September 12, 2000

Mr. J. A. Scalice
Chief Nuclear Officer and
Executive Vice President
Tennessee Valley Authority
6A Lookout Place
1101 Market Street
Chattanooga, TN 37402-2801

SUBJECT: SEQUOYAH NUCLEAR PLANT, UNITS 1 AND 2 -SECOND 10-YEAR INTERVAL INSERVICE INSPECTION PROGRAM PLAN REQUESTS FOR RELIEF 1-ISI-11, 1-ISI-12, 1-ISI-13, 2-ISI-11, 2-ISI-12, AND 2-ISI-13 (TAC NOS. MA9069 AND MA9070)

Dear Mr. Scalice:

By letter dated October 5, 1999, the Tennessee Valley Authority (TVA) submitted a request for relief from the American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code, Section XI repair requirements under Title 10, *Code of Federal Regulations* (10 CFR), Section 50.55a(g)(5)(iii) for the Sequoyah Nuclear Plant, Units 1 and 2. The request proposed second 10-Year Interval Inservice Inspection (ISI) Program Plan Requests for Relief designated as 1-ISI-11, 1-ISI-12, 1-ISI-13, 2-ISI-11, 2-ISI-12, and 2-ISI-13, all involving ASME Code-required weld inspections that cannot be totally completed because of component configurations. TVA, in its letter, stated that Code examination of the subject welds is limited due to design configuration or material properties and requested relief for the second 10-year ISI interval.

The U.S. Nuclear Regulatory Commission staff, with technical assistance from its contractor, the Idaho National Engineering and Environmental Laboratory (INEEL), has completed its review of the information provided in TVA's October 5, 1999, letter. The staff's evaluation and conclusions are contained in the enclosed Safety Evaluation (Enclosure 1). Enclosure 2 is the INEEL Technical Letter Report, which discusses the details of each relief request. The subject relief requests are summarized in tabular form as Enclosure 3. For the items discussed in Requests for Relief 1-ISI-11, 1-ISI-12, 1-ISI-13, 2-ISI-11, 2-ISI-12, and 2-ISI-13, the Code requirements are impractical to meet, and reasonable assurance of the structural integrity of the subject components has been provided by the examinations that have been completed. Therefore, relief is hereby granted pursuant to 10 CFR 50.55a(g)(6)(i). The staff has determined that granting relief pursuant to 10 CFR 50.55a(g)(6)(i) is authorized by law and will not endanger life or property, or the common defense and security and is otherwise in the public interest giving due consideration to the burden upon the licensee that could result if the requirements were imposed on the facility.

Please contact Mr. Ronald W. Hernan at (301) 415-2010 should you have any questions.

Sincerely,

***/RA/***

Richard P. Correia, Chief, Section 2
Project Directorate II
Division of Licensing Project Management
Office of Nuclear Reactor Regulation

Docket Nos. 50-327 and 50-328

Enclosures: As stated

cc w/enclosures: See next page

Please contact Mr. Ronald W. Hernan at (301) 415-2010 should you have any questions.

Sincerely,

***/RA/***

Richard P. Correia, Chief, Section 2
Project Directorate II
Division of Licensing Project Management
Office of Nuclear Reactor Regulation

Docket Nos. 50-327 and 50-328

Enclosures: As stated

cc w/enclosures: See next page

DISTRIBUTION:
PUBLIC (PUBLIC)
PDII-2 Reading (Hardcopy)
HBerkow (RidsNrrDlpmLpdii)
RCorreia (RidsNrrDlpmLpdii2)
BClayton (Hardcopy)
RHernan (Hardcopy)
TMcLellan (RidsNrrDeEmcb)
ACRS (RidsAcrsAcnwMailCenter)
D. Lange, EDO (RidsEdo MailCenter)
PFredrickson, RII (RidsRgn2MailCenter)
OGC (RidsOgcRp)
GHill (4) (Hardcopy)
TSullivan (RidsNrrDeEmcb)

**Accession Number ML003749239**

| OFFICE | PDII-3/PM | | PDII-3/LA | E | OGC | | PDII-2/SC | |
|---|---|---|---|---|---|---|---|---|
| NAME | RHernan | | BClayton | | KBarber | | RCorreia | |
| DATE | 08/21/00 | | 09/12/00 | | 08/22/00 | | 09/07/00 | |

OFFICIAL RECORD COPY

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

SECOND 10-YEAR INTERVAL INSERVICE INSPECTION

REQUESTS FOR RELIEF 1-ISI-11, 1-ISI-12, 1-ISI-13, 2-ISI-11, 2-ISI-12, AND 2-ISI-13

SEQUOYAH NUCLEAR PLANT, UNITS 1 AND 2

TENNESSEE VALLEY AUTHORITY

DOCKET NUMBERS: 50-327 AND 50-328

## 1.0 INTRODUCTION

Inservice inspection of the American Society of Mechanical Engineers (ASME) Code Class 1, 2, and 3 components is performed in accordance with Section XI of the ASME Boiler and Pressure Vessel (B&PV) Code and applicable addenda as required by Title 10, *Code of Federal Regulations* (10 CFR), Section 50.55a(g), except where specific written relief has been granted by the Commission pursuant to 10 CFR 50.55a(g)(6)(i). It is stated in 10 CFR 50.55a(a)(3) that alternatives to the requirements of paragraph (g) may be used, when authorized by the NRC, if (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 10-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) 12 months prior to the start of the 120-month interval, subject to the limitations and modifications listed therein. The Code of record for the Sequoyah Nuclear Plant, Units 1 and 2, second 10-year ISI interval is the 1989 Edition of the ASME Boiler and Pressure Vessel Code.

