September 17, 2003

Mr. John L. Skolds, Chairman
and Chief Executive Officer
AmerGen Energy Company, LLC
4300 Winfield Road
Warrenville, Illinois 60555

SUBJECT: CLINTON POWER STATION, UNIT 1 - ISSUANCE OF AMENDMENT (TAC NO. MB1639)

Dear Mr. Skolds:

The U.S. Nuclear Regulatory Commission (Commission) has issued the enclosed Amendment No. 158 to Facility Operating License No. NPF-62 for the Clinton Power Station, Unit 1. The amendment is in response to your application dated April 2, 2001 (U-603456), as supplemented by letters dated January 15 (RS-02-013), and August 23, 2002 (RS-02-150), March 28 (RS-03-069), and August 19, 2003 (RS-03-164).

The amendment identifies the conditions under which the inclined fuel transfer system blind flange may be removed when primary containment integrity is required (i.e., during Modes 1, 2, and 3) and restricts this configuration to no more than 40 days per operating cycle. These changes are reflected by (1) adding Note 5 for the Actions of Technical Specification (TS) 3.6.1.3, “Primary Containment Isolation Valves (PCIVs),” (2) deleting Note 3 of TS Surveillance Requirement 3.6.1.3.3, (3) adding a conditional note to TS 3.6.1.1, “Primary Containment - Operating,” and (4) associated TS Bases changes.

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 JHopkins for/

Douglas V. Pickett, Senior Project Manager, Section 2
Project Directorate III
Division of Licensing Project Management
Office of Nuclear Reactor Regulation

Docket No. 50-461

Enclosures: 1. Amendment No. 158 to NPF-62
2. Safety Evaluation

cc w/encls: See next page

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ADAMS Accession Number: ML032680619 (Technical Specifications)
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*See DSolorio to AMendiola memo dated 7/2/03
**See MRubin to AMendiola memo dated 8/22/03
***See DTrimble to AMendiola memo dated 6/6/03

Clinton Power Station, Unit 1

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AMERGEN ENERGY COMPANY, LLC

DOCKET NO. 50-461

CLINTON POWER STATION, UNIT 1

AMENDMENT TO FACILITY OPERATING LICENSE

Amendment No. 158
License No. NPF-62

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

   A. The application for amendment by AmerGen Energy Company, LLC (the licensee), dated April 2, 2001, as supplemented by letters dated January 15, and August 23, 2002, March 28, and August 19, 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-62 is hereby amended to read as follows:

(2) Technical Specifications and Environmental Protection Plan

The Technical Specifications contained in Appendix A and the Environmental Protection Plan contained in Appendix B, as revised through Amendment No. 158 are hereby incorporated into this license. AmerGen Energy Company, LLC 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 within 30 days of the date of issuance.

FOR THE NUCLEAR REGULATORY COMMISSION

/RA/

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 17, 2003

ATTACHMENT TO LICENSE AMENDMENT NO. 158

FACILITY OPERATING LICENSE NO. NPF-62

DOCKET NO. 50-461

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 Pages	Insert Pages
3.6-1	3.6-1
3.6-9	3.6-9
3.6-17	3.6-17

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELATED TO AMENDMENT NO. 158 TO FACILITY OPERATING LICENSE NO. NPF-62

AMERGEN ENERGY COMPANY, LLC

CLINTON POWER STATION, UNIT 1

DOCKET NO. 50-461

1.0 INTRODUCTION

The Inclined Fuel Transfer System (IFTS) blind flange forms part of the primary containment pressure boundary. The IFTS blind flange, which is the single isolation barrier for the IFTS penetration, satisfies containment isolation requirements during power operation. License Amendment No. 107, approved by the Nuclear Regulatory Commission (NRC) on October 3, 1996, revised the Clinton Power Station Technical Specification (TS) Surveillance Requirement (SR) 3.6.1.3.3 to permit removal of the IFTS blind flange during Modes 1, 2, or 3 for the purpose of testing and exercising the system prior to a refueling outage. Prior to Amendment No. 107, the IFTS blind flange was only permitted to be removed during Modes 4 or 5.

