August 31, 1999

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Mr. John K. Wood
Vice President - Nuclear, Perry
FirstEnergy Nuclear Operating Company
P.O. Box 97, A200
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SUBJECT: PERRY NUCLEAR POWER PLANT, UNIT 1 - ISSUANCE OF AMENDMENT RE: RESIDUAL HEAT REMOVAL LEAK-OFF LINE (TAC NO. MA5063)

Dear Mr. Wood:

The U.S. Nuclear Regulatory Commission has issued the enclosed Amendment No. 106 to Facility Operating License No. NPF-58 for the Perry Nuclear Power Plant, Unit 1 (PNPP). The amendment is in response to your application dated March 17, 1999 (PY-CEI/NRR-2362L). The amendment approves a proposed modification that changes the PNPP as described in the Updated Safety Analysis Report. The modification incorporates a leak-off line in the residual heat removal system which will eliminate an operator work around and significantly reduce the collective dose to operations personnel.

A copy of the Safety Evaluation is also enclosed. Notice of Issuance will be included in the Commission's next biweekly Federal Register notice.

Sincerely,
Original Signed By
Douglas V. Pickett, Sr. Project Manager, Section 2
Project Directorate III
Division of Licensing Project Management
Office of Nuclear Reactor Regulation

Docket No. 50-440

Enclosures: 1. Amendment No. 106 to License No. NPF-58
2. Safety Evaluation

DOCUMENT NAME: G:\PERRY\PD3-2\A5063AMD.WPD *See GThomas to DPickett memo of 6/25/99

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

FIRSTENERGY NUCLEAR OPERATING COMPANY

DOCKET NO. 50-440

PERRY NUCLEAR POWER PLANT, UNIT 1

AMENDMENT TO FACILITY OPERATING LICENSE

Amendment No. 106
License No. NPF-58

1. The U.S. Nuclear Regulatory Commission (the Commission) has found that:

   A. The application for amendment by the FirstEnergy Nuclear Operating Company dated March 17, 1999, complies with the standards and requirements of the Atomic Energy Act of 1954, as amended (the Act), and the Commission's rules and regulations set forth in 10 CFR Chapter I;

   B. The facility will operate in conformity with the application, the provisions of the Act, and the rules and regulations of the Commission;

   C. There is reasonable assurance (i) that the activities authorized by this amendment can be conducted without endangering the health and safety of the public, and (ii) that such activities will be conducted in compliance with the Commission's regulations;

   D. The issuance of this amendment will not be inimical to the common defense and security or to the health and safety of the public; and

   E. The issuance of this amendment is in accordance with 10 CFR Part 51 of the Commission's regulations and all applicable requirements have been satisfied.

2. Accordingly, the license is amended to authorize revision of the Updated Safety Analysis Report (USAR) as set forth in the application for amendment by the licensee, dated March 17, 1999. The licensee shall update the USAR by adding a description of the modification that incorporates a leak-off line in the residual heat removal system, as authorized by this amendment and in accordance with 10 CFR 50.71(e).

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3. This license amendment is effective as of its date of issuance and shall be implemented not later than 90 days after issuance.

FOR THE NUCLEAR REGULATORY COMMISSION

Anthony J. Mendiola, Chief, Section 2
Project Directorate III
Division of Licensing Project Management
Office of Nuclear Reactor Regulation

Date of Issuance: August 31, 1999

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

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELATED TO AMENDMENT NO. 106 TO FACILITY OPERATING LICENSE NO. NPF-58

FIRSTENERGY NUCLEAR OPERATING COMPANY

PERRY NUCLEAR POWER PLANT, UNIT 1

DOCKET NO. 50-440

1.0 INTRODUCTION

By letter dated March 17, 1999, the Perry licensee submitted a description of a proposed modification to the residual heat removal (RHR) system. The change involves the addition of a leak-off line in the RHR shutdown suction line. The leak-off line is designed to eliminate the need for manual pressure control in the RHR shutdown suction line and will significantly reduce the collective radiation dose to plant operations personnel. The licensee's submittal included the following aspects: system considerations, piping impact, operational impact, alternate shutdown cooling impact, containment isolation system impact, electrical and control systems impact, failure mode and effects analysis, thermal hydraulic considerations, evaluation of the fire protection program, inadvertent reactor vessel drain down, evaluation against internally generated missiles, evaluation for fire protection against pipe breaks, evaluation of adjacent components, evaluation of the GL 96-05 program, evaluation of the suppression pool and environmental considerations.

