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

February 5, 2014

Mr. Raymond A. Lieb
Site Vice President
FirstEnergy Nuclear Operating Company
Mail Stop A-DB-3080
5501 North State, Route 2
Oak Harbor, OH 43449-9760

SUBJECT: DAVIS-BESSE NUCLEAR POWER STATION, UNIT NO. 1 - SAFETY EVALUATION FOR RELIEF REQUEST RP-3 (TAC NO. MF0757) (L-13-067)

Dear Mr. Lieb:

By letter dated February 27, 2013 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML13059A321), as supplemented by a letter dated September 25, 2013 (ADAMS Accession No. ML13269A095), FirstEnergy Nuclear Operating Company (the licensee) submitted a request for relief, RP-3, pursuant to Section 50.55a(a)(3)(i) to Title 10 of the *Code of Federal Regulations* (10 CFR) for the Davis-Besse Nuclear Power Station, Unit No. 1 (DBNPS). Specifically, the licensee has requested to perform periodic functional testing and flow rate tests each cycle instead of vibration monitoring on certain inaccessible pumps.

The U.S. Nuclear Regulatory Commission (NRC) staff determined that granting relief pursuant to 10 CFR 50.55a(f)(6)(i) is authorized by law and will not endanger life or property or the common defense and security, and is otherwise in the public interest giving due consideration to the burden upon the licensee that could result if the requirements were imposed on the facility. Furthermore, the staff concluded that the testing performed to the extent practical provides reasonable assurance of the operational readiness of emergency diesel generator (EDG) fuel oil transfer pumps P195-1 and P195-2. Accordingly, the NRC staff concludes that the licensee has adequately addressed all of the regulatory requirements set forth in 10 CFR 50.55a(f)(5)(iii). Therefore, the NRC staff recommends granting the proposed relief, RP-3, for EDG fuel oil transfer pumps P195-1 and P195-2 at DBNPS for the fourth 10-year inservice testing (IST) program interval.

This relief is authorized for the fourth 10-year IST interval at DBNPS, Unit 1, which began on September 21, 2013, and ends on September 20, 2023.

Should you have any questions, please feel free to contact Ms. Eva Brown at (301) 415-2315.

Sincerely,

Travis L. Tate, Chief
Plant Licensing Branch III-2 and Planning
and Analysis Branch
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket No. 50-346

Enclosure: Safety Evaluation

cc w/encl: Distribution via Listserv

UNITED STATES
NUCLEAR REGULATORY COMMISSION
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SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION
RELIEF REQUEST NO. RP-3
RELATED TO PERIODIC FUNCTIONAL AND FLOW RATE TESTING
FOR CERTAIN INACCESSIBLE PUMPS
FIRSTENERGY NUCLEAR OPERATING COMPANY
DAVIS-BESSE NUCLEAR POWER STATION, UNIT 1
DOCKET NO. 50-346

1.0 INTRODUCTION

By letter dated February 27, 2013 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML13059A321) as supplemented by a letter dated September 25, 2013 (ADAMS Accession No. ML13269A095), FirstEnergy Nuclear Operating Company (the licensee) submitted a request for relief pursuant to Section 50.55a(a)(3)(i) to Title 10 of the *Code of Federal Regulations* (10 CFR) for the Davis-Besse Nuclear Power Station, Unit No. 1 (DBNPS). Specifically, the licensee requested to perform periodic functional testing and flow rate tests each cycle instead of vibration monitoring on certain inaccessible pumps.

This relief was requested for the fourth 10-year inservice testing (IST) interval at DBNPS, which began on September 21, 2012, and ends on September 20, 2022.

2.0 REGULATORY EVALUATION

Section 50.55a(f), *Inservice testing requirements,* to 10 CFR, states that ASME [American Society of Mechanical Engineers] Code Class 1, 2, and 3; and Class MC and CC components (including supports) must meet the requirements set forth in the ASME, *Code for Operation and Maintenance of Nuclear Power Plants* (OM Code) and applicable addenda.

