

SOUTHERN CALIFORNIA  
**EDISON**

An EDISON INTERNATIONAL<sup>SM</sup> Company

Dwight E. Nunn  
Vice President

March 18, 2003

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

**Subject: Docket No. 50-362**  
**30-day Post Refueling Outage Response to NRC Bulletin 2001-01**  
**"Circumferential Cracking of Reactor Pressure Vessel Head**  
**Penetration Nozzles", NRC Bulletin 2002-01, "Reactor Pressure**  
**Vessel Head Degradation and Reactor Coolant Pressure Boundary**  
**Integrity", and NRC Bulletin 2002-02, "Reactor Pressure Vessel**  
**Head and Vessel Head Penetration Nozzle Inspection Programs"**  
**for San Onofre Nuclear Generating Station, Unit 3**

References: See Enclosure 1

Dear Sir or Madam:

This letter provides the Southern California Edison Company (SCE) 30-day post refueling outage response to NRC Bulletin 2001-01, "Circumferential Cracking of Reactor Pressure Vessel Head Penetration Nozzles", NRC Bulletin 2002-01, "Reactor Pressure Vessel Head Degradation and Reactor Coolant Pressure Boundary Integrity", and NRC Bulletin 2002-02, "Reactor Pressure Vessel Head and Vessel Head Penetration Nozzle Inspection Programs" (References 1, 2, and 3) for San Onofre Nuclear Generating Station (SONGS) Unit 3.

As required by NRC Bulletin 2001-01, SCE provided responses that included the information requested by Items 1 through 4 of the bulletin in a letter dated August 31, 2001 (Reference 4). As required by NRC Bulletin 2002-01, SCE provided responses that included the information requested by Items (1) A through E of the bulletin in a letter dated April 2, 2002 (Reference 5). As required by NRC Bulletin 2002-02, SCE provided responses that included the information requested by Items (1) A and B of the bulletin in a letter dated September 11, 2002 (Reference 6) as supplemented by a letter dated December 31, 2002 (Reference 7). Those responses noted that the inspection of SONGS Unit 3 reactor vessel head was planned to occur during the outage scheduled to begin in January of 2003.

P. O. Box 128  
San Clemente, CA 92674-0128  
949-368-1480  
Fax 949-368-1490

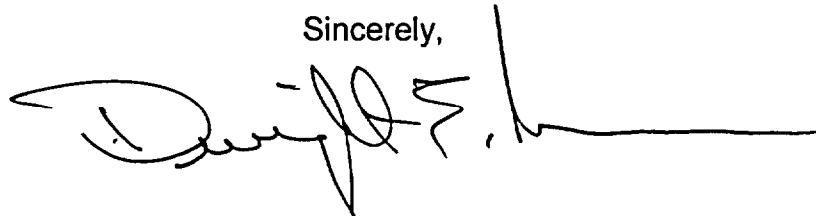
A095  
A096  
A088

The SONGS Unit-3 reactor pressure vessel head (RPVH) inspection effort has recently been completed, and consistent with the 30-day reporting requirements of NRC Bulletin 2001-01, Item 5, NRC Bulletin 2002-01, Item 2, and NRC Bulletin 2002-02, Item 2, the inspection scope and results of the SONGS Unit 3 reactor vessel head inspection are provided in the Enclosure 2. This inspection also fulfills the requirement to inspect the SONGS Unit 3 reactor vessel head imposed by a letter from the NRC to Harold B. Ray, "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)", dated November 23, 1999 (Reference 8).

In summary, a bare metal visual inspection of all 102 RPVH penetrations, a volumetric and inside diameter surface examination of all 102 RPVH penetrations, and a surface examination of all 91 control element drive mechanism (CEDM) J-groove attachment welds were performed. No primary water stress corrosion cracking was identified in any reactor vessel head penetration or attachment weld, no through-wall leakage was identified at any reactor vessel head penetration, and no indication of reactor vessel head degradation was identified during the performance of these inspections at SONGS Unit 3. Consequently, the SONGS Unit 3 reactor head required no corrective actions nor root cause evaluations.

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

Sincerely,

A handwritten signature in black ink, appearing to read "David E. L.", with a long horizontal line extending to the right.

Enclosures

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

**Enclosure 1 to the Southern California Edison (SCE)  
30-day Response to NRC Bulletins 2001-01, 2002-01 and 2002-02  
San Onofre Nuclear Generating Station Unit 3  
References**

