VIRGINIA ELECTRIC AND POWER COMPANY
RICHMOND, VIRGINIA 23261

July 1, 2004

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

Serial No. 04-380
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 SPECIFICATIONS CHANGE REQUEST
REACTOR COOLANT SYSTEM PRESSURE/TEMPERATURE LIMITS
LTOPS SETPOINTS AND LTOPS ENABLE TEMPERATURES

Pursuant to 10 CFR 50.90, Virginia Electric and Power Company (Dominion) requests an amendment to Facility Operating License Numbers NPF-4 and NPF-7 in the form of changes to the Technical Specifications for North Anna Power Station Units 1 and 2. The proposed changes are being made to provide Reactor Coolant System (RCS) pressure/temperature (P/T) operating limits, Low Temperature Overpressure Protection System (LTOPS) setpoint allowable values, and LTOPS enable temperature (T_{enable}) values at cumulative core burnups up to 50.3 Effective Full Power Years (EFPY) and 52.3 EFPY (corresponding to the period of the renewed license) for Units 1 and 2, respectively. The existing Technical Specification P/T limits, LTOPS setpoint allowable values, and LTOPS T_{enable} values are valid to cumulative core burnups of 32.3 EFPY and 34.3 EFPY for Units 1 and 2, respectively. Following the issuance of the license amendments, the Reactor Vessel Integrity Database (RVID) will be updated to reflect license renewal values.

A discussion of the proposed change is included in Attachment 1. The Technical Specification marked-up pages that reflect the proposed changes and the Technical Specification pages that incorporate the proposed changes are provided in Attachments 2 and 3, respectively. In addition, Technical Specification Bases changes reflecting the proposed changes are included for information only. The Technical Specification Bases will be revised in accordance with the Technical Specification Bases Control Program, Technical Specification 5.5.13, following NRC approval of the license amendment.

The proposed changes have been reviewed and approved by the Station Nuclear Safety and Operating Committee and the Management Safety Review Committee.

In accordance with the requirements of 10 CFR 50.92, the enclosed application is judged to involve no significant hazards and our basis for that determination is included in Attachment 4. In addition, the proposed change has been determined to qualify for categorical exclusion from an environmental assessment as set forth in 10 CFR 51.22(c)(9). The basis for these determinations is included in Attachment 1.

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After NRC approval of the amendment request, Dominion requests a six month implementation period to accommodate the numerous licensing basis changes necessary to implement the revised pressure/temperature limits. The current pressure/temperature limits are valid to the years 2018 (32.3 EFPY) and 2020 (34.3 EFPY) for North Anna Unit 1 and 2, respectively. The extended implementation time will have no impact on safe operation of North Anna Units 1 and 2.

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

Very truly yours,

W. R. Matthews
Senior Vice President – Nuclear Operations

Attachments

Commitments made in this letter:

Following NRC issuance of the license amendments, the Reactor Vessel Integrity Database (RVID) will be updated to reflect license renewal values.

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SN: 04-380
Docket Nos.: 50-338/339
Subject: Proposed TS Change Request
RCS PT Limits and LTOP Enable Setpoints

COMMONWEALTH OF VIRGINIA)
)
COUNTY OF HENRICO)

The foregoing document was acknowledged before me, in and for the County and Commonwealth aforesaid, today by William R. Matthews, who is Senior Vice President - Nuclear Operations of Virginia Electric and Power Company. He has affirmed before me that he 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 his knowledge and belief.

Acknowledged before me this 1st day of July, 2004.

My Commission Expires: March 31, 2008.

Maggie McClure
Notary Public

(SEAL)

Attachment 1

Virginia Electric and Power Company
North Anna Power Station Units 1 and 2
Proposed Technical Specification Changes for
Reactor Coolant System Pressure/Temperature Limits
LTOPS Setpoints and LTOPS Enable Temperatures

