March 7, 2003

Mr. William R. Kanda
Vice President - Nuclear, Perry
FirstEnergy Nuclear Operating Company
Perry Nuclear Power Plant
P.O. Box 97, A200
10 Center Road
Perry, OH 44081

SUBJECT: PERRY NUCLEAR POWER PLANT, UNIT 1 - ISSUANCE OF AMENDMENT (TAC NO. MB4694)

Dear Mr. Kanda:

The U.S. Nuclear Regulatory Commission has issued the enclosed Amendment No. 123 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 March 14, 2002 (PY-CEI/NRR-2614L), as supplemented by letters dated July 17 (PY-CEI/NRR-2649L) and September 12, 2002 (PY-CEI/NRR-2659L), and January 24, 2003 (PY-CEI/NRR-2682L).

This amendment supplements License Amendment No. 100, which was issued on February 24, 1999, by placing restrictions on removing the inclined fuel transfer system (IFTS) blind flange during Operational Modes 1, 2, and 3. The amendment includes a time limit on the removal of the IFTS blind flange, provides a requirement to install the upper pool IFTS gate prior to IFTS blind flange removal, and limits the unbolted configuration of the IFTS blind flange when it is rotated.

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/ by D. Pickett

Stephen P. Sands, 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. 123 to
License No. NPF-58
2. Safety Evaluation

cc w/encls: See next page

March 7, 2003

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Vice President - Nuclear, Perry
FirstEnergy Nuclear Operating Company
Perry Nuclear Power Plant
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Docket No. 50-440

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License No. NPF-58
2. Safety Evaluation

DISTRIBUTION:

PUBLIC	MRubin	OGC
PD 3-2 r/f	AMendiola	WBeckner, TSB
ACRS	SSands	GGrant, RIII
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ADAMS ACCESSION NUMBER: ML030360652

OFFICE	PM:PD3-2	LA:PD3-2	SC:SPSB	SC:SPLB	OGC	SC:PD3-2
NAME	SSands ***/RA/ by DPickett***	THarris	MRubin*	SWeerakkkody**	AHodgen	AMendiola ***/RA/ by L***
DATE	02/25/03	03/03/03	01/10/03	12/13/03	03/05/03	03/06/03

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*See MRubin to AMendiola memorandum dated January 9, 2003
**See SWeeerakkody to AMendiola memorandum dated December 13, 2002

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FIRSTENERGY NUCLEAR OPERATING COMPANY

DOCKET NO. 50-440

PERRY NUCLEAR POWER PLANT, UNIT 1

AMENDMENT TO FACILITY OPERATING LICENSE

Amendment No. 123
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 March 14, 2002, as supplemented by letters dated July 17 and September 12, 2002, and January 24, 2003, 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. 123 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 the date of its issuance and shall be implemented within 90 days of the date of issuance.

FOR THE NUCLEAR REGULATORY COMMISSION

/RA/ by LRaghavan

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: March 7, 2003

ATTACHMENT TO LICENSE AMENDMENT NO. 123

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	Insert
3.6-1	3.6-1
3.6-16a	3.6-16a

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELATED TO AMENDMENT NO. 123 TO FACILITY OPERATING LICENSE NO. NPF-58

FIRSTENERGY NUCLEAR OPERATING COMPANY

PERRY NUCLEAR POWER PLANT, UNIT 1

DOCKET NO. 50-440

1.0 INTRODUCTION

The inclined fuel transfer system (IFTS) blind flange forms part of the primary containment boundary and is used to satisfy containment isolation requirements during power operation. License Amendment No. 100, issued by the Nuclear Regulatory Commission (NRC) on February 24, 1999, revised the Perry Nuclear Power Plant (PNPP) Technical Specifications (TSs) to permit removal of the IFTS blind flange during Modes 1, 2, or 3. Prior to Amendment 100, the IFTS blind flange was only permitted to be removed in Modes 4 or 5. Subsequent to Amendment No. 100, it was identified that the analysis for this TS change did not contain the rigor commensurate with the change. As a result, Licensee Event Report (LER) 2001-001, "Potential for Inadequate Suppression Pool Make-Up for the Emergency Core Cooling Systems," was generated and the allowance to remove the IFTS blind flange was suspended until this configuration could receive additional evaluation.

The supplemental information contained clarifying information and did not change the initial no significant hazards consideration determination and did not expand the scope of the original *Federal Register* notice.

