FENOC
FirstEnergy Nuclear Operating Company

Perry Nuclear Power Station
10 Center Road
Perry, Ohio 44081

Mark B. Bezilla
Vice President

440-280-5382
Fax: 440-280-8029

January 27, 2010
L-10-011

10 CFR 50.54(f)

ATTN: Document Control Desk
U. S. Nuclear Regulatory Commission
Washington, DC 20555-0001

SUBJECT:
Perry Nuclear Power Plant
Docket No. 50-440, License No. NPF-58
Response to NRC Request for Additional Information Regarding
Generic Letter 2008-01, "Managing Gas Accumulation in Emergency Core Cooling, Decay Heat Removal, and Containment Spray Systems" (TAC No. MD7862)

In a letter dated December 4, 2009, the Nuclear Regulatory Commission (NRC) provided a request for additional information (RAI) related to Generic Letter (GL) 2008-01 for the Perry Nuclear Power Plant (PNPP). The response to the request for additional information is provided in the attachments to this letter.

Previous FirstEnergy Nuclear Operating Company correspondence responding to GL 2008-01 for PNPP was provided in letters dated October 14, 2008, December 19, 2008, and August 10, 2009 (Accession Nos. ML082980365, ML090430426, and ML092320128, respectively).

There are no regulatory commitments contained in this submittal. If there are any questions or if additional information is required, please contact Mr. Thomas A. Lentz, Manager - Fleet Licensing, at (330) 761-6071.

I declare under penalty of perjury that the foregoing is true and correct. Executed on January 27, 2010.

Sincerely,

Mark B. Bezilla

Attachments:
1. Response to NRC RAI on Generic Letter 2008-01 for PNPP
2. Reference Information Supporting the Response to RAI Number 1

cc: NRC Region III Administrator
NRC Resident Inspector
NRC Project Manager

A134
NRR

Response to NRC RAI on Generic Letter 2008-01 for PNPP

The Nuclear Regulatory Commission (NRC) staff requested additional information regarding the FirstEnergy Nuclear Operating Company (FENOC) response to Generic Letter (GL) 2008-01, "Managing Gas Accumulation in Emergency Core Cooling, Decay Heat Removal, and Containment Spray Systems," for the Perry Nuclear Power Plant (PNPP). The NRC staff requests are presented below in bold type, followed by the FENOC response.

1. **In page 26 of Attachment 1 of Reference 3, it was stated, "... a RHR pump is not manually re-started if the pump stops while in the Suppression Pool cooling mode, prior to performing a high point fill and vent through 1E12F0400A/B. This precaution would minimize the potential for the above conditions to result in a RHR water hammer during a LOOP scenario or pump failure."**

   The staff requests the licensee to clarify whether the operators will have sufficient time to complete a high point fill and vent procedure if a LOOP concurrent with a LOCA is postulated, while in the Suppression Pool cooling mode. If not, then please explain.

Response

As summarized above, the October 2008 response letter for PNPP discussed existing operator actions to mitigate voiding that can occur in the upper portion of a Residual Heat Removal (RHR) subsystem if the valve in that subsystem's return line back to the suppression pool is open and the running RHR pump stops due to a loss of offsite power (LOOP) event. Similar void management operator actions do not exist in response to a postulated LOOP occurring concurrent with a loss of coolant accident (LOCA) (i.e., a LOOP/LOCA), because the RHR subsystem receives an automatic initiation signal in such a scenario. The potential for voiding to occur in either RHR A or B as a result of such a pump stop during a postulated LOOP/LOCA event with a suppression pool return line valve open has previously been addressed by the industry and the NRC in multiple forums dating back to 1983, independent of GL 2008-01. A summary of the relevant reference documents is provided in Attachment 2.

This separate topic is acceptably addressed at PNPP consistent with the resolution of the generic industry issues discussed in Attachment 2. At PNPP, administrative controls are in place that specifically track the operational hours of the RHR system when one of these return line valves (1E12-F0024A or B) is open, and entry into the Corrective Action Program is required if the number of tracked hours approach an administrative limit, set to be consistent with the definition of "short operational periods" that was documented by the NRC in Reference 10 of Attachment 2. As noted by the NRC in that reference document, "The staff has taken the position that a design basis LOCA coincident with a LOOP is not postulated to occur during the low fraction of time

that RHR is expected to be operated in the SPC [suppression pool cooling] mode. Therefore, a water hammer analysis is not required for 'short operational periods,' which the staff has defined as 2 percent of the time of operation."

