UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELATED TO AMENDMENT NOS. 200 AND 181 TO

FACILITY OPERATING LICENSE NOS. NPF-4 AND NPF-7

VIRGINIA ELECTRIC AND POWER COMPANY

OLD DOMINION ELECTRIC COOPERATIVE

NORTH ANNA POWER STATION, UNITS NO. 1 AND NO. 2

DOCKET NOS. 50-338 AND 50-339

1.0 INTRODUCTION

By letter dated July 26, 1995, the Virginia Electric and Power Company (the licensee) proposed an amendment to the North Anna Units 1 and 2 (NA-1&2) Technical Specifications (TS). Specifically, the proposed amendment requested the following changes to the TSs:

Table 2.2-1, Reactor Trip system Instrumentation Trip Setpoints, Item 10, Pressurizer Pressure - High

Revise the existing trip setpoint from ≤ 2385 psig to ≤ 2360 psig.

Revise the allowable value from ≤ 2395 psig to ≤ 2370 psig.

TS 3.4.2, Reactor Coolant System Safety Valves - Shutdown

Revise the safety valve lift setpoint tolerance from ±1% to ±3% as-found and ±1% as-left*.

TS 3.4.3.1, Reactor Coolant System Safety and Relief Valves - Operating

Revise the safety valve lift setpoint tolerance from ±1% to +2%/-3% average as-found with no single valve outside ±3%, and ±1% per valve as-left*.

Bases for TS 3/4.4.2 and 3/4.4.3, Reactor Coolant System Safety and Relief Valves

Add or modify the following paragraphs to the 3/4.4.2 and 3/4.4.3 bases sections:

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The safety valve tolerance requirement for Modes 1-3 is expressed as an average value. That is, the as-found error (expressed as a positive or negative percentage) of each tested safety valve is summed and divided by the number of valves tested. This average as-found value is compared to the acceptable range of +2% to -3%. In addition, no single valve is allowed to be outside of ±3%.

An average tolerance of +2%/-3% was confirmed to be adequate for Modes 1-3 accident analyses. For the overpressure events, the analyses considered several combinations of valve tolerance with the arithmetic average of the three valves' tolerance equal to +2% (with no valve outside of ±3%). The case of a +2% tolerance on each of the three valves provided the most limiting results. The -3% tolerance is limiting for the DNB acceptance criterion.

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The OPERABILITY of the PORVs and block values is determined on the basis of their being capable of performing the following functions:

a) Manual control of PORVs to control reactor coolant system pressure. This is a function that may be used to mitigate certain accidents and for plant shutdown.

b) Maintaining the integrity of the reactor coolant pressure boundary. This function is related to controlling identified leakage and ensuring the ability to detect unidentified reactor coolant pressure boundary leakage.

2.0 BACKGROUND

Three code safety valves are installed on each unit's pressurizer. The valves have a nominal lift setpoint of 2485 psig and function to protect the reactor coolant system from overpressure.

The licensee stated that the PSVs have a history of drifting outside the currently allowed tolerance of ±1%, resulting in TS violations. Because up to a ±3% tolerance is permitted by ASME Code Section III, Division 1, Subsection NB, Part 7513, for code safety valves, a project was initiated to justify an increase in the PSV tolerance to reduce the number of TS violations. The analyses and evaluation described support the proposed PSV setpoint tolerance increase.

The licensee stated that the proposed TS changes do not affect the nominal lift setpoint of the pressurizer safety valves, nor the as-left tolerance requirement. Only the allowable as-found tolerance about the existing lift setpoint is to be changed.

To ensure acceptable analysis results with the increased as-found PSV tolerance, a concurrent reduction in the pressurizer high pressure reactor trip TS setpoint is also proposed by the licensee. This reduction provides a faster response of the reactor protection system to over pressure events without significantly impacting existing operating margin.

3.0 EVALUATION

VEPCO made analysis of the Loss of Load, Locked Rotor, and Rod Withdrawal events to demonstrate that increasing the at-power PSV lift setpoint tolerance to +2%/-3% average as-found with no single valve outside ±3% as-found and ±1% per valve as-left does not result in a transient pressure in excess of the overpressure safety limit. The transient analyses were performed with the RETRAN system transient analysis code. The evaluation of these events is summarized below.

3.1 Loss of Load

The Loss of Load analysis was performed to establish that a Loss of Load event would not result in primary side pressures beyond the limit of 2750 psia nor secondary side pressure beyond the limit of 1210 psia when the pressurizer safety valve lift setpoint tolerance is increased to 2%. The maximum primary side (cold leg) pressure was determined to be 2740 psia which is below the overpressure safety limit (110% of design pressure) of 2750 psia. The peak secondary pressure was 1181 psia which is below the acceptance criterion of 1210 psia. We find the results to be acceptable as the pressure values fall within the overpressure safety limits.

3.2 Locked Rotor Analysis

The Locked Rotor Analysis was performed in order to determine if an increased PSV value lift setpoint tolerance would result in an overpressurization of the primary side during a postulated Locked Rotor transient. The transient analysis using the RETRAN code for the Locked Rotor event with a 2% average PSV setpoint tolerance calculated a peak primary (cold leg) pressure of 2739 psia. This value is below the primary safety limit of 2750 psia. The maximum secondary side pressure was determined to be 1186 psia, which below the overpressure limit of 1210 psia. We find the results to be acceptable as the pressure values fall within the overpressure safety limits.

