February 10, 2000

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

SUBJECT: SEQUOYAH NUCLEAR PLANT, UNIT NOS. 1 AND 2 - EVALUATION OF RELIEF REQUESTS 1-ISI-9, 1-ISI-10, 2-ISI-8, 2-ISI-9, AND 2-ISI-10 PERTAINING TO ASME INSPECTIONS (TAC NOS. MA5174 AND MA5175)

Dear Mr. Scalice:

By letter dated November 17, 1998, the Tennessee Valley Authority (TVA) submitted a request for five reliefs (Relief Requests 1-ISI-9, 1-ISI-10, 2-ISI-8, 2-ISI-9, and 2-ISI-10) from the American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code for the Sequoyah Nuclear Plant. The U.S. Nuclear Regulatory Commission (NRC) staff has reviewed the subject relief requests submitted by TVA. Based on the information provided, the NRC staff agrees that the subject Code requirements are impractical and concludes that the relief requests are acceptable. Therefore, the proposed relief is authorized pursuant to Title 10, *Code of Federal Regulations,* Section 50.55a(g)(6)(i). The NRC staff's Safety Evaluation is enclosed with a Technical Letter Report prepared in support of the relief requests for the staff by the Idaho National Engineering and Environmental Laboratory attached.

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

Enclosure: Safety Evaluation w/attachment

cc w/encl: See next page

February 10, 2000

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

SUBJECT: SEQUOYAH NUCLEAR PLANT, UNIT NOS. 1 AND 2 - EVALUATION OF RELIEF REQUESTS 1-ISI-9, 1-ISI-10, 2-ISI-8, 2-ISI-9, AND 2-ISI-10 PERTAINING TO ASME INSPECTIONS (TAC NOS. MA5174 AND MA5175)

Dear Mr. Scalice:

By letter dated November 17, 1998, the Tennessee Valley Authority (TVA) submitted a request for five reliefs (Relief Requests 1-ISI-9, 1-ISI-10, 2-ISI-8, 2-ISI-9, and 2-ISI-10) from the American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code for the Sequoyah Nuclear Plant. The U.S. Nuclear Regulatory Commission (NRC) staff has reviewed the subject relief requests submitted by TVA. Based on the information provided, the NRC staff agrees that the subject Code requirements are impractical and concludes that the relief requests are acceptable. Therefore, the proposed relief is authorized pursuant to Title 10, *Code of Federal Regulations,* Section 10CFR 50.55a(g)(6)(i). The NRC staff's Safety Evaluation is enclosed with a Technical Letter Report prepared in support of the relief requests for the staff by the Idaho National Engineering and Environmental Laboratory attached.

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

Enclosure: Safety Evaluation w/attachment

cc w/encl: See next page

DISTRIBUTION:

File Center	BClayton	OGC	G. Hill (2)	R. Corriea
S. Peterson, EDO	ACRS	PUBLIC	R. Hernan	T. Chang
SQN R/F	E. Imbro	H. Berkow	P. Fredrickson, RII	T. McLellan

DOCUMENT NAME: C:\LTR97100.wpd

*** "NLO w/change"**

To receive a copy of this document, indicate in the box: "**C**" = Copy without attachment/enclosure "**E**" = Copy with attachment/enclosure "**N**" = No copy

OFFICE	PDII-2/PM		PDII-2/LA		OGC		PDII-2/SC	
NAME	RHernan		BClayton		RHoefling *		RCorriea	
DATE	1/27/00		1/27/00		2/7/00		2/10/00	

Official Record Copy

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

OF THE SECOND 10-YEAR INTERVAL INSERVICE INSPECTION PLAN

REQUESTS FOR RELIEF NOS. 1-ISI-9, 1-ISI-10, 2-ISI-8, 2-ISI-9, AND 2-ISI-10

FROM ASME SECTION XI REQUIREMENTS FOR

TENNESSEE VALLEY AUTHORITY

SEQUOYAH NUCLEAR PLANT, UNITS 1 AND 2

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 shall be performed in accordance with Section XI of the ASME Boiler and Pressure Vessel Code (ASME Code) and applicable addenda as required by Title 10 of the *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(6)(g)(i). 10 CFR 50.55a(a)(3) states that alternatives to the requirements of paragraph (g) may be used, when authorized by the U.S. Nuclear Regulatory Commission (NRC), if (i) the proposed alternatives would provide an acceptable level of quality and safety or if (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 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. For Sequoyah Nuclear Plant, Units 1 and 2, the applicable edition of Section XI of the ASME Code for the second 10-year inservice inspection (ISI) interval is the 1989 Edition.

