

September 12, 2000

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Mr. John K. Wood  
Vice President - Nuclear, Perry  
FirstEnergy Nuclear Operating Company  
P.O. Box 97, A200  
Perry, OH 44081

SUBJECT: PERRY NUCLEAR POWER PLANT, UNIT 1 - ISSUANCE OF AMENDMENT  
RE: REFUELING EQUIPMENT INTERLOCKS (TAC NO. MA6237)

Dear Mr. Wood:

The U.S. Nuclear Regulatory Commission has issued the enclosed Amendment No. 116 to Facility Operating License No. NPF-58 for the Perry Nuclear Power Plant, Unit 1. This amendment revises the Technical Specifications in response to your application dated August 4, 1999 (PY-CEI/NRR-2418L), as supplemented by submittal dated August 7, 2000 (PY-CEI/NRR-2510L).

This amendment revises Technical Specification 3.9.1, "Refueling Equipment Interlocks," by introducing an optional operator action when one or more required refueling equipment interlocks are inoperable. The new operator action permits continued in-vessel fuel movement under specific administrative controls.

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

Sincerely,

/RA/

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. 116 to  
License No. NPF-58  
2. Safety Evaluation

DOCUMENT NAME: G:\PDIII-2\PERRY\A6237AMD.wpd

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DATE	8/21/00	8/21/00	8/25/00	8/16/00	8/11/00

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\*No major changes made to safety evaluation



UNITED STATES  
NUCLEAR REGULATORY COMMISSION

WASHINGTON, D.C. 20555-0001

September 12, 2000

Mr. John K. Wood  
Vice President - Nuclear, Perry  
FirstEnergy Nuclear Operating Company  
P.O. Box 97, A200  
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cc w/encls: See next page

J. Wood  
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cc:

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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. 116  
License No. NPF-58

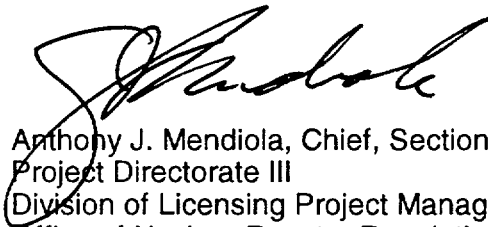
1. The U.S. Nuclear Regulatory Commission (the Commission) has found that:
  - A. The application for amendment by the FirstEnergy Nuclear Operating Company (the licensee) dated August 4, 1999, as supplemented by letter dated August 7, 2000, complies with the standards and requirements of the Atomic 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 by changes to the Technical Specifications as indicated in the attachment to this license amendment, and paragraph 2.C.(2) of Facility Operating License No. NPF-58 is hereby amended to read as follows:

(2) Technical Specifications

The Technical Specifications contained in Appendix A and the Environmental Protection Plan contained in Appendix B, as revised through Amendment No. 116 are hereby incorporated into this license. The FirstEnergy Nuclear Operating Company shall operate the facility in accordance with the Technical Specifications and the Environmental Protection Plan.

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

Attachment: Changes to the Technical  
Specifications

Date of Issuance: September 12, 2000

ATTACHMENT TO LICENSE AMENDMENT NO. 116

FACILITY OPERATING LICENSE NO. NPF-58

DOCKET NO. 50-440

Replace the following pages of the Appendix "A" Technical Specifications with the attached revised pages. The revised pages are identified by amendment number and contain marginal lines indicating the areas of change.

Remove

3.9-1

Insert

3.9-1

### 3.9 REFUELING OPERATIONS

### 3.9.1 Refueling Equipment Interlocks

LCO 3.9.1 The refueling equipment interlocks shall be OPERABLE.

APPLICABILITY: During in-vessel fuel movement with equipment associated with the interlocks.

## ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One or more required refueling equipment interlocks inoperable.	A.1 Suspend in-vessel fuel movement with equipment associated with the inoperable interlock(s).	Immediately
	<u>OR</u>	
	A.2.1 Insert a control rod withdrawal block.	Immediately
	<u>AND</u>	
	A.2.2 Verify all control rods are fully inserted.	Immediately

## SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.9.1.1	Perform CHANNEL FUNCTIONAL TEST on each of the following required refueling equipment interlock inputs: <ul style="list-style-type: none"> <li>a. All-rods-in,</li> <li>b. Refuel platform position, and</li> <li>c. Refuel platform main hoist, fuel loaded.</li> </ul>	7 days



UNITED STATES  
NUCLEAR REGULATORY COMMISSION

WASHINGTON, D.C. 20555-0001

September 12, 2000

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION  
RELATED TO AMENDMENT NO. 116 TO FACILITY OPERATING LICENSE NO. NPF-58  
FIRSTENERGY NUCLEAR OPERATING COMPANY  
PERRY NUCLEAR POWER PLANT, UNIT 1  
DOCKET NO. 50-440

1.0 INTRODUCTION

On August 4, 1999, as supplemented by letter dated August 7, 2000, FirstEnergy Nuclear Operating Company (FENOC) requested an amendment to the Perry Nuclear Power Plant (Perry) license, NPF-58. The amendment would revise Section 3.9.1, "Refueling Equipment Interlocks," of the Perry Technical Specification (TS) by adding a provision to Limiting Condition for Operation (LCO) 3.9.1. The proposed change would allow the licensee to start or resume in-vessel fuel movement with inoperable refueling equipment interlocks provided (1) control rod (CR) withdrawals are blocked and (2) all control rods are verified to be fully inserted.

The proposed license amendment replaces the licensee's previous submittal of April 9, 1997, which was subsequently withdrawn. During discussions with the licensee concerning the current license amendment, the licensee made reference to factual material found in its previous submittal. In these discussions, the licensee verified that the factual information contained in the submittal of April 9, 1997, was still accurate. Considering that this letter remains publicly available, the licensee agreed that referencing this factual material would be appropriate for this application.

The August 7, 2000, supplement contained clarifying information that was within the scope of the original application and *Federal Register* notice and did not change the staff's initial proposed no significant hazards consideration determination.

2.0 EVALUATION

During refueling, reactivity in boiling water reactors can be changed by either control rod withdrawals or fuel movements. Instead of analyzing the possible reactivity-initiated events during refueling, General Electric designed the refueling equipment interlocks to prevent inadvertent control rod withdrawals and fuel movement. Section 15.4 of the Perry Updated Safety Analysis Report (USAR) assumes that the refueling equipment interlocks will function and prevent inadvertent reactivity-initiated events.

LCO 3.9.1 requires that refueling equipment interlocks be operable during in-vessel fuel movement with equipment associated with the interlocks (i.e., all-rods in, refueling platform position, and refueling platform (main) hoist-fuel loaded interlocks). The corresponding Action



statement currently stipulates that in-vessel fuel movement must be suspended immediately if one or more of the associated refueling interlocks are inoperable.

Surveillance Requirement (SR) 3.9.1.1 requires that the channel functional test (CFT) for the refueling equipment interlocks be performed once every 7 days. In its submittal of April 9, 1997 (which was subsequently withdrawn), the licensee stated that fuel movement operations typically last 8 to 10 days and requested extension of the surveillance interval from 7 to 14 days. If fuel movement operations cannot be completed within 7 days, the licensee is currently required to cease fuel movement in order to perform the CFT of SR 3.9.1.1. The licensee stated that the 7-day interval is based on engineering judgment and that continuous fuel movement operation is preferable to halting, and then resuming fuel movement. Performance of SR 3.9.1.1, which takes approximately 12 hours, represents critical path outage time and is considered disruptive to plant outage operations. The licensee has proposed changes to the LCO such that, if fuel movement operations lasts longer than 7 days, the licensee would be permitted to declare the refueling interlocks inoperable and continue fuel movement under the new Action statements.

