July 9, 2004

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. MC0342)

Dear Mr. Kanda:

The Nuclear Regulatory Commission (NRC) has issued the enclosed Amendment No. 130 to Facility Operating License No. NPF-58 for the Perry Nuclear Power Plant (PNPP), Unit 1. This amendment revises the Technical Specifications (TS) in response to your application dated August 14, 2003.

By letter dated August 14, 2003, as supplemented by letters dated January 22 and May 6, 2004, FirstEnergy Nuclear Operating Company, the licensee for PNPP, Unit 1, submitted a request for NRC review and approval of a license amendment to modify TS Table 3.3.6.1-1, “Primary Containment and Drywell Isolation Instrumentation,” Item 1.f, to increase the analytical limit for detected temperature and the resulting TS Allowable Value related to the setpoint for the Main Steam Line Turbine Building Temperature - High system isolation function. Additionally, the use of the Generation of Thermal Hydraulic Information for Containments (GOTHIC) 7.0 computer program to perform analyses of main steamline leaks in the turbine building for PNPP has been requested to replace the currently approved COMPARE computer program for performing the analyses listed above.

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

Sincerely,

/RA/

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

cc w/encls: See next page

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

Sincerely,

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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. 130
License No. NPF-58

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

   A. The application for amendment by the FirstEnergy Nuclear Operating Company (the licensee) dated August 14, 2003, as supplemented by letters dated January 22 and May 6, 2004, 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 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. 130 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 JHopkins for/

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: July 9, 2004

ATTACHMENT TO LICENSE AMENDMENT NO. 130

FACILITY OPERATING LICENSE NO. NPF-58

DOCKET NO. 50-440

Replace the following page of the Appendix "A" Technical Specifications with the attached revised page. The revised page is identified by amendment number and contains a marginal line indicating the area of change.

Remove	Insert
3.3-54	3.3-54

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELATED TO AMENDMENT NO. 130 TO FACILITY OPERATING LICENSE NO. NPF-58

FIRSTENERGY NUCLEAR OPERATING COMPANY

PERRY NUCLEAR POWER PLANT

DOCKET NO. 50-440

1.0 INTRODUCTION

By letter dated August 14, 2003 (Ref. 1), as supplemented by letters dated January 22, (Ref. 2) and May 6, 2004 (Ref. 3), FirstEnergy Nuclear Operating Company, the licensee, requested use of the Generation of Thermal Hydraulic Information for Containments (GOTHIC) 7.0 (Ref. 4) computer program to perform analyses of main steamline leaks in the turbine building for the Perry Nuclear Power Plant (PNPP). These analyses support a proposed change to technical specification (TS) Table 3.3.6.1-1, "Primary Containment and Drywell Isolation Instrumentation," Item 1.f, to increase the analytical limit for detected temperature and the resulting TS Allowable Value (AV) related to the setpoint for the Main Steam Line Turbine Building Temperature - High system isolation function. The supplemental letters provided additional information that clarified the application and did not change the initial no significant hazards consideration determination and did not expand the scope of the original *Federal Register* notice.

The ambient temperature in the turbine building approaches the current isolation setpoint for the main steam isolation valves and drains during the summer months when there are consecutive days of high outside air temperature and the isolation setpoint may be reached without the presence of a steam leak. Main steamline isolation and an associated reactor scram would occur if this setpoint were reached. An unnecessary isolation of the main steam system is a plant transient, which should be avoided. The proposed license amendment request would revise the TS AV based on improved computer modeling, using the GOTHIC 7.0 code, of the expected building temperature transient in the event of a main steamline leak. GOTHIC 7.0 would replace the currently approved COMPARE (Ref. 5) computer program for performing these analyses.

The proposed changes would also revise TS 3.3.6.1, "Primary Containment and Drywell Isolation Instrumentation," Table 3.3.6.1-1, Item 1.f, "Allowable Value of Main Steam Line Turbine Building Temperature - High," to avoid an unnecessary isolation of the main steam system due to high ambient temperature in the Turbine Building.

