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Vice President

August 31, 2001

U.S. Nuclear Regulatory Commission
Attention: Document Control Desk
Washington, D.C. 20555-0001

Subject: **Docket Nos. 50-361 and 50-362**
30-day Response to NRC Bulletin 2001-01
Circumferential Cracking of Reactor Pressure Vessel
Head Penetration Nozzles
San Onofre Nuclear Generating Station, Units 2 and 3

References: See Enclosure

Gentlemen:

This letter provides the Southern California Edison Company (SCE) 30-day response to NRC Bulletin 2001-01, "Circumferential Cracking of Reactor Pressure Vessel Head Penetration Nozzles" (reference 1) for San Onofre Nuclear Generating Station (SONGS) Units 2 and 3. As requested, SCE will provide the information requested by Item 5 in NRC Bulletin 2001-01 within 30-days following the plant restart of San Onofre Unit 2 and of San Onofre Unit 3 following their next refueling outages.

The information requested in NRC Bulletin 2001-01, Items 1 through 4 and the SCE responses are the following:

1. Provide the following information:

1.a. The plant-specific susceptibility ranking for SONGS Units 2 and 3 (including all data used to determine each ranking) using the primary water stress corrosion cracking (PWSCC) susceptibility model described in Appendix B to the MRP-44, Part 2, report.

SCE Response

SONGS 2 and 3 have been ranked for the potential for primary water stress corrosion cracking (PWSCC) of the reactor pressure vessel (RPV) top head nozzles using the time-temperature model described in Appendix B to MRP-44, Part 2, and plant-specific input data reported in MRP-48 (reference 2). As shown in Table 2-1 of MRP-48 (reference 2), this evaluation indicates that it will take 10.7 effective full power years (EFPYs) for SONGS 2 and 10.8 EFPYs for

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SONGS 3 of additional operation from March 1, 2001, to reach the same time at temperature that Oconee Nuclear Station Unit 3 had at the time that its leaking nozzles were discovered in February 2001.

Using the criteria stated in NRC Bulletin 2001-01 (reference 1), SONGS 2 and 3 fall into the NRC category of moderately susceptible plants, with greater than 5 EFPY and less than 30 EFPY until reaching the Oconee 3 time at temperature.

SONGS 2 and 3 have reduced reactor coolant operating temperature a total of 13°F in two phases. These temperature reductions have been accounted for in the calculation of the remaining EFPYs relative to Oconee 3. In July, 2001, the NRC approved a power uprate Technical Specification change to the SONGS 2 and 3 licenses (reference 3). It was predicted that this change may result in a slight operating temperature increase, however, SCE implemented this change at SONGS 3 with no measurable change in operating temperature. SCE predicts that temperatures for the uprated condition at SONGS 2 will result in a minimal increase in temperature, based on the experience from SONGS 3.

1.b. A description of the vessel head penetration (VHP) nozzles for SONGS Units 2 and 3, including the number, type, inside and outside diameter, materials of construction, and the minimum distance between VHP nozzles.

SCE Response

The reactor vessel head penetration arrangement and requested nozzle details are provided in Table 2-3 of MRP-048 (reference 2). The reactor vessel closure head at SONGS 2 and 3 each contain 102 penetrations in which are attached penetrations for ninety-one (91) control element drive mechanisms (CEDMs), ten (10) in-core instrumentation (ICI) packages, and one (1) vent pipe. The CEDM nozzles are constructed from single piece Inconel forgings and machined to final dimensions prior to installation. The instrument nozzles are constructed from a stainless steel flange adapter and an Inconel pipe, machined to final dimensions prior to installation. The vent pipe is constructed from 3/4" Schedule 80 Inconel pipe.

1.c. A description of the reactor pressure vessel (RPV) head insulation type and configuration.