2.0 BACKGROUND

A more comprehensive technical evaluation has since been performed by the licensee to support removal of the blind flange. By letter dated March 14, 2002, and supplemented by letters dated July 17 and September 12, 2002, and January 24, 2003, FirstEnergy Nuclear Operating Company submitted a License Amendment Request (LAR) containing restrictions for removing the IFTS blind flange. This LAR supplements Amendment 100 by including: (1) a limit of 60 days per cycle on the time that the IFTS blind flange is removed and the IFTS tube is open, (2) a limit of 20 hours per 12 month period on the time that the IFTS is unbolted for removal or re-installation of the blind flange, (3) a requirement to install the upper pool IFTS gate and to remove the lower fuel transfer pool gates prior to IFTS blind flange removal, and (4) a requirement that the fuel-handling building be closed and the fuel-handling area exhaust subsystem be in operation during IFTS blind flange removal activities during Modes 1, 2, or 3. The LAR is for IFTS blind flange removal to accommodate testing, maintenance or design modification work on the IFTS prior to a plant outage, and not for the movement of any fuel. The technical evaluation in support of the change included both a deterministic as well as probabilistic evaluation.

3.0 TECHNICAL EVALUATION

3.1 Suppression Pool Makeup Inventory

In LER 2001-001, the licensee identified that removal of the IFTS blind flange at power could affect the suppression pool makeup (SPMU) system's ability to support the emergency core cooling system (ECCS). The SPMU system provides makeup water that can be transferred from the upper containment pools to the suppression pool following a loss-of-coolant accident (LOCA). The upper containment pools include the steam separator storage pool, the reactor cavity, and the dryer storage pool. With the IFTS flange removed at power and the upper pool IFTS gate removed, the potential exists to drain the upper containment pools and reduce the inventory available to the SPMU system. Reduced suppression pool water volume and increased suppression pool temperature could result in a subsequent loss of suction pressure for the ECCS pumps. The SPMU system is required in Modes 1, 2, and 3 by TS 3.6.2.4, "Suppression Pool Makeup (SPMU) System."

The licensee's proposed resolution for the above concern is to install the upper containment pool gate (upper pool IFTS gate) between the IFTS pool and the dryer storage pool, which provides the flow path between the upper containment pool and the IFTS pool. The upper pool IFTS gate will isolate the upper containment pool water inventory from the top of the IFTS tube to eliminate the potential for draining the upper containment pool water inventory and ensure the availability of the water inventory for the SPMU system. This upper containment pool gate, also referred to as the IFTS gate, is safety-related and has a passive "J" seal designed to be capable of sealing against the full hydrostatic head with a leakage less than 50 gpm. With the gate installed, a failure of the IFTS could result in loss of water from the upper IFTS pool, but would have no impact on the SPMU volume from the other upper containment pools. The inventory in these remaining pools is sufficient to support the SPMU function. The gate seals are constructed of ethylene propylene diene monomer (EPDM) and are fully capable of performing their safety function under the conditions postulated for this LAR. The material type and material manufacturer for the gate seals are the same as those for the PNPP's safety-related containment air lock door seals.

In addition, the licensee identified potential flow paths that might impact the SPMU system. There are four 1" siphon breaker lines which connect the IFTS pool to each of the upper containment pools. The siphon breaker lines terminate in the upper IFTS pool below the required SPMU water level. If the IFTS pool should begin to drain, water from the upper containment pools could be drained through these four lines. To address this concern, the licensee initially proposed to extend the elevation of the affected siphon breaker lines that discharge to the upper IFTS pool to above the minimum required SPMU level. The licensee committed to complete this modification prior to the implementation of the proposed LAR. By letter July 17, 2002, the licensee withdrew the commitment of siphon breaker modification in lieu of additional controls on water inventory. The licensee performed an additional detailed analysis and found that the modification was not necessary provided the suppression pool level is raised to 17 ft-11.7 inches and the upper containment pool is maintained at or above the normal minimum Technical Specification level of 22 ft-9 inches. These water levels are consistent with Technical Specification Surveillance Requirement (SR) 3.6.2.4.1.b for the SPMU system. Also, as a preventive measure, the fuel pool cooling and cleanup (FPCC) fuel transfer and storage pool supply isolation will be closed to isolate the normal flow of supply water to the IFTS pool area. These additional controls are stated in a reworded Technical Specification SR 3.6.1.3.4, Note 4. The staff reviewed the licensee's analysis and found it acceptable.

The staff reviewed the proposed modifications and found them acceptable because the modifications will isolate the SPMU water inventory from IFTS to ensure the availability of the water inventory for the SPMU system and resolve the safety concern identified in the LER.

3.2 Flood Analyses

The licensee performed a flood analysis assuming the upper IFTS tube components fail when the bottom valve is open, thus allowing water in the upper IFTS pool to drain down to the lower fuel transfer pool via the IFTS tube. It was assumed that the gate between the upper IFTS pool and the dryer storage pool is installed as previously discussed. It was also assumed that the fuel pool cooling and cleanup system does not handle the added flow and water ultimately overflows the lower pools. The overflow results in a maximum flood height of less than 8 inches within the fuel-handling building. This flooding height does not affect the limiting components for flooding in the areas of concern (fuel-handling building). The limiting components are containment isolation valves and an instrument air system pressure transmitter, which are located in the fuel-handling building at a height greater than 3 feet off the floor. The licensee's flood analysis has shown that worst case postulated flooding with implementation of the proposed LAR is bounded by existing flooding analyses for the affected buildings.