Specifically, the proposed change to Table 3.3.6.1-1, Item 1.f increases the AV from 138.9 °F to 149.6 °F. The analytical value will be 155 °F. This temperature increase corresponds to an increase in the Leak Detection System (LDS) upper boundary leakage limit from an equivalent mass steam leakage value of 25 gpm to 280 gpm.

This safety evaluation addresses the application of the GOTHIC 7.0 computer program including the modeling employed by the licensee to evaluate main steamline leaks in the turbine building, and increasing the AV in TS Table 3.3.6.1-1 from 138.9 °F to 149.6 °F. In addition, the licensee's assessment of the radiological consequences of a main steamline leak in the turbine building is addressed.

2.0 REGULATORY EVALUATION

General Design Criterion 54 requires, in part, that piping systems penetrating primary reactor containment be provided with leak detection. Timely detection and isolation of the leakage in the main steamline is required to demonstrate that the projected radiological dose consequences do not exceed Title 10 of the *Code of Federal Regulations* (10 CFR) Part 100 limits.

The LDS includes instrumentation to detect leakage from the reactor coolant pressure boundary (RCPB) and the main steam system piping. The turbine building LDS instrumentation assists in the detection of a small main steamline leak to prevent a significant release of radioactive material created by conditions other than a main steamline break (MSLB).

The basis for the leak size is addressed in the PNPP Updated Safety Analysis Report (USAR), Section 5.2.5.1.3.b. Once the steam leakage limit is detected, the LDS instrumentation will initiate the automatic closure of the associated containment isolation valves, which are the main steam isolation valves and the main steamline drains. Timely detection and automatic isolation will assist in preventing a significant release of radioactive material to the environment.

There is no accident analysis or transient that credits the subject leak detection instrumentation. In addition, the PNPP has many diverse methods to detect excessive RCPB leakage. For example, the following parameters are monitored by the LDS to limit RCPB leakage: reactor water level, main steamline flow rate, area differential temperatures, and low condenser vacuum (reference USAR Section 5.2.5.1 .a and Table 5.24). But these may not be effective for small steam leaks in the turbine building.

In the Background section of the application, the licensee states that there is no regulation or approved guidance, i.e., Regulatory Guide; Standard Review Plan; 10 CFR Part 50, Appendix A General Design Criteria; etc., that specifies the need for leak detection instrumentation or for the detection of an equivalent mass steam leakage value of 25 gpm outside containment.

Also, there is no accident analysis or transient that credits the subject leak detection instrumentation. Main steamline flow is the parameter used in the accident analysis to signal a MSLB outside containment. In addition, there are many diverse methods to detect excessive RCPB leakage. For example, the following parameters are monitored by the LDS to limit RCPB leakage: reactor water level, main steamline flow rate, area differential temperatures, and low condenser vacuum (reference USAR Section 5.2.5.1.a and Table 5.24).

The ambient temperature monitoring was Installed to meet the intent of the LDS equipment designer - General Electric (GE) and is part of the original plant licensing basis described in PNPP's Final Safety Analysis Report. The 25 gpm criterion was conservatively applied to the LDS temperature monitoring instrumentation to limit the radiological release to below

10 CFR Part 100 limits as recommended by GE in its supplied design specification for the LDS. The architectural engineer for PNPP selected the 25 gpm leakage criterion in the design phase of the LDS based on the recommendation from GE.

While it does not specify any leakage value, Section 10.3 of the Standard Review Plan (SRP), NUREG-0800 in paragraph I.2. provides guidance that reviewers should review the main steam system with regard to measures to limit blowdown of the system in the event of a MSLB. Paragraph I.3.b. states that the design of the main steam system should be reviewed with respect to the capability to detect and control system leakage, and to isolate portions of the system in case of excessive leakage or component malfunctions. Paragraph I.3.c. states that the design of the main steam system should also be reviewed with respect to the capability to preclude accidental releases to the environment.

