



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

December 9, 2021

Mr. Terry J. Brown
Site Vice President
Energy Harbor Nuclear Corp.
Mail Stop P-DB-3080
5501 North State Route 2
Oak Harbor, OH 43449-9760

SUBJECT: DAVIS-BESSE NUCLEAR POWER STATION, UNIT NO. 1 – APPROVAL OF
PLANT-SPECIFIC ANALYSIS OF CERTAIN REACTOR VESSEL INTERNAL
COMPONENTS IN ACCORDANCE WITH LICENSE RENEWAL COMMITMENT
NO. 53 (EPID L-2021-LRO-0010)

Dear Mr. Brown:

By letter dated March 10, 2021 (Agencywide Documents Access and Management System (ADAMS) Package Accession No. ML21069A304), Energy Harbor Nuclear Corp. (the licensee) submitted, in accordance with license renewal commitment No. 53, a plant-specific analysis of certain reactor vessel internal components at the Davis-Besse Nuclear Power Station, Unit No. 1 (Davis-Besse) for U.S. Nuclear Regulatory Commission (NRC) staff review and approval. In accordance with Condition 2.C.(11)(a) of the Davis-Besse license, certain license renewal commitments made by the licensee were made a part of the Updated Final Safety Analysis Report (UFSAR). The license renewal commitments that are part of the UFSAR are listed in Appendix A of NUREG-2193, "Safety Evaluation Report Related to the License Renewal of Davis-Besse Nuclear Power Station," Supplement 1, dated August 2015 (ADAMS Accession No. ML16104A350).

The NRC staff has reviewed the Davis-Besse plant-specific analysis provided on March 10, 2021, and concludes that the analysis is acceptable. Therefore, this analysis is approved and license renewal commitment No. 53 has been fulfilled. The NRC staff's assessment of the plant-specific analysis is enclosed.

T. Brown

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If you have any questions, please contact me at 301-415-1380 or via e-mail at Blake.Purnell@nrc.gov.

Sincerely,

/RA/

Blake Purnell, Project Manager
Plant Licensing Branch III
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket No. 50-346

Enclosure:
Staff Assessment

cc: Listserv

STAFF ASSESSMENT BY THE OFFICE OF NUCLEAR REACTOR REGULATION
PLANT-SPECIFIC ANALYSIS OF REACTOR VESSEL INTERNAL COMPONENTS

ENERGY HARBOR NUCLEAR GENERATION LLC

ENERGY HARBOR NUCLEAR CORP.

DAVIS-BESSE NUCLEAR POWER STATION, UNIT NO. 1

DOCKET NO. 50-346

1.0 INTRODUCTION

By letter dated March 10, 2021 (Agencywide Documents Access and Management System (ADAMS) Package Accession No. ML21069A304), Energy Harbor Nuclear Corp. (the licensee) submitted, in accordance with license renewal commitment (LRC) No. 53, a plant-specific analysis of certain reactor vessel internal (RVI) components at the Davis-Besse Nuclear Power Station, Unit No. 1 (Davis-Besse) for U.S. Nuclear Regulatory Commission (NRC) staff review and approval. The purpose of the analysis is to demonstrate that specific RVI components will maintain their functionality during the period of extended operation.

2.0 BACKGROUND

By letter dated December 8, 2015 (ADAMS Package Accession No. ML15286A038), the NRC staff issued the renewed license for Davis-Besse. In accordance with Condition 2.C.(11)(a) of the Davis-Besse license, certain license renewal commitments made by the licensee were made a part of the Updated Final Safety Analysis Report (UFSAR). The license renewal commitments that are part of the UFSAR are listed in Appendix A of NUREG-2193, "Safety Evaluation Report Related to the License Renewal of Davis-Besse Nuclear Power Station," Supplement 1, dated August 2015 (ADAMS Accession No. ML16104A350).

LRC No. 53 relates to inspections required by the Electric Power Research Institute Technical Report No. 1022863, "Materials Reliability Program: Pressurized Water Reactor Internals Inspection and Evaluation Guidelines (MRP-227-A)," dated December 2011 (ADAMS Package Accession No. ML120170453). LRC No. 53 states:

In response to MRP-227-A Applicant/Licensee Action Item 7, develop and submit for NRC review and approval a plant-specific analysis to demonstrate that the Incore Monitoring Instrumentation (IMI) guide tube assembly spiders, Control Rod Guide Tube (CRGT) spacer castings, and additional RV [reactor vessel] Internals component items that may be fabricated from CASS [cast austenitic stainless steel], martensitic stainless steel [SS], or martensitic precipitation-hardened stainless-steel [PHSS] materials (e.g., Core Support Shield (CSS) vent valve top and bottom retaining rings) will maintain their functionality during the period of extended operation. The analysis will consider the possible loss of fracture toughness in these component items due to thermal embrittlement and/or irradiation embrittlement and may also need to consider limitations on accessibility for inspection and the resolution/sensitivity of the inspection techniques. The Davis-Besse analysis will be consistent with the licensing basis

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and the need to maintain the functionality of the component items being evaluated under all licensing basis conditions of operation.