## 2.0 EVALUATION

The U.S. Nuclear Regulatory Commission (NRC) staff, with technical assistance from the Idaho National Engineering and Environmental Laboratory (INEEL), has reviewed the information concerning ISI program Requests for Relief 1-ISI-11, 1-ISI-12, 1-ISI-13, 2-ISI-11, 2-ISI-12, and

2-ISI-13, for Sequoyah Nuclear Plant, Units 1 and 2, which was submitted by the Tennessee Valley Authority (TVA, the licensee) in a letter dated October 5, 1999.

The NRC staff adopts the evaluations and recommendations for granting relief contained in the enclosed Technical Letter Report (TLR) prepared by INEEL (Enclosure 2). Enclosure 3 lists each relief request and the status of approval.

For the Sequoyah Nuclear Plant, Units 1 and 2, the staff determined that for Requests for Relief 1-ISI-11, 1-ISI-12, 1-ISI-13, 2-ISI-11, 2-ISI-12, and 2-ISI-13 the Code requirement of 100% volumetric examination is impractical to perform for the welds discussed in each of the requests because of access limitations. To gain access for complete examination of these welds would require design modifications. Imposition of this requirement would create an undue burden on the licensee.

For the welds contained in Requests for Relief 1-ISI-11, 1-ISI-13, 2-ISI-11 and 2-ISI-13, the licensee has examined a significant portion of these welds, obtaining 15% through 75% coverage. In addition, the licensee obtained 100% coverage for the code required surface examinations for the subject welds. For Requests for Relief 1-ISI-12 and 2-ISI-12, the licensee has examined a significant portion of the subject weld's surface, obtaining 77% and 83% respectively. Based on the coverage obtained, the staff determined that any existing patterns of degradation would have been detected by the examinations completed, and the examinations performed provide reasonable assurance of structural integrity of the subject welds.

## 3.0 CONCLUSION

The Sequoyah Nuclear Plant, Units 1 and 2, Requets for Relief 1-ISI-11, 1-ISI-12, 1-ISI-13, 2-ISI-11, 2-ISI-12, and 2-ISI-13 to the Code requirements have been reviewed by the staff with the assistance of its contractor, INEEL. The TLR provides INEEL's evaluation of these requests for relief. The staff has reviewed the contractor's TLR and adopts the evaluations and recommendations for granting relief for Requests for Relief 1-ISI-11, 1-ISI-12, 1-ISI-13, 2-ISI-11, 2-ISI-12, and 2-ISI-13.

The staff concludes that certain inservice examinations cannot be performed to the extent required by the Code at the Sequoyah Nuclear Plant, Units 1 and 2. For the items discussed in Requests for Relief 1-ISI-11, 1-ISI-12, 1-ISI-13, 2-ISI-11, 2-ISI-12, and 2-ISI-13, the Code requirements are impractical to meet, and reasonable assurance of the structural integrity of the subject components has been provided by the examinations that have been completed. Therefore, relief is granted pursuant to 10 CFR 50.55a(g)(6)(i). The staff has determined that granting relief pursuant to 10 CFR 50.55a(g)(6)(i) is authorized by law and will not endanger life or property, or the common defense and security and is otherwise in the public interest giving due consideration to the burden upon the licensee that could result if the requirements were imposed on the facility.

Principal Contributor: Thomas K. McLellan, EMCB/DE

Date: September 12, 2000

**TECHNICAL LETTER REPORT**
**ON SECOND 10-YEAR INTERVAL INSERVICE INSPECTION**
**REQUESTS FOR RELIEF**
**FOR**
**TENNESSEE VALLEY AUTHORITY**
**SEQUOYAH NUCLEAR PLANT, UNITS 1 AND 2**
**DOCKET NUMBERS: 50-327 AND 50-328**

## 1. INTRODUCTION

By letter dated October 5, 1999, the licensee, Tennessee Valley Authority (TVA, the licensee), submitted requests for relief from the requirements of the American Society of Mechanical Engineers (ASME) Code, Section XI, for the Sequoyah Nuclear Plant, Units 1 and 2. These relief requests are for the second 10-year inservice inspection (ISI) interval. The Idaho National Engineering and Environmental Laboratory (INEEL) staff's evaluation of the subject requests for relief are in the following section.

## 2. EVALUATION

The information provided by TVA in support of the requests for relief from Code requirements has been evaluated and the bases for disposition are documented below. The Code of Record for the Sequoyah Nuclear Plant, Units 1 and 2, second 10-year ISI interval, which began December 16, 1995, is the 1989 Edition of Section XI of the ASME Boiler and Pressure Vessel Code.

### 2.1 Request for Relief No. 1-ISI-11, Examination Category C-B, C2.21, Nozzle-to-Shell (or Head) Welds

Code Requirement: Examination Category C-B, Item C2.21 requires 100% surface and volumetric examination of nozzle-to-shell (or head) welds in Class 2 vessels as defined by Figure IWC-2500-4(a) or (b). In the case of multiple vessels of similar design, size, and service, the required examinations may be limited to one vessel or distributed among the vessels.

Licensee's Code Relief Request: In accordance with 10 CFR 50.55a(g)(5)(iii), the licensee requested relief from the Code-required volumetric examination of Residual Heat Removal Heat Exchanger (1A) Nozzle-to-Shell Weld, RHRW-14-A.