The GOTHIC program has been previously approved for use by the Nuclear Regulatory Commission (NRC) for nuclear power plant applications such as containment pressure and temperature responses to design-basis accidents, high-energy line breaks for subcompartment loads, and heating, ventilation, and air conditioning (HVAC) analyses. However, the licensee's proposal includes the use of the GOTHIC 7.0 subdivided volume modeling capabilities, not previously reviewed by the NRC staff.

In its August 14, 2003 submittal, the licensee reports the ambient temperature in the turbine building approaches the isolation setpoint for the main steam isolation valves and drains during the summer months when there are consecutive days of high outside air temperature. Therefore, the isolation setpoint for the main steam isolation valves may be reached without the presence of a steam leak with the resulting main steam isolation and associated reactor scram. An unnecessary isolation of the Main Steam system is an avoidable plant transient. The proposed amendment will revise the AV based on improved computer modeling of the expected building temperature transients in the event of a steam leak larger than that originally postulated.

The turbine building temperature instrumentation is part of the nuclear boiler LDS and consists of thermocouples that sense high ambient temperatures. One function of the LDS is to detect leakage from the Main Steam system piping. The current high temperature AV is 138.9 °F and the corresponding analytical limit is currently 145 °F. The isolation setpoint is lower than the analytical limit, due to Perry's setpoint methodology (GE Topical Report NEDC-31336) that typically considers loop instrument accuracy, calibration accuracy, and instrument drift values. The turbine building temperature instrumentation is one method used to detect small steam leaks in an effort to prevent a significant release of radioactive material created by conditions other than a design-basis line break. Other instrumentation signals that can be used to detect steam leaks include radiation, low steamline pressure, reactor level, and main steamline flow.

The leak to be detected is currently an equivalent mass of 25 gpm of steam for piping outside the RCPB within the non-safety related turbine building. If the high temperature limit is reached, the system will isolate the main steam isolation valves and the main steamline drains to limit the release of radioactive material to the environment.

3.0 TECHNICAL EVALUATION OF COMPUTER MODELING, USING THE GOTHIC 7.0 CODE

COMPARE was developed to perform transient containment subcompartment pressure response analyses. Generally speaking, GOTHIC is more sophisticated than COMPARE because it uses built-in mechanistic models to handle interface mass, energy, and momentum transfer. However, the basic structure of volumes and junctions is similar to COMPARE. Both computer codes solve the same general mass and energy conservation equations to arrive at a solution. Because the licensee's desire was to build a more complex model of the turbine building, GOTHIC was chosen for this evaluation.

The GOTHIC code was used to address the effects of local temperature increases in the turbine building. The building was modeled with several large volumes. These volumes were treated as GOTHIC subdivided volumes. Subdivided volumes are partitioned into a one-, two- or three-dimensional computational grid. Within the subdivided volumes, the conservation equations are solved for the three dimensional distributions of velocity, temperature and pressure. The model incorporated realistic design features, such as multiple volumes to track steam flow from the leak, models for metal and concrete structures, and a model for building HVAC. The location of the steam leak was varied by assigning it to different nodes throughout the turbine building. The original COMPARE analysis used two volumes and did not include structures or HVAC.

The licensee's GOTHIC evaluation was performed using a spectrum of ambient temperatures in the turbine building consistent with winter, summer, and average conditions to determine the local temperature in the vicinity of the leak detection thermocouples. A spectrum of leak flow rates was evaluated.

3.1 Model Description

The model used six subdivided volumes to represent the turbine building. Based on sensitivity studies performed by the licensee, a seventh volume was removed from the model prior to performing the licensing calculations. The length, width, height and volume of each subdivided node were based on the general layout of the plant region being modeled using the guidelines and recommendations provided in the GOTHIC User's Guide.

