VIRGINIA ELECTRIC AND POWER COMPANY
RICHMOND, VIRGINIA 23261

February 25, 1992

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

Serial No. 92-018C
NL&P/JBL: R0
Docket No. 50-338
License No. NPF-4

Gentlemen:

**VIRGINIA ELECTRIC AND POWER COMPANY
NORTH ANNA POWER STATION UNIT 1
SUPPLEMENTAL INFORMATION REGARDING OUR
PROPOSED TECHNICAL SPECIFICATION CHANGE
FOR REDUCED MINIMUM RCS FLOW RATE LIMIT**

By letters dated January 8, 1992 (Serial No. 92-018) and February 10, 1992 (Serial No. 92-018B), Virginia Electric and Power Company requested a change to the Technical Specifications for North Anna Power Station Unit 1. The proposed change reduces the Reactor Coolant System (RCS) total flow rate limit for the remaining operating period of Cycle 9 until the North Anna Unit 1 steam generators are replaced in 1993. The reduction in flow rate is necessary to accommodate the possible interim system effects associated with increased steam generator tube plugging as a result of the current Unit 1 mid-cycle inspection outage. The attachment to this letter provides additional clarification of the information contained in the previous license amendment submittals and is submitted per the request of the NRC reviewer. This information has been discussed with the NRC reviewer. These clarifications do not change the basis for our determination that the proposed change does not involve a significant hazards consideration.

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

Very truly yours,

W. L. Stewart
Senior Vice President - Nuclear

Attachment



A001

cc: U.S. Nuclear Regulatory Commission
Region II
101 Marietta Street, N.W.
Suite 2900
Atlanta, Georgia 30323

Mr. M. S. Lesser
NRC Senior Resident Inspector
North Anna Power Station

Commissioner
Department of Health
Room 400
109 Governor Street
Richmond, Virginia 23219

Attachment 1

Additional Discussion In Support of Reduced RCS Flow Amendment
North Anna Unit 1

Part I - Items Requested in February 10, 1992 Meeting with NRC Staff

1. Provide additional details concerning the development of the net impact of power and flow reductions on DNBR.

The January 8, 1992 flow reduction package took credit for 4.8% of the 13.7% total retained DNBR margin to reduce the North Anna Unit 1 RCS minimum measured flowrate by approximately 3% to 275,300 gpm. This evaluation used up the majority of the remaining available retained DNBR margin for some accidents. For these accidents, the other portion of the retained margin has been used to accomodate generic issues such as rod bow penalty and thimble plug removal.

Based on the early tube plugging projections, it was prudent to consider a further reduction in this flowrate to ensure that the measured RCS flowrate would meet the Technical Specification limit. Because of the limited amount of remaining DNBR margin available for some transients, this additional flow reduction could not be supported by simply increasing the flow DNBR penalty of the January 8 evaluation. Instead, the February 10, 1992 flow reduction evaluation took credit for the inherent DNBR benefit associated with the 5% power reduction imposed by the January 28, 1992 Large Break LOCA package.

As discussed in Section 2.2.2 of the February 10 evaluation, a series of thermal/hydraulic statepoints were perturbed to determine a conservative power to flow tradeoff. These statepoints were selected to represent normal operation and bound limiting accident conditions. The statepoints were used to perform sensitivity studies to evaluate 1) a 1.5% increase in $F_{\Delta H}$ allowed by Technical Specifications at 95% power, 2) a power level that is 95% of the previous statepoint value and 3) a 2.5% reduction in total RCS flowrate to 268,500 gpm. These sensitivity studies confirmed that the 5% power reduction more than offsets the 2.5% decrease in RCS total flowrate and the $F_{\Delta H}$ increase. In fact, there is a net DNBR benefit of 1.2% to 2.5%, which has been ignored for conservatism.

Thus for those accidents which are affected by RCS flow only (discussed in Section 2.2.3), the new RCS minimum measured flowrate limit of 268,500 gpm is justifiable based on the following:

1) a DNBR penalty of 4.8% carried against the retained DNBR margin. This was the basis for the flow reduction of approximately 3% to 275,300 gpm, and

2) a 5% reduction in rated thermal power level, which more than offsets the proposed additional 2.5% reduction (from 275,300 gpm to 268,500 gpm) and the $F_{\Delta H}$ increase.

In addition, because there was insufficient retained DNBR margin to accommodate the additional RCS flow reduction, the core thermal limit

lines were recalculated in order to determine revised OTΔT and OPΔT setpoints. In this case, as stated in Section 2.1, the revised limit lines were calculated using the 1.46 DNBR design limit and a flowrate of 268,500 gpm. This had the effect of freeing the retained margin associated with flow reduction that had been a part of the existing OTΔT and OPΔT setpoints. Thus, the revised setpoints are somewhat lower than they would have been if only the the 2.5% flowrate change had been evaluated as discussed above for the accidents.

2. Discuss the role of the rod withdrawal at power transient in confirming the Overtemperature ΔT setpoints.

The core thermal limits define the acceptable operating conditions for which two key limits (vessel exit boiling and DNBR) are met. The Overtemperature ΔT protection setpoints are devised to generate a reactor trip should any combination of plant conditions exist which would cause either of these limits to be violated. The protection setpoints are calculated using a static analysis of plant conditions. The Rod Withdrawal at Power (RWAP) event is used to verify that the Overtemperature ΔT protection setpoints perform successfully under postulated transient conditions. The calculated setpoints are input in the RWAP transient analysis and are successfully verified if all transient results meet the DNBR limit. The RWAP event is used since its analysis covers a wide range of plant initial and transient conditions representative of the events which rely upon Overtemperature ΔT for core protection.

