

June 5, 2001

Mr. Gregory M. Rueger  
Senior Vice President, Generation and  
Chief Nuclear Officer  
Pacific Gas and Electric Company  
Diablo Canyon Nuclear Power Plant  
P. O. Box 3  
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SUBJECT: DIABLO CANYON NUCLEAR POWER PLANT, UNIT NO. 2 - INSERVICE  
INSPECTION RELIEF REQUEST – CONTROL ROD DRIVE MECHANISM  
CANOPY MULTIPLE PASS SEAL WELD REPAIR IN VERY HIGH RADIATION  
AREAS (TAC NO. MB1923)

Dear Mr. Rueger:

By letter dated May 11, 2001, as supplemented by letter dated May 14, 2001, Pacific Gas & Electric Company requested relief from surface examination for a control rod drive mechanism (CRDM) housing-to-canopy multiple-pass seal weld repair for Diablo Canyon Power Plant, Unit 2. The American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel (B&PV) Code, 1989 Edition with no Addenda, IWA-4000, requires liquid penetrant examination of a CRDM canopy multiple pass seal weld repair.

The staff's evaluation of the relief request is enclosed. Based on the evaluation, the staff has concluded that the Code-required surface examination of the subject canopy seal weld on CRDM H-10 would result in a hardship or unusual difficulty without a compensating increase in the level of quality and safety. Therefore, pursuant to 10 CFR 50.55a(a)(3)(ii), the licensee's proposed alternative described in Relief Request #CRDR-1 is authorized.

Sincerely,

*/RA/*

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

Docket No. 50-323

Enclosure: Safety Evaluation

cc w/encl: See next page

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Diablo Canyon Power Plant, Units 1 and 2

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SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELATED TO THE REQUEST FOR RELIEF NO. CRDR-1

SECOND TEN-YEAR INTERVAL INSERVICE INSPECTION PROGRAM PLAN

PACIFIC GAS AND ELECTRIC COMPANY

DIABLO CANYON POWER PLANT, UNIT 2

DOCKET NO. 50-323

1.0 INTRODUCTION

By letter dated May 11, 2001, as supplemented by letter dated May 14, 2001, Pacific Gas and Electric Company (the licensee) submitted for approval an inservice inspection relief request (RR) for the Diablo Canyon Power Plant (DCPP) Unit 2, from the requirements of the American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel (B&PV) Code, 1989 Edition with no Addenda, IWA-4000, which would require liquid penetrant (PT) examination of a Control Rod Drive Mechanism (CRDM) canopy multiple pass seal weld repair.

Specifically, the licensee requested relief from surface examination for a control rod drive mechanism housing-to-canopy multiple-pass seal weld repair. The relief requested is for the second 10-year inservice inspection interval at DCPP Unit 2. The licensee's basis for the request is that surface examination of the subject weld creates a hardship or unusual difficulty without a compensating increase in the level of quality and safety.

2.0 BACKGROUND

The inservice inspection of American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code (Code) Class 1, Class 2, and Class 3 components is to be performed in accordance with Section XI of the ASME Code and applicable edition and addenda as required by 10 CFR 50.55a(g), except where specific written relief has been granted by the Commission pursuant to 10 CFR 50.55a(g)(6)(i). Section 50.55a(a)(3) states in part that alternatives to the requirements of paragraph (g) may be used, when authorized by the NRC, if the licensee demonstrates that: (i) the proposed alternatives would provide an acceptable level of quality and safety, or (ii) compliance with the specified requirements would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety.

Pursuant to 10 CFR 50.55a(g)(4), ASME Code Class 1, 2, and 3 components (including supports) shall meet the requirements, except the design and access provisions and the pre-service examination requirements, set forth in the ASME Code, Section XI, "Rules for Inservice Inspection (ISI) of Nuclear Power Plant Components," to the extent practical within the

limitations of design, geometry, and materials of construction of the components. The regulations require that inservice examination of components and system pressure tests conducted during the first ten-year interval and subsequent intervals comply with the requirements in the latest edition and addenda of Section XI of the ASME Code incorporated by reference in 10 CFR 50.55a(b) twelve months prior to the start of the 120-month interval, subject to the limitations and modifications listed therein. The Code of record for the second 10-year inservice inspection (ISI) interval at DCPD Units 1 and 2 is the 1989 Edition of Section XI of the ASME Boiler and Pressure Vessel Code.

### 3.0 WELD SURFACE EXAMINATION

The component affected by the request for relief is the CRDM at location H-10, housing-to-canopy seal weld, in DCPD Unit 2. The DCPD CRDMs were designed and fabricated as ASME B&PV Code, Section III, 1965 Edition, Class A components. ASME Section XI, 1989 Edition is the Code being used for the repair of the canopy seal weld.

