Enclosure 4

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

SAFETY EVALUATION
PURGE/VENT VALVE ISOLATION DEPENDABILITY
NUREG-0737, ITEMS II.E.4.2 6&7
MILLSTONE NUCLEAR POWER STATION, UNIT NO. 2
DOCKET NO. 50-336

1.0 INTRODUCTION

As a consequence of the accident at TMI-2, implementation of a number of new requirements has been recommended for operating reactors. These new requirements are described in NUREG-0737, "Clarification of TMI Action Plan Requirements," November 1980. The staff has requested licensees to verify that these TMI action plan requirements have been met. This report provides an evaluation of the response to Action Plan Item II.E.4.2, positions 6 & 7 for Millstone, Unit No. 2.

2.0 REVIEW CRITERIA

Position 6 requires that containment purge/vent isolation valves that do not satisfy the operability criteria set forth in Branch Technical Position CSB 6-4 or the Staff Interim Position of October 23, 1979, must be sealed closed during operating conditions 1, 2, 3, and 4, as defined in SRP 6.2.4, item II.6.f (NUREG-0800). These valves must be verified closed at least every 31 days.

Sealed-closed isolation valves may be closed manual valves, closed remote-manual valves, and closed automatic valves which remain closed after a loss-of-coolant accident. Sealed-closed purge isolation valves should be under administrative control to assure that they cannot be inadvertently opened. Administrative control includes mechanical devices to seal or lock the valve closed or to prevent power from being supplied to the valve operator.

Key-locked switches in the control room are also acceptable administrative control devices to assure that the purge/vent valves are not inadvertently opened. Checking the valve position light in the control room every 31 days is an acceptable method for verifying that the purge valves are closed.

Position 7 requires that containment purge/vent isolation valves must close on a high radiation signal. The radiation monitor(s) that provide the high radiation signal to purge/vent isolation valves must sense primary containment atmosphere. However, the location of the monitor does not have to be inside primary containment, but can be downstream of the purge exhaust valves or in a separate system that directs primary containment atmosphere to radiation monitors located outside containment and then exhausts the containment air back into containment.

The staff has determined that any purge/vent isolation valves sealed closed during plant operating modes 1 through 4, in accordance with SRP 6.2.4, Item II.6.f (NUREG-0800) satisfy the requirements of Position 7 without a radiation closure signal, since these valves are not expected to be open during an accident. Purge/vent lines that are very small and that are used very infrequently also satisfy the requirements of Position 7 without a radiation closure signal, since the amount of containment atmosphere that can be released to the environment is small and since these valves are highly reliable and also unlikely to be open if an accident releasing radiation should occur.

Those plants that elect to seal closed the purge/vent valves to meet the provisions of II.E.4.2(6&7) will be required to identify this operational restriction in the plant Technical Specifications.

The evaluation of licensee compliance with Position 7 does not include a review of radiation monitor quality, setpoint, redundancy, or isolation/separation from safety systems.

EVALUATION AND CONCLUSION

Based on our review of the current TS, the 42-inch containment valve at Millstone-2 meets the requirements of NUREG-0737 Positions 6 and 7 for the following reasons. Amendment 61, dated October 6, 1980, changed TS 3.6.3.2 to prevent containment purging through the 42-inch valves in Modes 1, 2, 3 and 4 by requiring these valves to be locked closed and electrically deactivated. Thus, Position 6 is met. Position 7 is also satisfied in that the 42-inch valves automatically close on a high gaseous or particulate radiation monitor signal in Modes 5 or 6. This is required by TS Table 3.3-3.

Our review of NNECO's response dated May 20, 1981 and Sections 6.6 and 6.7 on Containment Post-Incident Hydrogen Control System and Enclosure Building Filtration System, respectively, indicates that the 6-inch hydrogen purge valves meet the intent of Position 6. The performance, reliability and size (<8-inches) of the 6-inch hydrogen purge lines are acceptable.

The NNECO letter of May 20, 1981 documents their finding that high radiation auto-closure of these small valves is not required since the valves auto close on high containment pressure and low pressurizer pressure signal. In addition, they find no path to the environment without dilution, filtration through particulate, absolute and charcoal filters, and discharge through a monitored high stack. However, it is the staff's judgement that those lines that provide for a direct path from the containment atmosphere to the environs (e.g., purge/vent lines) should be isolated on that parameter so that radioactivity releases will be contained. Such a radiation signal will also provide the only isolation signal to the purge/vent lines for very small breaks, thus limiting the amount of radiation release from the containment.

The attachment provides our generic SE on this subject.

Attachment: Generic Evaluation of
Radiological Consequences of Accidents
While Purging or Venting at Power

Attachment to
enclosure 4

GENERIC EVALUATION OF THE RADIOLOGICAL CONSEQUENCES OF ACCIDENTS WHILE PURGING OR VENTING AT POWER MULTI PLANT ACTION ITEM B-24

The release of radioactivity through vent or purge valves from a potential large LOCA at power has been considered generically to assure that such events do not constitute an undue hazard to the people residing around operating reactor sites. To evaluate the radiological consequences of such accidents, the following assumptions have been made:

a. vent and purge valve isolation signals, circuitry and purge valve actuation are reliable;

b. purge system isolation valve closure times are generally sufficient to prevent the release of activity associated with fuel failures that could follow a large break (a total accident elapsed time of about 15 seconds or less);

c. maximum allowable coolant iodine equilibrium and spiking activity limits do not exceed those contained in Standard Technical Specifications (STS);

d. fission products generated by pipe breaks are reflective of coolant activity and fuel failures estimated using 10 CFR Part 50, Appendix K, analysis techniques; and

e. radiological consequences of accidents while purging or venting would be bounded by those produced by a large break.