Based on the above, operation of RHR in this configuration is acceptably limited and managed, independent of the information request in GL 2008-01.

2. Consistent with Section 3.7 of Ref. 1, briefly discuss the training that is considered to be a necessary part of applying procedures and other activities when addressing the issues identified in the GL.

Response

Operating experience information related to gas accumulation is an ongoing PNPP training topic, as directed by the associated training curriculum review committees. Recent training on this topic for licensed and non-licensed operators occurred in 2009, and for Instrumentation and Controls (I&C) technicians and engineering staff in 2008.

When procedures related to gas management are updated, FENOC's procedure revision process determines whether a formal training needs analysis should be performed. The established procedure approval and change management processes also address the need for personnel awareness or training on the revisions. As a result of these established processes, personnel that implement gas management procedures at PNPP (Operations personnel and I&C technicians) have been made aware of the procedure changes implemented in response to GL 2008-01.

Monitoring of industry-sponsored gas accumulation training recommendations continues, since such input presents the opportunity to incorporate appropriate training into associated accredited training programs.

Reference Information Supporting the Response to RAI Number 1

SUMMARY

As early as the 1980s, both the Boiling Water Reactor (BWR) industry and the NRC recognized that with an RHR subsystem (A or B) aligned in suppression pool cooling (SPC) mode, the potential exists for water hammer should a simultaneous LOOP/LOCA event occur. This potential exists due to the resultant automatic restart of the pump after the upper portions of the subsystem have become voided by water flow out of the system through the open valve that normally isolates the return line to the suppression pool. Although the postulated "LOOP/LOCA/RHR in operation with the return line to the suppression pool open" scenario is a low probability event that was not part of the original design or licensing basis for BWRs, the topic continued to be addressed by both the BWR industry and the NRC until resolution was reached in 2003. That resolution is independent of the industry activities in response to Generic Letter 2008-01.[1]

HISTORY

In a 1983 report entitled "The Potential for Water Hammer during the Restart of RHR Pumps at BWR Nuclear Power Plants"[2] (as also discussed in 1987's Information Notice 87-10, Rev. 0),[3] the NRC recognized that the BWR design for RHR subsystems A and B did not include the effects of a LOOP/LOCA concurrent with one of these RHR subsystems being in operation with the return line to the suppression pool open, such as occurs when a subsystem is in SPC mode and during periodic system tests.

In 1995, General Electric (GE) documented in Topical Report NEDC-32513, "Suppression Pool Cooling and Water Hammer,"[4] that the probability of occurrence of the RHR system being in the SPC mode coincident with the initiation of a LOOP/LOCA is less than the probability of events considered in the design of BWRs ($<10^{-6}$/reactor year). As a result, the consequences of such a combination of events were not included in the design and licensing basis. This concept was also addressed in 1995 on the docket of the plant now identified as the Columbia Generating Station. In their inspection report,[5] the NRC documented a basis for not issuing a Violation related to this issue regarding the potential for an RHR system water hammer:

> *Based on the licensee's letter* [entitled] *"Resolution of RHR Potential Water Hammer Issue," the NRC did not issue this violation. In the letter, the licensee explained that a design change was not needed since the probability of a loss-of-coolant accident*

---

[1] NRC Generic Letter 2008-01, "Managing Gas Accumulation in Emergency Core Cooling, Decay Heat Removal, and Containment Spray Systems," January 11, 2008.
[2] Engineering Evaluation AEOD/E309, "The Potential for Water Hammer during the Restart of RHR Pumps at BWR Nuclear Power Plants," April 1983.
[3] NRC Information Notice 87-10, "Potential for Water Hammer during Restart of Residual Heat Removal Pumps," February 11, 1987.
[4] General Electric Topical Report NEDC-32513, "Suppression Pool Cooling and Water Hammer," December 29, 1995.
[5] NRC Inspection Report 50-397/95-29, November 13, 1995.

condition coincident with a loss of power was beyond the regulatory requirements to warrant a design change. The NRC agreed with the licensee's assessment.

As presented in Regulatory Information Summary (RIS) 2005-20,[6] a nonconforming condition is defined as a condition of a structure, system, or component (SSC) that involves a failure to meet the current licensing basis. In the 1990's and early 2000's, a number of NRC documents continued to question whether plants could create just such a nonconforming condition by running the system in this configuration for extended periods, thereby increasing the probability of the postulated scenario to the point that the design of the plant would be required to withstand the water hammer. Therefore, the issue that continued to be addressed was how to limit the number of hours of operation in this particular configuration so the likelihood of this scenario remains low enough that this particular water hammer need not be considered as being part of the design and licensing basis.

