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

January 31, 2012

Mr. Vito A. Kaminskas
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 - SAFETY EVALUATION IN SUPPORT OF 10 CFR 50.55A REQUESTS FOR THE THIRD 10-YEAR IN-SERVICE INSPECTION INTERVAL (TAC NO. ME5381)

Dear Mr. Kaminskas:

By letter to the U.S. Nuclear Regulatory Commission (NRC), dated January 24, 2011 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML1100320065), as supplemented by letter dated September 9, 2011 (ADAMS Accession No. ML112520658), FirstEnergy Nuclear Operating Company, the licensee, submitted its third 10-year inservice inspection interval program plan requests for relief (RRs) IR-001, Revision 3, IR-009, Revision 2, IR-012, Revision 3, IR-013, Revision 2, IR-027, Revision 2, IR-043, Revision 2, IR-054, Revision 1, IR-056, Revision 1, and PT-001, Revision 2, for the Perry Nuclear Power Plant, Unit No. 1 (PNPP).

In its letter dated April 5, 2011 (ADAMS Accession No. ML111020311), the licensee withdrew its alternatives contained in RRs IR-001, Revision 3, and IR-012, Revision 3. The NRC acknowledged this action in letter dated April 19, 2011 (ADAMS Accession No. ML11050105).

Also, in its letter dated January 30, 2012 (ADAMS Accession No. ML12030A195), the licensee withdrew its alternative contained in RR IR-009, Revision 2. The NRC acknowledged this action in letter dated January 31, 2012 (ADAMS Accession No. ML120200454).

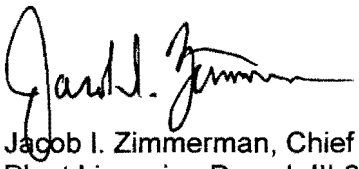
RRs identified as IR-027, Revision 2, IR-043, Revision 2, IR-054, Revision 1, IR-056, Revision 1, and PT-001, Revision 2, were transmitted under separate NRC correspondence (ADAMS Accession No. ML1201080372).

The NRC staff has concluded that the licensee has adequately addressed all of the regulatory requirements set forth in Title 10 of the *Code of Federal Regulations* (10 CFR), Section 50.55a(a)(3)(ii), and is in compliance with the requirements of 10 CFR 50.55a with the authorizing of these alternatives contained in RRs IR-013, Revision 2. Therefore, the NRC staff authorizes the licensee's proposed alternative contained in RR IR-013, Revision 2.

The NRC staff's safety evaluation is enclosed.

Please contact the PNPP Project Manager, Michael Mahoney, at (301) 415-3867 if you have any questions on this action.

Sincerely,



Jacob I. Zimmerman, Chief
Plant Licensing Branch III-2
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket No. STN 50-440

Enclosure:
Safety Evaluation

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

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

ON THE THIRD 10-YEAR INTERVAL INSERVICE INSPECTION

REQUESTS FOR RELIEF

FIRSTENERGY NUCLEAR OPERATING COMPANY

PERRY NUCLEAR POWER PLANT, UNIT NO. 1

DOCKET NUMBER: STN 50-440

1.0 INTRODUCTION

The U. S. Nuclear Regulatory Commission (NRC, the Commission) staff, with technical assistance from its contractor, the Pacific Northwest National Laboratory (PNNL), has reviewed and evaluated the information provided by FirstEnergy Nuclear Operating Company (the licensee), in its letter dated January 24, 2011 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML110320065), which proposed its third 10-year inservice inspection (ISI) interval, which expires on May 17, 2019, Program Plan alternatives, contained in requests for relief (RRs) IR-001, Revision 3, IR-009, Revision 2, IR-012, Revision 3, IR-013, Revision 2, IR-027, Revision 2, IR-043, Revision 2, IR-054, Revision 1, IR-056, Revision 1, and PT-001, Revision 2, for Perry Nuclear Power Plant, Unit No. 1 (PNPP). Additionally, in response to a NRC request for additional information (RAI), the licensee submitted additional information in its letter dated September 9, 2011, (ADAMS Accession No. ML112520658). In addition, in its letter dated April 5, 2011 (ADAMS Accession No. ML111050105), the licensee withdrew alternatives contained in RRs IR-001, Revision 3, and IR-012, Revision 3, and by letter dated January 30, 2012 (ADAMS Accession No. ML120200454), the licensee withdrew IR-013, Revision 2. RRs identified as IR-027, Revision 2, IR-043, Revision 2, IR-054, Revision 1, IR-056, Revision 1, and PT-001, Revision 2, were transmitted under separate NRC correspondence (ADAMS Accession No. ML1201080372). This safety evaluation (SE) only discusses RR IR-013, Revision 2.