The licensee has proposed to revise LCO 3.9.1 of the Perry TS as follows:

Currently, LCO 3.9.1, "Refueling Equipment Interlocks," reads:	<p><b>LCO 3.9.1</b></p> <p><b>APPLICABILITY:</b> The refueling equipment interlocks shall be operable during in-vessel fuel movement with equipment associated with the interlocks.</p> <p><b>ACTION:</b></p> <p><b>A.</b> One or more required refueling equipment interlocks inoperable,</p> <p><b>A.1</b> Immediately suspend in-vessel fuel movement with equipment associated with the inoperable interlocks.</p>
FENOC proposes to amend LCO 3.9.1 as follows,	<p><b>LCO 3.9.1</b></p> <p><b>APPLICABILITY:</b> The refueling equipment interlocks shall be operable during in-vessel fuel movement with equipment associated with the interlocks.</p> <p><b>ACTION:</b></p> <p><b>A.</b> One or more required refueling equipment interlocks inoperable,</p> <p><b>A.1</b> Immediately suspend in-vessel fuel movement with equipment associated with the inoperable interlocks.</p> <p><b>OR</b></p> <p><b>A.2.1</b> Immediately, insert a control rod withdrawal block.</p> <p><b>AND</b></p> <p><b>A2.2</b> Immediately, verify all control rods are fully inserted.</p>

## 2.1 Licensee's Justification

The proposed change would introduce alternative operator actions when the refueling equipment interlocks are inoperable. When operable, the equipment interlocks permit fuel loading to proceed without the need to apply a control rod withdrawal block at all times because the interlocks automatically detect inadvertent undesirable actions and initiate a control rod withdrawal block at the appropriate condition. The proposed alternative actions would immediately apply a CR withdrawal block when a refueling equipment interlock becomes inoperable and require verification that all control rods are fully inserted.

FENOC added that "the proposed additional Required Actions provide an equivalent level of assurance that fuel will not be loaded into a core cell with a control rod withdrawn as do the current Required Action or the Surveillance Requirement."

The primary refueling equipment interlock safety function is to block CR withdrawal when fuel is being moved over the core. The proposed actions would block CR withdrawals. The other refueling equipment interlock safety function is to prevent fuel from being loaded into the vessel when a CR is withdrawn. The proposed Required Action A.2.1 would also provide this function. The CR withdrawal block will prevent any CRs from being withdrawn inappropriately.

## 2.2 NRC Evaluation

### (1) Impact of the Proposed Change on the Prevention of Criticality During Refueling

USAR Section 15.4.1.1, "Control Rod Removal During Refueling," describes the functions of the refuel equipment interlocks. Paragraph 15.4.1.1.2 b. of the USAR states that "to minimize the possibility of loading fuel into a cell containing no control rod, it is required that all control rods are fully inserted when fuel is being loaded into the core. This requirement is backed up by the refueling interlocks on rod withdrawal and movement of the refueling platform. When the mode switch is in the 'refuel' position, the interlocks prevent the platform from being moved over the core if a control rod is withdrawn and fuel is on the hoist. Likewise, if the refueling platform is over the core and fuel is on the hoist, control rod motion is blocked by the interlocks." The corresponding USAR Section 15.4.1.1.3, "Core and System Performances," states: "Since the probability of inadvertent criticality during refueling is precluded, the core and system performances were not analyzed. The withdrawal of the highest worth control rod during refueling will not result in criticality. This is verified experimentally by performing shutdown margin checks.... Additional reactivity insertion is precluded by the interlocks (see Section 7.6). As a result, no radioactive material is ever released from the fuel making it unnecessary to access any radiological consequences." Therefore, the refueling interlocks block any inappropriate movement of CRs to prevent the reactor from becoming critical during refueling.