To mitigate any potential flooding, water leakage detection is provided by high water level instrumentation that consists of control room annunciation for the fuel-handling building lower pool water level. Based on indications of an increase in lower pool level, this instrumentation can be used indirectly to monitor the upper IFTS pool water level when the IFTS is in service. To provide this indication, the lower pool gate(s) need to be removed. The licensee will establish a procedure requirement to remove the lower pool gates as part of the implementation of the proposed LAR. Based on the results of licensee's flood analysis, the staff's concern on the potential flooding resulting from the removal of the IFTS blind flange is resolved.

3.3 Containment Integrity

Removal of the IFTS blind flange during Modes 1, 2, or 3 affects containment integrity. In Amendment 100, issued on February 24, 1999, the licensee addressed containment integrity requirements assuming a design-basis large-break LOCA (LBLOCA) with the IFTS blind flange removed. The capability of the water seal in the IFTS tube is calculated to be higher than the peak containment pressure of 7.8 psig resulting from the LBLOCA. Therefore, it was concluded that containment integrity would be maintained. However, the small-break LOCA (SBLOCA) was not considered in Amendment 100.

In general, the SBLOCA results in lower containment pressures than the LBLOCA. Perry's updated safety analysis report (USAR) Section 6.2.1.1.5, describes a SBLOCA with drywell bypass leakage. If drywell bypass leakage is sufficiently large and no credit is taken for operator action (i.e., initiation of containment sprays), the containment pressure resulting from a SBLOCA could be higher than the pressure resulting from a LBLOCA and higher than the capability of the IFTS water seal. If the bottom gate valve of the IFTS tube was not closed, the water seal would be expelled from the IFTS tube and containment integrity would be breached. In a letter dated March 3, 2000, the licensee responded to the staff's concern by stating that the offsite dose consequences of a SBLOCA was bounded by a LBLOCA, thus, making the LBLOCA the design basis for IFTS flange removal. However, the staff did not agree because General Design Criteria 16, 50, and 54 of 10 CFR Part 50, Appendix A (i.e., containment integrity) could be violated following a SBLOCA with IFTS blind flange removal. Both containment integrity and offsite dose consequences are required to be analyzed for a spectrum of breaks. Furthermore, if a SBLOCA were concurrent with a loss-of-offsite power with the bottom gate valve open, a reactor scram and containment evacuation signal would likely follow thus precluding plant personnel from taking the necessary manual actions needed to close the bottom gate valve. Therefore, the staff's focus was on the licensee demonstrating the leak tightness of the drywell.

In the amendment request, the licensee addressed the containment integrity issues described above. If drywell bypass leakage is demonstrated to be sufficiently low, the containment pressure resulting from a SBLOCA will be less than the pressure resulting from a LBLOCA. The licensee identified two drywell leakage tests at PNPP, namely, (1) the drywell bypass leakage test performed at a frequency of once per 10 years as required by the TSs, and (2) additional confirmatory testing every fuel cycle (24 months). The staff did not consider the frequency and acceptance criteria of the TS surveillance requirements to be adequate to address the drywell bypass leakage concern. The staff requested additional information from the licensee to clarify the 24-month confirmatory test for drywell leakage.

By letter dated September 12, 2002, the licensee described the drywell leak testing performed once every fuel cycle. PNPP USAR Appendix 1B contains regulatory commitments that cannot be changed without prior review and approval by the staff. Commitment 18 of USAR Appendix 1B describes an assessment of drywell bypass leak tightness that must be performed once per operating cycle. This testing is performed per Surveillance Instruction SVI-T23-T0401, “Drywell Integrity Verification Test.” The test is performed by pressurizing the drywell with airflow from the combustible gas control system at a capacity of 500 standard cubic feet per minute (scfm). A calculation is then performed to verify that the measured leakage rate is within the acceptance criteria of 400 scfm. The acceptance criterion of 400 scfm is 7 percent of the TS allowable limit and less than 1 percent of the design limit. The licensee stated that as long as the TS allowable limit (10 percent of the design limit) is maintained, the containment pressure resulting from SBLOCA will be substantially less than the capability of the IFTS water seal. Based on a previous analysis performed by a similar plant (i.e., River Bend Station, Unit 1), the staff found 10 percent of the design limit acceptable. The licensee committed that prior to plant restart following a USAR Appendix 1B test failure, it would confirm that the TS allowable design limit is being met. In addition, the licensee stated that the actual values resulting from previous TS surveillance tests ranged between 0.2 percent to 4.2 percent of the design value (< 10 percent criterion with sufficient margin). The staff finds that maintaining drywell leakage in this range ensures that the containment pressures following a SBLOCA would be lower than the capability of the IFTS water seal.

Based on the additional drywell leakage as test described above along with the actual test data, the staff concludes that the containment pressure resulting from a SBLOCA will be limited. Therefore, the staff found that the concern of the adequacy of water seal capability following a SBLOCA is resolved.