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

Discussion of Changes

1.0 Introduction

Virginia Electric and Power Company (Dominion) proposes changes to the North Anna Units 1 and 2 Technical Specifications pursuant to 10CFR50.90. The proposed changes are requested to provide Reactor Coolant System (RCS) pressure/temperature (P/T) operating limits, Low Temperature Overpressure Protection System (LTOPS) setpoint allowable values, and LTOPS enable temperature (T_{enable}) values that are valid for cumulative core burnups up to 50.3 Effective Full Power Years (EFPY) and 52.3 EFPY (corresponding to the period of the renewed license) for North Anna Units 1 and 2, respectively. The currently licensed set of unadjusted RCS P/T limit curves (i.e., the set submitted in References 1 and 4, and approved in Reference 6) are not being changed. The higher cumulative core burnup applicability limits in this submittal are achieved through inherent margin in the RT_{NDT} value assumed in the development of the unadjusted RCS P/T limit curves (References 1 and 4). Technical Specification bases changes reflecting the proposed changes discussed above are included for information only. The Technical Specification bases will be revised in accordance with the Technical Specification Bases Control Program, TS 5.5.13 following approval of the Technical Specification changes. The proposed changes qualify for categorical exclusion for an environmental assessment as set forth in 10CFR51.22(c)(9). Therefore, no environmental impact statement or environmental assessment is needed in connection with approval of the proposed Technical Specification changes.

2.0 Background

10 CFR 50 Appendix G specifies the fracture toughness requirements for ferritic materials of pressure-retaining components of the reactor coolant pressure boundary of light water nuclear power reactors to provide adequate margins of safety during any condition of normal operation, including anticipated operational occurrences and system hydrostatic tests, to which the pressure boundary may be subjected over its service lifetime. The ASME Boiler and Pressure Vessel Code (BPVC) forms the basis for the requirements of Appendix G to 10 CFR 50. Appendix G references the requirements of ASME BPVC Section III, Division 1, "Rules for Construction of Nuclear Power Plant Components," and ASME BPVC Section XI which presents the "Rules for Inservice Inspection of Nuclear Power Plant Components."

10 CFR 50 Appendix H defines the requirements for reactor vessel materials surveillance programs. Dominion compliance with the requirements of Appendix H is documented for North Anna Units 1 and 2 in References 11 and 12, respectively. Appendix H states that the purpose of the materials surveillance program is to monitor changes in the fracture toughness properties of ferritic materials in the reactor vessel beltline region of light water nuclear power reactors resulting from exposure of these materials to neutron irradiation and the thermal environment. Fracture toughness data are obtained from material specimens exposed in surveillance capsules, which are withdrawn periodically from the reactor vessel. These data are used as described in Appendix G to 10 CFR 50. The

current North Anna Units 1 and 2 surveillance capsule withdrawal schedules are documented in Reference 13. The withdrawal schedules contained in the North Anna UFSAR were approved in Reference 14.

A method for performing analyses to guard against brittle fracture in reactor pressure vessels is presented in "Protection Against Non-ductile Failure," Appendix G to Section III of the ASME Boiler and Pressure Vessel Code. The method utilizes fracture mechanics concepts and is based on the reference nil-ductility temperature (RT_{NDT}). RT_{NDT} is defined as the greater of either the drop weight nil-ductility transition temperature (NDTT per ASTM E-208) or the temperature 60°F less than the 50 ft-lb (and 35 mil lateral expansion) temperature as determined from Charpy specimens oriented normal (transverse) to the major working direction of the material. The RT_{NDT} of a given material is used to index that material to a reference stress intensity factor curve (K_{1C}), which appears in Appendix G of the ASME Code. The K_{1C} curve is a lower bound of static fracture toughness results obtained from several heats of pressure vessel steel. When a given material is indexed to the K_{1C} curve, allowable stress intensity factors can be obtained for this material as a function of temperature. Allowable operating limits can then be determined utilizing these allowable stress intensity factors.

RT_{NDT} and the operating limits of nuclear power plants can be adjusted to account for the effects of radiation on the reactor vessel material properties. The radiation embrittlement or changes in mechanical properties of a given reactor pressure vessel steel can be monitored by a reactor vessel materials surveillance program. A surveillance capsule is periodically removed from the operating nuclear reactor and the encapsulated specimens are tested. The increase in the average Charpy V-notch 30 ft-lb temperature (ΔRT_{NDT}) due to irradiation is added to the original RT_{NDT} to adjust the RT_{NDT} for radiation embrittlement. This adjusted RT_{NDT} (RT_{NDT} initial plus ΔRT_{NDT}) is used to index the material to the K_{1C} curve and to set operating limits for the nuclear power plant which reflect the effects of irradiation on the reactor vessel materials.

