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

February 25, 2019

Mr. David B. Hamilton
Site Vice President
FirstEnergy Nuclear Operating Company
Mail Stop A-PY-A290
P.O. Box 97, 10 Center Road
Perry, OH 44081-0097

SUBJECT: PERRY NUCLEAR POWER PLANT, UNIT NO. 1 - REQUEST FOR ALTERNATIVES RELATED TO INSERVICE TESTING PROGRAM FOR THE FOURTH 10-YEAR INSERVICE TESTING INTERVAL (EPID L-2018-LLR-0092, L-2018-LLR-0093, L-2018-LLR-0094, L-2018-LLR-0095, AND L-2018-LLR-0096)

Dear Mr. Hamilton:

By letter dated June 21, 2018, as supplemented by letter dated October 16, 2018, FirstEnergy Nuclear Operating Company submitted a request to the U.S. Nuclear Regulatory Commission (NRC) for the use of alternatives to certain inservice testing requirements of the American Society of Mechanical Engineers (ASME) Code for Operation and Maintenance of Nuclear Power Plants (OM Code) at Perry Nuclear Power Plant, Unit 1.

Specifically, pursuant to Title 10 of the *Code of Federal Regulations* (10 CFR) 50.55a(z)(1), the licensee requested to use the proposed alternatives on the basis that the alternatives provide an acceptable level of quality and safety.

The NRC staff has reviewed the subject request and concludes, as set forth in the enclosed safety evaluation, that FENOC has adequately addressed all of the regulatory requirements set forth in 10 CFR 50.55a(z)(1). Therefore, the NRC authorizes the use of these alternative requests for PNPP for the fourth 10-year IST program interval, which begins on May 18, 2019, and is scheduled to end on May 17, 2029.

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

Sincerely,

David J. Wrona, Branch Chief
Plant Licensing Branch III
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket No. 50-440

Enclosure:
Safety Evaluation

cc: ListServ

UNITED STATES
NUCLEAR REGULATORY COMMISSION
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SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

ALTERNATIVE REQUESTS RELATED TO THE INSERVICE TESTING PROGRAM

FOURTH 10-YEAR INSERVICE TESTING INTERVAL

FIRSTENERGY NUCLEAR OPERATING COMPANY

PERRY NUCLEAR POWER PLANT, UNIT NO. 1

DOCKET NO. 50-440

1.0 INTRODUCTION

By letter dated June 21, 2018 (Agencywide Documents and Access Management System (ADAMS) Accession No. ML18172A068), as supplemented by letter dated October 16, 2018 (ADAMS Accession No. ML18290A461), FirstEnergy Nuclear Operating Company (FENOC, the licensee) submitted five alternative requests for the fourth 10-year inservice testing (IST) program interval at Perry Nuclear Power Plant, Unit No. 1 (PNPP). The licensee requested alternatives to certain IST requirements of the American Society of Mechanical Engineers (ASME) Code for Operation and Maintenance of Nuclear Power Plants (OM Code). The fourth 10-year IST interval at PNPP will begin on May 18, 2019, and ends on May 17, 2029. The U.S. Nuclear Regulatory Commission (NRC or Commission) staff's evaluation of the alternative requests is contained herein.

2.0 REGULATORY EVALUATION

Paragraph (f)(4) of Title 10 of the *Code of Federal Regulations* (10 CFR), "Inservice Testing Requirements," requires, in part, that pumps and valves that are within the scope of the ASME OM Code must meet the IST requirements (except design and access provisions) set forth in the ASME OM Code and addenda that become effective subsequent to editions and addenda specified in paragraphs (f)(2) and (3) and that are incorporated by reference in paragraph (a)(1)(iv) of 10 CFR 50.55a.

Paragraph (z) of 10 CFR 50.55a states that alternatives to the requirements of paragraphs (b) through (h) of 10 CFR 50.55a or portions thereof may be used when authorized by the Director, Office of Nuclear Reactor Regulation, or Director, Office of New Reactors, as appropriate. A proposed alternative must be submitted and authorized prior to implementation. The applicant or licensee must demonstrate that: (1) *Acceptable level of quality and safety.* The proposed alternative would provide an acceptable level of quality and safety; or (2) *Hardship without a compensating increase in quality and safety.* Compliance with the specified requirements of this section would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety.

Based on the above, and subject to the following technical evaluation, the NRC staff finds that regulatory authority exists for the licensee to request and the Commission to authorize the proposed alternatives.

3.0 TECHNICAL EVALUATION

3.1 Licensee's Alternative Request PR-1

3.1.1 ASME Code Affected Components

The request applies to the following pumps:

Pump ID	Pump Description	Code Class	Pump Group
1E12-C003	Residual Heat Removal (RHR) Waterleg Pump	2	A
1E21-C002	Low Pressure Core Spray (LPCS) Waterleg Pump	2	A
1E22-C003	High Pressure Core Spray (HPCS) Waterleg Pump	2	A
1E51-C003	Reactor Core Isolation Cooling (RCIC) Waterleg Pump	2	A

3.1.2 Applicable Code Edition

ASME OM Code 2012 Edition

3.1.3 Applicable Code Requirements

ISTB-3300, "Reference Values," states, in part, that:

> Reference values shall be obtained as follows: ...(e)(2) Reference values shall be established at the comprehensive pump test flow rate for the Group A and Group B tests, if practicable. If not practicable, the reference point flow rate shall be established at the highest practical flow rate.

ISTB-3400, "Frequency of Inservice Tests," states, "An inservice test shall be run on each pump as specified in Table ISTB-3400-1."

Table ISTB-3400-1, "Inservice Test Frequency," specifies that a Group A pump test shall be performed on a quarterly frequency.

ISTB-5121, "Group A Test Procedure," and subparagraphs (b), (c), and (d) state, in part, that:

> Group A tests shall be conducted with the pump operating as close as practical to a specified reference point and within the variances from the reference point as described in this paragraph. The test parameters shown in Table ISTB-3000-1 shall be determined and recorded as required by this paragraph. The test shall be conducted as follows:
>
> (b) The resistance of the system shall be varied until the flow rate is as close as practical to the reference point with the variance not to exceed +2% or -1% of the reference point. The differential pressure shall then be determined and compared to its reference value. Alternatively, the flow rate shall be varied until the differential pressure

is as close as practical to the reference point with the variance not to exceed +1% or -2% of the reference point and the flow rate determined and compared with the reference flow rate.

