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

Subject: **Docket Nos. 50-361 and 50-362**
Inspection and Mitigation of Alloy 82/182 Pressurizer Butt Welds
San Onofre Nuclear Generating Station, Units 2 and 3

References: 1) Letter from A. E. Scherer (SCE) to the U. S. Nuclear Regulatory Commission (NRC) dated January 31, 2007; Subject: Docket Nos. 50-361 and 50-362, Inspection and Mitigation of Alloy 82/182 Pressurizer Butt Welds, San Onofre Nuclear Generating Station, Units 2 and 3

2) Letter from A. E. Scherer (SCE) to the U. S. Nuclear Regulatory Commission (NRC) dated February 26, 2007; Subject: Docket Nos. 50-361 and 50-362, Inspection and Mitigation of Alloy 82/182 Pressurizer Butt Welds, San Onofre Nuclear Generating Station, Units 2 and 3

Dear Sir or Madam:

This letter supersedes in its entirety both referenced letters from the Southern California Edison Company (SCE). The purpose of this letter is to revise Items 2 and 3 under the Commitment to Interim Enhanced Leakage Monitoring based on discussions with United States Nuclear Regulatory Commission (NRC) Staff conducted on March 2, 2007.

In October 2006, while performing inspections of its pressurizer Alloy 82/182 butt welds in accordance with Material Reliability Program (MRP)-139, another licensee of a pressurized water reactor discovered several circumferential indications in its pressurizer surge, safety, and relief nozzles. Because of the potential importance of this issue, SCE is submitting this letter to notify you of actions taken and planned for

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inspecting and mitigating Alloy 600/82/182 butt welds on pressurizer spray, surge, and safety nozzles at San Onofre Nuclear Generating Station (SONGS), Unit 2 and Unit 3.

NOZZLE DESIGN, INSPECTION, AND MITIGATION INFORMATION

The SONGS Unit 2 and Unit 3 pressurizer design provided five large bore nozzles including one spray line nozzle, two active and one spare safety valve nozzles and the surge line nozzle. The design of these nozzles incorporate a forged stainless steel safe end for the spray line nozzle, and cast stainless steel safe ends for the remaining safety valve and surge line nozzles.

The carbon steel pressurizer vessel and its adjoining Alloy 182 weld "butter" associated with these large bore nozzles received post weld heat treatment prior to attachment of the stainless steel safe end. A post weld heat treatment was not performed after attaching the stainless steel safe end using the alloy 82/182 weld.

A performance demonstration initiative (PDI) compliant inspection meeting MRP-139 requirements was performed on the spray line nozzle during the Cycle-14 refueling outages in January and October 2006 for SONGS Units 2 and 3 respectively. No indications were identified during those inspections. In addition, a full structural weld overlay was implemented on the spray line nozzles during Cycle-14 refueling outages. As a result, the SONGS Units 2 and 3 spray line has been successfully mitigated from primary water stress corrosion cracking (PWSCC).

The three safety valve nozzles and the surge line nozzle dissimilar metal welds (DMWs) were also volumetrically examined during the Cycle-14 refueling outage. Six small, linear, axially orientated indications were identified in two of the SONGS Unit 2 pressurizer safety valve nozzles. Eddy current examination of those indications demonstrated that there was no surface connection and therefore were not PWSCC. No other indications were identified during these safety valve and surge line volumetric examinations. In addition to the inspection performed on safety valve and surge line nozzles, a full structural weld overlay was successfully applied to the three safety valve nozzles on both SONGS Units 2 and 3. As a result, the pressurizer safety valve nozzles have been successfully mitigated from PWSCC.

An MRP-139 compliant inspection of the safety valve and surge line nozzles was not possible because volumetric examination into the cast stainless steel safe end material has not been qualified. The technique used to inspect these nozzles was PDI qualified for the existing geometry except for the cast material. The presence of the cast safe end component precluded a qualified examination within the casting, and limited the extent of axial scanning into the Alloy 82/182 from the safe end side. Axial scanning from the vessel side of the weld (for detection of circumferentially oriented planar flaws), and circumferential scanning in both directions on the vessel nozzle and Alloy 82/182 weld and "butter" surface was accomplished within the qualified PDI procedure requirements. Therefore, the entire PWSCC sensitive Alloy 82/182 material up to the

safe end fusion line (approximately three fourths of the required volume) was successfully examined. This does not meet MRP-139 minimum volume requirement of 90%.

A full structural weld overlay of the SONGS Unit 2 surge line has been planned for the Cycle-15 refueling outage scheduled to begin before the end of 2007. A full structural weld overlay was also planned and initiated on the SONGS Unit 3 surge line during the Cycle-14 refueling outage in October, 2006. Those mitigation plans would have satisfied the remaining MRP-139 requirement applicable to pressurizer DMWs in 2007. Unexpected defects were identified however, within the initial weld overlay layer on the SONGS Unit 3 pressurizer surge line. Weld procedure modifications failed to resolve the defects during a second weld overlay attempt. In both cases, the weld defects adversely affected underlying material. Based on the confidence gained from the inspection effort that susceptible surge line materials were free of PWSCC, a decision was made to defer further attempts at performing a weld overlay on SONGS Unit 3 until the cause of the welding defects was understood and corrected. This decision would have caused SONGS Unit 3 not to be in full conformance with MRP-139 requirements for pressurizer DMWs until the Fall of 2008.