Subsequent to Amendment No. 107, it was identified that the analysis for this TS change did not contain the rigor commensurate with the change. Amendment No. 107 did not place any time limits or constraints when opening the IFTS blind flange during power operations. In addition, Amendment No. 107 did not authorize removal of the flange for any purpose other than maintenance and testing. Finally, concerns were identified with the potential for leakage of water from the containment upper pool through the IFTS transfer tube affecting the upper pool dump volume necessary for long-term accident mitigation. By letter dated October 2, 2000, AmerGen Energy Company, LLC (AmerGen, or the licensee), informed the staff that, based on a risk evaluation, the TS Bases for SR 3.6.1.3.3 would be revised such that the IFTS flange could not be in the open position for more than 40 days per operating cycle during plant operation. In addition, the licensee also informed the staff of their intention to move new fuel to the upper containment fuel storage pool using IFTS prior to the start of future refueling outages.

A more comprehensive technical evaluation has since been performed by the licensee to support removal of the blind flange during Modes 1, 2, and 3. By letter dated April 2, 2001, and supplemented by letters dated January 15, August 23, 2002, March 28, and August 19, 2003, AmerGen submitted a proposed license amendment request addressing the above concerns. This request supplements Amendment No. 107 by including: (1) a limit of 40 days per cycle with the IFTS blind flange removed and the IFTS tube open, (2) a requirement to install the gate seal separating the Steam Dryer Pool from the Reactor Cavity Pool prior to IFTS blind flange removal, (3) additional flexibility to permit IFTS blind flange removal for other than maintenance and testing purposes (e.g., for the movement of new fuel prior to the start of future refueling outages), and (4) an additional limit of 12 hours per operating cycle with the blind flange in the unbolted configuration during Modes 1, 2, or 3.

The supplemental letter of August 19, 2003, 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 REGULATORY EVALUATION

Clinton Power Station TS Bases B.3.6.1.3 states that the OPERABILITY requirements for primary containment isolation valves (PCIVs) help ensure that an adequate primary containment boundary is maintained during and after an accident by minimizing potential paths to the environment. In addition to the concerns identified by the licensee, the staff also identified two new issues: (1) the adequacy of a water seal during a small break loss-of-coolant-accident (LOCA) following flange removal, and (2) the need for leak testing the IFTS drain valves. The relevant regulatory requirements on which the staff review was based are 10 CFR Part 50, Appendix A, General Design Criteria (GDC) 16, 50, and 54.

The potential for leakage of water from the containment upper pool through the IFTS transfer tube affecting the required upper pool dump volume is mitigated by installation of the inflatable gate separating the steam dryer pool from the reactor cavity pool. The gate ensures the operability of the suppression pool makeup (SPMU) system per Clinton Power Station (CPS) TS limiting condition for operation (LCO) 3.6.2.4. Therefore, the SPMU system will be able to transfer water from the upper containment pool to the suppression pool after a LOCA in meeting 10 CFR Part 50.36 Criterion 3.

The NRC staff has considered the risk implications of the licensee's request to remove the blind flange while in Modes 1, 2, or 3. The primary concerns in terms of risk involve the potential for blind flange removal and IFTS operation to adversely impact: (1) SPMU 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 SPMU 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, "An Approach for Using Probabilistic Risk Assessment in Risk-Informed Decisions on Plant-Specific Changes to the Licensing Basis," July 1998, and RG 1.177, "An Approach for Plant-Specific, Risk-Informed Decisionmaking: Technical Specifications," August 1998. These RGs provide a basis for confirming that the increases in CDF and LERF are small and consistent with the intent of the Commission's Safety Goal Policy Statement.

The staff's review criteria for human factors engineering are based on an adaptation of existing NRC review guidance as found in: NUREG-800, "Standard Review Plan," (draft for comment, 2003); NUREG-0711, Rev. 1, "Human Factors Engineering Program Review Model," (2002); NUREG-0700, Rev. 2, "Human- System Interface Design Review Guideline," (2002); Information Notice (IN) 97-78, "Crediting of Operator Actions in Place of Automatic Actions and Modifications of Operator Actions, Including Response Times," (1997); NUREG-1764, "Guidance for the Review of Human Actions, Draft Report for Comment," (2002); RG 1.174, RG 1.177, IN 91-18, "Information to Licensees Regarding Two Inspection Manual Sections On Resolution of Degraded and Non-Conforming Conditions and on Operability," (1991), and

ANSI/ANS 58.8, "Time Response Design Criteria for Safety-Related Operator Actions," (1994).