3.4 Probabilistic Evaluation

The NRC staff has considered the risk implications of the licensee's request to remove the blind flange for up to 60 days per operating cycle while in Modes 1, 2, or 3, and to permit limited operation of the IFTS during that period. The primary concerns in terms of risk involve the potential for blind flange removal and IFTS operation to adversely impact: (1) suppression pool makeup capability, (2) containment isolation reliability, and (3) containment ultimate pressure capacity. Removal of the blind flange could also affect the integrity of the containment in beyond-design-basis seismic events. An adverse impact on suppression pool makeup could result in an increase in core damage frequency (CDF), whereas an adverse impact on containment isolation capability/reliability or containment ultimate pressure capacity could result in an increase in releases to the environment. These releases could potentially contribute to the large early release frequency (LERF) for the plant. Guidance on acceptable levels of increase in CDF and LERF is contained in Regulatory Guides (RGs) 1.174 and 1.177 (References 1 and 2), and provides a basis for confirming that the increases are small and consistent with the intent of the Commission's Safety Goal Policy Statement. The NRC staff used this guidance in assessing the risk impact of the proposed changes, as discussed below.

The impact of the proposed change on suppression pool makeup, containment isolation reliability, containment ultimate pressure capacity, and seismic risk is provided below.

3.4.1 Suppression Pool Makeup

A loss of water from the upper containment pool through the IFTS could result in the failure of makeup to the suppression pool from the SPMU system. Reduced suppression pool volume and increased suppression pool temperature could result in a subsequent loss of ECCS suction pressure for some scenarios, and a net increase in CDF.

The licensee reviewed the SPMU system calculations to determine the upper pool water inventory needed to maintain the system operable. The upper IFTS pool inventory was not credited because the IFTS tube and associated components that provide isolation for the upper IFTS pool (e.g., sheave box, fill valve, flap valve, vent pipe) are non-safety and non-seismic. As a result of this assessment, the licensee has established a requirement to install the upper containment pool gate (between the IFTS pool and the dryer storage pool within the upper containment) prior to IFTS blind flange removal during Modes 1, 2, or 3. This upper containment pool gate, also referred to as the IFTS gate, is safety-related and has a passive "J" seal designed to be capable of sealing against the full hydrostatic head, with a leakage less than 50 gpm. The licensee also established a requirement to close the FPCC fuel transfer and storage pool supply isolation valve prior to IFTS blind flange removal. This would prevent any cross-connected drainage to the IFTS pool from the rest of the upper pool area if the IFTS pool level is lowered. With the upper containment pool gate installed and the FPCC isolation valve closed, a failure of the IFTS would result in loss of water from the upper IFTS pool, but would have no impact on the SPMU volume from the other upper containment pools. The inventory in these remaining pools is sufficient to support the SPMU function. The actions described above to close the upper containment pool gate and FPCC isolation valve are included in the revised Note 4 to TS Surveillance Requirement 3.6.1.3.4.

The probabilistic safety assessment (PSA) evaluation conservatively assumed that the IFTS gate is not installed during IFTS operation in Modes 1, 2, or 3, and that failure of either the IFTS bottom gate valve or the IFTS drain valve would reduce the SPMU volume and fail the SPMU function. The SPMU function is important for assuring adequate net positive suction head

(NPSH) for the ECCS pumps in anticipated transient without scram scenarios, but is not necessary for adequate NPSH in LOCA scenarios at PNPP.

The licensee estimated an increase in CDF of about 3E-9 per year based on the frequency of sequences requiring SPMU, in conjunction with the probability of spurious actuation of either the IFTS bottom gate valve or drain valve, or the probability of gross leakage from the flap valve. This value is below the guideline value of 1E-7 per year provided in RG 1.174 for assuring that the increase in risk associated with a license amendment request is small and consistent with the intent of the Commission's Safety Goal Policy Statement. The incremental conditional core damage probability (ICCDP) for an exposure of 60 days per year is 1.8E-9. This value is below the ICCDP guideline value of 5E-8 provided in RG 1.177 for confirming that a proposed permanent TS change has only a small quantitative impact on plant risk. Based on these results, the staff concludes that the proposed LAR has an acceptably small impact on CDF.

3.4.2 Containment Isolation Reliability

Removal of the blind flange effectively extends the containment pressure boundary to include the IFTS transfer tube and associated piping and valves. New potential release paths are created by removal of the blind flange. These paths are from the upper containment to the fuel building through either the IFTS bottom valve and spent fuel storage pool, or the IFTS drain line and drain tank. Releases via these paths could impact LERF and the incremental conditional large early release probability (ICLERP), but would not impact CDF or ICCDP. To evaluate these release paths, the following three configurations were analyzed by the licensee:

1. releases via the bottom gate valve with flap valve open (carriage in upper position)
2. releases via the drain valve with flap valve open (carriage in upper position), and
3. vent tube releases via the drain valve or bottom gate valve with flap valve closed (carriage in lower position).