Section 50.55a(f)(5)(iii) to 10 CFR, states, in part, that licensees may determine that conformance with certain code requirements is impractical and that the licensee shall notify the U.S. Nuclear Regulatory Commission (NRC or Commission) and submit information in support of the determination.

Section 50.55a(f)(6)(i) to 10 CFR, states that the Commission will evaluate determinations under paragraph (f)(5) of this section that code requirements are impractical. The Commission may grant such relief and may impose such alternative requirements as it determines is authorized by

law and will not endanger life or property or the common defense and security and is otherwise in the public interest giving due consideration to the burden upon the licensee that could result if the requirements were imposed on the facility.

ASME OM Code Article ISTB-3400, *Frequency of Inservice Tests*, states that, "[a]n inservice test shall be run on each pump as specified in Table ISTB-3400-1."

Table ISTB-3400-1, *Inservice Test Frequency*, notes that Group A and Group B tests shall be performed quarterly, and comprehensive pump tests (CPTs) shall be performed biennially.

Subsection ISTB-5100, *Centrifugal Pumps (Except Vertical Line Shaft Centrifugal Pumps)*, (a), *Duration of Tests*, (1), states, "[f]or the Group A test and the comprehensive test, after pump conditions are as stable as the system permits, each pump shall be run at least 2 min. At the end of this time at least one measurement or determination of each of the quantities required by Table ISTB-3000-1 shall be made and recorded."

Subsection ISTB-5121, *Group A Test Procedure*, (b), states, in part, "[t]he resistance to the system shall be varied until the flow rate equals the reference point. The differential pressure shall then be determined and compared to its reference value."

Subsection ISTB-5121, *Group A Test Procedure*, (c), states, "[w]here it is not practical to vary system resistance, flow rate and pressure shall be determined and compared to their respective reference values."

Subsection ISTB-5121, *Group A Test Procedure*, (d), states, in part, "[v]ibration (displacement or velocity) shall be determined and compared with the reference value."

Subsection ISTB-5121, *Group A Test Procedure*, (e), states, in part, "[a]ll deviations from the reference values shall be compared with the ranges of Table ISTB-5121-1 and corrective action taken as specified in ISTB-6200. Vibration measurements shall be compared to both the relative and absolute criteria shown in the alert and required action ranges of Table ISTB-5121-1."

Subsection ISTB-5123, *Comprehensive Test Procedure*, (b), states, in part, "[f]or centrifugal and vertical line shaft pumps, the resistance of the system shall be varied until the flow rate equals the reference point. The differential pressure shall then be determined and compared to its reference value."

Subsection ISTB-5123, *Comprehensive Test Procedure*, (c), states, "[w]here it is not practical to vary system resistance, flow rate and pressure shall be determined and compared to their respective reference values."

Subsection ISTB-5123, *Comprehensive Test Procedure*, (d), states, in part, "[v]ibration (displacement or velocity) shall be determined and compared with corresponding reference values."

Subsection ISTB-5123, *Comprehensive Test Procedure*, (e), states, in part, "[a]ll deviations from the reference values shall be compared with the ranges of Table ISTB-5121-1 and corrective action taken as specified in ISTB-6200. The vibration measurements shall be compared to both the relative and absolute criteria shown in the alert and required action ranges of Table

ISTB-5121-1."

Table ISTB-5121-1, *Centrifugal Pump Test Acceptance Criteria*, notes the Group A and CPT acceptance criteria.

The licensee requested relief from the Group A and CPT requirements specified in paragraphs ISTB-5100(a)(1), ISTB-5121, and ISTB-5123 for Emergency Diesel Generator (EDG) fuel oil transfer pumps P195-1 and P195-2. These pumps are Class 3, Group A pumps.