(c) Where it is not practical to vary system resistance, flow rate and pressure shall be determined and compared to their respective reference values.

(d) Vibration (displacement or velocity) shall be determined and compared with the reference value. Vibration measurements shall be broad band (unfiltered). If velocity measurements are used, they shall be peak. If displacement amplitudes are used, they shall be peak-to-peak.

3.1.4 Reason for Request

The licensee stated:

The waterleg pumps are designed to remain in service during operation at power to ensure the emergency standby systems are maintained pressurized to reduce the likelihood of water hammer. The waterleg pumps run continuously, with flow established through a recirculation line, in order to provide enough head to keep the applicable system's discharge piping full to the highest elevation. During comprehensive pump testing, the waterleg pump normal discharge path must be redirected through drain lines to provide enough flow to establish the applicable flow values. This requires taking the system out of service and racking out safety-related pump breakers for the RHR, LPCS, and HPCS systems or isolating the RCIC system pump to prevent potential system damage due to water hammer or cavitation upon receipt of an auto actuation signal.

Quarterly full flow testing of the listed safety-related waterleg pumps would result in the inoperability of its associated emergency core cooling system (ECCS) without a compensating increase in the level of quality or safety.

3.1.5 Proposed Alternative and Basis for Use

The licensee stated:

The waterleg pumps shall be monitored at their normal operational flowrate on a quarterly basis by observing pump discharge pressure and bearing vibration. These parameters will be evaluated to adequately assess the pump's performance. The pumps will be full flow tested each refueling outage in conjunction with the comprehensive pump test performed in accordance with the requirements specified in ISTB-5123, Comprehensive Test Procedure.

The ECCS is equipped with sensors that continuously monitor pump discharge pressure and provide an alarm in the main control room when the low pressure setpoint is reached. This will provide indication of a low pressure condition that could be indicative of a waterleg pump malfunction and allow operators to respond accordingly. In addition, each of these waterleg pump's supported system pump discharge header is verified to be filled with water in accordance

with Technical Specifications [TSs] Surveillance Requirement (SR) 3.5.1.1, SR 3.5.2.3 and SR 3.5.3.1, which also demonstrates proper waterleg pump performance. The proposed alternative is consistent with the guidance provided in NUREG-1482, "Guidelines for Inservice Testing at Nuclear Power Plants," Revision 2, Section 5.11, Waterleg Pumps.

In conclusion, using the provisions as delineated in this proposed request provides a reasonable alternative to the Code requirements specified in ISTB-3400, ISTB-3300(e)(2), ISTB-5121, ISTB-5121(b) and ISTB-5121(c) for the waterleg pumps. This is based on the determination that the proposed alternative for monitoring the pumps will continue to provide reasonable assurance of the operational readiness of the waterleg pumps and, thereby, provides an acceptable level of quality and safety pursuant to 10 CFR 50.55a(z)(1).

3.1.6 Duration of Proposed Alternative

The licensee requested to use the proposed alternative during the entire fourth 10-year IST interval, which begins on May 18, 2019, and ends on May 17, 2029.

3.1.7 NRC Staff Evaluation

The 2012 Edition of the ASME OM Code, paragraph ISTB-3400, requires inservice tests to be run on each pump according to Table ISTB-3400-1, which specifies that Group A pump tests will be performed quarterly. Paragraph ISTB-3300 requires that for Group A and Group B tests reference values are established at the comprehensive pump test flow rate if practical, otherwise the reference point flow rate is the highest practical flow rate. Paragraph ISTB-5121 requires Group A testing as close as practical to the reference point within the variances specified in the subparagraphs.

The RHR, LPCS, HPCS, and RCIC waterleg pumps are continuously operating pumps. Their safety function is to keep their respective discharge header piping in a filled condition to prevent water hammer upon the start of a main pump. The actual output and hydraulic performance of the waterleg pumps are not critical to the safety function, as long as the pumps are capable of maintaining the discharge header piping full of water.

In lieu of an ASME OM Code-required quarterly Group A test and flow measurement, the licensee proposed to monitor the pump discharge pressures and bearing vibrations on a quarterly basis. In addition to this, there is an annunciator that alarms in the control room to alert reactor operators of a low pressure condition indicative of a waterleg pump malfunction or any other condition that allows pressure to degrade (e.g., excessive leakage beyond waterleg pump make-up capabilities). The low pressure alarm will provide an early detection of a low header pressure. The licensee stated that operators will take appropriate actions following receipt of a low pressure alarm. Additional information submitted in a letter dated May 28, 2009 (ADAMS Accession No. ML091560034), for the same request for the third (current) IST interval indicates that operator actions include alarm validation, verifying whether the waterleg pumps are running, and initiating a system fill and vent, as necessary. Also, PNPP TS SRs 3.5.1.1, 3.5.2.4, and 3.5.3.1 require periodic verification that the respective RHR/LPCS/HPCS/RCIC headers are filled with water from the pump discharge valve to the injection valve.

The continuous monitoring of discharge pressure in the control room and periodic verification that the headers are filled with water will provide reasonable assurance that the waterleg pumps are operable, or that the system leakage has not exceeded the capacity of the waterleg pumps. In addition, the quarterly vibration measurement of the pump bearings meets the requirements of subparagraph (d) of ISTB-5121 and will provide the required test results reflecting the mechanical condition of the pumps. Therefore, the NRC staff finds that the proposed alternative provides reasonable assurance of the operational readiness of the waterleg pumps identified in the request and provides an acceptable level of quality and safety.

3.2 Licensee's Alternative Request PR-2

3.2.1 ASME Code Affected Components

The request applies to the following pumps:

Table 1

Pump ID	Pump Description	Code Class	Pump Group
1E51-C001	Reactor Core Isolation Cooling Pump	2	B
P47-C001A & B	Control Complex Chilled Water Pumps	3	A
1R45-C001A, B, & C	Fuel Oil Transfer #1 Pumps	3	B
1R45-C002A, B, & C	Fuel Oil Transfer #2 Pumps	3	B

3.2.2 Applicable Code Edition

ASME OM Code 2012 Edition

3.2.3 Applicable Code Requirements

ISTA-3130, "Application of Code Cases," (b), states, "Code Cases shall be applicable to the edition and addenda specified in the test plan."

