VIRGINIA ELECTRIC AND POWER COMPANY
RICHMOND, VIRGINIA 23261

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

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Docket Nos. 50-338/339
License Nos. NPF-4/7

Gentlemen:

VIRGINIA ELECTRIC AND POWER COMPANY
NORTH ANNA POWER STATION UNITS 1 AND 2
TECHNICAL SPECIFICATION BASES CHANGE
CLARIFICATION OF CONTROL ROD DROP TIME TEST CRITERIA

Virginia Electric and Power Company has revised the Bases Section 3/4.1.3, "Movable Control Assemblies" to explain that the control rod drop time surveillance test criteria are adjusted downward from the Technical Specifications Limiting Condition for Operation value to conservatively account for the effects of a concurrent seismic event on post-accident trip reactivity insertion.

The Technical Specifications Bases changes have been reviewed and approved by the Station Nuclear Safety and Operating Committee and the Management Safety Review Committee. It has been determined that these changes do not involve an unreviewed safety question as defined in 10 CFR 50.59. A discussion of the changes and the Technical Specifications Bases changes are provided in Attachments 1 and 2 respectively.

There are no commitments made in this letter. If you have any further questions, please contact us.

Very truly yours,

D. A. Christian
Vice President – Nuclear Operations

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Attachments:

Attachment 1 Discussion of Changes
Attachment 2 Technical Specification Bases Changes

cc: U.S. Nuclear Regulatory Commission
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Attachment 1

Discussion of Changes

North Anna Power Station
Units 1 and 2
Virginia Electric and Power Company

DISCUSSION OF CHANGE

Introduction

Both the accident analyses and Technical Specifications Limiting Condition for Operation (LCO) 3.1.3.4 for North Anna assume a control rod drop time of 2.7 seconds from the beginning of decay of the stationary gripper coil voltage to dashpot entry. The acceptance criteria for rod drop time surveillance testing is adjusted downward from the Safety Analysis Limit of 2.7 seconds to reflect analytical conservatisms for hydraulic uncertainties, mechanical design, and includes the effects of a concurrent seismic event on the rod drop time. Currently, the actual acceptance criteria applied to the control rod drop time limit provided by Westinghouse in 1990, with all uncertainties included and conservatively decreased to account for the effects of a seismic event, is 2.13 seconds. As part of a recent analytical effort to assess the end of cycle temperature coastdown operations, Westinghouse has reevaluated the rod drop times and informed us on August 13, 1999 that the 0.57 second seismic event margin allowance might not be adequate for our current fuel designs and measured rod drop times to ensure compliance with the safety analysis in all conceivable cases.

Changes will provide additional clarification in Technical Specification Bases Section 3/4.1.3, "Movable Control Assemblies" to explain that the control rod drop time surveillance test criteria are adjusted downward from the Technical Specifications LCO value to conservatively account for the effects of a concurrent seismic event on post-accident trip reactivity insertion.

Additionally, revised surveillance test criteria will provide adequate margins for accommodating longer observed drop times on the periphery of the core. The revised test criteria will separate rod drop time requirements as applied to the Control Bank A RCCAs and all other RCCAs.

The revised criteria will continue to accomplish the following objectives:

- verification that each individual rod continues to meet the LCO limit of 2.7 seconds
- verification that the safety analysis assumption is also met, i.e. that the effective drop time (i.e. trip reactivity vs. time for insertion of all the RCCA's less the most reactive RCCA, which is assumed not to insert) meets the safety analysis limit of 2.7 seconds when appropriate allowances are applied for hydraulic and mechanical uncertainties and seismic effects.

The changes to the Bases provide clarification and are supported by the existing Technical Specifications. Therefore, the changes do not create an unreviewed safety question.

Background

Licensing Basis

On September 6, 1990, the NRC issued Amendments 139 for Unit 1 and 122 for Unit 2 allowing the increase in the control rod drop time requirement specified in LCO 3.1.3.4 from a previous value of 2.2 seconds to the new value of 2.7 seconds. Changes supported a planned fuel design change from the Westinghouse Low Parasitic (LOPAR) 17 x 17 fuel assembly to a new 17 x 17 assembly with Westinghouse VANTAGE 5H fuel assembly design features as part of the North Anna Improved Fuel (NAIF) design.