3.0 TECHNICAL EVALUATION

3.1 Licensee's Request for Alternative

Components for Which Relief is Being Requested

Emergency Diesel Generator Fuel Oil Transfer Pump, Class 3, Group A, P195-1
Emergency Diesel Generator Fuel Oil Transfer Pump, Class 3, Group A, P195-2

Licensee's Proposed Alternative and Basis

The licensee states:

> 10 CFR 50.55a(f)(2) requires that ASME Class 1 and 2 components be designed and provided with access to enable the performance of inservice tests if the construction permit was issued on or after January 1, 1971, but before July 1, 1974. The DBNPS construction permit was issued on March 24, 1971. However, the EDG fuel oil transfer system is ASME Code Class 3, and therefore, was not required to be designed to permit performance of Code-required inservice testing. The EDG fuel oil transfer pumps and motors are submerged inside the EDG fuel oil storage tank and are not accessible for vibration measurements. There is no installed flow instrumentation, pressure instrumentation, valve test connections, or accessible recirculation lines. The pumps transfer diesel fuel oil from the EDG fuel oil storage tanks to the EDG day tanks.
>
> The EDG fuel oil transfer pumps do not have installed instrumentation to measure either flow or discharge pressure. The only possible flow measurement is by measuring EDG day tank volume change over time. Error in measuring this volume is dependent on fuel oil temperature and a limited change in level indication because the EDG day tank has a large upper circular section. Flow rate is dependent upon EDG fuel oil storage tank level and fuel oil viscosity, which varies with environmental temperature conditions. There are no accessible recirculation pathways nor designed drainage pathways in the pipe line that is used to transfer fuel oil from the EDG fuel oil storage tank to the EDG day tank.
>
> Code compliance would require modification of the fuel oil transfer system to accommodate Code-required flow, differential pressure, and vibration

measurements. This modification would involve replacement of the existing pumps and their relocation external to the tanks, installation of flow test loops, and installation of flow and pressure instrumentation. A modification of this magnitude is unwarranted considering the reduced safety significance of the DBNPS fuel oil transfer system as compared to typical designs. The EDG fuel oil storage tank configuration consists of a safety-related 40,000 gallon, seven-day capacity storage tank for each EDG. Each of the seven-day storage tanks has an internally mounted, submerged EDG fuel oil transfer pump normally supplying the corresponding 6,000 gallon gross capacity day tank. There is sufficient fuel oil in each day tank to operate its associated EDG for more than 20 hours at the continuous rated load. In addition, the supply lines from the EDG day tanks can be cross-connected, which permits either EDG to be supplied with fuel oil from either storage tank in an emergency. Each EDG day tank has a safety-related fill connection and the capability of emergency fill from the non-safety-related 100,000 gallon diesel fuel oil storage tank using a flexible hose. Because of the large capacity of the day tanks, and the three diverse methods of replenishing the day tanks during EDG operation (100,000 gallon tank, 40,000 gallon tanks, and safety-related fill connection), the DBNPS EDG fuel oil transfer pumps are of lower safety significance than in a fuel oil transfer system with relatively small day tanks.

Proposed Alternative

The licensee states:

> Since the EDG fuel oil transfer pumps are inaccessible, no vibration monitoring will be performed. The following testing will be performed in lieu of the IST requirements, test acceptance criteria, and test frequency requirements described above.
>
> Fuel oil transfer system functional testing is performed every 92 days as required by Technical Specification (TS) Surveillance Requirement (SR) 3.8.1.7. This SR verifies that the fuel oil transfer system operates to transfer fuel oil from the fuel oil storage tank to the day tank. Periodic operation of the EDGs for testing purposes requires automatic operation of the EDG fuel oil transfer pumps in order to maintain the required level in the EDG day tanks.
>
> Pump flow rate tests are performed each cycle. Fuel oil is added to the EDG fuel oil storage tank, if necessary, to ensure a specified minimum fuel oil level is established above the EDG fuel oil transfer pump prior to testing. The minimum fuel oil level ensures pump suction pressure is consistent for repeatable system flow characteristics.
>
> The pump flow rate is calculated by measuring the change in EDG day tank level over time. An EDG day tank level change of approximately 150 gallons or more is timed to determine flow rate. As described above, consistent

