VIRGINIA ELECTRIC AND POWER COMPANY
RICHMOND, VIRGINIA 23261

July 14, 2005

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

Serial No. 05-420
NL&OS/ETS R0
Docket Nos. 50-338/339
License Nos. NPF-4/7

VIRGINIA ELECTRIC AND POWER COMPANY
NORTH ANNA POWER STATION UNITS 1 AND 2
PROPOSED TECHNICAL SPECIFICATION CHANGES
CORRECTION TO EQUATION FOR OTΔT FUNCTION ALLOWABLE VALUE

Pursuant to 10 CFR 50.90, Virginia Electric and Power Company (Dominion) requests amendments, in the form of changes to the Technical Specifications to Facility Operating Licenses Numbers NPF-4 and NPF-7 for North Anna Power Station Units 1 and 2, respectively. The proposed changes will correct two errors in the units of measure used to determine the Overtemperature ΔT Function Allowable Value. A discussion of the proposed Technical Specifications changes is provided in Attachment 1. The marked-up and proposed Technical Specifications pages are provided in Attachments 2 and 3, respectively.

We have evaluated the proposed Technical Specifications changes and have determined that they do not involve a significant hazards consideration as defined in 10 CFR 50.92. The basis for our determination that the changes do not involve a significant hazards consideration is included in Attachment 1. We have also determined that operation with the proposed changes will not result in any significant increase in the amount of effluents that may be released offsite and no significant increase in individual or cumulative occupational radiation exposure. Therefore, the proposed amendment is eligible for categorical exclusion as set forth in 10 CFR 51.22(c)(9). Pursuant to 10 CFR 51.22(b), no environmental impact statement or environmental assessment is needed in connection with the approval of the proposed changes. The basis for our determination that the changes do not involve any significant increase in effluents or radiation exposure is also included in Attachment 1.

The proposed changes have been reviewed and approved by the Station Nuclear Safety and Operating Committee, as well as the Management Safety Review Committee. Approval of the proposed changes is requested by April 2006 with a 30-day implementation period.

If you have any questions or require additional information, please contact Mr. Thomas Shaub at (804) 273-2763.

Very truly yours,

Leslie N. Hartz
Vice President – Nuclear Engineering

Attachments

Commitments made in this letter:

1. No regulatory commitments are made in this letter.

cc: U.S. Nuclear Regulatory Commission
Region II
Sam Nunn Atlanta Federal Center
61 Forsyth Street, SW
Suite 23T85
Atlanta, Georgia 30303

Mr. J. E. Reasor, Jr.
Old Dominion Electric Cooperative
Innsbrook Corporate Center
4201 Dominion Blvd.
Suite 300
Glen Allen, Virginia 23060

Commissioner
Bureau of Radiological Health
1500 East Main Street
Suite 240
Richmond, VA 23218

Mr. J. T. Reece
NRC Senior Resident Inspector
North Anna Power Station

Mr. R. E. Martin
NRC Lead Project Manager – North Anna and Surry
U. S. Nuclear Regulatory Commission
One White Flint North
11555 Rockville Pike
Rockville, MD 20852

Mr. S. R. Monarque
NRC Project Manager
U. S. Nuclear Regulatory Commission
One White Flint North
11555 Rockville Pike
Mail Stop 8-H12
Rockville, MD 20852

Mr. J. Honcharik
NRC Project Manager
U. S. Nuclear Regulatory Commission
One White Flint North
11555 Rockville Pike
Rockville, MD 20852

COMMONWEALTH OF VIRGINIA)
)
COUNTY OF HENRICO)

The foregoing document was acknowledged before me, in and for the County and Commonwealth aforesaid, today by Leslie N. Hartz, who is Vice President – Nuclear Engineering, of Virginia Electric and Power Company. She has affirmed before me that she is duly authorized to execute and file the foregoing document in behalf of that Company, and that the statements in the document are true to the best of her knowledge and belief.

Acknowledged before me this 14TH day of July, 2005.

My Commission Expires May 31, 2006.