Examples of this continuing resolution process included:

- In 1997, Supplement 1 to Information Notice 87-10[7] reinforced that operation of RHR in the SPC mode for durations longer than assumed in the safety analysis "*may be outside the original design-basis analysis (LOCA) assumptions.*"
- In 1997, a safety evaluation for a Task Interface Agreement (TIA) response[8] regarding Quad Cities use of NEDC-32513 stated "*In general, although the original design basis may not have considered a LOCA while in SPC mode, licensees may be required to do so based on frequency of use of SPC mode.*"
- In 2002, a TIA response[9] took an interim position regarding LaSalle's extended use of RHR in SPC mode, which noted that a waterhammer analysis would not be required as long as RHR operation in SPC mode was limited to short operational periods.

In 2003, following concerns raised by Exelon related to the 2002 LaSalle TIA response,[10] the NRC provided a final response that established the definition for "short operational periods":

---

[6] NRC Regulatory Information Summary 2005-20, Revision 1, "Revision to NRC Inspection Manual Part 9900 Technical Guidance, 'Operability Determinations & Functionality Assessments for Resolution of Degraded or Nonconforming Conditions Adverse to Quality or Safety'," April 16, 2008.
[7] NRC Information Notice 87-10, Supplement 1, "Potential for Water Hammer During Restart of Residual Heat Removal Pumps," May 15, 1997.
[8] NRC Letter from R. Capra (NRR Division of Reactor Projects) to J. Grobe (NRC Region III Division of Reactor Safety), "Task Interface Agreement AITS-96-0389 – Quad Cities, Unit 1 and 2, Regarding NEDC-32513 Applicability to RHR System Water Hammer Potential (TAC Nos. M97323 and M97324)," October 21, 1997.
[9] NRC letter from L. Marsh (NRR Division of Licensing Project Management) to G. Grant (Region III Division of Reactor Projects), "Task Interface Agreement (TIA 2001-14) Evaluation of LaSalle Waterhammer Analysis (TAC Nos. MB3366 and MB3367)," July 1, 2002.
[10] NRC letter from L. Marsh (NRR Division of Licensing Project Management) to G. Grant (Region III Division of Reactor Projects), "Task Interface Agreement (TIA 2001-14) Evaluation of LaSalle Waterhammer Analysis, Revision 1 (TAC Nos. MB7220 and MB7221)," April 28, 2003.

> *After careful review ...the staff has taken the position that a design basis LOCA coincident with a LOOP is not postulated to occur during the low fraction of time that RHR is expected to be operated in the SPC mode. Therefore, a water hammer analysis is not required for "short operational periods," which the staff has defined as 2 percent of the time of operation.*

The above two (2) percent criterion for defining "short operational periods" is a direct parallel to the similar two percent criterion established by the NRC for defining when a moderate energy fluid system need not be designed to the requirements of a high-energy fluid system, even though the moderate energy system is sometimes operated in the high-energy range [reference General Design Criterion (GDC) 4,[11] and Standard Review Plan (SRP) 3.6.2 Branch Technical Position (BTP) MEB 3-1, "Postulated Rupture Locations in Fluid System Piping Inside and Outside Containment".[12]

Although use of the two percent criterion for defining "short operational periods" reduces the probability of the postulated scenario of a "LOOP/LOCA/RHR in operation with the return line to the suppression pool open" to significantly less than the "$<10^{-6}$/reactor year" value previously discussed, a 2004 industry topical report[13] that requested an increase of the two percent criterion to a value of 10 percent per year was not accepted for review by the NRC.

CONCLUSION

At PNPP, administrative controls are in place to track and limit operation of RHR A and B with the return line to the suppression pool open to short operational periods, using a limit consistent with that established by the NRC. Since the "LOOP/LOCA/RHR in operation with the return line to the suppression pool open" scenario is not part of the design and licensing basis, this issue is not relevant to the response to GL 2008-01.

---

[11] 10CFR50 Appendix A, General Design Criterion 4, "Environmental and Dynamic Effects Design Bases."
[12] BTP MEB 3-1 is now BTP 3-4, "Postulated Rupture Locations in Fluid System Piping Inside and Outside Containment," Revision 2, March 2007.
[13] General Electric Topical Report NEDO-33150-NP, "BWR Residual Heat Removal System Potential for Water Hammer," Revision 0, July 2004.