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BVY 09-002

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

References: (a) NRC Generic Letter 2008-01, "Managing Gas Accumulation in Emergency Core Cooling, Decay Heat Removal, and Containment Spray Systems," NVY 08-008, dated January 11, 2008
(b) Letter, Entergy to USNRC, "Vermont Yankee Three Month Response to Generic Letter 2008-01," BVY 08-020, dated April 10, 2008
(c) Letter, Entergy to USNRC, "Vermont Yankee Nine Month Response to Generic Letter 2008-01," BVY 08-071, dated October 14, 2008

Subject: **Vermont Yankee Nuclear Power Station**
License No. DPR-28 (Docket No. 50-271)
Vermont Yankee Supplemental Response to Generic Letter 2008-01

Dear Sir or Madam:

The Nuclear Regulatory Commission (NRC) issued Reference (a) to address the issue of gas accumulation in emergency core cooling, decay heat removal, and containment spray systems. In References (b) and (c), Entergy Nuclear Operations, Inc. provided its schedule and initial response for the Vermont Yankee Nuclear Power Station.

Attachment 1 to this letter provides the supplemental information related to portions of the subject systems that were inaccessible. The requested information is being provided pursuant the requirements of 10 CFR 50.54(f).

There are no new regulatory commitments contained in this letter.

If you have any questions or require additional information, please contact Mr. David Mannai at 802-451-3304.

I declare under the penalty of perjury that the foregoing information is true and correct. Executed on January 28, 2009.

Sincerely,

Michael J. Colomb
Site Vice President
Vermont Yankee Nuclear Power Station

Attachment (1)
cc list (next page)

A134
NRR

cc: Mr. Samuel J. Collins, Regional Administrator
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Docket No. 50-271

Attachment 1

Vermont Yankee Nuclear Power Station

Vermont Yankee Supplemental Response to NRC Generic Letter 2008-01

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Summary

This supplement to the Entergy Nuclear Operations, Inc. (ENO) response to Generic Letter 08-01 provides information, based on piping evaluations, a review of historical events and operational controls that demonstrates gas accumulation in inaccessible Core Standby Cooling System (CSCS) piping will not have an adverse affect on system operability.

Background

The response to NRC Generic Letter (GL) 08-01 (Reference (1)) was completed in two parts. This plan was communicated to the NRC in Reference (2). The first part was to review, evaluate and walkdown the CSCS piping in normally accessible areas. The results of this evaluation were submitted in Reference (3). The second part was to review, evaluate and walkdown the CSCS piping in inaccessible areas and provide a follow-up letter to the NRC by Jan 30, 2009. This supplement satisfies this commitment and completes ENO's response to GL 08-01 for the Vermont Yankee Nuclear Power Station (VY).

The evaluation and walkdowns in inaccessible areas were performed during Refueling Outage (RFO) 27. The result of these activities is captured within this document.

Walkdown Evaluation

The piping slope inside the drywell was not measured during RFO27. This decision was based on the BWROG report (Reference (4)), discussed below, that indicates piping downstream of the first normally closed valve and the reactor would not be subjected to a pressure transient that exceeds the normal operating pressure. Additionally, the results of piping walkdowns outside containment demonstrated that the piping was constructed without an intentional slope. Variations in piping layout due to this method of construction were found not to promote potential air voids that would exceed the void acceptance volume calculated in piping analysis outside containment.

The BWROG report demonstrates that any voids contained in sections of injection piping downstream of the first normally closed motor operated isolation valve will not create a waterhammer which could challenge the operability of those systems required to mitigate postulated events. A portion of the piping that discharges into the reactor vessel, or lines directly connected to the vessel, will void (due to flashing) during vessel depressurization and are designed accordingly. Any pressure transients occurring due to voids are accounted for in the original piping design margin. Given the diversity in plant piping configurations for HPCI, the uniqueness of the turbine driven pump, and operating experience the report recommended that a plant specific assessment of the HPCI system be performed. A plant specific evaluation was performed for each CSCS System and is discussed below.

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Inaccessible piping in the following systems was evaluated:

Low Pressure Cooling Injection (LPCI)

The LPCI mode of Residual Heat Removal (RHR) injects into the Reactor Recirculation pump discharge piping within the drywell. There is no normally closed motor operated valve (MOV) between the LPCI injection isolation valve outside the drywell and the reactor. This piping was walked down during RFO 27 and the existing vents were identified and photographed. The vents are located on the horizontal piping between the check valve and the manual isolation valve. The horizontal piping is vented after maintenance activities and prior to start-up. The vent valves are at a higher elevation than where the piping connects into the Reactor Recirculation piping. Based on this, no additional action is recommended.

Shut Down Cooling (SDC)

The suction piping of the SDC mode of RHR is piped into the Reactor Recirculation pump suction piping. There is no normally closed MOV between the SDC injection isolation valve outside the drywell and the reactor. The SDC suction piping has a normally closed valve in the suction piping, yet this valve being closed cannot contribute to water hammer as there would not be a suction path to the pump. This piping was walked down during RFO 27 and the existing vents were identified and photographed. The vents are located on the horizontal piping between the Motor Operated Valve and the manual isolation valve. The piping is vented after maintenance activities and prior to start-up. The vent valves are at the same elevation as the piping that connects into the Reactor Recirculation piping. Based on this, no additional action is recommended.

