

May 31, 2002

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

**Subject: Docket Nos. 50-361 and 50-362
ASME Code Relief Request Regarding the Use of
Electrical Discharge Machining
San Onofre Nuclear Generating Station Units 2 and 3**

Reference: Letter from John R. Hamilton (Entergy) to the Document Control Desk
(NRC) dated March 14, 2002; Subject: Entergy Operations, Inc., Use of
Electrical Discharge Machining (EDM)

Dear Sir or Madam:

Pursuant to 10CFR50.55a(a)(3)(i), the Southern California Edison Company (SCE) proposes an alternative method to the thermal removal process requirements of ASME Section XI (Code) IWA-4320, 1989 Edition, no Addenda. SCE proposes to use an Electrical Discharge Machining (EDM) process to perform certain repairs and to prepare for Code required post repair testing if it becomes necessary during San Onofre Nuclear Generating Station (SONGS) Units 2 and 3 refueling outages. SONGS Unit 2 is currently in the refueling outage, and inspections of the reactor vessel head penetrations (RVHP) are in progress. The SONGS Unit 3 outage is scheduled to begin in January, 2003.

SONGS Units 2 and 3 are currently in the second 10-year inservice inspection (ISI) interval, and the ASME Code of record is the 1989 edition, with no addenda. Later editions of the Code have recognized the need for using processes such as Electrical Discharge Machining (EDM) and allow the alternative of qualifying the process in lieu of unnecessarily removing material mechanically from the thermally cut surfaces. The enclosed relief request RVHP - 3 "Electrical Discharge Machining" proposes to use the alternative rules of later editions of the Code to qualify the EDM process.

The qualification testing requirements of IWA-4461.4 of ASME Section XI, 1995 Edition, 1997 Addenda have been met for the proposed EDM process. The depth of the heat affected material layer on the EDM cut surfaces has been determined by metallographic examination as part of the EDM qualification and found to be superficial. SCE will perform surface treatment using abrasives to completely remove the layer of heat affected material created by the EDM process.

SCE requests approval of RVHP - 3 in the event that RVHP inspections that are scheduled during the current Unit 2 refueling outage and the Unit 3 refueling outage reveal the need for such repairs.

This relief request RVHP - 3 is similar to the relief request submitted by Entergy on March 14, 2002 (Reference).

Should you have any questions, please contact Mr. Jack Rainsberry at (949) 368-7420.

Sincerely,

A handwritten signature in black ink, appearing to read "J. Rainsberry". The signature is fluid and cursive, with a large initial "J" and "R".

Enclosure

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

ENCLOSURE

**Proposed Alternative Repair Method for
Reactor Vessel Head Penetrations at
SONGS Units 2 and 3**

**Relief Request No. RVHP - 3
Electrical Discharge Machining**

Relief Request No. RVHP - 3
Electrical Discharge Machining
SONGS Units 2 and 3

Code Class: 1

Code References: ASME Section XI, 1989 Edition, with no Addenda
ASME Section XI, 1995 Edition, 1997 Addenda

Section XI, IWB-2500-1 Examination Category: B-E

Item Numbers: B4.11, B4.12, and B4.13

System/Component: Control Element Drive Mechanism (CEDM) nozzles (91 penetrations)
Incore Instrumentation (ICI) nozzles (10 penetrations)
Reactor head vent nozzle (1 penetration)

SONGS Units: 2 and 3

Inspection Interval: Second 10-Year ISI Interval

Code Requirement:

IWA-4120 of ASME Section XI, 1989 Edition, no Addenda, states that repairs and the installation of replacement items shall be performed in accordance with the Owner's Design Specification and the original construction code of the component or system. Later editions and addenda of the construction code or ASME Section III, either in their entirety or portions thereof, and Code Cases may be used.

ASME Section XI also imposes repair requirements that supplement or amend the repair rules of the construction code. Where applicable, compliance with these additional requirements is mandatory. When performing defect removal of P-Number 3 (low alloy) or P-Number 43 (inconel) materials using a thermal removal process, the supplemental requirements of IWA-4321 or IWA-4322 (respectively) apply:

IWA-4321

When thermal removal processes are used on P-No. 3 low-alloy materials, the material shall be preheated to 200°F prior to the thermal processing and additional material shall be

subsequently removed from the thermally processed surface by a mechanical method to attain a bright metal surface. If the 200°F preheat is not applied prior to thermal processing, additional material removal by a mechanical method shall be subsequently performed on the thermally processed surface as follows: a minimum of 1/32" of additional material shall be removed from the repair cavity when repair welding is required and a minimum of 1/16" of additional material shall be removed from the repair cavity when no repair welding is required.

IWA-4322

"if thermal removal processes are used on P-No. 8 and P-No. 43 materials, a minimum of 1/16" material shall be mechanically removed from the thermally processed areas."