The NRC staff adopts the evaluations and recommendations contained in PNNL's Technical Letter Report which has been incorporated into this SE, for authorizing the licensee's alternatives.

2.0 REGULATORY REQUIREMENTS

The American Society of Mechanical Engineers Boiler and Pressure Vessel Code (ASME Code) Class 1, 2, and 3, inservice examination of components are to be performed in accordance with Section XI of the ASME Code, and applicable addenda, as required by Title 10 of the *Code of Federal Regulations* (10 CFR) 50.55a(g), except where specific relief has been granted by the Commission pursuant to 10 CFR 50.55a(g)(6)(i). The regulation at 10 CFR 50.55a(a)(3) states,

in part, that alternatives to the requirements of paragraph (g) may be used, when authorized by the NRC, if the licensee demonstrates that (i) the proposed alternatives would provide an acceptable level of quality and safety or (ii) compliance with the specified requirements would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety.

Pursuant to 10 CFR 50.55a(g)(4), ASME Code Class 1, 2, and 3, components (including supports) shall meet the requirements, except the design and access provisions and the preservice examination requirements, set forth in the ASME Code, Section XI, to the extent practical within the limitations of design, geometry, and materials of construction of the components. The regulations require that inservice examination of components and system pressure tests conducted during the first 10-year interval and subsequent intervals comply with the requirements in the latest edition and addenda of Section XI of the ASME Code, which was incorporated by reference in 10 CFR 50.55a(b) 12 months prior to the start of the 120-month interval, subject to the limitations and modifications listed therein. The applicable ISI ASME Code of record for the PNPP third 10-year ISI for PNPP is the 2001 Edition through the 2003 Addenda of the ASME Code, Section XI. The third 10-year ISI interval for PNPP interval ends on May 17, 2019.

3.0 EVALUATION

Proposed Alternative IR-013, Revision 2, ASME Code, Section XI, Table IWC-2500-1 Examination Category C-G, Item C6.10, Pressure Retaining Welds in Pumps and Valves

ASME Code Requirement

ASME Code, Section XI, Table IWC-2500-1, Examination Category C-G, Item C6.10, requires 100-percent surface examination, as defined by Figure IWC-2500-8, of selected Class 2 pump casing welds. ASME Code Case N-460, "Alternative Examination Coverage for Class 1 and Class 2 Welds, Section XI, Division 1," as an alternative approved for use by the NRC in Regulatory Guide (RG) 1.147, Revision 16, "Inservice Inspection Code Case Acceptability", Revision 16 states that a reduction in examination coverage due to part geometry or interference for any Class 1 and 2 weld is acceptable provided that the reduction is less than 10 percent, i.e., greater than 90-percent examination coverage is obtained.

Licensee's Proposed Alternative to ASME Code

In accordance with 10 CFR 50.55a(a)(3)(ii), the licensee proposed that in addition to accessible examinations that they will perform, if for any reason, disassembly of these pumps is required during the upcoming interval for maintenance, repair, or modification, an examination of the inaccessible pump casing welds will be performed from the inside surface of the pump as an alternative to the ASME Code-required surface examination for ASME Code Class 2 pump casing welds below the floor.

Licensee's Proposed Alternative Examination and Basis for Use (as stated)

> The subject pumps are Byron Jackson vertical pumps installed for PNPP residual heat removal (RHR) (that is, the low pressure coolant injection mode), low pressure core spray (LPCS), and high pressure core spray (HPCS) emergency core cooling systems (ECCS). Other than the number of stages, the basic design of the pumps

are similar. The inservice examination program sketch for the RHR A pump that was provided in the January 24, 2011 submittal request as a typical sketch shows that the pump casings or barrels are below the floor elevation. Additional details can be seen in the provided drawings. The pump barrels are encased in a steel-lined concrete pit. The weights of the major pump components, the number of stages, and the depths of the pump barrels are provided in the following table.

Description	RHR Pumps	LPCS Pump	HPCS Pump
Barrel Weight (lbs)	7,000	4,800	10,000
Motor Weight (lbs)	7,800	11,500	20,900
Discharge Head-Column-Bowl Assembly Weight (lbs)	16,000	13,100	28,000
Number of Stages	3	5	13
Approximate Depth of Pump Barrel	21 ft	23ft	23.5ft

In addition to disassembly of the piping and electrical connections, disassembly of the pumps would involve significant rigging and heavy load lifts. Furthermore, due to the impeller assembly lengths, the pumps cannot be pulled without partial disassembly of the pump internals, thus making disassembly even more difficult. Accurate man-hours involved with disassembly of these pumps are not available because there is little experience with disassembly. It is estimated to take several hundred man-hours to disassemble each pump. This estimate does not include the man-hours required for reassembly. General area dose rates in the areas of the pumps vary, with the lowest being less than 2 millirem/hour in the area of the LPCS pump to the highest being over 35 millirem/hour in the area of the RHR A pump. It is estimated that dose for disassembly and reassembly would result in at least 1 rem (LPCS pump) to more than 10 rem (RHR A pump). Thus, substantial personnel exposure would be necessary to disassemble and reassemble the pumps. With the sizes and weights of the components, significant rigging, lifts, and dose, disassembly and reassembly of these pumps would provide a hardship or unusual difficulty.