Core Spray (CS)

The CS piping ties directly into the reactor within the drywell. There is no normally closed MOV between the CS injection isolation valve outside the drywell and the reactor. This piping was walked down during RFO 27 and the existing vents were identified and photographed. The vents are located on the vertical piping between the check valve and the normally open manual isolation valve. The piping is vented after maintenance activities and prior to start-up. The vent valves are located at a lower elevation than the piping injects into the reactor. Ultrasonic testing of the piping confirmed that there was no significant voiding. This flow path is used during each refuel outage to flood the reactor vessel and any voids are swept out of the piping. Based on this, no additional action is recommended.

High Pressure Coolant Injection (HPCI)

The HPCI pump injects into the feedwater piping inside the steam tunnel and the feedwater piping injects into the reactor. The HPCI pipe is vented at a higher elevation than where it ties into the feedwater piping. Air in the HPCI piping is vented at this location. The piping is vented after maintenance activities and prior to start-up. The HPCI piping inside the steam tunnel has been walked down and photographs taken of the vents. There is no normally closed valve between where the HPCI piping injects into the feedwater piping and the reactor. Based on this, no additional action is recommended.

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Historical Events

Water Hammer Events

In the late 1970s and early 1980s, VY had incidents of water hammer while placing RHR in the SDC mode of operation. The investigations concluded that these events were most probably caused by water hammer as rapid condensation occurs in a steam bubble trapped in the elevated portion of the RHR return line during cooldown. Corrective actions included installing a vent at the high point of the elevated piping inside the drywell and procedure changes discussed below.

SDC Loop Isolation after RHR Pump Start

In 1991, with the reactor vessel cooldown in progress, the "B" RHR pump was started in an attempt to place shutdown cooling in service. A Group IV Primary Containment Isolation System (PCIS) signal was received, the SDC suction valves isolated and the RHR pump tripped. Based on the reactor level drop, it is believed that voids in the RHR piping caused a water hammer resulting in the pressure spike. Corrective actions included a procedure change to partially open the injection valve, prior to starting the RHR pump, to achieve a nominal flow upon pump start, to clear any void in the piping prior to establishing normal SDC flow.

Group IV Isolation While Starting SDC

In 1994, when attempting to start SDC using the "B" RHR loop, a PCIS Group IV signal was generated. A calculation identified that isolations could occur at flow rates greater than approximately 2000 gpm into piping downstream of the LPCI Injection valves. Corrective actions included a procedure change to fill and vent the SDC suction piping using the condensate transfer system prior to establishing SDC operation.

Actuation of PCIS Group IV Isolation when Initiating SDC

In 1997, when initiating SDC and actuation of PCIS Group IV Isolation occurred. It was concluded that these SDC isolations were the result of voiding of piping downstream of RHR injection valve V10-27A when RHR system was in standby mode. The resultant water hammer when RHR was placed in SDC mode caused a high pressure spike which exceeded the PCIS Group IV logic setpoint. Piping with stagnant high points which has been heated and pressurized is prone to formation of steam voids at the high points upon subsequent depressurization. Additional procedure changes were made to minimize the potential for recurrence as discussed below.

Since these events, the plant procedure (Reference (5)) for establishing SDC has been revised to require both a "hot" flush with reactor water to preheat the SDC piping and an additional flush from the condensate transfer system to eliminate PCIS Group IV Isolations due to pressure spikes. Based on the performance over the last few years, the issue of water hammer events and Group IV PCIS Isolations has been resolved.

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Conclusion

The CSCS piping in inaccessible areas has been reviewed, walked down and evaluated for the potential that gas accumulation would result in challenges to operations. No configurations were identified requiring any additional action.

Previous incidents have been reviewed and corrective actions have been implemented to minimize the potential for reoccurrence. The potential for water hammer in the SDC piping or Group IV PCIS Isolations have been addressed by adding vents, implementing modifications and procedure changes to pre-heat the return piping prior to initiating SDC.

The CSCS injection piping within primary containment is between a normally closed motor operated valve located outside containment and the reactor. The BWROG has evaluated this configuration and determined that no water hammer greater than the expected pressure transient of an actual injection will occur due to voids in this section of piping. HPCI has been evaluated and determined that the potential for water hammer in the injection piping including the feedwater piping does not exist.

Based on this no additional action is required for CSCS piping in inaccessible areas.

References

1. NRC Generic Letter 2008-01, "Managing Gas Accumulation in Emergency Core Cooling, Decay Heat Removal, and Containment Spray Systems," NVY 08-008, dated January 11, 2008
2. Letter, Entergy to USNRC, "Vermont Yankee Three Month Response to Generic Letter 2008-01," BVY 08-020, dated April 10, 2008
3. Letter, Entergy to USNRC, "Vermont Yankee Nine Month Response to Generic Letter 2008-01," BVY 08-071, dated October 14, 2008
4. BWROG Report 0000-88-8869-R0, Effect of Voiding in ECCS Drywell Injection Piping
5. OP 2124, Residual Heat Removal System