#### 3.1 Requirements for which Relief is Requested (as stated)

American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel (B&PV) Code, 1989 Edition with no Addenda, IWA-4000, requires repairs be performed in accordance with the owner's original construction Code of the component or system, or later editions and addenda of the Code. The Diablo Canyon Power Plant CRDMs were designed and fabricated as ASME B&PV Code, Section III, 1965 Edition, Class A components. The construction code would require [liquid penetrant] PT examination be applicable to an appurtenance to a pressure-retaining component, specifically the multiple pass seal weld repair of CRDM canopy seal welds.

#### 3.2 Licensee's Proposed Alternative (as stated)

Relief is requested to perform visual (VT-1) examinations and pressure verification testing in lieu of performance of PT examinations of multiple CRDM seal weld repairs.

The alternative CRDM canopy seal multiple pass weld repair uses a Gas Tungsten Arc Welding (GTAW) process and VT-1 examination controlled remotely. The VT-1 examination will use a video camera with approximately 8X magnification, within several inches of the weld, qualified to ensure identification of a flaw significantly smaller than the analyzed critical flaw size. Alloy 52 nickel-based weld repair material was selected rather than austenitic stainless steel as required by Code Case N-504-1, Paragraph (b), for the repair because of its resistance to stress corrosion cracking. Consequently, the ferrite requirements of Code Case N-504-1, Paragraph (e) do not apply. The repair will be documented on Form NIS-2, reviewed by the Authorized Nuclear Inspector, and maintained in accordance with the requirements for archiving of permanent plant records.

The GTAW multiple pass weld repair and VT-1 examination methods result in significantly lower radiation exposure because the equipment is remotely operated after setup. The radiation field typical for this type of repair has been measured to be between 0.7 and 1.3 rem/hour.

### 4.0 EVALUATION

The licensee has proposed to perform remote visual (VT-1) examination and pressure verification testing in lieu of the code-required PT for the multiple pass weld repair on the canopy seal weld for the CRDM at location H-10. The repair was performed in accordance with Section XI of the ASME Code, 1989 Edition, Paragraph IWA-4000. Subparagraph IWA-4120 states that repairs shall be performed in accordance with the owner's design specification and the original construction code of the component or system, and that later editions and addenda of the construction code or of Section III, either in their entirety or portions thereof, and Code Cases may be used. IWA-4120 also states that if repair welding cannot be performed in accordance with the above-mentioned requirements, the applicable alternative requirements of IWA-4500 may be used. The licensee's construction code, Section III, 1965, paragraph N-518.4 states that welds of attachments to pressure parts shall be examined by either a magnetic particle examination or a liquid penetrant examination. CRDM canopy seal weld repairs are considered to be within the jurisdiction of paragraph N-518.4. However, repair rules and criteria are not explicitly provided in ASME Section III, 1965. Therefore, the licensee applied the requirements of ASME Section III, 1989, Paragraph NB-5271.

The proposed remote visual examination would be conducted using a video camera with approximately 8X magnification, within several inches of the weld. The visual resolution of the video camera system has been demonstrated to have the capability of resolving a wire segment as narrow as 0.001-inches, which is significantly smaller than the critical flaw size calculated by the licensee for this weld. The licensee's proposed alternative is an enhanced visual examination technique with resolution and consistency much greater than that provided by the requirements of a Code (visually unaided) VT-1 and comparable to flaw sizes detectable using PT. Based on the licensee's analysis regarding critical flaw size and the ability of the remote visual examination system to resolve flaws well below the critical flaw size, reasonable assurance of the weld integrity is provided.

The welding process consists of multiple layers of weld metal welded over the existing seal weld. The multiple layers of weld metal provide a redundant CRDM nozzle-to-canopy seal. Each layer is a seal of itself. The adequacy of the seal is verified with a routine system leakage test that is performed at normal operating temperature and pressure, and held at such conditions for a minimum of four hours, prior to returning to the system to service.

The licensee's basis for performing the remote 8X enhanced visual examination (with a resolution of at least 0.001 inches) in lieu of a PT is the dose saving that is anticipated to be achieved through the use of the remote visual examination process when compared to a manual PT examination process. The licensee estimated a total dose resulting from the performance of a PT examination on the subject weld repair to be in the range of 850 to 1000 person-mrem. This dose estimate represents the total amount that could be averted for the examination since the dose associated with setting up the remote visual examination system is included in the dose associated with installing and removing the GTAW apparatus. Based on the determination above that reasonable assurance of weld integrity is provided by the use of the remote visual examination, multiple layer seal weld, and the pressure test, the dose associated with the performance of a Code-required PT, although not significant, nevertheless represents a dose which if incurred, would not result in a compensating increase in the level of quality and safety.

## 5.0 CONCLUSION

Based on the above evaluation, the staff concludes that the Code-required surface examination of the subject canopy seal weld on CRDM H-10 would result in a hardship or unusual difficulty without a compensating increase in the level of quality and safety. Therefore, pursuant to 10 CFR 50.55a(a)(3)(ii), the staff authorizes the proposed alternative for DCP Unit 2, second 10-year ISI interval.

Principal Contributor: D. Naujock

Date: June 5, 2001