ISTB-3000, "General Testing Requirements," states, in part, "The parameters to be measured during preservice and inservice testing are specified in Table ISTB-3000-1."

Table ISTB-3000-1, "Inservice Test Parameters," identifies the various parameters (pressure, differential pressure, flow rate, and vibration) measured during preservice, Group A, Group B, comprehensive, and pump periodic verification tests.

ISTB-3300, "Reference Values," (e)(2), states, "Reference values shall be established at the comprehensive pump test flow rate for the Group A and Group B tests, if practicable. If not practicable, the reference point flow rate shall be established at the highest practical flow rate."

ISTB-3400, "Frequency of Inservice Tests," states, "An inservice test shall be run on each pump as specified in Table ISTB-3400-1."

Table ISTB-3400-1, "Inservice Test Frequency," requires a Group A and Group B test to be performed quarterly and a comprehensive test to be performed biennially.

Table ISTB-3510-1, "Required Instrument Accuracy," provides the required accuracy percent (%) for Group A, Group B, comprehensive and preservice tests for the various parameters (pressure, flow rate, and vibration).

Table ISTB-5121-1, "Centrifugal Pump Test Acceptance Criteria," provides the required acceptable, alert, and required action ranges for Group A, Group B, and comprehensive pump tests.

3.2.4 Reason for Request

The licensee stated:

> ASME Code Case OMN-18, "Alternative Testing Requirements for Pumps Tested Quarterly within ± 20% of Design Flow," is approved for use in Regulatory Guide (RG) 1.192, "Operation and Maintenance Code Case Acceptability," Revision 2. Table 2 of the RG identifies the approved Code Case, with conditions. However, Code Case OMN-18 is only applicable through the 2006 Addenda of the OM Code and ISTA-3130(b) requires applicability to the Code edition cited in the test plan, which would be the 2012 Edition.
>
> FirstEnergy Nuclear Operating Company (FENOC) is proposing this alternative for the affected Group A pumps (and the Group B pumps that are re-categorized as Group A pumps for testing) listed in [Table 1].
>
> The increased requirements imposed by the proposed alternative on the parameters to be monitored during every quarterly pump test and the more accurate instruments that must consistently be used during quarterly testing of Group A pumps (and the Group B pumps that are re-categorized as Group A pumps for testing), allows better trending of pump performance data due to the more consistent requirements for each of the quarterly tests.
>
> Due to the increased requirements on the parameters imposed by the proposed alternative during quarterly tests, there is no added value in performing the biennial comprehensive test.

3.2.5 Proposed Alternative and Basis for Use

The licensee stated:

> As an alternative to the ASME OM Code requirements [...] for performing a comprehensive pump test, each of the pumps identified in [Table 1] will have a modified Group A test performed each quarter in lieu of the biennial comprehensive pump test. This modified Group A pump testing would verify pump operational readiness on a quarterly frequency, thus, providing an acceptable level of quality and safety.
>
> FENOC is proposing to use the provisions of Code Case OMN-18 and perform a modified quarterly Group A test in lieu of performing a biennial comprehensive test. The modified quarterly tests will utilize a test flow rate within 20% of pump design flow and the pressure instrumentation used during the quarterly tests will

have an accuracy of at least 1/2%. This alternative testing is applicable to those pumps listed in [Table 1].

Specifically,

a. Pumps tested quarterly using this alternative must be tested within +/- 20% of pump design flow, as required by Code Case OMN-18.

b. The proposed alternative requires the accuracy of instruments used during quarterly Group A tests to meet the more accurate pressure and differential pressure requirements listed for the comprehensive test in Table ISTB-3510-1 (an accuracy improvement from +/- 2% to +/-1/2%). Consistent use of more accurate instruments during each quarterly test provides for improved Group A pump performance trend data evaluation.

c. Pumps that would normally be categorized as Group B pumps, but are re-categorized as Group A for testing, will be tested according to the provisions of this alternative. Due to the re-categorization from Group B to Group A, per Table ISTB-3000-1, additional vibration data will be obtained quarterly rather than once every two years for the affected pumps.

d. Use of this alternative provides for consistent acceptance criteria for pump flow and differential pressure tests. FENOC will utilize the Group A test acceptance criteria in Table ISTB-5121-1, except that the upper end values of the Group A acceptable ranges for flow and differential pressure will be 1.06 times the reference flow or 1.06 times the reference differential pressure, respectively. This revised upper end acceptance criteria is consistent with the RG 1.192, Revision 2, Table 2, condition associated with Code Case OMN-18. This modified Group A quarterly testing would be performed rather than the biennial comprehensive test.

e. The proposed testing will fulfill Division 1, Mandatory Appendix V, Pump Periodic Verification Test Program, requirements.

3.2.6 Duration of Proposed Alternative

The licensee requested to use the proposed alternative during the entire fourth 10-year IST interval, which begins on May 18, 2019, and ends on May 17, 2029.

3.2.7 NRC Staff Evaluation

The 2012 Edition of the ASME OM Code, Table ISTB-3000-1, specifies the parameters to be measured during inservice testing: Group B tests require measurement of speed (if variable speed), differential pressure, and flow rate; comprehensive and Group A tests require measurement of speed (if variable speed), differential pressure, flow rate, discharge pressure, and vibration. Table ISTB-3400-1 requires a Group A and Group B test to be performed quarterly and a comprehensive test to be performed biennially. Paragraph ISTB-3300 requires that for Group A and Group B tests reference values are established at the comprehensive pump test flow rate if practical, otherwise the reference point flow rate is the highest practical flow rate. Table ISTB-3510-1 requires that the pressure instrument accuracy is ± 2 percent for

Group A and Group B tests and ± 0.5 percent for comprehensive tests. Table ISTB-5121-1 specifies that the upper limit for the Acceptable Range for flow rate or differential pressure is 110 percent of the reference value for Group A and Group B tests and 106 percent for comprehensive tests.