ENCLOSURE

2.0 EVALUATION

By letter dated November 17, 1998, the Tennessee Power Authority (TVA, the licensee), submitted Requests for Relief Nos. 1-ISI-9, 1-ISI-10, 2-ISI-8, 2-ISI-9, and 2-ISI-10 for Sequoyah Nuclear Plant, Units 1 and 2. The Idaho National Engineering and Environmental Laboratory (INEEL) staff's evaluation of the subject request for relief is in the attached Technical Letter Report (TLR) prepared by INEEL. Based on the results of the review, the staff adopts the contractor's conclusions presented in the TLR.

The information provided by the licensee in support of the requests for relief from Code requirements has been evaluated and the basis for disposition is documented below.

Request for Relief No. 1-ISI-9: ASME Code, Section XI, Examination Category B-D, Item B3.110, requires 100% volumetric examination of nozzle-to-vessel welds, as defined in Figure IWB-2500-7(b).

10 CFR 50.55a(g)(5)(iii) states that, "if the licensee has determined that conformance with certain code requirements is impractical for its facility, the licensee shall notify the Commission and submit ... information to support the determinations." Pursuant to 10 CFR 50.55a(g)(5)(iii), the licensee requested relief from the Code-required volumetric examinations of the following pressurizer nozzle-to-vessel welds.

WELD	ITEM	DESCRIPTION	COVERAGE	LIMITATION
RCW-15	B3.110	Pressurizer Nozzle-to-Head Weld	78%	Nozzle Geometry
RCW-21	B3.110	Pressurizer Nozzle-to-Head Weld	64%	Nozzle Geometry

The staff has determined that the licensee properly demonstrated that complete volumetric examination of the subject pressurizer nozzle-to-vessel welds is limited due to (1) pressurizer heater penetrations and (2) the radius of curvature in the transition area between the nozzle and the vessel shell. The nozzles' geometric design configuration and proximity to heater penetrations make volumetric examinations impractical to perform on the subject welds. In order to meet the Code requirements, the nozzles and/or pressurizer would have to be modified to facilitate access for ultrasonic search units. Imposition of these requirements would place a significant burden on the licensee.

The licensee has completed a significant portion (64-78% composite coverage) of the subject nozzle examinations. Additionally, these nozzles are part of a larger population of Class 1 primary system nozzles that were examined during the interval. Therefore, the staff concludes that the examinations performed provide reasonable assurance of structural integrity of the subject nozzle-to-vessel welds. Relief is granted pursuant to 10 CFR 50.55a(g)(6)(i).

Request for Relief No. 1-ISI-10: ASME Code, Section XI, Examination Category B-J, Item No. B9.11, requires surface and volumetric examination as defined by Figure IWB-2500-8 for circumferential welds in piping NPS 4 or larger.

Pursuant to 10 CFR 50.55a(g)(5)(iii), the licensee requested relief from the Code-required volumetric examinations of the following welds:

WELD	ITEM	DESCRIPTION	COVERAGE	LIMITATION
RC-06	B9.11	RCP to pipe Circumferential Weld	75%	Pump configuration/cast stainless material
RC-07	B9.11	RCP to pipe Circumferential Weld	75%	Pump configuration/cast stainless material

The staff determined that complete volumetric examination cannot be performed due to (1) the pump geometries (pump taper interference) and (2) the effects of the coarse-grained cast stainless steel, which limits the search unit's contact with the surface. To meet the Code requirements for volumetric examination, the subject welds and/or adjoining components would require significant re-design and modifications. Imposition of this requirement would place a significant burden on the licensee.

The licensee has completed a significant portion (75%) of the Code-required volumetric examinations of the subject welds and 100% of the surface examinations have been completed as required by the Code. Furthermore, the subject welds are part of a larger population of Examination Category B-J welds that were examined during the interval. Therefore, the staff determined that the completed volumetric and surface examinations of the subject welds provide reasonable assurance of the structural integrity of the subject welds. Relief is granted pursuant to 10 CFR 50.55a(g)(6)(i).

Request for Relief No. 2-ISI-8: ASME Code, Section XI, Examination Category B-J, Item No. B9.31, requires surface and volumetric examination as defined by Figures IWB-2500-9, -10, and -11 for branch pipe connection welds in piping NPS 4 or larger.