Vicki L. Hull
Notary Public

(SEAL)

Attachment 1

Serial No. 05-420

Discussion of Changes

North Anna Power Station
Units 1 and 2
Virginia Electric and Power Company
(Dominion)

Discussion of Changes

Introduction

Pursuant to 10 CFR 50.90, Virginia Electric and Power Company (Dominion) requests changes to "Note 1: Overtemperature ΔT" in Technical Specifications Table 3.3.1-1, "Reactor Trip System Instrumentation." While preparing the Improved Technical Specification (ITS) compatible expanded cycle specific Core Operating Limits Reports (COLRs), two errors regarding units of measure were noted in Note 1 of Table 3.3.1-1 for the equation $f_1(\Delta I)$ used to determine the Overtemperature ΔT function Allowable Value. The proposed changes will correct the unit in the equation for $f_1(\Delta I) = 0\%$ of RTP, whereby the unit designation "% of RTP" will be deleted since the $f_1(\Delta I)$ function is dimensionless; and in the equation for $f_1(\Delta I) = [*] \{ [*] \% - (q_t - q_b) \}$, whereby the percentage designation "%" will also be deleted. These proposed changes are consistent with the equations for $f_1(\Delta I)$ specified in the original Technical Specifications, Core Operating Limit Report for Units 1 and Unit 2, and WCAP-12159.

Design/Licensing Bases

The Overtemperature ΔT trip function is provided to ensure that the design limit DNBR is met and also limits the range over which the Overpower ΔT trip function must provide protection. The inputs to the Overtemperature ΔT trip include pressurizer pressure, coolant temperature, axial power distribution, and reactor power as indicated by loop ΔT assuming full reactor coolant flow. The Overtemperature ΔT trip function is calculated for each loop as described in Note 1 of Technical Specifications Table 3.3.1-1. This function uses each loop's ΔT as a measure of reactor power and is compared with a setpoint that is automatically varied with the following parameters:

- Reactor coolant average temperature – the trip setpoint is varied to correct for changes in coolant density and specified heat capacity with changes in coolant temperature;

- Pressurizer pressure – the trip setpoint is varied to correct for changes in system pressure; and

- Axial power distribution – $f_1(\Delta I)$ – the trip setpoint is varied to account for imbalances in the axial power distribution as detected by the NIS upper and lower power range detectors. If axial peaks are greater than the design limit, as indicated by the difference between the upper and lower NIS power range detectors, the trip setpoint is reduced in accordance with Note 1 of Technical Specifications Table 3.3.1-1.

Discussion

While preparing the ITS compatible expanded Core Operating Limits Reports for the North Anna operating cycles N1C16 and N2C15, two errors in the equation $f_1(\Delta I)$ used to determine the Overtemperature ΔT function Allowable Value were identified. These are: (1) the % sign

should be deleted within the first equation for $f_1(\Delta I)$ in Note 1 of Table 3.3.1-1 and (2) the unit designation of "% of RTP" should be deleted in the second equation for $f_1(\Delta I)$. The first error does not occur in the Standard Technical Specifications (NUREG-1431), while the second error relating to the unit designation has been carried over from the Standard Technical Specifications. The following discussion supports the proposed changes and provides clarification:

Dimensions of $f_1(\Delta I)$

The Overtemperature ΔT trip function is calculated for each loop as described in Note 1 of Table 3.3.1-1. In the Overtemperature ΔT setpoint equation, $f_1(\Delta I)$ is a dimensionless quantity since the expression within the braces has zero dimension. $f_1(\Delta I)$ can be expressed as follows, using a general notation:

$$
\begin{aligned}
f_1(\Delta I) &= A\{C_1 - (q_t - q_b)\} && \text{when } (q_t - q_b) < C_1, && \Delta I = q_t - q_b \\
&= 0 && \text{when } C_1 \le (q_t - q_b) \le C_2 \\
&= B\{(q_t - q_b) - C_2\} && \text{when } (q_t - q_b) > C_2
\end{aligned}
$$

In the above expressions, C_1 and C_2 define the three ranges of ΔI. Graphically, A and B represent slopes of f_1 as a function of ΔI. The terms q_t and q_b are % RTP in the upper and lower halves of the core, respectively.

The numerical values of the four constants, A, B, C_1 and C_2, have been moved to the cycle-specific Core Operating Limits Report (COLR). It should be noted that C_1, C_2 and ΔI are in units of normalized power [% RTP], while A and B are in corresponding inverse units of [/ % RTP] or $[\%\ RTP]^{-1}$. Thus $f_1(\Delta I)$ is a dimensionless number.

