July 31, 1989

Docket Nos. 50-338
and 50-339

DISTRIBUTION
See attached sheet

Mr. W. R. Cartwright
Vice President - Nuclear
Virginia Electric and Power Company
5000 Dominion Blvd.
Glen Allen, Virginia 23060

Dear Mr. Cartwright:

SUBJECT: NORTH ANNA UNITS 1 AND 2 - ISSUANCE OF AMENDMENTS RE: MINIMUM MEASURED FLOW RATE IN REACTOR COOLANT SYSTEM (TAC NOS. 73385 AND 73386)

The Commission has issued the enclosed Amendment Nos. 120 and 104 to Facility Operating License Nos. NPF-4 and NPF-7 for the North Anna Power Station, Units No. 1 and No. 2 (NA-1&2). The amendments revise the Technical Specifications (TS) in response to your letter dated May 23, 1989.

The amendments reduce the NA-1&2 TS 3/4.2.5 limit on the minimum measured flow rate in the reactor coolant system from 289,200 gallons per minute (gpm) to 284,000 gpm. This reduction in the minimum flow rate is enveloped within the NA-1&2 UFSAR Chapter 15 accident analyses.

A copy of the Safety Evaluation is also enclosed. The Notice of Issuance will be included in the Commission's biweekly Federal Register notice.

Sincerely,

Original signed by

Leon B. Engle, Project Manager
Project Directorate II-2
Division of Reactor Projects-I/II
Office of Nuclear Reactor Regulation

Enclosures:
1. Amendment No. 120 to NPF-4
2. Amendment No. 140 to NPF-7
3. Safety Evaluation

cc w/enclosures:
See next page

[AMENDMENT/NA-1&2]

LA:PDII-2	PM:PDII-2	SRXB	D:PDII	OGC
DMiller	LEngle/jd	WHodges	HBerkow	MYoung
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Mr. W. R. Cartwright
Virginia Electric & Power Company

North Anna Power Station
Units 1 and 2

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Mr. G. E. Kane
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DATED: July 31, 1989

AMENDMENT NO. 120 TO FACILITY OPERATING LICENSE NO. NPF-4-NORTH ANNA UNIT 1
AMENDMENT NO. 104 TO FACILITY OPERATING LICENSE NO. NPF-7-NORTH ANNA UNIT 2

Docket File
NRC & Local PDRs
PDII-2 Reading
S. Varga, 14/E/4
G. Lainas, 14/H/3
H. Berkow
D. Miller
L. Engle
OGC-WF
D. Hagan, 3302 MNBB
E. Jordan, 3302 MNBB
B. Grimes, 9/A/2
T. Meek (8), P1-137
Wanda Jones, P-130A
J. Calvo, 11/F/23
ACRS (10)
GPA/PA
ARM/LFMB
B. Sinkule, R-II

cc: Plant Service list

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

VIRGINIA ELECTRIC AND POWER COMPANY

OLD DOMINION ELECTRIC COOPERATIVE

DOCKET NO. 50-338

NORTH ANNA POWER STATION, UNIT NO. 1

AMENDMENT TO FACILITY OPERATING LICENSE

Amendment No. 120
License No. NPF-4

1. The Nuclear Regulatory Commission (the Commission) has found that:

   A. The application for amendment by Virginia Electric and Power Company et al., (the licensee) dated May 23, 1989, complies with the standards and requirements of the Atomic Energy Act of 1954, as amended (the Act), and the Commission's rules and regulations set forth in 10 CFR Chapter I;

   B. The facility will operate in conformity with the application, the provisions of the Act, and the rules and regulations of the Commission;

   C. There is reasonable assurance (i) that the activities authorized by this amendment can be conducted without endangering the health and safety of the public, and (ii) that such activities will be conducted in compliance with the Commission's regulations;

   D. The issuance of this amendment will not be inimical to the common defense and security or to the health and safety of the public; and

   E. The issuance of this amendment is in accordance with 10 CFR Part 51 of the Commission's regulations and all applicable requirements have been satisfied.

2. Accordingly, the license is amended by changes to the Technical Specifications as indicated in the attachment to this license amendment, and paragraph 2.D.(2) of Facility Operating License No. NPF-4 is hereby amended to read as follows:

   (2) Technical Specifications

   The Technical Specifications contained in Appendices A and B, as revised through Amendment No. 120 , are hereby incorporated in the license. The licensee shall operate the facility in accordance with the Technical Specifications.