Boundary conditions were imposed on the model to represent known plant conditions. A pressure boundary was connected to the top of the turbine building to maintain the building pressure near atmospheric pressure and to prevent any unrealistic pressure increase from the main steamline leak. The main steamline leak was modeled as a boundary condition based on the leak flow rate (variable from 25 gpm, the current value specified in the USAR, to 383 gpm, the maximum opening size for which the makeup systems can keep up) and the leak enthalpy, 1190.4 british thermal units per pounds-mass at the steamline operating conditions. Air flow from the auxiliary building steam tunnel into the turbine building was included in the model with a constant flow rate and temperature based on plant data, 2500 standard cubic feet per minute at 121 °F. The turbine building ventilation system was also modeled as a boundary condition based on the design flow rates with a constant inlet temperature of 63 °F for all outside air temperatures, based on plant data.

Flow paths representing the large vertical and horizontal openings between the various subdivided volumes were modeled with fixed inertia lengths and fixed friction lengths. The friction length was based on the approximate thickness of the turbine building walls and floor. The hydraulic diameter and inertia length of the flow paths were based on the general dimensions within and between the various turbine building volumes. In addition, the forward and reverse loss coefficient for all flow paths was set to 2.78, as recommended in the GOTHIC User's Guide.

The purpose of the leak detection system is to provide a redundant means of detecting and isolating leaks in the primary coolant system for boiling-water reactors. The system was intended by GE to prevent the escalation of a leak into the design-basis accident. For this system, the design-basis accident is the full MSLB (a 28-inch pipe break). The licensee considered three leak locations along the main steamline pipe run. One location was chosen to determine the effects of ventilation on the LDS thermocouples. The other two locations were chosen because they were the farthest from the LDS thermocouples and therefore represented the worst case from a detection standpoint. The licensee determined that leaks in piping that were physically closer to the LDS thermocouples were bounded by leaks in these three locations. Also, leaks in main steam branch lines were not considered because these leaks could not propagate into the large MSLB that is the primary focus of this leak detection system.

Heat loads from components and structures within each of the turbine building subdivided volumes were approximated with artificial thermal conductors that added heat to the turbine building using the specified heat flux model available in GOTHIC. The outdoor and initial turbine building temperature data were used to determine the turbine building thermal characteristics. The correct heat loads were determined through a trial-and-error method of simply setting the temperature boundary conditions and then modifying the heat flux of the conductors until the correct turbine building temperature was achieved.

Thermal conductors were used to model heat conduction with the environment through the turbine building walls, above the grade elevation, and the roof with constant heat transfer coefficients on the exterior surfaces. For the walls, the heat transfer coefficient was based on still air on a vertical non-reflective surface. For the roof, the heat transfer coefficient was based on still air on a horizontal non-reflective surface with heat flowing upwards. Natural convection heat transfer was used to model the interior surfaces. Below grade, a constant temperature, direct conduction model was used. Concrete walls, steel walls, steel ceilings and steel structures (I-beams, hangers, and platform grating) were also modeled. Minor structures, such as stairs and handrails, were ignored. HVAC ducts were not included because they were determined to be insulated.

3.2 Model Evaluation

The model used the GOTHIC subdivided volume feature to address the effects of local temperature increases in the turbine building. With this feature, a building like the turbine building is subdivided into smaller regions (nodes) based on the need to locate a specific region in the room or to account for structures or changes in dimensions. Unlike the lumped parameter approach, there is no need to specifically model flow paths within these regions, as they are automatically included with this feature. Both the region characteristics and flow path characteristics within the subdivided nodes can be modified to account for structure and flow area changes.

The licensee performed a sensitivity study replacing the subdivided volume containing the LDS thermocouples and leak with a lumped-parameter node (a single, large volume). The purpose of this study was to assess the effects of using the subdivided volume for large leak flow rates because the possibility of localized temperature increase diminishes as the mass flow rate increases. The study was performed for a 280 gpm leak with winter initial conditions, the proposed revised leak rate to be used to set the TS temperature AV. The result showed that the lumped-parameter model predicted a shorter time to reach the temperature of interest and therefore the subdivided volume approach was considered to be conservative for this application.