3.0 TECHNICAL EVALUATION

The licensee has proposed the following changes to the Clinton TS:

(1) The addition of a conditional note before the Actions for TS 3.6.1.1, "Primary Containment - Operating," which will identify the controls required for allowing the IFTS penetration to be in the unbolted configuration during operating Modes 1, 2, and 3. The Note will state the following:

"Applicable Conditions and Required Actions are not required to be entered for the Inclined Fuel Transfer System (IFTS) penetration for up to 12 hours per cycle when the IFTS blind flange is unbolted."

(2) The addition of a conditional note (i.e., Note 5) before the Actions for TS 3.6.1.3, "Primary Containment Isolation Valves (PCIVs)," which will identify the controls required for allowing the IFTS blind flange to be removed during operating Modes 1, 2, and 3. Note 5 will state the following:

"Not applicable for the Inclined Fuel Transfer System (IFTS) penetration when the associated primary containment blind flange is removed, provided that the fuel building fuel transfer pool water is maintained ≥ el. 753 ft., the steam dryer pool to reactor cavity pool gate is installed with the seal inflated and a backup air supply provided, the total time the flange is open does not exceed 40 days per operating cycle, and the IFTS transfer tube drain valve(s) remain(s) closed, except that the IFTS tube drain valve(s) may be opened under administrative controls."

(3) The elimination of conditional Note 3 to Surveillance Requirement 3.6.1.3.3.

3.1 DETERMINISTIC EVALUATION

3.1.1 Suppression Pool Makeup Inventory

In License Amendment No. 107, the potential leakage of water from the upper pool was not addressed. In their submittal of April 2, 2001, the licensee evaluated the impact on the SPMU system resulting from water leakage from the upper containment pool through the IFTS transfer tube to the fuel building spent fuel pool. The function of the SPMU system is to transfer water from the upper containment pool to the suppression pool after a LOCA. The required water volume from the upper containment pool is equal to the difference between the total post LOCA drawdown volume and the assumed water volume loss from the suppression pool. As stated in the Bases for TS LCO 3.6.2.4, this water volume is required to be ≥ 14,652 ft^3. The SPMU system is required in Modes 1, 2, and 3 by TS 3.6.2.4, "Suppression Pool Makeup System." Excessive leakage of water from the upper containment pool could result in the inability to provide the required volume of water to the suppression pool. Reduced suppression pool water

volume and increased suppression pool temperature could result in a subsequent loss of suction pressure for the emergency core cooling system (ECCS) pumps.

The licensee proposed the resolution of the above concern by requiring an administrative control to ensure the upper pool water volume meets these design requirements. In addition to the dedicated individual stationed at the IFTS controls, these administrative controls include the requirement that the inflatable gate seal, separating the steam dryer pool and the reactor cavity pool, be installed with the gate seal inflated and an available backup air supply provided. Installation of this gate seal separates the volume of water above the IFTS transfer tube from the volume of water available for the SPMU system ensuring the required water dump volume is available. These administrative controls are defined in Note 5 to TS LCO 3.6.1.3 under the proposed change as well as in the governing plant procedure.

The staff has reviewed the proposed modification and the administrative controls in the added note and finds them acceptable, because the modification will isolate the SPMU water inventory from IFTS to ensure the availability of the water inventory for the SPMU function. Installation of the inflatable gate seal ensures the operability of the SPMU system per CPS TS LCO 3.6.2.4. Therefore, the SPMU system is able to transfer the required water from the upper containment pool to the suppression pool after a LOCA in meeting 10 CFR Part 50.36 Criterion 3.

