VIRGINIA ELECTRIC AND POWER COMPANY
RICHMOND, VIRGINIA 23261

March 18, 1993

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

Serial No. 93-125
NA&F/EJL/DCH: R0
Docket Nos. 50-338
50-339
License Nos. NPF-4
NPF-7

Gentlemen:

VIRGINIA ELECTRIC AND POWER COMPANY
NORTH ANNA POWER STATION UNITS 1 and 2
PROPOSED TECHNICAL SPECIFICATIONS CHANGES
OPERATION WITH A CONTROL ROD URGENT FAILURE CONDITION

Pursuant to 10 CFR 50.90, the Virginia Electric and Power Company requests amendments, in the form of changes to the Technical Specifications, to Facility Operating License Nos. NPF-4 and NPF-7 for North Anna Power Station Units 1 and 2, respectively. The proposed changes address operation with a control rod urgent failure condition (control rods out of service due to failures external to the individual control rod drive mechanisms, i.e. programming circuitry, but remaining trippable). The proposed changes will allow plant personnel to effect repairs to the Rod Control System in an orderly manner while continuing to ensure that the control and shutdown banks are capable of performing their safety function as designed.

A discussion of the proposed Technical Specifications changes is provided in Attachment 1. The proposed Technical Specifications changes are provided in Attachment 2. It has been determined that the proposed Technical Specifications changes do not involve an unreviewed safety question as defined in 10 CFR 50.59 or a significant hazards consideration as defined in 10 CFR 50.92. The basis for our determination that these changes do not involve a significant hazards consideration is provided in Attachment 3. The proposed Technical Specifications changes have been reviewed and approved by the Station Nuclear Safety and Operating Committee and the Management Safety Review Committee.

Should you have any questions or require additional information, please contact us.

Very truly yours,

W. L. Stewart
Senior Vice President - Nuclear

Attachments

A001

cc: U.S. Nuclear Regulatory Commission
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Commissioner
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COMMONWEALTH OF VIRGINIA)
)
COUNTY OF HENRICO)

The foregoing document was acknowledged before me, in and for the County and Commonwealth aforesaid, today by W. L. Stewart who is Senior Vice President - Nuclear, of Virginia Electric and Power Company. He is duly authorized to execute and file the foregoing document in behalf of that Company, and the statements in the document are true to the best of his knowledge and belief.

Acknowledged before me this 18TH day of March, 1993.

My Commission Expires: May 31, 1994.

Vicki L. Hull
Notary Public

(SEAL)

Attachment 1

Discussion of Changes

Discussion of Changes

INTRODUCTION

Virginia Electric and Power Company proposes revisions to Technical Specifications (TS) 3.1.3.1- Group Height, 3.1.3.5- Shutdown Rod Insertion Limit, 3.1.3.6- Control Rod Insertion Limits, and 3/4.1.3- Bases, for North Anna Power Stations, Units 1 and 2. These proposed changes address operation with a rod urgent failure condition (control rods out of service due to failures external to the individual rod drive mechanisms, i.e. programming circuitry, but remaining trippable), including limited operation with one control or shutdown bank inserted up to 18 steps below its insertion limit. A discussion of these proposed changes is provided in the following:

1. TS 3.1.3.1 specifies shutdown and control rod operability and alignment limits within individual groups. The proposed TS modifies the wording of the action statements to clearly define operable as trippable. The existing Specification alludes to control rods being inoperable due to other causes but does not explicitly state what those causes are. Trippable, aligned rods are fully capable of performing their intended safety function.

This change will allow plant personnel to effect repairs to the Rod Control System in an orderly manner while continuing to ensure that the control and shutdown banks are capable of performing their safety function as designed.