SCE Response

As reported in Table 2-1 of MRP-48 (reference 2), SONGS 2 and 3 have encapsulated and contoured RPV head insulation. The insulation package consists of a combination of reflective and encapsulated segments and includes close fitting encapsulated cerablanket insulation assemblies surrounding each of the RPV head penetrations and the vent pipe. These assemblies are semi-permanently attached to the reflective panels with metal belt straps and loops. The clearance between the RPV head and the insulation panels varies due to the contour of the head and the placement of the insulation panels. Several areas are close fitting with clearances of less than 1 inch.

1.d A description of the VHP nozzle and RPV head inspections (type, scope, qualification requirements, and acceptance criteria) that have been performed at SONGS Units 2 and 3 in the past 4 years, and the findings. Include a description of any limitations (insulation or other impediments) to accessibility of the bare metal of the RPV head for visual examinations.

SCE Response

As reported in Table 1 of MRP-48 (reference 2), SCE has performed RPV head and nozzle inspections within the past four years at SONGS 2 and 3.

SCE performs an effective visual examination as outlined in Bulletin 2001-01 each refueling outage on 34 peripheral RPV head penetrations. There have been observations of loose debris accumulation around the top of some of the CEDMs, however, there have been no findings of indications of leakage from the reactor vessel head penetrations at SONGS 2 and 3.

A minimum of two inspectors, familiar with the nozzle locations, installation configuration, and the types of indications resulting from PWSCC (extremely small leak rates) inspect each nozzle. Acceptance criteria were established and incorporated into the inspection procedure to identify a potential nozzle leak. Any brown, rust-type stains on a nozzle or the base metal, or the accumulation of boric acid and/or corrosion products are indicative of a potential nozzle leak. An additional criterion is the presence of localized carbon steel degradation of the annular region adjacent to the nozzle. Should any of these observations be made during the inspection, an evaluation of the deposits would be performed by Chemistry to assist in the determination of whether the leakage is from the RCS, and approximately when it initiated. Any discrepancies found during the inspection would be documented with photographs and a description would be provided in the procedure. Besides the loose debris, no other discrepancies were discovered during the previous inspections.

1.e A description of the configuration of the missile shield, the control rod drive mechanism (CRDM) housings and their support/restraint system, and all components, structures, and cabling from the top of the RPV head up to the missile shield. Include the elevations of these items relative to the bottom of the missile shield.

SCE Response

The missile shield consists of 2 each 32'-10" X 12'- 0" X 3'-0" and 2 each 32'-10" X 11'-0" X 3'-0" reinforced concrete panels supported at elevation 83'-6" (bottom of the missile shield) above the reactor vessel on corbels protruding from the steam generator enclosures. Each panel is secured to the corbel with 5' 3" long 1-1/2 inch diameter A325 embedded anchor bolts that pass through the thickness of the panel.

CRDM housings are approximately 19'-1" in length, including the upper pressure housing and the motor housing assemblies. The motor housings are threaded onto the penetration nozzles and seal welded at an approximate elevation of 45'. The upper pressure housings are threaded onto the motor housings and seal welded at an approximate elevation of 50'. A seismic support plate is bolted to the reactor vessel head lift rig legs at elevation 58'-10". Two levels of rigid links are attached to this plate and link all of the CEDMS together and to the plate. One level of the links runs North/South, the other East/West. A 1-1/4" horizontal plate is attached to the reactor vessel head lift rig shroud at the level of the base of the CEDM motors. This plate supports the CEDM magnetic coils and ventilation shroud and forms the top of an air plenum below the motor housings. The shroud forms the side of the plenum and the reactor head insulation forms the bottom.