3.1.2 Containment Integrity

Removal of the IFTS blind flange during Modes 1, 2, 3 affects containment integrity. In Amendment No. 107, the licensee demonstrated that the IFTS penetration water seal would maintain containment integrity following a design-basis large-break LOCA with the IFTS blind flange removed. The water seal in the IFTS penetration has a higher pressure (9 psig) than the peak containment pressure of 8.74 psig resulting from a large-break LOCA. The IFTS drain valves (a potential leaking path) may be opened under administrative controls. The staff reviewed Amendment No. 107 and found it acceptable in a safety evaluation report dated October 3, 1996.

Removal of IFTS blind flange creates two potential containment leakage paths. One potential release path is through the IFTS drainline and drain valves, and the other potential path is through the IFTS transfer tube during the period of time that the bottom gate valve of the IFTS tube is open. In reviewing the proposed TS changes, the staff identified two new issues that were not addressed in Amendment No. 107. First, the drain valves in the 4-inch drainline were not leak tested. Secondly, the water seal in the IFTS may not be adequate to sustain the containment pressure resulting from a small-break LOCA that has large drywell bypass leakage. These two issues are discussed below.

3.1.2.1 Drain Valve Leak Testing

Crediting manual actions by plant operators is a concern once the blind flange has been removed and the transfer tube is in the drained condition. When the tube is in the drained condition, the drain line connects the primary containment atmosphere to the Fuel Pool Cooling and Cleanup System surge tank piping in the fuel building. This condition could potentially bypass the water seal created by the fuel building fuel transfer pool. The licensee states that

evolutions where the drainlines are open are of a relatively short duration and a dedicated individual, who is in continuous communication with the control room, will be stationed at the IFTS control panel in the fuel building to initiate closure of the IFTS transfer tube drainline isolation valve(s) if the need for primary containment isolation is indicated. The individual will initiate rapid closure of the IFTS transfer tube drainline motor-operated isolation valve (1F42-F003) and the IFTS transfer tube drain line manual isolation valve (1F42-F301). Thus, the licensee concludes that the transfer tube drainline can be isolated when the tube is in the drained condition.

By letters dated August 23, 2002 and March 28, 2003, the licensee described the manual actions that the dedicated individual will perform to isolate the IFTS transfer tube drainline following an accident. The dedicated individual will attempt to close the IFTS drain valve (1F42-F003) from the IFTS control panel located in the fuel building by taking the MANUAL-LOCAL-REMOTE switch to the MANUAL position and then position the 1F42F-F003 control switch to close the valve. Next, the individual will close the IFTS drainline manual isolation valve, 1F42-F301, by walking from the IFTS control panel to the 1F42-F301 valve located about 100 feet away on the same elevation north of the Spent Fuel Pool. The licensee states that the dedicated individual can perform these operations quickly (nominally within two minutes). The licensee further states that the 1F42-F003 and 1F42-F301 valves are readily accessible through an open floor plate at the 755' elevation of the fuel building. The 1F42-F003 valve also will be checked to confirm that it closed and, if still open, will be manually closed. Supplemental lighting will be staged in the immediate location of the drain valves. The licensee indicates that environmental conditions (i.e., temperature, radiation levels, lighting, noise, etc.) are not severe enough to impede the individual from performing these actions. The staff concludes that the proposed manual operator actions are reasonable and acceptable.

Leak testing the drainline isolation valves was not addressed in Amendment No. 107 and, in a letter dated January 15, 2002, the licensee indicated that these valves would not be leak tested. The staff concluded that leak testing would be necessary in order to provide reasonable assurance that the drain valves were functional and capable of providing containment isolation. The staff discussed its finding with the licensee and, by letter dated August 23, 2002, the licensee committed to leak test the IFTS drain valve (1F42-F003) prior to IFTS operations during each refueling cycle to ensure that the drain valve is sufficiently leak tight. The staff finds this commitment acceptable.