Pursuant to 10 CFR 50.55a(g)(5)(iii), the licensee requested relief from the Code-required volumetric examination of the following weld:

WELD	ITEM	DESCRIPTION	COVERAGE	LIMITATION
SIW-07	B9.31	Safety Injection Branch Connection	63%	Branch configuration/cast stainless material

The staff determined that component geometry (surface contour of the examination surface) limits access and precludes complete volumetric examination of this weld. Additionally, the attenuative effects of the coarse-grained cast stainless material in the primary loop piping preclude examination coverage via extended beam paths. Therefore, the Code volumetric examination requirements are impractical for this weld. To meet the Code requirements, design modifications including the change of piping materials would be necessary. Imposition of this requirement would impose a significant burden on the licensee.

The licensee has performed 63% of the required volumetric examination, and 100% of the surface examination. In addition, this weld is part of a larger sample of Examination Category B-J welds examined. Therefore, the staff determined that the examinations performed and the

subject welds are part of a sample provides reasonable assurance of structural integrity of the subject welds. Relief is granted pursuant to 10 CFR 50.55a(g)(6)(i).

Request for Relief No. 2-ISI-9: ASME Code, Section XI, Examination Category B-D, Item B3.110, requires 100% volumetric examination of nozzle-to-vessel welds, as defined in Figure IWB-2500-7(b).

Pursuant to 10 CFR 50.55a(g)(5)(iii), the licensee requested relief from the Code-required volumetric examinations of the following pressurizer nozzle-to-vessel welds.

WELD	ITEM	DESCRIPTION	COVERAGE	LIMITATION
RCW-15	B3.110	Pressurizer Nozzle-to-Head Weld	71%	Nozzle Geometry
RCW-21	B3.110	Pressurizer Nozzle-to-Head Weld	60%	Nozzle Geometry

The staff determined that complete volumetric examination of the subject pressurizer nozzle-to-vessel welds is limited due to pressurizer heater penetrations and the radius of curvature in the transition area between the nozzle and the vessel shell. The nozzles geometric design configuration and proximity to heater penetrations make volumetric examinations impractical to perform on these welds. In order to meet the Code requirements, the nozzles and/or pressurizer would have to be modified to facilitate access for ultrasonic search units. Imposition of these requirements would place a significant burden on the licensee.

The licensee has completed a significant portion (60-71% composite coverage) of the subject nozzle examinations. Additionally, these nozzles are part of a larger population of Class 1 primary system nozzles that were examined during the interval. Therefore, the staff determined that these examinations provide reasonable assurance of the structural integrity of the subject nozzle-to-vessel welds. Relief is granted pursuant to 10 CFR 50.55a(g)(6)(i).

Request for Relief No. 2-ISI-10: ASME Code, Section XI, Examination Category B-J, Item No. B9.11, requires surface and volumetric examination as defined by Figure IWB-2500-8 for circumferential welds in piping NPS 4 or larger.

Pursuant to 10 CFR 50.55a(g)(5)(iii), the licensee requested relief from the Code-required volumetric examinations of the following welds:

WELD	ITEM	DESCRIPTION	COVERAGE	LIMITATION
RC-06	B9.11	RCP to pipe Circumferential Weld	50%	Pump configuration/cast stainless material
RC-07	B9.11	RCP to pipe Circumferential Weld	50%	Pump configuration/cast stainless material

The staff determined that complete volumetric examination cannot be performed due to the pump geometries (pump nozzle taper interference) and the attenuative effects of the coarse-grained cast stainless material that prevents extended beam path examination. Therefore, the Code volumetric examination requirement for the subject welds is impractical.

To meet the Code requirements for volumetric examination, the subject welds and/or adjoining components would require significant re-design and modifications. Imposition of this requirement would impose a significant burden on the licensee.

The licensee has completed 50% of the Code-required volumetric examinations of the subject welds. Additionally 100% of the surface examinations have been completed. Furthermore, the subject welds are part of a larger population of Examination Category B-J welds that were examined during the interval. The staff concludes that the above examinations provide reasonable assurance of structural integrity of the subject welds. Relief is granted pursuant to 10 CFR 50.55a(g)(6)(i).

3. CONCLUSION

The staff concludes that for Requests for Relief Nos. 1-ISI-9, 1-ISI-10, 2-ISI-8, 2-ISI-9, and 2-ISI-10, the Code requirements are impractical. The staff further concludes that the examinations performed for the subject welds as part of a larger population of respective examination Categories provide reasonable assurance of structural integrity of the subject welds. Therefore, Requests for Relief Nos. 1-ISI-9, 1-ISI-10, 2-ISI-8, 2-ISI-9, and 2-ISI-10, are granted pursuant to 10 CFR 50.55a(g)(6)(i).