Proposed Alternative

Background

Reactor Vessel Head Penetration (RVHP) nozzles at SONGS 2 and 3 are considered to have a moderate susceptibility to Primary Water Stress Corrosion Cracking (PWSCC). This is based upon a susceptibility ranking of greater than 5 effective full power years (EFPY) but less than 30 EFPY from the Oconee Nuclear Station 3 time-at-temperature condition. Susceptibility rankings for SONGS 2 and 3 have been reported to the NRC in response to NRC Bulletin 2001-01 (Reference). SONGS 2 and 3 RVHP nozzles are manufactured from SB-166 or SB-167 Alloy 600 materials that are P-Number 43 inconel alloys.

Should repairs of RVHP nozzles or J-welds become necessary at either SONGS Unit 2 or Unit 3, Southern California Edison (SCE) proposes to utilize the electrical discharge machining (EDM) process to excavate PWSCC cracks or defects and may use the EDM process to remove weld crown surfaces of repair welds to facilitate performance of final non-destructive examination (NDE). Since the EDM process is a thermal removal process, a minimum of 1/16" of material must be mechanically removed from all Alloy 600 (P-43) EDM processed areas to comply with IWA-4320. The use of mechanical removal processes would have deleterious affects on the Alloy 600 RVHP head penetration nozzles and welds. This magnitude of material removal would require the use of mechanical removal processes, such as grinding or machining, which create a cold-work layer and would result in an increased susceptibility of Alloy 600 materials and their associated welds to PWSCC.

Proposed Alternative

Pursuant to 10CFR50.55a(a)(3)(i), SCE proposes an alternative to the thermal removal processing requirements of ASME XI, 1989 Edition, no Addenda, IWA-4320. Instead of mechanically removing the additional amount of material from all thermally processed areas as required by ASME XI, 1989 Edition, no Addenda, IWA-4321 and IWA-4122, SCE

proposes to use IWA-4461.4 in the 1995 Edition, 1997 Addenda of ASME Section XI which qualifies using the EDM process without the unnecessary subsequent mechanical material removal. In addition to the requirements of IWA-4461.4, SCE will completely remove the superficial layer of heat affected material created from the EDM process by performing surface treatment using abrasives when performing repair activities on RVHP head penetration nozzles or J-welds.

Basis for Proposed Alternative

The depth of the heat affected material layer on EDM cut surfaces was determined by metallographic examination of the test coupons during qualification testing and found to be ≤ 0.001 " for P-8 material, ≤ 0.002 " for P-43 material and ≤ 0.004 " for P-3 material. IWA-4320 of the 1989 Edition of ASME Section XI requires the subsequent mechanical removal of an additional 1/16" (minimum) of material from all thermally processed areas of P-Number 43 materials and 1/32" (when welding over) or 1/16" (when not welding over) P-Number 3 materials. SCE believes that the requirement to remove these amounts of material is not necessary for EDM cut surfaces and that the basis of this requirement is to ensure that thermally cut or excavated surfaces are free of unacceptable surface irregularities, oxides, and fissures that were created by the thermal removal process.

Suitability of IWA-4461.4 of ASME Section XI, 1995 Edition, 1997 Addenda

The qualification requirements of IWA-4461.4 ensure that the proposed thermal process is capable of producing a surface finish that is free of cracks or fissures and meets the required surface roughness criteria of the owner. Where the cut surface is exposed to a corrosive medium, then corrosion testing or evaluations must also be performed. The qualification requirements of IWA-4461.4 are summarized below.

- (a) The qualification test shall consist of two coupons of the same P-Number material to be cut in production.
- (b) The qualification coupons shall be cut using the maximum heat input to be used in production.
- (c) The thermally cut surface of each coupon shall be visually examined at 10X and shall be free of cracks. The Owner shall specify surface roughness acceptable for the application and shall verify that the qualification coupon meets the criterion.
- (d) Each qualification test coupon shall be cross-sectioned, and the exposed surfaces shall be polished, etched with a suitable etchant, and visually examined at 10X. All sectioned surfaces shall be free of cracks.

- (e) Corrosion testing of the thermally cut surface and heat affected zone shall be performed if the cut surface is to be exposed to a corrosive media. Alternatively, corrosion resistance of the thermally cut surface may be evaluated. The Owner shall specify the acceptance criteria.

Conclusion

10CFR50.55a(a)(3) states:

"Proposed alternatives to the requirements of paragraphs (c), (d), (e), (f), (g), and (h) of this section or portions thereof may be used when authorized by the Director of the Office of Nuclear Reactor Regulation. The applicant shall demonstrate that:

- (i) The proposed alternatives would provide an acceptable level of quality and safety, or
- (ii) Compliance with the specified requirements of this section would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety."

SCE believes that compliance with the repair rules as stated in the ASME Code, 1989 Edition with no Addenda would result in an increased susceptibility of RVHP nozzles to PWSCC. The proposed alternative of complying with ASME Section XI, 1995 Edition, 1997 Addenda and the additional commitment to completely remove the layer of heat affected material from the repair areas would provide an acceptable level of quality and safety. Therefore, we request that the proposed alternative be authorized pursuant to 10CFR50.55a(a)(3).

Reference:

Letter from D. E. Nunn (SCE) to the Document Control Desk (SCE) 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