3.1.2.2 Small-Break LOCA

In general, the small-break LOCA would result in a lower calculated containment pressure than a large-break LOCA. However, updated safety analysis report (USAR) Section 6.2.1.1.5 describes a small-break LOCA with drywell bypass leakage. If drywell leakage is sufficiently large, the containment pressure resulting from a small-break LOCA could exceed the pressure resulting from a large-break LOCA and higher than the capability of the IFTS water seal. Since the bottom gate valve may not be closed, the water seal might be cleared from the IFTS tube and containment integrity could be breached. In their submittal dated April 2, 2001, the licensee addressed the staff's concern by stating that from a dose perspective, the small-break LOCA is not limiting since fuel damage is not expected to occur for such an event. Therefore, the licensee determined that a large-break LOCA was the design-basis for IFTS flange removal. The staff agrees that a small-break LOCA does not have the dose consequences of a large-break LOCA. However, the staff cannot dismiss the concern of small-break LOCA

because GDC 16 and 50 concerning containment integrity could be violated following a small-break LOCA with the IFTS flange removed. Containment integrity must be maintained and offsite dose consequences must be within limits for a spectrum of breaks (both large and small-break LOCAs). Therefore, leaving the bottom gate valve open following a small-break LOCA may result in not meeting containment integrity requirements.

License Amendment No. 107 did not limit the time when the IFTS blind flange may be open while primary containment integrity is required. Amendment No. 107 assumed that the IFTS blind flange would only be removed for short periods of time for the purposes of testing and maintenance. However, the licensee now desires to transfer new fuel to the upper containment pool during operating modes requiring containment integrity which would require the flange to be removed longer than previously anticipated.

The staff evaluated the proposed TS changes against Note 1 of NUREG-1434, "Standard Technical Specifications, General Electric Plants, BWR/6," Section 3.6.1.3. Note 1 provides that containment penetrations may be unisolated intermittently under administrative controls. Pursuant to 10 CFR 50.36, the LCO in the TSs are the lowest functional capability of performance levels of equipment required for safe operation of the facility. For the IFTS tube, as long as the water seal remains in the IFTS, the isolation provision satisfies the lowest functional capability for the LCO. The licensee demonstrated that the water seal is able to withstand the containment pressure of 9.0 psig and can maintain the IFTS tube penetration isolated. At this pressure, the water seal is adequate for a design-basis large-break LOCA. The staff found it acceptable in Amendment No. 107. This finding remains valid regardless of the operation of the IFTS bottom valve.

For small-break LOCA with sufficiently high drywell bypass leakage, the containment pressure could be higher than 9 psig, and the water seal could be cleared from the IFTS tube if the bottom gate valve is open. In the supplemental letters, the licensee committed to revise station procedures. If the bottom gate valve is open at the initiation of a LOCA with offsite power available, the IFTS operator will isolate the bottom gate valve in accordance with CPS procedure 3702.01, "Inclined Fuel Transfer System (IFTS)," using the hydraulic actuator. If the fuel transfer carriage or cabling is part way through the open valve, the operator will raise the carriage to a point above the fill/drain position and then will close the valve. These actions can be performed from the ITS control panel located in the fuel building under LOCA conditions.

In the event of a LOCA with a loss of offsite power (LOOP), power to the IFTS control panel would be lost. Assuming that a reactor scram does not occur, contingency actions provided in station procedures will enable manual closure of the IFTS bottom gate valve. Equipment and tools needed to perform the contingency actions, including lighting sufficient to allow the actions to be performed under LOOP conditions and a hydraulic supply to operate the bottom gate valve will be staged in the area before operation of the valve while the plant is in Modes 1, 2, or 3. The required actions will be taken from the containment and the fuel building. The licensee states that the equipment and tools will be demonstrated to be capable of performing their supporting functions before removal of the blind flange in Modes 1, 2 or 3. The carriage will be lifted and the bottom gate valve will be closed in approximately one to one and a half hours under these conditions. In addition, personnel required to perform these actions will be trained on the actions and associated procedures using walk-throughs prior to operation of the bottom valve or removing the IFTS blind flange in Modes 1, 2, or 3. The licensee states that the proposed change does not affect emergency operating procedures though station

procedures will be revised to provide direction to station personnel as to the need to close the IFTS bottom valve if an accident were to occur.

