



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

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION  
FOR CONTAINMENT PURGING/VENTING DURING NORMAL OPERATIONS  
AND OVERRIDE AND RESET OF CONTROL CIRCUITRY  
IN THE VENTILATION/PURGE ISOLATION AND  
OTHER ENGINEERED SAFETY FEATURE SYSTEMS (B-24)  
VIRGINIA ELECTRIC AND POWER COMPANY  
NORTH ANNA POWER STATION, UNITS NO. 1 AND NO.2  
DOCKET NOS. 50-338 AND 50-339

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/vent penetrations which could lead to a degradation of containment integrity and, for PWRs a degradation of ECCS performance. By letter dated November 28, 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 (BDA-LOCA).

In our letter of November 1978, we requested that licensees 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.

By letters dated January 17 and December 20, 1979, July 1, July 30 and December 22, 1981, and February 19 and June 8, 1982, the Virginia Electric and Power Company (the licensee) responded to our generic concerns for the

North Anna Power Station, Units No. 1 and No. 2 (NA-1&2). Also, the licensee responded to our concerns in its response (NUREG-0737) dated December 15, 1980 as supplemented by letters dated June 18, 1981, December 9, 1981 and June 18, 1982.

This Safety Evaluation (SE) primarily addresses action items applicable to NA-1. In the case of NA-2, the majority of action items for containment purging/venting were addressed in the NRC SEs related to the licensing of NA-2 for 5 percent low-physics testing and full power operation (NUREG-0053, Supplements #10 and #11, April and August, 1980, respectively). Also, the Technical Specifications issued as part of NA-2 Facility Operating License NPF-7 on August 21, 1980 specified certain limiting conditions for operation applicable to our generic concerns regarding containment purging and venting. Where applicable, this SE will indicate in the following text where the resolution of generic concerns are identifiable for NA-1 and/or NA-2.

This SE addresses the following generic issues regarding containment purging and venting. One issue is the conformance of NA-1&2 to Standard Review Plan (SRP) Section 6.2.4, Revision 1 and Branch Technical Position (BTP) CSB 6-4, Revision 1. Another issue applicable to NA-1&2 is Item 6 of NUREG-0737, II.E.4.2.

The issue of containment leakage due to seal deterioration is also addressed in this SE for NA-1&2. An issue applicable to both NA-1&2 is the Override and Reset of Containment Purge Isolation and other Engineered Safety Features Systems (ESFS). Also, Item 7 of NUREG-0737, II.E.4.2 regarding radiation signal purge valves is addressed in this SE for NA-1.

Finally, it is noted that certain generic concerns for containment purging and venting have already been resolved in documents other than those listed above. Our letter of April 23, 1980 and enclosed SE resolved Items 1, 2, 3 and 4 of NUREG-0737, II.E.4.2 for NA-1. Also, our letter of January 6, 1981 and enclosed SE addressed and closed out the issue of mechanical operability of purge and vent valves for NA-1. In addition, our letter of December 10, 1981 and enclosed SE addressed Item II.E.4.2.5(a), Containment Pressure Setpoint of Containment Isolation for NA-1&2.

Discussions and our evaluations of these matters are provided below.

Discussion and Evaluation:

SRP, Section 6.2.4, Revision 1, BTP CSB 6-4, Revision 1 and Item 6 of NUREG-0737, II.E.4.2 for NA-1

The purge/vent systems at NA-1 consist of two 42-inch penetrations for purging the containment atmosphere to facilitate personnel access. In addition, the plant has a containment vacuum system which includes a 6-inch penetration and two 2-inch penetrations for evacuating the containment to the prescribed subatmospheric condition.

By letter dated January 17, 1979, the licensee stated that since NA-1 operates with a subatmospheric containment as specified in the Technical Specifications (TS), containment purging operations are not permitted during Operating Modes 1, 2, 3 and 4 (Power Operations, Startup, Hot Standby, and Hot Shutdown). Therefore, purging operations are not allowed as specified in the NA-1 TS when the average reactor coolant system temperature is greater than 200°F.

Our review and evaluation of these matters identified a conflict in the applicability of the NA-1&2 TS 3.6.1.1 and 3.6.5.1. TS 3.6.1.1 required that primary containment integrity be maintained in Operating Modes 1, 2, 3 and 4. TS 3.6.5.1 required that the steam jet air ejector isolation valves be closed when operating in Modes 1, 2 and 3 thus conflicting with TS 3.6.1.1.

We identified our concern to the licensee, and by letter dated July 30, 1980, the licensee proposed a change to the NA-1&2 TS 3.6.5.1 which would require the steam jet air ejector valves be closed in Modes 1, 2, 3 and 4. By Amendments No. 28 and No. 9 to Facility Operating Licenses NPF-4 and NPF-7 for NA-1&2 respectively, TS were issued on May 14, 1981 requiring that steam jet air ejector valves be closed in Modes 1, 2, 3 and 4.