Attachment: INEEL Technical Letter Report

Principal Contributor: Thomas K. McLellan, NRR

Date: February 10, 2000

TECHNICAL LETTER REPORT

ON SECOND 10-YEAR INTERVAL INSERVICE INSPECTION

REQUESTS FOR RELIEF 1-ISI-9, 1-ISI-10, 2-ISI-8, 2-ISI-9 AND 2-ISI-10

FOR

TENNESSEE VALLEY AUTHORITY

SEQUOYAH NUCLEAR PLANT, UNITS 1 AND 2

DOCKET NUMBERS: 50-327 AND 50-328

1. INTRODUCTION

By letter dated November 17, 1998, the licensee, Tennessee Valley Authority (TVA), submitted Requests for Relief 1-ISI-9, 1-ISI-10, 2-ISI-8, 2-ISI-9 and 2-ISI-10, seeking relief from the requirements of the ASME Code, Section XI, for the Sequoyah Nuclear Plant , Units 1 and 2 (SQN), second 10-year inservice inspection (ISI) interval. The Idaho National Engineering and Environmental Laboratory (INEEL) staff's evaluation of the subject request for relief is 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 SQN, 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-9, Examination Category B-D, Item B3.110, Pressurizer Full Penetration Nozzle-to-Vessel Welds (Unit 1)

Code Requirement: Examination Category B-D, Item B3.110, requires 100% volumetric examination of nozzle-to-shell welds, as defined in Figure IWB-2500-7(b).

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 of the following pressurizer nozzle-to-shell welds.

WELD	ITEM	DESCRIPTION	COVERAGE	LIMITATION
RCW-15	B3.110	Pressurizer Nozzle-to-Head Weld	78%	Nozzle Geometry
RCW-21	B3.110	Pressurizer Nozzle-to-Head Weld	64%	Nozzle Geometry

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

> "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 welds in accordance with the code requirements, the pressurizer would require extensive design modifications. The physical arrangement of RCW-21, in conjunction with the close curvature of the outside wall surfaces of the nozzle, precludes ultrasonic examination from the nozzle side. For scans normal to the weld on the bottom vessel head side, examinations are limited to areas up to approximately 4 inches from the weld centerline. Limitations on the bottom head side of RCW-21 are due to the presence of 78 immersion heaters penetrating the head, which restricts the scanning surface of the transducers. The scans for flaws oriented transverse to the weld are not obstructed. Therefore, 100% of the required examination coverage for flaws transverse to the weld was obtained. Total examination coverage of Weld RCW-21 was approximately 64% of the code required volume.

"The physical arrangement of RCW-15, in conjunction with the close curvature of the outside wall surfaces of the nozzle, precludes ultrasonic examination from the nozzle side. Scans normal to the weld from the head side were not obstructed allowing complete coverage of the weld from one side. Examination coverage of the weld from one side provides reasonable assurance that no flaws parallel to the weld are present. In addition, approximately 100% of the required ultrasonic examination volume for flaws transverse to the weld was performed from the vessel head side. Total combined examination coverage of Weld RCW-15 was approximately 78% of the code required volume.

"Radiographic examination, as an alternate volumetric examination method, was determined to be impractical due to the thickness of the component. Gaining access to the inside surface of the pressurizer to place radiographic film would require extensive personnel protection due to high radiation and contamination levels. The pressurizer manway would have to be removed, decontamination performed, and specialized scaffolding erected to gain access. The additional code coverage gained by radiography and/or ultrasonics from the inner surface is impractical when weighed against the radiological concerns. The estimated radiological conditions were determined to be:

> "35-40 rad/hour beta (uncorrected)
> 10-12 rem/hour gamma
> 1 rad/hour per 100 square cm

"Maximum stay time to maintain exposure to less than 1 rem is approximately 5 minutes. Special clothing would be required for protection from the extremely high contamination levels and from the high beta dose rate.

"Respiratory protection would be required. Industrial safety would also be a major concern (heat stress, confined space, and climbing/falling hazards). Estimates are based on actual experience inside primary components such as steam generators.

"A percentage sampling approach provided by the ASME Section XI Code, in combination with examinations performed on similar items, provides reasonable assurance that significant degradation, if present, would have been detected.

"Performance of an ultrasonic volumetric examination of essentially 100% of full penetration welds in the pressurizer nozzle-to-vessel head (Welds RCW-15 and RCW-21), would be impractical. As previously discussed, TVA determined that it would be impractical to attempt other volumetric examinations in order to increase examination coverage. A maximum extent practical ultrasonic examination of the subject welds provides assurance of an acceptable level of quality and safety. Significant degradation, if present, would have been detected during the ultrasonic examination that was performed on the subject welds. As a result, assurance of structural integrity for these welds is provided by the alternative examinations that were performed."

