VIRGINIA ELECTRIC AND POWER COMPANY
RICHMOND, VIRGINIA 23261

January 31, 1992

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

Serial No. 92-018A
NL&P/JBL: R0
Docket Nos. 50-338
License Nos. 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 letter dated January 8, 1992, Virginia Electric and Power Company requested a change to the Technical Specifications for North Anna Power Station Unit 1. The proposed change requested is to reduce the limit for Reactor Coolant System (RCS) total flow rate for the remaining operating period until the North Anna Unit 1 steam generators are replaced in 1993. The reduction in flow rate is necessary to accommodate the interim system effects associated with increased steam generator tube plugging as a result of the current Unit 1 mid-cycle inspection outage.

Per your request, a conference call was held on January 27, 1992 with the NRC reviewer, Mr. H. I. Abelson, to discuss this proposed Technical Specification change. The attachment to this letter describes the clarifications discussed on the conference call. 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

cc: U.S. Nuclear Regulatory Commission
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Suite 2900
Atlanta, Georgia 30323

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

Commissioner
Department of Health
Room 400
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ATTACHMENT 1

SUPPLEMENTAL INFORMATION FOR RCS MINIMUM MEASURED FLOW RATE
TECHNICAL SPECIFICATIONS CHANGE PACKAGE
NORTH ANNA UNIT 1

DESCRIPTION OF VIRGINIA POWER RETAINED MARGIN ACCOUNTING

The WRB-1 critical heat flux (CHF) correlation utilized by Virginia Power in the performance of DNBR analysis has a correlation DNBR limit of 1.17. In deterministic DNBR analyses, key DNBR analysis parameter uncertainties are applied as transient analysis initial conditions in the direction which most adversely affects the DNBR. Verifying that the DNBR remains above 1.17 throughout the transient ensures that the onset of DNB will not occur with a probability of 95% and a confidence level of 95%.

By combining the key DNBR analysis parameter uncertainties with the WRB-1 correlation uncertainties in a statistical manner (rather than applying them as transient analysis initial conditions), a statistical DNBR limit of 1.26 was established. Transient analyses performed against this more restrictive limit are initiated from nominal values of key DNBR parameters, since the DNBR effect of uncertainties in these parameters is included in the statistical DNBR limit. Verifying that the DNBR remains above 1.26 ensures that the onset of DNB will not occur with 95% probability and confidence.

Virginia Power has chosen to perform safety analyses against a DNBR design limit of 1.46. Performance of safety analyses against this limit assures that the 1.26 statistical DNBR design limit would always be met, and that an additional (1.46-1.26)/1.46 = 13.7% DNBR remains available to accommodate changes in plant operating conditions, or in detailed core thermal/hydraulic (T/H) analysis methods. The percentage difference between the statistical DNBR limit and the design DNBR limit as calculated above has been termed "retained DNBR margin". It is sometimes called "generic" retained DNBR margin, in reference to the fact that it can be used to account for the DNBR impact of changes in plant operating conditions or T/H analysis methods without regard to which specific transient analyses are affected by the changes. In all cases, the 1.26 statistical DNBR limit continues to be met for all transients.

Retained DNBR margin is a convenient vehicle for accommodating changes which affect many or all aspects of T/H design and safety analysis. Penalties against retained margin totaling up to 13.7% DNBR may be accommodated without requiring across-the-board reanalyses of UFSAR transients. Penalties are typically calculated by assessing the maximum perturbation of a DNB analysis parameter, such as flow or temperature, and multiplying this perturbation by a partial derivative representing the maximum predicted marginal change in DNBR per unit change in the DNB analysis parameter. The calculated penalty is arithmetically subtracted from available retained DNBR margin. For example, with 13.7% available retained margin, a 3.7% penalty to accommodate effects of observed fuel rod bowing would leave 10.0% retained DNBR margin available for other penalties.

It should be noted that the penalties arithmetically subtracted from the 13.7% available retained DNBR margin may vary from accident to accident. Accidents have been reanalyzed over time, and phenomena which were previously accounted for by a penalty against retained DNBR margin may have been explicitly modelled in the accident reanalyses. The phenomena are then directly accounted for in the transient-specific DNBR result, and the penalty against retained DNBR margin need no longer be assessed.