The extent of the shift in RT_{NDT} is enhanced by certain chemical elements (such as copper and nickel) present in reactor vessel steels. The NRC has published a method for predicting radiation embrittlement in Regulatory Guide 1.99 Revision 2 (Radiation Embrittlement of Reactor Vessel Materials). This methodology permits the use of credible surveillance data, such as that obtained from the capsule analysis, if it is available in place of the calculational methodology based on a curve fit of an irradiated materials properties database. The North Anna Units 1 and 2 design and licensing basis reflects the regulatory requirements described above by the imposition of restrictions on allowable pressure and temperature (RCS P/T limits) and on heatup and cooldown rate. The Low Temperature Overpressure Protection System (LTOPS) ensures that material integrity limits are not exceeded during the design basis accidents. The readjustments of the current RCS P/T limit curves, LTOPS setpoints, and LTOPS T_{enable} values proposed in this license amendment are performed in accordance with ASME Section XI and the regulatory requirements described above as well.

3.0 Discussion

3.1 Licensing and Design Basis

The current North Anna Units 1 and 2 Technical Specification RCS P/T limits, LTOPS Setpoint allowable values and LTOPS T_{enable} values were provided to the NRC for approval in Reference 1. In addition, RAI responses were provided in References 2, 3, 4, and 5. The NRC approved the Technical Specification changes in Reference 6. The cumulative core burnup applicability limit for the current limits are 32.3 EFPY for North Anna Unit 1 and 34.3 EFPY for North Anna Unit 2. This corresponds to a ¼-thickness (¼-T) RT_{NDT} of 209.4°F, which conservatively represents the limiting materials for both North Anna Units 1 and 2. However, the North Anna Unit 2 RCS P/T limit curves were originally prepared using a limiting ¼-T RT_{NDT} of 218.5°F, which corresponds to operation for 50.3 EFPY for North Anna Unit 1 and 52.3 EFPY for North Anna Unit 2 (References 1 and 4). Dominion chose at the time to implement the RCS P/T limits, LTOPS Setpoints, and LTOPS T_{enable} values based upon a ¼-T RT_{NDT} value of 209.4°F because it minimized the amount of required changes to the plant and the submittals supporting license renewal for North Anna Units 1 and 2 (References 7 and 8) were not yet approved by the NRC.

Following the approval of the current Technical Specification RCS P/T limits, LTOPS Setpoint allowable values, and LTOPS T_{enable} values, the submittals supporting license renewal for North Anna Units 1 and 2 (References 7 and 8) were approved by the NRC (Reference 9). These submittals documented that the limiting ¼-T RT_{NDT} value of 218.5°F was predicted to bound the end-of-license-renewal limiting material for both North Anna Units 1 and 2 (Unit 2 Lower Shell Forging 990533/297355). Reviews of the North Anna Units 1 and 2 reactor vessel integrity data continue to confirm the conclusions from the license renewal effort.

In order to extend the cumulative core burnup applicability limit for the North Anna Units 1 and 2 Technical Specification RCS P/T limits, LTOPS setpoint allowable values, and LTOPS T_{enable} values, the North Anna Units 1 and 2 Technical Specifications governing these values are being revised to be consistent with a ¼-T RT_{NDT} value of 218.5°F. These changes include:

1. The RCS P/T limits in Appendix A have been modified to include pressure and temperature measurement uncertainty, as well as the pressure difference between the point of measurement (RCS hot leg) and point of interest (reactor vessel beltline).
2. The cumulative core burnup applicability limits will be extended to 50.3 EFPY for North Anna Unit 1 and 52.3 EFPY for North Anna Unit 2.
3. Technical Specification LTOPS setpoints and LTOPS T_{enable} values have been prepared to reflect the extended cumulative core burnup applicability limits using methodologies identical to those used for the current license (References 1 through 6).
4. The changes to the Technical Specification P/T limits, LTOPS setpoint allowable values, and T_{enable} values will be common for North Anna Units 1 and 2 to provide more consistent operational requirements.

In addition to the Technical Specification changes, Dominion is increasing the administrative cooldown rate limit from 50°F/hr to 75°F/hr. The justification for this increase is provided in Section 3.4.4.