Licensee's Basis for Requesting Relief (as stated):
"The design configuration of the RHR heat exchanger nozzle, shell, and component support precludes an ultrasonic examination of the required volume for the following nozzle-to-shell weld RHRW-14-A. The design configuration limits ultrasonic examination to approximately 32%, as calculated in accordance with TVA procedure N-GP-28 (enclosed), of the required examination volume of the weld.

"The design configuration of the subject nozzle-to-head welds precludes ultrasonic examinations of essentially 100% of the required examination volume. In order to examine the weld in accordance with the code requirement, the RHR heat exchanger would require extensive design modifications. The physical arrangement of weld RHRW-14-A, in conjunction with the small radius of curvature of the outside wall surfaces of the nozzle, precludes ultrasonic examination from the nozzle side. For scans normal to the weld on the vessel shell side, examinations are limited circumferentially due to large support pads attached by fillet welds at two locations (90 and 270 degree nozzle azimuths) and the close proximity of heat exchanger weld RHRW-16-A (tube sheet-to-head weld at 0 degree nozzle azimuth) and heat exchanger weld RHRW-17-A (bottom head-to-shell weld at 180 degree nozzle azimuth). The axial scan area is limited due to the close proximity of the support pad fillet weld. A total of four areas (24% of total circumference) are unrestricted for one side examination coverage. Total ultrasonic examination coverage for weld RHRW-14-A was approximately 32% of the required code coverage for the weld.

"Radiographic examination from the outside surface as an alternate volumetric examination method was determined to be impractical due to the component thickness and a divider plate inside the component head affecting radiographic quality. Performing radiographic examination from the inside surface of the heat exchanger would require placing a radiographic source near the center of the head. This would require extensive modifications in order to gain access to the inside for source placement. The heat exchanger would require disassembly at the tube-sheet and the component moved in an upward direction for approximately two feet. Thus, additional radiography and/or ultrasonics examinations from the inner surface, to gain any additional coverage, are also impractical.

"Performance of an ultrasonic volumetric examination of essentially 100% of the required volume of the RHR heat exchanger full penetration nozzle-to-shell weld RHRW-14-A would be impractical. In addition, it is impractical to perform other volumetric examinations which may increase examination coverage. The surface examination of 100% of the weld areas and adjacent metal, and a maximum extent practical ultrasonic examination of the subject weld provide reasonable assurance of an acceptable level of quality and safety. Significant degradation, if present, would have been detected during the surface and ultrasonic examinations that were performed on the subject weld. As a result, assurance of structural integrity for this weld is provided by the examinations that were performed.

"Therefore, pursuant to 10 CFR 50.55a(g)(5)(iii), it is requested that relief be granted for the second inspection interval."

Licensee's Proposed Alternative Examination (as stated):
"In lieu of the code required 100% ultrasonic examination, an ultrasonic examination was performed on accessible areas to the maximum extent practical given the physical limitations of the nozzle-to-shell weld. The code required

surface examination (liquid penetrant) of 100% of the nozzle-to-shell weld was also performed. Refer to Attachment 1[1] for examination data reports."

Evaluation: The Code requires 100% surface and volumetric examination of Class 2 pressure vessel nozzle-to-shell welds. However, sketches, photographs, and examination reports provided by the licensee show that complete volumetric examination of the subject RHR heat exchanger nozzle weld is limited due to the nozzle design configuration (extreme nozzle to shell radius). Therefore, the Code examination requirements are impractical for this weld. To meet the Code requirements, the subject component would require significant engineering redesign and modification to allow access to the subject weld. Imposition of the Code requirements would result in a considerable burden on the licensee.

The licensee was able to obtain 32% of the required volumetric coverage. Additionally, the Code-required 100% surface examination was performed on the nozzle weld. Therefore, based on the volume examined and the Code-required surface examinations performed, it is concluded that significant patterns of degradation, if present, would have been detected and reasonable assurance of the structural integrity of the pressure-retaining nozzle weld has been provided.

Based on the impracticality of meeting the Code examination requirements for the subject weld, and the reasonable assurance provided by the examinations that were completed, it is recommended that relief be granted pursuant to 10 CFR 50.55a(g)(6)(i).

2.2 Request for Relief No. 1-ISI-12, Examination Category C-C, Item C3.30, Integrally Welded Attachments to Pumps

**Note:** The licensee is using Code Case N-509, Alternative Rules for the Selection and Examination of Class 1, 2, and 3 Integrally Welded Attachments, in lieu of the requirements of the Code for the examination of Class 1, 2, and 3 integrally welded attachments. Code Case N-509, has been approved conditionally for general use in Regulatory Guide 1.147, Rev. 12.

Code Requirement: Code Case N-509, Examination Category C-C, Item C3.30, requires a 100% surface examination as defined by Figure IWC-2500-8 for pump integrally welded attachments. A 10% sample of the welded attachments associated with the component supports are selected for examination.

Licensee's Code Relief Request: In accordance with 10 CFR 50.55a(g)(5)(iii), the licensee requested relief from the Code-required surface examinations of the integral welded attachments located on the Centrifugal Charging Pump 1A-A.