For North Anna, the numerical values of the four constants are:

$A = 0.0165\ [\%\ RTP]^{-1}$
$B = 0.0198\ [\%\ RTP]^{-1}$
$C_1 = -35\%\ RTP$
$C_2 = +3\ \%\ RTP$

Substituting the numerical values in the expressions for $f_1(\Delta I)$, we get

$$
\begin{aligned}
&(1) \quad f_1(\Delta I) = 0.0165\{-35 - (q_t - q_b)\} && \text{when } (q_t - q_b) < -35\ \%\ RTP \\
&(2) \quad = 0 && \text{when } -35\ \%\ RTP \le (q_t - q_b) \le +3\ \%\ RTP \\
&(3) \quad = 0.0198\{(q_t - q_b) - 3\} && \text{when } (q_t - q_b) > +3\ \%\ RTP
\end{aligned}
$$

Equation (2) applies in the "middle range," where the $f_1(\Delta I)$ penalty is zero. Away from the middle range on both sides, $f_1(\Delta I)$ is non-zero and positive.

The errors corrected in the above expressions are:

1. The middle expression, $f_1 = 0$, has no units, since $f_1(\Delta I)$ is dimensionless.
2. There should be no % sign next to –35 within the braces in the first expression.

It is understood from the context that when numerical values with the proper units and algebraic signs are substituted in the equations, $f_1(\Delta I)$ comes out to be a dimensionless number.

History of the $f_1(\Delta I)$Equation

Change Traveler WOG-ED-29 documents previous attempts at corrections to the $f_1(\Delta I)$ equation concerning (i) overlapping end points in defining ranges of the axial flux difference, and (ii) confusion as to the magnitude and sign of the rate coefficients A and B. The proposed changes refer to the current equation presented in the North Anna Technical Specifications.

The rate coefficients A and B are given in the original Technical Specifications as "a percentage per % RTP," representing a fractional change (in the ΔT setpoint) for each % RTP that ΔI is away from the end points of the middle region. In one version (NUREG-1431 Rev 1, WOG STS dated 4/7/95), the coefficients appear as 100 times their true value and are corrected in the Change Traveler. Probably, at that time $f_1(\Delta I)$ was expressed as a %, not a fraction; thus, the coefficients were input as percentages.

In the 1977 Westinghouse version of the OTΔT equation specified in WCAP-8746, the $f_1(\Delta I)$ function had the dimension of temperature, and the K constants were in special units such as "% of full power ΔT/°F." These units were confusing and may have contributed to the present situation wherein some subtle errors were left behind in the equations.

In later documents such as WCAP-14483-A, the equation was normalized so that the effect of changes from nominal conditions could be expressed in terms of dimensionless quantities – a development conductive to a better understanding of the physical phenomenon. It is the latter formulation that is adopted by the North Anna Improved Technical Specifications.

Precedent/Operating Experience

In the initial response to resolve these errors, the WOG ITS Working Group agreed to revise NUREG-1431 to eliminate the errors from the Improved Standard Technical Specifications. WOG had agreed to make these changes as part of Rev 3 to NUREG-1431 as part of their efforts to correct editorial errors in the NUREG. The proposed changes were made part of a "TSTF Standard Technical Specification Proposed Change" presented at the 2002 December WOG meeting whereby changes were considered editorial and were to be incorporated into Rev 3 of NUREG-1431. However, based upon the 2004 status report obtained from Excel Services, Inc., the NRC did not consider the changes as editorial, and indicated that a plant specific change request package would be required. These proposed changes represent the plant specific changes for the North Anna Technical Specifications.

Proposed Changes

The proposed changes will correct the Note 1 equation within Table 3.3.1-1: for $f_1(\Delta I) = 0\%$ of RTP, the unit designation "% of RTP" will be deleted since the $f_1(\Delta I)$ function is dimensionless; and for $f_1(\Delta I) = [*] \{ [*] \% - (q_t - q_b) \}$, "%" will also be deleted.

Table 3.3.1-1 Note 1: Overtemperature ΔT

Delete "%" in first equation for $f_1(\Delta I)$

From:

$f_1(\Delta I) = [*] \{ [*]\% - (q_t - q_b)\}$ when $(q_t - q_b) < [*]\%$ RTP

To:

$f_1(\Delta I) = [*] \{ [*] - (q_t - q_b)\}$ when $(q_t - q_b) < [*]\%$ RTP

Delete "% of RTP" in second equation for $f_1(\Delta I)$

From:

$f_1(\Delta I) = 0$**% of RTP** when $[*]\%$ RTP $\leq (q_t - q_b) \leq [*]\%$ RTP

To:

$f_1(\Delta I) = 0$ when $[*]\%$ RTP $\leq (q_t - q_b) \leq [*]\%$ RTP

Safety Considerations

The proposed changes do not have any impact on equipment operability. The errors only relate to the unit designations for the $f_1(\Delta I)$ equation that were incorrectly assigned. These errors do not affect the value of the variable, or the way in which the plant or equipment is operated.