3. This license amendment is effective as of the date of issuance and shall be implemented within 30 days.

FOR THE NUCLEAR REGULATORY COMMISSION

Herbert N. Berkow, Director
Project Directorate II-2
Division of Reactor Projects-I/II
Office of Nuclear Reactor Regulation

Attachment:
Changes to the Technical
Specifications

Date of Issuance: July 31, 1989

ATTACHMENT TO LICENSE AMENDMENT NO. 120

TO FACILITY OPERATING LICENSE NO. NPF-4

DOCKET NO. 50-338

Replace the following pages of the Appendix "A" Technical Specifications with the enclosed pages as indicated. The revised pages are identified by amendment number and contain vertical lines indicating the area of change. The corresponding overleaf pages are also provided to maintain document completeness.

Page
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B 3/4 2-6

TABLE 3.2-1

DNB PARAMETERS

PARAMETER	LIMITS		
	3 Loops in Operation	2 Loops in Operation** & Loop Stop Valves Open	2 Loops in Operation** & Isolated Loop Stop Valves Closed
Reactor Coolant System T_{avg}	$\leq$ 591°F		
Pressurizer Pressure	$\geq$ 2205 psig*		
Reactor Coolant System Total Flow Rate	$\geq$ 284,000 gpm		

* Limit not applicable during either a THERMAL POWER ramp increase in excess of 5% RATED THERMAL POWER per minute or a THERMAL POWER step increase in excess of 10% RATED THERMAL POWER.

**Values dependent on NRC approval of ECCS evaluation for these conditions.

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a. abnormal perturbations in the radial power shape, such as from rod misalignment, effect $F^N_{\Delta H}$ more directly than F_Q,

b. although rod movement has a direct influence upon limiting F_Q to within its limit, such control is not readily available to limit $F^N_{\Delta H}$, and

c. errors in prediction for control power shape detected during startup physics tests can be compensated for in F_Q by restricting axial flux distributions. This compensation for $F^N_{\Delta H}$ is less readily available.

Fuel rod bowing reduces the value of the DNB ratio. Credit is available to offset this reduction in the margin available between the safety analysis design DNBR values (1.46 for Virginia Electric and Power Company statistical methods) and the limiting design DNBR value (1.26 for Virginia Electric and Power Company statistical methods). A discussion of the rod bow penalty is presented in the FSAR.

The hot channel factor $F_Q^M(Z)$ is measured periodically and increased by a cycle and height dependent power factor, N(Z), to provide assurance that the limit on the hot channel factor, $F_Q(Z)$, is met. N(Z) accounts for the non-equilibrium effects of normal operation transients and was determined from expected power control maneuvers over the full range of burnup conditions in the core. The N(Z) function for normal operation is provided in the Core Surveillance Report per Specification 6.9.1.7.

3/4.2.4 QUADRANT POWER TILT RATIO

The quadrant power tilt ratio limit assures that the radial power distribution satisfies the design values used in the power capability analysis. Radial power distribution measurements are made during startup testing and periodically during power operation.

The limit of 1.02 at which corrective action is required provides DNB and linear heat generation rate protection with x-y plane power tilts.

The two hour time allowance for operation with a tilt condition greater than 1.02 but less than 1.09 is provided to allow identification and correction of a dropped or misaligned rod. In the event such action does not correct the tilt, the margin for uncertainty on F_Q is reinstated by reducing the power by 3 percent for each percent of tilt in excess of 1.0.

For purposes of monitoring QUADRANT POWER TILT RATIO when one excore detector is inoperable, the moveable incore detectors are used to confirm that the normalized symmetric power distribution is consistent with the QUADRANT POWER TILT RATIO. The incore detector monitoring is done with a full incore flux map or two sets of 4 symmetric thimbles. The two sets of 4 symmetric thimbles is a unique set of 8 detector locations. These locations are C-8, E-5, E-11, H-3, H-13, L-5, L-11 and N-8.

3/4.2.5 DNB PARAMETERS

The limits on the DNB related parameters assure that each of the parameters are maintained within the normal steady state envelope of operation assumed in the transient and accident analyses. The limits have been analytically demonstrated to be adequate to maintain a minimum DNBR greater than the design limit throughout each analyzed transient. Measurement uncertainties are accounted for in the DNB design margin.

The 12 hour periodic surveillance of these parameters thru instrument readout is sufficient to ensure that the parameters are restored within their limits following load changes and other expected transient operation. The 18 month periodic measurement of the RCS total flow rate is adequate to detect flow degradation and ensure correlation of the flow indication channels with measured flow such that the indicated percent flow will provide sufficient verification of flow rate on a 12 hour basis.