2. TS 3.1.3.5 defines the shutdown bank insertion limit. The proposed TS 3.1.3.5 Action b. provides for up to 72 hours of continued power operation for diagnosis and repair of the Rod Control System with a maximum of one shutdown bank inserted below its insertion limit provided that:

   a. the shutdown bank is inserted no more than 18 steps below the insertion limit as measured by the group step counter demand position indicators,

   b. the affected bank is trippable,

   c. each shutdown and control rod is aligned to within ± 12 steps of its respective group step counter demand position,

   d. the insertion limits of Specification 3.1.3.6 are met for each control bank, and

   e. the shutdown margin requirement of Specification 3.1.1.1 is determined to be met at least once per 12 hours.

The affected shutdown bank must be restored to service within the allowed 72 hour period or hot standby must be established within the following 6 hours.

3. TS 3.1.3.6 defines the control bank insertion limit. The proposed TS 3.1.3.6 Action b. provides for up to 72 hours of continued power operation for diagnosis and repair of the Rod Control System with a maximum of one control bank inserted below its insertion limit provided that:

a. the control bank is inserted no more than 18 steps below the insertion limit as measured by the group step counter demand position indicators,

b. the affected bank is trippable,

c. each shutdown and control rod is aligned to within ±12 steps of its respective group step counter demand position,

d. the insertion limits of Specification 3.1.3.5 are met for each shutdown bank, and

e. the shutdown margin requirement of Specification 3.1.1.1 is determined to be met at least once per 12 hours.

The affected control bank must be restored to operable status within the allowed 72 hours or hot standby must be established within the following 6 hours. Control Bank D is excluded from the 72 hour provision since insertion of D Bank below the insertion limit is not required for rod surveillance testing.

4. The TS 3/4.1.3 Bases are being supplemented to discuss the technical basis for the allowances for operation with one or more banks out of service due to failures in a Rod Control System power or logic cabinet.

BACKGROUND

North Anna Technical Specifications require periodic testing of all control and shutdown rods in the core during power operation to ensure that the rods are trippable, i.e. able to fall into the core upon receipt of a reactor trip signal. This testing involves moving each rod not fully inserted into the core at least 10 steps in either direction at least once per month. This is typically done at or near full power, one bank at a time. Current procedures call for sequential insertion and withdrawal of 18 steps for the bank being tested.

Since all of the control and shutdown banks except control bank D are required to be essentially fully withdrawn from the core at full power, special test exceptions are included in the insertion limit Technical Specifications for the case of control rod surveillance testing. The current Specifications are not prescriptive concerning the allowed duration of the test mode.

North Anna Power Station has occasionally experienced some difficulty during rod surveillance testing. Specifically, control rod urgent failure alarms are sometimes received during the test. The urgent failure alarm is indicative of an internal failure in the rod control equipment that has affected the ability of the

system to move rods. Automatic rod motion and overlapped rod motion are stopped on an urgent failure. The failure may be in either the system logic cabinet or in the power cabinet and may take some time to diagnose.

A power cabinet urgent failure can be caused by coil current regulator failure, a phase failure (excessive ripple in coil voltage), a logic error (simultaneous zero current order to the stationary and movable grippers) or a multiplex error (current sensed in the movable or lift coils for a rod or group of rods not selected by the multiplex function). The system responds to these conditions via failure detection logic which overrides the existing current orders from the logic cabinet with a low current order to all grippers in that cabinet. This is done to prevent spurious rod drops due to the failure. Also an "inhibit" signal is sent to the logic cabinet pulser unit to stop all rod motion, in or out, in auto or manual. Movement of individual banks which are not associated with an alarmed cabinet may still be accomplished by selection of individual bank operation on the control board.

An urgent failure in the logic cabinet can be caused by pulser failure, slave cycle failure or loose circuit cards. An "inhibit" signal is sent to the pulser which stops auto and manual rod motion but still allows individual banks to move.

An urgent failure condition during rod surveillance testing may result in an immovable (but still trippable) group or bank up to 18

steps below the insertion limits. In addition, there is a potential that an immovable (but still trippable) group or bank may occur during power maneuvers (e.g. during turbine valve freedom testing) where the insertion limits are fully met.