The staff reviewed the subdivided modeling of the turbine building and determined that the licensee applied the guidelines and recommendations provided in the GOTHIC User's Guide in an appropriate manner. Therefore, the staff finds the use of the subdivided model acceptable for this application.

During its review, the staff noted that the pressure boundary condition did not maintain the turbine building pressure near atmospheric pressure. The licensee's response stated that a loss coefficient in the path from the turbine building to the boundary volume, which was set to 2.78, should not have been assigned to this flow path because the flow is driven by exhaust fans and there is no net pressure loss across the exhaust ductwork. Removing the loss coefficient resulted in a steady atmospheric pressure response during the steam leak and increases the time to reach 155 °F from 1004 to 1133 seconds due to the loss of the temperature-increasing pressure effect. This result was for the 280 gpm leak case with winter initial conditions. The staff agrees with the licensee's assessment for this boundary condition and the correction to the model to remove the loss coefficient from this flow path.

The boundary conditions used for the air inlet to the turbine building from the auxiliary building and for the ventilation system were based on plant operating data. These values were used to establish a steady-state condition within the turbine building prior to the start of the main steamline leak. A 3600 second null transient was run for each case before the leak path was opened. The staff finds this approach acceptable for this evaluation because the initial conditions in the volume with the leak path and the LDS thermocouples were near their expected values prior to the leak. Therefore, the staff finds the use of these boundary condition models acceptable for this application.

During its review, the staff noted that the GOTHIC User's Guide modeling guidance to use a loss coefficient of 2.78 for sharp-edged orifices in a wall that is much larger than the orifice opening might not necessarily be appropriate to all the flow paths. The licensee's response stated that missing from this suggestion was a guide as to just what exactly "much larger" means. One of the references for this value is Idel'Chik's handbook (Ref. 6). The licensee stated that while this reference does not give any guidelines for how much larger the wall should be compared to the orifice, it does suggest values in the range of 2.78 as appropriate for this application based on the PNPP wall thickness to hydraulic diameter ratio for these flow paths. The lowest loss coefficient value for a simple opening in a thick wall would be 1.5, which is the combination of an entrance loss coefficient of 0.5 and an exit loss coefficient of 1.0. The licensee stated that values closer to 2.78 are considered appropriate for many of the junctions used in this model. A sensitivity study was performed by the licensee changing all junction losses to 1.5. The time to reach the temperature of interest, 155 °F, increases from 1004 to 2147 seconds. This result was for the 280 gpm leak case with winter initial conditions. Therefore, there is some uncertainty in the time to reach the temperature of interest that must be considered in evaluating the TS Allowable Value.

Sensitivity studies performed by the licensee demonstrated that the values used for the inertial lengths, friction lengths and hydraulic diameters of the flow paths had little impact on the time to reach the temperature of interest. For example, a sensitivity study performed by the licensee that increased the inertia length in the flow paths from 30 feet, the base value, to 100 feet decreased the time to reach 155 °F from 1004 to 986 seconds (for the 280 gpm leak case with winter initial conditions). Similar results were shown by sensitivity studies performed by the licensee for the friction length and hydraulic diameter values. Therefore, the staff finds the use of the values for the inertial lengths, friction lengths and hydraulic diameters in the original model acceptable for this evaluation.

The licensee identified potential leak locations based on the plant layout of the main steamline. The selection included LDS points far from the postulated leak and the leak was oriented away from the detection point to add conservatism to the model. Three sets of initial conditions were used to determine the longest time to reach the temperature of interest. To include additional conservatism in the analyses, all steam leak flow paths were oriented to point in the "West" direction, opposite from the LDS thermocouples on the "East" wall, based on a directional sensitivity case run by the licensee. Therefore, the staff finds the selection of the leak locations and modeling acceptable for this evaluation.

