UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

SAFETY EVALUATION
BY THE OFFICE OF NUCLEAR REACTOR REGULATION
THIRD 10-YEAR INTERVAL INSERVICE INSPECTION PROGRAM
REQUESTS FOR RELIEF FOR
ST. LUCIE NUCLEAR POWER PLANT, UNIT 1

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 and applicable addenda as required by 10 CFR 50.55a(g), except where specific written relief has been authorized by the U.S. Nuclear Regulatory Commission (Commission or NRC) pursuant to 10 CFR 50.55a(g)(6)(i). 10 CFR 50.55a(a)(3) states 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 preservice 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. The Code of record for St. Lucie Nuclear Power Plant, Unit 1, is the 1989 Edition.

2.0 EVALUATION

By letter dated February 2, 1998, Florida Power and Light Company (licensee) submitted its third 10-year interval inservice inspection program plan requests for relief for St. Lucie Nuclear Power Station, Unit 1. The Idaho National Engineering and Environmental Laboratory has evaluated the information provided by the licensee in support of its third 10-year interval inservice inspection program plan requests for relief for St. Lucie Nuclear Power Station, Unit 1. Based on the results of the review, the staff adopts the contractor's conclusions and recommendations presented in the Technical Evaluation Report attached.

ENCLOSURE 1

The information provided by the licensee in support of its alternative to the Code requirements has been evaluated and the basis for disposition is documented below.

2.1 ISI Relief Request No. 01

ASME Code, Section XI, Paragraph IWA-6220 requires that the licensee prepare reports using NIS-1, Owner's Report for Inservice Inspections, and NIS-2, Owner's Report for Repair or Replacements; IWA-6230 requires that these reports be filed with the enforcement and regulatory authorities having jurisdiction at the plant site within 90 days of completion of the inservice inspection conducted during each refueling outage. Pursuant to 10 CFR 50.55a(a)(3)(i), the licensee proposed to use Code Case N-532, "Alternative Requirements to Repair and Replacement and Inservice Summary Report Preparation and Submission as Required by IWA-4000 and IWA-6000," in lieu of the Code reporting requirements.

The use of Form NIS-1, Owner's Report for Inservice Inspections, and Form NIS-2, Owner's Report for Repairs or Replacements, and submittal of the 90-day Summary Report are Code requirements. Alternatives contained in Code Case N-532 allow the licensee to submit these records in an abstract format on Form NIS-2A, Repair/Replacement Certification Record, and Form OAR-1, Owner's Activity Report, following the completion of an inspection period.

The requirements associated with documentation of inservice examinations and repairs/replacements and the subsequent submittal of Forms NIS-1 and NIS-2 within 90 days following a refueling outage are administrative only. It is noted that repair and replacement documentation reviews and approvals by the Authorized Nuclear Inspector continue to be required by this Code Case and that the licensee is required to establish a Repair/Replacement Plan in accordance with IWA-6340 of the 1992 Edition of Section XI.

The licensee has implemented Inspection Program B of the Code. Under this program, examination schedules are satisfied on a "per period" basis. Considering the milestones associated with Inspection Program B, submittal of the results of examinations and an abstract of repairs/replacements on a periodic basis is a reasonable alternative. In addition, the staff determined that the forms contained in Code Case N-532, which provide a summary of the status of repairs or replacements and a more detailed status of examinations by period and interval, are an improvement over report forms currently required by the Code. For example, OAR-1 includes the status of examinations credited for the period and percent credited to date for the interval, by Examination Category. This type of information provides the regulatory authorities a more comprehensive report on the status of the inservice inspection program.

The staff concluded that considering the administrative nature of the Code recording and reporting criteria, the use of the alternatives to Code requirements contained in Code Case N-532 provides an acceptable level of quality and safety. Therefore, the licensee's proposed alternative is authorized pursuant to 10 CFR 50.55a(a)(3)(i). The use of alternatives contained in Code Case N-532 is authorized for the current interval or until such time as Code Case N-532 is published in a future revision of Regulatory Guide 1.147. At that time, if the licensee intends to continue to implement the alternatives of Code Case N-532, the licensee is to follow all provisions in the Code Case with limitations issued in Regulatory Guide 1.147, if any.

2.2 ISI Relief Request No. 02

ASME Code, Section XI, requires, for systems borated for the purpose of controlling reactivity, Subparagraph IWA-5242(a), removal of insulation from pressure retaining bolted connections for VT-2 visual examination during system pressure testing. Pursuant to 10 CFR 50.55a(a)(3)(i), the licensee proposed to use Code Case N-533, "Alternative Requirements for VT-2 Visual Examination of Class 1 Insulated Pressure-Retaining Bolted Connections, Section XI, Division 1," in lieu of the examination requirements of IWA-5242 for bolted connections in systems borated for the purpose of controlling reactivity. The Code requires the removal of all insulation from pressure-retaining bolted connections in systems borated for the purpose of controlling reactivity when performing VT-2 visual examinations during system pressure tests. As an alternative, the licensee has proposed to use Code Case N-533 which includes performance of a VT-2 visual examination with the insulation in place, and a direct visual examination with the insulation removed each refueling outage for Class 1 systems and each period for Class 2 and 3 systems. As stated by the licensee, pressure testing with the insulation in place will be performed at operating pressure and temperature following a 4-hour hold time. For the direct visual examination, the connections need not be pressurized and any evidence of leakage will be evaluated in accordance with IWA-5250.

Using a two-phased approach, Code Case N-533 provides a reasonable strategy for assuring the leak-tight integrity of systems borated for the purpose of controlling reactivity. First, by using a 4-hour hold time, any significant leakage will have time to penetrate the insulation and be detected by the system leakage test with the insulation in place. Secondly, by removing the insulation each refueling outage for Class 1 systems and each period for Class 2 and 3 systems, the licensee will be able to detect minor leakage by the presence of boric acid crystals or residue. This two-phased approach provides an acceptable level of quality and safety for bolted connections in borated systems. Therefore, the licensee's proposed alternative is authorized pursuant to 10 CFR 50.55a(a)(3)(i). The use of Code Case N-533 is authorized for the current interval, or until Code Case N-533 is approved for general use by reference in Regulatory Guide 1.147. After that time, the licensee may continue to use Code Case N-533 with the limitations, if any, listed in Regulatory Guide 1.147.

2.3 ISI Relief Request No. 03

ASME Code, Section XI, IWA-2300, requires that personnel performing VT-2 and VT-3 visual examinations be qualified in accordance with comparable levels of competency as defined in ANSI N45.2.6. Additionally, the examination personnel shall have natural or corrected near distance acuity, in at least one eye, equivalent to a Snellen fraction of 20/20. For far vision, personnel shall have natural or corrected far distance visual acuity of 20/30 or equivalent. Pursuant to 10 CFR 50.55a(a)(3)(i), the licensee proposed to use Code Case N-546, "Alternative Requirements for Qualification of VT-2 Examination Personnel," in lieu of the requirements of the Code for the qualification of VT-2 visual examination personnel.

The Code requires that VT-2 visual examination personnel be qualified to levels of competency comparable to those identified in ANSI N45.2.6. The Code also requires that the examination personnel be qualified for near and far distance vision acuity. In lieu of the Code requirements, the licensee proposed to implement Code Case N-546 for personnel performing VT-2 visual

examinations. This Code Case includes the following requirements:

1. At least 40 hours plant walkdown experience, such as that gained by licensed and nonlicensed operators, local leak rate personnel, system engineers, and inspection and nondestructive examination personnel.

2. At least 4 hours of training on Section XI requirements and plant specific procedures for VT-2 visual examination.

3. Vision test requirements of IWA-2321, 1995 Edition.

The qualification requirements in Code Case N-546 are not significantly different from those for VT-2 visual examiner certification. Licensed and nonlicensed operators, local leak rate personnel, system engineers, and inspection and nondestructive examination personnel typically have a sound working knowledge of plant components and piping layouts. This knowledge makes them acceptable candidates for performing VT-2 visual examinations.

In addition to meeting the requirements contained in Code Case N-546, the licensee has committed to use procedural guidelines for consistent quality VT-2 visual examinations, verify and maintain records of the qualification of persons selected to perform VT-2 visual examinations, and perform independent reviews and evaluations of leakage found by a person(s) other than those that performed the VT-2 visual examination. Based on a review of Code Case N-546 and the additional commitments made by the licensee, the staff determined that the proposed alternative to the Code requirements provides an acceptable level of quality and safety. Therefore, the licensee's request to implement Code Case N-546 with the additional commitments is authorized pursuant to 10 CFR 50.55a(a)(3)(i). The use of this Code Case is authorized for the current interval at St. Lucie, Unit 1, or until the Code Case is approved for general use by reference in Regulatory Guide 1.147. After that time, the licensee must follow the conditions, if any, specified in the regulatory guide.

2.4 <u>ISI Relief Request No. 06</u>

The licensee requested relief from the requirements of ASME Code Section XI, 1989 Edition, Article IWF-5300, with regard to visual examination and functional testing of hydraulic and mechanical snubbers. Article IWF-5300 references the first addenda to ASME/ANSI OM-1987, Part 4 (OM-4) for such snubber activities. The licensee requested the use of the Technical Specifications (TS), 4.7.10, for the required snubber visual examination and functional testing, pursuant to 10 CFR 50.55a(a)(3)(i). In response to the staff's request during a conference call with the licensee on March 25, 1999, the licensee submitted a letter on April 8, 1999, which revised the earlier relief request provided in its letter of February 2, 1998. The original relief request was supplemented to specifically state that the snubber VT-3 visual examinations will be conducted in accordance with ASME Code Section XI, Paragraph IWA-2213 and that snubber repairs or replacements will also be performed in accordance with the plant ASME Section XI Program.

In its April 8, 1999 letter, the licensee stated that the first addenda to ASME/ANSI OM-1987, Part 4 (OM-4), contains a visual examination schedule which was recommended for removal

from plant TS by Generic Letter (GL) 90-09, "Alternative Requirements for Snubber Visual Inspection Intervals and Corrective Actions," dated December 11, 1990. This generic letter was issued to reduce the burden placed upon utilities by the then overly restrictive visual examination schedule. The St. Lucie, Unit 1, TS amendment No. 110 incorporated the requirements of GL 90-09 and removed the restrictive visual examination requirement from the St. Lucie TS.

The initial sample size for functional testing is the same in OM-4 and the TS ("10% Plan"). The sample expansion required by OM-4 would result in fewer snubbers being tested but would significantly increase the required engineering man-hour required to identify the sample expansion, due to the OM-4 requirement of failure mode grouping. Plant TS requires a 10% sample expansion (based on design type population) without the extensive engineering man-hours required by OM-4. St. Lucie currently performs functional testing during refueling outages, including any sample expansion requirements. The licensee stated in its April 8, 1999 letter, that OM-4 imposes requirements that could extend the off-load window which would extend refueling outage with no increase in the level of quality or safety.

A single functional test failure, which is identified in OM-4 as generic or application induced failure, would require the entire group of snubbers to be replaced or modified. Once all the units/components are replaced, OM-4 requires a shutdown after 2 months of power operation and prior to 12 calendar months after initial criticality to perform inspection/testing. The licensee stated that this would result in hardship in regard to material replacement, extended outages, forced shutdowns, radiation exposure and extensive costs and man-hours without an increase in the level of quality or safety.

The licensee stated in the April 8, 1999 letter, that, in lieu of using Article IWF-5000, the ongoing examination and testing program, in accordance with TS requirements (which incorporate the visual examination schedule of GL 90-09), are designed to demonstrate the functional integrity of the snubbers and are, at least, equivalent to the requirements of Article IWF-5000.

The licensee stated that, according to the TS requirements, the initial test sample shall be 10% for each design type population, and the sample expansion shall be based on 10% of the population. In addition, the following will be considered in the selection of snubbers:

1) Snubbers immediately adjacent to those found unacceptable;

2) Snubbers from the same system having similar operating conditions, such as temperature, humidity, vibration and radiation.

Based on the information provided by the licensee and the above evaluation, the staff has determined that the licensee has presented an adequate justification for the relief request from the requirements of ASME Code 1989 Edition, Section XI, Article IWF-5300 (which references OMa-1988 Addenda to the OM-1987 Edition, Part 4), with regard to visual examination and functional testing of St. Lucie snubbers. The staff has determined that the proposed alternative use of the St. Lucie TS for snubber activities would provide an acceptable level of quality and safety. Therefore, pursuant to 10 CFR 50.55a(a)(3)(i), the licensee's request for relief for the third 10-year interval of the St. Lucie ISI program is authorized.

The licensee clarified in its April 8, 1999 letter, that snubber VT-3 visual examinations will be conducted in accordance with IWA-2213 and plant TS 4.7.10, surveillance requirements for snubbers. In addition, the St. Lucie Plant Section XI Repair and Replacement Program shall govern corrective actions for snubbers requiring repairs or replacements. This is acceptable to the staff.

