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

Millstone Nuclear Power Station, Unit No. 1
Response to Request for Additional Information
Purge/Vent Valve Debris Screens

This letter provides Northeast Nuclear Energy Company's (NNECO's) response to the NRC Staff's June 29, 1994[1] request for additional information on purge/vent valve debris screens.

Summary

NNECO does not believe that purge/vent valve debris screens warrant installation. Sufficient information exists to support NNECO's conclusion that debris screens will not enhance the overall safety of Millstone Unit No. 1. This conclusion is based upon the limited time that any valve is open, the low likelihood that debris would reach any valve, and the expectation that debris would not prevent closure of any valve.

Discussion

The Staff completed their review of TMI Action Plan Item II.E.4.2 and provided a safety evaluation to NNECO in February 1985.[2] In the safety evaluation, the Staff concluded that debris screens must be provided in the drywell to ensure that isolation valve

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(1) J. W. Andersen letter to J. F. Opeka, "Millstone Nuclear Power Station, Unit 1 - Purge/Vent Valve Debris Screens," dated June 29, 1994.

(2) J. A. Zwolinski letter to W. G. Counsil, "Containment Isolation Dependability (NUREG 0737, Item II.E.4.2) and Long-term Review Containment Purge and Vent (MPA B-24)," dated February 25, 1985.

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closure would not be prevented by debris which could become entrained in the escaping air and steam following a loss of coolant accident (LOCA).

NNECO had maintained, since the inception of this issue, that debris screens are not necessary. However, the Staff rejected NNECO's position in the February 25, 1985, safety evaluation. NNECO responded to the safety evaluation and stated that the debris screens would be installed.[3]

NNECO revisited the installation of debris screens (in conjunction with a number of other issues relating to purging and venting) in the Integrated Safety Assessment Program (ISAP) Final Report.[4] In that document NNECO restated the reasons why debris screens were not required. NNECO concluded the purge and vent review by stating that NNECO would only pursue the implementation of modifications that would have the greatest benefit to plant operations and would most effectively address the Staff's concerns on purge and vent issues. All other modifications were to be eliminated.

NNECO reiterated the intention not to install debris screens in two subsequent ISAP update reports.[5][6] Therefore, NNECO believes that the appropriate actions were taken to withdraw the commitment.

Nonetheless, following discussions with NNECO, the Staff recently revisited this issue and determined that NNECO had not submitted sufficient justification to support the position that debris screens were not necessary. The Staff requested that NNECO provide additional information on why screens are not needed. Accordingly, the basis for NNECO's determination that screens are of limited benefit is provided below.

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(3) J. F. Opeka letter to J. A. Zwolinski, "Containment Purge and Vent," dated June 28, 1985.

(4) J. F. Opeka letter to U.S. Nuclear Regulatory Commission, "Integrated Safety Assessment Program, Final Report for Millstone Unit No. 1," dated July 31, 1986.

(5) E. J. Mroczka letter to U.S. Nuclear Regulatory Commission, "Integrated Safety Assessment Program (ISAP)," dated August 4, 1987.

(6) E. J. Mroczka letter to U.S. Nuclear Regulatory Commission, "Integrated Safety Assessment Program (ISAP)," dated November 9, 1988.

Justification for not Installing Debris Screens

At Millstone Unit No. 1, there are three valves which need to be addressed (see Figure 1): the 18-inch supply valve, AC-5; the 18-inch vent valve, AC-7; and the 2-inch (bypass) vent valve, AC-9. As stated in TMI Action Plan Item II.E.4.2 of NUREG 0737, the purge/vent lines on the torus would not be subjected to debris. Venting to the stack through AC-8 is not performed during power operation.

