SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

ALTERNATIVE REQUEST NO. VRR3 RELATED TO THE INSERVICE TESTING PROGRAM,

BEAVER VALLEY POWER STATION UNIT 1, FOURTH 10-YEAR INTERVAL

BEAVER VALLEY POWER STATION UNIT 2, THIRD 10-YEAR INTERVAL

FIRSTENERGY NUCLEAR OPERATING COMPANY

DOCKET NOS. 50-334 AND 50-412

1.0 INTRODUCTION

By letter dated February 21, 2011 (Accession No. ML110550162), FirstEnergy Nuclear Operating Company (FENOC), the licensee submitted request VRR3 to the Nuclear Regulatory Commission (NRC). The licensee requested authorization to perform position verification testing of several solenoid-operated valves (SOVs), at the Beaver Valley Power Station (BVPS) Units 1 and 2, on a different test frequency than the two year interval, as required by the American Society of Mechanical Engineers (ASME) Code for Operation and Maintenance of Nuclear Power Plants (OM Code). By letter dated August 22, 2011 (Accession No. ML1123107376), the NRC requested additional information for request VRR3. The licensee provided the additional information in a letter dated September 14, 2011 (Accession No. ML11262A0450). VRR3 is applicable to the fourth ten-year inservice testing (IST) program interval for BVPS Unit 1 and the third ten-year IST program interval for BVPS Unit 2.

Specifically, pursuant to Title 10 of the *Code of Federal Regulations* (10 CFR) Part 50, Section 50.55a(a)(3)(i), the licensee requested to use the proposed alternative in VRR3, on the basis that the alternative provides an acceptable level of quality and safety.

2.0 REGULATORY EVALUATION

10 CFR 50.55a(f), "Inservice Testing Requirements," requires, in part, that IST of certain ASME Class 1, 2, and 3 components must meet the requirements of the ASME OM Code and applicable addenda, except where alternatives have been authorized pursuant to paragraphs (a)(3)(i) or (a)(3)(ii).

In proposing alternatives, a licensee must demonstrate that the proposed alternatives provide an acceptable level of quality and safety (10 CFR 50.55a(a)(3)(i)), or compliance would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety (10 CFR 50.55a(a)(3)(ii)). Section 50.55a allows the NRC to authorize alternatives to ASME OM Code requirements upon making the necessary findings.

The 2001 Edition of the ASME OM Code with Addenda through OMb-2003 is the code of record for both the BVPS Unit 1 fourth ten-year IST program interval and the Unit 2 third ten-year IST program interval.

ENCLOSURE

The NRC's findings with respect to authorization of the requested alternative, VRR3, are given below:

3.0 TECHNICAL EVALUATION

3.1 Licensee's Alternative Request VRR3

ISTC-3700, *Position Verification Testing*, states, in part, that, "Valves with remote position indicators shall be observed locally at least once every 2 years to verify that valve operation is accurately indicated." ISTC-3700 also states that, "Where local observation is not possible, other indications shall be used for verification of valve operation."

ISTC-5152(b), *Stroke Test Acceptance Criteria*, states that, "Valves with reference stroke times of less than or equal to 10 sec shall exhibit no more than ±50% change in stroke time when compared to the reference value."

ISTC-5152(c) states that, "Valves that stroke in less than 2 sec may be exempted from ISTC-5152(b). In such cases the maximum limiting stroke time shall be 2 sec."

Alternative testing is requested for the following Class 2, Category A valves:

SOV-1 HY-102A1	A Hydrogen Analyzer Containment Dome Inlet Flow Sample
SOV-1 HY-1 02A2	A Hydrogen Analyzer Containment Dome Inlet Flow Sample
SOV-1HY-102B1	B Hydrogen Analyzer Containment Dome Inlet Flow Sample
SOV-1HY-102B2	B Hydrogen Analyzer Containment Dome Inlet Flow Sample
SOV-1 HY-1 03A1	A Hydrogen Analyzer Pressurizer Cubicle Inlet Flow Sample
SOV-1 HY-1 03A2	A Hydrogen Analyzer Pressurizer Cubicle Inlet Flow Sample
SOV-1HY-103B1	B Hydrogen Analyzer Pressurizer Cubicle Inlet Flow Sample
SOV-1HY-103B2	B Hydrogen Analyzer Pressurizer Cubicle Inlet Flow Sample
SOV-1HY-104A1	A Hydrogen Analyzer Flow Sample Discharge
SOV-1 HY-104A2	A Hydrogen Analyzer Flow Sample Discharge
SOV-1HY-104B1	B Hydrogen Analyzer Flow Sample Discharge
SOV-1 HY-1 04B2	B Hydrogen Analyzer Flow Sample Discharge
2HCS*SOV133A	Hydrogen Analyzer A Outlet Inside Containment Isolation
2HCS*SOV133B	Hydrogen Analyzer B Outlet Inside Containment Isolation
2HCS*SOV134A	Hydrogen Analyzer A Outlet Outside Containment Isolation
2HCS*SOV1 34B	Hydrogen Analyzer B Outlet Outside Containment Isolation
2HCS*SOV135A	Hydrogen Analyzer B Inlet Inside Containment Isolation
2HCS*SOV135B	Hydrogen Analyzer B Inlet Outside Containment Isolation
2HCS*SOV1 36A	Hydrogen Analyzer A Inlet Inside Containment Isolation

2HCS*SOV1 36B	Hydrogen Analyzer A Inlet Outside Containment Isolation
2HCS*SOV1 14A	Containment Isolation to Hydrogen Recombiner 21A
2HCS*SOV1 14B	Containment Isolation to Hydrogen Recombiner 21 B
2HCS*SOV1 15A	Backup Containment Isolation to Hydrogen Recombiner 21A
2HCS*SOV1 15B	Backup Containment Isolation to Hydrogen Recombiner 21B

The licensee notes the following in their submittal:

The valves listed previously are category A containment isolation valves and are required by BVPS IST programs to be seat leakage tested in accordance with 10 CFR 50, Appendix J, Option B (Type C leak test). Due to the design of the valves, position verification testing is performed in conjunction with the Type C test. Each of the listed valves is an SOV designed such that the position of the valve cannot be observed locally. The design of these valves is such that the coil position is internal to the valve body and is not observable in either the energized or de-energized state.

The subject valves are seat leakage tested using local leakage rate test equipment, as part of the Appendix J, Type C, Leak Test Program at BVPS. As part of the leakage rate test, the position verification test is also performed. This method involves attempting to pressurize the containment penetration volume to approximately 45 psig for BVPS-1 and approximately 46 psig for BVPS-2 with the valve open as indicated by its remote position lights on the Control Room bench board. If the attempt to pressurize the containment penetration fails, the valve position is verified to be open. The valve is then closed using the control switch in the Control Room and the containment penetration volume is pressurized to approximately 45 psig for BVPS-1 and approximately 46 psig for BVPS-2. Being able to maintain pressure in the penetration, while the valve is indicating closed by its remote position lights on the Control Room bench board, verifies that the valve is closed. This method satisfies the requirement for position verification testing and ensures that the remote indicating lights in the Control Room accurately reflect the local valve position in the field.

Position verification testing is required to be performed once every two years and is typically performed during a refueling outage, regardless of whether the containment penetration is due for Type C leakage testing or not. In order to perform the Type C leakage testing, piping and valves associated with the individual valve being tested are drained, vented and aligned. Because the position verification test requires the Type C leakage test to be performed, the above actions are completed during each refueling outage. Performing the position verification test at the same frequency as the Appendix J, Type C, leakage test will result in operations and test personnel time and dose savings, since the test would be performed with the leakage test and would not be performed as frequently.