- 1) NRC Bulletin 2001-01, "Circumferential Cracking of Reactor Pressure Vessel Head Penetration Nozzles," dated August 3, 2001.
- 2) NRC Bulletin 2002-01, "Reactor Pressure Vessel Head Degradation and Reactor Coolant Pressure Boundary Integrity," dated March 18, 2002
- 3) NRC Bulletin 2002-02, "Reactor Pressure Vessel Head and Vessel Head Penetration Nozzle Inspection Programs," dated August 9, 2002
- 4) Letter from D. E. Nunn (SCE) to the Document Control Desk (NRC) dated August 31, 2001; 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
- 5) Letter from D. E. Nunn (SCE) to the Document Control Desk (NRC) dated April 2, 2002; Subject: Docket Nos. 50-361 and 50-362, 15-day Response to NRC Bulletin 2002-01, "Reactor Pressure Vessel Head Degradation and Reactor Coolant Pressure Boundary Integrity," San Onofre Nuclear Generating Station, Units 2 and 3
- 6) Letter from D. E. Nunn (SCE) to the Document Control Desk (NRC) dated September 11, 2002; Subject: Docket Nos. 50-361 and 50-362, 30-day Response to NRC Bulletin 2002-02, "Reactor Pressure Vessel Head and Vessel Head Penetration Nozzle Inspection Programs," San Onofre Nuclear Generating Station, Units 2 and 3
- 7) Letter from A. E. Scherer (SCE) to the Document Control Desk (NRC) dated December 31, 2002; Subject: Additional Information Regarding the Southern California Edison Company 30-day Response to NRC Bulletin 2002-02, "Reactor Pressure Vessel Head and Vessel Head Penetration Nozzle Inspection Programs," San Onofre Nuclear Generating Station, Units 2 and 3
- 8) Letter from L. Raghavan, Office of Nuclear Reactor Regulation, to Harold 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)

**Enclosure 2 to the Southern California Edison (SCE)  
30-day Response to NRC Bulletins 2001-01, 2002-01 and 2002-02  
San Onofre Nuclear Generating Station Unit 3,  
Reactor Pressure Vessel Head Inspection Scope and Results**

The following Inspections were completed on San Onofre Nuclear Generating Station (SONGS) Unit-3 during the Cycle 12 refueling outage:

1. Ultrasonic testing of all of the 102 reactor pressure vessel head (RPVH) penetration Nozzle Base Material from at least 1 inch above the top of the attachment weld, to as far down as possible, 360 degrees around the penetration.
2. Eddy Current Testing of all of the 91 control element drive mechanism (CEDM) J-groove welds and approximately 50 degrees of all 10 incore instrumentation (ICI) nozzles.
3. Eddy Current Testing of all of the 102 RPVH penetrations inside diameter surfaces from at least 1 inch above the top of the attachment weld, to as far down as possible, 360 degrees around the penetration.
4. Supplementary Eddy Current Examination of the outside surface on 3 CEDM penetration tubes to resolve indeterminate ultrasonic examination results.
5. Bare Metal Visual Examination of the all of the 102 RPVH penetrations to Reactor Pressure Vessel Junctions at the top of the RPVH.

No evidence of Primary Water Stress Corrosion Cracking (PWSCC), Reactor Vessel Head degradation or boric acid leakage from the reactor coolant pressure boundary (RCPB) was detected during this inspection.

**NRC Bulletin 2001-01 Request:**

5. Addressees are requested to provide the following information within 30 days after plant restart following the next refueling outage:
  - a. a description of the extent of [vessel head penetration] VHP nozzle leakage and cracking detected at your plant, including the number, location, size, and nature of each crack detected;
  - b. if cracking is identified, a description of the inspections (type, scope, qualification requirements, and acceptance criteria), repairs, and other corrective actions you have taken to satisfy applicable regulatory requirements. This information is requested only if there are any changes from prior information submitted in accordance with this bulletin.

**SCE Response:**

No VHP nozzle leakage or cracking was detected at SONGS Unit 3.

**NRC Bulletin 2002-01 Request:**

2. Within 30 days after plant restart following the next inspection of the reactor pressure vessel head to identify any degradation, all [pressurized water reactor] PWR addressees are required to submit to the NRC the following information:
  - A. The inspection scope (if different than that provided in response to Item 1.D.) and results, including the location, size, and nature of any degradation detected,

**SCE Response:**

The scope of the inspections performed at SONGS Unit 3 in January 2003 met the scope committed to by the response to question 1.D of NRC Bulletin 2002-01. No degradation was detected.

**NRC Bulletin 2002-01 Request:**

- B. The corrective actions taken and the root cause of the degradation.

**SCE Response:**

No indications found in any penetration were determined to be related to PWSCC and there was no indication of reactor vessel head degradation identified during the performance of the volumetric, surface or visual inspections. Therefore, the SONGS Unit 3 reactor head required no corrective actions nor root cause evaluations.

**NRC Bulletin 2002-02 Request:**

2. Within 30 days after plant restart following the next inspection of the [reactor pressure vessel] RPV nozzles to identify the presence of any degradation, all PWR addressees are requested to provide:
  - A. The inspection scope and results, including the location, size, extent, and nature of any degradation (e.g., cracking, leakage, and wastage) that was detected; details of the [non-destructive examination] NDE used (i.e., method, number, type, and frequency of transducers or transducer packages, essential variables, equipment, procedure and personnel qualification requirements, including personnel pass/fail criteria); and criteria used to determine whether an indication, "shadow," or "backwall anomaly" is acceptable or rejectable.