The cable support structure (CSS) is located between the top of the CRDM and bottom of the missile shield. The CSS is a 27'-8" long X 22'-2" wide X 18'-3" tall, two level steel frame structure that spans the reactor cavity in the North/South direction and supports the CRDM power cables, Reed Switch Position Transducer (RSPT) cables, Core Exit Thermocouple cables and Fixed Incore Detector cables. The cables supported by the CSS are jumpers between the terminations on the head assembly and the building side cables. A flexible conduit sheath protects the CRDM and RSPT cables. The building side cables are routed to the CSS in cable trays mounted on the steam generator enclosure walls. The cable trays are mounted below the corbels on the steam generator walls in three levels. Cables originate from both the east and west ends of the steam generator enclosure. Building side cables are connected to the CSS jumpers at two large connector panels on the CSS. Building side cables coming from trays mounted on the north side generator enclosure wall are terminated at the integral connector panel on the CSS. A similar arrangement exists on the south end of the CSS. More than two hundred and seventy cable connections are made at this elevation. At the head assembly end of the jumpers, the cables hang down below the structure of the CSS. A steel lattice structure and tie wraps align the CRDM and RSPT cables with the appropriate terminations on the head assembly. Small structural supports align the other instrumentation cables.

The CSS structure is supported on the 63'-6" operating deck level using four braced Wide-Flange legs. The base plates on each of the four legs span the refueling bridge rail and are bolted to the deck with two bolts each. Additional lateral support is provided to the CSS by a system of seismic angle iron struts bolted to embedments in the steam generator enclosure walls. There are two embedments on both the north and south steam generator enclosures. An integral bridge located on the underside of the CSS provides access to the reactor head assembly.

2. **If either SONGS Units 2 or 3 has previously experienced either leakage from or cracking in VHP nozzles, provide the information requested in NRC Bulletin 2001-01, Items 2.a., 2.b., 2.c., and 2.d.**

SCE Response

Neither SONGS Unit 2 or 3 has previously experienced leakage from or cracking in VHP nozzles. Therefore, the request for information in items 2.a., 2.b., 2.c., and 2.d. is not applicable to SONGS Units 2 and 3.

3. **If the susceptibility ranking for SONGS Units 2 or 3 is within 5 effective full power years (EFPY) of Oconee Nuclear Station Unit 3 (ONS3), addressees are requested to provide the information requested in NRC Bulletin 2001-01, Items 3.a. and 3.b.**

SCE Response

SONGS 2 has 10.7 EFPY and SONGS 3 has 10.8 EFPY remaining to reach ONS3 time and temperature operating history as of March 1, 2001. Therefore, the request for information in items 3.a. and 3.b. is not applicable to SONGS Units 2 and 3.

4. If the susceptibility ranking for SONGS Units 2 and 3 is greater than 5 EFPY and less than 30 EFPY of ONS3, provide the following information:

4.a. Plans for future inspections (type, scope, qualification requirements, and acceptance criteria) and the schedule.

SCE Response

In the communications with the NRC regarding Generic Letter 97-01 (reference 4), SCE committed to performing an eddy current inspection of the inside diameter of 100 percent of the RPV head penetrations at SONGS 3. The NRC directed SCE to perform this inspection between the years 2002 and 2008 in the Generic Letter 97-01 close out letter (reference 5). Based on recent industry developments, SCE is revising the inspection plans for SONGS 2 and 3 to be responsive to NRC Bulletin 2001-01 (reference 1). The details of this change in plans are discussed in the following paragraphs.

SCE is monitoring the industry progress regarding VHP nozzle cracking and inspection capabilities. Several utilities have Fall, 2001 and Spring, 2002 outages before the next SONGS refueling outage. The Unit 2 Cycle 12 Refueling Outage is currently scheduled to begin in May, 2002 and the Unit 3 Cycle 12 Refueling Outage is currently scheduled to begin in January, 2003. SONGS will be monitoring the industry's experience with tooling and techniques, schedule implementation, retesting required, false positives and methods for disposition, flaw detection capabilities, and the impact of surface discontinuities on the inspection methods. Results of the head inspections at those plants with refueling outages prior to SONGS will be considered, and the SONGS inspection plan will be modified as appropriate.

It is SCE's opinion that a qualified volumetric inspection or a qualified "wetted surface" inspection would best establish the condition of the reactor vessel head penetrations. Therefore, SCE has elected to perform a qualified volumetric inspection or a qualified "wetted surface" inspection of all of the reactor vessel head penetrations, provided that one of these inspection techniques becomes available and is proven.