With the reactor mode switch in the "refuel" position, the refueling interlocks receive and process signals from the refueling equipment. The refueling platform position indication interlock senses whether the platform is over or near the core; the refueling platform main hoist grapple senses whether fuel is loaded; and the all-rods-in interlock senses whether all the control rods are inserted to their full-in position. The refueling equipment interlocks combine the signals to enforce the design-basis assumptions by preventing the operation of the refueling equipment to move fuel if all CRs are not inserted and preventing CR withdrawals if fuel loading is in progress. The one-rod-out interlock and the refueling equipment interlocks prevent inadvertent fuel loading into defueled uncontrolled cells and inadvertent withdrawal of a CR next to or near another loaded fuel cell with a withdrawn CR. The refueling equipment interlocks

prevent fuel loading unless all CRs are inserted, and if fuel loading is in progress, the interlocks prevent CR withdrawals. These restrictions also minimize the impact of more reactive mislocated fuel assemblies because CR withdrawals are not allowed before core loading verifications are completed. An additional safety feature in the CR design makes it physically difficult to decouple and remove a CR blade without first removing the fuel assemblies from the fuel cell.

Core physics calculations indicate that two loaded adjacent uncontrolled fuel cells<sup>1</sup> may result in prompt critical conditions. If the loaded uncontrolled fuel cells (LUFCs) are separated by an inserted CR, a critical condition can ensue. But if two LUFCs are separated by two inserted CRs, the core reactivity will remain subcritical. Two LUFCs can be created by an inadvertent CR withdrawal next to an LUFC. In addition, inadvertent loading of fuel into defueled uncontrolled fuel cells can also result in LUFCs.

The amendment proposes to start or resume fuel movement with inoperable refueling interlocks with two provisos:

- CR withdrawals are blocked during fuel movement with inoperable refueling interlocks. This prevents simultaneous activities that affect reactivity and minimizes the probability of inadvertently withdrawing CRs from loaded fuel cells (creating two LUFCs), and
- All CRs are verified to be fully inserted. Verifying that all CRs are fully inserted before loading fuel during a core offload/spiral reload, reduces the possibility of inadvertently loading fuel into defueled uncontrolled fuel cells (fuel loading error).

The proposed alternative will compensate for the inoperable refueling interlocks function by (1) verifying all CRs are inserted when moving fuel and (2) blocking CR withdrawals during fuel movements.

During refueling operations, the following LCOs are applicable:

- LCO 3.9.1 requires that the refueling equipment interlocks be OPERABLE. With one or more required refueling equipment interlocks inoperable, the current Action statement requires immediate suspension of fuel movement.
- LCO 3.9.2 requires that the refuel position one-rod-out interlock be OPERABLE. With the refuel position one-rod-out interlock inoperable, the Action statement requires immediate suspension of CR withdrawal and initiation of actions to fully insert CRs in core cells containing one or more fuel assemblies.
- LCO 3.9.3 requires the licensee to fully insert all CRs when loading fuel assemblies into the core. With one or more CRs not fully inserted, the Action statement requires immediate suspension of loading fuel assemblies into the core.
- LCO 3.9.4 requires that one CR "full-in" position indication channel for each CR shall be OPERABLE while in Mode 5. With one or more required CR position indication channels inoperable, the Action statement requires either (1) immediate suspension of

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<sup>1</sup> A fuel cell with all four fuel assemblies inserted and a fully withdrawn CR is referred to as a loaded uncontrolled fuel cell.

in-vessel fuel movement, suspension of CR withdrawal, and initiation of actions to fully insert all CRs in core cells containing one or more fuel assemblies, or (2) immediate initiation of actions to fully insert the CR associated with the inoperable position indication and action to disarm the CR drive associated with the fully inserted CR.

- LCO 3.9.5 requires that each withdrawn CR shall be OPERABLE while in Mode 5. With one or more withdrawn CRs inoperable, the Action statement requires immediate action to fully insert inoperable withdrawn CRs.

LCO 3.10.6 is a Special Operations TS that permits multiple CRs to be withdrawn in Mode 5 under specific administrative controls. LCO 3.10.6, which only allows for fuel assemblies to be loaded in compliance with an approved spiral reload sequence, permits concurrent suspension of the requirements of LCO 3.9.3, 3.9.4, and 3.9.5 along with bypassing the "full-in" position indication for any number of CRs. Therefore, under LCO 3.10.6, the licensee could take the above actions, enter the Action statements in LCO 3.9.2, and start loading fuel with 30 to 50 CRs withdrawn from defueled cells for maintenance.