2.5 ISI Relief Request No. 07

FPL originally submitted a relief request for the alternative repair method by letter dated July 30, 1993 (Letter No. I-93-190). In this submittal, FPL requested approval for a temporary non-Code repair for pinhole leaks that had been detected in the bottom of the refueling water tank (RWT); approval was sought until the following refueling outage for the unit. The non-Code repair was to consist of adding a reinforced vinyl ester liner to the bottom of the RWT; this was proposed in lieu of performing an ASME Code-required weld repair of the leaking bottom plates. On October 21, 1993, the NRC approved this relief request on the condition that FPL would perform a Code-required weld repair of the leaking tank liner during the following refueling outage for the unit. On November 16, 1994, FPL submitted a letter informing the staff that it did not consider a Code repair of the RWT bottom to be practical for the Fall 1994 refueling outage. Instead, pursuant to 10 CFR 50.55a(a)(3)(i), FPL requested approval to extend the use of the alternative non-Code repair to the steam generator replacement outage. This request was approved by the staff on November 25, 1994. However, in the SE of November 25, 1994, the NRC requested, as a condition of approval, that FPL complete ongoing laboratory testing and in situ inspections to confirm the ultimate capabilities of the vinyl ester coating as an alternative repair method. On January 6, 1997, FPL indicated that they had completed the laboratory testing and in situ inspections of the vinyl ester coating and had confirmed that the lining meets the manufacture's specifications for physical and chemical properties and that the coating installed in the RWT was performing as expected. Therefore, in its letter of January 6, 1997, FPL also requested approval of the use of the reinforced vinyl ester liner for both the remainder of the second 10-year ISI interval and for the third 10-year ISI interval. In its SE of May 27, 1997, the staff informed FPL that they were approving the extension of use of the alternative vinyl ester coating repair for the remainder of the second 10-year ISI interval; however, the staff also stated that, if FPL desired to extend the use of the coating into the third 10-year ISI interval, FPL would have to resubmit the request for approval.

Section 50.55a(g)(4) to Title 10 of the Code of Federal Regulations requires, in part, that "throughout the service life of a boiling or pressurized water-cooled nuclear power facility, components (including supports) which are classified as ASME Code Class 1, Class 2 and Class 3 must meet the requirements . . . set forth in Section XI of editions of the ASME Boiler and Pressure Vessel Code . . . to the extent practical within the limitations of design, geometry, and materials of construction of the components."

However, Section 50.55a(a)(3)(i) to Title 10 of the Code of Federal Regulations (10 CFR 50.55a(a)(3)), allows the Director of the Office of Nuclear Reactor Regulation to authorize alternatives to the requirements of Section XI of the ASME Code, when an applicant can demonstrate that the alternative program will provide an acceptable level of quality and safety in lieu of complying the requirement in Section XI.

Subparagraph IWC-3132 of the 1989 Edition of Section XI states that relevant flaws that are detected in ASME Code Class 2 structures or components as a result of an inservice visual examination shall be unacceptable for continued service unless it is demonstrated that the flaws are acceptable by either "Supplemental Examination," by "Corrective Measures or Repairs," or by "Evaluation."

Article IWA-4000 of the 1989 Edition of Section XI provides the general requirements for performing welded repairs of ASME Code Class 2 components that do not meet the acceptance standards for continued service contained in Subparagraph IWC-3132 to the 1989 Edition of Section XI.

Pursuant to 10 CFR 50.55a(a)(3)(i), FPL seeks approval to use a reinforced epoxy coating as an alternative repair for pinhole leaks in the St. Lucie, Unit 1, RWT for the third 10-year ISI interval for the plant. FPL is seeking approval for this alternative program in lieu of complying with the requirements for performing a Code-required weld repair of the leaking RWT bottom liner pursuant to Article IWA-4000.

The RWT is an above-ground aluminum tank sitting on a sand bed and supported by a concrete ring foundation. The RWT is a Quality Group B, ASME Class 2 structure constructed in accordance with ANSI B96.1-1967. A copper ground grid is below the tank and the licensee has reported that the tank bottom has come in contact with the ground grid.

In the original relief request submittal, FPL conducted a root cause evaluation of the as found condition to determine the failure mechanism for the RWT bottom. FPL determined that the root cause for the failure of the tank bottom was galvanic corrosion as a result of the galvanic couple between the tank bottom and the surrounding copper ground grid. FPL proposed that the lack of joint sealing compound at the interface between the tank floor and the concrete wall permitted the intrusion of water into the sand bed that accelerated the galvanic corrosion. To correct the consequences of the leaks, FPL placed a joint sealing compound between the tank bottom plates and the concrete ring wall and repaired the area around the RWT to prevent standing water from rising to a level above the top of the ring wall foundation.

In the November 25, 1994, SE, the NRC staff determined that the tank bottom is continuously supported by the sand bed. The tank bottom is a fluid boundary and carries the static compressive load from the hydrostatic head of the fluid level. The height of this tank results in a maximum compressive load of approximately 16 psig for a full tank. FPL also indicated that seismic loads were appropriately considered for the loading conditions on the RWT. The loads resulting from a seismic event tend to slide the tank sideways or tip the tank over. There are 45 anchor bolts distributed around the tank that restrain the tank from sliding or tipping over.

During the Spring 1996 refueling outage, FPL completely drained RWT in order to conduct a hands-on inspection of the coating liner, to evaluate the performance of the installed coating liner, and to obtain sufficient data to support the request for approval of the liner as a permanent repair to the tank bottom.

FPL performed non-destructive tests of the coating liner to test the liner for acceptability of the following conditions and properties: hardness, delamination, adhesion, peeling, flaking,

undercutting, blistering, cracking, discoloration, holidays, and pinholes. A small hole, 1/32-inch diameter and 1/16-inch deep, that did not penetrate through the liner, was detected. The affected area was cleaned and repaired using Duromar SAR-SU. A small amount of duct tape was found on the RWT wall. The liner was cut open, the tape was removed, and the liner was repaired with Duromar SAR-UW epoxy coating. All of the remaining properties were satisfactory and verified the manufacturer's published information on the physical properties of the Dudick Protecto-Line 800 system. Furthermore, an independent testing laboratory confirmed that the chemical properties of the coating liner conformed to the coating vendor's published information, and that the repairs to the liner were in accordance with vendor's specifications for the coating system.

The licensee has proposed and committed to an augmented inspection program that involves a visual or hands-on inspection during each of the refueling outages for the remainder of the third inspection interval. These inspections are expected to identify any degradation of the liner. The inspection of the caulking material between the RWT bottom and the concrete ring wall will improve the chances that the sand bed will remain dry and that galvanic corrosion effects will not be significant.

The program for the third 10-year ISI interval consists of remote visual examination during refueling outages SL1-16, SL1-18, SL1-19, and SL1-21. A full-hands-on examination would be conducted during refueling outages SL1-17 and SL1-20. The program for the fourth 10-year ISI interval will be submitted as part of the ISI plan for that interval. In addition, the caulking material between the RWT bottom and the concrete foundation ring wall will be inspected on an annual basis. .

Previous remote visual and full hands-on inspections and hands-on testing of the liner have indicated that the alternative vinyl ester coating repair is performing as expected. The independent test laboratory results on the liner material confirm that the correct lining material was used.

The staff finds that the fiberglass reinforced vinyl ester liner in the RWT is performing as expected and is structurally acceptable for continued service. The licensee has committed to perform remote visual examinations during refueling outages Nos. SL1-16, SL1-18, SL1-19, and SL1-21and full hands-on inspections during refueling outage Nos. SL1-17 and SL1-20 in the third 10-year ISI interval. The lining is a coatings industry standard with demonstrated capability for the intended application. Consequently, the staff finds the proposed alternative to an ASME Code-repair for the RWT bottom would provide an acceptable level of quality and safety.

In accordance with the provisions of 10 CFR 50.55a(a)(3)(i), the alternative to continue with the use of the vinyl ester lining for the bottom of the tank, along with the proposed inspections, in lieu of a Code-repair or replacement, for the remainder of the third 10-year ISI interval is authorized. If FPL desires to request approval for use of the alternative vinyl ester coating during fourth 10-year ISI interval, FPL will be required to resubmit its evaluation of the coating prior to entering the fourth 10-year interval.

2.6 ISI Relief Request No. 09

ASME Code, Section XI, Examination Category B-G-1, Item B6.10, requires 100% surface examination of all RPV closure head nuts. Pursuant to 10 CFR 50.55a(a)(3)(i), the licensee proposed an alternative to the requirements of the Code for the RPV closure head nuts. The licensee stated:

> FPL will perform a visual VT-1 on the RPV Closure Head Nuts. The IWB-3517 acceptance criteria of the 1989 Edition of Section XI will be used for evaluation of indications.

The Code requires surface examination of the RPV closure head nuts. As an alternative to the Code requirements, the licensee proposed to perform a VT-1 visual examination of the RPV closure head nuts. Review of the examination requirements for Examination Category B-G-1, indicates that with the exception of the reactor pressure vessel closure head nuts and the closure studs (when removed), all other items in this Examination Category require VT-1 visual examinations or volumetric examinations (as applicable). Typical relevant conditions that would require corrective action prior to putting closure head nuts back into service would include corrosion, deformed or sheared threads, deformation, and degradation mechanisms (i.e., boric acid attack). Surface examination procedures are typically qualified for the detection of linear type flaws (cracks) with corresponding acceptance criteria for rejectable linear flaw lengths only. When performing surface examinations in accordance with the 1989 Edition of the Code, Item B6.1 0, the surface examination acceptance criteria is not provided, as it was in the course of preparation. Without clearly defined acceptance criteria, relevant conditions that require corrective measures may not be adequately addressed.

The 1989 Addenda of Section XI, Article IWB-3000, Acceptance Standards, IWB-3517.1, Visual Examination, VT-1, describes relevant conditions that require corrective action prior to continued service of bolting and associated nuts. Included for corrective action in IWB-3517.1 is the requirement to compare crack-like flaws to the flaw standards of IWB-351 5 for acceptance. Surface examination acceptance criteria are typically limited to linear type flaws (i.e. cracking, aligned pitting and corrosion). Because the VT-1 visual examination acceptance criteria include the requirement for evaluation of crack-like indications and other relevant conditions requiring corrective action such as deformed or sheared threads, localized corrosion, deformation of part, and other degradation mechanisms, it is concluded that the VT-1 visual examination provides a more comprehensive assessment of the condition of the closure head nut. The staff determined that a VT-1 visual examination provides an acceptable level of quality and safety. In addition, the 1989 Addenda of Section XI changes the requirement for the subject reactor pressure vessel closure head nuts from surface examination to VT-1 visual examination and provides appropriate acceptance criteria. Therefore, the licensee's proposed alternative to perform VT-1 visual examinations, that provides an acceptable level of quality and safety, is authorized pursuant to 10 CFR 50.55a(a)(3)(i).

2.7 ISI Relief Request No. 12

ASME Code, Section XI, Table IWB-2500-1, Examination Category B-P, Table IWC-2500-1, Examination Category C-H, and Table IWD-2500-1, Examination Categories D-A, D-B, and D-C,

require system hydrostatic testing of pressure retaining components in accordance with IWA-5000 once each 10-year interval. Pursuant to 10 CFR 50.55a(a)(3)(i), the licensee proposed to use Code Case N-498-1, "Alternate Rules for 10-Year Hydrostatic Pressure Testing. for Class 1, 2, and 3 Systems, Section XI, Division 1." The licensee stated:

> FPL will perform a system leakage test on Class 1 systems and system pressure tests on Class 2 and 3 systems once each interval in accordance with the alternatives of ASME Code Case N-498-1.
>
> This Code Case is an alternative to 10 year hydrostatic tests required by the 1989 Edition of Section XI for Class 1, 2, and 3 systems. Use of this alternative reduces the need for special system alignments and temporary system alteration to conduct hydrostatic tests.

The Code requires a system hydrostatic test once per interval in accordance with the requirements of IWA-5000 for Class 3 pressure-retaining systems. In lieu of the Code required hydrostatic testing, the licensee has requested authorization to use Code Case N-498-1, Alternative Rules for 10-Year System Hydrostatic Testing for Class 1, 2 and 3 Systems, dated May 11, 1994.

The system hydrostatic test, as stipulated in Section XI, is not a test of the structural integrity of the system but rather an enhanced leakage test. Hydrostatic testing only subjects the piping components to a small increase in pressure over the design pressure; therefore, piping dead weight, thermal expansion, and seismic loads present far greater challenges to the structural integrity of a system. Consequently, the Section XI hydrostatic pressure test is primarily regarded as a means to enhance leak detection during the examination of components under pressure, rather than as a method to determine the structural integrity of the components. In addition, industry experience indicates that leaks are not being discovered as a result of hydrostatic test pressures causing a preexisting flaw to propagate through the wall. In most cases leaks are being found when the system is at normal operating pressure.

Code Case N-498 was previously approved for general use on Class 1 and 2 systems in Regulatory Guide 1.147, Rev. 9. For Class 3 systems, Revision N-498-1 specifies requirements identical to those for Class 2 components (for Class 1 and 2 systems, the alternative requirements in N-498-1 are unchanged from N-498). In lieu of 10-year hydrostatic pressure testing at or near the end of the 10-year interval, Code Case N-498-1 requires a VT-2 visual examination at nominal operating pressure and temperature in conjunction with a system leakage test performed in accordance with paragraph IWA-5000 of the 1992 Edition of Section XI.

Class 3 systems do not normally receive the amount and/or type of nondestructive examinations that Class 1 and 2 systems receive. While Class 1 and 2 system failures are relatively uncommon, Class 3 leaks occur more frequently and are caused by different failure mechanisms. Common causes of failure are flow accelerated corrosion (FAC) , microbiologically-induced corrosion (MIC), and general corrosion. In general, licensees have implemented programs for the prevention, detection, and evaluation of FAC and MIC; therefore,

Class 3 systems receive inspection commensurate with their functions and expected failure mechanisms.