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 pressurizer nozzle-to-head welds."

Evaluation: The Code requires 100% volumetric examination of the subject pressurizer nozzle-to-head welds. However, the reports and sketches[1] submitted by the licensee demonstrate that complete volumetric examination of the subject pressurizer nozzle-to-vessel welds is limited due to pressurizer heater penetrations and the radius of curvature in the transition area between the nozzle and the vessel shell. Therefore, the nozzles' geometric design configuration and proximity to heater penetrations make volumetric examinations impractical to perform on the subject welds. In order to meet the Code requirements, the nozzles and/or pressurizer would have to be modified to facilitate access for ultrasonic search units. Imposition of these requirements would place a considerable burden on the licensee.

The licensee has completed a significant portion (64-78% composite coverage) of the subject nozzles. Additionally, these nozzles are part of a larger population of Class 1 primary system nozzles that were examined during the interval. Therefore, any significant patterns of degradation would have been detected by the examinations performed, and reasonable assurance of the structural integrity of the subject nozzle-to-vessel welds has been provided. Based on the impracticality of meeting the Code coverage requirements for the subject welds, 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-10, Examination Category B-J, Item No. B9.11, Pressure Retaining Welds in Piping (Unit 1)

---

1. Reports, sketches, and attachments furnished with the licensee's submittal are not included in this report.

Code Requirement: Examination Category B-J, Item No. B9.11 requires surface and volumetric examination as defined by Figure IWB-2500-8 for circumferential welds in piping NPS 4 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 of the following welds:

WELD	ITEM	DESCRIPTION	COVERAGE	LIMITATION
RC-06	B9.11	RCP to pipe Circumferential Weld	75%	Pump configuration/cast stainless material
RC-07	B9.11	RCP to pipe Circumferential Weld	75%	Pump configuration/cast stainless material

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

"The design configuration and materials used in the fabrication of the reactor coolant pump and the reactor coolant piping preclude an ultrasonic examination of the required volume of pressure retaining circumferential Welds RC-06 and RC-07. The design configuration and materials limit ultrasonic examination to approximately 75% of Weld RC-06 and approximately 75% of Weld RC-07.

"The design configuration and materials used in the fabrication of the subject piping welds preclude ultrasonic examination of essentially 100% of the required examination volume. In order to examine the welds in accordance with the code requirement, the reactor coolant pump would require extensive redesign along with changing the pump and piping material.

"The weld joint detail for Weld RC-06 consists of a pipe elbow welded to a pump casing. The pipe elbow is static cast CF8M material welded to a static cast CF8M material pump casing. The weld joint detail for Weld RC-07 consists of a pump casing to pipe configuration. The pump is static cast CF8M material welded to centrifugal cast CF8M material piping. The examination is 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 limits search unit contact and movement.

"Total ultrasonic examination coverage for RC-06 and RC-07 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 pump. No scans were performed from the pump side in the axial direction with the sound beam directed toward the pump. No scans were performed from the pump side in the axial direction due to the pump 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.

"Radiographic examination, as an alternate volumetric examination method, was determined to be impractical due to material thickness (approximately 3 inches) and the pipe being filled with water. Realignment of the system to drain all water would substantially increase radiation levels.

"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 PWR's by material selection and prevention of a corrosive environment (reference Westinghouse RCS Piping Flawbase Handbook, WCAP-13670).

"A percentage sampling approach provided by the ASME Section XI Code, in combination with examinations performed on similar items, provides reasonable assurance that significant degradation, if present, would have been detected.

"Performance of an ultrasonic volumetric examination of essentially 100% of the required volume of pressure retaining circumferential Welds RC-06 and RC-07 in the reactor coolant main loop piping would be impractical. As previously discussed, TVA determined that it would be impractical to attempt other volumetric examinations in order to increase examination coverage. The surface examination of 100% of the weld area and adjacent metal and 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 examination and the surface examination that was performed on the subject welds. As a result, reasonable assurance of operational readiness has been provided."

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-06 and RC-07 was also performed. Refer to Attachment 1 for Examination Data Reports."

Evaluation: The Code requires 100% volumetric and surface examination of the subject welds. Review of the reports and sketches provided by the licensee demonstrated that complete volumetric examination cannot be performed due to the pump geometries (pump taper interference) and the effects of the coarse grained cast stainless material. Therefore, the Code volumetric examination requirement for the subject welds is impractical. To meet the Code requirements for volumetric examination, the subject welds and/or adjoining components would require significant re-design and modifications. Imposition of this requirement would place a considerable burden on the licensee.