The licensee modeled internal heat sources within the turbine building with GOTHIC thermal conductors. The specific heat flux for the conductors was determined by trial and error to match the expected turbine building temperature for a set of initial conditions. These values were used to establish a steady-state condition within the turbine building prior to the start of the main steamline leak. The staff finds this approach acceptable for this evaluation because the initial conditions in the volume with the leak path and the LDS thermocouples were near their expected values prior to the leak.

Heat conduction to the environment, through the turbine building exterior walls and ceiling, was modeled with thermal conductors. The conductor heat transfer coefficients were used during the steady-state runs. The staff finds this approach acceptable for this evaluation because the initial conditions in the volume with the leak path and the LDS thermocouples were near their expected values prior to the leak.

The large steel and concrete structures within the turbine building were modeled as heat sinks. Smaller structures, like stairs and handrails, and the HVAC ducts were not included. The GOTHIC heat transfer model used by the licensee maximized the transfer of the energy from the main steamline leak to the structures, which is conservative with respect to delaying the time to reach the temperature of interest in the turbine building atmosphere. The staff finds the treatment of the heat sinks within the turbine building acceptable for this evaluation.

3.3 Assessment of Model Changes and Uncertainties

The licensee performed a sensitivity study including the following changes to address the flow path model correction, to address uncertainties and for additional conservatism in some of the input values:

- turbine building to pressure boundary flow path loss coefficient corrected from 2.78 to 0
- all other flow path loss coefficients changed from 2.78 to 1.5, to address uncertainty
- all flow path inertia lengths set to 1 foot, to add conservatism
- all flow path hydraulic diameters set to 1 foot, to add conservatism

These cumulative changes to the model resulted in a time of 2215 seconds to reach 155 °F (for the 280 gpm leak case with winter initial conditions). For this study, the licensee did not adjust the boundary conditions or heat sources to obtain the desired initial turbine building temperature during the steady-state portion of the calculation. The turbine building starting temperature for this sensitivity case was 110.5 °F. This is 2 °F lower than the base case turbine building temperature of 112.5 ° F. To account for this difference, using a constant temperature increase of 42.5 °F (155 °F - 112.5 °F), the equivalent setpoint temperature for the sensitivity case would be 2 °F lower, or 153 °F. The time to reach 153 °F, or increase the temperature 42.5 °F, was found to be 1779 seconds.

With only the flow path correction, the time to reach the proposed TS AV of 155 °F was found to be 1133 seconds, about 18.9 minutes, as compared to the base case identified as Case W-3-33 (winter initial conditions, worst break location, 280 gpm leak rate) time of 1004 seconds (16.7 minutes).

3.4 <u>Radiological Consequences</u>

For the proposed new leak rate of 280 gpm, the licensee stated that the turbine building temperature will reach the proposed analytical allowable value of 155 °F in about 17.5 minutes. The projected steam release during this time interval would be approximately 34,600 lbm. With the correction to the GOTHIC model to remove the loss coefficient from the turbine building to the pressure boundary flow path, the time to reach the AV increased to 18.9 minutes with a projected release of about 37,280 lbm. In comparison, the current licensing basis MSLB (MSLB) outside containment is based on a projected steam release of about 141,700 lbm. This MSLB analysis, which assumes that the reactor coolant specific activity is at the maximum value allowable by technical specification limiting conditions of operation, estimates radiation doses at the exclusion area boundary and the low population zone that are a fraction of the limits established in 10 CFR Part 100. Therefore, the licensee concluded that the radiological consequences of the main steamline leak would be enveloped by the current licensing basis MSLB analysis results.

The licensee's sensitivity study, which included changes to the model to address uncertainty and to add additional conservatism to the analysis, would result in a projected release of about 58,560 lbm, as compared to the MSLB release of 141,700 lbm.