Licensee's Basis for Requesting Relief (as stated):

---

1. Attachments, drawings, photographs, and sketch's submitted by the licensee are not included in this report.

"The design configuration of the centrifugal charging pump and integrally welded attachments precludes a surface examination of the required area of the integrally welded attachments CCPH-1A-A-IA. The design configuration limits surface examination to approximately 77%, as calculated in accordance with TVA procedure N-GP-28, of the required area.

"The design configuration of the subject attachment welds precludes surface examination of essentially 100% of the required examination area. In order to examine the welds in accordance with the code requirement, the centrifugal charging pump would require extensive redesign and modification to allow access to the bottom side of the attachment lugs. Connecting piping would have to be disconnected and the pump disassembled and lifted to allow access to the remaining 23% examination area. The weld joint detail consists of a full penetration weld with fillet weld reinforcement. The attachment is circumferentially welded with a fillet weld. The bottom side of the attachment is inaccessible due to a support that bolts the pump to the supporting frame. The total surface examination coverage for integral attachment welds CCPH-1A-A-IA was approximately 77% of the required code coverage. Other nondestructive examination (NDE) techniques were considered, but due to the location of the inaccessible area, the same limitations would be encountered.

"Performing a surface examination of essentially 100% of the required area of integrally welded attachments CCPH-1A-A-IA would be impractical. In addition, it is impractical to perform other NDE examinations. The maximum extent practical surface examination of the weld area and adjacent metal of the subject weld provides reasonable assurance of an acceptable level of quality and safety. Significant degradation, if present, would have been detected during the surface examination that was performed on the subject integrally welded attachments. As a result, assurance of structural integrity for the integrally welded attachments is provided by the examination that was performed.

"Therefore, pursuant to 10 CFR 50.55a(g)(5)(iii), it is requested that relief be granted for the second inspection interval."

Licensee's Proposed Alternative Examination (as stated):
"In lieu of the code required 100% surface examination, a liquid penetrant examination was performed on accessible areas to the maximum extent practical given the physical limitations of the subject integrally welded attachments."

Evaluation: The Code (via Code Case N-509) requires 100% surface examination of the subject integrally welded attachments. Through review of sketches, photographs and examination reports submitted by the licensee it is determined that complete examination coverage is impractical due to restricted access caused by the design configuration of the pump. To meet the Code requirements, the integral attachments and/or interfering structures would require design modification and/or removal to allow access to the subject welds. Therefore, surface examination of the subject integral attachment welds is impractical to perform to the extent required by the Code.

Imposition of this requirement would create a considerable burden on the licensee without a compensating increase in safety.

The licensee has completed a significant portion of the Code-required surface examinations (77%) for the subject components. Based upon the surface coverage obtained, it is reasonable to conclude that existing patterns of degradation, if present, would have been detected, thus providing reasonable assurance of the structural integrity of the subject integral attachment welds. Therefore, it is recommended that relief be granted pursuant to 10 CFR 50.55a(g)(6)(i).

2.3 Request for Relief No. 1-ISI-13, Examination Category B-F, Items B5.70, Steam Generator Pressure Retaining Dissimilar Metal Welds

Code Requirement: Examination Category B-F, Item B5.70 requires 100% volumetric and surface examination, as defined by Figure IWB-2500-8, for steam generator nozzle-to-safe end dissimilar metal welds 4-inch NPS or larger.

Licensee's Code Relief Request: In accordance with 10 CFR 50.55a(g)(5)(iii), the licensee requested relief from the Code required volumetric examinations for the following steam generator nozzle dissimilar welds:

| | |
|---|---|
| RC-02-SE | Steam Generator Nozzle-to-safe End Butt Weld |
| RC-03-SE | Steam Generator Nozzle-to-safe End Butt Weld |

Licensee's Basis for Requesting Relief (as stated):
"The design configuration of the steam generator nozzle safe-ends and materials used in fabrication of the reactor coolant piping preclude an ultrasonic examination of the required volume of pressure retaining circumferential dissimilar metal welds RC-02-SE and RC-03-SE. The design configuration and materials used in fabrication limit ultrasonic examination to approximately 75% of weld RC-02-SE and approximately 75% of weld RC-03-SE, as calculated in accordance with TVA procedure N-GP-28.

"The weld joint detail for welds RC-02-SE and RC-03-SE consists of a pipe elbow welded to a steam generator primary head single piece cas[t]ing. The pipe elbow is static cast CF8M material. The steam generator bottom head is a single piece casting (SA-216 GR WCC) with integral cast nozzles. The nozzle safe end welds consist of approximately 0.5 inch layer of TY-308-L weld material (buttering) applied to the nozzle weld edge preparation surface. The examinations are limited due to the design configuration and the effects of the anisotropic coarse grain structure of cast stainless material and the weld joint configuration which limit search unit contact and movement.

"The total ultrasonic examination coverage for RC-02-SE and RC-03-SE was approximately 75% of the required code coverage for each weld. Due to the anisotropic coarse grain structure of cast stainless CF8M materials, the examination was limited to the ½ vee technique using refracted longitudinal waves. Circumferential scans for both welds were unlimited. Both welds received 100% coverage from one side scanning in the axial direction with the

sound beam directed toward the steam generator. No scans were performed from the steam generator side in the axial direction due to the steam generator nozzle weld taper interference; therefore, 0% coverage was obtained from this direction. It is reasonable to assume that circumferential flaws, if present, would be detected to the degree comparable with industry standards for such materials.