The licensee has completed a significant portion (75%) of the Code-required volumetric examinations of the subject welds. Additionally 100% of the surface examinations have

been completed as required by the Code. Furthermore, the subject welds are part of a larger population of Examination Category B-J welds that were examined during the interval. Based upon the volumetric and surface examinations of the subject welds completed , it is reasonable to conclude that patterns of degradation, if present, would have been detected. Consequently, reasonable assurance of the structural integrity of the subject welds has been provided. Therefore, it is recommended that relief be granted pursuant to 10 CFR 50.55a(g)(6)(i).

2.3 Request for Relief No. 2-ISI-8, Examination Category B-J, Item No. B9.31, Branch Pipe Connection Welds (Unit 2)

Code Requirement: Examination Category B-J, Item No. B9.31 requires surface and volumetric examination as defined by Figures IWB-2500-9, -10, and -11 for branch pipe connection welds in piping NPS 4 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 examination of the following weld:

WELD	ITEM	DESCRIPTION	COVERAGE	LIMITATION
SIW-07	B9.31	Safety Injection Branch Connection	63%	Branch configuration/cast stainless material

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

"The design configuration and materials used in the fabrication of Weld SIW-07 precludes ultrasonic examination of essentially 100% of the required examination volume. In order to examine the weld in accordance with the code requirement, the branch connection would require extensive redesign and changing of piping material.

"The weld joint detail for Weld SIW-07 is a branch connection welded to a pump casing. The pipe elbow is static cast CF8M material welded to a large bore piping configuration with the full penetration weld located in the branch (i.e., a branch connection welded to the outside diameter of the large bore reactor coolant system piping). The branch connection is stainless steel material and the large bore reactor coolant system pipe is centrifugal cast CF8M material (Cold Leg Loop #1 piping). The ultrasonic volumetric examination is limited due to the effects of the anisotropic coarse grain structure of cast stainless material of the large bore piping and the weld joint configurations, which limits search unit contact and movement on the branch connection side.

"The anisotropic coarse grain structure of centrifugal cast CF8M material, and the examination limitation parameters associated with refracted longitudinal waves, prevented a meaningful scan from the large bore piping side (main loop piping). Weld SIW-07 received 100% of the required coverage with the axial scans from the branch connection side utilizing both 45° shear waves and 60° refracted longitudinal waves. These examinations provide reasonable

assurance that circumferential flaws would be detected. Scans for flaws located transverse to the weld were limited due to the weld joint configuration that limited search unit contact and movement. A 31% required coverage was achieved for detection of transverse oriented flaws. The total ultrasonic examination coverage for SIW-07 was approximately 63% of the code required volume.

"Radiographic examination, as an alternate volumetric examination method, was determined to be impractical due to restricted access. Also, the wide variation in component thickness and joint configuration does not make radiography an amenable option to increase code required coverage.

"A percentage sampling approach provided by the ASME Section XI Code, in combination with examinations performed on similar items, provides reasonable assurance that significant degradation, if present, would have been detected.

"A percentage sampling approach provided by the ASME Section XI Code, in combination with examinations performed on similar items, provides reasonable assurance that significant degradation, if present, would have been detected.

"Performance of an ultrasonic volumetric examination of essentially 100% of the required volume of the pressure retaining branch connection Weld SIW-07 would be impractical. As previously discussed, TVA determined that it would be impractical to attempt other volumetric examinations in order to increase examination coverage. The surface examination of 100% of the weld, adjacent metal and maximum extent practical ultrasonic examination 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 ultrasonic examination and the surface examination that was performed on the subject weld. As a result, assurance of structural integrity for this weld is provided by the alternative examinations that were performed."

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 weld. A surface examination (PT) of essentially 100% of the weld was also performed. "

Evaluation: The Code requires 100% surface and volumetric examination of the subject Class 1 branch connection weld. The licensee provided the examination data reports that give the layouts and examination coverages of the subject weld. Figures supplied by the licensee revealed that component geometry (surface contour of the examination surface) limits access and precludes complete volumetric examination of this weld. Additionally, the attenuative effects of the coarse-grained cast stainless material in the primary loop piping preclude examination coverage via extended beam paths. Therefore, the Code volumetric examination requirements are impractical for this weld. To meet the Code requirements, design modifications including the change of piping

materials would be necessary. Imposition of this requirement would impose a significant burden on the licensee.

The licensee has performed 63% of the required volumetric examination, and 100% of the surface examination. In addition, this weld is part of a larger sample of Examination Category B-J welds examined. Therefore, reasonable assurance of structural integrity is provided by the examinations that have been completed on this and other welds within the entire sample.