ASSESSMENT FOR CONTINUED SERVICE DURING CYCLE-14

As outlined above, the only remaining pressurizer nozzle that is susceptible to PWSCC failure is the surge line nozzle for each unit. For comparative purposes, both SONGS Units 2 and 3 will have accumulated approximately nineteen and one half effective full power years upon completion of Cycle-14 in 2007 and 2008 respectively.

A review of fabrication records has revealed that a repair weld was performed at the safe end to vessel nozzle weld joint on SONGS Unit 2 surge line. A review of the SONGS Unit 3 fabrication records did not identify any weld repairs made during fabrication of the pressurizer surge line. Fabrication records of "in process" repair of these welds were not required, and the possibility of such repairs can not be fully ruled out by the document review. There have been no in service repairs made to the surge line DMW of either SONGS Unit 2 or Unit 3.

As described above, the volumetric examination of the surge line nozzles performed during the Cycle-14 refueling outages provides reasonable assurance that branching PWSCC defects are not present within the susceptible material of the surge line DMWs. NRC evaluations of the potential consequences from surge line cracks similar to those recorded at Wolf Creek were presented during the December 20, 2006 public meeting on this subject. Those evaluations indicate that the time interval between initiation of a through wall leak and piping failure would be at least 7 months. This is ample time for an effective leakage monitoring program to detect and correct defects before piping failure might occur.

CURRENT SONGS UNITS 2 AND 3 LEAKAGE MONITORING

The current reactor coolant system (RCS) leakage monitoring at San Onofre is required by Technical Specification Surveillance Requirement 3.4.13.1 every 72 hours except during periods of transient operation when the interval can be extended up to 120 hours. Surveillance interval extensions are rare, but are necessary to accommodate periods where large volumes of water must be added for reactivity and volume control. (Leakage calculations are based on integration of water inventories and are susceptible to small errors in charging and letdown flow measurements when large integrated volumes are involved).

Monitoring and investigation of RCS leakage inside containment is also achieved through a combination of containment airborne radiation monitors, containment sump levels, humidity and temperature indications, Reactor Coolant Drain Tank and Quench Tank levels, and isotopic/chemical analysis of containment atmosphere and containment sump water.

COMMITMENT TO MRP-139

SONGS Unit 2 will shutdown prior to December 31, 2007 for a refueling outage and to meet the requirements of Generic Letter 2004-02 "Potential Impact of Debris Blockage on Emergency Recirculation during Design Basis Accidents at Pressurized-Water Reactors." SCE will not operate SONGS Unit 2 after December 31, 2007 until SONGS Unit 2 is in compliance with the MRP-139 guidance.

SCE is confident in the inspections performed to date at SONGS Unit 3 and in the structural integrity of the SONGS pressurizer DMWs. Nevertheless, SCE decided for commercial reasons that a mid-cycle outage during 2007 will be scheduled for SONGS Unit 3. SCE will not operate SONGS Unit 3 after December 31, 2007, until SONGS Unit 3 is in compliance with the MRP-139 guidance.

COMMITMENT TO INTERIM ENHANCED LEAKAGE MONITORING

On or before March 2, 2007 SCE will implement an enhanced RCS leakage monitoring program for SONGS Units 2 and 3 which supplements the existing plant programs and procedures. The enhanced program will be in place at each unit until the pressurizer surge line butt weld (the only remaining unmitigated pressurizer butt weld) is successfully brought into compliance with MRP-139. The program will have the following elements.

1. SCE will perform daily measurement of reactor coolant system leakage during Modes 1 through 4.

2. If unidentified leakage rates, potentially associated with the pressurizer surge line DMW, are greater than either of the following limits for 72 hours:

   a. 0.1 gallons per minute (gpm) increase between two consecutive daily measurements and 0.1 gpm above the minimum RCS leak rate.

   b. 0.25 gpm increase above the baseline value.

   Then SCE will initiate a plant shutdown and perform a bare metal visual of the pressurizer surge line dissimilar metal weld. The plant must be in Hot Standby in 6 hours and in Cold Shutdown in 36 hours.

3. The minimum RCS leak rate value (limit 2.a) for inventory balance measurements is 0.05 gpm. This leak rate reflects design leakage from mechanical joints and instrument inaccuracies and was determined using recent monthly averages of water inventory balance measurements that were taken when RCS leak rate in each unit was observed to be at minimum values.

4. Measurement uncertainties are not applicable to the stated limits.

5. Additional leak detection methods and containment parameters (e.g., containment sump level and airborne radiation monitors) may be used to assist in determining if the source of increased leakage is from inside containment and to supplement daily leak rate monitoring during plant transients.

