



UNITED STATES  
NUCLEAR REGULATORY COMMISSION  
REGION IV  
1600 EAST LAMAR BLVD  
ARLINGTON, TEXAS 76011-4511

March 16, 2012

MEMORANDUM TO: Gregory Werner, Chief, Plant Support Branch 2  
Division of Reactor Safety

FROM: Elmo Collins, Regional Administrator **/RA/**  
Region IV

SUBJECT: AUGMENTED INSPECTION TEAM CHARTER TO EVALUATE THE  
STEAM GENERATOR TUBE INTEGRITY ISSUES AT SAN ONOFRE  
NUCLEAR GENERATING STATION UNIT 3

You have been selected to lead an Augmented Inspection Team (AIT) to assess the circumstances surrounding the tube leak and unexpected wear of tubes in the Unit 3 steam generators. The tube leak resulted in a rapid shutdown on January 31, 2012. The following are the other team members.

- John Reynoso (Region IV)
- Joel Rivera-Ortiz (Region II)
- Jonathan Ortega-Luciano (NRO)
- Emmett Murphy (NRR)
- Carl Thurston (RES)
- Andrew Johnson (NRR)

A. Basis

Unit 3 had been operating for approximately one year following replacement of the steam generators when operators received alarms on January 31, 2012, in the control room that indicated reactor coolant was leaking into steam generator E0-88. The leak was unexpected, and the licensee responded in accordance with their procedures to perform a rapid shutdown, since the leak, although small, had increased enough in a short period of time to warrant the precautionary shutdown. The estimated leak rate was 75 gallons per day. The facility license allows full power operation with a steady leak rate of less than 150 gallons per day.

The first indication of the leak was main condenser air ejector radiation monitors reaching their alarm set point. The radiation monitors continuously sample from a vent stack for the purpose of rapidly identifying steam generator tube leaks. This was a direct release of radioactivity to the atmosphere, which is allowed by the facility license, up to limits in the regulations. The licensee reviewed the amount of gaseous radioactivity released and estimated a dose of approximately 0.000452 mrem to a member of the public. The annual regulatory limit to a member of the public is 100 mrem per year.

During a radiation protection inspection the week of February 13, the inspectors reviewed the licensee dose estimates and did not identify any issues.

Unit 3 control room operators performed a controlled shutdown of Unit 3 on January 31, 2012, and reached cold shutdown conditions on February 2, 2012. The operators then prepared the steam generators for tube inspections, which were started on February 12, 2012. The first inspection confirmed the location of the leak in steam generator E088. One tube was found with a small leak and no other tubes were leaking.

The licensee completed an extensive and expanded eddy current inspection of 100% of the steam generator tubes in both Unit 3 steam generators. Following pre-established testing requirements, the licensee has identified 129 tubes in Unit 3 (roughly 65 per steam generator) that require in-situ pressure testing. This testing began on March 13, 2012.

On March 14, three steam generator tubes failed the in-situ pressure test; therefore, the tubes may have not maintained structural integrity during various accidents, including a main steam line break.

In accordance with Management Directive 8.3, "NRC Incident Investigation Program," deterministic and conditional risk criteria were used to evaluate the level of NRC response for this operational event. This event met three deterministic criteria and conditional large early release probability for additional follow-up inspection. Based on deterministic criteria being met and the risk assessment of this condition, Region IV, in consultation with the Office of Nuclear Reactor Regulation (NRR) and Office of Nuclear Security and Incident Response (NSIR), concluded that the NRC response should be an AIT.

This augmented inspection is chartered to identify the circumstances surrounding the tube degradation, review the licensee's actions following discovery of the conditions, and evaluate the licensee's review of potential causes of the unusual steam generator tube wear, and, assess adequacy of licensee's actions to prevent recurrence.

B. Scope

The augmented inspection team is to perform data gathering and fact finding in order to address the following:

**At SONGS**

1. Develop an event chronology of significant events associated with the design, construction, shipping, installation, and operation of both Unit 2 and 3 steam generators.