Significant Hazards Consideration Determination

Dominion has reviewed the requirements of 10 CFR 50.92 as they relate to the proposed changes and determined that a significant hazards consideration is not involved. The proposed changes correct two errors in the unit designations in the $f_1(\Delta I)$ equation used to determine the Overtemperature ΔT function allowable value as specified in Note 1 of Technical Specifications Table 3.3.1-1. The errors are in the units in the equations. For $f_1(\Delta I) = 0\%$ of RTP the unit designation "% of RTP" will be deleted since the $f_1(\Delta I)$ function is dimensionless; and for $f_1(\Delta I) = [*] \{ [*] \% - (q_t - q_b) \}$, the "%" will also be deleted. The following is provided to support the conclusion that the proposed changes do not involve a significant hazards consideration.

1. Do changes involve a significant increase in the probability or consequences of an accident previously evaluated?

The proposed changes do not significantly increase the probability or consequences of an accident previously evaluated in the UFSAR. The proposed changes correct errors in the unit designations used in the $f_1(\Delta I)$ equation. The actual numerical values of $f_1(\Delta I)$ calculated by the equation remain the same, only the units applied to the value are changed. The Overtemperature ΔT function allowable values are utilized by the Reactor Trip System (RTS) instrumentation to prevent reactor operation in conditions outside the range considered for accident analyses. The proposed changes will not alter the allowable values used by the RTS instrumentation. The Overtemperature ΔT allowable value is not an initiator to any accident previously evaluated. As a result, the probability of any accident previously evaluated is not significantly increased. As the Overtemperature ΔT allowable value is not changed, the probability or consequences of an accident previously evaluated is not significantly increased.

2. Do changes create the possibility of a new or different kind of accident from any accident previously evaluated?

   The proposed changes do not create the possibility of a new or different kind of accident from any accident already evaluated in the UFSAR. The proposed changes correct errors in the unit designations used in the $f_1(\Delta I)$ equation. Changes do not introduce a new mode of plant operation and do not involve any physical modifications to the plant. The changes will not introduce new accident initiators. Therefore, the proposed changes do not create the possibility of a new or different kind of accident from any accident previously analyzed.

3. Do changes involve a significant reduction in the margin of safety?

   The proposed changes do not involve a significant reduction in a margin of safety. The proposed changes correct errors in the unit designations used in the $f_1(\Delta I)$ equation. This will eliminate the possibility of an error resulting from incorrect interpretation of the equation and potential subsequent errors in the application of the equation. The allowable value of the Overtemperature ΔT function is unaffected. Therefore, the proposed changes will not significantly reduce the margin of safety as defined in the Technical Specifications.

   Based upon the above, Dominion concludes that the proposed changes involve no significant hazards consideration under the standards set forth in 10 CFR 50.92(c).

Environmental Review

10 CFR 51.22(c)(9) provides criteria for the identification of licensing and regulatory actions eligible for categorical exclusion for performing an environmental assessment. A proposed amendment to an operating license for a facility does not require an environmental assessment if operation of the facility in accordance with the proposed Amendment would not (1) involve a significant hazards consideration, (2) result in a significant change in the types or significant increase in the amounts of any effluents that may be released offsite, and (3) result in a significant increase in individual or cumulative occupation radiation exposure.

By reviewing the proposed changes it has been determined that they meet the eligibility criteria for categorical exclusion set forth in 10 CFR 51.22(c)(9). Therefore, pursuant to 10 CFR 51.22(b), no environmental impact statement or environmental assessment is required to be prepared in connection with the issuance of the proposed license amendment. The basis for this determination is as follows:

1. The proposed amendment involves no significant hazards consideration.

   As described in the significant hazards consideration evaluation, the proposed changes do not involve a significant hazards consideration.

2. There is no significant change in the type or significant increase in the amounts of any effluents that may be released offsite.

   The proposed changes do not involve the installation of any new equipment, or the modification of any equipment that may affect the types or amounts of effluents that may be released offsite. Therefore, there is no significant change in the types or significant increase in the amounts of any effluents that may be released offsite.