3.2 Design Inputs

3.2.1 Unadjusted Pressure/Temperature Limit Curves

The existing North Anna Units 1 and 2 design basis P/T limit curves (References 1 and 4) for normal operation are not being changed and will remain the starting point (design limit) for developing the revised RCS P/T limits and LTOPS setpoint allowable values. These curves do not include margins for pressure and temperature measurement uncertainty, or for the pressure difference between the point of measurement (RCS hot leg) and the point of interest (reactor vessel beltline). Curves that have been modified to include pressure and temperature measurement uncertainty, and the pressure difference between the point of measurement (RCS hot leg) and the point of interest (reactor vessel beltline) are presented in Appendix A.

3.2.2 Reactor Vessel Fluence (E > 1 MeV), RT_{NDT}, and Cumulative Core Burnup

The NRC was provided (in Reference 8) with information regarding reactor vessel fluence (E > 1 MeV) versus burnup and RT_{NDT} versus reactor vessel fluence in support of 60-year operation. The information in Reference 8 demonstrated that the limiting ¼-T RT_{NDT} value of 218.5°F represents the end-of-license-renewal limiting material for both North Anna Units 1 and 2 (Unit 2 Lower Shell Forging 990533/297355) at a fluence of (5.91 x 10^{19} n/cm^2) that corresponds to a cumulative core burnup of 50.3 EFPY for North Anna Unit 1 and 52.3 EFPY for North Anna Unit 2. Currently available material surveillance data has not changed this conclusion.

3.2.3 RCS Pressure Measurement Uncertainty for LTOPS

The Channel Statistical Accuracy (CSA) for the RCS pressure measurement uncertainty to be used for establishment of LTOPS setpoint allowable values has been calculated to be 1.524% of a 0 psig to 3000 psig instrument span, for a total CSA of 46 psi. This uncertainty reflects the component of the Wide Range RCS pressure uncertainty for the actuation of the PORV bistables (i.e., indication uncertainty is not applicable and has been removed). Wide Range RCS pressure is measured in the RCS hot leg. The Wide Range RCS pressure measurement channel feeds the logic for opening and closing the pressurizer PORV at conditions during which the LTOPS system is enabled.

3.2.4 Wide Range RCS Pressure Measurement Uncertainty for P/T Limits

The Channel Statistical Accuracy (CSA) for the Wide Range RCS pressure measurement uncertainty has been calculated to be 2.336% of a 0 psig to 3000 psig instrument span (indication uncertainty included), for a total CSA of 70 psi. Wide Range RCS pressure is measured in the RCS hot leg. The Wide Range RCS pressure measurement channel is used for confirming RCS pressure during normal operation heatup and cooldown.

3.2.5 Wide Range RCS Temperature Measurement Uncertainty

The Channel Statistical Accuracy (CSA) for the Wide Range RCS temperature measurement uncertainty has been calculated to be 1.93% of a 0°F to 700°F instrument span, for a total CSA of 13.5°F. Wide Range RCS temperature is measured in the RCS cold leg. The Wide Range RCS temperature measurement channel is used for confirming RCS temperature during normal operation heatup and cooldown, and as input to the comparator for the LTOPS enabling temperature.

3.2.6 Pressure Difference between Hot Leg and Reactor Vessel Beltline

The pressure difference between the point of measurement (Narrow Range or Wide Range RCS pressure measured in the RCS hot leg) and the point of interest (reactor vessel beltline) has been determined to be 57 psi. This value was developed in consideration of one reactor coolant pump (RCP), two RCP, and three RCP operation. This difference is applied as a bias to measured RCS pressure, to simulate pressure measurement at the reactor vessel beltline.

3.2.7 LTOPS PORV Lift Setpoint "Overshoot" Values from Mass Addition Accident Analysis

The mass addition and heat addition accident analyses that support the proposed North Anna Units 1 and 2 Technical Specification LTOPS setpoint allowable values are unchanged from those used for the current license (References 1 through 6). The PORV lift setpoint "overshoot" values determined in the accident analysis are presented in Appendix B. (See column labeled "PORV Setpoint Overshoot".) The maximum PORV lift setpoint overshoot is a function of the PORV lift setpoint and RCS temperature. Note that a pressure measurement location bias of approximately 9 psi, originally applied to the values contained in the "PORV Setpoint Overshoot" column to account for the static head difference between the RCS hot leg and the reactor vessel beltline, has been removed because it is redundant. The treatment of pressure measurement bias is now contained in the 57 psi value described in Item 3.1.6.

