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Richard J. St. Onge
Director
Nuclear Regulatory Affairs

October 2, 2009

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

Subject: Docket Nos. 50-361 and 50-362
Third Ten-Year Inservice Inspection (ISI) Interval
Relief Request ISI-3-30, Inspection of Reactor Vessel Head In-Core Instrument Nozzles
San Onofre Nuclear Generating Station, Units 2 and 3

Dear Sir or Madam,

Pursuant to 10 CFR 50.55a(a)(3)(ii), Southern California Edison (SCE) requests relief from the inspection coverage requirements of American Society of Mechanical Engineers (ASME) Code Case N-729-1, as conditioned by 10CFR50.55a(g)(6)(ii)(D)(3), for San Onofre Nuclear Generating Station (SONGS) Unit 2 and Unit 3 for the third 10-year inservice inspection (ISI) interval.

As published in the Federal Register on September 10, 2008, NRC revised 10CFR50.55a to, in part, supersede the NRC First Revised Order EA-03-009 by referencing ASME Code Case N-729-1, with conditions, in new paragraph 10 CFR50.55a(g)(6)(ii)(D). In addition, this revision to 10CFR50.55a requires that following September 1, 2009, ultrasonic examinations be performed using qualified personnel, procedures, and equipment. As discussed in the enclosed relief request, inspection of the Reactor Vessel Head In-Core Instrumentation penetrations in accordance with the revised rule would constitute a hardship. SCE proposes to perform an alternate examination which will reduce or eliminate this hardship.

SCE requests approval of the Enclosed Relief Request ISI-3-30 to support the return to service of SONGS Unit 2 from the Cycle 16 refueling outage. SCE currently anticipates that approval would be needed by December 26, 2009.

This letter and the enclosure contain no new commitments.

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NRR

P.O. Box 128
San Clemente, CA 92674

Should you have any questions, please contact Ms. Linda T. Conklin at (949) 368-9443.

Sincerely,

L Conklin for

Enclosure: as stated

cc: E. E. Collins, Regional Administrator, NRC Region IV
R. Hall, NRC Project Manager, San Onofre Units 2 and 3
G. G. Warnick, NRC Senior Resident Inspector, San Onofre Units 2 and 3

Enclosure

Relief Request ISI-3-30 Reactor Vessel Head Inspection in Accordance with 10 CFR 50.55a(a)(3)(ii) Inservice Inspection Hardship

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1. ASME Code Component(s) Affected

SONGS Unit 2: Item No. B4.20, Ten (10) In-Core Instrument (ICI) penetrations - [Reactor Pressure Vessel Head Penetrations 92 through 101]

SONGS Unit 3: Item No. B4.20, Ten (10) In-Core Instrument (ICI) penetrations - [Reactor Pressure Vessel Head Penetrations 92 through 101]

All 10 In-Core Instrument (ICI) nozzles in each Unit that are listed above are American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code, Section XI, Class 1 components.

2. Applicable Code Edition and Addenda

Code of Record for Current (Third) Ten-Year In-service Inspection (ISI) Interval, ASME Section XI, 1995 Edition, through the 1996 Addenda

The inspection requirement from which relief is being requested is ASME Code Case N-729-1, as required and conditioned by 10 CFR 50.55a(g)(6)(ii)(D).

3. Applicable Code Requirement

The inspection requirement from which relief is being requested is the nozzle tube surface exam of 50.55a(g)(6)(ii)(D)(3).

4. Reason for Request

50.55a(g)(6)(ii)(D)(3) requires a demonstrated volumetric or surface leak path assessment of ICI penetration J-groove welds and examination of essentially 100% of the Code Case N-729-1 required volume or equivalent surface of the Reactor Vessel Head (RVH) ICI nozzle tubes. This regulation further stipulates that after September 1, 2009, volumetric examination techniques must be qualified in accordance with paragraph 50.55a(g)(6)(ii)(D)(4)

Prior to the Rule change, Southern California Edison (SCE) performed volumetric examination of the ICI nozzle tube and a leak path assessment of the J-welds in accordance with NRC First Revised Order EA-03-009. Neither of these

examinations had been qualified to requirements of paragraph 10CFR50.55a(g)(6)(ii)(D). In addition, SCE supplemented these base examinations with eddy current examination (ECT) of the Inside Diameter (ID) and lower end penetration surfaces.

