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January 14, 2010

U.S. Nuclear Regulatory Commission
Attention: Document Control Desk
Washington, D. C. 20555

Serial No. 09-790
NLOS/WDC R0
Docket Nos. 50-336
50-423
License Nos. DPR-65
NPF-49

DOMINION NUCLEAR CONNECTICUT, INC.
MILLSTONE POWER STATION UNITS 2 AND 3
RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION REGARDING GENERIC LETTER 2008-01, MANAGING GAS ACCUMULATION IN EMERGENCY CORE COOLING, DECAY HEAT REMOVAL, AND CONTAINMENT SPRAY SYSTEMS

The NRC issued Generic Letter (GL) 2008-01 to request that each licensee evaluate the licensing basis, design, testing, and corrective action programs for the Emergency Core Cooling, Decay Heat Removal, and Containment Spray systems, to ensure that gas accumulation is maintained less than the amount that challenges operability of these systems, and that appropriate action is taken when conditions adverse to quality are identified.

Letters dated April 7, May 8 and October 14, 2008, and January 15, 2009 (Serial Nos. 08-0013, 08-0013A, 08-0013C and 09-010) provided Dominion Nuclear Connecticut, Inc. (DNC) responses to NRC GL 2008-01 for Millstone Power Station Units 2 and 3. The NRC requested additional information required to complete the review in a telephone conference call on October 29, 2009 and by letter dated November 6, 2009 (ADAMS Accession No. ML092960560). In response to this request, DNC is providing the attached information.

Please contact Ms. Wanda D. Craft at (804) 273-4687 if you have any questions or require additional information.

Sincerely,

L. N. Hartz
Vice President – Nuclear Support Services

COMMONWEALTH OF VIRGINIA)
)
COUNTY OF HENRICO)

The foregoing document was acknowledged before me, in and for the County and Commonwealth aforesaid, today by L. N. Hartz, who is Vice President – Nuclear Support Services of Dominion Nuclear Connecticut, Inc. She has affirmed before me that she is duly authorized to execute and file the foregoing document in behalf of that company, and that the statements in the document are true to the best of her knowledge and belief.

Acknowledged before me this 14th day of January, 2010.

My Commission Expires: 4/30/13

GINGER L. ALLIGOOD
Notary Public
Commonwealth of Virginia
310847
My Commission Expires Apr 30, 2013

Ginger L. Alligood
Notary Public

Commitments made in this letter: None

Attachments:

1. Response to Request for Additional Information Regarding Generic Letter 2008-01

cc: U. S. Nuclear Regulatory Commission
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NRC Senior Resident Inspector
Millstone Power Station

ATTACHMENT 1

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION REGARDING GENERIC LETTER 2008-01

DOMINION NUCLEAR CONNECTICUT, INC.
MILLSTONE POWER STATION UNITS 2 AND 3

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION REGARDING GENERIC LETTER 2008-01

This attachment contains the Millstone Power Station Units 2 and 3 (MPS2 and 3) response to a request for additional information (RAI), Reference 7, regarding Generic Letter (GL) 2008-01 "Managing Gas Accumulation in Emergency Core Cooling, Decay Heat Removal, and Containment Spray Systems." In GL 2008-01, the NRC requested "that each addressee evaluate its ECCS, Decay Heat Removal (DHR) system, and Containment Spray (CS) system licensing basis, design, testing, and corrective actions to ensure that gas accumulation is maintained less than the amount that challenges operability of these systems, and that appropriate action is taken when conditions adverse to quality are identified."

NRC QUESTION 1:

In Reference 4, Dominion Nuclear Connecticut, Inc. noted that "a corrective action is in place to monitor the status of the TSTF [Technical Specification Task Force] traveler described above." The TSTF traveler described above is being developed for making changes to Technical Specifications (TSs) related to the potential for unacceptable gas accumulation.

Clarify the schedule for evaluating the TSTF traveler and submitting a license amendment, if necessary.

RESPONSE:

Upon NRC approval of the TSTF traveler, Dominion will evaluate it for applicability to MPS2 and 3. If a license amendment is determined to be necessary to either supplement or replace the current Technical Specifications, Dominion will submit a license amendment(s) within one year of NRC approval of the TSTF traveler. This action will be tracked per the Corrective Action Program.

NRC QUESTION 2:

The licensee states in Reference 4 that MPS2 has several locations of possible gas accumulation that require further confirmation. "UT [ultrasonic testing] measurements of these potential voids will be performed to validate void size."