SPECIFIC CHANGES

Virginia Electric and Power Company is proposing modifications to the Technical Specifications that specifically address the issue of rod urgent failure as follows:

1. The proposed TS 3.1.3.1 provides for continued power operation with one or more control or shutdown banks which cannot be moved by the Rod Control System as a result of failures in a logic or power cabinet (i.e. external to the individual rod drive mechanisms). This allowance is contingent upon the rods being trippable and all rods in the affected banks being aligned to within ± 12 steps of their respective group step counter demand positions. The proposed TS Actions only address rods that are untrippable or misaligned, and no longer refer to rods being inoperable "due to other causes".

   This change will allow plant personnel to effect orderly repairs to the Rod Control System while continuing to ensure that the control and shutdown banks are capable of performing their safety function as designed. Since the affected banks would remain trippable and subject to the rod insertion limits

(except as discussed below) and the group height alignment limits, no degradation in the ability of the banks to perform their intended safety function (i.e., reactor trip) would be introduced.

2. The proposed TS 3.1.3.5 Action b. provides for up to 72 hours of continued power operation with a maximum of one shutdown bank inserted below its insertion limit provided that the shutdown bank is inserted no more than 18 steps below the insertion limit, the affected bank is trippable, and the shutdown and control rod alignment limits of Specification 3.1.3.1 are met. The specification also requires that no control bank is concurrently below its insertion limit, and the shutdown margin requirement of TS 3.1.1.1 is determined to be met at least once per 12 hours. The affected shutdown bank must be restored to operable status within 72 hours or hot standby must be achieved within the following 6 hours.

3. The proposed TS 3.1.3.6 Action b. provides for up to 72 hours of continued power operation with a maximum of one control bank inserted below its insertion limit provided that the control bank is inserted no more than 18 steps below the insertion limit, the affected bank is trippable, and the shutdown and control rod alignment limits of Specification 3.1.3.1 are met. The specification also requires that no shutdown bank is concurrently below its insertion limit, and the shutdown margin requirement of TS 3.1.1.1 is determined to

be met at least once per 12 hours.

The affected control bank must be restored to operable status within 72 hours or hot standby must be achieved within the following 6 hours. Control Bank D is excluded from the 72 hour provision since insertion of D Bank below the insertion limit is not required for rod surveillance testing.

4. The proposed TS 3/4.1.3 Bases changes discuss the technical basis for the allowances for operation under a rod urgent failure condition.

The technical basis supporting this proposed change is as follows:

a. The shutdown and control rods will remain fully trippable and therefore capable of performing their intended safety function.

b. The radial peaking factor ($F_{\Delta H}$) will be checked for the allowed conditions for each reload core by modeling the testing of each control and shutdown bank using the NRC approved methods discussed in Reference 1. Based on the results of these calculations, verification will be made that the DNBR criterion for ANS Condition II (UFSAR Chapter 15.2) transients initiated from the test condition will continue to be met. Through this reload design process, it will be verified that the test

controls for test bank and controlling bank (i.e. Bank D) insertion are appropriate to ensure that this criterion is met for all rod surveillance tests throughout the cycle.

c. During the proposed 72 hour repair period, insertion below the insertion limit is restricted to one control or shutdown bank at a time. Concurrent rod misalignment (i.e. misalignment of individual rods from their group step counter demand position by more than ± 12 steps) is not allowed. The insertion of the affected bank below the limit is constrained by the peaking factor requirements discussed above and is no more than 18 steps. Because of these constraints, the impact on core reactivity and power distribution is very small. The shutdown margin is specifically reconfirmed every 12 hours during the repair period. Explicit analytical checks on the radial power distribution during the test/repair period are performed as part of the reload safety evaluation process.