Volumetric J-weld leak path assessment techniques have been successfully demonstrated at the Electric Power Research Institute (EPRI). However, qualification of volumetric examination techniques in accordance with 10CFR50.55a(g)(6)(ii)(D)(4) for inspection of ICI nozzle tubes was not successful. As a result, compliance with current regulations requires leak path assessment of the ICI J-weld and examination of the required exam volume surface on the ICI nozzle tube inside, lower end and outside wetted surfaces.

SCE plans to perform a remote demonstrated leak path assessment of all ICI J-welds and remote eddy current examination of the ICI penetration inside and lower end surfaces. However, examination of the ICI nozzle tube outer surface below the J-weld cannot be performed remotely, which introduces a significant radiological hardship. In order to maintain radiological dose as low as reasonably achievable, SCE proposes to perform an alternative examination such that examination of the ICI nozzle tube outside wetted surface would not provide a compensating increase in the level of quality and safety.

The ICI penetration tube outside wetted surface is formed by a short extension of the tube below the J-weld. The length of this extension varies azimuthally around the penetration and from one penetration to another. These variations were introduced by tolerances in allowable J-weld reinforcement during original fabrication. Dimensional variations and the elliptical cross-section which results from conforming the lower end to the spherical head surface has impeded development of remotely controlled examinations.

Manually delivered eddy current examination of the nozzle tube Outside Diameter (OD) can be performed in $1/4^{th}$ inch increments using a hand held transducer. The estimated extension of San Onofre nozzle tubes below the ICI J-weld is approximately 1-inch. Surface coverage in accordance with Code Case N-729-1 would require several scans of each penetration for a total estimated worker exposure of approximately 5 Rem to examine all ICI locations. Liquid penetrant examination of the same surfaces is expected to result in significantly larger personnel exposures.

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5. Proposed Alternative and Basis for Use

SCE proposes to remotely perform a demonstrated volumetric ICI J-weld leak path assessment and qualified eddy current surface examination of the interior diameter and the bottom surfaces of the penetration nozzle consistent with current regulations. The required examination of the ICI penetration tube outer surface will not be performed. Instead, SCE proposes to supplement the demonstrated and qualified examinations by performing volumetric examination of the ICI nozzle tube required volume using ultrasonic equipment and techniques consistent with previous RVH examinations as described below. Improvements in data acquisition and analysis that were developed during qualification of Control Element Drive Mechanism (CEDM) volumetric examinations will be incorporated in the proposed ICI examinations where applicable.

The proposed alternate volumetric examination will include Time-of-Flight-Diffraction (TOFD) examination from the ID surface and from the lower end surface similar to the areas previously examined under NRC First-Revised Order EA-03-009. As described in the basis below, examination of essentially 100% of the penetration tube volume extending downward from the J-weld root to one inch below the J-weld root is necessary for ensuring quality and safety are not compromised. Therefore, Ultrasonic TOFD data collected over this volume will be reviewed for consistency with current data quality standards to ensure exam quality. If the TOFD data in this volume is determined to have unacceptable quality, then a manually delivered, compensatory eddy current examination of the ICI penetration tube OD surface will be performed in that region. The compensatory eddy current examination will include approximately $1/4^{th}$ inch of penetration surface adjacent to the lower extent of the J-weld fillet. As described below, verification that this surface is free from Primary Water Stress Corrosion Cracking (PWSCC) provides reasonable assurance that the structural integrity of the nozzle is acceptable. Performance of additional surface examination of the ICI nozzle tube outer surface below the J-weld would not provide a compensating increase in the level of quality and safety.

Ultrasonic technology and tooling for examination of CEDMs and ICI penetration tubes are equivalent. The significant difference between successful qualification of CEDM and ICI volumetric examinations techniques was due to penetration geometry and the effects of weld induced distortion in low restraint areas of the lower end of ICI penetrations. Although ultrasonic coupling in lower regions of ICI penetrations has been difficult in past examinations, that difficulty has not precluded successful volumetric examinations of the San Onofre Units 2 and 3 reactor vessel heads. Differences between as-built San Onofre penetrations and the qualification mockups and equipment configuration (probe alignment

techniques, etc.) may have contributed to qualification failure on ICI penetrations. Despite the failure to qualify volumetric examination of ICI penetrations, those techniques remain capable of detecting defects when sound ultrasonic data is available.