3.3 Rod Withdrawal Events

The licensee stated that recent reanalyses of the Rod Withdrawal at Power (RWAP) and Rod withdrawal from Subcritical (RWSC) events revealed that these events may result in significant pressurization of the RCS, particularly those cases initiated from low power.

The impact of a 3% PSV lift setpoint tolerance (bounding the 2% average tolerance) on RWAP results was quantified by the licensee. The limiting case was initiated from 8% power, and assumed a 30 pcm/sec reactivity insertion rate, a 3% PSV lift setpoint tolerance, a water loop seal (additional opening delay), and a -1.4 pcm/°F full power Doppler temperature coefficient. This case resulted in maximum RCS pressure of 2725 psia.

Similarly, the impact of 3% PSV lift setpoint tolerance on RWSC results was quantified. A case which assumed a 100 pcm/sec reactivity insertion rate, a 3% PSV lift setpoint tolerance, and a water loop seal was run. The peak RCS pressure in the analysis was 2587 psia.

The results for both the RWSC and RWAP are below 110% of the RCS design pressure, and are therefore acceptable.

3.4 DNB Considerations

An increased negative PSV lift setpoint tolerance potentially reduces the system pressure experienced at the point of minimum Departure from Nucleate Boiling Ratio (DNBR). Therefore the effect of a -3% PSV setpoint tolerance on the DNBR results of affected transients was evaluated by examining the North Anna USFAR Chapter 15 safety analysis results.

Of the affected transients, only the DNBR results of the Locked Rotor event were found to be potentially adversely affected by the increased negative tolerance. A conservative maximum impact on the Locked Rotor analysis was quantified by the licensee and the DNBR acceptance criteria was found to be met. We therefore find this acceptable.

3.5 Operational Margin Considerations

The licensee stated that the proposed setpoint tolerances were chosen such that an inadvertent opening of the safety valves during normal operation would not occur. The proposed high primary pressure trip setpoint is 2370 psig with an uncertainty of 18.72 psi. The nominal setpoint plus uncertainty is, therefore, 2389 psig. Because the nominal PSV lift setpoint minus 3% tolerance is 2425 psia, a reactor trip will occur before the PSVs open. It is therefore concluded that the proposed setpoint tolerance change will not present any operational considerations.

3.6 Mode 4 Considerations

The licensee calculated the shutdown overpressure protection requirements. The analysis used a tolerance of +3% on the pressurizer safety valve. Tolerance in the negative direction provides additional margin. The analysis showed that for two charging pumps injecting at double the flow of a single pump, two PSVs provide adequate overpressure protection. Therefore, for the case of one operable charging pump, as required in Mode 4 and below, one PSV will provide adequate overpressure protection with a tolerance of up to +3%. Therefore, the Mode 4 requirement (i.e., TS 3.4.2) is specified as ±3%, which we find to be acceptable.

3.7 Summary

The Loss of Load, Locked Rotor, and Rod Withdrawal event analyses demonstrate that increasing the at-power PSV lift setpoint tolerance to +2%/-3% average as-found with no single valve outside ±3% as-found and ±1% per valve as-left does not result in a transient pressure in excess of the overpressure safety limit. In addition, the licensee's analysis has shown that the increased setpoint tolerance does not adversely impact the DNBR results of an North Anna UFSAR Chapter 15 transient analyses. Mode 4 overpressure protection has been shown to be adequate with one PSV with a tolerance of ±3%. The reduction in the pressurizer high pressure reactor trip setpoint ensures that the analysis results for the loss of external load accident continue to meet the acceptance criteria with the higher PSV tolerance. The increased PSV setpoint tolerances and

reduction of the high pressurizer pressure reactor trip setpoint do not present any operational considerations which would significantly impact the performance of the plant during normal operation or during postulated accident conditions. Each pertinent safety criteria was evaluated by the licensee for the proposed TS changes, and all were found to be acceptable. Our review has found that these proposed changes are acceptable.

4.0 STATE CONSULTATION

In accordance with the Commission's regulations, the Virginia State official was notified of the proposed issuance of the amendment. The State official had no comment.

5.0 ENVIRONMENTAL CONSIDERATION

These amendments change a requirement with respect to installation or use of a facility component located within the restricted area as defined in 10 CFR Part 20. The NRC staff has determined that the amendments involve no significant increase in the amounts, and no significant change in the types, of any effluents that may be released offsite, and that there is no significant increase in individual or cumulative occupational radiation exposure. The Commission has previously issued a proposed finding that these amendments involve no significant hazards consideration and there has been no public comment on such finding (60 FR 45189). Accordingly, these amendments meet the eligibility criteria for categorical exclusion set forth in 10 CFR 51.22(c)(9). Pursuant to 10 CFR 51.22(b) no environmental impact statement or environmental assessment need be prepared in connection with the issuance of the amendments.

6.0 CONCLUSION

The Commission has concluded, based on the considerations discussed above, that: (1) there is reasonable assurance that the health and safety of the public will not be endangered by operation in the proposed manner, (2) such activities will be conducted in compliance with the Commission's regulations, and (3) the issuance of the amendments will not be inimical to the common defense and security or to the health and safety of the public.

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Date: April 1, 1996

DATED: April 1, 1996

AMENDMENT NO. 200 TO FACILITY OPERATING LICENSE NO. NPF-4-NORTH ANNA UNIT 1
AMENDMENT NO. 181 TO FACILITY OPERATING LICENSE NO. NPF-7-NORTH ANNA UNIT 2

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