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

2.4 Request for Relief No. 2-ISI-9, Examination Category B-D, Item B3.110 Pressurizer Full Penetration Nozzle-to-Vessel Welds (Unit 2)

Code Requirement: Examination Category B-D, Item B3.110, requires 100% volumetric examination of nozzle-to-shell welds, as defined in Figure IWB-2500-7(b).

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 of the following pressurizer nozzle-to-shell welds.

WELD	ITEM	DESCRIPTION	COVERAGE	LIMITATION
RCW-15	B3.110	Pressurizer Nozzle-to-Head Weld	71%	Nozzle Geometry
RCW-21	B3.110	Pressurizer Nozzle-to-Head Weld	60%	Nozzle Geometry

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

"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 welds in accordance with the code requirements, the pressurizer would require extensive design modifications. The physical arrangement of RCW-21, in conjunction with the close curvature of the outside wall surfaces of the nozzle, precludes ultrasonic examination from the nozzle side. For scans normal to the weld on the bottom vessel head side, examinations are limited to areas up to approximately 4 inches from the weld centerline. Limitations on the bottom head side of RCW-21 are due to the presence of 78 immersion heaters penetrating the head, which restricts the scanning surface of the transducers. The scans for flaws oriented transverse to the weld are not obstructed. Therefore, 100% of the required examination coverage for flaws transverse to the weld was obtained. Total examination coverage of Weld RCW-21 was approximately 60% Unit of the code required volume.

"The physical arrangement of RCW-15, in conjunction with the close curvature of the outside wall surfaces of the nozzle, precludes ultrasonic examination from

the nozzle side. Scans normal to the weld from the head side were not obstructed allowing complete coverage of the weld from one side. Examination coverage of the weld from one side provides reasonable assurance that no flaws parallel to the weld are present. In addition, approximately 81% of the required ultrasonic examination volume for flaws transverse to the weld was performed from the vessel head side. Total combined examination coverage of Weld RCW-15 was approximately 71% of the code required volume.

"Radiographic examination, as an alternate volumetric examination method, was determined to be impractical due to the thickness of the component. Gaining access to the inside surface of the pressurizer to place radiographic film would require extensive personnel protection due to high radiation and contamination levels. The pressurizer manway would have to be removed, decontamination performed, and specialized scaffolding erected to gain access. The additional code coverage gained by radiography and/or ultrasonics from the inner surface is impractical when weighed against the radiological concerns. The estimated radiological conditions were determined to be:

"35-40 rad/hour beta (uncorrected)
10-12 rem/hour gamma
1 rad/hour per 100 square cm

"Maximum stay time to maintain exposure to less than 1 rem is approximately 5 minutes. Special clothing would be required for protection from the extremely high contamination levels and from the high beta dose rate.

"Respiratory protection would be required. Industrial safety would also be a major concern (heat stress, confined space, and climbing/falling hazards). Estimates are based on actual experience inside primary components such as steam generators.

"A percentage sampling approach provided by the ASME Section XI Code, in combination with examinations performed on similar items, provides reasonable assurance that significant degradation, if present, would have been detected.

"Performance of an ultrasonic volumetric examination of essentially 100% of full penetration welds in the pressurizer nozzle-to-vessel head (Welds RCW-15 and RCW-21), would be impractical. As previously discussed, TVA determined that it would be impractical to attempt other volumetric examinations in order to increase examination coverage. A maximum extent practical ultrasonic examination of the subject welds provides assurance of an acceptable level of quality and safety. Significant degradation, if present, would have been detected during the ultrasonic examination that was performed on the welds. As a result, assurance of structural integrity for these welds is provided by the alternative examinations that were performed."

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 pressurizer nozzle-to-head welds."

Evaluation: The Code requires 100% volumetric examination of the subject pressurizer nozzle-to-head welds. However, review of the reports and sketches submitted by the licensee demonstrate that complete volumetric examination of the subject pressurizer nozzle-to-vessel welds is limited due to pressurizer heater penetrations and the radius of curvature in the transition area between the nozzle and the vessel shell. Therefore, the nozzles geometric design configuration and proximity to heater penetrations make volumetric examinations impractical to perform on these welds. In order to meet the Code requirements, the nozzles and/or pressurizer would have to be modified to facilitate access for ultrasonic search units. Imposition of these requirements would place a considerable burden on the licensee.