In lieu of these requirements, the licensee proposed to re-classify the Group B pumps listed in Table 1 above as Group A pumps for testing, and perform IST for these pumps in accordance with a modified Group A test procedure. Specifically, the licensee proposed to use ASME OM Code Case OMN-18, which allows Group A tests to be performed quarterly within ± 20 percent of pump design flow rate with instrument accuracies meeting the requirements of Table ISTB-3510-1 for comprehensive and preservice tests, and no comprehensive test is required. Subparagraph ISTA-3130(b) states that Code Cases shall be applicable to the edition and addenda specified in the test plan. Code Case OMN-18 is applicable to the 1994 Addenda and subsequent Editions and Addenda through the 2006 Addenda of the ASME OM Code. The licensee proposed to apply Code Case OMN-18 to the 2012 Edition of the ASME OM Code as an alternative to the requirements of subparagraph ISTA-3130(b).

Regulatory Guide (RG) 1.192, "Operation and Maintenance Code Case Acceptability, ASME OM Code," Revision 2, Table 2, "Conditionally Acceptable OM Code Cases," lists Code Case OMN-18 (published with the 2012 Edition) as acceptable to the NRC for application in a licensee's IST program with two conditions: (1) the upper end values of the Group A test Acceptable Range must be 1.06 times the reference value for flow and differential pressure (or discharge pressure); and (2) the high values of the Required Action Ranges must be any measurement greater than 1.06 times the reference value for flow and differential pressure (or discharge pressure). The Code Case is approved for use with up to the 2006 Addenda of the OM Code. NRC staff reviewed the 2012 Edition of the ASME OM Code and the 2006 Addenda and confirmed that there are no changes in the applicable ASME OM Code requirements referenced within Code Case OMN-18, therefore there is no technical reason for prohibiting the use of Code Case OMN-18 with the 2012 Edition of the ASME OM Code.

Consistent with the Code Case, the licensee proposed that for Group A pumps (including Group B pumps that are reclassified as Group A for testing), a modified quarterly test be performed every quarter, and the biennial comprehensive test is not required. The modified Group A quarterly test would be performed within ± 20 percent of the pump design flow rate, using the more accurate pressure instrumentation that is required for a comprehensive test (± 0.5 percent versus ± 2 percent). This modified quarterly test would replace the comprehensive test. The licensee stated that the Acceptable Range upper limit for the modified Group A quarterly test will be tightened from 1.10 times reference value to 1.06 times reference value. By letter dated October 16, 2018 (ADAMS Accession No. ML18290A461), the licensee stated that the Required Action Range will remain at >1.06 times reference value to satisfy the condition in RG 1.192, Revision 2. Additionally, vibration data will be obtained quarterly in accordance with the requirements of a Group A test, whereas vibration data would only be obtained biennially during the comprehensive test for Group B pumps. The modified test strategy results in eight identical tests using more accurate instrumentation instead of seven quarterly Group A tests with one comprehensive test that uses the more accurate instrumentation. The eight identical tests will provide better trending to identify pump degradation.

The licensee's proposed implementation of Code Case OMN-18 is consistent with the requirements of the Code Case and is consistent with the NRC staff condition in RG 1.192, Revision 2. Furthermore, there are no relevant changes to ASME OM Code sections

referenced in the Code Case when comparing the 2012 Edition to the 2006 Addenda for which Code Case OMN-18 was originally written. The modified testing for the Group A pumps (including Group B pumps that are reclassified as Group A for testing) will provide for better trending of pump performance. Therefore, the NRC staff finds that the proposed alternative provides reasonable assurance of the operational readiness of the subject pumps and provides an acceptable level of quality and safety.

3.3 Licensee's Alternative Request SR-1

3.3.1 ASME Code Affected Components

The request applies to all snubbers within the scope of the IST program at PNPP.

3.3.2 Applicable Code Edition

ASME OM Code 2012 Edition

3.3.3 Applicable Code Requirements

ISTA-3130, "Application of Code Cases," subparagraph (b) states, "Code Cases shall be applicable to the edition and addenda specified in the test plan."

ISTD-4252, "Subsequent Examination Intervals," subparagraph (c) states, "The duration of examination intervals following the completion of the second refueling outage shall be in accordance with Table ISTD-4252-1."

ASME OM Code Case OMN-13, Revision 2, "Performance-Based Requirements for Extending Snubber Inservice Visual Examination Interval at LWR Power Plants."

3.3.4 Reason for Request

The licensee stated:

> ASME has approved Code Case OMN-13, Revision 2, which provides alternative rules for establishing the intervals for the visual examination of snubbers. This Code Case is unconditionally approved for use in Regulatory Guide (RG) 1.192, Operation and Maintenance Code Case Acceptability, ASME OM Code, Revision 2. However, Code Case OMN-13 is only applicable to the 1995 Edition through 2011 Addenda of the OM Code. During the fourth ten [10]-year IST interval, PNPP will be implementing the ASME OM Code 2012 Edition and proposes to implement Code Case OMN-13, Revision 2, for snubbers.

3.3.5 Proposed Alternative and Basis for Use

The licensee stated:

> An alternative to ISTA-3130(b) is proposed to implement Code Case OMN-13, "Performance-Based Requirements for Extending Snubber Inservice Visual Examination Intervals at LWR [light-water reactor] Power Plants," Revision 2, since the Code Case indicates applicability through the OM-2011 Addenda and adherence to ISTA-3130(b) would require applicability to the OM-2012 Edition. A

review of the ASME OM-2012 Edition and Code Case OMN-13, Revision 2, confirmed that there are no changes in the applicable Code sections referenced within the Code Case when comparing the OM-2011 Addenda to the OM-2012 Edition.

By using Code Case OMN-13, Revision 2, PNPP will be able to alter the visual examination intervals required by paragraph ISTD-4252(c) of the 2012 Edition of the ASME OM Code. ISTD-4252(c) requires each snubber within scope of ISTA-1100 be visually examined in accordance with Table ISTD-4252-1 on a frequency not to exceed 48 months. This Code Case establishes specific requirements that must be met in order to allow extension of the visual examination interval to once every 10 years if the licensee can demonstrate that the requirements of paragraphs 3.1 through 3.6 of Code Case OMN-13 have been met for one interval in addition to service life monitoring requirements of ISTD-6000. In addition, specific requirements of paragraphs 3.7 and 3.8 will be met for the fourth interval.