The staff determined that considering that Code Case N-498 was found to be an acceptable alternative for Class 1 and 2 systems, and that Class 3 systems receive inspections commensurate with their function and expected failure mechanisms, the licensee's proposed alternative, to use Code Case N-498-1, provides an acceptable level of quality and safety. Therefore, the licensee's proposed alternative be authorized pursuant to 10 CFR 50.55a(a)(3)(i). The use of the Code Case N-498-1 is authorized for the current interval or until such time as the Code Case is published in a future revision of Regulatory Guide 1.147. At that time, if the licensee intends to continue to implement Code Case N-498-1, the licensee should follow all provisions in Code Case N-498-1 with limitations issued in Regulatory Guide 1.147, if any.

2.8 ISI Relief Request No. 14

ASME Code, Section XI, Table IWB-2500-1, Examination Category B-D, Items B3.90 and B3.100 require that, for reactor pressure vessel (RPV) nozzle welds and inner radius sections, at least 25% but not more than 50% (credited) of the nozzles shall be examined by the end of the first inspection period and the remainder by the end of the inspection interval. Examination Category B-F, Item B5.10, Note (1) states that the reactor vessel nozzle-to-safe end weld examinations may be performed with the vessel nozzle examinations. Pursuant to 10 CFR 50.55a(a)(3)(i), the licensee has proposed to use Code Case N-521 as an alternative to the Code requirement to examine at least 25% of the vessel-to-nozzle welds and nozzle inner radius sections during the first examination period. The licensee stated:

> FPL will perform the Code required volumetric examinations on the RPV nozzle inside radius sections and the nozzle to vessel welds in accordance with the rules of Code Case N-521. The examinations will be performed approximately 10 years after the previous examinations, within the guidelines of IWA-2430.

The Code requires the examination of at least 25%, but not more than 50% of RPV nozzles and associated inside radius (IR) sections and nozzle safe ends during the first inspection interval. The licensee has requested authorization to use Code Case N-521 and defer examination of these areas until the end of the second 10-year interval. Code Case N-521 states that examination of RPV nozzles, IR sections, and nozzle-to-safe end welds may be deferred provided (a) no inservice repairs or replacements by welding have ever been performed on any of the subject areas, (b) none of the subject areas contain identified flaws or relevant conditions that currently require successive inspections in accordance with IWB-2420(b), and (c) the unit is not in the first interval.

The licensee has confirmed that the above conditions have been met. In addition, the licensee volumetrically examined all the subject areas during the May 1996 outage of 'the previous interval. By examining the nozzle-to-vessel welds, and associated IR sections and nozzle-to-safe end welds, at the end of the previous 10-year interval, the licensee has established a new sequence of examinations that will not exceed 10 years between inspections. The staff concluded that since the licensee repeated the examinations at the end of the previous interval, the maximum time of 10 years between inspections will not be exceeded, and will meet the conditions in the Code Case, the licensee's proposed alternative provides an acceptable level of

quality and safety. Therefore, the licensee's proposed alternative is authorized pursuant to 10 CFR 50.55a(a)(3)(i).

2.9 ISI Relief Request No. 15

ASME Code Examination Categories B-J, C-F-1, and C-F-2, Items B9.12, C5.12, C5.22, C5.52, and C5.62, require surface and volumetric examination of Class 1 and 2 longitudinal piping welds. Items B9.22, C5.42, and C5.82 require surface examination of Class 1 and 2 longitudinal piping welds. For Class 1, the examination volume/surface area includes at least one pipe diameter but not more than 12 inches of each longitudinal weld intersecting the circumferential weld required to be examined by Examination Categories B-J and B-F. Class 2 longitudinal piping welds require examination of 2.5T of the weld length from intersecting circumferential welds. Pursuant to 10 CFR 50.55a(a)(3)(i), the licensee proposed to use Code Case N-524, "Alternative Examination Requirements for Longitudinal Welds in Class 1 and 2 Piping." The licensee stated:

> FPL will examine those areas of Class 1 and 2 longitudinal welds within the boundaries of the intersecting circumferential weld in accordance with the requirements of Code Case N-524.
>
> This Code Case is an alternative to the examination requirements of the longitudinal welds presently required by ASME Section XI for Class 1 and 2 piping welds. Use of this alternative reduces the need for building a scaffold and removal of insulation for the Reactor Coolant, Safety Injection, Residual Heat Removal, and other Class 1 and 2 piping systems. Use of this Code Case provides an acceptable level of quality and safety by the use of a system leakage test and the additional nondestructive examinations identified above.
>
> This Code Case was approved by the Code Committee as an alternative to the examination requirements on Longitudinal seam welds of Code Categories B-F, B-J, C-F-1, and C-F-2. It was approved for use by ASME on August 9, 1993.

ASME Section XI requires the examination of a certain length of longitudinal welds intersecting the required circumferential weld. The licensee's proposed alternative is to examine only the portions of longitudinal weld contained within the examination area of the intersecting circumferential weld. This alternative is contained in Code Case N-524, "Alternative Examination Requirements for Longitudinal Welds in Class 1 and Class 2 Piping," which has previously been found acceptable for use at other facilities.

Longitudinal welds are produced during the manufacture of the piping, not in the field as are circumferential welds. Consequently, the welds are fabricated under the strict guidelines specified by the manufacturing standard, which provides assurance of structural integrity. These welds have also been subjected to the preservice and initial inservice examinations, which provide additional assurance of structural integrity. No significant loading conditions or material degradation mechanisms have become evident to date that specifically relate to longitudinal seam welds in nuclear plant piping. The most critical region of the longitudinal weld is the portion that intersects the circumferential weld. The staff concluded that since this region will be

examined during the examination of the circumferential weld, the licensee's proposed alternative provides an acceptable level of quality and safety. Therefore, the licensee's proposed alternative is authorized pursuant to 10 CFR 50.55a(a)(3)(i). The use of the Code Case N-524 is authorized for the current interval or until such time as the Code Case is published in a future revision of Regulatory Guide 1.147. At that time, if the licensee continues to implement Code Case N-524, the licensee should follow all provisions in Code Case N-524, with conditions specified in the Regulatory Guide.

3.0 STAFF CONCLUSIONS

The staff, with the assistance of its contractor, has reviewed the licensee's submittal and concludes that for Requests for Relief Nos. 01, 02, 03, 06, 07, 09, 12, 14 and 15, FPL's proposed alternatives to the Code requirements provide an acceptable level of quality and safety. Therefore, the staff authorizes these proposed alternatives pursuant to 10 CFR 50.55a(a)(3)(i).

Attachment: Technical Evaluation Report

Principal Contributors: T. McLellan, J. Medoff, A.J. Lee

Date: June 18, 1999

TECHNICAL LETTER REPORT
ON
THIRD 10-YEAR INTERVAL INSERVICE INSPECTION
REQUESTS FOR RELIEF
FOR
FLORIDA POWER & LIGHT COMPANY
ST. LUCIE NUCLEAR POWER PLANT, UNIT 1
DOCKET NUMBER: 50-335

1. INTRODUCTION

By letter dated February 2, 1998, the licensee, Florida Power & Light Company (FPL), submitted the inservice inspection (ISI) program for the St. Lucie Nuclear Power Plant, Unit 1, third 10-year interval. Contained in the program were requests for relief from ASME Section XI requirements for the third 10-year ISI interval. The Idaho National Engineering and Environmental Laboratory (INEEL) staff's evaluation of the subject requests for relief are in the following section.

B. EVALUATION

The information provided by Florida Power & Light Company 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 St. Lucie Nuclear Power Plant, Unit 1, third 10-year ISI interval, which began February 11, 1998, is the 1989 Edition of Section XI of the ASME Boiler and Pressure Vessel Code.

2.1 Request for Relief 1, Use of Code Case N-532, *Alternative Requirements to Repair and Replacement and Inservice Summary Report Preparation and Submission as Required by IWA-4000 and IWA-6000*

Code Requirement: Section XI, Paragraph IWA-6220 requires that the licensee prepare reports using NIS-1, *Owner's Report for Inservice Inspections*, and NIS-2, *Owner's Report for Repair or Replacements*; IWA-6230 requires that these reports be filed with the enforcement and regulatory authorities having jurisdiction at the plant site within 90 days of completion of the inservice inspection conducted during each refueling outage.

Licensee's Proposed Alternative: In accordance with 10 CFR 50.55a(a)(3)(i), the licensee proposed to use Code Case N-532 in lieu of the Code reporting requirements. The licensee stated:

"FPL will prepare OAR-1 and NIS-2A forms in accordance with the requirements of Code Case N-532. The forms will be submitted after the end of the period.

"For Table 1 of the Code Case, FPL will provide the required information. On those Code Categories that are covered by requirements other than Section XI (i.e. Code Category B-Q for steam generator tubes), a note will be placed in the table explaining the details.

"For Table 2, items with flaws or relevant conditions that required evaluation for continued service in accordance with the following will be included:

IWB-3132.4,	*Acceptance by Analytical Evaluation,*
IWB-3142.4,	*Acceptance by Analytical Evaluation,*
IWC-3122.4,	*Acceptance by Evaluation,*
IWC-3132.4,	*Acceptance by Evaluation*
IWD-3000,	*Acceptance Standards* (the rules of IWB-3000 will be used)
IWE-3122.4,	*Acceptance by Evaluation* (92A92 Code)
IWF-3112.3,	*Acceptance by Evaluation or Test*
IWL-3122.4,	*Acceptance by Evaluation or Test* (92A92 Code)

"Flaws meeting the intent of the above sections will be included. This will preclude the evaluation of geometric and acceptable indications from appearing on the report.

"For Table 3, Repairs, Replacements, or Corrective Measures that were required for continued service since the previous OAR-1 Form (or NIS-1 form) was written will be included."

Licensee's Basis for Proposed Alternative (as stated):

"The documentation required by IWA-6000 includes the NIS-1 and NIS-2 forms. These forms give a summary of the status of the examinations. They include what components and piping systems were examined. They do not require the inclusion of class 3 components or the new IWE and IWL examinations.

"The information included on the NIS-1 is verified by the ANII, and reviewed by several other groups. These may include QA auditors and the USNRC. By submitting the NIS-1 to the regulatory agencies having jurisdiction at the plant, it means the same information is being reviewed one more time by personnel who have little or no knowledge of plant specifics.

"The NIS-2 report on repairs and replacements lists the components where work has been performed. Again, the ANII reviews and verifies each report. Some of these reports are reviewed by USNRC inspectors during refuel outages. Sending these reports to the regulatory agencies does not provide any detail about the repair or replacement.

"Code Case N-532 is an alternative to the documentation requirements of IWA-6000 of Section XI. Use of this alternative reduces the documentation required to be gathered and submitted each outage. Submittals are reduced to once at the end of the period. The forms in the Code Case enhance the type of information being submitted, being more specific in the number of examinations performed and what types of problems were encountered. FPL will use this Code Case to replace the NIS-1 and NIS-2 reports.

"The current requirement is to submit the NIS-1 and NIS-2 summary reports to the enforcement and regulatory authorities having jurisdiction at the plant site within 90

days of the end of the outage. The NIS-1 report gives a summary of the types of examinations performed and the results. The NIS-2 reports give details on Repairs and Replacements. Code Case N-532 allows the use of the OAR-1 form and three tables of examination information and the NIS-2A forms as replacements.

"By using this Code Case, FPL will reduce the amount of information to be submitted, but will provide more specific information about the status of examinations. This will reduce the amount of time and costs involved in collection of the data, and provide more specific information to the enforcement and regulatory agencies having jurisdiction at the plant site.

"Code Case N-532 requires specific Program B information to be submitted. The preparation of the Code required documentation involves excessive cost and man-hours. The information provided with the NIS-1 and NIS-2 forms does not provide any supporting evidence of the status of examinations performed.

"Code Case N-532 was approved for use by ASME on December 12, 1994, as an alternative to the Code required documentation of IWA-6000. Use of this Code case provides an acceptable level of quality and safety by the use of alternate documentation that enhances the process of determining if FPL has met the requirements of Section XI."

Evaluation: The use of Form NIS-1, *Owner's Report For Inservice Inspections*, and Form NIS-2, *Owner's Report for Repairs or Replacements*, and submittal of the 90-day Summary Report are Code requirements. Alternatives contained in Code Case N-532 allow the licensee to submit these records in an abstract format on Form NIS-2A, Repair/Replacement Certification Record, and Form OAR-1, Owner's Activity Report, following the completion of an inspection period.

The requirements associated with documentation of inservice examinations and repairs/replacements and the subsequent submittal of Forms NIS-1 and NIS-2 within 90 days following a refueling outage are administrative only. It is noted that repair and replacement documentation reviews and approvals by the Authorized Nuclear Inspector continue to be required by this Code Case and that the licensee is required to establish a Repair/Replacement Plan in accordance with IWA-6340 of the 1992 Edition of Section XI.