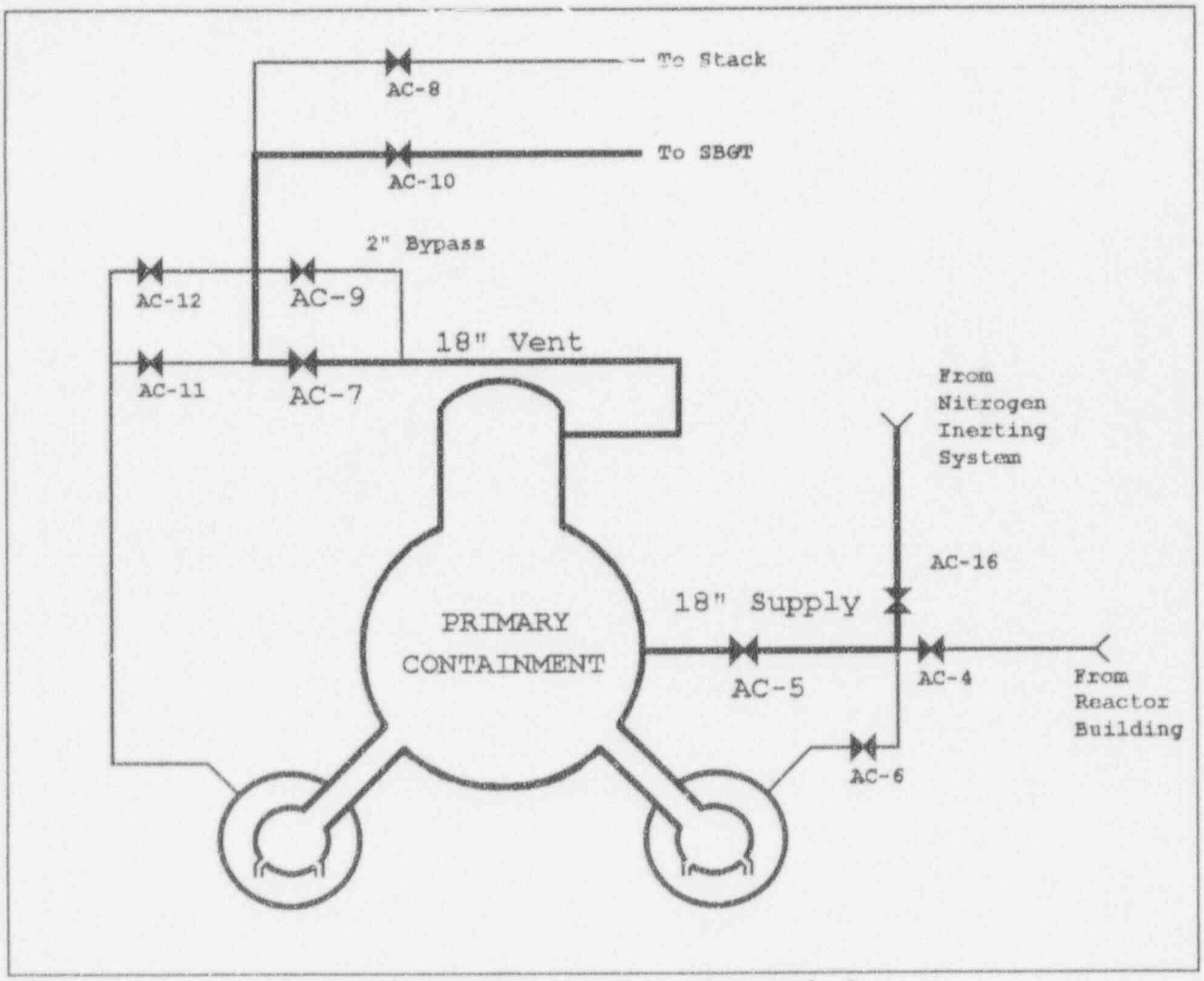

Figure 1 Atmospheric Control System

NNECO believes that the design and operation of the valves and the configuration of the piping up to the valves minimize the potential that debris could cause clogging of the valves. Further, the limited time that the valves are open significantly decreases the

probability that an accident which generates debris would occur while the valves were open.

<u>Valve design is such that clogging would not be expected.</u>

Both 18-inch valves are butterfly valves. These valves have soft seats with offset vanes. Figure 2 provides a simplified drawing showing how these particular valves are designed. Closure increases flow velocities through each valve, which will aid in debris removal from the valve seat. In addition, the valves experience a two second delay before auto closure initiates. This delay would provide time for debris which could become lodged during closure to be swept through the valve.