2. Review information to determine probable contributing causes of the event or degraded condition, where applicable:
  - Operational Issues
  - Equipment failures
  - Human factor and procedural issues
  - Quality assurance issues
  - Safety culture component issues
3. Assess whether operational activities could have contributed to the unexpected tube wear. Focus on differences in configuration and operation between Units 2 and 3 (differences in operation of the units – temperature, pressures, steam flow, etc.).
4. Collect and assess differences in steam generator design and manufacturing between Units 2 and 3. Review all design and manufacturing changes to ensure they were properly reviewed and approved in accordance with procedures.
5. Review quality assurance/quality control findings, self-assessments, and audits done by San Onofre Nuclear Generating Station during manufacturing of both steam generators. Review a sample of nuclear notifications associated with the steam generators.
6. Review implementation of generic communications, such as Information Notices, Generic Letters, and Bulletins associated with steam generator issues.
7. Review receipt inspections for adequacy of acceptance criteria and issues associated with handling of the steam generators and shipment from Japan to California.
8. Review steam and water modeling for steam generators. Assess the adequacy of the steam generator models in predicting flow and vibration characteristics in the steam generators.
9. Collect data to support an independent assessment of the risk significance of the event. Work with Region IV senior reactor analysts to determine information that needs to be collected.
10. Assess the results of the charter items above to determine whether there were issues with quality assurance, radiological controls, or safety culture components.
11. Given results of inspection activities, identify differences between Units 2 and 3 steam generators. Promptly report differences impacting restart of Unit 2 to Projects Branch D Chief.

**At Mitsubishi Heavy Industries and Associated Sub-Contractors (as determined)**

1. Collect and assess differences in steam generator design and manufacturing between Units 2 and 3. Review all design and manufacturing changes to ensure properly reviewed and approved in accordance with procedures.
2. Review MHI actions following identification of the weld issues on the primary to secondary divider plate on the U3 S/G during manufacturing that was previously corrected.
3. Review Mitsubishi Heavy Industries implementation of generic communications, such as Information Notices, Generic Letters, and Bulletins associated with steam generator issues.
4. Review quality assurance/quality control findings, self-assessments, and audits for Mitsubishi Heavy Industries and other vendors used during manufacturing of both steam generators. Review a sample of non-conformance reports.

Independent of the AIT, the resident inspectors were on-site during the rapid shutdown of Unit 3. As part of their inspection, they will provide the AIT the following information to include in the AIT report:

1. Assess licensee actions taken in response to the event, actions to cool the plant down, and actions performed during recovery of plant systems, and other operator actions.
2. Assess procedure use and adequacy for the Unit 3 steam generator tube leak.
3. Assess whether plant systems responded as expected. Compare the actual plant response to the applicable safety analyses.

**C. Guidance**

The team currently has two members on-site at this time following the in-situ pressure testing. The remaining team members will report to San Onofre Nuclear Generating Station on Monday, March 19, 2012. Inspection Procedure 93800, "Augmented Team Inspection," provides additional guidance to be used during the conduct of the inspection. Your duties will be as described in this procedure and should emphasize fact-finding in the review of the circumstances surrounding the event. It is not the responsibility of the team to examine the regulatory process. The team should notify Region IV management of any potential generic issues identified to this event for discussion with the Office of Nuclear Reactor Regulation. Safety or security concerns identified that are not directly related to the event should be reported to the Region IV office for appropriate action.

It is anticipated that the on-site portion of the inspection will be completed by March 30, 2012. You should provide a recommendation concerning when the on-site inspection should be concluded after you are on site.

You should provide daily briefings to Region IV management on the team's progress in completing the inspection items. In accordance with IP 93800, you should promptly recommend a change in inspection scope or escalation if information indicates that the assumptions used in the MD 8.3 risk analysis were incorrect.

A report documenting the results of the inspection should be issued within 30 days of the completion of the inspection. The report should address all applicable areas specified in Section 03.02 of Inspection Procedure 93800. At the completion of the inspection, you should provide recommendations for improving the Reactor Oversight Process baseline inspection procedures and Augmented Inspection process based on any lessons learned, as well as recommendations for generic communications.

cc w/attachment via e-mail:

- E. Collins, RA
- A. Howell, DRA
- A. Vogel, D: DRS
- T. Blount, DD DRS
- K. Kennedy, D: DRP
- G. Warnick, SRI
- J. Reynoso, SI
- M. Herrera, IRTS
- M. Markley, NRR/LPL4
- H. Chernoff, NRR/IOEB
- R. Borchardt, EDO
- M. Virgilio, DEDR
- E. Leeds, D: NRR
- J. Wiggins, D: NSIR
- L. Chang, OEDO
- W. Maier, RSLO
- V. Dricks, PAO
- L. Uselding, PAO
- R. Hall, PM
- L. Lund, DD/DORL
- J. Wiel, DCA
- C. Hoxie, BC:RSCB/DSA/RES
- K. Gibson, D:DSA/RES
- M. Scott, DD:DSA/RES
- B. Holian, DD:RES
- B. Sheron, D:RES
- J. Luehman, DD:DCIP/NRO
- L. Dudes, D:DCIP/NRO
- H. Christensen, DD:DRS/RII
- J. Munday, D:DRS/RII

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Publicly Avail	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Sensitive	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Sens. Type Initials	GEW	
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