# SAFETY EVALUATION REPORT FOR CONTAINMENT PURGING AND VENTING DURING NORMAL OPERATION OF THE DAVIS-BESSE NUCLEAR POWER STATION, UNIT 1

(Docket No. 50-346)

## I. INTRODUCTION

A number of events have occurred over the past several years which directly relate to the practice of containment purging and venting during normal plant operation. These events have raised concerns relative to potential failures affecting the purge penetrations which could lead to degradation in containment integrity, and, for PWRs, a degradation in ECCS performance. By letter dated November 29, 1978, the Commission (NRC) requested all licensees of operating reactors to respond to certain generic concerns about containment purging or venting during normal plant operation. The generic concerns were twofold:

(1) Events had occurred where licensees overrode or bypassed the safety actuation isolation signals to the containment isolation valves. These events were determined to be abnormal occurrences and were so characterized in our report to Congress in January 1979.

(2) Recent licensing reviews have required tests or analyses to show that containment purge or vent valves would shut without degrading containment integrity during the dynamic loads of a design basis loss of coolant accident (DBA-LOCA).

The NRC position of the November 1978 letter requested licensees to cease purging (or venting) of containment or limit purging (or venting) to an absolute minimum. Licensees who elected to purge (or vent) the containment were requested to demonstrate that the containment purge (or vent) system design met the criteria outlined in the NRC Standard Review Plan (SRP) 6.2.4, Revision 1, and the associated Branch Technical Position (BTP) CSB 6-4, Revision 1.

II. DISCUSSION AND EVALUATION

The Purge/Ventilation System at Davis-Besse Nuclear Power Station, Unit 1 utilizes four 48-inch butterfly type isolation valves. Two valves are located in the supply line and two are located in the exhaust line for redundancy; all are air operated.

The licensee responded to the NRC position letter of November 1978 by stating that Davis-Besse Technical Specification No. 3.6.1.7 limits the use of the Containment Purge System to 90 hours per year in operating Modes 1 through 4. This purging and venting is achieved by manually opening the purge and exhaust valves. In further compliance with the NRC position letter, the licensee indicated (in a letter dated December 13, 1979) that they will limit all purging and venting times to as low as achievable.

The licensee indicated that an analysis of the minimum containment backpressure (for the ECCS analysis) has been made assuming the 48-inch purge line valves are not fully closed until 11 seconds following a LOCA. The peak containment backpressure was calculated to be 22.96 psig at 18.90 seconds. The result indicates that the calculated containment pressure is above the assumed minimum pressure prior to initiation of ECCS, and remains above thereafter. The licensee concluded that the ECCS performance is not affected by the open purge line isolation valves.

The licensee indicated that the fans, filters, and ductwork located downstream of the isolation valves are not safety-related, nor are they seismic Category I. The licensee performed an analysis to demonstrate the acceptability of the provisions made to protect these structures and found the environmental conditions caused by a LOCA-induced blowdown to be less severe than the peak values calculated

for the 6-inch steam line break analyzed in their FSAR.

III. CONCLUSIONS

We have reviewed the Davis-Besse Unit 1 purge system against the provisions of BTP CSB 6-4 (Revision 1), "Containment Purging During Normal Plant Operations." The licensee has not provided sufficient information concerning the provisions made to insure that isolation valve closure will not be prevented by debris which could potentially become entrained in the escaping air and steam. We recommend that debris screens be provided for the purge supply and exhaust systems. The debris screens should be designed to seismic Category I criteria and installed about one-pipe-diameter away from the inner side of each inboard isolation valve. The piping between the debris screen and the isolation valve should also be designed to seismic Category I criteria.

In addition, as a result of numerous reports on the unsatisfactory performance of resilient seats in butterfly-type isolation valves due to seal deterioration, periodic leakage integrity tests of the 48-inch butterfly isolation valves in the purge system are necessary. Therefore, the licensee should also propose a Technical Specification for testing the valves in accordance with the following testing frequency:

> "The leakage integrity tests of the isolation valves in the containment purge/vent lines shall be conducted at least once every three months."

The purpose of the leakage integrity tests of the isolation valves in the containment purge 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.

Subject to successful implementation of the above recommended actions, we find the purge/vent system design and operating practices for Davis-Besse Unit 1 to be acceptable.

1. Purging/venting should be minimized during reactor operation because the plant is inherently safer with closed purge/vent valves (containment) than with open lines which require valve action to provide containment. (Serious consideration is being given to ultimately requiring that future plants be designed such that purging/venting is not required during operation).
2. Some purging/venting on current plants will be permitted provided that:
   a) purging is needed and justified for safety purposes, and
   b) valves are judged by the staff to be both operable and reliable, and
   c) the estimated amount of radioactivity released during the time required to close the valve(s) following a LOCA either
      i. does not cause the total dose to exceed the 10 CFR Part 100 Guidelines; then a goal should be established which represents a limit on the annual hours of purging expected through each particular valve, or
      ii. causes the total dose to exceed the guideline values; then purging/venting shall be limited to 90 hours/year.
3. Purging/venting should not be permitted when valves are being used that are known to be not operable or reliable under transient or accident conditions.

## INTERIM POSITION FOR CONTAINMENT PURGE AND VENT VALVE OPERATION PENDING RESOLUTION OF ISOLATION VALVE OPERABILITY

Once the conditions listed below are met, restrictions on use of the containment purge and vent system isolation valves will be revised based on our review of your responses to the November 1978 letter justifying your proposed operational mode. The revised restrictions can be established separately for each system.

1. Whenever the containment integrity is required, emphasis should be placed on operating the containment in a passive mode as much as possible and on limiting all purging and venting times to as low as achievable. To justify venting or purging, there must be an established need to improve working conditions to perform a safety related surveillance or safety related maintenance procedure. (Examples of improved working conditions would include deinerting, reducing temperature*, humidity*, and airborne activity sufficiently to permit efficient performance or to significantly reduce occupational radiation exposures), and

2. Maintain the containment purge and vent isolation valves closed whenever the reactor is not in the cold shutdown or refueling mode until such time as you can show that:

   a. All isolation valves greater than 3" nominal diameter used for containment purge and venting operations are operable under the most severe design basis accident flow condition loading and can close within the time limit stated in your Technical Specifications, design criteria or operating procedures. The operability of butterfly valves may, on an interim basis, be demonstrated by limiting the valve to be no more than 30° to 50° open (90° being full open). The maximum opening shall be determined in consultation with the valve supplier. The valve opening must be such that the critical valve parts will not be damaged by DBA-LOCA loads and that the valve will tend to close when the fluid dynamic forces are introduced, and

   b. Modifications, as necessary, have been made to segregate the containment ventilation isolation signals to ensure that, as a minimum, at least one of the automatic safety injection actuation signals is uninhibited and operable to initiate valve closure when any other isolation signal may be blocked, reset, or overridden.

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* Only where temperature and humidity controls are not in the present design.