6. The baseline value (limit 2.b) will be based on leak rate measurements obtained during the initial 7 days after reaching Mode 1 following the last bare metal visual examination of the pressurizer Alloy 600/82/182 butt weld locations.

7. SCE will report any mitigation and/or results of any bare metal visual inspections to the NRC within 60 days of plant startup.

SUMMARY

Details concerning the locations inspected and mitigated are summarized in the attached tables. SCE has concluded that based on the inspections performed during the completed Cycle-14 refueling outages, both SONGS Units 2 and 3 can be safely operated to their next scheduled refueling outages.

Full structural weld overlays have been completed on the pressurizer spray and safety valve nozzles during the Cycle-14 refueling outages. Those modifications have

mitigated susceptibility to PWSCC failure at those locations. SCE is currently planning to implement a full structural weld overlay modifications on the pressurizer surge line nozzle of both SONGS Units 2 and 3 in 2007. These design modifications mitigate susceptibility to PWSCC related piping failure and will result in full conformance with MRP-139 2007 requirements. Future inspections of the pressurizer Alloy 82/182 DMWs following mitigation will be in accordance with the 10-year inservice inspection program.

SCE is committing that neither SONGS Unit 2 nor Unit 3 will operate past December 31, 2007, without meeting the MRP-139 requirements for pressurizer DMWs.

SCE is committing for SONGS Unit 2 and Unit 3 to implement an interim enhanced leakage monitoring program not later than March 2, 2007, that will remain in effect until the unit meets the MRP-139 requirements for pressurizer DMWs.

The NRC will be informed if SCE revises the commitment to the enhanced leakage monitoring program described herein or the commitment to have all pressurizer DMWs compliant with MRP-139, prior to operation after December 31, 2007.

If there are any questions, please contact Ms. Linda Conklin at (949) 368-9443.

Sincerely,

Attachments

cc: B. S. Mallett, Regional Administrator, NRC Region IV
N. Kalyanam, NRC Project Manager, San Onofre Units 2 and 3
C. C. Osterholtz, NRC Senior Resident Inspector, San Onofre Units 2 and 3

Inspection and Mitigation Information Table

SONGS Unit 2
Inspection and Mitigation Summary for Alloy 600/82/182 Pressurizer Butt Welds

Nozzle		MRP-139 Volumetric Inspection Requirement Met or to be Met		Mitigation Completed or to be Completed	Comments
Function / Designation	Susceptible Material Description	Outage Designation	Start Date (MM/YYYY)	Outage Designation	
Spray	Alloy 82/182	U2C14 Refueling	1/3/2006	Full Structural Weld Overlay Completed in U2C14	
Safety PSV 200	Alloy 82/182	U2C14 See Comments	1/3/2006	Full Structural Weld Overlay Completed in U2C14	Entire volume of Alloy 82/182 weld material was inspected with PDI qualified technique. Approximately 75% of the MRP-139 volume inspected.
Safety PSV 201	Alloy 82/182	U2C14 See Comments	1/3/2006	Full Structural Weld Overlay Completed in U2C14	Entire volume of Alloy 82/182 weld material was inspected with PDI qualified technique. Approximately 75% of the MRP-139 volume inspected.
Safety Spare	Alloy 82/182	U2C14 See Comments	1/3/2006	Full Structural Weld Overlay Completed in U2C14	Entire volume of Alloy 82/182 weld material was inspected with PDI qualified technique. Approximately 75% of the MRP-139 volume inspected.
Surge	Alloy 82/182	U2C14 See Comments	1/3/2006	MRP-139 Compliance Prior to Plant Operation Past 12/31/2007	Entire volume of Alloy 82/182 weld material was inspected with PDI qualified technique. Approximately 75% of the MRP-139 volume inspected.

SONGS Unit 3
Inspection and Mitigation Summary for Alloy 600/82/182 Pressurizer Butt Welds

Nozzle		MRP-139 Volumetric Inspection Requirement Met or to be Met		Mitigation Completed or to be Completed	Comments
Function / Designation	Susceptible Material Description	Outage Designation	Start Date (MM/YYYY)	Outage Designation	
Spray	Alloy 82/182	U3C14 Refueling	10/16/2006	Full Structural Weld Overlay Completed in U2C14	
Safety PSV 200	Alloy 82/182	U3C14 See comments	10/16/2006	Full Structural Weld Overlay Completed in U2C14	Entire volume of Alloy 82/182 weld material was inspected with PDI qualified technique. Approximately 75% of the MRP-139 volume inspected
Safety PSV 201	Alloy 82/182	U3C14 See comments	10/16/2006	Full Structural Weld Overlay Completed in U2C14	Entire volume of Alloy 82/182 weld material was inspected with PDI qualified technique. Approximately 75% of the MRP-139 volume inspected
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Surge	Alloy 82/182	U3C14 See comments	10/16/2006	MRP-139 Compliance Prior to Plant Operation Past 12/31/2007	Entire volume of Alloy 82/182 weld material was inspected with PDI qualified technique. Approximately 75% of the MRP-139 volume inspected