Enclosure 3

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

SAFETY EVALUATION REPORT BY THE OFFICE OF NUCLEAR REACTOR REGULATION FOR CONTAINMENT PURGING AND VENTING DURING NORMAL OPERATION OF

CRYSTAL RIVER NUCLEAR POWER PLANT, UNIT NO. 3

DOCKET NO. 50-302

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 and ventilation system at the Crystal River Nuclear Power Plant, Unit 3 (Crystal River) consists of one 48-inch line for exhaust and one 48-inch line for supply with double valve isolation provided. The outboard isolation valves are pneumatic-operated, 48-inch butterfly type valves. The inboard isolation valves are motor-operated, 48-inch butterfly type valves. The inboard valve in the exhaust line is provided with an 18-inch duct extension that includes a wire mesh screen for protection from debris. The purge system is equipped with fans, filters, and ductwork located outside the containment and includes the use of charcoal filters. The function of the purge/vent system is to purge contaminated air from the containment vessel whenever access is required.

The licensee responded to the NRC position letter of November 1978, by indicating that they planned to justify unlimited purging of the Containment Building. The licensee, in addressing justification for unlimited purging, expressed the following concerns:

(1) The elimination of continuous purging or restricting purging to 90 hours per year would result in an increase of radioactivity within the containment.

(2) The relative merits of dumping batches of containment atmosphere into the environment as opposed to continuous low-level discharge during all modes of operation is questionable. In considering the apparent advantage of decay with hold-up, it is uncertain that the dose released to the environment would be attenuated with reduced purging.

(3) The accumulated dose received by personnel working within the containment will increase as a result of limited purging.

(4) The restriction of purging operations will render the RCS leakage detection capabilities of radiation monitor RM-A6 inoperable due to saturation caused by increased radioactivity within the containment.

The licensee provided an analysis of the mass of air and steam released to the environment prior to purge system isolation following LOCA. The results of the analysis indicated that the maximum total mass of containment atmosphere released through the purge to be 12, 810 lbM of saturated steam and air. We have reviewed the licensee's assumptions used in the analysis, and conclude that the mass released has been conservatively calculated.

The licensee provided an analysis of the reduction in containment pressure resulting from the partial loss of containment atmosphere during a LOCA for ECCS backpressure determination. The analysis indicated that the containment pressure reduction from the "worst case" double-ended break at the pump discharge is 1.5 psig. The mass of air/steam released through the purge system corresponding to this "worst case" break is 11,900 lbM. The licensee stated that even with the purge system assumed operational at the start of the event, the resultant containment pressure is still higher than the value obtained from the "Lowered Loop Containment Pressure Evaluation" (Generic 17-FA), used for demonstrating ECCS conformance to 10 CFR Secton 50.48. We have reviewed the assumptions made in the licensee's evalution and find them to be acceptable.

The licensee indicated that the fans, filters, and ductwork of the supply and exhaust system located beyond the isolation valves are not considered safety-related, therefore, they are not relied on to mitigate the consequences of a LOCA.

The licensee indicated that the inboard isolation valve in the exhaust line is provided with an 18-inch duct extension that includes a wire mesh screen for protection from debris. However, the licensee has not provided information for us to determine debris screen design adequacy. Furthermore, it is essential that both the supply and exhaust lines be equipped with debris screens.

III. CONCLUSIONS

We have reviewed the Crystal River Purge System against the guidelines of BTP CSB 6-4, Revision 1, "Containment Purging During Normal Operations." Although the licensee provided information to justify unlimited purging/venting during power operations, our view is that system use should be limited. The plant is inherently safer with closed purge/vent valves than with open lines which require valve action to provide containment integrity. We, therefore, recommend that the licensee commit to limit the use of the purge/vent system to a specified annual time that is commensurate with identified needs.

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 critria.

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 it so 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.