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

VIRGINIA ELECTRIC AND POWER COMPANY

OLD DOMINION ELECTRIC COOPERATIVE

DOCKET NO. 50-339

NORTH ANNA POWER STATION, UNIT NO. 2

AMENDMENT TO FACILITY OPERATING LICENSE

Amendment No. 104
License No. NPF-7

1. The Nuclear Regulatory Commission (the Commission) has found that:

   A. The application for amendment by Virginia Electric and Power Company, et al., (the licensee) dated May 23, 1989, complies with the standards and requirements of the Atomic Energy Act of 1954, as amended (the Act), and the Commission's rules and regulations set forth in 10 CFR Chapter I;

   B. The facility will operate in conformity with the application, the provisions of the Act, and the rules and regulations of the Commission;

   C. There is reasonable assurance (i) that the activities authorized by this amendment can be conducted without endangering the health and safety of the public, and (ii) that such activities will be conducted in compliance with the Commission's regulations;

   D. The issuance of this amendment will not be inimical to the common defense and security or to the health and safety of the public; and

   E. The issuance of this amendment is in accordance with 10 CFR Part 51 of the Commission's regulations and all applicable requirements have been satisfied.

2. Accordingly, the license is amended by changes to the Technical Specifications as indicated in the attachment to this license amendment, and paragraph 2.C.(2) of Facility Operating License No. NPF-7 is hereby amended to read as follows:

   (2) Technical Specifications

   The Technical Specifications contained in Appendices A and B, as revised through Amendment No. 104 , are hereby incorporated in the license. The licensee shall operate the facility in accordance with the Technical Specifications.

3. This license amendment is effective as of the date of issuance and shall be implemented within 30 days.

FOR THE NUCLEAR REGULATORY COMMISSION

Herbert N. Berkow, Director
Project Directorate II-2
Division of Reactor Projects-I/II
Office of Nuclear Reactor Regulation

Attachment:
Changes to the Technical
Specifications

Date of Issuance: July 31, 1989

ATTACHMENT TO LICENSE AMENDMENT NO. 104

TO FACILITY OPERATING LICENSE NO. NPF-7

DOCKET NO. 50-339

Replace the following pages of the Appendix "A" Technical Specifications with the enclosed pages as indicated. The revised pages are identified by amendment number and contain vertical lines indicating the area of change. The corresponding overleaf pages are also provided to maintain document completeness.

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B 3/4 2-6

POWER DISTRIBUTION LIMITS

DNB PARAMETERS

LIMITING CONDITION FOR OPERATION

3.2.5 The following DNB related parameters shall be maintained within the limits shown on Table 3.2-1:

a. Reactor Coolant System T_{avg}

b. Pressurizer Pressure

c. Reactor Coolant System Total Flow Rate

APPLICABILITY: MODE 1

ACTION:

With any of the above parameters exceeding its limit, restore the parameter to within its limit within 2 hours or reduce THERMAL POWER to less than 5% of RATED THERMAL POWER within the next 4 hours.

SURVEILLANCE REQUIREMENTS

4.2.5.1 Each of the parameters of Table 3.2-1 shall be verified to be within their limits at least once per 12 hours.

4.2.5.2 The Reactor Coolant System total flow rate shall be determined to be within its limit by measurement at least once per 18 months.

TABLE 3.2-1

DNB PARAMETERS

PARAMETER	LIMITS		
	3 Loops in Operation	2 Loops in Operation** & Loop Stop Valves Open	2 Loops in Operation** & Isolated Loop Stop Valves Closed
Reactor Coolant System T_{avg}	$\leq$591°F		
Pressurizer Pressure	$\geq$2205 psig*		
Reactor Coolant System Total Flow Rate	$\geq$284,000 gpm		

*Limit not applicable during either a THERMAL POWER ramp increase in excess of 5% RATED THERMAL POWER per minute or a THERMAL POWER step increase in excess of 10% RATED THERMAL POWER.

**Values dependent on NRC approval of ECCS evaluation for these conditions.

When $F^N_{\Delta H}$ is measured, 4% is the appropriate experimental error allowance for a full core map taken with the incore detection system. The specified limit for $F^N_{\Delta H}$ contains a 4% error allowance. Normal operation will result in a measured $F^N_{\Delta H}$ less than or equal to 1.49. The 4% allowance is based on the following considerations:

a. abnormal perturbations in the radial power shape, such as from rod misalignment, effect $F^N_{\Delta H}$ more directly than F_Q,

b. although rod movement has a direct influence upon limiting F_Q to within its limit, such control is not readily available to limit $F^N_{\Delta H}$, and

c. errors in prediction for control power shape detected during startup physics tests can be compensated for in F_Q by restricting axial flux distributions. This compensation for $F^N_{\Delta H}$ is less readily available.