For those transients which were identified as being impacted by the proposed reduction in Total RCS Flow Rate, but which did not require reanalysis, a penalty was developed to be taken out of retained DNBR margin. The penalty was developed by considering a range of statepoint conditions which bounded both normal operation and accident conditions, and by evaluating the DNBR impact of marginal changes in RCS flow rate. A partial derivative developed with the WRB-1 CHF correlation of 1.6% (percent change in DNBR per percent change in RCS flow) was determined to bound all statepoints considered. By multiplying this partial derivative by the proposed 3% change in Total RCS Flow Rate, a DNBR penalty of 4.8% DNBR was obtained.

The Main Steamline Break (MSLB) accident analysis utilizes the W-3 CHF correlation for DNBR calculations. Because W-3 has a different DNBR sensitivity to marginal changes in flow, a separate penalty was developed to accommodate the effect of the proposed reduction in RCS flow rate on MSLB analysis results. This penalty was quantified at 4.3% DNBR, and will be assessed against available MSLB retained DNBR margin which was quantified in a manner analogous to that described previously.

Because the DNBR results of transient analyses do not typically approach the 1.46 design limit, there is some amount of additional DNBR margin between the transient analysis minimum DNBR result and the design DNBR limit. This margin has been termed "analysis DNBR margin." Analysis DNBR margin has not been used in any evaluation to justifiy the proposed reduction in RCS flow rate.

APPROACH FOR ASSESSING THE UFSAR CHAPTER 15 ACCIDENTS

The process of distinguishing those accidents requiring reanalysis from those which did not was essentially a screening process which subjected the individual accidents to the following tests:

1. Is the accident impacted by neither RCS flow nor steam generator tube plugging? In some cases (e.g., Waste Gas Decay Tank Rupture), the answer is no and thus the event need not be considered further.

2. Is the accident impacted by plugging but not by flow? These events (e.g. Chemical and Volume Control System Malfunction, which is sensitive to RCS volume but not flow) will be addressed under 10 CFR 50.59 to support unit restart with extended plugging but have not been addressed here since they are not impacted by the proposed RCS flow Technical Specification Change.

3. Is the accident impacted by RCS flow alone (i.e. and not by other tube plugging phenomena)? In some cases the dynamics of the event are not impacted by plugging effects, and the impact is limited to the direct effect of RCS flow on the DNBR. An example is accidental depressurization of the reactor coolant system. Accidents in this category were dispositioned via application of the generic DNBR penalty against retained DNBR margin.

4. Is the accident potentially impacted by both RCS flow and steam generator tube plugging effects? These are accidents which, in addition to the direct flow effect on DNBR, may be sensitive to

   a. steam generator hydraulic resistance (i.e. pressure drop)

   b. steam generator heat transfer area and/or secondary side initial conditions

   c. reactor coolant system volume

   d. instrumentation effects (i.e. overtemperatutre Delta-T trip)

   Accidents in this category were either explicitly reanalyzed (e.g. Locked Reactor Coolant Pump Rotor, Loss of Normal Feedwater) or assessed using available sensitivity study results for the specific accident (as was done for the Main Feedline Break).

RELATIONSHIP BETWEEN STEAM GENERATOR TUBE PLUGGING AND THE PROPOSED VALUE OF TOTAL RCS FLOW RATE

According to Westinghouse estimates of RCS flow rate as a function of tube plugging percentage, the proposed flow rate corresponds to approximately 32% average tube plugging. This estimate is based on an extrapolation of previous measured RCS flow data. Because RCS flow measurement uncertainty may cause measured flow rates to vary by as much as 2% from their true value, there exists an expected range of steam generator tube plugging over which the proposed flow rate may be met. This range is estimated to be between 28% and 36%. However, it should be emphasized that this is only an estimated range. Upon resumption of Cycle 9 power operation, the actual RCS Total Flow Rate will be confirmed by measurement. If the flow decreases with increasing levels of steam generator tube plugging more slowly than projected, the analyses and evaluations which support the proposed reduction in RCS flow rate are valid for average steam generator tube plugging levels up to 40%.