

September 10, 2002

Mr. Harold B. Ray  
Executive Vice President  
Southern California Edison Company  
San Onofre Nuclear Generating Station  
P.O. Box 128  
San Clemente, CA 92674-0128

SUBJECT: SAN ONOFRE NUCLEAR GENERATING STATION (SONGS), UNITS 2 AND 3 - REQUEST FOR RELIEF FROM THE REQUIREMENTS OF THE AMERICAN SOCIETY OF MECHANICAL ENGINEERS (ASME) BOILER AND PRESSURE VESSEL CODE (CODE) CONCERNING USE OF ELECTRICAL DISCHARGE MACHINING (EDM) (TAC NOS. MB5251 AND MB5252)

Dear Mr. Ray:

By letter dated May 31, 2002, Southern California Edison Company (SCE) submitted Relief Request RVHP-3 from the requirements of ASME Code Section XI, Subsection IWA-4320 "Thermal Removal Process," 1989 Edition, no Addenda.

In Relief Request RVHP-3, SCE proposed using the EDM process as an alternative means to remove thermally processed material from the reactor vessel head penetrations (RVHP) should removal be necessary as a result of the Bulletin 2001-01, "Circumferential Cracking of Reactor Pressure Vessel Head Penetration Nozzles," inservice inspections at SONGS, Units 2 and 3. SCE has proposed to use the qualifying requirements of ASME Code Section XI, IWA-4461.4, 1995 Edition, 1997 Addenda, in lieu of the requirements of IWA-4320 of the 1989 Edition, no Addenda. SCE has stated that adherence to the more recent edition would meet the ASME Code's intent without the unnecessary removal of mechanical material.

The NRC staff's evaluation and conclusions are contained in the enclosed safety evaluation. The staff finds that the proposed alternative in RVHP-3 provides an acceptable level of quality and safety; therefore, pursuant to 10 CFR 50.55a(a)(3)(i), the proposed alternative is authorized for the remainder of the terms of the current operating licenses in the event that inspections during refueling outages for SONGS, Unit 2 and 3 reveal the need for RVHP repairs.

Sincerely,

*/RA/*

Stephen Dembek, Chief, Section 2  
Project Directorate IV  
Division of Licensing Project Management  
Office of Nuclear Reactor Regulation

Docket Nos. 50-361 and 50-362

Enclosure: Safety Evaluation

cc w/encl: See next page

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NAME	BPham/kes	AWang	MMcAllister	EAndruszkiewicz		SDembek
DATE				8/14/02		

San Onofre Nuclear Generating Station, Units 2 and 3

cc:

Mr. Raymond Waldo, Plant Manager  
Nuclear Generation  
Southern California Edison Company  
San Onofre Nuclear Generating Station  
P. O. Box 128  
San Clemente, CA 92674-0128

Mr. Douglas K. Porter  
Southern California Edison Company  
2244 Walnut Grove Avenue  
Rosemead, CA 91770

Mr. David Spath, Chief  
Division of Drinking Water and  
Environmental Management  
P. O. Box 942732  
Sacramento, CA 94234-7320

Chairman, Board of Supervisors  
County of San Diego  
1600 Pacific Highway, Room 335  
San Diego, CA 92101

Eileen M. Teichert, Esq.  
Supervising Deputy City Attorney  
City of Riverside  
3900 Main Street  
Riverside, CA 92522

Mr. Gary L. Nolff  
Power Projects/Contracts Manager  
Riverside Public Utilities  
2911 Adams Street  
Riverside, CA 92504

Regional Administrator, Region IV  
U.S. Nuclear Regulatory Commission  
611 Ryan Plaza Drive, Suite 400  
Arlington, TX 76011-8064

Mr. Michael Olson  
San Onofre Liaison  
San Diego Gas & Electric Company  
P.O. Box 1831  
San Diego, CA 92112-4150

Mr. Ed Bailey, Radiation Program Director  
Radiologic Health Branch  
State Department of Health Services  
Post Office Box 942732 (MS 178)  
Sacramento, CA 94327-7320

Resident Inspector/San Onofre NPS  
c/o U.S. Nuclear Regulatory Commission  
Post Office Box 4329  
San Clemente, CA 92674

Mayor  
City of San Clemente  
100 Avenida Presidio  
San Clemente, CA 92672

Mr. Dwight E. Nunn, Vice President  
Southern California Edison Company  
San Onofre Nuclear Generating Station  
P.O. Box 128  
San Clemente, CA 92674-0128

Mr. James D. Boyd, Commissioner  
California Energy Commission  
1516 Ninth Street (MS 31)  
Sacramento, CA 95814

Mr. Joseph J. Wambold, Vice President  
Southern California Edison Company  
San Onofre Nuclear Generating Station  
P.O. Box 128  
San Clemente, CA 92674-0128

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION  
RELIEF REQUEST TO USE ALTERNATIVE THERMAL REMOVAL TECHNIQUES  
FOR REACTOR VESSEL HEAD PENETRATION REPAIRS  
SOUTHERN CALIFORNIA EDISON COMPANY  
SAN ONOFRE NUCLEAR GENERATING STATION (SONGS) UNITS 2 AND 3  
DOCKET NOS. 50-361 AND 50-362