4.0 <u>TECHNICAL EVALUATION OF INCREASING THE ALLOWABLE VALUE (AV) FROM 138.9 °F TO 149.6 °F</u>

The staff has reviewed the licensee's regulatory and technical analyses in support of its proposed license amendment, which are described in the Technical Analysis section of the licensee's August 14, 2003, submittal.

4.1 The licensee's analysis uses the Gothic computer code to address the effects of local temperature increases in the Turbine Building. The review of the use of the Gothic code and associated calculations was performed by the Probabilistic Safety Analysis Branch and is presented above.

4.2 The licensee's analysis shows that a steam leak of 280 gpm will cause a main steam isolation on Turbine Building high temperature in about 17.5 minutes. The amount of steam released is approximately 25 percent of the limiting line break release. The dose consequences of this release are evaluated above in Section 3.4 of the safety evaluation report.

4.3 As discussed in the Regulatory Evaluation section above, Section 10.3 of the SRP provides guidance that reviewers should review the main steam system with regard to measures to limit blowdown of the system in the event of a MSLB. Also, the SRP states that the design of the main steam system should be reviewed with respect to the capability to detect and control system leakage, to isolate portions of the system in case of excessive leakage or component malfunctions, and the capability to preclude accidental releases to the environment. This guidance was used by the staff to determine the acceptability of the proposed TS changes.

The proposed change in the AV will still allow for the continued detection and control of the system leakage. The current leak to be detected is an equivalent mass of 25 gpm with the proposed limit the equivalent mass of 280 gpm. A 280 gpm leak will cause a main steam isolation on Turbine Building high temperature in about 17.5 minutes. Leaks smaller than 280 gpm may not cause a high temperature alarm but will be detected by other systems. Main steamline leakage in the Turbine Building is directed to the Turbine Building/Heater Bay vent, which is monitored for radioactive gaseous and particulate effluents. The licensee stated in its January 22, 2004, submittal, that leaks smaller than 280 gpm will be detected by these radiation monitors. The radiation vent monitors will alarm before the thermocouple set limits are reached.

Since there is a significant increase in the allowable leakage rate from outside the containment, the staff requested the licensee to confirm that the capacity of the Feedwater System and the Control Rod Drive (CRD) System is sufficient to compensate for the increased leakage. The licensee in a letter dated May 6, 2004, confirmed that the make up capability of the Feedwater System is more than adequate to accommodate the increased leakage since 280 gpm is insignificant (0.6 percent) in relation to the total Feedwater flow capacity. Since normal operating systems such as Feedwater System and CRD Systems are sufficient to compensate for the increased leakage, no challenges are expected for reactor core isolation coolant and high-pressure core spray systems.

The licensee established the Loss-of-Coolant Accident limit as an equivalent 2 inch diameter schedule 80 pipe break based on the normal make up capability, which is approximately an equivalent mass Main Steam leakage value of 383 gpm. The proposed upper bound equivalent mass steam leak of 280 gpm is less than the 383 gpm and hence is acceptable. The value of 383 gpm was calculated using the GOTHIC computer code and this code was reviewed by the NRC staff above in Section 3.0 of this safety evaluation report.

The licensee also evaluated the proposed AV change to determine if Equipment Qualification (EQ) conclusions would be impacted. The EQ accident scenario is based on a large MSLB that results in a maximum temperature of at least 160 °F for greater than 2 hours. This analysis bounds the proposed amendment.