The licensee also states that, "MPS2 has utilized this methodology [Joint Owners group methodology using plant specific information for piping restraints and relief valve set points to determine the acceptable gas volume accumulation such that a relief valve does not lift] in technical evaluation (M2-EV-08-0027) for evaluation of any gas accumulation found in discharge piping of susceptible GL 2008-01 in scope systems [Emergency Core Cooling, Decay Heat Removal, and Containment Spray System]."

Clarify how voids are being detected in the pump discharge piping. If gas accumulation is detected, how are these potential voids going to be monitored and trended?

RESPONSE:

The RAI specifically addresses pump discharge piping, but the following discussion applies to pump suction piping, pump discharge piping and piping system components (i.e., piping systems). As part of the GL 2008-01 review, piping system high points were identified. High point determination included identification of local high points due to pipe slope. Accessible piping system high points are monitored on a quarterly basis at MPS2. There is no Technical Specifications (TS) for monitoring ECCS piping full. A quarterly surveillance period was selected based on operating experience at MPS2 (i.e., gas accumulation has not been problematic). However, should additional experience gained by implementation of the monitoring program indicate a shorter surveillance period (e.g., monthly) is necessary, then the monitoring program will be adjusted accordingly.

Piping system high points include both piping and components. Accessible piping is monitored with ultrasonic testing (UT) on a periodic basis. Piping system locations that are susceptible to potential gas accumulation, but which are not monitored with UT (e.g., pump casings) are manually vented on a periodic basis.

Gas is not expected to be found in the piping systems (i.e., piping/piping components such as pumps), but a condition report (CR) is initiated if gas is identified. CRs are used to document and trend gas accumulation in piping systems. Per MPS2 procedures, a UT reading of less than 100% full, requires that the location be manually vented. If the identified gas volume is less than pre-established gas accumulation allowable limits, the piping system remains operable. If the gas accumulation is greater than the pre-established gas accumulation allowable limit, the system is declared inoperable and cannot be declared operable until the affected area is vented and any predicted gas accumulations that could accumulate during the surveillance interval have been analytically determined to remain within the pre-established gas accumulation allowable limits.

NRC QUESTION 3:

In Reference 4, the licensee states that for MPS2 "with the exception of SIT [Safety Injection Tank] back leakage, there are no known gas intrusion mechanisms that impact these piping systems [emergency core cooling, decay heat removal, and containment spray systems] during the operating cycle." Discuss measures used to guard against gas intrusion due to inadvertent draining, system realignments, incorrect maintenance procedures, or other evolutions (Part 1).

References 1 and 3 identify additional gas intrusion mechanisms, such as leakage from the reactor coolant system and issues related to the charging systems that may apply to MPS2. Please list the potential gas intrusion mechanisms identified in the references and justify why they are not a concern for MPS2 (Part 2).

RESPONSE:

Response to Question 3 – Part 1:
The periodic UT and venting of equipment discussed above in response to Question 2 addresses this question. The periodic monitoring discussed above will guard against unidentified gas intrusion due to inadvertent draining, system realignments, incorrect maintenance procedures, or other evolutions that might cause gas to enter the piping system. Maintenance personnel coordinate activities with Operations personnel to maintain and restore the piping systems. In addition, critical maintenance procedures require a specific post maintenance (post filling and venting) UT be performed to ensure that the post maintenance filling and venting evolution was effective prior to declaring the system operable.

Response to Question 3 – Part 2:
The following paragraphs list potential sources of gas intrusion for MPS2 and the basis for why these potential sources of gas are not a concern for MPS2.

Reactor coolant system (RCS) back leakage could carry hydrogen solute through leaking isolation valves/check valves. Hydrogen is introduced into the RCS through the volume control tank (VCT). The VCT is maintained at a pressure of approximately 30 to 35 psia. This causes hydrogen to be absorbed (saturated) by the charging fluid at the VCT pressure. The emergency core cooling pumps (e.g., high pressure safety injection (HPSI) and low pressure safety injection (LPSI) pumps) are located at elevation (-) 45.5 ft in the Auxiliary Building. The refueling water storage tank (RWST) is located at grade 14.5 ft and the tank is approximately 27 ft tall. Hydrogen does not come out of solution because the RWST overpressure (RWST head is approximately 50 psia at the pumps) is greater than the saturation pressure for the hydrogen in solution in the RCS. In summary, RCS back leakage degassing is not a concern at MPS2 because of the low saturation pressure of hydrogen within the RCS (low volume of hydrogen in solution in the RCS) and RWST overpressure (low potential of hydrogen degassing) due to the location of ECCS equipment in the lower levels of the Auxiliary Building.