If, on the other hand, a reactor scram follows a LOCA and LOOP, the containment would be evacuated in accordance with Clinton procedure 4100.01, “Reactor Scram.” As a result, manual actions inside containment would become impractical and plant operators would not be able to close the bottom gate valve in a timely fashion. Under these conditions, operators will be allowed controlled re-entry into containment in accordance with radiation protection procedures to ensure that the IFTS transfer tube is isolated as quickly as possible after a LOCA. If the containment atmosphere pressure exceeds the IFTS water seal pressure, gases would pass through the IFTS water seal and be scrubbed by the spent fuel pool before entering into the fuel building where it would be contained within the boundary of the secondary containment and filtered by the standby gas treatment system prior to release to the environment. In this case (during a limited-time flange opening concurrent with a design-basis small-break LOCA, LOOP, and high drywell bypass leakage), both the probability and dose consequences are small. Based on the risks being insignificant (see the probabilistic evaluation of this safety evaluation), the staff has determined that this case is acceptable.

There are currently no procedures that require the operator to stop leakage from the bottom gate valve. Leakage past the bottom gate valve could result in a high level in the surge tank of the fuel pool cooling and cleaning (FC) system which would be sensed in the control room. If the FC surge tank overflowed, water would collect in the fuel building equipment/floor drain sumps, and actuate a control room alarm, alerting the operator to close the bottom gate valve. The staff believes that if the bottom gate valve is closed even with small leakage, the water seal in the IFTS can be maintained because there is sufficient water inventory in the IFTS tube. Therefore, containment integrity can be maintained in meeting the requirements of GDC 16 and 50.

3.2 RISK EVALUATION

3.2.1 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.

AmerGen will procedurally require the Steam Dryer Pool to Reactor Cavity Pool gate within the upper containment to be installed with the seal inflated and a backup air supply provided prior to IFTS blind flange removal during Modes 1, 2, or 3. This action is taken to ensure that an adequate containment upper pool dump volume is maintained to support SPMU volume requirements. The licensee indicated that even if the portion of the pool that communicates with the IFTS tube should inadvertently drain to the spent fuel pool, this would have no impact on the SPMU volume from the other upper containment pools, and there is sufficient inventory in these other pools to support the SPMU function.

Based on these results, the staff concludes that the amendment request has no significant impact on core damage frequency.

3.2.2 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 drainline 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 incremental conditional core damage probability (ICCDP). To evaluate these release paths, the following three configurations were considered by the staff:

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.

During periods when the blind flange has been removed and the IFTS is not in use, the potential for releases will be reduced by leaving the IFTS carriage in either of two positions. During shift changes or between consecutive days of operation, the IFTS carriage will be stored in the middle to lower portion of the transfer tube, thereby allowing the IFTS flap valve, IFTS fill valve (1F42-F001), lower gate valve (1F42-F004), and both drainline valves (1F42-F003 and 1F42-F301) to be closed. During extended periods of time that the IFTS is not being used, the IFTS carriage will be stored in the upper pool with the IFTS manual gate valve (1F42-F002) closed. Closure of this valve will provide additional defense-in-depth for containment isolation. The IFTS operating procedure (CPS Procedure 3702.01) will be revised to require this gate valve to be closed during extended periods of system inactivity.

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

Containment isolation for this path is provided by the IFTS bottom gate valve (1F42-F004) and the IFTS water seal in the Spent Fuel Storage pool. 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 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 past the bottom gate valve is also not expected as it would result in a high spent fuel pool level alarm in the Control Room. CPS procedure 3702.01 requires the gate between the Fuel Building Fuel Transfer Pool (in which the IFTS tube terminates) and the fuel building spent fuel pool 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 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 TS change, implemented as part of Amendment No. 107, that requires the Fuel Building Fuel Transfer Pool water level to be maintained at or above elevation 753 feet (at least 24 feet above the IFTS transfer tube outlet). 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 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, "An Approach for Estimating the Frequencies of Various Containment Failure Modes and Bypass Events," August 1998, 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. Fission product releases into the Fuel Building via the Fuel Building water pool would be within the boundaries of secondary containment, and would also be filtered by the Standby Gas Treatment System.

The licensee contends and the staff concurs that releases via the bottom isolation valve would not contribute to LERF for the aforementioned reasons.