The potential impacts on LERF and ICLERP are described in the sections below.

3.4.2.1 Releases Via the Bottom Valve (carriage in upper position)

Containment isolation for this path is provided by the IFTS bottom gate valve and the IFTS water seal in the spent fuel storage pool. The IFTS operating procedure requires that, during long-term periods when the IFTS is not in use, the IFTS carriage must be stored in the containment (upper position). With the IFTS carriage in the upper position, the IFTS safety interlocks prevent opening of the bottom gate valve. Interlocks also prevent the IFTS bottom valve from opening when the IFTS tube is flooded, using head pressure of the water column above the bottom gate valve to operate a blocking valve in the bottom valve hydraulics. Potential mechanisms leading to a release via the bottom gate valve are: over-pressure of the IFTS tube, inadvertent operation of the bottom valve combined with clearing and displacement of the water seal, or excessive leakage of the bottom valve combined with clearing and displacement of the water seal.

Catastrophic failure or inadvertent operation of the bottom gate valve is unlikely due to the high pressure capacity of the valve relative to the anticipated accident loads, system interlocks, and the licensee's administrative controls for maintaining the valve closed. Excessive leakage is also not expected as it would be detected and isolated as a result of a gradual increase in the water level in the fuel-handling building water pool. In this regard, procedures will be revised as part of this amendment to require the gates between the lower IFTS pool and the fuel preparation and storage pool, and the spent fuel storage pools to be removed prior to blind flange removal in Modes 1, 2, or 3, in order to provide annunciation of abnormal pool water level using level instrumentation for these two pools.

In the unlikely event of bottom valve failure or leakage, the water seal will continue to maintain a leak-tight barrier to the release of fission products up to a containment pressure of about 10 psig. This pressure retention capability is assured by a technical specification change, implemented as part of Amendment 100, that requires the fuel-handling building fuel transfer pool water level to be maintained at least 40 feet above the pool bottom. At containment pressures greater than 10 psig, which could develop in a beyond-design-basis accident, the pressure inside the IFTS tube will exceed the hydrostatic pressure at the bottom valve outlet, and releases into the fuel-handling building water pool will occur. However, the releases would pass through and be scrubbed by approximately 20 feet of overlying water in the water pool. Accordingly, these releases would not be considered “large releases” based on the guidance in RG 1.174, and supporting documents such as NUREG/CR-6595 (Reference 3), and would not contribute to LERF. Additional fission product scrubbing by the water in the containment suppression pool may also occur prior to the fission products reaching the upper containment since releases from the reactor generally pass into or through the suppression pool. As part of this amendment, procedures will be established to require that fuel-handling building closure be in effect during periods when the blind flange is removed. This will ensure that the fuel-handling area exhaust subsystem is in operation when the blind flange is removed. This will further mitigate any fission products released via the fuel-handling building water pool. The licensee contends, and the staff concurs, that releases via the bottom isolation valve would not contribute to LERF for the aforementioned reasons.

3.4.2.2 Releases via the Drain Line (carriage in upper position)

Containment isolation for this path is provided by a motor operated valve (MOV) (1F42F003) in the drainline within the intermediate building. Although a manual isolation valve (1G41F0607) is also located in the drain line downstream of the MOV, this valve would not be easily accessible and is not credited for reasons described in the supporting documentation for Amendment 100. The drainline isolation valve may only be opened under administrative controls (described in Amendment 100) when the IFTS is being operated. During non-working hours when the IFTS is placed in long-term shutdown, the system will be isolated by closure of the drainline isolation valve. Potential failure modes that may lead to a release via the IFTS drainline are: over-pressure failure of the drainline or isolation valve, excessive leakage of the isolation valve, and inadvertent operation or failure to manually close the isolation valve.

The IFTS drainline is non-safety-related, but is constructed to American National Standards Institute B31.1 quality group standards. As part of the implementation of Amendment 100, a drainline pipe support was modified to provide the necessary support for dynamic loads anticipated in Modes 1, 2, or 3, and all pipe stresses were determined to be within American Society of Mechanical Engineers Code Section III allowables. In order to ensure pressure integrity in a beyond-design-basis event, the licensee assessed the ultimate pressure capacity of the drainline and drainline components and determined the capacity to be greater than that of the containment shell. (The capacity of the containment shell is 78 psig based on the lower bound vessel strength and 94 psig based on the mean vessel strength.)

The IFTS drainline isolation valve is a 4-inch, non-safety-related motor operated valve, with a rated pressure of 150 psig. This pressure capability is substantially greater than the pressure to which the valve will be exposed in a design-basis accident, and at the containment ultimate pressure capacity. A seismic assessment report was specifically prepared for the motor operated drain valve which demonstrated that the valve would remain functional following a seismic event. Based on the substantial pressure capacity of the IFTS drainline and drainline isolation valve relative to the expected accident pressures, the NRC staff considers the probability of over-pressure failure of the drainline and associated isolation valve to be negligible.

