FENOC
FirstEnergy Nuclear Operating Company

Perry Nuclear Power Plant
10 Center Road
Perry, Ohio 44081

William R. Kanda
Vice President - Nuclear

440-280-5579
Fax: 440-280-8029

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United States Nuclear Regulatory Commission
Document Control Desk
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Perry Nuclear Power Plant
Docket No. 50-440
Response to Request for Additional Information Regarding License Amendment Request to Increase Main Steam Line Turbine Building High Temperature Trip Setpoint Allowable Value, TAC No. MC0342

Ladies and Gentlemen:

This letter provides responses to the Nuclear Regulatory Commission Request for Additional Information dated November 10, 2003 and January 16, 2004 pertaining to the Perry Nuclear Power Plant License Amendment Request (LAR) submitted on August 14, 2003 (PY-CEI/NRR-2675L). This LAR increases the analytical limit and the resulting Technical Specification Allowable Value related to the setpoint for the Main Steam Line Turbine Building Temperature – High system isolation function.

There are no regulatory commitments contained in this letter or its attachments. If you have questions or require additional information, please contact Mr. Vernon K. Higaki, Manager - Regulatory Affairs, at (440) 280-5294.

Very truly yours,

Attachments:

1. Notarized Affidavit
2. Response to Request for Additional Information
3. Compact Disc Containing Supporting Analysis

cc: NRC Project Manager
NRC Resident Inspector
NRC Region III
State of Ohio

A001

I, William R. Kanda, hereby affirm that (1) I am Vice President – Perry, of the FirstEnergy Nuclear Operating Company, (2) I am duly authorized to execute and file this certification as the duly authorized agent for The Cleveland Electric Illuminating Company, Toledo Edison Company, Ohio Edison Company, and Pennsylvania Power Company, and (3) the statements set forth herein are true and correct to the best of my knowledge, information and belief.

William R. Kanda

Subscribed to and affirmed before me, the 22nd day of January, 2004

Brenda Alvord
My commission expires 8-15-06

The following Nuclear Regulatory Commission (NRC) Request for Additional Information (RAI) was received by letters dated November 10, 2003 and January 16, 2004, regarding the License Amendment Request (LAR) submitted by the Perry Nuclear Plant (PNPP) staff on August 14, 2003 (PY-CEI/NRR-2675L). The subject LAR increases the analytical limit and the resulting Technical Specification Allowable Value related to the setpoint for the Main Steam Line Turbine Building Temperature – High system isolation function. Each specific NRC RAI and the corresponding PNPP response are provided below.

NRC REQUEST

1. Provide a description of the GOTHIC nodal model (include the GOTHIC version number) used to model the building (volumes, flow paths, active heat removal systems and heat structures, and their initial conditions). Identify the model used for the break flow, the model(s) used for heat transfer to structures, and the model used for flow between volumes. If the GOTHIC "jet breakup model" is used, provide justification to support its use for this application.

RESPONSE

The version of GOTHIC used for the analysis to support the proposed LAR is Version 7.0 dated July 2001. Attachment 3 is a Compact Disc (CD) that contains the calculations completed to support the proposed LAR. The supplied files describe the input to the GOTHIC analysis such as how the volumes, flow paths, ventilation systems, and heat structures are modeled to evaluate the temperature response of different steam leak rates modeled in the Turbine Building.

The "jet breakup model" is similar to the "drop breakup model" in that it determines if aerodynamic forces are likely to break up any continuous liquid flowing through the junction into drops. The flow path modeled for this application is all steam and contains no drops. Therefore, this option was not applied to the GOTHIC analysis completed to support the proposed LAR. However, to support the response to this question, a sample case was run with the GOTHIC analysis by changing the "drop breakup model" table value from "off" to "on" for all flow paths. As expected, this sample case showed no difference in the analysis results.

NRC REQUEST

2. Provide a benchmark of the GOTHIC model to the current COMPARE model using GOTHIC models which closely resemble COMPARE.

RESPONSE

A simplistic GOTHIC model that matches the original COMPARE model is expected to yield results similar to the COMPARE analysis since both computer codes solve the same fundamental heat transfer equations. Therefore, a benchmark of the GOTHIC model to the current COMPARE model was not completed. However, due to the nature of the transient analyzed for the proposed LAR (steam leak in a large volume), the use of GOTHIC provides an effective model for accurately predicting the local area temperature response in a very large volume such as the Turbine

Building. The GOTHIC model generated to support the proposed LAR is more detailed than the original COMPARE bulk temperature analyses because it accounts for factors such as break location within the zone, local temperature effects, heat sinks, Heating Ventilation and Air Conditioning (HVAC) effects, and seasonal plant operating conditions. The original COMPARE model can only perform bulk temperature analyses and cannot take into account such factors as break location within the zone or thermal stratification effects. For the supporting LAR analysis, all attempts were made to make the GOTHIC model as realistic as possible. The GOTHIC analysis was iterated at various flow rates and break locations to determine the temperature response at sensor locations. Also, please reference the August 14, 2003 LAR letter (Attachment 2 Pages 3 and 4), for additional discussion regarding COMPARE and GOTHIC.