The licensee has implemented Inspection Program B of the Code. Under this program, examination schedules are satisfied on a "per period" basis. Considering the milestones associated with Inspection Program B, submittal of the results of examinations and an abstract of repairs/replacements on a periodic basis is a reasonable alternative. In addition, the INEEL staff believes that the forms contained in Code Case N-532, which provide a summary of the status of repairs/replacements and a more detailed status of examinations by period and interval, are an improvement over report forms currently required by the Code. For example, OAR-1 includes the status of examinations credited for the period and percent credited to date for the interval, by Examination Category. This type of information provides the regulatory authorities a more comprehensive report on the status of the inservice inspection program.

Considering the administrative nature of the Code recording and reporting criteria, the INEEL staff believes that use of the alternatives to Code requirements contained in Code Case N-532 will continue to provide an acceptable level of quality and safety. Therefore, it is recommended that the licensee's proposed alternative be authorized pursuant to 10 CFR 50.55a(a)(3)(i). The use of alternatives contained in Code Case N-532 should be authorized for the current interval or until such time as the Code Case is published in a future revision of Regulatory Guide 1.147. At that time, if the licensee intends to continue to implement the alternatives of this Code Case, the licensee is to follow all provisions in Code Case N-532 with limitations issued in Regulatory Guide 1.147, if any.

2.2 Request for Relief 2, Use of Code Case N-533, *Alternative Requirements for VT-2 Visual Examination of Class 1 Insulated Pressure-Retaining Bolted Connections, Section XI, Division 1*

Code Requirement: For systems borated for the purpose of controlling reactivity, Subparagraph IWA-5242(a) requires removal of insulation from pressure-retaining bolted connections for VT-2 visual examination during system pressure testing.

Licensee's Proposed Alternative: In accordance with 10 CFR 50.55a(a)(3)(i), the licensee proposed to use Code Case N-533 in lieu of the examination requirements of IWA-5242 for bolted connections in systems borated for the purpose of controlling reactivity. The licensee stated:

"FPL will examine bolted connections on systems borated for the purpose of controlling reactivity in accordance with the requirements of Code Case N-533. This Code Case was written specifically for Class 1 systems. However, FPL requests to apply it to Class 1, 2, and 3 systems.

"Each refueling outage, FPL will remove the insulation from the bolted connections and perform a VT-2 visual examination in accordance with paragraph (b) of the Code Case on Class 1 systems. For Class 2 and 3 systems, this examination will be performed once each period. The connections are not required to be pressurized during the examination and any evidence of leakage will be evaluated in accordance with IWA-5250.

"In addition to the requirements of paragraph (a) of the Code Case, the system pressure test and VT-2 examination with the insulation installed on the bolted joints at normal operating pressure and temperature will include a 4-hour hold time and will be completed prior to returning the unit to service."

Licensee's Basis for Proposed Alternative (as stated):

"The ambient conditions during the installaticn of insulation after VT-2 examinations at normal operating pressure and temperature (NOP/NOT) require heat stress work restrictions. Containment entries at NOP/NOT are physically demanding on personnel due to the adverse heat environment. Stay times for personnel in many areas are less than one hour and would require multiple containment entries to complete the examination activities. Ambient temperatures range from 95 to 110 degrees F. Personnel should not be exposed to such adverse work environment unnecessarily without a compensating increase in the level of quality and safety. Performing the VT-

2 visual examination using Code Case N-533 will accomplish the examinations and the insulation installation while maintaining personnel safety and examination quality at an appropriate level.

"Historical data indicate that personnel contaminations increase with increasing environmental temperatures due to the profuse sweating caused by the elevated temperatures. Reinstalling contaminated insulating material under adverse conditions (i.e., to piping that is at 2250 psia and greater than 500 degrees F) would negatively impact total personnel contaminations and expose personnel to unnecessary safety risk. Additionally, increased dose would be accumulated due to reduced examination efficiency as a result of the necessity to wear special protective equipment (e.g., ice vest).

"The removal of scaffolding from containment would be through the reactor containment hatch rather than the equipment hatch since the plant is in Mode 4 with the equipment hatch secured. This will place added physical and heat stress limitations on the personnel involved."

Evaluation: The Code requires the removal of all insulation from pressure-retaining bolted connections in systems borated for the purpose of controlling reactivity when performing VT-2 visual examinations during system pressure tests. As an alternative, the licensee has proposed to use Code Case N-533 which includes performance of a VT-2 visual examination with the insulation in place, and a direct visual examination with the insulation removed each refueling outage for Class 1 systems and each period for Class 2 and 3 systems. As stated by the licensee, pressure testing with the insulation in place will be performed at operating pressure and temperature following a 4-hour hold time. For the direct visual examination, the connections need not be pressurized and any evidence of leakage will be evaluated in accordance with IWA-5250.

Using a two-phased approach, Code Case N-533 provides a reasonable strategy for assuring the leak-tight integrity of systems borated for the purpose of controlling reactivity. First, by using a 4-hour hold time, any significant leakage will have time to penetrate the insulation and be detected by the system leakage test with the insulation in place. Secondly, by removing the insulation each refueling outage for Class 1 systems and each period for Class 2 and 3 systems, the licensee will be able to detect minor leakage by the presence of boric acid crystals or residue. This two-phased approach provides an acceptable level of quality and safety for bolted connections in borated systems. Therefore, it is recommended that the licensee's proposed alternative be authorized pursuant to 10 CFR 50.55a(a)(3)(i). The use of Code Case N-533 should be authorized for the current interval, or until the Code Case is approved for general use by reference in Regulatory Guide 1.147. After that time, the licensee may continue to use the Code Case with the limitations, if any, listed in Regulatory Guide 1.147.

2.3 Request for Relief 3, Use of Code Case N-546, *Alternative Requirements for Qualification of VT-2 Examination Personnel*

Code Requirement: Section XI, IWA-2300, requires that personnel performing VT-2 and VT-3 visual examinations be qualified in accordance with comparable levels of competency as defined in ANSI N45.2.6. Additionally, the examination personnel shall have natural or corrected near distance acuity, in at least one eye, equivalent to a Snellen fraction of 20/20. For far vision, personnel shall have natural or corrected far distance visual acuity of 20/30 or equivalent.

Licensee's Proposed Alternative: In accordance with 10 CFR 50.55a(a)(3)(i), the licensee proposed to use Code Case N-546 in lieu of the requirements of the Code for the qualification of VT-2 visual examination personnel. The licensee stated:

> "FPL will use Code Case N-546 in lieu of the requirements of Article IWA-2300 for the qualification of VT-2 examiners.
>
> "A program has been developed and formal procedures implemented so that consistent VT-2 visual examinations are performed. Leakage evaluations will include an independent review and evaluation of findings by persons other than those that performed the VT-2 examinations. Finally, FPL will document and maintain records to verify that persons selected are qualified.
>
> "Examination personnel will have at least 40 hours of plant walkdown experience, receive a minimum of four hours of training on Section XI requirements and plant specific procedures for VT-2 visual examinations, and pass the vision test requirements of IWA-2321, 1995 edition. In addition to the requirements of the Code Case N-546, FPL has developed a procedure to assure consistent VT-2 visual examinations are performed. FPL will proceduralize the requirement that an independent review and evaluation of the findings be performed by persons other than those that performed the VT-2 examinations. FPL will also implement a program that documents the qualifications, training, and visual acuity of persons selected to perform the VT-2 examinations and will maintain records that all of the requirements in the code case and specified herein, are met.

Licensee's Basis for Proposed Alternative (as stated):

> "Code Case N-546 is an alternative to the qualification requirements of IWA-2300 for VT-2 visual examination personnel This alternative enables St. Lucie to utilize plant operators perform VT-2 leak examinations during routine system pressure test walkdowns, reducing the burden of costly contractor NDE personnel. The proposed alternative qualification requirement will provide a reasonable assurance that personnel used for the examinations will have sufficient training. Thus an acceptable level of quality and safety will be achieved and public health and safety will not be endangered by allowing the proposed alternative qualification in lieu of the Code requirement.
>
> "Use of Code Case N-546 allows experienced plant personnel such as licensed and non-licensed operators, local leak rate test personnel, system engineers, and inspection and nondestructive examination personnel to perform VT-2 visual examinations without having to be certified to comparable levels of competency defined in ANSI N45.2.6. The FPL individuals performing the visual examinations will

be subject to the conditions provided in Code Case N-546.

"This approach alleviates the need to contract certified VT-2 personnel to perform these examinations and reduces the administrative burden of maintaining a Section XI qualification and certification program for VT-2 examination personnel. The level of safety and quality will not decrease with the elimination of contract personnel and the use of qualified FPL personnel to determine if leakage is present. The qualification requirements in Code Case N-546, in conjunction with the additional commitments, are comparable to those qualifications required for VT-2 visual examiner certification.

"FPL plant operators have many hours of training in the proper functioning of the plant and its components. They are already trained to report any abnormal conditions that may affect the plant. Leakage is one condition that is reported. By providing the additional training and allowing the plant operators to perform the VT-2 examinations, FPL will reduce costs and radiation exposure by having fewer people performing examinations in the same areas. In addition, the training required for operators may enhance the VT-2 examination as they are more familiar with the plant components than most temporary contractors."

Evaluation: The Code requires that VT-2 visual examination personnel be qualified to levels of competency comparable to those identified in ANSI N45.2.6. The Code also requires that the examination personnel be qualified for near and far distance vision acuity. In lieu of the Code requirements, the licensee proposed to implement Code Case N-546 for personnel performing VT-2 visual examinations. This Code Case includes the following requirements:

1. At least 40 hours plant walkdown experience, such as that gained by licensed and nonlicensed operators, local leak rate personnel, system engineers, and inspection and nondestructive examination personnel.

2. At least four hours of training on Section XI requirements and plant specific procedures for VT-2 visual examination.

3. Vision test requirements of IWA-2321, 1995 Edition.

The qualification requirements in Code Case N-546 are not significantly different from those for VT-2 visual examiner certification. Licensed and nonlicensed operators, local leak rate personnel, system engineers, and inspection and nondestructive examination personnel typically have a sound working knowledge of plant components and piping layouts. This knowledge makes them acceptable candidates for performing VT-2 visual examinations.

In addition to meeting the requirements contained in Code Case N-546, the licensee has committed to use procedural guidelines for consistent, quality VT-2 visual examinations, verify and maintain records of the qualification of persons selected to perform VT-2 visual examinations, and perform independent reviews and evaluations of leakage found by a person(s) other than those that performed the VT-2 visual

examination. Based on a review of Code Case N-546 and the additional commitments made by the licensee, the INEEL staff believes that the proposed alternative to the Code requirements will provide an acceptable level of quality and safety. Therefore, it is recommended that the licensee's request to implement Code Case N-546 with the additional commitments be authorized pursuant to 10 CFR 50.55a(a)(3)(i). The use of this Code Case should be authorized for the current interval at St. Lucie, Unit 1 or until the Code Case is approved for general use by reference in Regulatory Guide 1.147. After that time, the licensee must follow the conditions, if any, specified in the regulatory guide.

2.4 Request for Relief No. 4, IWA-5250(a)(2), Corrective Measures for Bolted Connections

Code Requirement: IWA-5250(a)(2) requires that if leakage occurs at a bolted connection, the bolting shall be removed, VT-3 visually examined for corrosion, and evaluated in accordance with IWA-3100.

Licensee's Proposed Alternative: In accordance with 10 CFR 50.55a(a)(3)(i), the licensee proposed an alternative to the requirements of IWA-5250(a)(2), to remove at leaking bolted connections. The licensee stated:

"When FPL finds leakage at bolted connections by VT-2 visual examination during system pressure testing, an evaluation will be performed to determine the susceptibility of the bolting to corrosion and assess the potential for failure. The following criteria may be considered, as applicable, but not limited to, when evaluating the acceptability of the bolting:

1. Service age of the bolting
2. Bolt and component material
3. Corrosiveness of process fluid
4. Leakage location and system function
5. Leakage history at connection or other system components
6. Visual evidence of corrosion at connection (while connection is assembled)

"When the pressure test is performed with the system in service or required by the Technical specifications to be operable, and the bolting is susceptible to corrosion, the evaluation shall address the connections structural integrity until the next component/system outage of sufficient duration. If the evaluation concludes that the system can perform its safety related function, removal of the bolt closest to the leakage and VT-3 visual examination of the bolt will be performed when the system of component is taken out of service for a sufficient duration for accomplishment of the system maintenance activities.

"For bolting that is susceptible to corrosion, and when the initial evaluation indicates that the connection cannot conclusively perform its safety function until the next component/system outage of sufficient duration, the bolt closest to the source of leakage will be removed, receive a VT-3 visual examination, and be evaluated in accordance with IWA-3100(a)."

Licensee's Basis for Proposed Alternative (as stated):

"The requirement to remove all bolting from a bolted connection to check for degradation is a burden. This requirement does not take into account the corrosiveness of the fluid, the material of the leaking component, the type of location of the leakage, and the history of material degradation in a similar environment. Additional examinations are performed by system engineers during routine surveillance required by plant Technical Specifications and procedures. Previous corrective actions are not taken into account. The 1992 and later Editions of ASME Section XI change the IWA-5250 requirements to allow the removal of the bolt closest to the source of leakage, reducing the number of bolts to be examined.

"ASME Code interpretation XI-1-92-01 states that new bolting or bolting that has received a visual examination prior to installation and has not been inservice does not have to be evaluated in accordance with this section. This is recognition by the code that leakage at this point would be considered a maintenance item, and one in which the requirements of IWA5250(a)(2) do not apply.