The potential for excessive leakage though the IFTS drainline is also considered very unlikely since: (1) the first drainline isolation valve is specifically included in the Primary Containment Leakage Rate Testing Program as a result of Amendment 100, (2) the first drainline isolation valve can be closed remotely by the IFTS operator at the IFTS control panel or, if necessary, the drainline isolation valves can be closed locally by the designated equipment operator, and (3) either valve is capable of withstanding full accident pressures. In the event of excessive leakage through the drainline, the manual gate valve located between the sheave box and the blind flange (1F42-F002) can also be closed, if necessary, although this is not proceduralized or credited in the licensee’s analysis.

Spurious or inadvertent operation of the drainline isolation valve, or failure to close an isolation valve that may be open during an IFTS evolution, could defeat the isolation provisions and result in releases to the environment. The IFTS control system contains interlocks that prevent the drainline isolation valve from opening when the flap valve is open. The interlocks also prevent the IFTS bottom valve from opening when the IFTS tube is flooded, using head pressure of the water column above the bottom gate valve to operate a blocking valve in the bottom valve hydraulics. Also, as part of the implementation of Amendment 100, the licensee has committed to designate an individual to be responsible for closing the isolation valve if an accident were to occur with the blind flange removed in Modes 1, 2, or 3. The likelihood of mis-positioning drainline isolation valves or failing to close at least one of the valves in response to an accident that occurs during IFTS operation is considered very small due to the system interlocks and administrative controls.

3.4.3 Vent Tube Releases Via the Drain Valve or Bottom Gate Valve (carriage in lower position)

With the blind flange removed and the flap valve closed, the bottom gate valve and the drainline would typically be open. A potential containment bypass path exists from the upper containment (via the open IFTS vent tube) past either the IFTS bottom gate valve or the IFTS drain valve.

As discussed above, in the event of bottom valve failure or leakage, the water seal will continue to maintain a leak-tight barrier to the release of fission products up to a containment pressure of about 10 psig. At containment pressures greater than 10 psig, releases into the fuel-handling building water pool will occur, but would pass through and be scrubbed by approximately 20 feet of overlying water in the water pool. Accordingly, these releases would not be considered “large releases” based on the guidance in RG 1.174 and supporting documents such as NUREG/CR-6595, and would not contribute to LERF.

In the event of drainline isolation failure, the size of the flow path (4-inch diameter sheave box vent line and 4-inch diameter drainline) would reduce the magnitude of the release, but is not sufficiently restrictive to completely eliminate the potential for early health effects. The fission products would not pass through (and be scrubbed by) the water in the spent fuel storage pool. The releases might be scrubbed by the suppression pool prior to reaching the upper containment; however, the drywell-to-wetwell leakage allowed by TS is large enough that fission products released during the late stages of an accident (at low steaming rates) may bypass the suppression pool. The net result is that releases via the IFTS drainline may contribute marginally to LERF.

3.4.4 Integrated Impact on LERF

The increase in LERF due to each of the above leak paths was modeled and quantified by the licensee using the plant-specific PSA. Releases from the bottom valve are scrubbed and are not considered to be large releases as described above. Based on anticipated IFTS operations described in a September 12, 2002, license amendment supplement, the licensee estimates that the IFTS carriage will be in the lower position (with the IFTS bottom valve and drain valves open and the flap valve closed) for a maximum of approximately 7 days, and the carriage will be in the upper position (with the IFTS bottom valve and drain valves closed and the flap valve open) for a maximum of approximately 15 days within the requested 60 day period. The supporting PSA analysis bounded the expected times for the actual IFTS configurations by assuming the carriage is in the lower position for 10 of the 60 days per year, and in the upper position for 50 of the 60 days per year.

Events were added to the Level 2 PSA to represent inadvertent opening of the drainline isolation valve and failure of the designated individual to close the isolation valve. A failure rate of 5E-7 per hour was assumed for inadvertent opening of the isolation valve. This is conservative relative to NUREG/CR-2728 (Reference 4), which provides a value of 1E-7 per hour. A failure probability of 0.01 per demand was assumed for failure of the designated individual to close the isolation valve, based on NUREG/CR-1278 (Reference 5). Failure of the IFTS drain valve and failure of the designated individual to close the valve coincident with a core damage event was assumed to result in a large early release, i.e., fission product scrubbing by the containment suppression pool was not credited.