"Radiographic examination, as an alternate volumetric examination method, was determined to be impractical due the high radiation doses that would be received while placing the radiography source inside the steam generator. It is estimated the NDE examiners would receive a dose of 2050 mRem per weld performing a radiographic examination (NDE examiners would receive a dose of 300 mRem per weld performing an ultrasonic examination). Radiography from the outside surface with a Co-60 source would be impractical due to high surface dose rates (150 to 200 mRem). Long exposure times would cause an unacceptable fog level on the film.

"Westinghouse plants have no history of pipe cracking failure in the reactor coolant primary loop. For stress corrosion cracking (SCC) to occur, the following three conditions must exist simultaneously: high tensile stresses, a susceptible material, and a corrosive environment. The potential for SCC is minimized in Westinghouse pressurized water reactor by material selection and prevention of a corrosive environment (Reference Westinghouse RCS Piping Flawbase Handbook, WCAP-13670).

"The examination of the steam generator dissimilar metal butt welds during the inspection interval, in accordance with ASME Section XI Code, provides reasonable assurance that significant degradation, if present, would be detected.

"Performance of an ultrasonic volumetric examination of essentially 100% of the required volume pressure retaining dissimilar metal welds RC-02-SE and RC-03-SE in the reactor coolant main loop piping is impractical. In addition, it is impractical to perform other volumetric examinations, which may increase examination coverage. The surface examination of 100% of the weld area, adjacent metal, and a maximum extent practical ultrasonic examination of the subject welds provide reasonable assurance of an acceptable level of quality and safety. Significant degradation, if present, would have been detected during the ultrasonic and surface examinations that were performed on he subject welds. As a result, assurance of structural integrity for these welds is provided by the examinations that were performed.

"Therefore, pursuant to 10 CFR 50.55a(g)(iii), it is requested that relief be granted for the second inspection interval."

Licensee's Proposed Alternative Examination (as stated):
"In lieu of the code required 100% ultrasonic examination, an ultrasonic examination was performed on accessible areas to the maximum extent practical given the physical limitations of the subject welds. A surface examination (liquid penetrant) of 100% of welds RC-02-SE and RC-03-SE was also performed."

Evaluation: The Code requires 100% surface and volumetric examination for dissimilar metal safe-end welds. However, complete volumetric examination of the subject welds was limited by component geometry (extreme nozzle taper) and material properties (course grain structure of cast stainless steel). As supported by sketches, and examination reports attached to the licensee's submittal, these restrictions limit access and make the Code volumetric coverage requirements impractical for the subject dissimilar metal welds. To meet the Code coverage requirements, design modifications would be necessary to provide access for examination. Imposition of the Code requirements would result in an undue hardship on the licensee.

The licensee has examined a significant portion (75%) of each of the subject dissimilar metal welds, in addition to a complete surface examination. As a result, any existing patterns of degradation would have been detected and reasonable assurance of the continued structural integrity has been provided. Therefore, it is recommended that relief be granted pursuant to 10 CFR 50.55a(g)(6)(i).

2.4 Request for Relief No. 2-ISI-11, Examination Category C-B, C2.21, Nozzle-to-Shell (or Head) Welds

Code Requirement: Examination Category C-B, Item C2.21 requires 100% surface and volumetric examination of nozzle-to-shell (or head) welds in Class 2 vessels as defined by Figure IWC-2500-4(a) or (b). In the case of multiple vessels of similar design, size, and service, the required examinations may be limited to one vessel or distributed among the vessels.

Licensee's Code Relief Request: In accordance with 10 CFR 50.55a(g)(5)(iii), the licensee requested relief from the Code-required volumetric examination of Residual Heat Removal Heat Exchanger (1A) Nozzle-to-Shell Weld, RHRW-14-A.

Licensee's Basis for Requesting Relief (as stated):
"The design configuration of the RHR heat exchanger nozzle, shell, and component support precludes an ultrasonic examination of the required volume for the following nozzle-to-shell weld RHRW-14-A. The design configuration limits ultrasonic examination to approximately 15%, as calculated in accordance with TVA procedure N-GP-28, of the required examination volume of the weld. This percent of coverage is slightly different than the Unit 1 32% of coverage for the same weld area due to the physical configuration in the Unit 2 components.

"The design configuration of the subject nozzle-to-head welds precludes ultrasonic examination of essentially 100% of the required examination volume. In order to examine the weld in accordance with the code requirement, the RHR heat exchanger would require extensive design modifications. The physical arrangement of weld RHRW-14-A, in conjunction with the small radius of curvature of the outside wall surface of the nozzle, precludes ultrasonic examination from the nozzle side. For scans normal to the weld on the vessel shell side, examinations are limited circumferentially due to large support pads attached by fillet welds at two locations (90 and 270 degree nozzle azimuths) and the close proximately of heat exchanger weld RHRW-16-A (tube sheet-to-

head weld at 0 degree nozzle azimuth) and heat exchanger weld RHRW-17-A (bottom head-to-shell) weld at 180 degree nozzle azimuth). The axial scan area is limited due to the close proximity of the support pad fillet weld. A total of four areas (24% of total circumference) are unrestricted for one side examination coverage. Total ultrasonic examination coverage for weld RHRW-14-A was approximately 15% of the required code coverage for the weld.

"Radiographic examination from the outside surface as an alternate volumetric examination method was determined to be impractical due to the component thickness and a divider plate inside the component head affecting radiographic quality. Performing radiographic examination from the inside surface of the heat exchanger would require placing a radiographic source near the center of the head. This would require extensive modifications in order to gain access to the inside for source placement. The heat exchanger would require disassembly at the tube-sheet and the component moved in an upward direction for approximately two feet. Thus additional radiography and/or ultrasonics examinations from the inner surface, to gain additional coverage, are also impractical.