"Removal of pressure retaining bolting at mechanical connections for VT-3 visual examination and subsequent evaluation in locations where leakage has been identified is not always the most prudent course of action to determine the acceptability of the bolting. This is a task that could easily cause more harm than good. 'Many bolted connections are studs threaded into a component, such as valves and pumps. Removal of these studs can be difficult due to the length of time they have been installed. Large studs, such as those found on the Reactor Coolant Pumps, pose additional problems with removal. Damage to the pump casings can occur if too much torque is required to remove a stud.

"The Code requirement to remove, examine, and evaluate bolting in this situation does not allow the Owner to consider other factors which may indicate the acceptability of mechanical joint bolting. FPL considers this requirement to by unnecessarily prescriptive and restrictive.

"Other factors which should be considered when evaluating bolting acceptability when leakage has been identified at a mechanical joint include, but should not be limited to: joint bolting materials, service age of joint bolting materials, location of the leakage, history of leakage at the joint, evidence of corrosion with the joint assembled, and corrosiveness of process fluid.

"ASME Section XI is written to primarily address examinations and testing during periods of plant or system shutdown. No guidance is given to address components that are examined or tested while the plant or system is in service. However, many Code Class 3 and a few Code Class 2 systems are pressure tested, including VT2 visually examined, utilizing the "inservice test" requirements of IWA-5000.

"Performance of the test while the system is inservice may identify leakage at a bolted connection that, upon evaluation, may conclude that the joints structural integrity and pressure retaining ability is not challenged. It would not be prudent to negatively impact a safety systems availability by removing the system from service to address a

leak that does not challenge the systems ability to perform its safety function.

"In addition, a situation frequently encountered at commercial nuclear plants such as St. Lucie, is the complete replacement of bolting materials (studs, bolts, nuts, washers, etc.) At mechanical joints during plant outages. When the associated system process piping is pressurized during plant start-up, leakage is identified at these joints. The root cause of this leakage is most often due to thermal expansion of the piping and bolting materials at the joint and subsequent process fluid seepage at the joint gasket. Proper retorquing of the joint bolting, in most cases, stops the leakage. Removal of any of the joint bolting to evaluate for corrosion would be unwarranted in this situation due to new condition of the bolting materials. ASME

"Later editions of the Code have realized the problems inherent in removal of all bolting. The wording of the Code has been changed to avoid removing of all bolting to perform an evaluation."

Evaluation: In accordance with the 1989 Edition of ASME XI, if leakage occurs at a bolted connection, the bolting shall be removed, VT-3 visually examined for corrosion, and evaluated in accordance with IWA-3100. In lieu of this requirement, the licensee has proposed to conduct an evaluation of the bolting to determine its susceptibility to corrosion. This evaluation considers a number of parameters, including bolting materials, the potential for corrosion, and visual evidence of corrosion with the bolting in place. If the evaluation indicates that the system can perform it's safety related function, removal and VT-3 examination of one bolt closest to the leakage will be performed when the subject component is taken out of service for a sufficient duration to accomplish the maintenance activities. If the evaluation indicates that the system cannot conclusively perform its safety related function, the bolt closest to the source of the leakage will be removed, visually examined (VT-3), and evaluated to IWA-3100.

IWA-3100 invokes the use of subparagraphs IWB-3000, IWC-3000, IWD-3000 for Class 1, 2, and 3 pressure retaining components respectively. However none of these subparagraphs provide an acceptance criteria for VT-3 examinations. Therefore the ability to perform a meaningful evaluation on the bolting without an applicable acceptance criteria is questionable. The INEEL staff believes that a VT-1 visual examination utilizing the acceptance criteria defined in IWB-3000 provides a more appropriate method of examination of the subject bolting than a VT-3 visual examination. Similar requests for relief have been approved with the condition that a VT-1 visual examination be performed utilizing the acceptance criteria for VT-1 examinations. Based on the determination that a meaningful evaluation of the bolting condition cannot be performed due to the absence of an acceptance criteria for VT-3 examinations, it is concluded that an acceptable level of quality is not provided. In addition, when removal and visual examination of one bolt indicates that degradation is occurring, the remaining bolting should be removed and visually examined. Therefore it is recommended that the licensees proposed alternative not be authorized.

2.5 Request for Relief 5, Examination Category B-A, Item B1.21, Reactor Pressure Vessel (RPV) Circumferential Head Weld

Code Requirement: Examination Category B-A, Item B1.21, requires 100% volumetric examination of accessible length of RPV circumferential head welds, as defined by Figure IWB-2500-3.

Licensee's Proposed Alternative: In accordance with 10 CFR 50.55a(a)(3)(ii), the licensee proposed to perform a VT-3 visual examination of accessible areas of RPV circumferential head Weld 209-04 in lieu of the Code-required volumetric examination. The licensee stated:

> "FPL will perform a visual VT-3 examination of the accessible outside surface areas of the weld once during the interval. The areas will include those between the CRDs, to the extent practical. During system leakage tests, this weld is required to have a visual VT-2 performed to check for leakage.

Licensee's Basis for Proposed Alternative (as stated):

> "Weld 209-04 is located under the RPV head shroud, has Control Rod Drive (CRD) mechanisms penetrating it, and is generally inaccessible for volumetric examination. The shroud is welded and bolted to the RPV head in several areas. Removal and replacement of the shroud would be time consuming, involve high radiation exposure, could create an airborne contamination hazard, and possibly cause harm to the RPV head.
>
> "Remote or manual examination of the weld from the outside surface is impractical. The shroud, which extends below the weld, would interfere with robotic equipment and manual examinations from the bottom side. On and above the weld are the CRDs, which limit the examination from the other direction. Performing Radiography is impractical due to the high radiation and limited access. CRDs penetrate the weld, further limiting the amount of weld that could be shot. Performing Ultrasonic examination from the inside surface is impractical due to the interference of the CRDs and the high radiation.
>
> "During previous inservice examinations, it was shown that examination of the weld is impractical. The only method of examination that was able to produce credible results was the VT-2 during pressure tests.
>
> "Volumetric examination of the weld from the outside surface is limited due to te shroud and CRDs. At best, it is estimated that less than 5% of the weld could be examined.
>
> "The failure [potential] of the weld is small. The weld is outside the beltline region and receives minimal exposure to the neutron flux (which embrittles the metal). Having FPL remove the shroud to gain access to a small percentage of the weld would be a hardship without a compensating increase in safety. Removing the shroud would also increase the possibility of damage to the RPV head."

Evaluation: The Code requires 100% volumetric examination of the accessible length for the subject RPV head weld. In lieu of the Code-required volumetric examination, the licensee proposed to perform a VT-3 visual examination on the accessible portions of the

outside surface of the weld.

As stated by the licensee, access to circumferential head Weld 209-04 is obstructed by control rod drives and the surrounding shroud. The INEEL staff agrees that the subject weld is difficult to access and that imposition of the Code requirements would result in a burden. However, the licensee has not proposed an alternative that provides reasonable assurance of the structural integrity. First, the proposed VT-3 examination is limited to accessible areas of the outside surface. Thus, the coverage has not been adequately specified. Secondly, as defined by the Code, VT-3 visual examinations are conducted to determined the general condition of components and the corresponding acceptance criteria does not address appropriate modes of inservice degradation, such as cracking. Furthermore, the licensee did not discuss the possibility of performing a remote visual examination of the interior surface of the head. Therefore, the INEEL staff concludes that the licensee's proposal to perform a VT-3 visual examination of accessible areas of the outside surface of the weld is not an acceptable alternative. To be considered acceptable, the licensee should consider performing a VT-1 visual examination on entire surface of the weld including the interior of the head using a remote VT-1 visual examination.

2.6 Request for Relief No. 6, Alternative Snubber Examinations

Note: This request for relief is evaluated elsewhere by the Mechanical Engineering Branch of the NRC.

2.7 Request for Relief 7, Non-Code Repair of the Refueling Water Tank

Note: This request for relief is evaluated elsewhere by the Mechanical Engineering Branch of the NRC.

2.8 Request for Relief No. 8, IWB-2412-1 and IWC-2412-2, Scheduling of Examinations

Code Requirement: IWB-2412-1 and IWC-2412-1 establish the requirements for scheduling examinations for Class 1 and 2 components. IWB-2420 and IWC-2420 required that the sequence of component examinations established during the first interval be repeated during each successive interval.

Licensee's Proposed Alternative: In accordance with 10 CFR 50.55a(a)(3)(ii), the licensee proposed an alternative to the scheduling requirements of the Code. The licensee stated:

> "FPL proposes to use an alternative to the IWB-2412-1 and IWC2412-1 tables. The table proposed is:

Inspection Interval	Inspection Period, Calendar Years of Plant Service	Minimum Examinations Completed,	Maximum Examinations Credited, %
3rd	23	16	50
	27	50	75
	30	100	100

Notes: Except as noted in Table IWB-2500-1, B1.30.

"A minimum of 16% of the required examinations will be performed during the second period.

"A table similar to this is currently being incorporated into the latest edition of the Code, with a Code Case being written to allow this scheduling philosophy to be used for all Editions of Section XI.

"The sequence of examinations established during the previous inspection interval will be repeated to the extent practical, but may be modified in a manner which reduces scaffold, insulation, and radiation exposure.

"Florida Power and Light will schedule the same areas for examination that were performed during the Second Interval to the extent practical. The sequence of examinations established during the second interval will be followed to the extent practical, but will be altered to reduce radiation exposure and expense, and allow the examination, preparation of areas, and the recovery process to be minimized. Substitute welds may be selected. When welds are substituted, they will be similar in configuration to those originally scheduled, and on the same or similar line, if possible. The number of examinations performed will meet or exceed the minimum required by each category. The number of welds and components examined will meet the percentage requirements as shown in the table above."

Licensee's Basis for Proposed Alternative (as stated):

"Florida Power and Light performed examinations on Class 1 systems during the first Period of the First Interval in accordance with the 1970 Edition with Addenda through Winter 1970 of Section XI. During the second and third periods, examinations were performed in accordance with the 1974 Edition with Addenda through Summer 1975 on all Code classes (pro-rated for the Interval). With this schedule, the sequence of examinations was not established for about one-half of the areas until the second interval.

"Modifying the sequence of examinations reduces the need for personnel to prepare and examine components in essentially the same area several times. The radiation exposure, time, and manpower required to perform these tasks can be significantly reduced by changing the sequence of examinations. St. Lucie has not had any problems with piping and components, so modifying the ISI schedule would have no effect on the safe operation of the plant.

"St. Lucie has now gone through several outages with a form of this altered scheduling criteria. The second interval inservice inspection plan was scheduled with this philosophy to the extent practical within the guidelines of 83S83 Edition of Section XI. A 40% to 45% dose reduction has been achieved from previous outages. This is approximately 10 to 15 man-rem of exposure per outage.

"Rescheduling ISI activities has lowered radiation exposure manpower, and costs associated with the preparation, examination, and recovery of the selected areas. This also reduced radiation exposure to other workers in the areas by eliminating barriers caused by scaffold and removed insulation, decreasing the amount of time required to perform a task.

"While it is desirable to have examination schedules move forward in the interval (less than 10 years between successive exams), the wording of the Code's Program B makes this difficult. A review of Program B requirements shows that it is weighted towards moving examinations towards the end of the interval, increasing the amount of time between successive examinations (opposite from NRC desires). The maximum examinations allowed for credit during the 1st period is 34%. If the minimum examinations were performed during the 1st period (16%) and the maximum examined during the 2nd (67%), then 51% of the interval exams could be performed during the 2nd period. This same thought process can be applied to the 3rd period. When a sample size in a category is small, Inspection Program B requires a larger number of examinations to be scheduled later in the interval. Since St. Lucie ISI examinations were originally in scheduled one-third each period, it is not possible to move examination schedules forward without scheduling others later in the interval.

"Program B allows up to 50% of the 10 year examinations to be performed during the 2nd or 3rd periods. Allowing this same latitude during the 1st period would enable FPL to perform examinations with a more efficient schedule, reduce radiation exposure and costs, and meet NRC desires to have the time frame between successive examinations not exceed 10 years. Most of the rescheduled weld examinations would be performed with less than 10 years between successive examinations.

"For Class 2 and Class 3 systems, all piping welds and components selected for examination will be performed in the same or an earlier period as the previous interval. Class 1 systems will have examination schedules altered to achieve radiation exposure and cost reductions.

"FPL realizes that the objective of the Code selection method is to examine components in all parts of the plant and to repeat those examinations on a regular basis to determine if changes are occurring. This philosophy was used when the selection and scheduling of Class 1 components was performed.

"Grouping of examinations was performed to eliminate duplicate scaffold to the extent practical. These groupings mostly involve the areas around the Reactor Coolant System (RCS) loops. However, lines from other loops and systems that pass through the scheduled loop area will be included for examination at that time. This means that welds from all four RCS loops are examined during each period. Examination areas

are grouped together outside the biological shield, but no distinction was made as to the loop involved. These outside areas have been scheduled on all four loops during all three periods on the same schedule as the previous interval to the extent practical. Additionally, there were areas where grouping of examinations produced no advantages. These areas are scattered throughout the containment and were scheduled the same as the second interval.