Basis for Proposed Alternate Examination Coverage

The short extension of the ICI penetration below the J-weld has no structural function and cracks that are confined to this volume have no significance to quality or public safety. For PWSCC to develop into a safety significant defect, a crack must grow upward through the penetration volume adjacent to the J-weld and extend above it, or it must grow through the J-weld itself. The risk of PWSCC within the J-weld is managed at San Onofre by using demonstrated Leak Path Assessment (LPA) examinations in accordance with 10CFR50.55(a).

The time required for a through-thickness, axial crack to grow from the bottom of an ICI penetration tube upward to reach the root of the J-weld has been calculated using finite element flaw tolerance methodologies documented in WCAP-15819-P revision 1 (Reference 2). That reference was originally provided for NRC review in a response to a Request for Additional Information associated with SCE Relaxation Requests 1 and 2 (Reference 3). Figures C-5 and C-6 of that document can be used to estimate the axial position below which an undetected, through thickness crack would not reach the J-weld root during one operating cycle [1.75 Effective Full Power Years (EFPY)]. Based on these figures, through-thickness axial PWSCC located at least one inch below the top of the weld will not grow to reach the J-weld root within one operating cycle. This is the distance that must be examined to ensure that quality and safety will not be challenged between examinations. Surface examinations of the ID and bottom end of the penetration preclude the possibility of through thickness cracks. Therefore, the through-thickness crack growth rates assumed in this analysis conservatively bound potential crack growth.

Although the volumetric examination techniques proposed for ICI penetrations failed to be qualified at EPRI, exam data quality at and above ICI J-welds has been acceptable at San Onofre. The qualifications performed at EPRI for CEDM volumetric examinations identified improvements to the previous examination techniques. SCE proposes to perform volumetric examination of ICI penetrations incorporating technique improvements developed for CEDMs. These examinations will significantly reduce the possibility of undetected PWSCC. All acceptable ultrasonic data produced during the proposed alternate examinations will be analyzed for indication of defects. If EPRI-qualified analysts determine that volumetric TOFD data quality over the 1-inch length below the J-weld root is deficient, then compensatory examination of the outside tube surface will be

performed in that area. The manually deployed compensatory eddy current examination will only include the outside penetration tube surface that is within 1/4th inch of the J-weld fillet. This will minimize radiological exposure while providing reasonable assurance that PWSCC will not reduce quality or safety during the subsequent operating cycle. Compensatory action will not be taken for degraded TOFD data that is outside of the target volume at and below the J-weld root.

The proposed alternatives will minimize the radiological consequence of examinations at San Onofre Units 2 and 3 to as low as reasonably achievable while providing confirmation that the structural integrity of the ICI nozzle tube is acceptable.

In addition to the proposed alternate and compensatory examinations, SCE has implemented a program for enhanced monitoring of RCS leakage consistent with the September 2006 Pressurized Water Reactor Owners Group industry initiatives. This leakage monitoring program is designed to detect and respond to increased RCS leakage at levels well below Technical Specification limits.

6. Duration of Proposed Alternative

The proposed alternative will apply to the existing RPVH for the remainder of the current SONGS Unit 2 and Unit 3 third 10-year ISI interval. The third 10-year interval began on August 18, 2003 and is scheduled to end on August 17, 2013. SCE currently plans to install replacement Reactor Vessel Heads in the Units 2 and 3 Cycle 17 refueling outages, currently scheduled for fall of 2011 and 2012. The replacement heads incorporate design changes that will remove the need for relief.

7. Precedents

None

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8. References

1. First Revised NRC Order (EA-03-009) Establishing Interim Inspection Requirements for Reactor Pressure Vessel Heads at Pressurized Water Reactors, issued on February 20, 2004 [ML 040220181]

2. WCAP-15819-P, Revision 1, "Structural Integrity Evaluation of Reactor Vessel Upper Head Penetrations to Support Continued Operation: San Onofre Units 2 and 3," dated January 2004

3. Letter from A. E. Scherer (SCE) to Document Control Desk (NRC) dated February 9, 2004, Subject: Response to NRC Request for Additional Information Regarding Relaxation Requests 1 and 2 for Reactor Pressure Vessel Head Penetration Inspection Requirements in Nuclear Regulatory Commission Order EA-03-009 for San Onofre Nuclear Generating Station (SONGS) Units 2 and 3 (TAC Nos. MC1540, MC1541, MC1542, and MC1543) [ML 040500598]