EDG fuel oil transfer pump suction pressure is established prior to the test. For the proposed testing, the EDG day tank level is measured prior to starting and after stopping the EDG fuel oil transfer pump. Measurement of EDG day tank level after starting the EDG fuel oil transfer pump may not reflect static tank level, due to movement of fuel entering the tank. Since measuring the EDG day tank level is not practical while the pump is running, the volume of fuel oil transferred to the day tank after stabilization of pump conditions and the EDG fuel oil transfer pump flow rate cannot be reliably calculated by this method. Therefore, each fuel oil transfer pump will not be run for at least two minutes after the stabilization of pump conditions as stated in ISTB-5100(e)(1). Based upon these conditions, pump flow rates are repeatable and capable of predicting pump degradation.

The EDG fuel oil transfer pumps are rated at 10 gallons per minute (gpm). A conservative minimum flow rate of six gpm will be used in lieu of ASME OM Code Table ISTB-5121-1. The calculated consumption rate for the EDG at maximum power output is 3.6 gpm. Therefore, the minimum flow rate (6 gpm) is conservative relative to the maximum required pump flow rate (3.6 gpm), and will ensure the EDG fuel oil transfer pumps do not degrade below required design system flow requirements. Pump flow rates will be trended for degradation. In lieu of alert levels being specified, required actions will be performed if pump flow rate is determined to be outside the acceptable range.

The EDG fuel oil storage tanks are drained, cleaned, and filled with fresh oil on a 48-month frequency. The EDG day tanks are drained, cleaned, and inspected on a 10-year frequency. At these times, a long term pump duration test is possible. The EDG fuel oil transfer pump will be required to continuously pump 1,000 gallons of fuel from the EDG fuel oil storage tank to the EDG day tank. Flow rate will be calculated and evaluated for degradation.

3.2 NRC Staff Evaluation

The 2004 Edition through the 2006 Addenda of the ASME OM Code requires that pump flow rate, differential pressure, and vibration be evaluated against reference values to monitor pump condition and to allow detection of hydraulic degradation. Article ISTB-5121 specifies the Group A test criteria for centrifugal pumps, and ISTB-5123 specifies the comprehensive test criteria for centrifugal pumps. Test frequencies are specified in Table ISTB-3400-1.

The construction permit for DBNPS was issued on March 24, 1971, therefore, 10 CFR 50.55a(f)(2) applies for design and accessibility. Section 50.55a(f)(2) to 10 CFR requires that Class 1 and 2 components be designed and provided with access to enable testing if the construction permit was issued between January 1, 1971, and July 1, 1974. Class 3 components are not required to meet this criteria. The EDG fuel oil transfer system is Class 3, therefore, it was not required to be designed to permit performance of IST. The EDG fuel oil transfer pumps are canned rotor pumps, and are submerged inside the underground EDG fuel oil storage tank. These pumps are not accessible during operations. The NRC staff notes that modifications to accommodate

code-required instrumentation would require relocation of the pumps themselves, and does not appear warranted given the system's significance due to the system design. There are no installed flow or pressure instrumentation or recirculation lines available to perform the ASME OM Code-required testing. Therefore, it is impractical to perform flow rate and differential pressure tests or to take vibration measurements on these pumps.

The DBNPS EDG fuel oil storage tank configuration consists of a safety-related 40,000 gallon, seven-day capacity underground storage tank for each EDG. Each of the underground storage tanks has an internally mounted submerged EDG fuel oil transfer pump normally supplying the corresponding 6,000 gallon gross capacity day tank. There is sufficient fuel oil in each day tank to operate its associated EDG for more than 20 hours at the continuous rated load. In addition, the supply lines from the EDG day tanks can be cross-connected, which permits either EDG to be supplied with fuel oil from either fuel oil storage tank in an emergency. Each EDG day tank also has a safety-related fill connection and the capability of emergency fill from the nonsafety-related 100,000 gallon diesel fuel oil storage tank using a flexible hose. Because of the large capacity of the day tanks, and the three diverse methods of replenishing the day tanks during EDG operation (100,000 gallon non-safety-related storage tank, 40,000 gallon safety-related storage tanks, and safety-related fill connection), the DBNPS EDG fuel oil transfer pumps are of lower safety significance than in a fuel oil transfer system with relatively small day tanks.