The staff determined, based on the above, that the proposed change in the AV for Main Steam Line Turbine Building Temperature - High is acceptable as the proposed change is consistent with the guidance in SRP Section 10.3, bounded by the EQ analysis, and is within the makeup capability of the Feedwater and CRD Systems

5.0 FINDINGS

The staff finds the application of GOTHIC 7.0 and the model developed, with the correction to the turbine building to pressure boundary flow path loss coefficient, to evaluate the PNPP turbine building response to main steamline leaks acceptable. The analyses conservatively calculate the temperature response time for the LDS thermocouples in the turbine building to support the TS Table 3.3.6.1-1, "Primary Containment and Drywell Isolation Instrumentation," Item 1.f, increase in the analytical limit for detected temperature and the resulting TS AV related to the setpoint for the Main Steam Line Turbine Building Temperature - High system isolation function.

There is reasonable assurance that the analytical temperature limit would be reached and the leak isolated before the projected steam release would approach the release for the design base MSLB break for the proposed main steamline leak rate of 280 gpm. The projected release of steam prior to detection and isolation would be about 37,280 lbm, as compared to the MSLB limiting case release of 141,700 lbm. A sensitivity study performed by the licensee, to address uncertainty and add additional conservatism to the analysis, indicated that the analytical temperature limit would be reached in about 30 minutes with a projected steam release of 58,560 lbm.

The licensee determined, and the staff concludes, that the radiological consequences of the steam release corresponding to the proposed main steamline leak rate of 280 gpm with detection and isolation at the TS analytical value, would be enveloped by the current licensing basis MSLB analysis results. As such, there is reasonable assurance that the radiological consequences will be a fraction of the 10 CFR Part 100 limits.

6.0 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.

7.0 ENVIRONMENTAL CONSIDERATIONS

The amendment changes the requirements with respect to installation or use of a facility component located within the restricted area as defined in 10 CFR Part 20 or change the surveillance requirements. The staff has determined that the amendment involves no significant increase in the amounts, and no significant change in the types, of any effluents that may be released offsite, and that there is no significant increase in individual or cumulative occupational radiation exposure. The Commission has previously issued a proposed finding that this amendment involves no significant hazards consideration and there has been no public comment on such finding (69 FR 696). 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.

8.0 CONCLUSIONS

On the basis of the above regulatory and technical evaluations of the licensee's justifications for TS changes, the staff concludes that the licensee's proposed change to TS 3.3.6.1, " Primary Containment and Drywell Isolation Instrumentation", Table 3.3.6.1-1, Item 1.f, "Allowable Value of Main Steam Line Turbine Building Temperature - High is acceptable.

The staff has concluded, based on the considerations 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.

9.0 REFERENCES

1. Letter PY-CEI/NRR-2675L, from W. R. Kanda, FENOC, to USNRC, "License Amendment Request Pursuant to 10 CFR 50.59: "Increase in Main Steam Line Turbine Building High temperature Trip Setpoint Allowable Value," August 14, 2003.

2. Letter PY-CEI/NRR-2754L, from W. R. Kanda, FENOC, to USNRC, "Response to Request for Additional Information Regarding License Amendment Request to Increase in Main Steam Line Turbine Building High temperature Trip Setpoint Allowable Value, TAC No. MC0342," January 22, 2004.

3. Letter PY-CEI/NRR-2796L, from W. R. Kanda, FENOC, to USNRC, "Response to Second Request for Additional Information Regarding License Amendment Request to Increase in Main Steam Line Turbine Building High temperature Trip Setpoint Allowable Value, TAC No. MC0342," May 6, 2004.

4. George, Thomas L., et al., "GOTHIC Containment Analysis Package," Version 7.0, developed for EPRI, July 2001, Numerical Applications, Inc. (Generation of Thermal-Hydraulic Information for Containments).

5. R. G. Gido, R. G. Lawton, C. I. Grimes, and J. A. Kudrick, "COMPARE: A Computer Program for the Transient Calculation of a System of Volumes Connected by Flowing Vents," LA-NUREG-6488-MS.

6. I.E. Idel'Chik, "Handbook of Hydraulic Resistance, Coefficients of Local Resistance and of Friction," AEC-TR-6630, Gosudartvennoe Energeticheskoe Izdatel'stvo Moskva-Leningrad, 1960.

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