE also submits into the record the enclosed

---

<sup>1</sup> MHI, San Onofre Nuclear Generating Station, Unit 2 & 3, Replacement Steam Generators, *Root Cause Analysis Report for tube wear identified in the Unit 2 and Unit 3 Steam Generators of San Onofre Nuclear Generating Station*, UES-20120254Rev.0 Non-Proprietary [hereinafter “RCA”].

<sup>2</sup> MHI, San Onofre Nuclear Generating Station, Unit 2 & 3, Replacement Steam Generators, *Supplemental Technical Evaluation Report*, L5-04GA588(0) Non-Proprietary [hereinafter “STER”].

technical review of the RCA and STER conducted by Large & Associates, nuclear Consulting Engineers retained by FoE, entitled *Review of Tube Wear Identified in the San Onofre Replacement Steam Generators - Mitsubishi Reports UES-20120254 Rev.0 (3/64) and L5-04GA588(0) together with Other Relevant Information.*

### **Key Findings from the RCA and STER**

As the RCA and STER demonstrate, Southern California Edison (SCE) controlled the specification and design of the replacement steam generators (RSGs) for the San Onofre Nuclear Generating Station from the early stages of the procurement and design process. SCE issued certified design specifications in September 2004 detailing, among other things, the design strategy for the anti-vibration bar (AVB) support systems,<sup>3</sup> which subsequently played a large role in the tube degradation in the RSGs.

In addition, the RCA shows that, in mid-2005, SCE and MHI formed a special AVB Design Team responsible for investigating the high local void fraction predicted by MHI's computer analysis of the RSG design.<sup>4</sup> (Void fraction is a direct contributory factor of fluid elastic instability (FEI)—the mechanical cause of the premature wear of the RSG tubes. Knowledge of a high void fraction, therefore, forewarns of the potential for FEI.)

SCE, through these two roles, was acutely aware of and involved in the thermal hydraulic modeling. In fact, SCE specifically required that the thermal-hydraulic modeling techniques deployed for the RSG design be approved by SCE.<sup>5</sup> As a joint member of the AVB Design Team, SCE knew about the predicted high void fraction and was involved in identifying potential modifications and/or departures from the RSG design intended to alleviate the problem. SCE declined, however, to implement any substantial design changes, as the RCA states:

MHI and SCE recognized that the SONGS RSG steam quality (void fraction) was high and performed feasibility studies of different methods to decrease it. Several design adjustments were made to reduce the steam quality (void fraction) but the effects were small. Design measures to reduce the steam quality (void fraction) by a greater amount were considered, but these changes had unacceptable consequences and MHI and SCE agreed not to implement them.<sup>6</sup>

The RCA further states:

However, the AVB Design Team recognized that the design for the SONGS RSGs resulted in higher steam quality (void fraction) than previous designs and had considered making changes to the design to reduce the void fraction (e.g. using a larger downcomer,

---

<sup>3</sup> STER at 51.

<sup>4</sup> RCA at 17.

<sup>5</sup> *Id.* at 8.

<sup>6</sup> *Id.* at 48.

using large flow slot design for the tube support plates and even removing a TSP). But each of the considered changes had unacceptable consequences and the AVB Design Team agreed not to implement them. *Among the difficulties associated with the potential changes was the possibility that making them could impede the ability to justify the RSG design under the provisions of 10 C.F.R. §50.59.*<sup>7</sup>

The RCA shows that SCE and MHI understood the design problems that would lead to high steam or void fraction as far back as 2005. It also supports the proposition that SCE foresaw the high likelihood that FEI and other tube excitation mechanisms would result from the design changes. Despite this understanding, the document reports that the joint SCE/MHI AVB Design Team rejected changes in the design to reduce the void fraction because the change would have had regulatory consequences.