Specific requirements of Code Case OMN-13 include:

Examination for Indications of Degradation or Severe Operating Environments
Examination Prior to Maintenance or Testing
Examination Corrective Action
Frequency of Examinations
Monitoring of Reservoir Fluid Level
Review of Operational Readiness Test Data
Examination During Disassembly
Transient Dynamic Event Service Life Evaluation

PNPP has met these requirements for the third IST interval to provide equivalent assurance that snubbers remain visually acceptable to perform their safety function.

RG 1.192, "Operation and Maintenance Code Case Acceptability, ASME OM Code," Revision 2, Table 1, Acceptable OM Code Cases, lists Code Case OMN-13, Revision 2 (2012 Edition) as acceptable to the NRC for application in a licensee's IST program without conditions.

Using the provisions of this request as an alternative to the requirements of ISTA-3130(b), will provide adequate detection of observable snubber degradation, and, along with the testing and service life monitoring requirements of Subsection ISTD, will continue to provide reasonable assurance of the operational readiness of the PNPP snubbers. Therefore, the proposed alternative provides an acceptable level of quality and safety pursuant to 10 CFR 50.55a(z)(1).

3.3.6 Duration of Proposed Alternative

The licensee requested to use the proposed alternative during the entire fourth 10-year IST interval, which begins on May 18, 2019, and ends on May 17, 2029.

3.3.7 NRC Staff Evaluation

The 2012 Edition of the ASME OM Code, subparagraph ISTD-4252(c), requires snubber examination intervals following the second refueling outage to be in accordance with intervals specified in Table ISTD-4252-1. The snubber visual examination interval can be extended up to 48 months by meeting the requirements as specified in Table ISTD-4252-1 and its notes. Subparagraph ISTA-3130(b) states that Code Cases shall be applicable to the ASME OM Code edition and addenda specified in the test plan. The licensee has proposed an alternative to the requirements of subparagraphs ISTD-4252(c) and ISTA-3130(b) for all snubbers in the IST program. Specifically, the licensee proposed to use ASME OM Code Case OMN-13, Revision 2, which allows extension of the visual examination interval beyond the interval allowed in Table ISTD-4252-1. Code Case OMN-13, Revision 2, is applicable to the 1995 Edition through the 2011 Addenda of the ASME OM Code. The licensee has proposed to apply Code Case OMN-13, Revision 2, to the 2012 Edition of the ASME OM Code to extend the visual inspection frequency of snubbers within the scope of IST program at PNPP.

Application of ASME OM Code Cases is addressed in 10 CFR 50.55a(b)(6) through reference to RG 1.192, Revision 2, which lists acceptable and conditionally acceptable Code Cases for implementation in the IST program and snubber program. RG 1.192, Revision 2, shows Code Case OMN-13, Revision 2 in Table 1 as acceptable for use without conditions. Code Case OMN-13, Revision 2, was published with the 2012 Edition of the ASME OM Code, and it is applicable to the 1995 Edition through the 2011 Addenda of the ASME OM Code. The NRC staff reviewed the 2012 Edition of the ASME OM Code and Code Case OMN-13, Revision 2, and confirmed that there are no changes in the applicable ASME OM Code sections referenced within Code Case OMN-13, Revision 2. Therefore, there is no technical reason for prohibiting the use of Code Case OMN-13, Revision 2, with the 2012 Edition of the ASME OM Code. The NRC staff finds that the licensee's proposed alternative provides an acceptable level of quality and safety.

3.4 Licensee's Alternative Request VR-1

3.4.1 ASME Code Affected Components

The request applies to the following valves:

Valve	Description	Class
	Category B Valves (Typical of 177)	
1C11-126	Scram Inlet Valve	2
1C11-127	Scram Exhaust Valve	2
	Category C Valves (Typical of 177)	
1C11-114	Scram Discharge Header Check Valve (Open direction only)	2
1C11-115	Charging Water Header Check Valve (Open direction only)	2

3.4.2 Applicable Code Edition

ASME OM Code 2012 Edition

3.4.3 Applicable Code Requirements

ISTC-3510, "Exercising Test Frequency," states, in part, that "Active ... Category B, and Category C check valves shall be exercised nominally every 3 months, except as provided by paras. ISTC-3520..."

ISTC-3520, "Exercising Requirements," paragraph ISTC-3521, "Category A and Category B Valves," states, "Category A and Category B valves shall be tested as follows: (a) full-stroke exercising of Category A and Category B valves during operation at power to the position(s) required to fulfill its function(s)..."

ISTC-3520, "Exercising Requirements," paragraph ISTC-3522, "Category C Check Valves," states, "Category C check valves shall be exercised as follows: (a) During operation at power, each check valve shall be exercised or examined in a manner that verifies obturator travel by using the methods in para. ISTC-5221..."

ISTC-5130, "Pneumatically Operated Valves," paragraph ISTC-5131, "Valve Stroke Testing," (a), states, "Active valves shall have their stroke times measured when exercised in accordance with para. ISTC-3500."

ISTC-5220, "Check Valves," paragraph ISTC-5221, "Valve Obturator Movement," (a), states, "The necessary valve obturator movement during exercise testing shall be demonstrated by performing both an open and a close test."

3.4.4 Reason for Request

The licensee stated:

> The affected subject valves have a safety function of ensuring rod insertion during a reactor scram. For example, scram inlet valve 1C11-126 opens to supply pressurized water to the bottom of the control rod drive (CRD) piston to rapidly insert the control rod into the core. Scram exhaust valve 1C11-127 opens to vent water from above the CRD piston to the scram discharge header allowing the control rod movement during the scram.
>
> Scram discharge header check valve 1C11-114 has a safety function to close and prevent reverse flow from the scram discharge header back to the top of the control rod drive piston. During the scram, this check valve has a safety function to open and allow water from above the control rod drive piston to flow into the scram discharge header (with 1C11-127 open) allowing control rod movement.
>
> Charging water header check valve 1C11-115 has a safety function to close and prevent loss of water pressure in the event supply pressure to the scram accumulator is lost. During the scram, this check valve opens to allow flow to the bottom of the control rod drive piston (with 1C11-126 open). Check valve 1C11-115 can only be verified closed by securing the CRD pumps and monitoring depressurization of the charging water header. Securing the CRD pumps would result in a loss of cooling water to the reactor recirculation pumps and all the CRD mechanisms, which would be burdensome due to the potential for equipment damage or reactor scram.

