

**OFFICE OF THE SECRETARY**  
**CORRESPONDENCE CONTROL TICKET**

*Wed, May 8, 2013 16:10*

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<b>PAPER NUMBER:</b>	LTR-13-0390	<b>LOGGING DATE:</b>	05/03/2013
<b>ACTION OFFICE:</b>	EDO		
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<b>AFFILIATION:</b>	Public Commenter		
<b>ADDRESSEE:</b>	Macfarlane A M		
<b>SUBJECT:</b>	LTR-13-0390 - Vinod Arora E-mails re: San Onofre Nuclear Generating Station Restart		
<b>ACTION:</b>	Appropriate		
<b>DISTRIBUTION:</b>	SECY to Ack.		
<b>LETTER DATE:</b>	05/02/2013		
<b>ACKNOWLEDGED:</b>	Yes		
<b>SPECIAL HANDLING:</b>			
<b>NOTES:</b>			
<b>FILE LOCATION:</b>	ADAMS		
<b>DUE DATE:</b>		<b>DATE SIGNED:</b>	

## Wright, Darlene

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**From:** Vinod Arora [vinnie48in@gmail.com]  
**Sent:** Friday, May 03, 2013 12:45 AM  
**To:** vinnie48in  
**Subject:** fyi

The World's Foremost Renowned Professeur Titulaire, Michel J. Pettigrew, Ecole Polytechnique de Montreal, on the subject of fluid elastic instability and turbulence-induced vibration in 1970's states, "It is concluded that, although there are still areas of uncertainty, most flow-induced vibration problems can be avoided provided that nuclear components are properly analysed at the design stage and that the analyses are supported by adequate testing and development work when required. There has been no case yet where vibration considerations have seriously constrained the designer."

Violette R., Pettigrew M. J. & Mureithi N. W. state in a 2006 research paper, "In nuclear power plant steam generators, U-tubes are very susceptible to undergo fluid elastic instability because of the high velocity of the two-phase mixture flow in the U-tube region and also because of their low natural frequencies in their out of plane modes. In nuclear power plant steam generator design, flat bar supports have been introduced in order to restrain vibrations of the U-tubes in the out of plane direction. Since those supports are not as effective in restraining the in-plane vibrations of the tubes, there is a clear need to verify if fluid elastic instability can occur for a cluster of cylinders preferentially flexible in the flow direction. Almost all the available data about fluid elastic instability of heat exchanger tube bundles concerns tubes that are axisymmetrically flexible. In those cases, the instability is found to be mostly in the direction transverse to the flow. Thus, the direction parallel to the flow has raised less concern in terms of bundle stability."

Channel 10News Question to MHI: Edison says that a letter from MHI to the NRC proves that SCE believed the San Onofre nuclear plant's steam generators were safe when installed and that safety measures were not sacrificed for licensing reasons. Is that true?

MHI Answer: MHI's top priority is, and always has been, the safe and reliable operation of all the plants and components that it designs, engineers, supplies and supports. In designing steam generators, minimizing tube wear due to tube vibration is always given a high priority, and this was a priority for MHI during the design of the SONGS replacement steam generators (RSGs). The SONGS RSGs were designed according to industry standards and our customer's specifications. The design went through an extensive review process which included the participation of third-party experts and MHI believed they would operate as expected: safely and successfully. No safety measures were sacrificed in the design.

Note: MHI Root Cause states, "The forced outage of Unit 3 and the subsequent discovery of thousands of U-bend tube wear indications in both Unit 2 and Unit 3 after such a short operating period was wholly unexpected. Such an outcome should have been prevented by the conservative design and the precision manufacture. The identification of the unexpected tube degradation led to an extensive evaluation as to the causes the degradation and the questioning of the original design assumptions."

**Root Cause:** Root Causes" are defined as the basic reasons [e.g., hardware (design deficiency), process (e.g., mechanistic or operational parameters), or human performance errors (e.g., Root Cause: Root Causes" are defined as the basic reasons [e.g., hardware (design deficiency), process (e.g., mechanistic or operational parameters), or human performance errors (e.g., lack of critical questioning & investigative attitude, lack of solid team work and alignment between the designer and manufacturer, lack of academic research and Industry benchmarking, etc.) for a problem, which if corrected, will prevent recurrence of that problem., etc.) for a problem, which if corrected, will prevent recurrence of that problem.

**SONGS SG Root Cause:** Negative Safety Culture (Production over Safety)

### Contributing Causes

#### 1. Human Performance Errors

- Lack of critical questioning & investigative attitude by SCE/MHI
- Lack of solid team work and alignment between MHI & SCE AVB Design Team
- Lack of academic research and Industry benchmarking by SCE/MHI

- Avoidance of 10CFR 50.90 License Amendment Process by SCE/MHI and Defective 10 CFR 50.59 Evaluation/Screen
  - Complacency, Ignorance and Time Pressure by SCE/MHI
  - Lack of Benchmarking of Computer Codes and Full Scale Mock-up Testing by MHI
  - Inexperienced Designer and Low Cost/Inexperienced/Aggressive/Ignorant Manufacturer
- Blind Trust by NRC Commission In SCE's Error Likely Conservative Assumptions, Unexplained Safety Explanations and False Public Safety Sermons