3. There is no significant increase in individual or cumulative occupation radiation exposure.

   The proposed changes do not involve plant physical changes, or introduce any new mode of operation. Therefore, there is no significant increase in individual or cumulative occupational radiation exposure.

References

The following references support the proposed Technical Specification changes and the evaluation of these changes.

1. NUREG-1431, Rev 1, "Standard Technical Specifications Westinghouse Plants," April 1995; Improved Technical Specification 3.3.1, "Reactor Trip System (RTS) Instrumentation," with supporting Bases

2. Original North Anna Technical Specifications 3.3.1, "Reactor Trip System (RTS) Instrumentation"

Attachment 2

Serial No. 05-420

Mark-up of Unit 1 and Unit 2 Technical Specifications Changes

North Anna Power Station
Units 1 and 2
Virginia Electric and Power Company
(Dominion)

Table 3.3.1-1 (page 4 of 5)
Reactor Trip System Instrumentation

Note 1: Overtemperature ΔT

The Overtemperature ΔT Function Allowable Value shall not exceed the following nominal trip setpoint by more than 2.0% of ΔT span.

$$\Delta T \leq \Delta T_0 \left\{ K_1 - K_2 \frac{(1+\tau_1 s)}{(1+\tau_2 s)} [T - T'] + K_3 (P - P') - f_1(\Delta I) \right\}$$

Where: ΔT is measured RCS ΔT, °F.
ΔT_0 is the indicated ΔT at RTP, °F.
s is the Laplace transform operator, sec^{-1}.
T is the measured RCS average temperature, °F.
T' is the nominal T_{avg} at RTP, $\leq$ [*]°F.

P is the measured pressurizer pressure, psig
P' is the nominal RCS operating pressure, $\geq$ [*] psig

$K_1 \leq$ [*] $K_2 \geq$ [*]/°F $K_3 \geq$ [*]/psig

$\tau_1 \geq$ [*] sec $\tau_2 \leq$ [*] sec

$f_1(\Delta I) =$ [*]{[*]% - $(q_t - q_b)$} when $q_t - q_b <$ [*]% RTP
0% of RTP when [*]% RTP $\leq q_t - q_b \leq$ [*]% RTP
[*]{$(q_t - q_b)$ - [*]} when $q_t - q_b >$ [*]% RTP

Where q_t and q_b are percent RTP in the upper and lower halves of the core, respectively, and $q_t + q_b$ is the total THERMAL POWER in percent RTP.

The values denoted with [*] are specified in the COLR.

Attachment 3

Serial No. 05-420

Proposed Unit 1 and Unit 2 Technical Specifications Changes

North Anna Power Station
Units 1 and 2
Virginia Electric and Power Company
(Dominion)

Table 3.3.1-1 (page 4 of 5)
Reactor Trip System Instrumentation

Note 1: Overtemperature ΔT

The Overtemperature ΔT Function Allowable Value shall not exceed the following nominal trip setpoint by more than 2.0% of ΔT span.

$$\Delta T \leq \Delta T_0 \left\{ K_1 - K_2 \frac{(1+\tau_1 s)}{(1+\tau_2 s)}[T - T'] + K_3(P - P') - f_1(\Delta I) \right\}$$

Where: ΔT is measured RCS ΔT, °F.
ΔT_0 is the indicated ΔT at RTP, °F.
s is the Laplace transform operator, sec^{-1}.
T is the measured RCS average temperature, °F.
T' is the nominal T_{avg} at RTP, $\leq$ [*]°F.

P is the measured pressurizer pressure, psig
P' is the nominal RCS operating pressure, $\geq$ [*] psig

$K_1 \leq$ [*] $K_2 \geq$ [*]/°F $K_3 \geq$ [*]/psig

$\tau_1 \geq$ [*] sec $\tau_2 \leq$ [*] sec

$$f_1(\Delta I) = \begin{cases} [*]\{[*] - (q_t - q_b)\} & \text{when } q_t - q_b < [*]\% \text{ RTP} \\ 0 & \text{when } [*]\% \text{ RTP} \leq q_t - q_b \leq [*]\% \text{ RTP} \\ [*]\{(q_t - q_b) - [*]\} & \text{when } q_t - q_b > [*]\% \text{ RTP} \end{cases}$$

Where q_t and q_b are percent RTP in the upper and lower halves of the core, respectively, and $q_t + q_b$ is the total THERMAL POWER in percent RTP.

The values denoted with [*] are specified in the COLR.