In addition to position verification testing and seat leakage testing, the Unit 1 SOVs, associated with the containment hydrogen analyzers, are stroke timed open and closed one at a time on a quarterly frequency. The opening stroke time for each valve is measured from the time the control switch is placed in the open position until the red indicating light is the only indicating light remaining illuminated. The closing stroke time for each valve is measured from the time the control switch is placed in the closed position until the green indicating light is the only indicating light remaining illuminated. The stroke times are compared to a 2.0 second limiting

time established in accordance with paragraph ISTC-5152(c) of ASME OM Code. If the stroke time is within the 2.0 second limiting time, then the valve is considered to have passed and is operating acceptably.

The Unit 2 SOVs associated with containment hydrogen analyzers are ganged in sets of two valves per control switch. Two operators time the valves so that pre-conditioning is avoided by not cycling the valves more than once. For each valve, the opening stroke time is measured from the time the common control switch is placed in the open position until the red indicating light is the only indicating light remaining illuminated. For each valve, the closing stroke time is measured from the time the common control switch is placed in the closed position until the green indicating light is the only indicating light remaining illuminated. These valves are stroke time tested quarterly. The stroke times are compared to a 2.0 second limiting time established in accordance with ISTC-5152(c). If the stroke time is within the 2.0 second limiting time, then the valve is considered to have passed and is operating acceptably.

The Unit 2 SOVs associated with the containment hydrogen recombiners are not required to be stroke time tested.

The hydrogen analyzer valves are normally closed and must remain closed for isolation of Unit 1 containment penetration numbers 109-44, 95-64, 109-49, 95-69, 109-52 and 95-72, and Unit 2 containment penetration numbers 105b, 97b, 57c and 55c. Following an accident, they must be capable of opening to allow the hydrogen analyzers to obtain a sample from the containment dome.

The hydrogen recombiner valves 2HCS*SOV114A and 2HCS*SOV115A provide isolation of the Unit 2 containment penetration number 93. These valves are normally closed under Shift Manager Clearance #2BVP-CYC-014-1/2W-2W00-46-SM-002A, due to the associated hydrogen recombiner system being retired in place. Therefore, these SOVs are not required to be stroke timed. However, these valves may be opened following a severe beyond design bases accident to vent the containment atmosphere via the containment atmosphere purge blower.

The hydrogen recombiner valves 2HCS*SOV114B and 2HCS*SOV115B are normally closed and provide isolation of the Unit 2 containment penetration number 92. These valves are maintained in their safety position and are passive valves. Therefore, these SOVs are not required to be stroke timed.

Option B of 10 CFR 50, Appendix J permits the extension of Type C leakage testing to a frequency based on leakage-rate limits and historical valve performance. Valves whose leakage test results indicate good performance may have their seat leakage test frequency extended up to 60 months or three refueling outages (based on an 18-month fuel cycle). In order for the seat leakage test frequency of a valve to be extended, the individual containment isolation valve must first successfully pass two consecutive as-found seat leakage tests before it can be placed on an extended seat leakage test frequency.

Over the past five refueling outages for Units 1 and 2, the associated valves have always passed both the position verification test and the Type C leakage rate test. Valve performance data is recorded into a database and trended by the IST coordinator. If the leak rate exceeds the allowable limit, the valves are repaired or replaced. Any maintenance performed on these

valves that might affect position indication is followed by an applicable post-maintenance test, including position verification testing, regardless of the Type C test frequency.

Additionally, all of the SOVs that are required to be stroke timed tested are exercised on a quarterly test frequency, with their stroke times measured and compared to the ASME OM Code acceptance criteria of less than two seconds. (As noted above, the Unit 2 hydrogen recombiner valves providing isolation of containment penetration number 93 are not required to be stroke timed.) For the past five years, no quarterly, stroke time failures have been noted.

Valve exercise testing each quarter and position verification and seat leakage testing in accordance with frequency specified by 10 CFR 50 Appendix J, Option B, provides an adequate assessment of valve health and therefore an acceptable level of quality and safety. A dose savings of approximately 55 mR for both units is expected with the implementation of this alternative. Therefore, radiation exposure, as well as operations and test personnel time, will be reduced by performing the position indication verification test at the same interval as the Appendix J seat leakage test.