Fuel rod bowing reduces the value of the DNB ratio. Credit is available to offset this reduction in the margin available between the safety analysis design DNBR value (1.46 for Virginia Electric and Power Company statistical methods) and the limiting design DNBR value (1.26 for Virginia Electric and Power Company statistical methods). A discussion of the rod bow penalty is presented in the FSAR.

The hot channel factor $F_Q M(Z)$ is measured periodically and increased by a cycle and height dependent power factor, N(Z), to provide assurance that the limit on the hot channel factor, $F_Q(Z)$, is met. N(Z) accounts for the non-equilibrium effects of normal operation transients and was determined from expected power control maneuvers over the full range of burnup conditions in the core. The N(Z) function for normal operation is provided in the Core Surveillance Report per Specification 6.9.1.7.

3/4.2.4 QUADRANT POWER TILT RATIO

The quadrant power tilt ratio limit assures that the radial power distribution satisfies the design values used in the power capability analysis. Radial power distribution measurements are made during startup testing and periodically during power operation.

The limit of 1.02 at which corrective action is required provides DNB and linear heat generation rate protection with x-y plane power tilts.

The two hour time allowance for operation with a tilt condition greater than 1.02 but less than 1.09 is provided to allow identification and correction of a dropped or misaligned rod. In the event such action does not correct the tilt, the margin for uncertainty on F_Q is reinstated by reducing the power by 3 percent for each percent of tilt in excess of 1.0.

For purposes of monitoring QUADRANT POWER TILT RATIO when one excore detector is inoperable, the movable incore detectors are used to confirm that the normalized symmetric power distribution is consistent with the QUADRANT POWER TILT RATIO. The incore detector monitoring is done with a full incore flux map or two sets of 4 symmetric thimbles. The two sets of 4 symmetric thimbles is a unique set of 8 detector locations. These locations are C-8, E-5, E-11, H-3, H-13, L-5, L-11, and N-8.

3/4.2.5 DNB PARAMETERS

The limits on the DNB related parameters assure that each of the parameters are maintained within the normal steady state envelope of operation assumed in the transient and accident analyses. The limits have been analytically demonstrated to be adequate to maintain a minimum DNBR greater than the design limit throughout each analyzed transient. Measurement uncertainties must be accounted for during the periodic surveillance.

The 12 hour periodic surveillance of these parameters thru instrument readout is sufficient to ensure that the parameters are restored within their limits following load changes and other expected transient operation. The 18 month periodic measurement of the RCS total flow rate is adequate to detect flow degradation and ensure correlation of the flow indication channels with measured flow such that the indicated percent flow will provide sufficient verification of flow rate on a 12 hour basis.

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

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELATED TO AMENDMENT NOS. 120 AND 104 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 May 23, 1989, the Virginia Electric and Power Company (the licensee) proposed a change to the Technical Specifications (TS) for the North Anna Power Station, Unit Nos. 1 and 2 (NA-1&2). The proposed change would reduce the TS 3/4.2.5 limit on the minimum measured flow rate in the reactor coolant system (RCS) for both NA-1&2. The change allows a lower total RCS flow by taking credit for a previously unused design margin without requiring a reanalysis of the Updated Final Safety Analysis Report (UFSAR) Chapter 15 accident analyses. The reduced RCS flow rate will be offset by the conservatism inherent in the existing calculated Departure from Nucleate Boiling Ratio (DNBR). This reduction in DNBR design margin is considered acceptable since it does not adversely affect the UFSAR Chapter 15 accident analysis.

As required by TS 3.2.5 and 4.2.5.2, the licensee performs RCS flow measurements at NA-1&2 once per fuel cycle. Because the RCS flow is sensitive to the steam generator tube plugging (SGTP) which has been performed during refueling outages, the flow rates have been trended as a function of SGTP. The RCS flow rates have decreased predictably with increased SGTP. As additional tubes are plugged, both units are expected to approach the TS flow limit.

As discussed below, the NA-1&2 TS minimum RCS flow rate may be reduced by absorbing a penalty in the available DNBR design margin. The flow rate would be reduced for both NA-1&2 to preserve consistency between the two sets of TS.

2.0 DISCUSSION

Two different flow rates have been used in the currently docketed analyses for NA-1&2 which were approved as a part of the 1986 core uprating (Amendment Nos. 84 and 71 dated August 25, 1986). These are the Westinghouse Improved Thermal Design Procedure (ITDP) flow rate, which is used for statistical DNBR analysis, and a lower, non-ITDP flow rate, which is used for non-statistical analysis of both DNB and non-DNB events such as the Loss of Coolant Accident (LOCA).