"Performance of an ultrasonic volumetric examination of essentially 100% of the required volume of the RHR heat exchanger full penetration nozzle-to-shell weld RHRW-14-A would be impractical. In addition, it is impractical to perform other volumetric examinations which may increase examination coverage. The surface examination of 100% of the weld areas and adjacent metal, and a maximum extent practical ultrasonic examination of the subject weld provide reasonable assurance of an acceptable level of quality and safety. Significant degradation, if present, would have been detected during the surface and ultrasonic examinations that were performed on the subject weld. As a result, assurance of structural integrity for this weld is provided by the examinations that were performed.

"Therefore, pursuant to 10 CFR 50.55a(g)(5)(iii), it is requested that relief be granted for the second inspection interval."

Licensee's Proposed Alternative Examination (as stated):
"In lieu of the code required 100% ultrasonic examination, an ultrasonic examination was performed on accessible areas to the maximum extent practical given the physical limitations of the nozzle-to-shell weld. The code required surface examination (PT) of 100% of the nozzle-to-shell weld was also performed."

Evaluation: The Code requires 100% surface and volumetric examination of Class 2 pressure vessel nozzle-to-shell welds. However, sketches, photographs, and examination reports provided by the licensee show that complete volumetric examination of the subject RHR heat exchanger nozzle weld is limited due to the nozzle design configuration (extreme nozzle to shell radius) and interference from large support pads. Therefore, the Code examination requirements are impractical for this weld. To meet the Code requirements, the subject component would require significant

engineering redesign and modification to allow access to the subject weld. Imposition of the Code requirements would result in a considerable burden on the licensee.

The licensee was able to obtain 15% of the required volumetric coverage. Additionally, the Code-required 100% surface examination was performed on the nozzle weld. Therefore, based on the volume examined and the Code-required surface examinations performed, it is concluded that significant patterns of degradation, if present, would have been detected and reasonable assurance of the structural integrity of the pressure-retaining nozzle weld has been provided.

Based on the impracticality of meeting the Code examination requirements for the subject weld, and the reasonable assurance provided by the examinations that were completed, it is recommended that relief be granted pursuant to 10 CFR 50.55a(g)(6)(i).

2.5 Request for Relief No. 2-ISI-12, Examination Category C-C, Item C3.30, Integrally Welded Attachments to Pumps

**Note:** The licensee is using Code Case N-509, Alternative Rules for the Selection and Examination of Class 1, 2, and 3 Integrally Welded Attachments, in lieu of the requirements of the Code for the examination of Class 1, 2, and 3 integrally welded attachments. Code Case N-509, has been approved conditionally for general use in Regulatory Guide 1.147, Rev. 12.

Code Requirement: Code Case N-509, Examination Categories C-C, Item C3.30, requires a 100% surface examination as defined by Figure IWC-2500-8 for pump integrally welded attachments. A 10% sample of the welded attachments associated with the component supports are selected for examination.

Licensee's Code Relief Request: In accordance with 10 CFR 50.55a(g)(5)(iii), the licensee requested relief from the Code-required surface examinations of the integral welded attachments located on the Centrifugal Charging Pump 2A-A.

Licensee's Basis for Requesting Relief (as stated):
"The design configuration of the centrifugal charging pump and integrally welded attachments precludes a surface examination of the required area of the integrally welded attachments CCPH-2A-A-IA. The design configuration limits surface examination to approximately 83.5%, as calculated in accordance with TVA procedure N-GP-28, of the required area.

"The design configuration of the subject attachment welds precludes surface examination of essentially 100% of the required examination area. In order to examine the welds in accordance with the code requirement, the centrifugal charging pump would require extensive redesign and modification to allow access to the bottom side of the attachment lugs. Connecting piping would have to be disconnected and the pump disassembled and lifted to allow access to the remaining 16.5% examination area. The weld joint detail consists of a full penetration weld with fillet weld reinforcement. The attachment is circumferentially welded with a fillet weld. The bottom side of the attachment is

inaccessible due to a support that bolts the pump to the supporting frame. The total surface examination coverage for integral attachment welds CCPH-2A-A-IA was approximately 83.5% of the required code coverage. Other nondestructive examination (NDE) techniques were considered, but due to the location of the inaccessible area, the same limitations would be encountered.

"Performing an (sic) surface examination of essentially 100% of the required area of integrally welded attachments CCPH-2A-A-IA would be impractical. In addition, it is impractical to perform other NDE examinations. The maximum extent practical surface examination of the weld area and adjacent metal of the subject weld provides reasonable assurance of an acceptable level of quality and safety. Significant degradation, if present, would have been detected during the surface examination that was performed on the subject integrally welded attachments. As a result, assurance of structural integrity for the integrally welded attachments is provided by the examination that was performed.

"Therefore, pursuant to 10 CFR 50.55a(g)(5)(iii), it is requested that relief be granted for the second inspection interval."

Licensee's Proposed Alternative Examination (as stated):
"In lieu of the code required 100% surface examination, a liquid penetrant examination was performed on accessible areas to the maximum extent practical given the physical limitations of the subject integrally welded attachments."