3.3 Method of Analysis

To develop the proposed North Anna Units 1 and 2 Technical Specification P/T limit curves, LTOPS setpoint allowable values, and LTOPS T_{enable} values, the unadjusted P/T limit curves (References 1 and 4) were modified to account for pressure and temperature measurement uncertainty, and for the pressure difference between the point of measurement (RCS hot leg) and the point of interest (the reactor vessel beltline). The resulting proposed revised North Anna Units 1 and 2 Technical Specification P/T limit curves are presented in Appendix A.

The temperature-dependent pressurizer PORV lift setpoint pressure "overshoot" values determined in the design basis mass addition and heat addition accident analysis were subtracted from the modified LTOPS design basis (i.e., isothermal) P/T limit curve. The

current Technical Specification PORV lift setpoint pressure is also subtracted from the modified LTOPS design basis (i.e., isothermal) P/T limit curve. The margin between the proposed Technical Specification PORV lift setpoint pressure and the temperature-dependent LTOPS setpoint pressure limit is verified to be positive at each temperature. The results of the LTOPS margin assessment performed using this methodology are presented in Appendix B.

The LTOPS T_{enable} value was determined using ASME Section XI (specifically, the features of ASME Code Case N-641, Reference 10 now included in ASME Section XI) and is calculated as the ¼-T RT_{NDT} + margin required by ASME Code Case N-641 plant specific application + margin for the temperature lag between the quarter-thickness vessel location and the coolant temperature during a 60°F/hr heatup (13°F, as required by the NRC in Reference 6) + temperature measurement instrument uncertainty.

3.4 Results

3.4.1 Revised P/T Limit Curves

As described in Section 3.2.1, the unadjusted P/T limit curves, including the LTOPS design basis P/T limit curve (i.e., the "steady state", "isothermal", or "0°F/hr cooldown" curve), were modified to account for pressure and temperature measurement uncertainty, and for the pressure difference between the point of measurement (RCS hot leg) and the point of interest (the reactor vessel beltline). The resulting proposed revised North Anna Units 1 and 2 Technical Specification P/T limit curves are presented in Appendix A.

3.4.2 Revised LTOPS Setpoints

The North Anna Technical Specifications LTOPS setpoint allowable values consist of the following variables:

- LTOPS PORV Setpoint #1
- LTOPS PORV Setpoint #2
- Break Point Temperature (T_{BP})
- LTOPS T_{enable} (Derived in Section 3.4.3)

T_{BP} is the temperature at which LTOPS switches from LTOPS PORV lift Setpoint #1 to LTOPS PORV lift Setpoint #2. LTOPS T_{enable} is the temperature below which LTOPS must be enabled. For the temperatures above T_{enable}, overpressure protection is provided by the pressurizer safety valves (PSVs). In addition to the setpoints described above, the LTOPS PORV bistables are set in a staggered fashion for each of the two pressurizer PORVs. The staggered bistable control setpoints for each PORV avoids simultaneous PORV lift. Therefore, the LTOPS setpoints delineate one set of T.S. setpoint allowable values and two sets of staggered bistable control setpoints.

The results of calculations performed for the LTOPS margin assessment outlined in Section 3.3 are presented in Appendix B. As Appendix B demonstrates, the revised North Anna Units 1 and 2 Technical Specification LTOPS setpoint allowable values provide bounding protection for 100% of the proposed revised design basis isothermal curve

under postulated mass addition and heat addition accident conditions. The analysis includes consideration of pressure and temperature uncertainties, as well as the pressure difference between the point of measurement (RCS hot leg) and the point of interest (reactor vessel beltline). The design basis P/T limit curves are based on a ¼-T RT_{NDT} of 218.5°F, which conservatively bounds the most limiting ¼-T RT_{NDT} value at cumulative core burnups of 50.3 EFPY and 52.3 EFPY for North Anna Units 1 and 2. Therefore, the revised North Anna Units 1 and 2 LTOPS setpoint allowable values are concluded to be conservative for cumulative core burnups up to 50.3 EFPY and 52.3 EFPY for North Anna Units 1 and 2 respectively.