SAFETY SIGNIFICANCE

The safety evaluation which supports this proposed modification to the Specifications is summarized as follows:

a. operation with a bank (except D Bank) below the insertion limits by up to 18 steps will not cause core radial peaking factors which result in violation of the applicable DNB limits for ANS Condition II transients.

b. operation with a bank (except D Bank) below the insertion limits by up to 18 steps will not result in shutdown margins lower than assumed in the accident analyses and required by Specification 3.1.1.1. This will be assessed during the reload core design process and reconfirmed during the repair period.

c. Since a. and b. above apply and the control rods will remain fully trippable during the repair period, the results and conclusions of the UFSAR for anticipated (i.e. ANS Condition II) transients, such as uncontrolled rod withdrawal, remain unchanged.

d. Because the proposed operation with a single control or shutdown bank inserted up to 18 steps below the insertion limit is 1) limited to 72 hours in duration (equivalent

to the allowed period of operation prior to obtaining the first flux map for a misaligned rod with the Standard Specifications) and 2) not allowed to produce radial power distributions that exceed the ANS Condition II design limits, additional evaluation of these accidents is not required. Since the probability of a more severe (Condition III or IV) event during the 72 hour repair period is negligible, additional evaluation of these events is not warranted. This is a similar approach to the existing Technical Specifications treatment of a single inoperable rod (TS 3.1.3.1.c.2).

The existing inoperable rod Specification allows for evaluation of certain of the UFSAR Chapter 15 accidents within 5 days of identification of the misaligned rod condition. This evaluation is required to support continued power operation (i.e., beyond 5 days) with an inoperable control rod.

e. A requirement for power reduction in response to a rod urgent failure alarm with a single bank up to 18 steps below the insertion limits is not warranted since 1) the perturbation to the normal operation power distribution will be much less severe than that of a fully misaligned single control rod, 2) by design, steady state and Condition II transient criteria will be met for full power conditions, and 3) the rod urgent failure condition

may render the capability to manually insert control banks unavailable, which could severely restrict the operator's ability to control axial power distribution swings to within the TS limits during a subsequent power reduction.

f. Occasional operation without manual rod insertion capability will not invalidate any of the accident analyses in UFSAR Chapter 15 since credit is not taken for this control mode in the analyses. Manual rod insertion is listed as a contingency action for Anticipated Transient without Scram (ATWS) in the Emergency Operating Procedures and is considered in the generic assessment of ATWS risk in Reference 3. However the major contributor to limiting ATWS risk is the ATWS Mitigation System Actuation Circuitry (AMSAC), which provides a turbine trip, auxiliary feedwater initiation, and control rod drive motor generator set breaker trip which is diverse from the reactor protection system. Therefore temporary operation without manual rod insertion capability will have a negligible impact on ATWS risk.

Conclusion

This assessment of the proposed changes has demonstrated that the probability and consequences of the design basis accidents analyzed

in the UFSAR are not increased with a 72 hour allowance for operation with one inoperable but trippable control or shutdown bank inserted up to 18 steps below the insertion limit.

The proposed change will result in a small increase in the probability that, at any given time, a control or shutdown bank will be inserted slightly below (i.e. up to 18 steps) its insertion limit. However, by design, the control and shutdown banks will continue to meet the safety analysis criterion for steady state and ANS Condition II (moderate frequency) transients. The allowed insertion is not a malfunction of equipment important to safety in this case and therefore the probability of such a malfunction is not increased. Limiting the allowed time for operation with rods out of service but trippable with a control or shutdown bank below the insertion limit eliminates the need for consideration of this condition coincident with any of the low frequency (ANS Condition III or IV) design basis accidents.

In addition, the margin of safety as defined in the basis of the technical specifications has not been reduced because current core design limits continue to be met for the accidents of concern.

Therefore, it is concluded that the proposed changes to the Technical Specifications do not create an unreviewed safety question as defined in 10 CFR 50.59.

REFERENCES

1. VEP-FRD-42, Rev. 1-A, "Reload Nuclear Design Methodology", September 1986.

2. WCAP-11993, Joint Westinghouse Owner's Group/ Westinghouse Program, Assessment of Compliance with ATWS Rule Basis for Westinghouse PWR's, Westinghouse Electric Corporation, December 1988.