A mechanical vacuum pump system is periodically used during normal plant operation to maintain the containment at the prescribed subatmospheric pressure. This system utilized 2-inch gate valves for containment isolation. The mechanical vacuum pump system does not fall within the scope of review for containment purge/vent operations. However, we have reviewed the isolation provisions for the penetrations of this system and conclude that their isolation provisions comply with General Design Criteria 54 and 56 and we find them acceptable.

Therefore, based on the above, NA-1&2 TS Section 3.6.1.1, Containment Integrity, requires that the purge and vent valves be sealed closed when the average reactor coolant temperature is above 200°F in all plant modes other than cold shutdown or refueling. These specifications meet the intent of SRP, Section 6.2.4, Revision 1 and BTP CSB 6-4, Revision 1. In addition, the above specifications satisfy the requirements of Item 6 of NUREG-0737, II.E.4.2.

#### Containment Leakage Integrity Tests, NA-1&2

As a result of the numerous reports on unsatisfactory performance of the resilient seats for butterfly-type isolation valves in containment purge and vent lines, periodic leakage integrity tests of the above 42-inch and 6-inch butterfly isolation valves have been found necessary. Therefore, we request that the licensee propose technical specifications for NA-1&2 for testing these valves in accordance with the following recommended testing frequency:

"The leakage integrity tests of the isolation valves in the containment purge lines and the steam jet air ejector system lines shall be conducted at least once every six months."

The purpose of the leakage integrity tests of the isolation valves in the containment purge lines and the steam jet air ejector system 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.

#### Override of Containment Purge Isolation, NA-1&2

The attached report "Override and Reset of Control Circuitry in the Ventilation/Purge Isolation and Other Engineered Safety Feature Systems," for NA-1&2 was prepared for us by Franklin Research Center (FRC) as part of our technical evaluation of the design compliance with NRC provided criteria.

The report concludes that the staff criteria does not apply to the containment ventilation isolation system because plant technical specifications require the maintenance of subatmospheric conditions at all times when the average reactor coolant temperature is equal to or greater than 200°F, thus precluding containment purging during normal plant operation. We agree with the contractor's finding in this regard.

The report also provides conclusions and recommendations concerning the other engineered safety feature (ESF) systems. The following addresses the other ESF systems with respect to each of the review criteria.

#### Criterion 1

The licensee has proposed the addition of a keylock switch to the feedwater bypass valve circuitry to satisfy Criterion 1. The proposed switch will prevent overriding of the feedwater bypass valve system when open. We agree with the contractor that this modification, combined with the licensee's provisions that the keylock switch will be closed only during cold shutdown or refueling, meets the intent of Criterion 1.

#### Criterion 2

The licensee has proposed to add covers to the pushbutton reset switches for the containment isolation and containment spray systems, to satisfy Criterion 2. We agree with the contractor that this modification, combined with the licensee's commitment to supplement the covers with suitable instructions to the operator concerning the effect of these pushbuttons or the authority necessary to operate them, satisfies Criterion 2.

Criterion 3

The licensee has agreed to update operating and annunciation response procedures to indicate that the containment isolation and containment spray annunciators provide information as the reset status of the associated ESF signal. We agree with the contractor that the existing annunciation in conjunction with appropriate procedural warnings will meet the intent of Criterion 3.

Criterion 4

Criterion 4 is not applicable

Criterion 5

The ESF instrumentation and control systems comply with Criterion 5.

Criterion 6

The contractor has determined that Criterion 6 is not satisfied with respect to the air ejection vent to atmosphere isolation valves, the feedwater flow control valves and the feedwater bypass control valves. The contractor's report concludes that the air ejection vent to atmosphere isolation valves and feedwater flow control valves represent acceptable deviations from Criterion 6. We agree with the contractor in this regard.

Regarding the feedwater bypass control valves, the licensee's proposed modifications, described under Criterion 1 above, are such that two operator actions will be required to reset the feedwater bypass valves following an accident signal. The licensee has also committed to either re-label or provide an appropriate warning sign to identify the consequences of depressing the feedwater bypass control valve pushbutton. We agree with the contractor that these additional design features will minimize the probability of unintentional valve repositioning after resetting the ESF actuation signal. Thus, we are in agreement with the contractor that, with these additional features, the design satisfies Criterion 6.

Based on our review of the contractor's technical report we conclude that, with the modifications the licensee has agreed to make, the electrical, instrumentation and control design aspects of the override of containment purge valve isolation and other engineered safety features signals are acceptable.

Item 7 of NUREG-0737, II.E.4.2, Radiation Signal Purge Valves, NA-1&2

We have determined that any purge/vent isolation valves sealed closed when the reactor coolant temperature is above 200°F satisfy the requirements

of position 7 without a radiation closure signal since the valves are sealed closed by Technical Specifications. We consider this item to be closed.

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