The licensee performed a 10 CFR 50.59 evaluation for the modification and concluded that there is a slight increase in the probability of a malfunction of the equipment important to safety previously evaluated in the safety analysis report. This conclusion was due to the re-designation of the containment isolation valve RHR heat exchanger (HX) B vent valve MOV 1E12-FO73B (refer to the attached Figure 1) from a manual, normally closed valve, to an automatic, normally open valve. The licensee submitted the RHR system modification package as a result of the 10 CFR 50.59 evaluation.

2.0 BACKGROUND

Figure 1 shows the RHR system configuration, the affected valves, and the proposed leak-off line connection which connects the existing 8-inch fill/vent line of the condensate transfer system to the heat exchanger vent valves FO74B, FO73B (line containing valve F620). The shutdown cooling (SDC) mode of the RHR is used during reactor shutdown only. Isolation valves E12-FOO8 and E12-FOO9 are normally closed and can be opened only when the reactor low pressure permissive of about 130 psig is satisfied. The SDC suction isolation valves are also closed automatically on reactor low level and area high temperature to prevent reactor drain down events.

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During normal power operation, the leakage past the normally closed SDC suction valves, FOO8, FOO9 and F550, will raise the temperature and pressure in the SDC header. Normal design leakage through the isolation valves causes the isolated SDC suction header to heat up and pressurize. When the SDC suction piping header pressure reaches 180 psig, an alarm is sounded in the control room. In response to this alarm, plant operators typically take manual actions to vent the SDC suction header in accordance with plant procedures. This practice increases the radiation exposure to the operators. If venting is not performed and the SDC suction header pressure is allowed to increase, relief valve FOO5, which is set at about 185 psig, will open and relieve header pressure. Pressure discharge from the relief valve may result in steam flashing and excessive wear on the relief valve.

In order to provide a long-term resolution for this issue, the licensee has proposed to modify the RHR system to eliminate the need to periodically vent the SDC suction header thus eliminating an operator work around and reducing operator dose. The proposed modification adds a 3/4-inch leak-off line connecting the 20-inch SDC header to the one-inch RHR B HX vent line (see Figure 1). The cross connection will be installed on the existing RHR system flush line near high point vent valve F581 to the HX vent line between valves FO74B and FO73B. At present, HX vent valves FO74B and F073B are normally closed and opened only during venting of the HX. With this modification, FO74B will remain closed while FO73B will be kept normally open to maintain the flow path between the SDC suction header and the suppression pool. Vent valve FO73B will be designated as a normally open containment isolation valve and will receive an automatic closure signal upon receipt of either reactor low level (level 3), high drywell pressure, or RHR system line break (i.e., high ambient temperature or high differential temperature sensed in the RHR "B" room). A manual valve, F620, will be added in the leak-off line for isolation during HX venting.

3.0 EVALUATION

The RHR system has six modes of operation: shutdown cooling (SDC) mode, low-pressure coolant injection (LPCI), suppression pool cooling mode, containment spray cooling mode, fuel pool supplemental cooling mode and containment flooding mode. The SDC header only supports SDC operation and not the remaining RHR functional modes. Therefore, this modification only affects the SDC mode of operation.

The 3/4-inch piping connecting the SDC header and the HX vent line will conform to the RHR system design bases (i.e., ASME Section III, Division 1, Subsection NC (Class 2 piping)). The licensee has determined that the proposed leak-off line will not be subject to damage from internally generated missiles and that it will be routed such that the extended SDC header boundary will not be the target for jet loads or pipe whip from postulated pipe breaks. As discussed in section 3.6.2.1.6 of the Updated Final Safety Analysis Report (USAR), circumferential breaks in high energy fluid system piping are only postulated for piping exceeding one-inch nominal pipe diameter. Therefore, there is no requirement to postulate either a crack or pipe break in the 3/4-inch leak-off piping.