## **2. Design Deficiencies - SCE**

- Increase of the tube bundle heat transfer surface area from 105,000ft<sup>2</sup> (OSG) to 116,100 ft<sup>2</sup> (an 11% increase) to generate more heat, more heat and more profits
- Increase in the number of tubes from 9,350 (OSG) to 9,727 (RSG), 7% increase in heat transfer surface area and low tube-to-tube clearances
- RSG tube bundle being taller than that of the OSG (Average Length of Heated Tube increase from 680- 750 inches – equivalent to 700 tubes, 7% increase in heat transfer surface area
- Lack of In-Plane AVBs (Incorrect Assumptions)
- Low-frequency 56 HZ retainer bar to fit excessive number of tubes
- Reduction in Tube Wall thickness from 0.048 inches to 0.043 inches to pump more RCS Flows
- Removal of Stay Cylinder

## **3. Operational Causes - To generate more heat, more power and profits - SCE**

- Operation at Low Steam Pressures
- Increased Reactor Coolant Flows
- Poor Circulation Ratios

## Wright, Darlene

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**From:** Vinod Arora [vinnie48in@gmail.com]  
**Sent:** Thursday, May 02, 2013 11:00 AM  
**To:** CHAIRMAN Resource; Leeds, Eric; Borchardt, Bill; Benney, Brian; Hall, Randy; Lantz, Ryan; Howell, Art; R4ALLEGATION Resource  
**Subject:** Actions for Honorable NRC Chairman, Dr. Macfarlane on San Onofre

Sincere Thanks to NRC Chairman, Mr. Victor Dricks, Mr. Cale Young, Mr. Ryan Lantz, Mr. Randy Hall and entire NRC Staff. Thanks to NRC for posting this blog.

Jim Messina, Chair, Organizing for Action, for His Excellency, President of the United States, states, "I've spent enough time in Washington to know that the way you win a fight with the gun lobby, faced with some of the most powerful special interests, is just to refuse to give up." Following his example, 8.4 Million Southern Californians will keep questioning NRC and SCE, until they are convinced that SONGS Unit 2 is safe for restart. 8.4 Million Southern Californians pay for SONGS Unit 2, therefore, they are justified in expressing their concerns about their safety.

So far, all the available evidence indicates that the following major problems have not been addressed:

Problem Number 1. The design of San Onofre Replacement Steam generators (RSGs) are identical. SONGS Unit 2 potentially did not suffer in-plane fluid elastic instability due to operation at higher steam pressures and lower RCS flows (Rejecting the impact of double Tube-to-AVB contact forces and better supports responsible for prevention of Unit 2 FEI). SONGS Unit 3 suffered in-plane fluid elastic instability due to operation at lower steam pressures and higher RCS flows (Rejecting the impact of insufficient Tube-to-AVB contact forces and loose supports due to manufacturing errors responsible for Unit 3 FEI). This conclusion is consistent with Westinghouse Operational Assessment, but challenges the SCE, NRC AIT, AREVA and MHI conclusions. NRC AIT Report, SCE, MHI and AREVA conclusions on Unit 3 and Unit 2 FEI are incomplete, inconsistent, confusing and inconclusive and based on faulty computer simulations and hideous testing data (Shielded under the false pretense of MHI Proprietary information). The analysis in these reports does not meet the intent of NRC CAL ACTION 1, which states "Southern California Edison Company (SCE) will determine the causes of the tube-to-tube interactions that resulted in steam generator tube wear in Unit 3, and will implement actions to prevent loss of integrity due to these causes in the Unit 2 steam generator tubes. SCE will establish a protocol of inspections and/or operational limits for Unit 2, including plans for a mid-cycle shutdown for further inspections." Repeated requests to NRC, SCE and its Independent Experts to examine carefully the operational difference between Units 2 & 3 and determine its impact on CAL Action 1 have not been addressed to date. NRR has not asked SCE in its RAI(s) the impact of operational differences between Units 2 and 3 on Unit 2 and Unit 3 tube-to-tube wear. Honorable NRC Commissioner Mr. Apostolakis was very confused on Unit 2 FEI inconsistent and conflicting statements by SCE, Westinghouse and AREVA.

Required Action 1: To protect NRC Commission's Independent Public Safety Charter Mission, Honorable NRC Chairman is humbly requested that NRC Office of Inspector General retain an Independent Thermal-Hydraulic Expert to examine the operational differences between Units 2 & 3 during Cycle 16 and determine its impact on NRC CAL Action 1 by examining the entire SONGS Cycle 16 operational data for Units 2 & 3. Unit 2 Restart Permission at 70% power should be contingent on completion of the corrective actions required by NRC CAL Action 1 and 10CFR 50 Appendix B.

Problem Number 2. In light of massive amounts of tube damage (wear), fatigue and tube failure in Unit 3, along with incomplete tube inspections for detection of circumferential incubating cracks in Unit 2, NRC is legally required to ask SCE to check MHI Fatigue Calculations and post the results on its website before any approval

of SONGS proposed New License Amendment for restart of Unit 2, to demonstrate that the proposed license amendment (1) Would not involve a significant increase in the probability of an accident previously evaluated in the SONGS FSAR; or, (2) Would not create the possibility of a new or different type of accident previously evaluated in the SONGS FSAR; or, (3) Would not involve a significant reduction in the required margin of safety by operating Unit 2 at 70% power.

Required Action 2: Based on the above review, NRC should ask SCE to provide a calculation justifying the engineering basis of MHI Fatigue Calculations to meet the ASME Code, NRC RG 1.121, the NRC Chairman and its own Standards. The calculation should be performed by a California Licensed Mechanical or Civil Engineer and Independently Verified by a California Licensed Structural Engineer. In addition, SCE and its Independent Experts should address the synergic effects of tube-to-tube wear and high cycle fatigue, which can be caused by in-plane fluid elastic instability in Unit 2 during anticipated operational occurrences and design bases accidents.