At the time the response to GL 2008-1 was made for MPS2, the charging system contained nitrogen gas filled bladders in the pump discharge pulsation dampeners. However, since the issuance of the MPS2 GL 2008-01 response, the gas bladder filled dampeners have been replaced with water solid dampeners. Therefore, the charging system discharge dampeners are no longer a potential gas intrusion source.

Some facilities have reported gas accumulation at the letdown pressure breakdown orifices. Pressure fluctuations (i.e., pressure drops) in the VCT have led to degassing downstream of the letdown orifices. MPS2 has been evaluated for this phenomenon and is not affected.

Another potential gas stripping mechanism that has been reported by some facilities is gas stripping at a pressure breakdown orifice/valve in a minimum recirculation line where the discharge of the minimum recirculation line is piped directly to the pump suction. The drop in pressure across the breakdown orifice/valve can cause the

pressure to drop below the saturation pressure for any gas held in solution. This would cause gas to accumulate in the minimum flow recirculation line. The minimum recirculation lines for the affected pumps are not directly routed to the pump suction (e.g., minimum recirculation is routed to the RWST) and therefore, degassing of the minimum recirculation lines is not a concern at MPS2.

NRC QUESTION 4:

In Reference 4, the licensee states that if gas accumulation was discovered at MPS2 or MPS3, a condition report would be initiated and the shift manager would be notified.

Clarify how gas accumulation is determined, including the overall criteria (Part 1). Also, discuss any follow-up actions that would be taken (Part 2).

RESPONSE:

Response to Question 4 – Part 1:
MPS2 and 3 periodically monitor ECCS piping for gas accumulation in accordance with Millstone Power Station approved procedures. Station procedures require that accessible ECCS piping and equipment high points (gas accumulation points) are monitored by either UT or are manually vented. Manually vented locations include equipment (e.g., pumps) that cannot be examined by UT. UT examinations are performed in accordance with Dominion Fleet approved UT procedures with qualified individuals and calibrated equipment. UT water levels are recorded within approved Station Work Orders.

Calculated void volumes are compared to pre-established void allowables. Void allowables are determined in accordance with GL 2008-01 and implementing reports generated as a result of GL 2008-01 activities (e.g., FAI Report/09-130, Technical Basis for Gas Transport to the Pump Suction, Fauske & Associates, December 2009). When more than one void allowable limit is applicable to a specific pipe location, the more restrictive limit is applied to that location. Allowable void limits in discharge piping have been established to preclude challenges to suction side and discharge side relief valves (i.e., relief valve lift is precluded assuming the maximum allowed void size is present).

Response to Question 4 – Part 2:
When a gas accumulation is discovered as part of the periodic monitoring program, a CR is generated to track the condition. When gas is discovered within the system via proceduralized periodic UT, the procedure requires that the gas be vented from the system. The CR may drive other corrective actions to be developed depending upon the circumstances (e.g., a new void formation trend in the system will typically result in entering the troubleshooting procedure in order to determine the source of the gas intrusion and to recommend corrective actions to prevent or minimize future gas accumulation).

NRC QUESTION 5:

In Reference 4, the licensee states for MPS3 that "when gas voids were present in pump suction lines, the pumps were evaluated to ensure gas would not accumulate within the pumps due to low flow rates."

Were any follow-up actions taken in regard to this issue, if so what were they? Discuss in generic terms the source of the gas voids present.

RESPONSE:

When gas voids were discovered in the suction lines to the ECCS pumps, a CR(s) was generated to address the issue. As part of the corrective actions, the probable source of the gas was determined. If the source of the gas could be eliminated, it was eliminated. If a vent valve was not local to the void, then a vent valve was installed to allow venting the void. ECCS pump suction line high points are entered into the monthly MPS3 surveillance procedures that fulfill the requirements for establishing that a system is full relative to Technical Specification Surveillance 4.5.2.b.1.

Of the two recent (since 2005) gas voids discovered in MPS3-ECCS supply lines, one was attributed to inadequate venting capability due to a historic design deficiency and the other is understood to be a result of gas stripping during pump minimum flow recirculation operation (i.e., quarterly pump surveillance testing). Relative to the historic design deficiency issue, a vent valve was not present to support system restoration following maintenance. Subsequent to the void discovery, a vent valve was installed to support return to service of this line following maintenance.