Design Basis

The verification of the rod drop times allows the operator to determine that the maximum rod drop time permitted is consistent with the assumed rod drop time used in the safety analysis. Measuring rod drop times ensures that the reactor internals and rod drive mechanisms will not interfere with rod motion, and that no degradation in these systems has occurred that would adversely affect control rod motion or drop time.

Discussion

The drop time of each control rod is measured at full Reactor Coolant System flow conditions in order to verify that the time from initiation of the rod drop to the entry of the rod into the dashpot is less than or equal to the maximum time allowed by Technical Specifications. The acceptance limit applied in the control rod drop time surveillance procedures includes conservatisms for hydraulic uncertainties, mechanical design, and seismic events. Since seismic events are not anticipated during rod drop time testing, Westinghouse performed an analysis in 1990 and determined an appropriate test criteria of 2.13 seconds which corresponds to the 2.7 seconds assumed in the safety analysis and accounts for the effects caused by a seismic event and other necessary conservatisms relating to component mechanical design tolerances and hydraulic performance uncertainties.

On August 13, 1999, Westinghouse provided the results of their recent analytical effort to assess the potential impact of an end of cycle proposed 10 F Tavg coastdown at hot full power. As part of that effort, the impact of reduced temperatures on control rod drop times was investigated. The impact of the temperature coast was small. However, based upon the evaluation, Westinghouse recommended a slightly lower surveillance value of 2.03 seconds.

Based on a review of recent rod drop time test results, separate rod drop time criteria were developed to be applied to Control Bank A RCCA's and all other RCCA's. The location of Control Bank A rods near the core periphery has two effects:

- Because of higher outlet plenum cross flows in the vicinity of the outlet nozzles, the observed RCCA drop times in these locations have historically been slightly larger than for interior locations.

- Because of the Virginia Power low-leakage loading pattern design philosophy, these peripheral RCCA's (particularly Control Bank A) make only a minor contribution to overall trip reactivity.

Based on these considerations, the following revised test criteria are being incorporated into the surveillance test procedures:

- For all individual RCCA's **except Control Bank A** – drop time to dashpot ≤ 2.03 seconds
- For individual RCCA's **in Control Bank A** – drop time to dashpot ≤ 2.25 seconds
- For the average of **8 Control Bank A RCCA's** - drop time to dashpot ≤ 2.03 seconds

These revised criteria will continue to accomplish the following objectives:

- verification that each individual rod continues to meet the LCO limit of 2.7 seconds
- verification that the safety analysis assumption is also met, i.e. that the effective drop time (i.e. trip reactivity vs. time for insertion of all the RCCA's less the most reactive RCCA, which is assumed not to insert) meets the safety analysis limit of 2.7 seconds when appropriate allowances are applied for hydraulic and mechanical uncertainties and seismic effects.

Additionally, in performing Reload Safety Analysis Checklist (RSAC) trip reactivity calculations, either 1) no credit will be taken for the reactivity effects of Control Bank A RCCA's, or 2) a conservatively calculated trip reactivity curve associated with delayed insertion of Control Bank A will be used. It is anticipated that Option 1) would normally be used because the contribution of Control Bank A to total trip reactivity is typically well within the available margin to the safety analysis assumption. Note that the drop time test criteria recommended above can be supported without this assumption. However, it will be imposed for additional conservatism since the individual RCCA drop time criterion is being relaxed from the value of 2.03 seconds for individual Control Bank A RCCA's only.

The current position of specifying the safety analysis assumption for the control rod drop time limit in the Technical Specifications and the accommodating seismic considerations in the surveillance procedures is consistent with discussions between the Westinghouse Owners Group and the NRC. As an enhancement, clarification is being provided to the Technical Specifications Bases to identify that the surveillance criteria limits for measured drop times are adjusted downward from the Technical Specifications limit.

Specific Changes

Add following sentences to Units 1 and 2 Technical Specifications Bases Section 3/4.1.3, "Movable Control Assemblies" in last paragraph:

The surveillance criteria limits for measured drop times are adjusted downward from the TS limit. This ensures that the accident analysis assumptions regarding the negative reactivity insertion rate of the control rod system as a whole remain bounding for a reactor trip concurrent with a postulated seismic event.