The proposed revised Technical Specification LTOPS allowable values (valid for both North Anna Units 1 and 2) are shown below. The development of the bistable control setpoints will be performed in a manner to provide for additional margin to accommodate postulated setpoint drift between periodic calibrations.

Technical Specification LTOPS Setpoints

North Anna Unit 1	≤540 psig @ ≤280°F
North Anna Unit 2	≤375 psig @ ≤180°F

3.4.3 Revised LTOPS T_{enable}

As described in Section 3.3, the temperature below which LTOPS must be enabled is calculated as ¼-T RT_{NDT} + 31.9°F (determined in Reference 1) + margin for the temperature lag between the quarter-thickness vessel location and the coolant temperature during a 60°F/hr heatup (13°F, as required by the NRC in Reference 6) + temperature measurement instrument uncertainty (13.5°F). To summarize, here is the equation in algebraic form:

LTOPS T_{enable}(°F) = RT_{NDT}(1/4-T) + 31.9°F + 13°F[ΔT(1/4-T)] + 13.5°F(Temperature Measurement Uncertainty)

Using a limiting ¼-T RT_{NDT} of 218.5°F which corresponds to operation for 50.3 EFPY for North Anna Unit 1 and 52.3 EFPY for North Anna Unit 2, a minimum value for LTOPS T_{enable} of 276.9°F is required. To provide additional conservatism, the LTOPS T_{enable} value of 280°F is proposed for both North Anna Units 1 and 2.

3.4.4 Justification for Administrative RCS Cooldown Rate Limit of 75°F/hr for North Anna Units 1 and 2

While the maximum allowable RCS cooldown rate assumed in the development of the P/T limit curves is 100°F/hr, a 50°F/hr administrative RCS cooldown rate is currently in effect as described in Reference 1. The administrative limit was established to ensure the adequacy of the P/T limits for non-linear cooldown ramp rates (i.e., short duration temperature changes of limited magnitude that may occur during normal operation, but which may result in calculated cooldown rates in excess of the limits prescribed in the

Technical Specifications). This section addresses use of a 75°F/hr administrative cooldown rate limit.

The concern presented by an increase in the allowable administrative RCS cooldown rate is related to the operator's ability to control cooldown rate. It can be reasonably estimated that cooldown rate can be controlled to within 25°F/hr. While it is possible to have short duration changes of limited magnitude that can exceed this rate, such changes only produce small changes in overall metal temperature, and have no significant effect on the applied stress intensity at the assumed crack tip. Studies of the effects of "step changes" in cooldown rate suggest that more restrictive limits may be appropriate if cooldown rates are not held constant at rates less than analyzed. However, on the basis of engineering judgement, small step changes (e.g., < 25°F) do not present a significant concern since the reactor vessel material would experience insignificant temperature change at the assumed ¼-T flaw location (i.e., limited contribution to reactor vessel stress). Increasing the administrative cooldown rate from 50°F/hr to 75°F/hr continues to provide adequate margin to the analyzed rate to accommodate small unanticipated changes in cooldown rate due to short duration temperature changes of limited magnitude.

3.4.5 RT_{PTS} Screening

Reference 8 stated that the limiting material with respect to PTS screening was the North Anna Unit 2 Lower Shell Forging 990533/297355. The information in Reference 8 demonstrated that the limiting RT_{PTS} value of 227.5°F represents the end-of-license-renewal limiting material for both North Anna Units 1 and 2 (Unit 2 Lower Shell Forging 990533/297355) corresponding to a cumulative core burnup of 50.3 EFPY for North Anna Unit 1 and 52.3 EFPY for North Anna Unit 2. Currently available material surveillance data has not changed this conclusion.

4.0 Changes to North Anna Units 1 and 2 Technical Specifications

The following specific changes to the North Anna Units 1 and 2 Technical Specifications are proposed:

Technical Specification 3.4.3: Figures 3.4.3-1, 3.4.3-2, 3.4.3-3 and 3.4.3-4 and the cumulative core burnup limits are being replaced by revised Figures 3.4.3-1 and 3.4.3-2, Reactor Coolant System Heatup and Cooldown Limitations. The proposed curves will be valid for both North Anna Units 1 and 2.