### **Relevance to the § 2.206 Process**

The RCA demonstrates that SCE was aware of the high void fraction and, accordingly, the increased risk of FEI at least as early as the 2005–2006 period but decided not to take measures that could have significantly mitigated the problem. This information is contrary to claims made by SCE in its submission to the 2.206 Petition Review Board on January 9, 2013 that SCE was unaware of any potential problem of FEI:

*As a result of its recent evaluations, SCE has determined that MHI’s thermal-hydraulic analysis code did not predict the fluid elastic instability that occurred in the RSGs. That concern, however, was not known during the design and manufacturing of the RSGs. Therefore, those concerns could not have been a basis for a license amendment and do not provide any basis for an allegation that SCE violated 50.59 in 2009-2011.*<sup>8</sup>

The information contained in the RCA shows that SCE made false representations to the NRC, including to the Board in this 2.206 proceeding, about the state of its knowledge regarding the defects in the RSG design at the time it conducted its 50.59 evaluations. Specifically, the new information contained in the RCA demonstrates that SCE should have deduced that the RSG design, through a high void fraction and therefore increased risk of FEI, would risk adversely affecting the design function of the RSGs’ reactor coolant pressure boundary. As SCE concedes, design changes that have an adverse effect on the design function—in this instance, the reactor coolant pressure boundary (RCPB) that functions as a barrier to the release of fission products—cannot be screened out under 10 C.F.R. § 50.59. SCE’s position that it properly screened out these changes is therefore untenable when viewed with the information contained in RCA.

---

<sup>7</sup> *Id.* at 22 (emphasis supplied).

<sup>8</sup> SCE Response to FoE 2.206 Petition (Jan. 9, 2012) at 11 (emphasis supplied).

SCE argues in its 2.206 Response to this Board that “later-identified errors in an evaluation or nonconformances do not mean that an earlier 50.59 evaluation, such as SCE’s 50.59 analysis for the RSGs, was deficient or that a license amendment should have been obtained.”<sup>9</sup> This statement cannot be squared with what the RCA shows SCE to have known about the design problems during the engineering design phase. This information negates SCE’s justification of its 50.59 analysis—i.e., that it is not deficient because the design errors were not identified until after the fact.

As the RCA reveals, this was not the case. SCE was aware that the void fraction of the RSGs was high, a known precursor to FEI, and decided to proceed despite this knowledge. The fact that SCE had this information available to it at the time it performed the 50.59 evaluations undermines the credibility of its 50.59 analysis and SCE’s reliance on it to argue that no license amendment should have been sought.

The RCA, which reveals SCE’s understanding of the design problems and risks, raises serious questions about SCE’s representations to the NRC about the state of its knowledge at the time it performed the 50.59 analysis. The inconsistency between the statements made by SCE in its 2.206 Response and the information in the RCA is deeply troubling and should prompt further investigation by the NRC.

Last, SCE’s request in its January 9, 2013 submission that the Board deny FoE’s 2.206 Petition is based almost entirely on its claim that the NRC Staff has already reviewed the issue of whether SCE properly evaluated the RSGs under § 50.59 and found that the design changes were appropriately evaluated.<sup>10</sup> The NRC assessment included reviews by the Agency at the time the SGs were replaced, as well as the Staff’s subsequent review of SCE’s 50.59 evaluations as documented in the July and November 2012 AIT Reports. SCE’s argument on this point is negated by the new information revealed by the RCA and STER. As described above, the RCA demonstrates that SCE had knowledge of the defects inherent to the design of the RSGs prior to conducting the § 50.59 evaluations.

To ensure that the record before the Petition Review Board is complete, FoE requests that the Chairman direct that the RCA and STER, as well as the technical review provided by Large & Associates, be placed in the record of this proceeding. Your attention to these documents is much appreciated in the interest of providing an open and transparent process for the important safety concerns at issue in this matter.

---

<sup>9</sup> *Id.* at 12.

<sup>10</sup> *Id.* at 2, 6–8.

Sincerely,

/s/ Richard Ayres

Richard Ayres

*Counsel for Friends of the Earth*

(202) 452-9300

[ayresr@ayreslawgroup.com](mailto:ayresr@ayreslawgroup.com)

Enc.:

*Mitsubishi Heavy Industries, Root Cause Analysis Report for tube wear identified in the Unit 2 and Unit 3 Steam Generators of San Onofre Nuclear Generating Station and Supplemental Technical Evaluation Report.*

*Large and Associates, Review of Tube Wear Identified in the San Onofre Replacement Steam Generators - Mitsubishi Reports UES-20120254 Rev.0 (3/64) and L5-04GA588(0) together with Other Relevant Information.*