3.2.2.2 Releases via the Drainline (carriage in upper position)

Containment isolation for this path is provided by a motor-operated valve (1F42-F003) in the drainline within the Fuel Building. Although a manual isolation valve (1F42-F301) is also located in the drainline downstream of the motor-operated valve and accessible, operation of the manual isolation valve is not credited. The drainline isolation valve may only be opened under administrative controls 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 constructed of 4-inch diameter Schedule 40S (0.237 inch nominal wall thickness) piping. The line is non-safety-related, but is constructed to ANSI B31.1 quality group standards. The design pressure for the drainline is 100 psig. The ultimate pressure capacity of the line would be considerably greater given that a safety factor is applied in the design calculation and that actual material strengths normally exceed the minimum specification requirements on which the design value is based. Also, based on the manufacturer's assessment, the drainline expansion joint (1F42-D300) is capable of withstanding a pressure of 180 psig under accident conditions. The maximum drainline pressure in a beyond-design-basis events with successful containment venting would be 78 psig (45 psig containment vent pressure plus 33 psig hydrostatic head), and approximately 127 psig if venting is unsuccessful (94 psig ultimate pressure capacity plus 33 psig hydrostatic head). Based on this assessment, the IFTS tube, drainline, and expansion joint will maintain their pressure retention capability for the maximum containment pressures expected following a beyond-design-basis accident.

The IFTS drainline isolation valve (1F42-F003) is a 4-inch, non-safety-related motor-operated valve, with a rated pressure of 150 psig. The body and bonnet have a pressure class rating of 240 psig. The associated ultimate pressure capacity is substantially greater than the pressure to which the valve will be exposed to during a design-basis accident, and at the containment ultimate pressure capacity. Based on the substantial pressure capacity of the IFTS drainline and drain line isolation valve relative to the expected accident pressures, the staff considers the probability of over-pressure failure of the drainline and associated isolation valve to be negligible.

The licensee indicates that a seismic assessment performed for the IFTS drainline and drainline isolation valves shows: (1) there is substantial margin between the calculated and allowable stresses in the piping, and (2) based on the small seismic accelerations at these valves, the drainline piping and isolation valves will maintain their pressure retaining capability if the Seismic Margins Earthquake of 0.3g is applied.

The potential for excessive leakage though the IFTS drainline is also considered very unlikely since: (1) the first drainline isolation valve will be leak tested prior to IFTS operations each refueling cycle to ensure that the drain valve is sufficiently leak tight, (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 isolation 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.

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 No. 107, the licensee 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.

3.2.2.3 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 excessive 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 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.

3.2.2.4 Integrated Impact on LERF

The licensee quantified the possible increase in LERF due to removal of the blind flange. The supporting risk analysis bounded the expected times for the actual IFTS configurations by assuming the carriage is in the lower position (with the IFTS bottom gate valve and drainline valves open) for the entire 40 days per cycle. Releases from the bottom gate valve would be scrubbed and were not considered to be large releases, as described above. Failure to close the drainline isolation 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 licensee assumed a value of 0.1 for the probability that the dedicated operator fails to successfully close the drainline isolation valve, and estimated the average annualized contribution to LERF for the proposed change to be about 1E-7 per year. As such, the proposed change is consistent with the acceptance criteria in RG 1.174.

The staff notes that a human error probability value of 0.1 is conservative given the licensee's commitment (as part of Amendment No. 107) to provide a dedicated operator in continuous communication with the control room, and the accessibility of both isolation valves. Based on NUREG/CR-1278, "Handbook of Human Reliability Analysis with Emphasis on Nuclear Power Plant Applications," August 1983, a more realistic probability for failure of the designated individual to close the isolation valve would be about 0.01 per demand. Using the 0.01 human error probability, the staff estimates that the incremental conditional large early release probability (ICLERP) would be less than 2E-8. This is below the ICLERP guideline value of 5E- provided in RG 1.177 for confirming that a proposed permanent technical specification change has only a small quantitative impact on plant risk, and is therefore acceptable.

3.2.3 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 components, and its impact on the ultimate pressure capacity of the containment and LERF.

The pressure to which the IFTS tube and components 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 IFTS drainline is at approximately the same elevation as the top of the fuel transfer pool.