The valves listed in Part 1 of this request do not have direct position indication; therefore, to measure stroke times and proper position as required by the Code, special test methods or test equipment would be required. Additionally, exercising these valves more frequently than required by Technical Specifications (TS) could result in a plant trip, which is burdensome without a compensating increase in the level of quality and safety.

3.4.5 Proposed Alternative and Basis for Use

The licensee stated:

As discussed in NUREG-1482, "Guidelines for Inservice Testing at Nuclear Power Plants," Revision 2, Section 4.4.6, the rod scram test frequency identified in the plant TS may be used as the valve testing frequency to minimize rapid reactivity transients and unnecessary wear of the CRD mechanisms. Furthermore, verifying that the associated control rod meets the scram insertion time limits defined in the TS can be an acceptable alternative method of detecting degradation of these valves in lieu of valve stroke measurement.

The TS 3.1.4 surveillances place conservative limits on the control rod insertion times, ensuring the necessary quality of the control rod drive system and its components are maintained. Therefore, FirstEnergy Nuclear Operating Company requests scram insertion timing per the requirements of Surveillance Requirement (SR) 3.1.4.1, SR 3.1.4.2, SR 3.1.4.3 and SR 3.1.4.4, including their test frequencies, be substituted for individual valve testing. For the check valves listed in Part 1 of this request, this includes only open direction testing.

Using the provisions of this proposed request provides a reasonable alternative to the Code requirements delineated in ISTC-3510, ISTC-3521, ISTC-3522, ISTC-5131 and ISTC-5221. This proposed alternative method of detecting valve degradation provides reasonable assurance of the valves' operational readiness. Therefore, the proposed alternative provides an acceptable level of quality and safety.

3.4.6 Duration of Proposed Alternative

The licensee requested to use the proposed alternative during the entire fourth 10-year IST interval, which begins on May 18, 2019, and ends on May 17, 2029.

3.4.7 NRC Staff Evaluation

The 2012 Edition of the ASME OM Code, paragraph ISTC-3510, requires that Category A, B, and C valves be exercised nominally every 3 months except as provided by paragraphs ISTC-3520, ISTC-3540, ISTC-3550, ISTC-3570, ISTC-5221, and ISTC-5222. For Category A and B valves (including the subject pneumatically-operated valves), subparagraph ISTC-3521(a) requires full-stroke exercising of Category B valves during operation at power to the position required to fulfill its function. It also states that if exercising is not practicable during operation at power or cold shutdowns, it may be limited to full-stroke testing during refueling outages. Subparagraph ISTC-5131(a) requires that active pneumatically-operated valves shall have their stroke times measured when exercised in accordance with paragraph ISTC-3500.

Similarly for check valves, subparagraph ISTC-3522(a), requires that Category C check valves be exercised during operation at power in a manner that verifies obturator travel by using the methods in paragraph ISTC-5221. It also states that if exercising is not practicable during operation at power or cold shutdowns, it shall be performed during refueling outages. Subparagraph ISTC-5221(a) states the necessary valve obturator movement during exercise testing shall be demonstrated by performing both an open and a close test.

The licensee proposed an alternative in lieu of these requirements for pneumatically-operated valves 1C11-126 and 1C11-127 as well as for check valves 1C11-114 and 1C11-115. Specifically, the licensee proposed (1) to test the valves at the rod scram test frequency identified in the plant TSs, and (2) to identify valve degradation by verifying that control rods meet the scram insertion time limits defined in the plant TS in lieu of conducting valve stroke time tests.

The subject pneumatically operated valves have a safety function in ensuring control rod insertion during a reactor scram. Valve 1C11-126, scram exhaust valve, opens to vent the control rod drive piston to the scram discharge volume allowing control rod movement. Valve 1C11-127, scram inlet valve, opens to supply pressurized water to the bottom of the control rod drive piston which rapidly inserts the control rod into the reactor core. These valves are classified as Category B valves in accordance with the ASME OM Code. The subject check valves also have a safety function in ensuring control rod insertion during a reactor scram. Valve 1C11-114, scram discharge header check valve, opens to allow water to pass from the control rod drive pistons to the scram discharge header. Valve 1C11-115, charging water header check valve, closes to prevent loss of water pressure in the event supply pressure to the scram accumulator is lost. These valves are classified as Category C valves in accordance with the ASME OM Code.

NUREG-1482, Revision 2 (ADAMS Accession No. ML13295A020), Section 4.4.6, states that for CRD system valves (which includes the four subject valves) for which testing could result in rapid insertion of one or more control rods, the rod scram test frequency identified in the facility's TS may be used as the valve testing frequency to minimize rapid reactivity transients and wear of the CRD mechanisms. It also states that the scram inlet and outlet valves are power-operated valves that full-stroke in milliseconds and are not equipped with indication for both positions and therefore, it may be impractical to measure their full-stroke time as required by the Code. Furthermore, it states that verifying that the associated control rod meets the scram insertion time limits defined in the plant's TSs can be an acceptable alternative method of detecting degradation of these valves. The NRC staff finds that the proposed alternative is consistent with the staff position in NUREG-1482, Revision 2; therefore, the alternative provides reasonable assurance of the operational readiness of the CRD valves and provides an acceptable level of quality and safety.

3.5 Licensee's Alternative Request VR-2

3.5.1 ASME Code Affected Components

The request applies to the following valves:

Valve	Description	Class
1B21-F041A	Dikkers Valve – Automatic Depressurization System (ADS)	1
1B21-F041B	Dikkers Valve – ADS	1
1B21-F041C	Dikkers Valve	1
1B21-F041D	Dikkers Valve	1
1B21-F041E	Dikkers Valve – ADS	1
1B21-F041F	Dikkers Valve – ADS	1
1B21-F041G	Dikkers Valve	1
1B21-F041K	Dikkers Valve	1
1B21-F047B	Dikkers Valve	1
1B21-F047C	Dikkers Valve	1
1B21-F047D	Dikkers Valve – ADS	1
1B21-F047F	Dikkers Valve – Low Level Setpoint (LLS)	1
1B21-F047G	Dikkers Valve	1
1B21-F047H	Dikkers Valve – ADS	1
1B21-F051A	Dikkers Valve – LLS	1
1B21-F051B	Dikkers Valve – LLS	1
1B21-F051C	Dikkers Valve – ADS/LLS	1
1B21-F051D	Dikkers Valve – LLS	1
1B21-F051G	Dikkers Valve – ADS/LLS	1

3.5.2 Applicable Code Edition

ASME OM Code 2012 Edition

3.5.3 Applicable Code Requirements

ISTA-3130, "Application of Code Cases," subparagraph (b), states, "Code Cases shall be applicable to the edition and addenda specified in the test plan."