LCO 3.9.1 prevents inadvertent refueling errors by requiring that the refueling equipment interlocks remain operable. If the licensee were to conduct refueling activities under LCO 3.10.6 and subsequently declare the refueling equipment interlocks inoperable (in order to defer performance of SR 3.9.1.1), the proposed changes to LCO 3.9.1 would permit continued refueling activities following the immediate insertion of a CR withdrawal block and verification that all CRs are fully inserted. The staff considers these actions sufficient to prevent inadvertent refueling errors thereby ensuring that the objectives of LCO 3.9.1 are met. Therefore, the proposed changes provide equivalent protection against inadvertent criticality during refueling and will not significantly increase the risk of inadvertent criticality.

## (2) Impact of the Proposed Change on the SRs

The licensee reviewed the SR tests from two outages to determine if a longer SR interval would increase the probability that the interlocks would fail the CFT. The licensee reported that (1) the instrumentation associated with the interlocks did not require excessive corrective maintenance, and (2) the self-identifying indications, alarms, and rod blocks, rather than the CFTs, alerted the operators to instrument failures. The licensee reviewed the corrective maintenance history of the instrumentation and found no evidence that inoperable instrument or logic would remain undetected until the next SR if the CFT surveillance interval were extended.

Since the licensee may defer the SR if this amendment is approved, the staff referred to the licensee's submittal of April 9, 1997, to verify the reliability of the refueling equipment interlocks. The submittal showed that the refueling equipment interlocks are reliable and that indications and alarms will alert operators to inoperable interlock instrumentation. The licensee stated that the objective of the current amendment is to defer the surveillance interval and thereby not disrupt fuel movement operations as opposed to operating with inoperable refueling equipment interlocks. As stated in the licensee's submittal of April 9, 1997, and subsequently verified by the staff, the licensee's procedures require performance of SR 3.9.1.1 prior to initiating in-vessel fuel movement. Therefore, the licensee may defer the second CFT (i.e., 7 days into fuel movement) and continue in-vessel fuel movement provided that they declare the refueling equipment interlocks inoperable, apply a withdrawal block to all CRs, and verify that all control rods are inserted.

The Integrated Operating Instruction of the Perry Operations Manual (OM) requires the licensee to perform the reactor mode switch refuel mode functional test once every 7 days (SVI-C71-T0427) or suspend core alteration. SVI-C71-T0427 requires the licensee to demonstrate the operability of the reactor mode switch-refuel position interlocks.

This amendment will not affect any requirements that involve the operability and reliability of the refueling equipment hardware. Any LCO or SR (whether in the TS or licensee-controlled documents) that ensures the operability of the refueling platform and the fuel grapple main hoist will remain in force. The proposed amendment involves only the instrumentation and logic of the refueling equipment interlocks.

The Perry Operational Requirements Manual (ORM) 6.5.4, "Refueling Platform," requires the refueling platform to be operable during handling of fuel assemblies or control rods within the reactor pressure vessel. The ORM 6.5.4 Action states: "With the requirements for refueling platform OPERABILITY not satisfied, suspend use of any inoperable refueling platform equipment from operations involving the handling of control rods and fuel assemblies within the reactor pressure vessel after placing the load in a safe condition." Therefore, the refueling equipment should be functional and any pertinent requirements should be met.

The staff has evaluated the impact of the proposed change on SR 3.9.1.1 and finds it acceptable because

- the proposed change will compensate for the function of the inoperable interlocks,
- the refueling equipment hardware is still required to be operable,
- the licensee's procedures require performance of SR 3.9.1.1 prior to initiating in-vessel fuel movement, and
- the objective of the proposed change is to extend the SR interval rather than to conduct refueling operations with inoperable interlocks.

### 3.0 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.

### 4.0 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. The staff has determined that the amendment involves no significant increase in the amounts and no significant change in the types of any effluents 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 46439). 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), no environmental impact statement or environmental assessment need be prepared in connection with the issuance of this amendment.

## 5.0 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 Contributor: Zena Abdullahi, NRR

Date: September 12, 2000