In the event that a qualified volumetric inspection or a qualified "wetted surface" inspection is not available to support the SONGS 2 refueling outage, an effective visual inspection of all of the RPV head penetrations will be performed as defined in Bulletin 2001-01(reference 1). SCE is in the process of evaluating the removal and replacement of the reactor head insulation. The reactor head insulation at SONGS includes both insulation panels and an encapsulated collar around each penetration. The collars on the penetrations in the center of the reactor head present some uncertainty in the ability to efficiently remove them to perform an effective visual examination without significant impact to outage schedule and/or radiation exposure goals.

Qualification requirements and acceptance criteria will be developed by following the industry inspections scheduled prior to the SONGS 2 refueling outage. Appropriate actions in accordance with ASME Code requirements will be taken for all indications found.

4.b. The basis for concluding that the inspections identified in 4.a will assure that regulatory requirements are met (see Applicable Regulatory Requirements section of NRC Bulleting 2001-01). Include the following specific information in this discussion:

(1) If your future inspection plans do not include a qualified visual examination at the next scheduled refueling outage, provide your basis for concluding that the regulatory requirements discussed in the Applicable Regulatory Requirements section will continue to be met until the inspections are performed.

(2) The corrective actions that will be taken, including alternative inspection methods (for example, volumetric examination), if leakage is detected.

SCE Response

SONGS is currently planning to perform a qualified "wetted surface" inspection, a qualified volumetric inspection, or an effective visual inspection of the 102 reactor vessel head penetrations. The specific techniques associated with the first two options will have to be qualified and approved by industry prior to use at SONGS. If leakage is identified during an effective visual inspection, then volumetric examination techniques that are available at that time will be implemented to determine the source of the leak and the leakage path. Contingency plans for repair will be in place to resolve any indications identified.

If you have any questions or would like additional information concerning this subject, please call Mr. Jack Rainsberry (949-368-7420).

Sincerely,

Enclosures

cc: E. W. Merschoff, Regional Administrator, NRC Region IV
J. E. Donoghue, NRC Project Manager, San Onofre Units 2, and 3
C. C. Osterholtz, NRC Senior Resident Inspector, San Onofre Units 2 & 3

Enclosure to the SCE 30-day Response to NRC Bulletin 2001-01

References:

1) NRC Bulletin 2001-01, " Circumferential Cracking of Reactor Pressure Vessel Head Penetration Nozzles," dated August 3, 2001

2) EPRI Report TP-1006284, PWR Materials Reliability Program Response to NRC Bulletin 2001-01 (MRP-48)

3) Letter from J. E. Donoghue, (NRC) to H. B. Ray (SCE) dated July 6, 2001; Subject: San Onofre Nuclear Generating Station, Units 2 And 3 - Issuance of Amendments Re: Increase in Reactor Power to 3438 MWt (TAC Nos. MB1623 and MB1624)

4) Letter from A. E. Scherer, (SCE) to the Document Control Desk (NRC) dated January 13, 1999; Subject: Docket Nos. 50-361 and 50-362, Request for Additional Information Regarding Generic Letter 97-01: "Degradation of Control Rod Drive Mechanism Nozzle and Other Vessel Head Penetrations" (TAC Nos. M98593 and M98594), San Onofre Nuclear Generating Station Units 2 and 3

5) Letter from L. Raghavan, (NRC) to H. B. Ray (SCE) dated November 23, 1999; Subject: San Onofre Nuclear Generating Station (SONGS), Units 2 and 3: Review of The Responses For Generic Letter 97-01, "Degradation of CRDM/CEDM Nozzle and Other Vessel Closure Head Penetrations" (TAC Nos. M98593 and M98594)

State of California
County of San Diego

Subscribed and sworn to (or affirmed) before me this 31st day of August, 2001, by

Dwight E. Nunn
Vice President

Notary Public

MARIANE SANCHEZ
Commission # 1196482
Notary Public - California
San Diego County
My Comm. Expires Oct 14, 2002