The NA-1&2 TS require that the RCS flow rate be measured every 18 months in order to verify the assumed ITDP flow rate of 289,200 gpm. No uncertainty is applied because the measurement uncertainty has been statistically absorbed by the ITDP methodology. No comparison with the non-ITDP flow rate is necessary since, even with the application of the required measurement uncertainty, the non-ITDP 284,000 gpm limit is substantially below the ITDP value.

Sufficient analysis margin exists to lower the minimum measured flow rate from the ITDP limit of 289,200 gpm to the non-ITDP limit of 284,000 gpm. As a part of the Reload Safety Evaluation (RSE) process for each cycle, a table of retained DNBR margin (derived from the TS Bases 3/4.2.3) is prepared for the reload cores. Approximately 10% retained DNBR margin remains available after all pertinent penalties have been absorbed. This available margin can be used to offset the desired flow limit reduction.

The maximum DNBR sensitivity to flow rate for NA-1&2 is 1.6% per percent flow. This sensitivity was determined over a range of statepoints which bound all operating and DNB-related accident conditions as a part of licensee's NRC-approved Statistical DNBR Methodology. Further, it is slightly more conservative than the ITDP sensitivity which was used to develop the DNBR limit for the NA-1&2 core uprating. Based upon this sensitivity, each percent reduction in the 289,200 gpm limit must be offset by a 1.6% penalty on the retained DNBR margin. Such a penalty may be applied without requiring reanalysis of the ITDP events for NA-1&2. Enough DNBR design margin exists (approximately 10%) to lower the NA-1&2 TS minimum measured RCS flow rate to the non-ITDP flow limit of 284,000 gpm. This proposed limit is 1.8% below 289,200 gpm, so that the retained margin DNBR penalty would be

$$(1.8\%\ \text{flow}) * (1.6\%\ \text{DNBR}/\%\ \text{flow}) = 2.9\%\ \text{DNBR}.$$

The RCS flow limit of TS Table 3.2-1 may therefore be lowered to 284,000 gpm. This reduction will be offset by a retained DNBR margin penalty of 2.9%, which can absorbed by the available retained DNBR margin. The total remaining DNBR margin will still be approximately 7%. It is noted that measured flow rates below the 284,000 gpm level would invalidate the assumptions of the non-ITDP accident analyses of UFSAR Chapter 15 and are therefore unacceptable at this time.

There are no other areas which are impacted by the limit change. Flow-rated items such as loop transport times or RTD response times either include substantial margin in the safety analyses when compared to a change of less than 2% or are insensitive to the actual value of the flow (i.e., they are sensitive only to relative changes such as a fractional deviation from the measured full power delta T). Therefore it is only necessary to absorb the penalty on retained DNBR margin in order to support the flow limit reduction.

3.0 TS CHANGES

The TS must be updated in two places to implement the RCS minimum flow limit change. These changes are:

TS Table 3.2-1

The minimum allowable RCS total flow rate will be changed from 289,200 gpm to 284,000 gpm. This limit change is offset by a penalty on retained DNBR margin as discussed above.

TS Bases 3/4.2.5

A flow limit of 289,200 gpm was assumed in the currently docketed UFSAR accident analyses which was performed with the Westinghouse ITDP. The new limit no longer reflects this assumption and the TS Bases is revised accordingly.

4.0 EVALUATION

Based on the above, the minimum measured RCS flow rate at NA-1&2 may be reduced from 289,200 gpm to 284,000 gpm without reanalysis of the UFSAR Chapter 15 accidents. A 2.9% penalty will be extracted from available retained DNBR margin (approximately 10%) in order to compensate for this flow reduction. Further reductions would require reanalysis or re-evaluation of all of the UFSAR Chapter 15 events. Potential accident consequences remain within the bounds of the UFSAR accident analysis. Therefore, we find the proposed change to be acceptable.

5.0 ENVIRONMENTAL CONSIDERATION

These amendments involve a change in the installation or use of a facility component located within the restricted area as defined in 10 CFR Part 20. The 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 published a proposed finding that the amendments involve no significant hazards consideration and there has been no public comment on such finding. Accordingly, the 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

We have 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, and (2) such activities will be conducted in compliance with the Commission's regulations, and the issuance of the amendments will not be inimical to the common defense and security or to the health and safety of the public.

Date: July 31, 1989

Principal Contributor:
Leon Engle