Evaluation: The Code requires 100% surface examination of the subject integrally welded attachments. Through review of sketches, photographs and examination reports submitted by the licensee it is determined that complete examination coverage is impractical due to restricted access caused by the design configuration of the pump. To meet the Code requirements, the integral attachments and/or interfering structures would require design modification and/or removal to allow access to the subject welds. Therefore, surface examination of the subject integral attachment welds is impractical to perform to the extent required by the Code. Imposition of this requirement would create a considerable burden on the licensee without a compensating increase in safety.

The licensee has completed a significant portion of the Code-required surface examinations (83.5%) for the subject components. Based upon the surface coverage obtained, it is reasonable to conclude that existing patterns of degradation, if present, would have been detected, thus providing reasonable assurance of the structural integrity of the subject integral attachment welds. Therefore, it is recommended that relief be granted pursuant to 10 CFR 50.55a(g)(6)(i).

2.6 Request for Relief No. 2-ISI-13, Examination Category B-F, Items B5.70, Steam Generator Pressure Retaining Dissimilar Metal Welds

Code Requirement: Examination Category B-F, Item B5.70 requires 100% volumetric and surface examination, as defined by Figure IWB-2500-8, for steam generator nozzle-to-safe end dissimilar metal welds 4-inch NPS or larger.

Licensee's Code Relief Request: In accordance with 10 CFR 50.55a(g)(5)(iii), the licensee requested relief from the Code required volumetric examinations for the following steam generator nozzle dissimilar welds:

| | |
|---|---|
| RC-02-SE | Steam Generator Nozzle-to-Safe End Butt Weld |
| RC-03-SE | Steam Generator Nozzle-to-Safe End Butt Weld |

Licensee's Basis for Requesting Relief (as stated):
"The design configuration of the steam generator nozzle safe-ends and materials used in fabrication of the reactor coolant piping preclude an ultrasonic examination of the required volume of pressure retaining circumferential dissimilar metal welds RC-02-SE and RC-03-SE. The design configuration and materials used in fabrication limit ultrasonic examination to approximately 75% of weld RC-02-SE and approximately 75% of weld RC-03-SE, as calculated in accordance with TVA procedure N-GP-28.

"The weld joint detail for welds RC-02-SE and RC-03-SE consists of a pipe elbow welded to a steam generator primary head single piece casing. The pipe elbow is static cast CF8M material. The steam generator bottom head is a single piece casting (SA-216 GR WCC) with integral cast nozzles. The nozzle safe end welds consist of approximately 0.5 inch layer of TY-308-L weld material (buttering) applied to the nozzle weld edge preparation surface. The examinations are limited due to the design configuration and the effects of the anisotropic coarse grain structure of cast stainless material and the weld joint configuration which limit search unit contact and movement.

"The total ultrasonic examination coverage for RC-02-SE and RC-03-SE was approximately 75% of the required code coverage for each weld. Due to the anisotropic coarse grain structure of cast stainless CF8M materials, the examination was limited to the ½ vee technique using refracted longitudinal waves. Circumferential scans for both welds were unlimited. Both welds received 100% coverage from one side scanning in the axial direction with the sound beam directed toward the steam generator. No scans were performed from the steam generator side in the axial direction due to the steam generator nozzle weld taper interference; therefore, 0% coverage was obtained from this direction. It is reasonable to assume that circumferential flaws would be detected to the degree comparable with industry standards for such materials.

"Radiographic examination, as an alternate volumetric examination method, was determined to be impractical due the high radiation doses that would be received while placing the radiography source inside the steam generator. It is estimated the NDE examiners would receive a dose of 2050 mRem per weld performing a radiographic examination (NDE examiners would receive a dose of 300 mRem per weld performing an ultrasonic examination). Radiography from the outside surface with a Co-60 source would be impractical due to high surface dose rates (150 to 200 mRem). Long exposure times would cause an unacceptable fog level on the film.

"Westinghouse plants have no history of pipe cracking failure in the reactor coolant primary loop. For stress corrosion cracking (SCC) to occur, the following three conditions must exist simultaneously: high tensile stresses, a susceptible material, and a corrosive environment. The potential for SCC is minimized in Westinghouse pressurized water reactors by material selection and prevention of a corrosive environment (Reference Westinghouse RCS Piping Flawbase Handbook, WCAP-13670).

"The examination of the steam generator dissimilar metal butt welds during the inspection interval, in accordance with ASME Section XI Code, provides reasonable assurance that significant degradation, if present, would be detected.

"Performance of an ultrasonic volumetric examination of essentially 100% of the required volume of pressure retaining dissimilar metal welds RC-02-SE and RC-03-SE in the reactor coolant main loop piping is impractical. In addition, it is impractical to perform other volumetric examinations, which may increase examination coverage. The surface examination of 100% of the weld area, adjacent metal, and a maximum extent practical ultrasonic examination of the subject welds provides reasonable assurance of an acceptable level of quality and safety. Significant degradation, if present, would have been detected during the ultrasonic and surface examinations that were performed on the subject welds. As a result, assurance of structural integrity for these welds is provided by the examinations that were performed.

"Therefore, pursuant to 10 CFR 50.55a(g)(5)(iii), it is requested that relief be granted for the second inspection interval."

Licensee's Proposed Alternative Examination (as stated):
"In lieu of the code required 100% ultrasonic examination, an ultrasonic examination was performed on accessible areas to the maximum extent practical given the physical limitations of the subject welds. A surface examination (PT) of 100% of welds RC-02-SE and RC-03-SE was also performed."

