



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

June 7, 2022

**ST. LUCIE NUCLEAR PLANT, UNIT NO. 2 – AUTHORIZATION AND SAFETY EVALUATION
FOR RELIEF REQUEST NO. 20, REVISION 1 - THE USE OF AN ALTERNATIVE TO
REQUIREMENTS OF THE AMERICAN SOCIETY OF MECHANICAL ENGINEERS (ASME)
CODE FOR EXAMINATION OF REACTOR VESSEL CLOSURE HEAD CONTROL ELEMENT
DRIVE MECHANISM (CEDM) HOUSING #27 CANOPY SEAL WELD
(EPID L-2022-LLR-0007)**

LICENSEE INFORMATION

Recipient's Name and Address: Mr. Bob Coffey
Executive Vice President, Nuclear and
Chief Nuclear Officer
Florida Power and Light Company
700 Universe Blvd.
Mail Stop: EX/JB
Juno Beach, FL 33408

Licensee: Florida Power and Light Company

Plant Name and Unit: St. Lucie Nuclear Plant, Unit 2

Docket No.: 50-389

APPLICATION INFORMATION

Submittal Dates: January 12 and 14, 2022

Submittal Agencywide Documents Access and Management System (ADAMS) Accession Nos.: ML22013A798 and ML22014A114

Alternative Provision: The licensee requested an alternative under Title 10 of the *Code of Federal Regulations* (10 CFR), paragraph 50.55a(z)(2).

ISI Requirement: American Society of Mechanical Engineers (ASME) Boiler & Pressure Vessels Code (Code), Section XI, *Rules for Inservice Inspection of Nuclear Power Plant Components*, Subsection IWA-4000, Repair/Replacement Activities.

ASME Code, Section III, *Rules for Construction of Nuclear Power Plant Construction, Division 1*, paragraph NB-5271, *Welding Joints of Specially Designed Seals*.

Applicable Code Edition and Addenda: The Fourth 10-Year Inservice Inspection (ISI) interval Code of record for the St. Lucie Nuclear Plant, Unit 2 facility (St. Lucie, Unit 2) is the 2007 Edition with 2008 Addenda of American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code (Code), Section XI. The applicable construction code for the manufacture

of the reactor vessel closure head (RVCH) control element drive mechanism (CEDM) #27 is ASME Code, Section III, 1998 Edition through 2000 Addendum.

Brief Description of the Proposed Alternative: Florida Power and Light Company (FPL, the licensee) proposes to perform an enhanced remote visual examination of the repair/replacement of the CEDM housing #27 middle canopy seal weld overlay (WOL) in lieu of a surface examination, as required by ASME Code Section III, paragraph NB-5271. Because of extremely limited access and high dose rates, compliance with the ASME Code requirement to perform a surface examination would not meet the intent of the site's as low as reasonably achievable (ALARA) radiological control program and, therefore, presents a hardship to the utility and workers.

The proposed remote enhanced visual examination is conducted using a video camera with a minimum of 5X magnification. Lighting and acuity will be verified using ASME Code, Section XI, Table IWA-2211-1 requirements for VT-1 note (2). The licensee requested the proposed alternative for the remainder of the Fourth 10-year ISI interval.

For additional details on the licensee's request, please refer to the documents located at the ADAMS Accession Nos. identified above.

STAFF EVALUATION

On January 14, 2022 (ML22020A405), the U.S. Nuclear Regulatory Commission (NRC) staff verbally authorized the use of Relief Request No. 20 (RR-20) for the remainder of the Fourth 10-year ISI interval at St. Lucie, Unit 2. The basis for the NRC staff's authorization of RR-20 is documented below.

The licensee does not have a radiological survey at the middle canopy seal on CEDM #27. However, the measured dose rates at the head surface and shroud access are significant. Due to limited access and radiation dose, welding repair activities are planned to be performed remotely using machine welding equipment. However, the ASME Code, Section III requiring surface examination necessitates hands on access. The NRC staff finds that hands on access to perform a surface examination would result in hardship for the licensee.