The increase in LERF for the proposed change was computed to be 2.5E-7 per reactor year. This includes the contribution from events involving loss of SPMU, as described in Section 2.1. In accordance with RG 1.174, license amendments resulting in increases in LERF in the range of 1E-7 to 1E-6 per reactor year will be considered if it can be reasonably shown that the total LERF is less than 1E-5 per reactor year. The licensee has evaluated the total LERF from both internal and external events. The total LERF due to internal events for the IFTS configuration, including the SPMU contribution, is 6.0E-7 per year. The fire contribution to LERF for the IFTS configuration was quantified to be 3.5E-6 per year using current models. Although the LERF for internal flooding and seismic events was not explicitly determined, the LERF would be no greater than the CDF for these events, which is currently estimated to be 1.1E-6 per year and 4.0E-6 per year, respectively. Combining the above internal, fire, seismic and flooding results, it is concluded that the total LERF for the baseline and the IFTS configuration is less than 1E-5 per reactor year. Since the total LERF for the proposed configuration is less than 1E-5 per reactor year, the proposed change is consistent with the acceptance guidelines in RG 1.174.

The ICLERP is calculated to be 4.1E-8. This is below the ICLERP guideline value of 5E-8 provided in RG 1.177 for confirming that a proposed permanent TS change has only a small quantitative impact on plant risk.

3.5 Containment Ultimate Pressure Capacity

Removal of the blind flange introduces the possibility of a structural failure of the IFTS tube or connected piping at a beyond-design-basis pressure or seismic loading lower than if the blind flange were installed. Accordingly, the licensee assessed the pressure capacity of the IFTS transfer tube and connected piping, and its impact on the ultimate pressure capacity of the containment and LERF.

The licensee did not perform a fragility analysis to determine the failure pressure of the IFTS transfer tube, but performed engineering calculations that showed the IFTS components could withstand a containment pressure of 100 psig while maintaining considerable margin to the normal allowable stresses (hoop stresses of 2400 psi compared to the normal allowable stress of greater than 15,000 psi). The stresses in the drainline represent an even smaller fraction of the allowable because of the smaller diameter of the drainline. The pressure capacities of the upper and lower IFTS gate valves and both IFTS drainline isolation valves were also assessed and found to have ample margins above the estimated pressure loads.

The pressure to which the IFTS tube and drainline would be exposed is the sum of the containment pressure and the static water head of the overlying containment water pool. The static head is approximately 35 psig inside the transfer tube at the elevation of the top of the fuel transfer pool. (The static head at lower elevations within the tube is greater, but is offset by the pressure head of the fuel transfer pool which acts in a reverse direction. Thus, the containment pressure would have to exceed about 65 psig in order to exceed the IFTS tube pressure of 100 psig used in the engineering calculations. Plant emergency instructions specify that preparation for venting the containment be initiated at a pressure of 15 psig, and require that venting be performed if pressure cannot be maintained below the primary containment limit, which is 40 psig (or less, depending on containment water level). As such, containment pressure is not expected to exceed the values assumed in the licensee's engineering calculations. Even if venting is unsuccessful, the margins indicated in the engineering calculations are sufficiently large that failure of the containment shell appears more likely than failure of the IFTS tube or drainline (the capacity of the containment shell is 78 psig based on the lower bound vessel strength and 94 psig based on the mean vessel strength). Accordingly, the staff concludes that the containment ultimate pressure capacity would not be adversely impacted by removal of the blind flange.

3.6 Seismic Risk

The IFTS tube is classified as Seismic Category I. The licensee indicates that modifications to the IFTS drainline were completed as part of the implementation of Amendment 100, and an evaluation has shown that the drainline is seismically qualified.

The licensee determined that the primary impact of seismic events on the proposed LAR is during the removal and re-installation of the blind flange when the flange bolting is de-tensioned. This condition would exist for a total duration of approximately 20 hours (10 hours when the flange is being removed and 10 hours when the flange is being re-installed).

The licensee assumed an operating basis earthquake (OBE) or greater would be required to initiate a reactor scram and fail the bellows when the flange is de-tensioned. They conservatively estimated the mean frequency of a seismic event greater than OBE (0.075g) to be 2.5E-4 based on NUREG-1488 (Reference 6). This yields a mean probability of 5.7E-7 that the seismic event occurs during the period the flange is being removed or re-installed. They further estimated the conditional core damage probability for an unrecovered loss of offsite power where only ECCS is available for mitigation (i.e., no credit for non-qualified equipment) to be 3.9E-4. This results in a ICCDP of 2.2E-10, and an ICLERP of 2.2E-10 (the same probability) if all core damage events are assumed to proceed to a large early release. This value is less than the ICCDP and ICLERP guideline values of 5E-7 and 5E-8 provided in RG 1.177 for confirming that a proposed permanent TS change has only a small quantitative impact on plant risk. The licensee also performed a bounding evaluation in which seismic events greater than the review level earthquake of 0.30g were assumed to result in core damage and a large early release. This resulted in an incremental probability of core damage and large early release of 4.3E-8 (based on NUREG-1488), which is still below the guideline values provided in RG 1.177. To limit the seismic risk associated with the unbolted IFTS flange, the licensee has included within the proposed TS a limit of 20 hours per year on the time during which the blind flange will be unbolted for removal or re-installation.