3. Provide the expected RCS flow and SGTP relationship for the proposed RCS flow limit of 268,500 gpm.

Using Westinghouse estimates of RCS flow rates as a function of average tube plugging percentage, the proposed RCS flow limit of 268,500 gpm corresponds to 36.5% SGTP. This is a best-estimate prediction, which does not account for uncertainties in either flow measurement or predictions of RCS flow versus SGTP. If a 2% flow measurement uncertainty is included (ignoring flow prediction uncertainty), the expected range of SGTP over which this flow limit may not be met is 33% to 40% (average) SGTP. For SGTP less than 33%, there is increased confidence that the limit would be met. As SGTP exceeds the minimum range value above (33%), the probability of successfully meeting the 268,500 gpm flow limit decreases. At even greater SGTP, this confidence is diminished, such that for SGTP greater than 40%, there is only a small chance of meeting the limit.

Part II - Items Requested in February 13, 1992 Teleconference with NRC Staff

1. Provide additional discussion concerning the categorization of the following Group 4 events listed on Page 27 of Reference 2. These events seem to have been previously placed in Group 3 in the prior reduced RCS flow request (Reference 1).

   - Partial Loss of Flow
   - Accidental Depressurization of the Main Steam System
   - Single Rod Withdrawal at Power
   - Major Secondary System Pipe Ruptures (Main Steam Line Break)

In Reference 1, reanalyses of events which were potentially affected by botn reduced RCS flow rate and increased SGTP were presented only for the most limiting events of this type. The four events above are a subset of the Group 4 events for which one of the following outcomes is true. These events either: 1) have effects from extended SGTP upon key transient results which act to create less severe overall behavior (Main Steam Line Break), or 2) are bounded in severity by events which were explicitly reanalyzed in Reference 1 (three remaining events). For conservatism, a DNBR penalty was assessed in Reference 1 to incorporate the effects of reduced flow upon these nonlimiting events. In Reference 2, the four events above were listed as Group 4 to properly reflect the expected physical effects of reduced flow and increased SGTP, since none of the Group 4 events were reanalyzed.

Part III - Items Requested in February 20 and 21, 1992 Teleconferences with NRC Staff

1. Please discuss the means of confirming that the revised setpoint in Reference 2 for Overpower ΔT (OPΔT) is acceptable.

The OPΔT K4 value is reduced from 1.079 to 1.016 for the period until steam generator replacement. The numerical change in this constant revises the OPΔT trip setpoints so that credit can be taken for the 5% reduction in Rated Thermal Power level and will ensure reactor protection with the lower RCS flow rate.

As stated in North Anna Technical Specification Bases, "the OPΔT reactor trip provides assurance of fuel integrity, e.g., no melting, under all possible overpower conditions, limits the required range for OTΔT protection, and provides a backup to the High Flux trip. No credit was taken for operation of this trip in the accident analyses; however, its functional capability at the specified trip setting is required to enhance the overall reliability of the Reactor Protection System".

The new value of the OPΔT K4 was generated using the methodology of WCAP-8746 consistent with a 5% reduction in the high flux trip setpoint. The new high flux setpoint was verified in the Rod Withdrawal at Power analysis described in Ref 2.

2. Please clarify the basis for concluding that the impact of flow reduction on main steamline break analysis results may be fully compensated by a penalty against retained DNBR margin.

The evaluation of the main steamline break (MSLB) accident analysis presented in the Technical Specification change submittals considers the impact of both extended SGTP and the associated reduction in RCS flow rate. As described below, the impact of extended SGTP and flow reduction may be considered separately.

In the discussion of the MSLB (References 1 and 2), it is asserted that extended SGTP reduces the steam generator's capability to remove energy from the RCS. The reduced energy removal capability causes the cooldown due to a MSLB to be less severe. The discussion further states that calculated transient DNBR under conditions of extended SGTP would be less limiting than that of the current licensing analysis. It is emphasized that this portion of the discussion only addresses the impact of extended SGTP on steam generator heat removal capability, and not the impact of extended SGTP on RCS flow rate. In other words, if SGTP is increased but the current Technical Specification minimum measured total RCS flow rate continues to be met, the predicted RCS cooldown and core power excursion will be less limiting than that of the currently applicable analysis. Except for its impact on RCS flow rate, extended SGTP is considered to be an analysis benefit. This benefit is not quantified in the MSLB evaluation, and is only described to demonstrate that extended SGTP does not adversely impact the system transient response to a MSLB.

Because extended SGTP does not adversely impact the RCS system transient response to a MSLB, the reduc. i in RCS flow rate associated with extended SGTP may be considered in isolation in terms of its impact on detailed core thermal/hydraulics analysis (DNBR) results. The impact of a reduction in RCS flow rate on MSLB DNBR analysis results may be accommodated by a penalty against retained DNBR margin as described in References 1 and 2.

References:


1. Letter from W. L. Stewart (Va. Electric & Power Co.) to NRC, "North Anna Power Station Unit 1-Proposed Technical Specification Change-Reduced Minimum RCS Flow Rate Limit to Support Increased Steam Generator Tube Plugging Level," Serial No. 92-018, January 8, 1992.

2. Letter from W. L. Stewart (Va. Electric & Power Co.) to NRC, "North Anna Power Station Unit 1-Supplement to Proposed Technical Specification Change on Reduced Minimum RCS Flow Rate Limit to Support Increased Steam Generator Tube Plugging Level," Serial No. 92-018B, February 10, 1992.