Technical Specification 3.4.6, 3.4.7, 3.4.10, and 3.4.12: These specifications have been revised to reflect the proposed values for the LTOPS setpoint allowable values, LTOPS T_{enable} values and the establishment of required conditions for RCP start.

The revised bases for the sections described above are also included for information only.

5.0 Environmental Assessment

These Technical Specification (TS) changes modify the Reactor Coolant System (RCS) pressure/temperature (P/T) limit curves, LTOPS setpoint allowable values, LTOPS enable temperature (T_{enable}) values and extend the cumulative core burnup applicability limits for the Low Temperature Overpressure Protection System (LTOPS) meet the eligibility criteria for categorical exclusion from an environmental assessment set forth in 10 CFR 51.22(c)(9), as discussed below:

(i) The license condition involves no Significant Hazards Consideration.

As discussed in the attached evaluation of the Significant Hazards Consideration, the proposed changes to the RCS P/T limit curves, LTOPS setpoint allowable values, and LTOPS T_{enable} for North Anna will not involve a significant increase in the probability or consequences of an accident previously evaluated. The possibility of a new or different kind of accident from any accident previously evaluated is also not created, and the proposed changes do not involve a significant reduction in a margin of safety. Therefore, the proposed changes to the RCS P/T limit curves, LTOPS setpoint allowable values, and LTOPS T_{enable} values meet the requirements of 10 CFR 50.92(c) and do not involve a significant hazards consideration.

(ii) There is no significant change in the types or significant increase in the amounts of any effluents that may be released offsite.

The allowable operating pressures and temperatures under the proposed RCS P/T limit curves are not significantly different from those allowed under the existing Technical Specification P/T limits. No changes to plant systems, structures or components are proposed, and no new operating modes are established. Therefore, the proposed changes to the RCS P/T limit curves, LTOPS setpoint allowable values, and LTOPS T_{enable} will not significantly change the types, or significantly increase the amounts, of effluents that may be released offsite.

(iii) There is no significant increase in individual or cumulative occupational radiation exposure.

The proposed changes modify the North Anna Units 1 and 2 RCS P/T limit curves, LTOPS setpoint allowable values, LTOPS T_{enable} values, and extend the cumulative core burnup applicability limits for the LTOPS. The allowable operating pressures and temperatures under the proposed RCS P/T limit curves are not significantly different from those allowed under the existing Technical Specification P/T limits. No changes to plant systems, structures or components are proposed, and no new operating modes are established. In addition, the supporting analyses for the proposed changes continue to provide acceptable margin to vessel fracture under both normal operation and LTOPS design basis (mass addition and heat addition) accident conditions. Therefore, the proposed changes will not increase radiation levels compared to the existing Technical Specification P/T limits, LTOPS setpoint allowable values, and LTOPS T_{enable}, so individual and cumulative occupational exposures are unchanged.

Based on the above, the proposed changes do not have a significant effect on the environment, and meet the criteria of 10 CFR 51.22(c)(9). It is concluded that the proposed Technical Specification changes qualify for a categorical exclusion from a specific environmental review by the Commission, as described in 10 CFR 51.22.

7.0 Conclusions

Changes to the North Anna Units 1 and 2 Technical Specifications are proposed to extend the cumulative core burnup applicability limit for the North Anna Units 1 and 2 Technical Specification RCS P/T limits, LTOPS setpoint allowable values, and LTOPS T_{enable} values. These changes include:

- The RCS P/T limits in Appendix A have been modified to include pressure and temperature measurement uncertainty, as well as the pressure difference between the point of measurement (RCS hot leg) and point of interest (reactor vessel beltline).
- The cumulative core burnup applicability limits will be extended to 50.3 EFPY for North Anna Unit 1 and 52.3 EFPY for North Anna Unit 2.
- Technical Specification LTOPS setpoint allowable values and LTOPS T_{enable} values have been prepared to reflect the extended cumulative core burnup applicability limits using methodologies identical to those used for the current license (References 1 through 6).
- The changes to the Technical Specification P/T limits, LTOPS setpoint allowable values, and T_{enable} values will be common for North Anna Units 1 and 2 to provide more consistent operational requirements.