Safety Significance

This clarification in the Technical Specifications Bases for the Control Rod Drop Testing does not create an unreviewed safety question as described below:

- The proposed changes to the RCCA drop time surveillance limits will serve to ensure that the reactor trip reactivity insertion characteristics modeled in the safety analyses remain bounding, even with the unlikely occurrence of a concurrent seismic event. No system, structure or component or method of operation is being changed. No new or unique accident initiators or precursors are being introduced. All of the assumptions, bases and results of the UFSAR Chapter 15 accident analyses remain unchanged. Therefore there is no increase in the probability of occurrence or the consequences of any accident important to safety previously evaluated in the safety analysis report.

- No new type of accident is introduced by this change. The effectiveness of the surveillance testing program to confirm insertability of all RCCA's is not being compromised. The single failure of a RCCA to insert following trip continues to be modeled in all of the accident analyses. As an additional conservatism, no credit (or reduced credit) for the effects of control bank A following trip will be taken for future reload analyses. Therefore, neither the probability of occurrence nor the consequences of a malfunction of equipment important to safety are increased.

- All of the assumptions, bases and results of the UFSAR Chapter 15 accident analyses remain unchanged. Therefore no margin of safety is affected by this change.

Attachment 2

Technical Specifications Bases Changes

North Anna Power Station
Units 1 and 2
Virginia Electric and Power Company

The ACTION statements which permit limited variations from the basic requirements are accompanied by additional restrictions which ensure that the original design criteria are met. Misalignment of a rod requires measurement of peaking factors or a restriction in THERMAL POWER; either of these restrictions provides assurance of fuel rod integrity during continued operation. In addition, those accident analyses affected by a misaligned rod are reevaluated to confirm that the results remain valid during future operation.

Continuous monitoring of rod position with respect to insertion limits and rod deviation provided by the rod insertion limit monitor and rod position deviation monitor, respectively. OPERABILITY of the rod position deviation monitor is verified by a functional test at least once per 7 days and by comparison of the indicated positions versus the respective demand position indicators at least once per 12 hours. If the rod position deviation monitor or the rod insertion limit monitor is inoperable, the frequency of manual comparison of indicated rod (or bank) position is increased to an interval of at least once per 4 hours.

In the event that a malfunction of the Rod Control System renders control rods immovable, provision is made for continued operation provided:

- the affected control rods remain trippable, and
- the individual control rod alignment limits are met.

In the event that a malfunction of the Rod Control System renders control rod banks immovable during surveillance testing, provision is made for 72 hours of continued operation provided:

- the affected control rod banks remain trippable,
- the individual control rod alignment limits are met,
- a maximum of one control or shutdown bank is inserted no more than 18 steps below the insertion limit, and
- the SHUTDOWN MARGIN requirements are verified every 12 hours during the period the insertion limit is not met.

Control Bank D is excluded from the 72 hour provision since insertion of D Bank below the insertion limit is not required for control rod assembly surveillance testing.

Checks are performed for each reload core to ensure that bank insertions of up to 18 steps will not result in power distributions which violate the DNB criterion for ANS Condition II transients (moderate frequency transients analyzed in Section 15.2 of the UFSAR) or in a violation of the SHUTDOWN MARGIN requirement of Specification 3.1.1.1 during the repair period.

The 72 hour period for a control rod assembly bank to be inserted below its insertion limit restricts the likelihood of a more severe (i.e., ANS Condition III or IV) accident or transient condition occurring concurrently with the insertion limit violation.

The maximum rod drop time restriction is consistent with the assumed rod drop time used in the accident analyses. Measurement with $T_{avg} \geq 500$ °F and with all reactor coolant pumps operating ensures that the measured drop times will be representative of insertion times experienced during a reactor trip at operating conditions. The surveillance criteria limits for measured drop times are adjusted downward from the TS limit. This ensures that the accident analysis assumptions regarding the negative reactivity insertion rate of the control rod system as a whole remain bounding for a reactor trip concurrent with a postulated seismic event.

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- the affected control rod banks remain trippable,
- the individual control rod alignment limits are met,
- a maximum of one control or shutdown bank is inserted no more than 18 steps below the insertion limit, and
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The 72 hour period for a control rod assembly bank to be inserted below its insertion limit restricts the likelihood of a more severe (i.e., ANS Condition III or IV) accident or transient condition occurring concurrently with the insertion limit violation.

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