Relative to the gas stripping issue, a globe valve in the minimum flow recirculation line (Residual Heat Removal) acts as a high resistance in the minimum flow recirculation line. During required quarterly pump testing, the pressure drop across the valve causes the fluid inventory (air saturated RWST inventory at atmospheric pressure) to degas due to the pressure drop in the vena contracta. Since this phenomenon could not be eliminated as a source of gas, the maximum gas volume (based on experience/monitoring of the phenomenon) that could be generated during the mission time of the pump was subtracted from the overall gas allowable for this location. Any gas accumulated in the pump supply line due to quarterly pump testing is identified via the monthly surveillance. When gas is identified, Operations is procedurally directed to vent the gas.

NRC QUESTION 6:

Training was not identified in the GL but is considered to be a necessary part of applying procedures and other activities when addressing the issues identified in the GL. Provide a brief description of training.

RESPONSE:

Engineering Support (ES) training is performed quarterly at Millstone Power Station. An ES module addressing GL 2008-01 issues was developed, and this training was provided to all ES personnel during calendar year 2009. This training addressed general GL 2008-01 issues including what prompted the GL as well as specific Millstone Power Station experience and related scale model gas void transport testing. The gas transport testing was performed for Millstone Power Station at the laboratory facilities of Fauske & Associates. Video of the scale model testing was presented and explained. All Station Technical Advisors (STAs) receive training on GL 2008-01 relating to input and use of the gas void spreadsheet. This training is hands-on interactive training between the STAs and the Engineers that maintain the gas void spreadsheets.

Operations personnel are trained on the procedures that require verification that the ECCS is full (i.e., input to the gas void spreadsheets). The procedures include basis information related to implementation of GL 2008-01 insights. In addition, all Operations Support (OS) personnel received training on GL 2008-01 during 2009. This training included an overview of GL 2008-01, industry operating experience (OE) and site specific OE. The STAs are part of the OS personnel population. In addition, training on Institute of Nuclear Power Operations (INPO) Significant Operating Event Report (SEOR) 97-1 as well as INPO Significant Event Report (SER) 2-05 is an integral part of Licensed Operator Requalification Training (LORT) and Nuclear Licensed Operator Continuing Training (NLCT), which is provided every 2 years prior to respective outages. In addition, related OE from MPS3 gas intrusion events and the necessary operator actions continue to be reinforced on a periodic basis. The addition of new vent valves in the ECCS systems at both units has also been reviewed with the operators, reinforcing the importance of adequate venting when restoring systems to service to limit gas intrusion.

REFERENCES

1. Ruland, William H., "Preliminary Assessment of Responses to Generic Letter 2008-01, "Managing Gas Accumulation in Emergency Core Cooling, Decay Heat Removal, and Containment Spray Systems," and Future NRC Staff Review Plans," NRC letter to James H. Riley, Nuclear Energy Institute, (ADAMS Accession No. ML091390637), May 28, 2009.

2. Riley, James H., "Generic Letter (GL) 2008-01, "Managing Gas Accumulation in Emergency Core Cooling, Decay Heat Removal, and Containment Spray Systems' Evaluation and 3 Month Response Template," Letter to Administrative Points of Contact from Director, Engineering, Nuclear Generation Division, Nuclear Energy Institute, Enclosure 2, "Generic Letter 2008-01 Response Guidance," March 20, 2008.

3. Case, Michael J., "NRC Generic Letter 2008-01: Managing Gas Accumulation in Emergency Core Cooling, Decay Heat Removal, and Containment Spray Systems," Letter from Director, Division of Policy and Rulemaking, Office of Nuclear Regulation, NRC, (ADAMS Accession No. ML072910759), January 11, 2008.

4. Price, Alan, "Dominion Nuclear Connecticut, Inc. Millstone Power Station Units 2 and 3, Docket No. 50-336, 50-423, Nine-Month Response to NRC Generic Letter 2008-01," Letter to Document Control Desk, NRC, from Vice President, Nuclear Engineering, Dominion Nuclear Connecticut, Inc., (ADAMS Accession No. ML082890266), October 14, 2008.

5. Matthews, William R., "Dominion Nuclear Connecticut, Inc. Millstone Power Station Unit 3 Supplemental Response to Generic Letter 2008-01, "Letter to Document Control Desk, NRC, from Senior Vice President, Nuclear Operations, Dominion Nuclear Connecticut, Inc., (ADAMS Accession No. ML090150378), January 15, 2009.

6. Revision 2 to NRC Staff Criteria for Gas Movement in Suction Lines and Pump Response to Gas, (ADAMS Accession No. ML090900136), March 26, 2009.

7. The NRC requested additional information that is required to complete the review by telephone conference on October 29, 2009 and by NRC letter dated November 6, 2009 (ADAMS Accession No. ML092960560).