## SCE Response:

The SONGS-3 inspection scope performed during the Cycle 12 refueling outage was consistent with SCEs response to NRC Bulletin 2002-02 with the exception that the examination equipment was unable to access more than approximately 50° around the top of the attachment weld for the incore instrumentation (ICI) penetrations. Once it was determined that the examination equipment was not capable of completing the ICI penetration attachment weld surface inspections remotely, consideration was given to performing manual penetrant testing (PT) exams on the ten perimeter ICI attachment welds. SCE calculated a dose estimate of approximately 10 Person-Rem to conduct the inspections and disposition the inspection results. A decision was made not to PT the ICI attachment weld surfaces based on the following:

- No bare metal visual inspection indications on any penetrations.
- No primary water stress corrosion cracking (PWSCC) indications in the Ultrasonic Test (UT) data for all 102 penetrations
- No PWSCC indications on any weld surface (91 CEDM welds fully inspected and the partial inspection of 10 ICI J-groove welds)
- The dose estimate of approximately 10 Person-Rem

During the inspection, four penetrations (CEDMs 5, 24, 56, and 71) were identified as “special interest” penetrations based on inconclusive Ultrasonic Test results. Of these Special Interest penetrations, three CEDM nozzles (#5, 24, and 56) required supplemental ECT examination of the penetration tube outside diameter to resolve UT indications near the tube OD surface. The fourth special interest penetration (CEDM #71) made use of the planned ECT examination of the penetration J-groove weld to resolve the UT indications. Based on the supporting ECT surface examinations, it was determined that none of these special interest penetrations exhibited evidence of PWSCC.

There were two NDE tools used to perform the inspections, the inside diameter scanner and the outside surface scanner. There are three sizes of scanners designed to fit inside each of the CEDM, ICI, and vent line penetrations. The scanning motion is in the axial direction and the probe is indexed in the circumferential direction. The CEDM and ICI probes have a total of seven transducers: six ultrasonic transducers and one eddy current coil. Channels 1 and 2 are “Time of Flight Diffraction” (TOFD) and require two transducers for each channel. The transducer characteristics are presented in the following tables:

<b>CEDM Transducer</b>				
<b>Channel</b>	<b>Size (in.)</b>	<b>Frequency</b>	<b>Orientation</b>	<b>Mode</b>
1	0.25	5 MHz	Axial	TOFD
2	0.25	5 MHz	Circumferential	TOFD
3	0.25	2.25 MHz	0°	Lateral
4	0.25	5 MHz	0°	Lateral

<b>ICI Transducer</b>				
<b>Channel</b>	<b>Size (in.)</b>	<b>Frequency</b>	<b>Orientation</b>	<b>Mode</b>
1	0.25	5 MHz	Axial	TOFD
2	0.25	5 MHz	Circumferential	TOFD
3	0.25	5 MHz	0°	Lateral
4	0.25	5 MHz	45° Axial	Shear

<b>Vent Line Transducer</b>				
<b>Channel</b>	<b>Size (in.)</b>	<b>Frequency</b>	<b>Orientation</b>	<b>Mode</b>
1	0.25	5 MHz	45° Axial	Shear

The ICI probe assembly is similar to the CEDM probe assembly with the exception that a 5 MHz 45° downward oriented transducer is employed in place of the 2.25 MHz laterally oriented transducer. The vent probe has one ultrasonic transducer, oriented axially and 45° downward, and one eddy current transducer.

The outside surface scanner is used in two configurations for CEDM penetrations, one to scan the surface of the J-groove attachment weld and the other to scan the outside surface of the CEDM from the bottom of the J-groove attachment weld to the bottom of the CEDM penetration nozzle. Another configuration is used to scan the surface of the ICI penetration J-groove attachment welds.

The eddy current transducers in all configurations are Zetec cross-wound coils and operated at both 400 kHz and 100 kHz.

For the CEDM and ICI inspections, the axial shooting TOFD (Channel 1) is the base exam capable of detecting all relevant ID and OD flaws, as demonstrated on the MRP mock-ups.

The procedures controlling essential variables, equipment, procedure and personnel qualification requirements, including personnel pass/fail criteria; and criteria used to determine whether an indication, "shadow," or "backwall anomaly" is acceptable or rejectable, were consistent with the procedures used for the MRP demonstration.

There was no degradation detected during the SONGS Unit 3 reactor head inspections.

**NRC Bulletin 2002-02 Request:**

- B. the corrective actions taken and the root cause determinations for any degradation found.

**SCE Response:**

No indications found in any penetration were determined to be related to PWSCC and there was no indication of reactor vessel head degradation identified during the performance of the volumetric, surface or visual inspections. Therefore, the SONGS Unit 3 reactor head required no corrective actions nor root cause evaluations.



State of California  
County of San Diego

Subscribed and sworn to (or affirmed) before me this 18<sup>th</sup> day of  
March, 2003.



By: *Dwight E. Nunn*  
Dwight E. Nunn  
Vice President

*Frances M. Thurber*  
Notary Public