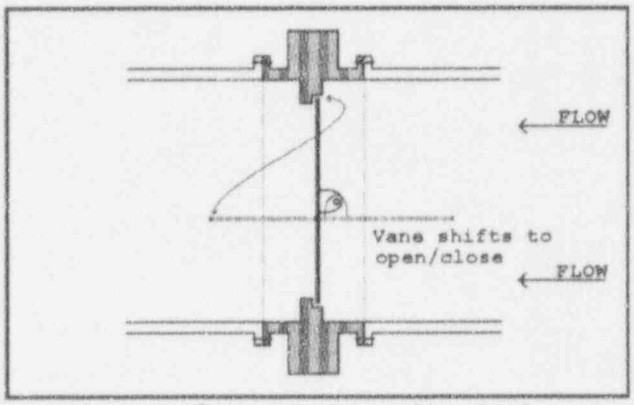

Figure 2 Butterfly Valve

The 2-inch bypass valve is a plug valve. This valve design provides an unrestricted flow path until closure. During closure, the velocity through the valve seat would increase as the plug closes. Any debris in the seat area would be swept away. Like the larger valve, the 2-inch valve experiences a two second delay before auto closure initiates. This delay would provide time for debris to be swept through.

<u>Piping configuration would preclude debris from reaching the valves.</u>

The supply side drywell penetration is located at elevation 9'-1", which is approximately eight feet above the lowest floor in the drywell. Floor gratings separate the penetration from the two upper drywell levels. Debris from the upper level which moves downward following a design basis accident would be partially screened by the grating. Although debris could be generated from postulated breaks below the grating, there are no break locations postulated nearby, which would force debris into the penetration. Flow velocities inside the drywell due to the penetration are not expected to be high enough to direct debris into the piping. Outside of the drywell, the piping takes three right angle turns. These turns may also contribute to trapping debris before it reaches the valve.

The vent side penetration is located at elevation 68'-6". This is in the upper regions of the drywell. Immediately across from the penetration is the biological shield wall. There are no nearby

postulated break locations which would force debris into the penetration. The vent piping also takes right angle turns outside of containment. The turns may contribute to trapping debris before it reaches the valve.

The 2-inch bypass valve is tapped off the 18-inch line. This configuration forces the debris to take an additional right angle turn off the vent piping flow path. Also, the smaller diameter of the 2-inch line would preclude most debris from reaching the valve from the larger diameter piping.

Limited time of use minimizes risk.

The primary reason that NNECO believes that installation of debris screens provides no additional safety benefit is the limited time that the 18-inch valves are open during power operation. There are two operations which require the valves to be open: purging the drywell at startup (inerting) or before a shutdown (de-inerting), and maintaining the nitrogen concentration or 1 psi differential during operation.

Purging during a reactor startup normally involves opening the 18-inch drywell vent valve (AC-7) and supplying nitrogen into the torus. This method of nitrogen addition minimizes the quantity of nitrogen required and utilizes natural diffusion as the nitrogen migrates to the upper region where the vent penetration is located. A maximum of 24 hours is allowed by Technical Specification 3.7.A.6 for establishing the inerted conditions.

De-inerting the drywell for a reactor shutdown involves opening both the 18-inch vent and the 18-inch supply valves (AC-5 and AC-7). This evolution is limited by Technical Specification 3.7.A.6 to 24 hours prior to shutdown.

In addition to the shutdown and startup limitations, the Millstone Unit No. 1 Technical Specifications allow operation without containment being inerted for a period of up to 48 hours. This allows drywell entry while operating for testing, surveillances, or maintenance on equipment important to safety. This limiting condition for operation, however, is infrequently invoked.