Evaluation: The Code requires 100% surface and volumetric examination for dissimilar metal safe-end welds. However, complete volumetric examination of the subject welds was limited by component geometry (extreme nozzle taper) and material properties (course grain structure of cast stainless steel). As supported by sketches, and examination reports attached to the licensee's submittal, these restrictions limit access and make the Code volumetric coverage requirements impractical for the subject dissimilar metal welds. To meet the Code coverage requirements, design modifications would be necessary to provide access for examination. Imposition of the Code requirements would result in an undue hardship on the licensee.

The licensee has examined a significant portion (75%) of each of the subject dissimilar metal welds, in addition to the complete surface examination. As a result, any existing patterns of degradation would have been detected and reasonable assurance of the continued structural integrity has been provided. Therefore, it is recommended that relief be granted pursuant to 10 CFR 50.55a(g)(6)(i).

## 3. CONCLUSION

The INEEL staff evaluated the licensee's submittal and concluded that certain inservice examinations cannot be performed to the extent required by the Code at the Sequoyah Nuclear Plant, Units 1 and 2. For requests for relief 1-ISI-11, 1-ISI-12, 1-ISI-13, 2-ISI-11, 2-ISI-12, and 2-ISI-13, outlined above, it is concluded that the Code requirements are impractical for the subject welds. Therefore, it is recommended that relief be granted pursuant to 10 CFR 50.55a(g)(6)(i).

**SEQUOYAH NUCLEAR PLANT, UNITS 1 AND 2** 
**Second 10-Year ISI Interval**

**SUMMARY OF RELIEF REQUESTS**

| Relief Request Number | INEEL TLR Sec. | System or Component | Exam Category | Item No. | Volume or Area to be Examined | Required Method | Licensee Proposed Alternative | Relief Request Disposition |
|---|---|---|---|---|---|---|---|---|
| 1-ISI-11 | 2.1 | RHR Heat Exchanger | C-B | C2.21 | Nozzle to Shell Weld | Volumetric | Volumetric coverages obtained be found acceptable | Granted 10 CFR50.55a(g)(6)(i) |
| 1-ISI-12 | 2.2 | Charging Pump | C-C | C3.30 | Integral Welded Attachments | Surface | Surface coverages obtained be found acceptable | Granted 10 CFR50.55a(g)(6)(i) |
| 1-ISI-13 | 2.3 | Steam Generator | B-F | B5.70 | Nozzle-to-Safe End Welds | Volumetric/Surface | Volumetric coverages obtained be found acceptable | Granted 10 CFR50.55a(g)(6)(i) |
| 2-ISI-11 | 2.4 | RHR Heat Exchanger | C-B | C2.21 | Nozzle to Shell Weld | Volumetric | Volumetric coverages obtained be found acceptable | Granted 10 CFR50.55a(g)(6)(i) |
| 2-ISI-12 | 2.5 | Charging Pump | C-C | C3.30 | Integral Welded Attachments | Surface | Surface coverages obtained be found acceptable | Granted 10 CFR50.55a(g)(6)(i) |
| 2-ISI-13 | 2.6 | Steam Generator | B-F | B5.70 | Nozzle-to-Safe End Welds | Volumetric/Surface | Volumetric coverages obtained be found acceptable | Granted 10 CFR50.55a(g)(6)(i) |

Mr. J. A. Scalice
Tennessee Valley Authority

**SEQUOYAH NUCLEAR PLANT**

cc:
Mr. Karl W. Singer, Senior Vice President
Nuclear Operations
Tennessee Valley Authority
6A Lookout Place
1101 Market Street
Chattanooga, TN 37402-2801

Mr. Jack A. Bailey
Vice President
Engineering & Technical Services
Tennessee Valley Authority
6A Lookout Place
1101 Market Street
Chattanooga, TN 37402-2801

Mr. Richard T. Purcell
Site Vice President
Sequoyah Nuclear Plant
Tennessee Valley Authority
P.O. Box 2000
Soddy Daisy, TN 37379

General Counsel
Tennessee Valley Authority
ET 10H
400 West Summit Hill Drive
Knoxville, TN 37902

Mr. Robert J. Adney, General Manager
Nuclear Assurance
Tennessee Valley Authority
5M Lookout Place
1101 Market Street
Chattanooga, TN 37402-2801

Mr. Mark J. Burzynski, Manager
Nuclear Licensing
Tennessee Valley Authority
4X Blue Ridge
1101 Market Street
Chattanooga, TN 37402-2801

Mr. Pedro Salas, Manager
Licensing and Industry Affairs
Sequoyah Nuclear Plant
Tennessee Valley Authority
P.O. Box 2000
Soddy Daisy, TN 37379

Mr. D. L. Koehl, Plant Manager
Sequoyah Nuclear Plant
Tennessee Valley Authority
P.O. Box 2000
Soddy Daisy, TN 37379

Mr. Russell A. Gibbs
Senior Resident Inspector
Sequoyah Nuclear Plant
U.S. Nuclear Regulatory Commission

2600 Igou Ferry Road
Soddy Daisy, TN 37379

Mr. Lawrence E. Nanney, Director
Division of Radiological Health
Dept. of Environment & Conservation
Third Floor, L and C Annex
401 Church Street
Nashville, TN  37243-1532

County Executive
Hamilton County Courthouse
Chattanooga, TN  37402-2801

Ms. Ann Harris
305 Pickel Road
Ten Mile, TN 37880