1.0 INTRODUCTION

By letter dated May 31, 2002, Southern California Edison Company (SCE/licensee), submitted Relief Request Number RVHP-3. SCE requests NRC approval for the use of an electrical discharge machining (EDM) process should repairs of reactor vessel head penetration (RVHP) nozzles or J-groove welds become necessary at SONGS, Units 2 and 3. The RVHP nozzles at SONGS Units 2 and 3 were determined to have a moderate susceptibility to primary water stress corrosion cracking (PWSCC). These nozzles were manufactured from SB-166 or SB-167 Alloy 600 materials which are P-Number 43 Inconel alloys. SCE plans to utilize the EDM process to excavate PWSCC cracks or defects and remove weld crown surfaces of repair welds to facilitate performance of final nondestructive examination (NDE). SCE proposes to qualify the EDM process in accordance with IWA-4461.4 of the 1995 Edition, 1997 Addenda of ASME Section XI to allow the use of thermal methods for metal removal without further mechanical processing.

2.0 BACKGROUND

Licensees are required per 10 CFR 50.55a to comply with ASME Code requirements. As part of their licensing basis, SONGS, Units 2 and 3 are in compliance with the 1989 Edition, no Addenda of the ASME Code. In this Edition of the Code, Section XI, IWA-4322 states, "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."

To propose an alternative to their existing ASME Code requirements, a licensee must make a submittal per 10 CFR 50.55a(a)(3). SCE specifically applied for this relief based on the provision in 10 CFR 50.55a(a)(3)(i) which states that proposed alternatives must provide an acceptable level of quality and safety.

### 3.0 EVALUATION

#### 3.1 Code Requirement

Pursuant to 10 CFR 50.55a(a)(3)(i), SCE proposes an alternative to the thermal removal requirements of IWA-4322 applicable to P-No. 43 materials. Instead of mechanically removing 1/16" of material from all thermally processed areas as required by IWA-4322, SCE proposes to qualify the EDM process in accordance with the qualification requirements from IWA-4461.4 of the 1995 Edition, 1997 Addenda of ASME Section XI. IWA-4322 requires the removal of a minimum of 1/16" of material from all thermally processed areas of P-No. 43 materials. 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.

#### 3.2 Licensee's Basis for Proposed Alternative

SCE has proposed to use the qualification requirements of IWA-4461.4, ASME Section XI, 1995 Edition, 1997 Addenda to 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, 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-No. 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.

In addition to the requirements of IWA-4461.4, SCE has also proposed to perform the following:

1. Determine the thickness of the resultant oxide layer on the cut surface by metallographic examination during the EDM process qualification.

2. Based upon the oxide thickness measurements obtained during the EDM qualification process, remove the oxide layer from cut or excavated surfaces when performing repair activities on RPV head penetration nozzles or J-welds.

Based on this proposal, the licensee concluded that their proposed alternative process would provide for an acceptable level of quality and safety with respect to the repair of the RVHP nozzles and welds.

### 3.3 Staff Evaluation

Although considered a thermal process for removing metal since it uses an electrical arc, EDM leaves an extremely small oxide layer on the cut surface of the metal remaining after the removal process. The licensee has committed to removing that oxide layer by mechanical means after metal removal by the EDM process. The amount of metal removed will be determined by the qualification requirements of IWA-4461.4, ASME Section XI, 1995 Edition, 1997 Addenda, with the additional requirements that SCE will determine the thickness of the resultant oxide layer on the cut surfaces as part of the EDM qualification. The thickness of the resultant oxide layer will be determined by metallographic examination. Based on the oxide thickness measurements obtained during the EDM process qualification, post-EDM polishing operations will be performed to ensure that the oxide surface layer is removed. Therefore, the NRC staff has concluded that the qualification requirements of IWA-4461.4, with additional proposed conditions, meet the intent of IWA-4322 to ensure that thermally cut or excavated surfaces are free of unacceptable surface irregularities, oxides, and fissures created by the thermal removal process.

The NRC staff has evaluated the licensee's request and supporting information to use Relief Request RVHP-3 for the EDM process for metal removal should repairs of RPV head penetration nozzles or J-groove welds become necessary at SONGS, Units 2 and 3 and concluded that it provides an acceptable alternative method of weld removal.

### 4.0 CONCLUSION

The NRC staff concludes that the licensee's request and supporting information to use the EDM process for metal removal, should repairs of the RVHP nozzles or J-welds at SONGS, Units 2 and 3 be necessary, provides an acceptable alternative method of metal removal for weld repair or removal of weld crown surfaces of repair welds to facilitate performance of final NDE. Therefore, pursuant to 10 CFR 50.55a(a)(3)(i), the relief request is authorized for the remainder of the terms of the current operating licenses since the applicant has demonstrated that the proposed alternative would provide an acceptable level of quality and safety.

Principal Contributor: W. Held

Date: September 10, 2002