The proposed modification will alter the containment isolation provisions for the one-inch HX containment penetration. The current USAR description of suppression pool penetrations states

that "two normally closed remote-manual actuated, motor-operated valves outside containment, and a check valve, located between containment and the drywell, provide isolation." As previously discussed, the proposed modification will result in the F073B valve being a normally open, automatic containment isolation valve that receives a closure signal upon receipt of either reactor low level (level 3), high drywell pressure, or RHR system line break signal. This isolation provision meets the requirements of General Design Criteria 56 and is acceptable to the staff. In addition, the valve must now be included as part of the diesel generator loading calculation following a loss-of-coolant accident (LOCA). The licensee has determined that the motor load of valve F073B will add approximately 0.22 kW to the diesel generator post-LOCA. The licensee has concluded, and the staff concurs, that this additional load will not adversely affect the diesel generator.

The licensee has examined potential failure modes of SDC operation resulting from the proposed modification. During the SDC mode, both the cross-tie valve F620 between the leak-off line and the HX vent line, and the HX vent valve FO73B will be closed as part of the procedures to start the SDC operation. If the valves are inadvertently opened during SDC mode, reactor water would be diverted to the suppression pool. Since the leak-off line is only 3/4 inch in diameter, it will take a significant amount of time to lower the level in the reactor. SDC suction valves FOO8, FOO9 and HX vent valve F073B will close automatically when the RPV level reaches low level 3. This automatic closing feature of the valves reduces the probability of a reactor drain down event during the SDC mode.

During normal operation, the SDC suction header is normally protected against overpressurization by the F005 relief valve and the alarm. If HX vent valve FO73B is inadvertently closed during normal operation, the SDC header will be placed in the same configuration that existed prior to the system modification. The modification will not increase the probability of increasing the pressurization of the SDC suction header.

The proposed modification was reviewed for potential failure modes and the effects of such failures. These failures include:

Breach of the pressure boundary

> The postulated pipe break scenario for both High Energy and Moderate energy fluid systems (USAR Section 3.6.2.1.6) exempts consideration of breaks or cracks for pipes less than or equal to 1-inch nominal diameter. Therefore, since the new leak-off line is only 3/4" diameter piping, pipe cracks or pipe breaks are not required to be postulated.

Plugging of the leak-off line

> If the 3/4" piping becomes clogged, the leak-off line will no longer relieve pressure build-up from the SDC header. Under these conditions, the SDC header would pressurize in a similar manner to the current configuration. Similar to current practice, operators would either manually vent the header or allow relief valve F005 to open. Therefore, plugging of the leak-off piping would not create an unanalyzed situation.

Failure of FO73B to close

Procedural controls will be used to verify that F073B is closed prior to initiating SDC mode of operation. However, in the event that procedural controls fail to ensure valve closure or if valve F073B is inadvertently opened during SDC operation, primary system water will be diverted to the suppression pool. Water will continue to be diverted until either control room operators take action to close the valve (valve F073B has control room position indication) or until the reactor vessel water level reaches Level 3 thus generating an automatic isolation signal that will automatically close valve F073B.

Failure of FO74B to close

Two separate conditions must be considered when addressing the failure to close F074B. The first condition is when valve F074B, which connects to the shell side of the RHR heat exchanger, is opened in conjunction with F073B during normal plant operation to vent the RHR heat exchanger. If a postulated accident were to occur under the current configuration, low pressure coolant injection (LPCI) or containment spray flow would be diverted through the one inch vent line to the suppression pool until operators closed one of the valves. This diversion of flow could occur under the current configuration. In the proposed configuration, an accident signal would automatically isolate valve F073B thus terminating LPCI or containment spray flow to the suppression pool. However, flow could still be diverted to the suppression pool via the open F074B valve and the SDC header relief valve F005. Nonetheless, flow diverted to the suppression pool would be reduced because flow is now restricted to a 3/4" pipe as opposed to a 1" pipe. Therefore, the consequences would be less severe.

The second condition to be considered with F074B inadvertently open is during normal operation when the RHR system is in standby readiness. If valve F073B is open as designed, the RHR keep-fill water leg pump will pump water directly through the one inch vent line to the suppression pool. The head of the keep-fill pump will not lift the SDC header relief valve (185 psi) and the RHR system will remain full of water. If valve F073B is inadvertenly closed, or if the downstream check valve prevents flow to the suppression pool, flow from the RHR keep-fill pump would interface with leakage past the F008 and F009 SDC header valves. In response to staff questions about potential pressure buildup in the RHR system, the licensee identified an additional relief valve, F055B, on the shell side of the RHR heat exchanger that relieves at 485 psi (not shown on Figure 1). Clearly, any pressure buildup that may be postulated would not adversely impact the RHR heat exchanger and could be relieved by the current practice of manual operator venting or actuation of the SDC header relief valve F005.