The ability to detect degradation and to ensure the operational readiness of the subject valves to perform their intended functions is not jeopardized by performing the position verification testing at the same test frequency as specified in 10 CFR 50, Appendix J, Option B. This frequency of testing and the provisions of this alternative request will demonstrate an acceptable level of quality and safety, since the alternative provides reasonable assurance of valve operational readiness.

3.2 NRC Staff Evaluation

The 24 SOVs are Category A containment isolation valves with leakage rate test requirements as specified in 10 CFR 50 Appendix J. As required by BVPS Unit 1 and Unit 2 Technical Specification 5.5.12, the licensee has implemented a containment leakage rate testing program in accordance with 10 CFR 50, Appendix J, Option B. This places the SOVs into a performance-based program, based on the leakage testing requirements.

The licensee has proposed an alternative test in lieu of the requirements found in 2001 Edition of the ASME OM Code, Section ISTC-3700, for the SOVs. Specifically, the licensee's proposal is to functionally test and verify that valve operation is accurately indicated on the schedule of the 10 CFR 50, Appendix J, Option B seat leakage testing rather than the two-year frequency, specified by ASME OM Code. This proposal synchronizes the position indication verification test requirements of ISTC-3700 with the leakage rate test requirements of 10 CFR 50, Appendix J, Option B. Both tests will be performed together on an Option B, performance-based schedule.

In order for a the seat leakage test frequency of a valve to be extended, the individual containment isolation valve must first successfully pass two consecutive as-found seat leakage tests at the code-required, two-year frequency before it can be placed on an extended test frequency. Valves that have demonstrated good performance for two consecutive cycles may have their test interval extended to every third refueling outage, not to exceed 60 months. Any position indication verification test failure would require the component to return to the initial interval of every refueling outage or two years until good performance was once again established.

Performance data, compiled from the IST programs for the 24 SOVs, show that the valves have not experienced any leakage rate or position verification failures, over the past five test cycles. Additionally, no quarterly, stroke-time failures (for the valves subject to exercising), have been detected. Also, maintaining the current two-year position verification test interval would result in additional personnel radiation exposure without an increase in the level of quality and safety. Therefore, based on the past performance of the SOVs and the quarterly valve stroking (for the valves subject to exercising), coupled with a 10 CFR 50, Appendix J, Option B performance-based program to test for leakage and verify valve position indication, the NRC staff finds that the proposed alternative provides an acceptable level of quality and safety and is acceptable.

4.0 CONCLUSION

As set forth above, the NRC staff has concluded that the proposed alternative, in request VRR3, provides an acceptable level of quality and safety for the following solenoid-operated valve assemblies:

SOV-1 HY-102A1	SOV-1 HY-1 02A2	SOV-1HY-102B1	SOV-1HY-102B2
SOV-1 HY-1 03A1	SOV-1 HY-1 03A2	SOV-1HY-103B1	SOV-1HY-103B2
SOV-1HY-104A1	SOV-1 HY-104A2	SOV-1HY-104B1	SOV-1 HY-1 04B2
2HCS*SOV133A	2HCS*SOV133B	2HCS*SOV134A	2HCS*SOV1 34B
2HCS*SOV135A	2HCS*SOV135B	2HCS*SOV1 36A	2HCS*SOV1 36B
2HCS*SOV1 14A	2HCS*SOV1 14B	2HCS*SOV1 15A	2HCS*SOV1 15B

Accordingly, the NRC staff concludes that the licensee has adequately addressed all of the regulatory requirements set forth in 10 CFR 50.55a(a)(3)(i), and is in compliance with the ASME OM Code's requirements. All other ASME OM Code requirements for which relief was not specifically requested and approved in the subject request for relief remain applicable.

Therefore, the NRC staff authorizes the alternative in request VRR3 for the remainder of the Beaver Valley Unit 1 fourth 10-year IST interval which commenced on September 20, 2007 and for the Beaver Valley Unit 2 third 10-year IST interval which commenced on November 18, 2007.

Principal Contributor: J. Billerbeck, NRR/DE/EPTB