"Since FPL began performing ISI examinations, the rules for radiation exposure, safety, and the selection and scheduling of ISI examination areas have changed significantly. The changes were enacted to provide additional safety to personnel working at the plants and to enhance the safety to the general public. 10CFR20.1101(b) mandates FPL to reduce radiation exposure to as low as reasonably achievable. Procedures and engineering controls based upon sound radiation protection principles are being used to the extent practicable. In order to meet this and other new regulations, FPL must reevaluate every aspect of every job at St. Lucie. Revising the ISI schedule will allow FPL to minimize the amount of work being performed in radiation areas, meet safety and ALARA requirements, and still meet Section XI scheduling."

Evaluation: The Code requires that examinations be scheduled in accordance with IWB-2412-1 and IWC-2412-1. In accordance with IWB-2420 and IWC-2420, the sequence of component examinations established during the first interval be repeated during each successive interval. The licensee has proposed to schedule the same areas for examination that were performed during the previous interval to the extent practical, but will alter the schedule and sequence to reduce radiation exposure and expense, and allow the examination, preparation of areas, and the recovery process to be minimized. Similar requests have been authorized at other plants when the changes have been clearly defined, when time duration between examinations generally does not exceed 10-years, and when examinations are distributed within the inspection interval in accordance with IWB-2412-1 and IWC-2412-1. Since the licensee has not addressed these issues, the request is generic in nature and it appears that examinations will be performed "as convenient". Therefore, it is recommended that the proposed alternative not be authorized. To be found acceptable, the licensee must provide specific details on how the alternative will be implemented, and describe how the proposed change will provide reasonable assurance of the structural integrity for the affected systems.

2.9 Request for Relief No. 9, Examination Category B-G-1, Item B6.10, Reactor Pressure Vessel (RPV) Closure Head Nuts

Code Requirement: Examination Category B-G-1, Item B6.10, requires 100% surface examination of all RPV closure head nuts.

Licensee's Proposed Alternative: In accordance with 10 CFR 50.55a(a)(3)(i), the licensee proposed an alternative to the requirements of the Code for the RPV closure head nuts. The licensee stated:

"FPL will perform a visual VT-1 on the RPV Closure Head Nuts. The IWB-3517 acceptance criteria of the 1989 Edition of Section XI will be used for evaluation of indications."

Licensee's Basis for Proposed Alternative (as stated):

"Beginning in the 1989 Addenda of ASME Section XI, the examination requirement for RPV Closure Head Nuts was change from surface to visual VT-1. In addition, the acceptance standards of IWB-3517 were adopted, which is the same standard as for Code Category B-G-2 bolting. A review of later Codes and Addenda shows this examination technique and acceptance standard has not changed.

"Conditions that require corrective measures prior to placing the RPV Closure head Nuts bock in service include corrosion, damaged threads, or deformation. Surface examinations are qualified for the detection of linear indications, and surface examination acceptance criteria mention only rejectable linear flaw lengths. The 1989 Code does not provide and acceptance criteria for linear indications found during surface examination of RPV Closure head Nuts, as they were in the course of preparation.

"By using the IWB-3517 acceptance criteria, FPL would have definite rules that could be followed for evaluation of indications found during examinations. The indications would be compared against published standards.

"Footnote 3 of IWB-3517 clearly states that only relevant conditions must be evaluated. This would preclude scratches, fabrication marks, roughness, etc. from being recorded (except as a general condition). These types of indications are often seen during surface examination, and may be considered non-relevant, which requires the areas in question to be cleaned and re-examined.

"Because the VT-1 visual examination acceptance criteria include the requirement for evaluation of crack-like indications and other relevant conditions requiring corrective action, such as deformed or sheared threads, localized corrosion, deformation of part, and other degradation mechanisms, it can be concluded that the VT-1 visual examination provides a more comprehensive assessment of the condition of the closure head nut than a surface examination. By performing a visual VT-1 examination of the RPV Closure Head Nuts, an acceptable level of quality and safety is provided."

Evaluation: The Code requires surface examination of the RPV closure head nuts. As an alternative to the Code requirements, the licensee proposed to perform a VT-1 visual examination of the RPV closure head nuts.

Review of the examination requirements for Examination Category B-G-1, indicates that with the exception of the reactor pressure vessel closure head nuts and the closure studs (when removed), all other items in this Examination Category require VT-1 visual examinations or volumetric examinations (as applicable). Typical relevant conditions that would require corrective action prior to putting closure head nuts back into service would include corrosion, deformed or sheared threads, deformation, and degradation mechanisms (i.e., boric acid attack). Surface examination procedures are typically qualified for the detection of linear type flaws (cracks) with corresponding acceptance criteria for rejectable linear flaw lengths only. When performing surface examinations in accordance with the 1989 Edition

of the Code, Item B6.10, the surface examination acceptance criteria is not provided, as it was in the course of preparation. Without clearly defined acceptance criteria, relevant conditions that require corrective measures may not be adequately addressed.

The 1989 Addenda of Section XI, Article IWB-3000, Acceptance Standards, IWB-3517.1, Visual Examination, VT-1, describes relevant conditions that require corrective action prior to continued service of bolting and associated nuts. Included for corrective action in IWB-3517.1 is the requirement to compare crack-like flaws to the flaw standards of IWB-3515 for acceptance. Surface examination acceptance criteria are typically limited to linear type flaws (i.e. cracking, aligned pitting and corrosion). Because the VT-1 visual examination acceptance criteria include the requirement for evaluation of crack-like indications and other relevant conditions requiring corrective action such as deformed or sheared threads, localized corrosion, deformation of part, and other degradation mechanisms, it is concluded that the VT-1 visual examination provides a more comprehensive assessment of the condition of the closure head nut. As a result, the INEEL staff believes that VT-1 visual examination provides an acceptable level of quality and safety. In addition, the 1989 Addenda of Section XI changes the requirement for the subject reactor pressure vessel closure head nuts from surface examination to VT-1 visual examination and provides appropriate acceptance criteria. Therefore, it is recommended that the proposed alternative VT-1 visual examination be authorized pursuant to 10 CFR 50.55a(a)(3)(i).

2.10 Request for Relief No. 10 (Units 1 and 2), IWB-2420, *Successive Examination* for Reactor Pressure Vessel (RPV) Bolting

Code Requirement: IWB-2420, *Successive Inspections*, requires that the sequence of component examinations established during the first inspection interval be repeated during successive intervals. Examination Category B-G-1, Item B6.20, requires volumetric examination, as defined by Figure IWB-2500-12, of closure studs with the studs in place. Item B6.30 requires volumetric and surface examination, as defined by Figure IWB-2500-12, for RPV closure head studs with the studs removed. As noted by the Code, this bolting may be examined (a) with the bolts in place under tension, (b)when the connection is disassembled, and (c) with the bolting removed.

Licensee's Proposed Alternative: In accordance with 10 CFR 50.55a(a)(3)(i), the licensee proposed an alternative to the successive inspection requirements of the Code. The licensee stated:

> "FPL will perform the required examinations during the second period for unit 1 and at the same time, perform the same examinations for unit 2, which will be in the late second or third period. Examinations will be performed on all three sets of bolting, and will be in accordance with Code category B-G-1 requirements and applicable relief requests. The bolting will then be placed on a 10 [year] schedule for examination."

Licensee's Basis for Proposed Alternative (as stated):

> "St. Lucie currently has three complete sets of RPV bolting. During refuel outages,

the RPV bolting is removed, cleaned, and placed into storage. The bolting in storage is then placed in service. During the next refuel outage on the opposite unit, this same work is performed, with the bolting that had previously been in one unit, being placed into service in the sister unit. This swapping of the bolting has resulted in examinations being performed in one unit now being credited for the other.

"The two St. Lucie units have ISI intervals approximately 5 years apart. With the RPV bolting moving from one unit to the other, this requires FPL to perform examinations on three complete sets of bolting instead of two. In addition, the bolting groups have been mixed on one occasion due to an unremovable stud (which has since been removed and placed with its original group).

"FPL performed examinations of all three sets of RPV bolting in 1994, except on the one stud. This was done to preclude missing any examinations due to the swapping of bolting from one unit to the other.

"Footnote (5) of Code Category B-G-1, which applies to all Code Item numbers, states deferral of examinations is permissible except when the detected leakage of borated water requires a visual VT-1 is accordance wit IWA-5250(a)(2). IWB-2420(a) states 'the sequence of examinations established during each successive inspection interval shall be repeated during each successive inspection interval, to the extent practical.' Earlier and later editions of Section XI allow deferral of examinations of B-G-1 bolting. This wording shows that the examination of RPV bolting was considered to be important, but that they can all be performed at the same time. FPL has been required to examine 1/3 of the bolting each period only because earlier editions of Section XI required it for the first interval. Later editions have dropped this schedule requirement as being unnecessary.

"Simplifying the examination schedule for the three sets of RPV studs will ensure that FPL meets the intent of ASME Section XI, which is to examine all bolting for flaws. No RPV bolting will be installed for use that has not been examined at least once during the interval. FPL will perform the examinations during the second period (the equivalent third period of St. Lucie Unit 2). This will mean the scheduled examinations for one third of the bolting will be accelerated.

Evaluation: The Code requires that the sequence of component examinations established during the first inspection interval be repeated during successive intervals. For the reactor pressure vessel (RPV) closure studs, the Code requires volumetric examination with the studs in place and volumetric and surface examination when the studs removed. The required examinations may be examined with the bolts in place under tension, when the connection is disassembled, or with the bolting removed.

As an alternative to the Code scheduling requirements, the licensee proposed to perform the required examinations during the second period for Unit 1 and at the same time, perform the same examinations for Unit 2, which will be in the late second or third period. The licensee also stated that examinations will be performed on all three sets of bolting in accordance with Code category B-G-1 requirements. Following these examinations, the bolting will then be placed on a 10 year schedule for examination.

As presented by the licensee, the licensee has three sets of RPV closure studs that are rotated between two units, with the third set in storage when not in use. Rotating the three sets between the two units can potentially improve the inspection process and reduce exposure since the examinations can be performed while not in use and out of a radiation environment. However, considering the latitude provided by the Code, the INEEL believes that examinations should be distributed throughout the interval. In this case, examination of one set each period would provide a reasonable distribution of examinations. Based on the information provided by the licensee, it is not clear when the examinations will be performed and how they will be distributed. Therefore, it is recommended that the licensee's proposed alterative not be authorized. To be found acceptable, the licensee must provide a proposed schedule that meets the distribution requirements of the Code.

2.11 Request for Relief No. 11, Use of Code Case N-416-1, *Alternative Pressure Test Requirements for Welded Repairs or Installation of Replacement Items by Welding, Section XI, Division 1*

Code Requirement: Section XI, Table IWA-4700(a) requires that a system hydrostatic test be performed in accordance with IWA-5000 after repairs by welding on the pressure-retaining boundary.

Licensee's Proposed Alternative: Pursuant to 10 CFR 50.55a(a)(3)(i), the licensee proposes to use Code Case N-416-1 in lieu of the requirements of the Code. The licensee stated:

"In lieu of the Code required hydrostatic testing for repairs or installation of replacement items by welding in Class 1, 2, and 3 piping systems, FPL proposes to apply ASME Code Case N-416-1 as alternative rules. Code Case N-416-1 requires:

(a) NDE be performed in accordance with the methods and acceptance criteria of the 1992 Edition of Section III,

(b) Visual examinations (VT-2) will be performed in conjunction with a system leakage test using the 1992 Edition of Section XI, in accordance with IWA-5000, at nominal operating pressure,

(c) the use of the Code Case will be documented on the Owner's Data Report Form NIS-2 or equivalent.

"FPL will implement the requirements of the Code Case, with the following two proposed exceptions:

1. FPL will perform VT-2 visual examination (in conjunction with a system leakage test) using the requirements of the 1989 Edition of Section XI, instead of the 1992 Edition specified by Code Case N-416-1. The VT-2 requirements specified in the 1989 Edition are the latest approved by the

USNRC and has proven effective in maintaining leak integrity of the pressure boundary. Maintaining a separate VT-2 program using the 1992 Edition is a hardship without an increase in the safety or quality.

2. In addition, considering the limited nature of NDE requirements for Class 3 components, FPL proposed to perform additional surface examinations on the root pass layer of butt and socket welds on the pressure-retaining boundary of Class 3 components exceeding 2" nominal pipe size only when those pressure retaining welds are required to have a surface examination in accordance with the 1992 Edition of Section III. For those Class 3 welds receiving radiography in lieu of a surface examination in accordance with Section III, no additional surface examination of the root layer will be performed."

Licensee's Basis for Proposed Alternative (as stated):

"Hydrostatic pressure tests impose significant costs, including potentially increased outage duration, while adding marginal (if any) value to the total repair or replacement quality.

"Industry experience has demonstrated that leaks are not being discovered as a result of hydrostatic test pressures propagating a pre-existing flaw through-wall. Most leaks are being found when the system is at normal operating pressure. Hydrostatic tests are time consuming, require extensive operator support, and usually mean radiation exposure to personnel. Often additional equipment must be brought in to test a localized repair/replacement, which may involve additional exposure and expense. In many cases, a system hydrostatic test must be conducted over large parts of the system.

"Code hydrostatic tests subject the piping system to a small increase in pressure over the nominal operating pressure and is not intended to present a significant challenge to pressure boundary integrity. It is used primarily as a means to enhance leakage detection during the examination of components under pressure, rather than a measure to determine the structural integrity of components. When normal system pressure is applied, many of the areas where leakage occurs stop leaking.