Therefore, the new analysis supporting the proposed LAR using GOTHIC provides a more sophisticated, sensitive, and realistic model for the Turbine Building temperature response.

NRC REQUEST

3. Provide electronic copy(ies) of the GOTHIC input deck(s) (*.GTH) for the model used for the LAR. The staff may perform independent, confirmatory analyses with the CONTAIN 2.0 code. In addition, the input deck should provide the full description of the nodal models and the GOTHIC models used for the LAR.

RESPONSE

As described in the response to Question 1, Attachment 3 contains electronic files of the calculations completed to support the proposed LAR.

The following explains the contents of the CD.

The first file is a directory titled "Base Cases." This directory contains the GOTHIC (*.GTH) input files used for the model.

The second file is titled "A-01 to 2.4.6.14." This file contains an addendum to the supporting calculation. This addendum contains two parts. Part 1 evaluates the temperature response in the Turbine Building to a new limiting Main Steam leak of 33 lbm/sec (32.9 lbm/sec). This is the analysis of the new steam leak rate proposed by the LAR. Part 2 models temporary fans in the Turbine Building and is not pertinent to the proposed LAR. Therefore, Part 2 should be disregarded.

The third file is titled "Calc 2.4.6.14 Rev 0." This is the first calculation completed to evaluate the temperature responses at different values of steam line leak rates. This calculation provides the necessary supporting data for the proposed LAR. Included in the calculation is an isometric sketch of the control volumes modeled and the corresponding GOTHIC generated model layout (Attachments A and B respectively).

NRC REQUEST

4. The submittal states that with a leak of 280 gallons per minute (gpm), the Main Steam system will isolate in about 17.5 minutes to limit the impact of the leak. The submittal does not discuss leaks of <280 gpm but >25 gpm. The staff is concerned that a lesser but still substantial leak could go undetected for an extended period of time with unanalyzed consequences. The licensee needs to provide an analysis that addresses the impact of leaks between 25 and 280 gpm.

RESPONSE

The four thermocouples related to the proposed LAR are installed in the Turbine Building (North of the steam tunnel structure) near the main steam piping. They are located on the East wall of the Turbine Building, with two thermocouples spaced equally on either side of the turbine centerline. The thermocouples are the initiating sensors for high temperature alarm as well as main steam isolation. These thermocouples are not credited in any USAR Chapter 15 accident or transient. This instrumentation is one of multiple diverse and redundant means for detecting a possible steam line leak. The other signals are radiation, low main steam line pressure, reactor level, and main steam line flow. In the event of a Main Steam line break, flow signals are credited to isolate the system.

As discussed in the August 14, 2003 LAR letter (Attachment 2, Page 5), all steam releases in the Turbine Building can be detected by other alternate means such as plant radiation monitors, rising temperature indication on the area ambient temperature monitors, operator rounds, a noted steam cycle efficiency decrease, etc. Specifically, leaks smaller than the 280 gpm would be detected by radiation alarms. Main steam line leakage in the Turbine Building would be directed to the Turbine Building/Heater Bay vent, which is monitored for radioactive gaseous and particulate effluents.

For dose evaluation purposes, the gaseous effluent releases are treated as continuous and long term (greater than 500 hours per year) and ground level. The High Alarm Set point for each release point radiation monitor is set at 70% of the annual dose rate limit (350 mrem/yr) and the Alert Set point is 10% of the annual dose rate limit (50 mrem/yr). With these limits, the radiation vent monitors will alarm before the thermocouple set points are reached. Particulate and Iodine emissions from the Turbine Building/Heater Bay vent are monitored to determine negative trends, which would indicate a steam leak. The alarm set points are well below the levels that would approach accident consequences. The Turbine Building monitoring and the above limits are discussed in the plant's Offsite Dose Requirements Manual.

These other redundant means of detection provide an opportunity for actions prior to automatic isolation. Also, these other redundant means are the same measures used today to detect Turbine Building steam releases smaller than the existing leak rate of 25 gpm. The proposed LAR does not alter these other means of detection.