The licensee did not perform a fragility analysis to determine the failure pressure of the IFTS transfer tube and components, but performed engineering assessments to confirm that the IFTS components could withstand a containment pressure of 63 psig while maintaining margin to the allowable stresses. The value of 63 psig corresponds to the ultimate pressure capacity of the equipment hatch reported in USAR Section 3.8.1.4.8 which, according to that assessment, is the most limiting structure in the containment pressure boundary. 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 staff notes that the containment fragility curves provided in the licensee's letter dated January 15, 2002, show a containment ultimate pressure capacity (for the containment structure and major penetrations) of approximately 94 psig, with a minimal contribution from the equipment hatch. An ultimate pressure capacity of 94 psig was also used in the Clinton individual plant evaluation. Although use of the higher pressure capacity in the calculations would result in greater stresses in the IFTS components, 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. More importantly, as discussed below, operator actions to vent containment would mitigate containment pressurization well before the containment pressure approaches the ultimate pressure capacity.

Plant emergency instructions specify that containment venting be performed before containment pressure reaches the Primary Containment Pressure Limit, which is 45 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. Accordingly, the staff concludes that the containment ultimate pressure capacity would not be adversely impacted by removal of the blind flange.

3.2.4 Seismic Risk

The licensee determined that the primary impact of seismic events concerning the amendment request is during the removal and re-installation of the blind flange when the flange bolting is de-tensioned. The licensee has concluded that the seismic condition of the IFTS while the blind flange is unbolted is indeterminate. Therefore, the licensee has concluded that the time that the system is in this condition should be limited. This condition is expected to exist for no more than a cumulative total of 12 hours per cycle during Modes 1, 2, or 3. To limit the seismic risk associated with the unbolted IFTS flange, the licensee has included within the proposed TSs a limit of 12 hours per cycle on the time during which the blind flange will be unbolted for removal or re-installation during Modes 1, 2, or 3.

The staff performed a scoping assessment of the seismic risk associated with two scenarios occurring while the IFTS flange is de-tensioned: (1) a seismic event greater than 0.1g, which

was assumed to result in loss of offsite power and failure of the IFTS bellows, and (2) a seismic event greater than the review level earthquake of 0.3g, which was assumed to result in core damage and a large early release. Based on data provided in NUREG-1488, "Revised Livermore Seismic Hazard Estimates for 69 Nuclear Power Plant Sites East of the Rocky Mountains," October 1993, the mean frequency of a seismic event greater than 0.1g at Clinton is about 1.5E-4 per year. This yields a mean probability of about 1.4E-7 that the seismic event occurs during the period the flange is being removed or re-installed. The conditional core damage probability for an unrecovered loss of offsite power where only ECCS is available for mitigation is expected to be on the order of 1E-3 to 1E-4. This results in an ICCDP and an ICLERP of about 1E-10 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 mean frequency of a seismic event greater than the review level earthquake of 0.3g at Clinton would be about 2E-5 per year based on data in NUREG-1488. This would result in an incremental probability of core damage and large early release of about 2E-8, which is still below the guideline values provided in RG 1.177.

On the basis of the implementation of the 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 amendment request would not have a substantial impact on the risk from seismic events.

3.2.5 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 RGs 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 Clinton. With the IFTS gate installed in accordance with the proposed TS, a breach 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. Based on these results, the staff concludes that the amendment request has no significant 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 Building water pool. In this regard, CPS procedure 3702.01 requires the gate between the Fuel Building Fuel Transfer Pool (in which the IFTS tube terminates) and the fuel building spent fuel pool 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 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 concerning the amendment request 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 12 hours per cycle on the time during which the blind flange will be unbolted for removal or re-installation. On the basis of the 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 amendment request would not have a substantial impact on the risk from seismic events.

4.0 STATE CONSULTATION

In accordance with the Commission's regulations, the Illinois 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. The NRC 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 the amendment involves no significant hazards consideration and there has been no public comment on such finding (68 FR 25650). Accordingly, the 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 the 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 the amendment will not be inimical to the common defense and security or to the health and safety of the public.

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