"FPL has compared the system pressure test requirements of the 1992 Edition of Section XI to the requirements of IWA-5000 of the 1989 Edition of Section XI. Based on that review FPL concluded that the 1992 Edition imposes a more uniform set of system pressure test requirements for Code Class 1, 2, and 3 systems. The terminology associated with the system pressure test requirements for all three Code classes has been clarified and streamlined. The test frequency and test pressure conditions associated with these tests has not been changed. In addition, the post-welded repair NDE requirements of the 1992 Edition of Section III remain the same as the requirements of the 1989 Edition of Section III.

"Hydrostatic tests place a burden on the systems, increase radiation exposure and costs, require significant setup time, and add marginal value (if any) to the repair of

replacement quality. These test result in hardships without a compensating increase in the level of quality and safety. Performing the tests in accordance with the proposed alternative will provide reasonable assurance that flaws will be discovered."

Evaluation: Section XI of the Code requires a system hydrostatic test to be performed in accordance with IWA-5000 after repairs by welding on the pressure-retaining boundary. The licensee proposes to implement the alternative to hydrostatic pressure tests contained in Code Case N-416-1 for Code Class 1, 2, and 3 repairs/replacements. The licensee also proposes to perform an additional surface examinations on the root pass layer of butt and socket welds on the pressure-retaining boundary of Class 3 components exceeding 2" nominal pipe size when those welds are required to have a surface examination in accordance with Section III. As proposed by the licensee, surface examination of the root layer will not be performed on Class 3 welds receiving radiography in lieu of a surface examination.

Code Case N-416-1 specifies that nondestructive examination (NDE) of the welds be performed in accordance with the applicable subsection of the 1992 Edition of Section III. This Code Case also allows a VT-2 visual examination to be performed at nominal operating pressure and temperature in conjunction with a system leakage test, in accordance with paragraph IWA-5000 of the 1992 Edition of Section XI. Comparison of the system pressure test requirements of the 1992 Edition of Section XI to those of the 1989 Edition of Section XI, the latest Code edition referenced in 10 CFR 50.55a, shows that:

- The test frequencies and pressure conditions are unchanged;
- The hold times either remained the same or increased;
- The terminology associated with the system pressure test requirements for all three Code classes has been clarified and streamlined; and
- The NDE requirements for welded repairs remain the same.

Therefore, it is concluded that the use of the 1989 Edition with Code Case N-416-1 will provide an acceptable level of quality and safety. However, the licensee has taken exception to the stipulation that a surface examination be performed on the root pass layer of Class 3 butt and socket welds by excluding systems 2-inch and smaller from the additional surface examination. The use of Code Case N-416-1 has been authorized for use at other plants when a clear commitment to meet the condition specified in Draft Regulatory Guide DG-1050 (draft revision 12 to Regulatory Guide 1.147) has been made. Specifically, when an additional surface examination is performed on the root pass layer of butt and socket welds of the

pressure retaining boundary of Class 3 components when a surface examination is performed in accordance with ASME Section III. Since the licensee has not justified the proposed exception, use of the proposed alternative should not be authorized.

2.12 Request for Relief No. 12, Use of Code Case N-498-1, *Alternate Rules for 10 Year Hydrostatic Pressure Testing for Class 1, 2, and 3 Systems, Section XI, Division 1*

Code Requirement: Table IWB-2500-1, Examination Category B-P, Table IWC-2500-1, Examination Category C-H, and Table IWD-2500-1, Examination Categories D-A, D-B and D-C, require system hydrostatic testing of pressure-retaining components in accordance with IWA-5000 once each 10-year interval.

Licensee's Proposed Alternative: In accordance with 10 CFR 50.55a(a)(3)(i), the licensee proposed to use Code Case N-498-1, *Alternate Rules for 10-Year Hydrostatic Pressure Testing for Class 1, 2, and 3 Systems, Section XI, Division 1*. The licensee stated:

> "FPL will perform a system leakage test on Class 1 systems and system pressure tests on Class 2 and 3 systems once each interval in accordance with the alternatives of ASME Code Case N-498-1.
>
> "This Code Case is an alternative to 10 year hydrostatic tests required by the 1989 Edition of Section XI for Class 1, 2, and 3 systems. Use of this alternative reduces the need for special system alignments and temporary system alteration to conduct hydrostatic tests."

Licensee's Basis for Proposed Alternative (as stated):

> "Hydrostatic tests do not significantly challenge the systems. They have been primarily used to enhance leakage. When leaks are detected, they have been at mechanical connections. The plant writes work orders for corrections, but usually when pressure is reduced to nominal, leaks at mechanical connections have stopped. This type of additional work for leakage that was not required to be corrected has increased radiation exposure and costs.
>
> "In order to perform hydrostatic tests, special system alignments and temporary system alterations are required. Temporary system alterations include removal of check valve internals, installation of temporary jumpers, and in some instances, the blanking off of pressure relief devices. The preparation for and performance of the10-year system hydrostatic tests involve excessive cost, man-hours, and man-REM with

little or no compensating increase in the level of quality and safety.

Evaluation: The Code requires a system hydrostatic test once per interval in accordance with the requirements of IWA-5000 for Class 3 pressure-retaining systems. In lieu of the Code-required hydrostatic testing, the licensee has requested authorization to use Code Case N-498-1, *Alternative Rules for 10-Year System Hydrostatic Testing for Class 1, 2, and 3 Systems*, dated May 11, 1994.

The system hydrostatic test, as stipulated in Section XI, is not a test of the structural integrity of the system but rather an enhanced leakage test.[1] Hydrostatic testing only subjects the piping components to a small increase in pressure over the design pressure; therefore, piping dead weight, thermal expansion, and seismic loads present far greater challenges to the structural integrity of a system. Consequently, the Section XI hydrostatic pressure test is primarily regarded as a means to enhance leak detection during the examination of components under pressure, rather than as a method to determine the structural integrity of the components. In addition, industry experience indicates that leaks are not being discovered as a result of hydrostatic test pressures causing a preexisting flaw to propagate through the wall. In most cases leaks are being found when the system is at normal operating pressure.

Code Case N-498, *Alternative Rules for 10-Year System Hydrostatic Testing for Class 1 and 2 Systems*, was previously approved for general use on Class 1 and 2 systems in Regulatory Guide 1.147, Rev. 9. For Class 3 systems, Revision N-498-1 specifies requirements identical to those for Class 2 components (for Class 1 and 2 systems, the alternative requirements in N-498-1 are unchanged from N-498). In lieu of 10-year hydrostatic pressure testing at or near the end of the 10-year interval, Code Case N-498-1 requires a VT-2 visual examination at nominal operating

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S. H. Bush and R. R. Maccary, *"Development of In-Service Inspection Safety Philosophy for U.S.A. Nuclear Power Plants,"* ASME, 1971

pressure and temperature in conjunction with a system leakage test performed in accordance with paragraph IWA-5000 of the 1992 Edition of Section XI.

Class 3 systems do not normally receive the amount and/or type of nondestructive examinations that Class 1 and 2 systems receive. While Class 1 and 2 system failures are relatively uncommon, Class 3 leaks occur more frequently and are caused by different failure mechanisms. Common causes of failure are flow accelerated corrosion (FAC) , microbiologically-induced corrosion (MIC), and general corrosion. In general, licensees have implemented programs for the prevention, detection, and evaluation of FAC and MIC; therefore, Class 3 systems receive inspection commensurate with their functions and expected failure mechanisms.

Considering that Code Case N-498 was found to be an acceptable alternative for Class 1 and 2 systems, and that Class 3 systems receive inspections commensurate with their function and expected failure mechanisms, the licensee's proposed alternative, to use Code Case N-498-1, should provide an acceptable level of quality and safety. Therefore it is recommended that the licensee's proposed alternative be authorized pursuant to 10 CFR 50.55a(a)(3)(i). The use of the Code Case should be authorized for the current interval or until such time as the Code Case is published in a future revision of Regulatory Guide 1.147. At that time, if the licensee intends to continue to implement this Code Case, the licensee should follow all provisions in Code Case N-498-1 with limitations issued in Regulatory Guide 1.147, if any.

2.13 Request for Relief 13, Use of Code Case N-509, *Alternate Rules for the Selection and Examination of Class 1, 2, and 3 Integrally Welded Attachments, Section XI, Division 1*

Code Requirement: The Code requires examination of integrally-welded attachments as specified for Examination Categories B-H, B-K, C-C, D-A, D-B, and D-C. The

Code stipulates volumetric or surface examinations, as appropriate, and the extent of examinations.

Licensee's Proposed Alternative: Pursuant to 10 CFR 50.55a(a)(3)(i), the licensee has proposed to use Code Case N-509, *Alternate Rules for the Selection and Examination of Class 1, 2, and 3 Integrally Welded Attachments, Section XI, Division 1*, in lieu of the requirements of the Code for Class 1, 2, and 3 integrally-welded attachments. The licensee stated:

> "FPL will examine a minimum of 10% of each Code Class of integral attachment in accordance with the requirements of Code Case N-509. By using this Code Case, FPL will reduce the amount of scaffold, insulation removal, and minimize radiation exposure. While it is recognized that some additional radiation exposure will be accumulated in the performance of Class 1 integral attachments, the overall effect of the complying with the Code Case will be a reduction in total accumulated dose and costs.
>
> "Code Case N-509 requires the selection of component supports to be in accordance with the 1989 Edition of Section with addenda through 1990. FPL will select components supports in accordance with the requirements of Code Case N-491, *Alternate Rules for the Selection and Examination of Class 1, 2, and 3 Integrally Welded Attachments, Section XI* which was approved for use by ASME on March 14, 1991, and approved for use by the USNRC in Regulatory Guide 1.147, Rev. 11, dated October 1994."

Licensee's Basis for Proposed Alternative (as stated):

> "Use of this alternative reduces the need for the building of scaffold and removal of insulation from the reactor coolant, safety injection, residual heat removal, and other Class 1, 2, and 3 systems.
>
> "There is no requirement for the examination of Class 1 integral attachments for the 3rd interval. Code Case N-509 requires FPL to examine at least 10% of piping attachments and one integral attachment on one of multiple vessels of similar design, function and service. Additional scaffolding may be built and insulation removed, but careful scheduling of examinations in conjunction with piping weld and other support examinations will minimize this work and exposure. There will be an increase in weld cleaning and preparation time. The additional preparation increases overall radiation exposure and the possibility of personnel contamination. The Code Case will increase the amount of examinations FPL would be required to perform.
>
> "For Class 2 systems, the Code requires a surface examination of integral attachments whose base material design thickness is 3/4" or greater. Code Case N-

509 requires a surface examination of 10% of the population. Implementing the Code Case would result in a decrease in the building of scaffold, removal and replacement of insulation. By careful scheduling of examinations in conjunction with piping weld and support examinations, work, costs, and exposure would be reduced.

"For Class 3 systems, the Code requires a VT-3 of the integral attachments, with only one of multiple components of similar design, function, and service being examined. Code Case N-509 requires a VT-1 examination of 10% of the population. This would result in a decrease in the building of scaffold, removal and replacement of insulation. Again, by careful scheduling of examinations in conjunction with piping weld and support examinations, work, costs and exposure would be reduced.

"The preparation for and performance of the Section XI required examinations involve excessive cost, man-hours, and approximately on Man-REM per outage with little or no compensating increase in the level of quality or safety. FPL has not had any failure of integral attachment welds at the St. Lucie plants."

Evaluation: The licensee has proposed to apply the requirements of Code Case N-509 as an alternative to the Code requirements for the examination of integrally-welded attachments on Class 1, 2, and 3 piping and components. The licensee proposed to examine a minimum of 10% of each Code Class of integral attachment in accordance with the requirements of Code Case N-509. However, Code Case N-509 limits examinations to welded attachments on piping, pump, and valves, to a 10% sample of those attachments associated with component supports selected for examination under the 1990 Addenda (Code Case N-491). Consequently, Code Case N-509 requires a 10% sample of a sample which could result in an insignificant examination population. Therefore, the use of this Code Case is only acceptable for use when licensee's commit to examine a minimum of 10% of integral attachments distributed among all non-exempt Class 1, 2, and 3 piping, pumps and valves. The licensee has not made a clear commitment to this stipulation. Therefore, it is recommended that the licensee's alternative not be authorized.

2.14 Request for Relief No. 14, Use of Code Case N-521, *Alternative Rules for Deferral of Inspections of Nozzle-to-Vessel Welds, Inside Radius Sections, and Nozzle-to-Safe End Welds of a Pressurized Water Reactor (PWR) Vessel*

Code Requirement: Section XI, Table IWB-2500-1, Examination Category B-D, Items

B3.90 and B3.100 require that, for reactor pressure vessel (RPV) nozzle welds and inner radius sections, at least 25% but not more than 50% (credited) of the nozzles shall be examined by the end of the first inspection period and the remainder by the end of the inspection interval. Examination Category B-F, Item B5.10, Note (1) states that the reactor vessel nozzle-to-safe end weld examinations may be performed with the vessel nozzle examinations.

Licensee's Proposed Alternative: Pursuant to 10 CFR 50.55a(a)(3)(i), the licensee has proposed to use Code Case N-521 as an alternative to the Code requirement to examine at least 25% of the vessel-to-nozzle welds and nozzle inner radius sections during the first examination period. The licensee stated:

> "FPL will perform the Code required volumetric examinations on the RPV nozzle inside radius sections and the nozzle to vessel welds in accordance with the rules of Code Case N-521. The examinations will be performed approximately ten years after the previous examinations, within the guidelines of IWA-2430."

