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 Title 10, Code of Federal Regulations (10 CFR) Section 50.55a(g), except where specific written relief has been granted by the U.S. Nuclear Regulatory Commission (Commission or NRC) pursuant to 10 CFR 50.55a(g)(6)(i). As stated in 10 CFR 50.55a(a)(3), 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. 10 CFR 50.55a(g)(6)(i) states that the Commission may grant relief and impose such alternative requirements that it determines is authorized by law and will not endanger life or property or the common defense and security and are otherwise in the public interest giving due consideration to the burden on the facility that could result if the requirements were imposed on the facility.

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.

2.0 BACKGROUND

On June 8, 1999, the NRC issued Revision 12 to Regulatory Guide (RG) 1.147, "Inservice Inspection Code Case Acceptability, ASME Section XI, Division 1." This RG lists those ASME,

ENCLOSURE

Section XI Code Cases that are generally acceptable to the NRC staff for implementation in the inservice inspection of light-water-cooled nuclear power plants.

By letter dated June 18, 1999, the NRC staff authorized relief requests RR-01, RR-02, RR-03, RR-06, RR-07, RR-09, RR-12, RR-14, and RR-15, pursuant to 10 CFR 50.55a(a)(3)(i), in that the proposed alternatives provide an acceptable level of quality and safety. In that letter, the staff stated that relief requests RR-04, RR-05, RR-08, RR-10, RR-11, RR-13, and RR-16 were being resolved by NRC and FPL staff. During a meeting on June 18, 1999, and a subsequent telephone conversation between William Gleaves, NRC, and George Madden, FPL, on June 23, 1999, FPL agreed that due to circumstances surrounding RR-05, RR-08, RR-10, and RR-16, including but not limited to, the time that will be required to revise and submit those relief requests, and their complexity, FPL will submit those as new requests at a later time.

3.0 EVALUATION

By letter dated February 2, 1998, as supplemented June 17, 1999, Florida Power and Light Company (licensee or FPL) submitted its third 10-year interval inservice inspection program plan requests for relief for St. Lucie Plant, Unit 1. The NRC staff 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 Plant, Unit 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.

3.1 ISI Relief Request No. 04, Class 1, 2, and 3 Pressure Retaining Bolted Connections

Code Requirement: ASME Code, Section XI, 1989 Edition, IWA-5250(a)(2), 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 Code Relief Request: The licensee requested relief from the removal and subsequent VT-3 visual examination of applicable bolting when leakage is observed at a bolted connection during system pressure testing.

Licensee's Basis for Requesting Relief (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, and 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 changed 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.
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> "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 IWA-5250 (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 a valve or pump. 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 substantial 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 be 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 VT-2 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 joint's structural integrity and pressure retaining ability is not challenged. It would not be prudent to negatively impact safety system availability by removing the system from service to address a leak that does not challenge the system's 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.

"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. The proposed alternatives are consistent with Code Case N 566-1 that was approved by the Code Committee on February 15, 1999."

Licensee's Proposed Alternative Examination (as stated):

"When FPL finds leakage at bolted connections by VT-2 visual examination during system pressure testing, as an alternative to the requirements of IWA 5250(a)(2), either the requirements of (a) or (b) below will be met.

"(a) The leakage will be stopped and the bolting and component material will be evaluated for joint integrity as described in (c) below.

"(b) If the leakage is not stopped, the joint will be evaluated in accordance with IWB-3142.4 for joint integrity. This evaluation will include the considerations listed in (c) below. The evaluation will be submitted to the authority having jurisdiction in accordance with IWB-3144.

"(c) The evaluation for (a) and (b) above is to determine the susceptibility of the bolting to corrosion and failure. This evaluation will, at a minimum, consider the following factors:

1. The number and 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 connection's 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-1 visual examination and evaluation in accordance with IWB-3517 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. When the removed bolt shows evidence of unacceptable degradation, additional affected bolting shall be removed, VT-1 examined, and evaluated in accordance with IWB-3517, or the affected bolting shall be replaced.