The licensee has completed a significant portion (60-71% composite coverage) of the subject nozzles. Additionally, these nozzles are part of a larger population of Class 1 primary system nozzles that were examined during the interval. Therefore, any significant pattern of degradation would have been detected by the examinations and reasonable assurance of the structural integrity of the subject nozzle-to-vessel welds has been provided. Based on the impracticality of meeting the Code coverage requirements for the subject welds, 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-10, Examination Category B-J, Item No. B9.11, Pressure Retaining Welds in Piping (Unit 2)

Code Requirement: Examination Category B-J, Item No. B9.11 requires surface and volumetric examination as defined by Figure IWB-2500-8 for circumferential welds in piping NPS 4 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 of the following welds:

WELD	ITEM	DESCRIPTION	COVERAGE	LIMITATION
RC-06	B9.11	RCP to pipe Circumferential Weld	50%	Pump configuration/cast stainless material
RC-07	B9.11	RCP to pipe Circumferential Weld	50%	Pump configuration/cast stainless material

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

"The design configuration and materials used in the fabrication of the subject piping welds preclude ultrasonic examination of essentially 100% of the required examination volume. In order to examine the welds in accordance with the code requirement, the reactor coolant pump would require extensive redesign along with changing the pump and piping material.

"The weld joint detail for Weld RC-06 consists of a pipe elbow welded to a pump casing. The pipe elbow is static cast CF8M material welded to a static cast CF8M material pump casing. The weld joint detail for Weld RC-07 consists of a pump casing to pipe configuration. The pump is static cast CF8M material welded to centrifugal cast CF8M material piping. The examination is 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 limits search unit contact and movement.

"Total ultrasonic examination coverage for RC-06 and RC-07 was approximately 50% 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. Both welds received 100% coverage from one side scanning in the axial direction with the sound beam directed toward the pump. No scans were performed from the pump side in the axial direction with the sound beam directed toward the pump. No scans were performed from the pump side in the axial direction due to the pump 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. Circumferential scans were limited to 50% each, due to the loss of search unit contact associated wit the pump taper on the pump side.

"Radiographic examination, as an alternate volumetric examination method, was determined to be impractical due to material thickness (approximately 3 inches) and the pipe being filled with water. Realignment of the system to drain all water would substantially increase radiation levels.

"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 PWR's by material selection and prevention of a corrosive environment (reference Westinghouse RCS Piping Flawbase Handbook, WCAP-13670).

"A percentage sampling approach provided by the ASME Section XI Code, in combination with examinations performed on similar items, provides reasonable assurance that significant degradation, if present, would have been detected.

"Performance of an ultrasonic volumetric examination of essentially 100% of the required volume of pressure retaining circumferential Welds RC-06 and RC-07 in the reactor coolant main loop piping would be impractical. In addition, it would be impractical to perform other volumetric examinations, which may increase examination coverage. The surface examination of 100% of the weld area and adjacent metal and 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 examination and the surface examination that

was performed on the subject welds. As a result, assurance of structural integrity for these welds is provided by the alternative examinations that were performed.

Licensee's Proposed Alternative Examination (as stated):

"In lieu of the code required 100% ultrasonic examination, an ultrasonic 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-06 and RC-07 was also performed. Refer to Attachment 1 for Examination Data Reports."

Evaluation: The Code requires 100% volumetric and surface examination of the subject welds. Review of the reports and sketches provided by the licensee demonstrated that complete volumetric examination cannot be performed due to the pump geometries (pump nozzle taper interference) and the attenuative effects of the coarse-grained cast stainless material that prevents extended beam path examination. Therefore, the Code volumetric examination requirement for the subject welds is impractical. To meet the Code requirements for volumetric examination, the subject welds and/or adjoining components would require significant re-design and modifications. Imposition of this requirement would impose a considerable burden on the licensee.

The licensee has completed 50% of the Code-required volumetric examinations of the subject welds. Additionally 100% of the surface examinations have been completed as required by the Code. Furthermore, the subject welds are part of a larger population of Examination Category B-J welds that were examined during the interval. Based upon the volumetric examinations of the subject welds completed and the Code-required surface examinations, it is reasonable to conclude that patterns of degradation, if present, would have been detected. Consequently, reasonable assurance of the structural integrity of the subject welds 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 SQN. For Requests for Relief 1-ISI-9, 1-ISI-10, 2-ISI-8, 2-ISI-9, and 2-ISI-10, 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).

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. Masoud Bajestani
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. N. C. Kazanas, 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. Michael H. Mobley, Director
TN Dept. of Environment & Conservation
Division of Radiological Health
3rd Floor, L and C Annex
401 Church Street
Nashville, TN 37243-1532

County Executive
Hamilton County Courthouse
Chattanooga, TN 37402-2801