Mandatory Appendix I, "Inservice Testing of Pressure Relief Devices in Light-Water Reactor Nuclear Power Plants," Section I-1320, "Test Frequencies, Class 1 Pressure Relief Valves," paragraph (a), "5-Year Test Interval," states, in part, that:

> Class 1 pressure relief valves shall be tested at least once every 5 yr [years], starting with initial electric power generation. No maximum limit is specified for the number of valves to be tested within each interval; however, a minimum of 20 [percent] of the valves from each valve group shall be tested within any 24-[month] interval. This 20 [percent] shall consist of valves that have not been tested during the current 5-yr interval, if they exist. The test interval for any installed valve shall not exceed 5 yr. The 5-yr test interval shall begin from the date of the as-left set pressure test for each valve.

3.5.4 Reason for Request

The licensee stated:

> The nuclear boiler system provides reactor pressure vessel (RPV) overpressurization protection by opening the safety/relief valves (SRVs). The SRVs open at their reactor pressure setpoint. Pressure in the vessel is thereby maintained below the American Society of Mechanical Engineers (ASME) Code required limit.
>
> In addition to the above, the ADS and the individual SRVs are capable of being manually operated from the main control room. This provides the capability to manually depressurize the RPV in the event the main condenser is not available as a heat sink.
>
> The nuclear boiler system ADS provides automatic depressurization of the RPV under certain small break loss of coolant accident (LOCA) conditions so that the low pressure emergency core cooling systems (ECCS) can adequately cool the core. The SRVs, those used for ADS as well as those assigned purely for pressure relief, are used for overpressure protection and work together to ensure that the ASME Code limit is not exceeded.
>
> Perry Nuclear Power Plant (PNPP) license amendment number 115 approved a transition from an 18-month fuel cycle to a 24-month fuel cycle. Prior to transitioning to the 24-month fuel cycle, ASME Code requirements could be satisfied by removing and testing approximately one-third of the 19 SRVs each refueling outage in order to comply with the 5-year test interval requirements for Class 1 pressure relief valves imposed by the Code of Record during that time. Since transitioning to the 24-month fuel cycle, FirstEnergy Nuclear Operating Company (FENOC) would have to remove at least one-half of the subject relief valves each refueling outage for testing in order to satisfy the requirements of Appendix I.
>
> The removal of half of the 19 valves versus a third of the valves each outage requires the removal of additional insulation, instrumentation, and other interferences. This additional work results in an undesirable increase in radiation exposure to maintenance personnel.
>
> To provide a technical basis for the proposed alternative, FENOC reviewed the setpoint testing results for the time period from initial operation to the present time (approximately 30 years). There have been five as-found testing failures. Three of those failures involved exceeding the setpoint criteria. Two of the five failures had no as-found setpoint data obtained, due to severe seat leakage. With approximately 186 data points included in this review, the failure rate of the SRVs, at less than three percent, is considered minimal.
>
> FENOC maintains and rotates two individual complete valve assemblies for each SRV application. Historical test results show that the current maintenance and rotation strategy is effective at preventing any age-related failure mechanism.

The ASME OM Committee developed Code Case OMN-17, "Alternative Rules for Testing ASME Class 1 Pressure Relief/Safety Valves," which is published in the 2012 Edition of the OM Code. Regulatory Guide (RG) 1.192, "Operation and Maintenance Code Case Acceptability, ASME OM Code," Revision 2, Table 1 identifies Code Case OMN-17 as an acceptable Code Case. However, the inquiry and reply within Code Case OMN-17 indicates that its applicability to the OM Code is to the 2001 Edition through the 2006 Addenda of Appendix I, Section I-1320. ISTA-3130(b) requires Code Cases to be applicable to the Edition and addenda specified in the test plan, which would be the 2012 Edition. Therefore, prior NRC approval is needed to use Code Case OMN-17 for testing of the subject relief valves.

3.5.5 Proposed Alternative and Basis for Use

The licensee stated:

As an alternative to the Code required five-year test interval per Appendix I, paragraph I-1320(a), FENOC proposes that the subject Class 1 pressure relief valves be tested at least once every three refueling cycles (approximately 72 months) with a minimum of 20% of the valves tested within any 24-month interval. This 20% would consist of valves that have not been tested during the current three-cycle interval, if they exist. The test interval for any individual valve would not exceed 72 months, except that a 6-month grace period is allowed to coincide with refueling outages to accommodate extended shutdown periods. Prior to placing these valves in service, the valves shall be disassembled and inspected after as-found set-pressure testing to verify that parts are free of defects resulting from time-related degradation or service-induced wear. As-left set-pressure testing shall be performed following maintenance and prior to returning the valve to service. Each valve shall have been disassembled and inspected at least once during the 72-month test interval. Disassembly and inspections performed prior to the implementation of this alternative may be used.

Relief from ISTA-3130(b) is requested to implement Code Case OMN-17, since inquiry and reply within the Code Case indicates that its applicability is to the 2001 Edition through the 2006 Addenda of Appendix I. ISTA-3130(b) requires Code Cases to be applicable to the Edition and addenda specified in the test plan. The ASME OM Code that will apply to the test plan is the 2012 Edition with no Addenda. A review of the 2012 Edition of the OM Code and Code Case OMN-17 confirmed that there are no changes that would affect use of this Code Case relative to the applicable Code section referenced within the Code Case when comparing Appendix I of the 2001 Edition through the 2006 Addenda to Appendix I of the 2012 Edition.