"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-1 visual examination, and be evaluated in accordance with IWB-3517. When the removed bolt shows evidence of unacceptable degradation, additional affected bolting shall be removed, VT-1 examined, and evaluated in accordance with IWB-3517, or the affected bolting shall be replaced."

Staff Evaluation:

The ASME Code, Section XI, IWA-5250(a)(2) requires, if leakage occurs at a bolted connection, that the bolting must 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 evaluate the bolting and/or joint material for joint integrity and to determine the susceptibility of the bolting to corrosion and failure, while considering a minimum number of associated factors. Those factors include bolting materials, the corrosive nature of the process fluid, the leakage location and history, the service age of the bolting materials, and visual evidence of corrosion at the assembled connection. The licensee has also proposed to perform a VT-1 visual examination of the affected bolting in lieu of the specified VT-3 visual examination, when required. A VT-1 examination provides a more detailed examination and has defined acceptance criteria compared to a VT-3 visual examination. A VT-1 visual examination exceeds the examination attributes of a VT-3 examination, and provides greater quality and safety.

Based on the licensee-proposed alternative and the discussion provided above, the staff has determined that the alternative proposed by the licensee presents a sound engineering approach and 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) for the remainder of St. Lucie Plant, Unit 1, third 10-year ISI interval.

3.2 ISI RR No. 11, Hydrostatic Tests of Welded Repairs on Class 1, 2, and 3 Systems

In the St. Lucie, Unit 1, RR-11, as supplemented, the licensee proposed, in lieu of the Code-required hydrostatic testing for repairs or installation of replacement items by welding in ASME Code Class 1, 2, and 3 piping systems, to apply ASME Code Case N-416-1 as an alternative to the Code requirement. In addition to the Code Case, FPL proposed to perform additional surface examinations on the root pass layer or butt and socket welds of the pressure-retaining boundary of Class 3 systems when the surface examination method is used in accordance with the 1992 Edition of ASME Section III.

Code Case N-416-1 has been accepted for use in RG 1.147, Revision 12, subject to the condition that additional surface examinations be performed on the root pass layer of butt and socket welds of the pressure retaining boundary of Class 3 components when the surface examination method is used in accordance with ASME, Section III. Since the licensee has committed to follow the Code Case and additional condition in RG 1.147, Rev. 12, the staff finds the licensee's alternative to be acceptable.

3.3 ISI RR No. 13, Integral Attachments on Piping and Components

In the St. Lucie, Unit 1, RR-13, as supplemented, the licensee proposed, in lieu of the Code-required surface and visual examination of integral attachments, specified in the 1989 Edition of ASME Section XI, to apply ASME Code Case N-509 as an alternative to the Code requirement.

In addition to the Code Case, FPL proposed to examine a minimum of 10% of integral attachments distributed among all non-exempt Class 1, 2, and 3, piping, pumps, and valves. Code Case N-509 provides alternative requirements for scope, schedule, and additional and successive examinations for Class 1, 2, and 3, integrally welded attachments. This code case

relaxes the inspection requirements of Section XI in recognition that failures of integral attachments in service have been rare.

Code Case N-509 has been accepted for use in RG 1.147, Rev. 12, subject to the condition that, in addition to those conditions specified in the Code Case, a minimum 10% sample of integrally welded attachments for each item in each Code Class per interval should be examined. Since the licensee has committed to follow the Code Case and additional condition in RG 1.147, Rev. 12, the staff finds the licensee's alternative to be acceptable.

4.0 STAFF CONCLUSIONS

The staff, with the assistance of its contractor, has reviewed the licensee's submittal and concludes that for RR-04, FPL's proposed alternative to the Code requirement provides an acceptable level of quality and safety. Therefore, the staff authorizes this proposed alternative pursuant to 10 CFR 50.55a(a)(3)(i).

For RR-11 and RR-13, the licensee has proposed to follow the Code Cases with staff limitations contained in RG 1.147, Revision 12, "Inservice Inspection Code Case Acceptability, ASME Section XI, Division 1." Therefore, the alternatives proposed in these relief requests are acceptable to the staff.

Principal Contributor: W. Gleaves, NRR

Date: August 10, 1999