Licensee's Basis for Proposed Alternative (as stated):

> "During the May 1996 outage for St. Lucie Unit 1, 100% of the Reactor Pressure Vessel welds were examined using the Enhanced Data Acquisition System from Southwest Research Institute (SwRI), which captures essentially 100% of the ultrasonic signal for processing. Several of the SwRI personnel had qualified for certification with this equipment through an internal SwRI program and through the Electric Power Research Institute Nondestructive Examination Center for Appendix VIII. Every recorded indication was evaluated to determine its nature. No reportable indications were found on the nozzles or any other welds. This was the third Inservice Inspection of these nozzles and inside radius sections.
>
> "Performing the RPV nozzle examinations during the first period is a hardship on FPL. The Code would require two of the six (33%) nozzles to be examined. The examinations requires substantial preparation to the refuel cavity and RPV in order to be performed. To examine the inside radius sections in accordance with Code requirements, the core barrel would need to be removed. Leaving the Core Barrel in place would limit the inside radius section examination area to about half.
>
> "Significant costs are associated with the performance of the examination. Critical path time is increased. The estimated time for removal/replacement of the core barrel is two days. Moving the core barrel increases the risk of its damage. The performance of the examinations would take about 8 hours. St. Lucie does not have any Category B-F Safe-end welds. The nozzles and piping are both carbon steel, with cladding.

"FPL's last examination of the inside radius sections occurred in May 1996. By performing the RPV nozzle examinations during the 2006 outage, FPL will meet the intent of the Code to examine the same component every 10 years. By using this alternative schedule of examinations, FPL will be within the Code requirements.

"The same types of examination will be performed during the 2006 outage as would be performed during the first period. There will be 10 years between examinations, the same amount of time that is allowed by Code.

"By performing the examinations at a later date, no additional safety concerns exist, as only 10 years will have elapsed since the last examination.

"The Code Case is restricted to those PWR vessels that have never had any repairs or replacements performed on any of the nozzle-to-vessel welds, inside radius sections, and nozzle-to-safe end welds. In addition, there are no successive examination (IWB-2420(b)) required on any of these welds or areas. St. Lucie Unit 1 RPV meets both of these requirements, allowing the use of the Code Case."

Evaluation: The Code requires the examination of at least 25%, but not more than 50% of RPV nozzles and associated inside radius (IR) sections and nozzle safe ends during the first inspection interval. The licensee has requested authorization to use Code Case N-521 and defer examination of these areas until the end of the second 10-year interval.

Code Case N-521 states that examination of RPV nozzles, IR sections, and nozzle-to-safe end welds may be deferred provided (a) no inservice repairs or replacements by welding have ever been performed on any of the subject areas, (b) none of the subject areas contain identified flaws or relevant conditions that currently require successive inspections in accordance with IWB-2420(b), and (c) the unit is not in the first interval.

The licensee has confirmed that the above conditions have been met. In addition, the licensee has volumetrically examined all the subject areas during the May 1996 outage of the previous interval. By examining the nozzle-to-vessel welds, and associated IR sections and nozzle-to-safe end welds, at the end of the previous 10-year interval, the licensee has established a new sequence of examinations that will not exceed 10 years between inspections. Because the licensee repeated the

examinations at the end of the previous interval and will meet the conditions in the Code Case, the licensee's proposed alternative will provide an acceptable level of quality and safety since the maximum time of 10 years between inspections will not be exceeded. Therefore, it is recommended that the licensee's proposed alternative be authorized pursuant to 10 CFR 50.55a(a)(3)(i).

2.15 Request for Relief No. 15, Use of Code Case N-524, *Alternative Examination Requirements for Longitudinal Welds in Class 1 and 2 Piping*

Code Requirement: Examination Categories B-J, C-F-1 and C-F-2, Items B9.12, C5.12, C5.22, C5.52, and C5.62, require surface and volumetric examination of Class 1 and 2 longitudinal piping welds. Items B9:22, C5.42 and C5.82 require surface examination of Class 1 and 2 longitudinal piping welds. For Class 1, the examination volume/surface area includes at least one pipe diameter but not more than 12 inches of each longitudinal weld intersecting the circumferential weld required to be examined by Examination Categories B-J and B-F. Class 2 longitudinal piping welds require examination of 2.5T of the weld length from intersecting circumferential welds.

Licensee's Proposed Alternative: In accordance with 10 CFR 50.55a(a)(3)(i), the licensee proposed to use Code Case N-524, *Alternative Examination Requirements for Longitudinal Welds in Class 1 and 2 Piping*. The licensee stated:

> "FPL will examine those areas of Class 1 and 2 longitudinal welds within the boundaries of the intersecting circumferential weld in accordance with the requirements of Code Case N-524.
>
> "This Code Case is an alternative to the examination requirements of the longitudinal welds presently required by ASME Section XI for Class 1 and 2 piping welds. Use of this alternative reduces the need for building a scaffold and removal of insulation for the Reactor Coolant, Safety Injection, Residual Heat Removal, and other Class 1 and 2 piping systems. Use of this Code Case provides an acceptable level of quality and safety by the use of a system leakage test and the additional nondestructive examinations identified above.
>
> "This Code Case was approved by the Code Committee as an alternative to the examination requirements on Longitudinal seam welds of Code Categories B-F, B-J, C-F-1, and C-F-2. It was approved for use by ASME on August 9, 1993.

Licensee's Basis for Proposed Alternative (as stated):

"The current requirement for Class 1 systems is to examine longitudinal welds for a distance of one pipe diameter but not more than 12 inches from the intersecting circumferential weld. Often, additional scaffolding must be built and additional insulation removed to accomplish this examination. Much of the reactor coolant system piping is carbon steel with cladding. This material requires increased weld cleaning and preparation time. The additional preparation increases the overall radiation exposure and the potential for personnel contaminations.

"For Class 2 systems, the requirement is to examine the longitudinal welds for a distance of two and one-half times the material thickness from the intersecting circumferential weld. Essentially the same preparation requirements and radiation concerns discussed above for Class 1 applications apply to Class 2 piping.

"The preservice examination and initial inservice examinations have provided assurance of the structural integrity of the longitudinal welds during the service life of the plant to date. Based on results of these inservice inspections, St. Lucie Unit 1 has not experienced degradation that would warrant continued examination beyond the intersection area or volume bounded by this Code Case. In addition, experience in the United States has shown ASME Code longitudinal welds have not experienced degradation warranting continued examination beyond the boundaries required to meet the circumferential weld examination requirements. No significant loading conditions or known material degradation mechanisms have become evident to date which specifically relate to longitudinal seam welds in nuclear piping.

"Longitudinal welds are not produced in the field or fabrication shops as is the case of a circumferential weld. Longitudinal piping welds for Class 1 and 2 applications were made by the piping manufacturer under controlled conditions that produce higher quality welds and more uniform residual stress patterns. These welds were examined by the appropriate ASTM or ASME specifications. The manufacturing controls specified by the appropriate ASTM or ASME specifications provide assurance of the structural integrity of the longitudinal welds at the time the piping is manufactured."

Evaluation: ASME Section XI requires the examination of a certain length of longitudinal welds intersecting the required circumferential weld. The licensee's proposed alternative is to examine only the portions of longitudinal weld contained within the examination area of the intersecting circumferential weld. This alternative is contained in Code Case N-524, *Alternative Examination Requirements for Longitudinal Welds in Class 1 and Class 2 Piping,* which has previously been found acceptable for use at other facilities.

Longitudinal welds are produced during the manufacture of the piping, not in the

field as are circumferential welds. Consequently, the welds are fabricated under the strict guidelines specified by the manufacturing standard, which provides assurance of structural integrity. These welds have also been subjected to the preservice and initial inservice examinations, which provide additional assurance of structural integrity. No significant loading conditions or material degradation mechanisms have become evident to date that specifically relate to longitudinal seam welds in nuclear plant piping. The most critical region of the longitudinal weld is the portion that intersects the circumferential weld. Since this region will be examined during the examination of the circumferential weld, the licensee's alternative provides an acceptable level of quality and safety. Therefore, in accordance with 10 CFR 50.55a(a)(3)(i), it is recommended that the licensee's proposal to implement Code Case N-524 be authorized. The use of the Code Case should be authorized for the current interval or until such time as the Code Case is published in a future revision of Regulatory Guide 1.147. At that time, if the licensee continues to implement this Code Case, the licensee should follow all provisions in Code Case N-524, with conditions specified in the Regulatory Guide.

2.16 Request for Relief No. 16, Examination Category B-J, Items B9.11 and B9.12, Class 1 Piping Welds

Code Requirement: Examination Category B-J, Items B9.11 and B9.12 require 100% surface and volumetric examination, as defined by Figure IWB-2500-8, for circumferential and longitudinal piping welds, NPS 4 and larger.

Licensee's Proposed Alternative: In accordance with 10 CFR 50.55a(a)(3)(i), the licensee proposed an alternative examination for the piping welds listed below. The licensee stated:

> "FPL will conduct volumetric examinations from the inside surface of the Reactor Pressure Vessel during the Mechanized ultrasonic examinations of the nozzles. The first and second pipe welds, along with the associated longitudinal seam welds will be fully examined volumetrically from the inside surface. The outside surface of the welds will be examined volumetrically, both axially and circumferentially."

Loop	Weld ID	Description
Zone 1-006, Loop A Hot Leg	205-07-A RC-114-FW-1-500G RC-114-500G-LSA RC-114-500G-LSB	RPV outlet to extension Extension to pipe Longitudinal weld Longitudinal weld
Zone 1-007, Loop B Hot Leg	205-07-B RC-123-FW-1-500A RC-123-500A-LSA RC-123-500A-LSB	RPV outlet to extension Extension to pipe Longitudinal weld Longitudinal weld
Zone 1-009, Loop 1A2 Cold Leg	205-03-D RC-115-FW-1-500J RC-115-4-504-LSA RC-115-4-504-LSB	RPV inlet to extension Elbow to pipe Longitudinal weld Longitudinal weld
Zone 1-011, Loop 1B1 Cold Leg	205-03-A RC-121-FW-1-500C RC-121-2-504-LSA RC-121-2-504-LSB	RPV inlet to extension Elbow to pipe Longitudinal weld Longitudinal weld
Zone 1-013, Loop 1A1 Cold Leg	205-03-A RC-112-FW-1-500M RC-112-1-504-LSA RC-112-1-504-LSB	RPV inlet to extension Elbow to pipe Longitudinal weld Longitudinal weld
Zone 1-015, Loop 1B2 Cold Leg	205-03-B RC-124-FW-1-500F RC-124-3-504-LSA RC-124-3-504-LSB	RPV inlet to extension Elbow to pipe Longitudinal weld Longitudinal weld

Licensee's Basis for Proposed Alternative (as stated):

"Performance of these examinations on the Reactor Pressure Nozzle to pipe transition weld involves excessive costs, man-hours and man/rem with little or no compensating increase in the level of quality and safety.

"Section XI requires a volumetric examination of the inner one-third of the wall thickness, and a surface examination of the outside surface. In most cases, this is the most efficient and least expensive way of examining welds. In the case of the Main Reactor Coolant piping near the RPV, the size of the piping, location of the welds, high radiation dose rates, insulation removal, and erecting scaffolding is very time consuming, increasing the amount of radiation dose accumulated.

"Florida Power and Light Company has determined that performing the examinations as required by Code is difficult with high radiation dose without an increase in safety or quality.

"An ultrasonic examination of the affected welds has been performed successfully during the previous interval. The material of the welds is a carbon steel, and poses no unusual difficulties for ultrasonic examination.

"The proposed examination technique, along with the system pressure tests, provide assurance of an acceptable level of quality and safety. To gain access to the outside of the welds in order to perform the surface examinations is difficult, time consuming, and radiation intensive."

Evaluation: The Code requires volumetric examination of the inner 1/3 volume and a surface examination of the external surface for the subject Class 1 piping welds. In lieu of the Code requirements, the licensee has proposed to perform a full volumetric examination of the welds using mechanized ultrasonic equipment.

This alternative has been found acceptable at other plants when the licensee 1) commits to examine the full volume of the welds, and 2) the ultrasonic technique is demonstrated on OD connected cracks, not notches. It appears that the licensee will perform the examination on the full weld volume. However, qualification of the technique has not been discussed, and successful examination during the previous interval does not adequately qualify the technique for the current interval. Therefore, it is recommended that the proposed alternative not be authorized. To be considered acceptable, the licensee must provide a detailed technical discussion describing how the proposed technique has been qualified.

C. CONCLUSION

The INEEL staff has reviewed the licensee's submittal and concludes that for Requests for Relief Nos. 1, 2, 3, 9, 12, 14 and 15, the licensee's proposed alternatives to the Code requirements provide an acceptable level of quality and safety. Therefore, it is recommended that these proposed alternatives be authorized pursuant to 10 CFR 50.55a(a)(3)(i). For Request for Relief Nos. 4, 5, 8, 10, 11, 13. and 16, it is concluded that the licensee has not provided adequate justification to support the use of the proposed alternatives. Therefore, use of these alternatives should not be authorized. Requests for Relief Nos. 6 an 7 are evaluated elsewhere by the Mechanical Engineering Branch of the NRC.

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