The licensee determined that there is no safety impact due to the postulated failures described above and the staff finds the conclusions acceptable.

The licensee also performed a thermal hydraulic analysis of all the leakage paths associated with the modification using the RELAP5 code. The results of the analyses showed high operating temperatures and fluid velocities in the proposed leak-off line for currently allowable

leakage rates through the SDC suction valves. The elevated operating temperature could cause pipe stress problems and high velocity steam flow to the suppression pool. Calculations performed by the licensee showed that if the allowable leakage through the SDC suction line is reduced, the potential for elevated high temperature and high fluid velocities could be reduced. In order to reduce the potential for flow instability problems, the licensee has introduced administrative controls to reduce the allowable leakage rate of the SDC suction line penetration from a technical specification maximum value of 5 gpm to a total of 0.30 gpm. This is acceptable to the staff.

Motor operated valve (MOV) diagnostic testing will be performed on F073B after completion of the modification to ensure correct MOV operation. In addition, MOV F073B will be included in the Perry GL 96-05 MOV Program ("Periodic Verification of Design-Basis Capability of Safety-Related Motor-Operated Valves"). This will provide assurance that the MOV will perform its safety function when required.

Finally, the impact of the proposed modification upon the Perry safe shutdown capability (Appendix R) was evaluated. The impacts include: 1) the need to ensure that F073B or F620 is closed during shutdown cooling operation, and 2) the potential impact of fire-induced spurious valve operations in accordance with GL 86-10, "Fire Protection." Since the closure of F073B or F620 is required only under conditions of SDC operation, the conditional manual operation of F073B or F620 is classified as a "cold shutdown manual action." Valve closure is not time-sensitive and it can be expected that SDC operation would not be placed into service until well after 8 hours following a postulated fire. Therefore, there is ample time to close these valves prior to SDC operation and there is no impact on the safe shutdown timeline. With regard to GL 86-10, the licensee concluded that MOV F073B is not subject to spurious valve actuations due to fire. In summary, the licensee has concluded, and the staff concurs, that plant shutdown in accordance with 10 CFR Part 50, Appendix R can still be achieved.

The staff concluded that the licensee has adequately considered the effects of the RHR system modifications. The modification will not significantly affect any safety function of the RHR system. The modifications will be designed, manufactured and installed in accordance with the original codes and standards. The staff has reviewed the proposed changes in USAR pages 5.4-46, Figure 5.4-13 (sheet 2 of 3, sheet 3 of 3), Figure 6.3.3 (sheet 1 of 3) and has concluded that they are acceptable. Therefore, the staff concludes that the proposed RHR system leak- off connection is acceptable.

4.0 STATE CONSULTATION

In accordance with the Commission's regulations, the Ohio State official was notified of the proposed issuance of the amendment. The State official had no comments.

5.0 ENVIRONMENTAL CONSIDERATION

This amendment changes a requirement with respect to installation or use of a facility component located within the restricted area as defined in 10 CFR Part 20 or changes a surveillance requirement. The staff has determined that the amendment involves no significant increase in the amounts, and no significant change in the types, of any effluent that may be

released offsite and that there is no significant increase in individual or cumulative occupational radiation exposure. The Commission has previously issued a proposed finding that this amendment involves no significant hazards consideration and there has been no public comment on such finding (64 FR 27322). Accordingly, this amendment meets the eligibility criteria for categorical exclusion set forth in 10 CFR 51.22(c)(9). Pursuant to 10 CFR 51.22(b), Date:no environmental impact statement or environmental assessment need be prepared in connection with the issuance of this amendment.

6.0 CONCLUSION

The staff has concluded, based on the considerations discussed above, that: (1) there is reasonable assurance that the health and safety of the public will not be endangered by operation in the proposed manner, (2) such activities will be conducted in compliance with the Commission's regulations, and (3) the issuance of this amendment will not be inimical to the common defense and security or to the health and safety of the public.

Principal Contributors: George Thomas
Douglas Pickett

Date: August 31, 1999

Figure 1
Diagram of RHR Leak-Off Line Modification