In order to replace the CEDM #27 internal drive motor, the middle canopy seal weld must be cut to allow the motor housing and the rod travel housing to be unthreaded. The threaded joint forms the ASME Code Class 1 pressure boundary with the canopy seal providing leakage prevention only. Reassembly after the motor replacement requires rewelding the middle canopy seal weld. The rewelded canopy seal will have the original weld restored in addition to the application of a minimum 0.125-inch WOL to provide margin over the original canopy seal weld thickness. The application of the WOL is performed under the licensee's ASME Code, Section XI Repair/Replacement program using welding procedures and personnel qualified in accordance with ASME Code, Section IX, *Welding, Brazing, and Fusing Qualifications*. Section XI requires that repairs, such as the WOL on middle canopy seal, be performed in accordance with the owner's original Construction Code of the component or system, or later editions and addenda of the Code.

As part of the design process for the weld overlay, the licensee conservatively assumes a preexisting flaw through the original weld thickness around the entire circumference. The NRC staff notes that this is an adequate assumption because such a preexisting through wall flaw around the entire circumference of the seal weld is highly unlikely. The licensee evaluated crack growth of the postulated flaw, including stress corrosion cracking and fatigue crack growth,

using ASME Code, Section XI, IWB-3640 with guidance from NUREG-0313, Revision 2, *“Technical Report on Material Selection and Processing Guidelines for BWR Coolant Pressure Boundary Piping.”* The licensee determined that the assumed preexisting flaw would not reach 75 percent through wall thickness in 60 years. The NRC staff notes that 60 years is considerably longer than the current operating license at St. Lucie, Unit 2 with the addition of a subsequent license renewal period, should one be approved in the future. The NRC staff reviewed the licensee’s stress corrosion crack growth analysis and its fatigue crack growth analysis of the assumed preexisting flaw and determined that the methods used are adequate and consistent with the ASME Code and are, therefore, acceptable.

The licensee proposed, in lieu of the ASME Code, Section III required surface examination, the use of enhanced VT-1 visual examination, using a video camera with a minimum of 5X magnification. The NRC staff determined that this would most likely identify any significant surface-breaking defects in the WOL, and is, therefore acceptable. In addition, in the unlikely event that the WOL were to leak, the VT-2 inservice leakage examination performed at the conclusion of each refueling outage, and the boric acid corrosion control program and enhanced leak detection procedures to identify reactor coolant system leakage during operation would identify any leakage in the WOL permitting corrective action to be taken before the leak could become a safety concern.

Based on the above, the NRC staff finds that compliance with the ASME Code requirements to perform a surface examination of the weld repair on CEDM #27 middle canopy seal would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety. Additionally, the NRC staff finds that RR-20 will provide reasonable assurance of leak tightness of the CEDM middle canopy seal WOL repair.

CONCLUSION

The NRC staff has determined that complying with the specified requirements described in the licensee’s request referenced above would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety.

The proposed alternative provides reasonable assurance of leak tightness of the subject component. The NRC staff concludes that the licensee has adequately addressed the regulatory requirements set forth in 10 CFR 50.55a(z)(2).

The NRC staff authorizes the use of RR-20, Revision 1 at St. Lucie Plant, Unit 2 for the remainder of the Fourth 10-year ISI interval.

All other ASME BPV Code, Section XI, requirements for which an alternative was not specifically requested and authorized remain applicable, including third-party review by the Authorized Nuclear Inservice Inspector.

Principal Contributor: Davis, Robert

Date: June 7, 2022

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Plant Licensing Branch II-2
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SUBJECT: ST. LUCIE NUCLEAR PLANT, UNIT NO. 2 – AUTHORIZATION AND SAFETY EVALUATION FOR RELIEF REQUEST NO. 20, REVISION 1 - THE USE OF AN ALTERNATIVE TO REQUIREMENTS OF THE AMERICAN SOCIETY OF MECHANICAL ENGINEERS (ASME) CODE FOR EXAMINATION OF REACTOR VESSEL CLOSURE HEAD CONTROL ELEMENT DRIVE MECHANISM (CEDM) HOUSING #27 CANOPY SEAL WELD (EPID L-2022-LLR-0007) DATED: JUNE 7, 2022

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