The alternative testing proposed by the licensee includes fuel oil transfer system functional testing every 92 days as required by DBPNS TS SR 3.8.1; pump flow rate tests at each cycle based on a flow of approximately 150 gallons; and a periodic pump flow rate test of approximately 1,000 gallons, performed when the EDG fuel oil storage tanks are drained and cleaned every 48 months and when the EDG fuel oil day tanks are drained and cleaned every 10 years. The pump flow rate tests will be performed under preset and repeatable conditions. The pump flow rates will be analyzed and trended for indications of degradation. A minimum flow rate of 6 gpm will be established for test acceptance criteria in lieu of the acceptance criteria in Table ISTB-5121-1 for corrective action by the licensee. The proposed value of 6 gpm for the lower end of the acceptable range, is acceptable as the pump is still capable of providing rated flow to the EDG during maxium power output. The NRC staff finds that the proposed alternative testing provides an adequate means of monitoring these pumps for degradation.

In the September 25, 2013, supplement, the licensee stated that in the past 10 years, EDG fuel oil transfer pump P195-1 was replaced in September 2005 due to low electrical resistance in the motor. This was a motor issue, not a pump degradation issue. There is no other record of corrective maintenance for this pump. The licensee stated that there is no record of corrective maintenance for EDG fuel oil transfer pump P195-2 in the past 10 years. The licensee also stated that there is no record of failed starts for the EDG fuel oil transfer pumps in the past 10 years.

The licensee also provided a summary of inservice test results for each EDG fuel oil transfer test performed over the past 10 years. The flow rate for EDG fuel oil transfer pump P195-1 ranged from 11.9 gpm to 14.4 gpm. The flow rate for EDG fuel oil transfer pump P195-2 ranged from 12.5 gpm to 16.2 gpm. These flow rates are well above the licensee's minimum flow rate value of 6 gpm.

Based on the proposed alternative providing an adequate means for monitoring pump degradation and the lack of instrumentation to support testing during operation, the NRC staff

finds that compliance with the ASME OM Code testing requirements for flow rate, differential pressure, and vibration for the EDG fuel oil transfer pumps is impractical. The NRC staff further finds that the licensee's proposed method to test and trend the EDG fuel oil transfer pumps to trend degradation provides reasonable assurance of the pumps' operational readiness.

4.0 CONCLUSION

As set forth above, the NRC staff determines that granting relief pursuant to 10 CFR 50.55a(f)(6)(i) is authorized by law and will not endanger life or property or the common defense and security, and is otherwise in the public interest giving due consideration to the burden upon the licensee that could result if the requirements were imposed on the facility. Furthermore, the staff concluded that the testing performed to the extent practical provides reasonable assurance of the operational readiness of EDG fuel oil transfer pumps P195-1 and P195-2. Accordingly, the NRC staff concludes that the licensee has adequately addressed all of the regulatory requirements set forth in 10 CFR 50.55a(f)(5)(iii). Therefore, the NRC staff grants the proposed relief for EDG fuel oil transfer pumps P195-1 and P195-2 at DBNPS for the fourth 10-year IST program interval, which began on September 21, 2012, and is scheduled to end on September 20, 2022.

All other ASME OM Code requirements for which relief was not specifically requested and approved in the subject request for relief remain applicable.

Principle Contributor: Robert Wolfgang

Date of issuance: February 5, 2014

Should you have any questions, please feel free to contact Ms. Eva Brown at (301) 415-2315.

Sincerely,

/ RA /

Travis L. Tate, Chief
Plant Licensing Branch III-2 and Planning
and Analysis Branch
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket No. 50-346

Enclosure: Safety Evaluation

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