As indicated in the request, similar pump casing welds accessible above the floor elevation are examined on a continuing basis. Since the construction and operating conditions of these pump casing welds are identical to those of the inaccessible welds, it is reasonable to apply satisfactory results from examined welds to the unexamined welds. With the acceptable initial condition and the capability to examine the similar accessible welds on a continuing basis, it is concluded that disassembling the pumps to perform the applicable [ASME] Code examinations would result in hardship or unusual difficulty without a compensating increase in the level of quality or safety.

The barrel flange (the sole plate for the pump) is grouted and bolted to the floor and is not designed for routine removal. Thus, the annular space between the pump barrels and the pit walls, which is approximately 4.5 inches for the RHR and LPCS pumps and 2.5 inches for the HPCS pump, is not accessible for surface or remote visual examination. As can be seen in the provided drawings of the pumps, the interior surfaces of the pump barrel welds are only accessible through the suction side of the pump. The only access for remote visual examination from inside the pump barrels is through a 3/4-inch vent connection in the head shell. From there, lowering the fiberscope and locating the barrel welds would be difficult and only those portions of the circumferential barrel welds directly below the vent connection are able to be inspected. Lowering the fiberscope from the vent connection does not allow for control of the focal distances, making it unlikely that images of sufficient quality could be obtained, even for the very limited areas that could be seen. Based on the above, it is unlikely that any percentage of visual examinations could be credited for distance, lighting, and acuity requirements.

Each of the ECCS pumps has 15 [ASME Code, Section XI, Table IWC-2500-1] Category C-G, Item C6.10, casing welds of which eight (approximately 53 percent) are accessible. Those on the selected pumps receive the required surface examinations each inspection interval. For the seven casing welds in the barrel below the floor, no examinations are performed.

As indicated in the request, the design and weld configuration for RHR pump A is representative of the five ECCS pumps. With regard to selection for [ASME Code, Section XI, Table IWC-2500-1,] Category C-G, Note 1 of the table states that in the case of multiple pumps of similar design, size, function and service in a system, required weld examinations may be limited to all the welds in one pump in the same group. In this context, RHR pump A is only representative of RHR pumps A and B. The design, size and function of RHR pump C is similar, but RHR pump C performs the service of low pressure coolant injection (LPCI) while the RHR pumps A and B perform additional functions; therefore, PNPP groups it separately from the A and B pumps. The functions and service of the LPCS and HPCS pumps are different and also grouped separately. Thus, under [ASME Code, Section XI, Table IWC-2500-1] Category C-G, four of the five ECCS pumps are selected for examination.

The pump casings are only subject to the suction pressure. The design suction pressure is 115 pounds per square inch (psi) for the two core spray pumps and 215 psi for the three RHR pumps. During plant operation with the ECCS pumps in standby, the suction pressure for the pumps are approximately 9 psi for the LPCS and RHR pumps and 23 psi for the HPCS pump. In the unlikely event of cracking (the welds are carbon steel welds that are only subjected to low pressure conditions and operating experience review found no reported degradation of these welds), there could be some leakage through the casing. The affect of cracking on pump functionality would be indeterminate; however, based on engineering judgment, it would be expected to have little impact on the capacity of the pump. Likewise, the leakage would be expected to have little affect on the annular space between the barrel and the pit, the region outside the casing, because the concrete walls of the pit are greater than 1 foot thick and have a 1/4-inch steel leak-tight barrier. If there was sufficient leakage to fill the annular space, it would then leak out from the pump casing sole-plate-to-floor interface and would be detectable during [visual] VT-2

> [examination] walkdowns. The leakage would also run into the ECCS pump room floor drains and to the sumps where there are high level sump alarms that would alert [PNPP] Control Room operators to have the pump rooms inspected for leakage.