The licensee committed to submit the plant-specific analysis in LRC No. 53 to the NRC 1 year prior to the MRP-227-A inspection of the applicable component items. The licensee submitted this analysis on March 10, 2021, and plans to perform the MRP-227-A inspections at Davis-Besse during the Spring 2022 refueling outage.

3.0 STAFF ASSESSMENT

In NUREG-2193, Supplement 1, the NRC staff concluded that the Davis-Besse RVI program had demonstrated that the effects of aging would be adequately managed so that the intended functions) will be maintained consistent with the current licensing basis for the period of extended operation (PEO), as required by Title 10 of the *Code of Federal Regulations* (10 CFR) 54.21(a)(3).

The RVI program at Davis-Besse is based on MRP-227-A. The NRC staff's December 16, 2011, approval of MRP-227 and the associated safety evaluation (SE) are included within MRP-227-A. As discussed in Section 4.2 of the MRP-227 SE, the NRC staff imposed eight plant-specific action items for the implementation of MRP-227-A. Davis-Besse is a Babcock and Wilcox (B&W) reactor design. In accordance with Applicant/Licensee Action Item 7 (A/LAI 7) in Section 4.2.7 of the MRP-227 SE, the licensee committed (LRC No. 53) to provide the plant-specific analysis of relevant RVI components before implementing MRP-227-A.

The A/LAI 7 was established due to concerns regarding thermal embrittlement, including the potential for a synergistic effect of thermal and irradiation embrittlement, for CASS RVI components that are susceptible to thermal embrittlement and receive sufficient fluence to be subject to irradiation embrittlement. Davis-Besse is a Babcock and Wilcox (B&W) reactor design, and, for B&W designs, A/LAI 7 requires the development of a plant-specific analysis to demonstrate that RVI components fabricated from CASS, martensitic SS, or PHSS would maintain their functionality during the PEO. The analysis needs to consider possible loss of fracture toughness in these components due to thermal and irradiation embrittlement.

The NRC staff reviewed the licensee's plant-specific analysis to address A/LAI 7 for Davis-Besse. The analysis includes a discussion of the purpose, the methodology used, a summary of the background, evaluation inputs, evaluation, and a conclusion for each of the following RVI components:

- CRGT Spacer Castings (Grade CF3M CASS)
- IMI Guide Tube Spider Castings (Grade CF8 CASS)
- Vent Valve Retaining Rings (Type 15-5 PHSS)
- Select Original Vent Valve Locking Device Parts (Type 431 martensitic SS)

The analysis states that the CRGT spacer castings and vent valve retaining rings were screened in as potentially susceptible to thermal embrittlement, but not irradiation embrittlement. In addition, the vent valve retaining rings were screened in as potentially susceptible to irradiation embrittlement, but not thermal embrittlement.

Section 3.3.1 of MRP-227-A describes the four inspection categories: Primary, Expansion, Existing Programs, and No Additional Measures. Consistent with MRP-227-A, Table 4-1, the

licensee categorized the Davis-Besse CRGT spacer castings, IMI guide tube spider castings, and vent valve retaining ring as Primary components. Primary RVI components are either highly susceptible to effects of aging due to any active degradation mechanism, or components that have a degree of tolerance for a specific degradation mechanism, but for which no leading highly susceptible or accessible component exists.

Although MRP-227-A does not identify any components in the Existing Programs category for B&W plants, the licensee has categorized the original vent valve locking device parts as Existing Programs because these parts are within the scope of A/LAI 7. The Existing Programs category is for RVI components that are susceptible to the effects of aging due to one or more active degradation mechanisms, but that are managed under an existing generic or plant-specific aging management basis currently implemented by the pressurized-water reactor fleet which adequately manages the aging effect.

The NRC staff confirmed that the analysis demonstrated that the above components would remain functional during the PEO. The NRC staff notes that the classification as a primary component and its associated inspection requirements are intended to provide reasonable assurance of continued functionality. As discussed in NUREG-2193, Supplement 1, page 3-28, the continued functionality of the original vent valve locking device parts is verified through the inservice inspection program and applicable surveillance requirements in the Davis-Besse technical specifications. The NRC staff's review of the analysis determined that the licensee has adequately evaluated all plant-specific CASS, PHSS, and martensitic SS RVI components for Davis-Besse. The NRC staff found that the analysis demonstrated the adequate fracture toughness of these items with consideration for possible thermal and/or irradiation embrittlement. Therefore, the NRC staff determined that the licensee has satisfied the criteria of A/LAI 7 for MRP-227-A for David-Besse.

4.0 CONCLUSION

The NRC staff has reviewed the licensee's plant-specific analysis for the applicable RVI components. Based on its review, the NRC staff concludes that the licensee has demonstrated that the applicable RVI component items fabricated from CASS, martensitic SS, or PHSS materials would maintain their functionality during the PEO. Specifically, the NRC staff approves the plant-specific analysis for Davis-Besse because the analysis demonstrates the adequate fracture toughness of these items with consideration for possible thermal and/or irradiation embrittlement. Therefore, LRC No. 53 has been fulfilled.

Principal Contributor: Isaac Anchondo-Lopez

Date: December 9, 2021

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