The proposed alternative of increasing the test interval for the subject Class 1 pressure relief valves from five [5] years to three fuel cycles (approximately 72 months) would continue to provide an acceptable level of quality and safety. This proposed alternative meets the requirements stated in Code Case OMN-17, which is approved for use in RG 1.192, Revision 2. The proposed alternative will continue to provide assurance of the valves' operational readiness and provides an acceptable level of quality and safety pursuant to 10 CFR 50.55a(z)(1).

3.5.6 Duration of Proposed Alternative

The licensee requested to use the proposed alternative during the entire fourth 10-year IST interval, which begins on May 18, 2019, and ends on May 17, 2029.

3.5.7 NRC Staff Evaluation

The 2012 Edition of the ASME OM Code, Mandatory Appendix I, Section I-1320, requires that Class 1 pressure relief devices are tested at least once every 60 months with at least 20 percent of the valves being tested every 24 months. The 20 percent shall consist of valves that have not yet been tested within the current 60-month interval. Subparagraph ISTA-3130(b) states that Code Cases shall be applicable to the ASME OM Code edition and addenda specified in the test plan. The licensee has proposed an alternative to the requirements of Section I-1320 and subparagraph ISTA-3130(b) for the SRVs listed in the table above. Specifically, the licensee proposed to use ASME OM Code Case OMN-17, "Alternative Rules for Testing ASME Class 1 Pressure Relief/Safety Valves," which allows an increase in relief valve testing frequency from 60 months to 72 months (plus a 6-month grace period) if additional maintenance, disassembly, and inspection requirements are implemented. Code Case OMN-17 is applicable to the 2001 Edition through the 2006 Addenda of Appendix I, Section I-1320, of the ASME OM Code; therefore, the licensee also proposed to apply Code Case OMN-17 to the 2012 Edition of the ASME OM Code as an alternative to the requirements of subparagraph ISTA-3130(b).

The PNPP has implemented a 24-month fuel cycle. When the fuel cycle was 18 months, it was possible to test/replace approximately one-third of the relief valves each refueling outage and meet the 5-year period requirement and the 20 percent in 24 months requirement. With the 24-month fuel cycle, one-half of the relief valves must be replaced each refueling outage to meet the 5-year period requirement. The removal of half of the 19 valves versus a third of the valves each outage requires the removal of additional insulation, instrumentation, and other interferences. The additional work also results in increased radiation exposure to maintenance personnel. Therefore, the licensee requested implementation of the 72-month schedule.

Code Case OMN-17 allows licensees to extend the test frequency for safety valves from 60 months to 72 months plus a 6-month grace period. Subparagraph (d) of the Code Case imposes a special maintenance requirement to disassemble and inspect each safety and relief valve to verify that parts are free from defects resulting from time-related degradation or maintenance-induced wear prior to the start of the extended test frequency. The purpose of this maintenance requirement is to reduce the potential for set pressure drift. Additionally, subparagraph (e) of the Code Case requires that each valve must be disassembled and inspected prior to implementation of the 72-month interval. Consistent with the Code Case, the licensee stated that valves will be disassembled and inspected after as-found set-pressure testing to verify that parts are free of defects resulting from time-related degradation or service-induced wear. The licensee also stated that as-left set-pressure testing will be performed following maintenance and prior to returning the valve to service. The NRC staff determines that these actions provide reasonable assurance that set pressure drift will be minimized.

The licensee has been implementing Code Case OMN-17 for the current IST interval which began on May 18, 2009. The licensee stated that it reviewed the setpoint testing results for the past 30 years (since initial operation) and determined that the rate of failure is less than

3 percent (five as-found testing failures in 186 reviewed data points). The safety evaluation for the same alternative approved for the third (current) 10-year IST interval indicates that there had been four as-found testing failures in the 20 years of performance history at the time. Therefore, there has been just one more failure in the current 10-year IST interval while this same alternative has been used. Furthermore, the licensee's TS 3.4.4 requires 13 SRVs to be operable; therefore, six of the 19 SRVs are allowed to be inoperable (fail the surveillance test) and the minimum requirement is still met. Considering that just five failures have been found in 30 years, the failure rate is low and is bounded by the requirements of the TS.

The ASME OM Code 5-year test frequency requires that a minimum of 9 of the 19 SRVs be tested during one refueling outage (24-month cycle) and 10 of the SRVs be tested the following refueling outage. Extending the test frequency to three refueling cycles (approximately 6 years) would reduce the number of SRVs that are required to be tested over a period of three refueling outages from a minimum of 28 valves to 19 valves. Therefore, extending the test frequency would result in a significant reduction in the expected cumulative radiation exposure to the maintenance personnel performing these tasks. The NRC staff finds that the extension of the ASME Code 5-year test frequency to three refueling outages (approximately 6 years) is acceptable. Refurbishment prior to the start of each test interval provides reasonable assurance that set pressure drift will be minimized. Historical test results demonstrate good performance because the SRV as-found set pressure test results passed the current ASME Code and TS acceptance criterion of plus or minus 3 percent of set pressure with few failures, so the additional time beyond that required by the ASME OM Code should not impair operational readiness. Therefore, the NRC staff finds that the proposed alternative provides an acceptable level of quality and safety.

4.0 CONCLUSION

As set forth above, the NRC staff determined that for PNPP alternative requests PR-1, PR-2, SR-1, VR-1, and VR-2, the proposed alternatives provide an acceptable level of quality and safety. Accordingly, the NRC staff concludes that the licensee has adequately addressed all of the regulatory requirements set forth in 10 CFR 50.55a(z)(1), for these requests. Therefore, the NRC staff authorizes the use of these alternative requests for PNPP for the fourth 10-year IST program interval, which begins on May 18, 2019, and is scheduled to end on May 17, 2029.

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

Principal Contributor: Aaron Mink, NRR

Date: February 25, 2019

SUBJECT: PERRY NUCLEAR POWER PLANT, UNIT NO. 1 - REQUEST FOR ALTERNATIVES RELATED TO INSERVICE TESTING PROGRAM FOR THE FOURTH 10-YEAR INSERVICE TESTING INTERVAL (EPID L-2018-LLR-0092, L-2018-LLR-0093, L-2018-LLR-0094, L-2018-LLR-0095, AND L-2018-LLR-0096) DATED FEBRUARY 25, 2019

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