A large number of staff evaluations of the radiological consequences of LOCA's have been performed for construction permit, operating license, operating license amendment, and Systematic Evaluation Program reviews. In addition, a generic assessment of the amount of radioactivity that could be released while venting and purging from a spectrum of pipe breaks through the range of purge valve sizes utilized by industry has been made. In virtually all cases, the contribution through vent or purge valves is estimated to be of the order of 2 percent, or less, of the Exclusion Area Boundary (EAB) and outer boundary of the Low Population Zone (LPZ) doses that would occur from a large break LOCA in which a source term indicative of a substantial melt of the core with subsequent release of appreciable quantities of fission products is assumed.* For dose assessments in which only activity in primary coolant systems would be released, or for events in which fuel failures indicative of 10 CFR Part 50, Appendix K, LOCA analyses are indicated, EAB and LPZ dose estimates are substantially less than dose estimates made for a large break LOCA assuming a substantial fuel melt. Since the magnitude of the vent or purge contribution to severe LOCA dose estimates is small compared to other LOCA scenarios within design bases, we conclude that the consequences of such accidents are within applicable dose guidelines.

A generic assessment of the radiological consequences of large break accidents, including a resulting severe LOCA of the type hypothesized for site suitability purposes, while venting or purging at power indicates that the dose contribution through open valves is small. Therefore, we find total accident radiological consequences of such accidents would be less than the dose guidelines of 10 CFR Part 100.

---

*Estimates based upon SRP analysis techniques and 10 CFR Part 100.11.

BACKGROUND CRITERIA

PURGE/VENT VALVE LEAKAGE TESTS

The long term resolution of Generic Issue B-24, "Containment Purging During Normal Plant Operation," includes, in part, the implementation of Item B.4 of Branch Technical Position (BTP) CSB 6-4. Item B.4 specifies that provisions should be made for leakage rate testing of the (purge/vent system) isolation valves, individually, during reactor operation. Although Item B.4 does not address the testing frequency, Appendix J to 10 CFR Part 50 specifies a maximum test interval of 2 years.

As a result of the numerous reports on unsatisfactory performance of the resilient seats for the isolation valves in containment purge and vent lines (addressed in OIE Circular 77-11, dated September 6, 1977), Generic Issue B-20, "Containment Leakage Due to Seal Deterioration," was established to evaluate the matter and establish an appropriate testing frequency for the isolation valves. Excessive leakage past the resilient seats of isolation valves in purge/vent lines is typically caused by severe environmental conditions and/or wear due to frequent use. Consequently, the leakage test frequency for these valves should be keyed to the occurrence of severe environmental conditions and the use of the valves, rather than the current requirements of 10 CFR 50, Appendix J.

It is recommended that the following provision be added to the Technical Specifications for the leak testing of purge/vent line isolation valves:

> "Leakage integrity tests shall be performed on the containment isolation valves with resilient material seals in (a) active purge/vent systems (i.e., those which may be operated during plant operating Modes 1 through 4) at least once every three months and (b) passive purge systems (i.e., those which must be administratively controlled closed during reactor operating Modes 1 through 4) at least once every six months."

By way of clarification, the above proposed surveillance specification is predicated on our expectation that a plant would have a need to go to cold shutdown several times a year. To cover the possibility that this may not occur, a maximum test interval of 6 months is specified. However, it is not our intent to require a plant to shutdown just to conduct the valve leakage integrity tests. If licensees anticipate long duration power operations with infrequent shutdown, then installation of a leak test connection that is accessible from outside containment may be appropriate. This will permit simultaneous testing of the redundant valves. It will not be possible to satisfy explicitly the guidance of Item B.4 of BTP CSB 6-4 (which states that valves should be tested individually), but at least some testing of the valves during reactor operation will be possible.

It is intended that the above proposed surveillance specification be applied to the active purge/vent lines, as well as passive purge lines: i.e., the purge lines that are administratively controlled closed during reactor operating modes 1-4. The reason for including the passive purge lines is that B-20 is concerned with the potential adverse effect of seasonal weather conditions on the integrity of the isolation valves. Consequently, passive purge lines must also be included in the surveillance program.

The purpose of the leakage integrity tests of the isolation valves in the containment purge and vent lines is to identify excessive degradation of the resilient seats for these valves. Therefore, they need not be conducted with the precision required for the Type C isolation valve tests in 10 CFR Part 50, Appendix J. These tests would be performed in addition to the quantitative Type C tests required by Appendix J and would not relieve the licensee of the responsibility to conform to the requirements of Appendix J. In view of the wide variety of valve types and seating materials, the acceptance criteria for such tests should be developed on a plant-specific basis.