Additional nitrogen may be required during operation to maintain the desired nitrogen concentration, or to maintain the 1 psi differential pressure. When using the nitrogen inerting system, this is accomplished by supplying nitrogen through the 18-inch drywell supply valve (or the 18-inch torus supply valve, if required). The 2-inch bypass valves may be opened and re-closed as necessary to ensure uniform nitrogen distribution. This evolution

is typically performed several times each week for approximately 30 minutes each time.

During startup and operation, venting may also be performed to reduce pressurization resulting from containment heatup. Drywell venting is generally performed by opening the 2-inch bypass valve (AC-9).

Other factors considered.

Each flowpath has a second isolation valve. Although it is highly unlikely for debris to prevent full closure of the first valve, if the valve were to be prevented from closure, the second valve will provide isolation. A single failure of the second isolation valve on the vent path need not be assumed since the 18-inch vent valve is only opened while in a limiting condition for operation (either 3.7.A.6.b or 3.7.A.6.c).

The nitrogen supply tank pressure ranges between 40 and 50 psig. The drywell pressure is between 0 and 1 psig. Should a design basis accident occur while the nitrogen addition is in progress, the maximum drywell accident pressure of 43 psig will be substantially reduced in the supply side piping. This may contribute to slowing or preventing debris in the supply line.

Probabilistic risk assessment.

The need for debris screens is predicated upon the possibility that debris generated during a LOCA reach the isolation valves and prevent their complete closure, resulting in the inability to isolate containment. While both NNECO and the Staff agree that debris may be generated, there is no consensus on what kind of debris may be generated, or if the debris could actually affect the ability of the valves to close. The Staff concluded in 1985 that the benefit of having debris screens outweighed the small cost associated with installation. At Millstone Unit No. 1, the cost is not expected to be insignificant. Screens cannot easily be installed at the flanges where the butterfly valves are attached to the piping, since the vane itself extends into the piping. Nor can the screens be easily installed at the penetration, which would require welding directly to the containment vessel. Screens would have to be inserted in to the piping between these two points. Since the cost is not expected to be insignificant, it is appropriate for NNECO to quantify the actual benefit provided.

This is accomplished by comparing the probability of this specific event to the overall probability of any event which leads to a breach of containment and subsequent release of radioactivity. In order to ensure a conservative assessment, the following

assumptions were used: The 18-inch valves are opened for the maximum allowed durations for one shutdown, one startup, and one containment entry each year; nitrogen addition is always to the drywell; a LOCA with a core melt occurs, debris prevents closure of the open purge/vent valves; and the second valve remains open as a single failure.

The frequency of a LOCA plus a core melt occurring while either of these two flowpaths is open is 2×10^{-8}/yr (0.02×10^{-6}/yr). Given the assumptions described above, this scenario would be equivalent to a core melt with a failed containment. Thus, this value should be compared with the overall frequency of a core melt and containment failure which is 7×10^{-6}/yr. Therefore, removing this potential release pathway has an insignificant impact on the overall margin of safety established for Millstone Unit No. 1.

Any improvement in the risk needs to be balanced against the potential drawback of the screens. If significant debris is actually introduced, the screens would clog. This would reduce the capability to vent containment. Such capability may be needed for a beyond design basis event such as loss of decay heat removal following a LOCA.

Conclusion

Sufficient justification exists to support NNECO's position that debris will not prevent closure of the atmospheric control valves. Moreover, due to the limited time that any valve is open, installing screens would not improve the margin of safety established for Millstone Unit No. 1. Therefore, NNECO believes debris screens need not be installed.

This submittal is considered a Cost Beneficial Licensing Action by NNECO. Modifications to install debris screens are expected to cost more than the $100,000 guideline identified by the Staff and would not provide a significant or commensurate benefit to public health and safety.

If you have any questions regarding information contained herein, please contact Mr. Thomas B. Silko at (203) 440-2070.

Very truly yours,

NORTHEAST NUCLEAR ENERGY COMPANY

J. F. Opeka
Executive Vice President

cc: T. T. Martin, Region I Administrator
J. W. Andersen, NRC Acting Project Manager, Millstone Unit No. 1
P. D. Swetland, Senior Resident Inspector, Millstone Unit Nos. 1, 2, and 3