On the basis of the implementation of the seismic upgrades to the IFTS drainline, the further assessment of seismic aspects of the IFTS on the CDF and LERF, and the licensee's commitment to limit the time during which the unbolted configuration would exist, the NRC staff concludes that the proposed LAR would not have a substantial impact on the risk from seismic events.

3.7 Risk Conclusions

The primary concerns in terms of risk involve the potential for blind flange removal and IFTS operation to adversely impact: (1) suppression pool makeup capability via loss of containment building fuel transfer pool inventory, (2) containment isolation reliability, and (3) containment ultimate pressure capacity. Removal of the blind flange could also affect the integrity of the containment in beyond-design-basis seismic events. Guidance on acceptable levels of increase in CDF and LERF is contained in RG's 1.174 and 1.177, and provides a basis for confirming that the increases are small and consistent with the intent of the Commission's Safety Goal Policy Statement. The NRC staff used this guidance in assessing the risk impact of the proposed changes. NRC staff conclusions are summarized below.

Blind flange removal and operation of the IFTS during Modes 1, 2, or 3, will have an insignificant impact on CDF for Perry. With the IFTS gate installed in accordance with the proposed TS, an IFTS would result in loss of water from the upper IFTS pool, but would have no impact on the SPMU volume from the other upper containment pools. The inventory in these remaining pools is sufficient to support the SPMU function. Even if the IFTS gate is not installed during IFTS operation in Modes 1, 2, or 3, the increase in CDF would be below the acceptance guideline values provided in RGs 1.174 and 1.177. Based on these results, the staff concludes that the proposed LAR has an acceptably small impact on CDF.

Catastrophic failure or inadvertent operation of the IFTS bottom gate valve is not expected due to the high pressure capacity of the valve relative to the anticipated accident loads, and the administrative controls for maintaining the valve closed. Excessive leakage is not expected as it would be detected and isolated as a result of a gradual increase in the water level in the fuel-handling building water pool. In this regard, procedures will be revised as part of this amendment to require the gates between the lower IFTS pool and the fuel preparation and storage pool and the spent fuel storage pools to be removed prior to blind flange removal in Modes 1, 2, or 3, in order to provide annunciation of abnormal pool water level using level instrumentation for these two pools. In any event, flow through the IFTS bottom valve will be scrubbed by approximately 20 feet of overlying water in the spent fuel storage pool. Accordingly, these releases would not be considered “large releases” based on the guidance in RG 1.174 and supporting regulatory documents, such as NUREG/CR-6595.

Catastrophic failure or excessive leakage of the drainline isolation valves is not expected due to the high pressure capacity of the valves relative to the anticipated accident loads, and the administrative controls proposed by the licensee for leak testing the first valve and maintaining the valve closed when the IFTS is not in use. Failure to isolate the drainline is also very unlikely due to the licensee’s commitment to station a dedicated operator near the isolation valves whenever the IFTS is in use. Even if such releases are assumed to comprise a large early release, the estimated increase in LERF is below the guideline values provided in RGs 1.174 and 177.

Removal of the blind flange introduces the possibility of a structural failure of the IFTS tube or connected piping at a beyond-design-basis pressure or seismic loading lower than if the blind flange were installed. The licensee assessed the pressure capacity of the IFTS transfer tube and connected piping, and determined there is ample margin above the estimated pressure loads. The licensee determined that the primary impact of seismic events on the proposed LAR is during the removal and re-installation of the blind flange when the flange bolting is de-tensioned. To limit the seismic risk associated with the unbolted IFTS flange, the licensee has included a limit of 20 hours per year on the time during which the blind flange will be unbolted for removal or re-installation. On the basis of the implementation of the seismic upgrades to the IFTS drainline, the further assessment of seismic aspects of the IFTS on the CDF and LERF, and the licensee’s commitment to limit the time during which the unbolted configuration would exist, the NRC staff concludes that the proposed LAR would not have a substantial impact on the risk from seismic events.

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 (68 FR 5675). 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.

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.

7.0 REFERENCES:

1. U.S. Nuclear Regulatory Commission, Regulatory Guide 1.174, "An Approach for Using Probabilistic Risk Assessment in Risk-Informed Decisions on Plant-Specific Changes to the Licensing Basis," July 1998.

2. U.S. Nuclear Regulatory Commission, Regulatory Guide 1.177, "An Approach for Plant-Specific, Risk-Informed Decision Making: Technical Specifications," August 1998.

3. NUREG/CR-6595, "An Approach for Estimating the Frequencies of Various Containment Failure Modes and Bypass Events," August 1998.

4. NUREG/CR-2728, "Interim Reliability Evaluation Program Procedures Guide," January 1983.

5. NUREG/CR-1278, "Handbook of Human Reliability Analysis with Emphasis on Nuclear Power Plant Applications," August 1983.

6. NUREG-1488, "Revised Livermore Seismic Hazard Estimates for 69 Nuclear Power Plant Sites East of the Rocky Mountains," October 1993.

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