NRC Staff Evaluation

The ASME Code requires 100-percent surface examination, as applied from either the inside or outside surface, of selected ASME Code, Class 2, pump casing welds. The ASME Code also states that in the case of multiple pumps of similar design, size, function and service in a system, required weld examinations may be limited to all the welds in one pump in the same group. Examinations of portions of the subject casing welds are limited by the design of the pumps, which the subject welds are located below the flooring grade with the pump barrels encased in steel-lined concrete pits. In order for the licensee to obtain 100 percent of the ASME Code-required examination coverage, the associated pumps would require disassembly and internals removed for accessing the welds from the inside surface. The licensee noted that dose rates at the lowest for disassembly and reassembly would be less than 2 milli roentgen equivalent man (rem)/hour in the area of the LPCS pump to the highest being over 35 millirem/hour in the area of the RHR A pump. It also could result in at least 1 rem for the LPCS pump to more than 10 rem for the RHR A pump. This would not be in keeping with As Low As Reasonable Achievable because the relatively high doses would not be offset by quantifiable benefits to public health and safety.

Typical pump design and access limitations are shown in the sketches and technical descriptions included in the licensee's submittal. In order to achieve the ASME Code surface examination, disassembly of the pumps' internals would be necessary, as noted above, which would require moving 1,000 to 28,000 pounds with lengths up to 11 to 23.5 feet for certain components for disassembly and reassembly. Disassembly and reassembly of the pumps by moving of heavy and long components of the pumps could possibly cause damage to the subject pumps' internals. Imposing this requirement would place a burden on the licensee, therefore, the ASME Code-required 100 percent surface examinations are considered a hardship without a compensating increase of safety.

The licensee's proposed alternative is to examine only the accessible portions of selected pump casing welds. In addition, the licensee will perform additional ASME Code examinations should any of the pumps be dissembled for maintenance, repair or modification during the current third 10-year ISI interval. The licensee noted in its submittal dated September 5, 2011, that the subject pump casings are subject only to suction pressure and the design suction pressure is 115 pounds per square inch (psi) for the two LPCS pumps and 215 psi for the three RHR pumps. Also during plant operation with the ECCS pumps in standby, the suction pressure for the pumps are approximately 9 psi for the LPCS and RHR pumps and 23 psi for the HPCS pump. The subject pumps are of carbon steel welds and are only subjected to low pressure conditions. Since the subject pump casings exposed to low pressure during operation, the possibility of failure of the subject pump casings is not probable. An operating experience review performed by the licensee found no reported degradation in the subject welds in the industry. If there was any leakage through the casing, it was determined by the licensee based on engineering judgment, it would be expected to have little impact on the capacity of the pump. The licensee noted that if there was leakage it would be expected to have little effect on the annular space between the barrel and the pit, the region outside the casing because the concrete walls of the pit are greater than 1 foot thick and have a 1/4-inch steel leak-tight barrier. If for some reason there was sufficient leakage to fill the annular space, it would then leak out from the pump casing sole-plate-to-floor interface and would be detectable during VT-2 plant walkdowns. Furthermore, the leakage would also run into the ECCS

pump room floor drains and to the sumps where there are high level sump alarms that would alert the PNPP control room operators. Therefore, the NRC staff has determined that the licensee's proposed alternative, in addition to leakage monitoring, provides reasonable assurance of structural integrity of the subject pump casings welds.

4.0 CONCLUSIONS

The NRC staff has reviewed the licensee's submittals and concludes for the proposed alternative contained in RR IR-013, Revision 2, that the licensee has demonstrated that the ASME Code examination requirements are a hardship without a compensating increase in quality and safety and the licensee's proposed alternative, in addition to leakage monitoring provides reasonable assurance of the structural integrity of the subject pump casings welds described in RR IR-013, Revision 2. This relief applies to the third 10-year ISI interval for PNPP, which expires on May 17, 2019

Accordingly, the NRC staff concludes that the licensee has adequately addressed all of the regulatory requirements set forth in and 10 CFR 50.55a(a)(3)(ii), and is in compliance with the requirements of 10 CFR 50.55a with the authorizing of the alternative contained in RR IR-013, Revision 2, for PNPP. Therefore, the NRC staff authorizes the licensee's proposed alternative contained in RR IR-013, Revision 2, for the third 10-year ISI interval at PNPP.

All other ASME Code, Section XI, requirements for which relief was not specifically requested and approved in the subject requests for relief remain applicable, including third-party review by the Authorized Nuclear Inservice Inspector.

Principal Contributor: T. McLellan, NRR

Date of issuance: January 31, 2012

Please contact the PNPP Project Manager, Michael Mahoney, at (301) 415-3867 if you have any questions on this action.

Sincerely,

/RA/

Jacob I. Zimmerman, Chief
Plant Licensing Branch III-2
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket No. STN 50-440

Enclosure:
Safety Evaluation

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