The proposed changes to the North Anna Units 1 and 2 Technical Specifications will continue to provide acceptable margin with respect to the prevention of reactor vessel brittle fracture. Therefore, the proposed changes will not adversely impact safe operation of North Anna.

8.0 References

1. Letter from D. A. Christian to USNRC, "Virginia Electric and Power Company, North Anna Power Station Units 1 and 2, Proposed Technical Specifications Changes, Requests for Exemptions Per 10CFR50.60(b), Reactor Coolant System Pressure Temperature Limits, LTOPS Setpoints, and LTOPS Enable Temperatures," Serial No. 00-306, dated June 22, 2000.
2. Letter from W. R. Matthews to USNRC, "Virginia Electric and Power Company, North Anna Power Station Units 1 and 2, Response to Request for Additional Information, Proposed Technical Specifications Changes, Reactor Coolant System Pressure/Temperature Limits, LTOPS Setpoints, and LTOPS Enable Temperatures," Serial No. 01-020, dated January 4, 2001.
3. Letter from W. R. Matthews to USNRC, "Virginia Electric and Power Company, North Anna Power Station Units 1 and 2, Response to Request for Additional Information,

Proposed Technical Specifications Changes, Reactor Coolant System Pressure/Temperature Limits, LTOPS Setpoints, and LTOPS Enable Temperatures," Serial No. 01-020A, dated February 14, 2001

4. Letter from W. R. Matthews to USNRC, "Virginia Electric and Power Company, North Anna Power Station Units 1 and 2, Response to Request for Additional Information and Clarification of Exemption Request Regarding Proposed Technical Specifications Changes for Reactor Coolant System Pressure/Temperature Limits, LTOPS Setpoints, and LTOPS Enable Temperatures," Serial No. 01-020B, dated March 13, 2001.
5. Letter from W. R. Matthews to USNRC, "Virginia Electric and Power Company, North Anna Power Station Units 1 and 2, Response to Request for Additional Information, Proposed Technical Specifications Changes, Reactor Coolant System Pressure/Temperature Limits, LTOPS Setpoints, and LTOPS Enable Temperatures," Serial No. 01-168, dated March 22, 2001.
6. Letter from USNRC to D. A. Christian, "North Anna Power Station Units 1 and 2 – Issuance of Amendments and Exemption for the Requirements of 10CFR50, Section 50.60(a) RE: Amended Pressure - Temperature Limits (TAC NOS. MA9343, MA9344, MA9347, and MA9348)," Serial No. 01-293, dated May 2, 2001.
7. Letter from D. A. Christian to USNRC, "Virginia Electric and Power Company, Surry and North Anna Power Stations Units 1 and 2, License Renewal Applications - Submittal," Serial No. 01-282, dated May 29, 2001.
8. Letter from L. N. Hartz to USNRC, "Virginia Electric and Power Company (Dominion), Surry and North Anna Power Stations Units 1 and 2, Response to Request for Supplemental Information License Renewal Applications," Serial No. 02-601, dated October 15, 2002.
9. Letter from USNRC to D. A Christian, "License Renewal Safety Evaluation Report for North Anna, Units 1 and 2, and Surry, Units 1 And 2", Serial No. 02-709, November 5, 2002.
10. ASME Code Section XI, Code Case N-641, "Alternate Pressure-Temperature Relationship and Low Temperature Overpressure Protection System Requirements," dated January 17, 2000.
11. WCAP-8771, "North Anna Unit 1 Reactor Vessel Radiation Surveillance Program," dated September 1976.
12. WCAP-8772, "North Anna Unit 2 Reactor Vessel Radiation Surveillance Program," dated November 1976.
13. Letter from J. P. O'Hanlon to USNRC, "Virginia Electric and Power Company, North Anna Power Station Units 1 and Unit 2 Reactor Vessel Surveillance Capsule Withdrawal Schedules, Serial No. 98-646, dated December 17, 1998.
14. Letter from USNRC to J. P. O'Hanlon, North Anna Power Station, Unit 1 and Unit 2—Revision to Reactor Vessel Surveillance Capsule Withdrawal Schedule, Serial No. 99-446, dated August 13, 1999.

Appendix A

Pressure/Temperature Limit Curves for North Anna Units 1 and 2

North Anna Units 1 and 2
Reactor Coolant System Heatup Limitations

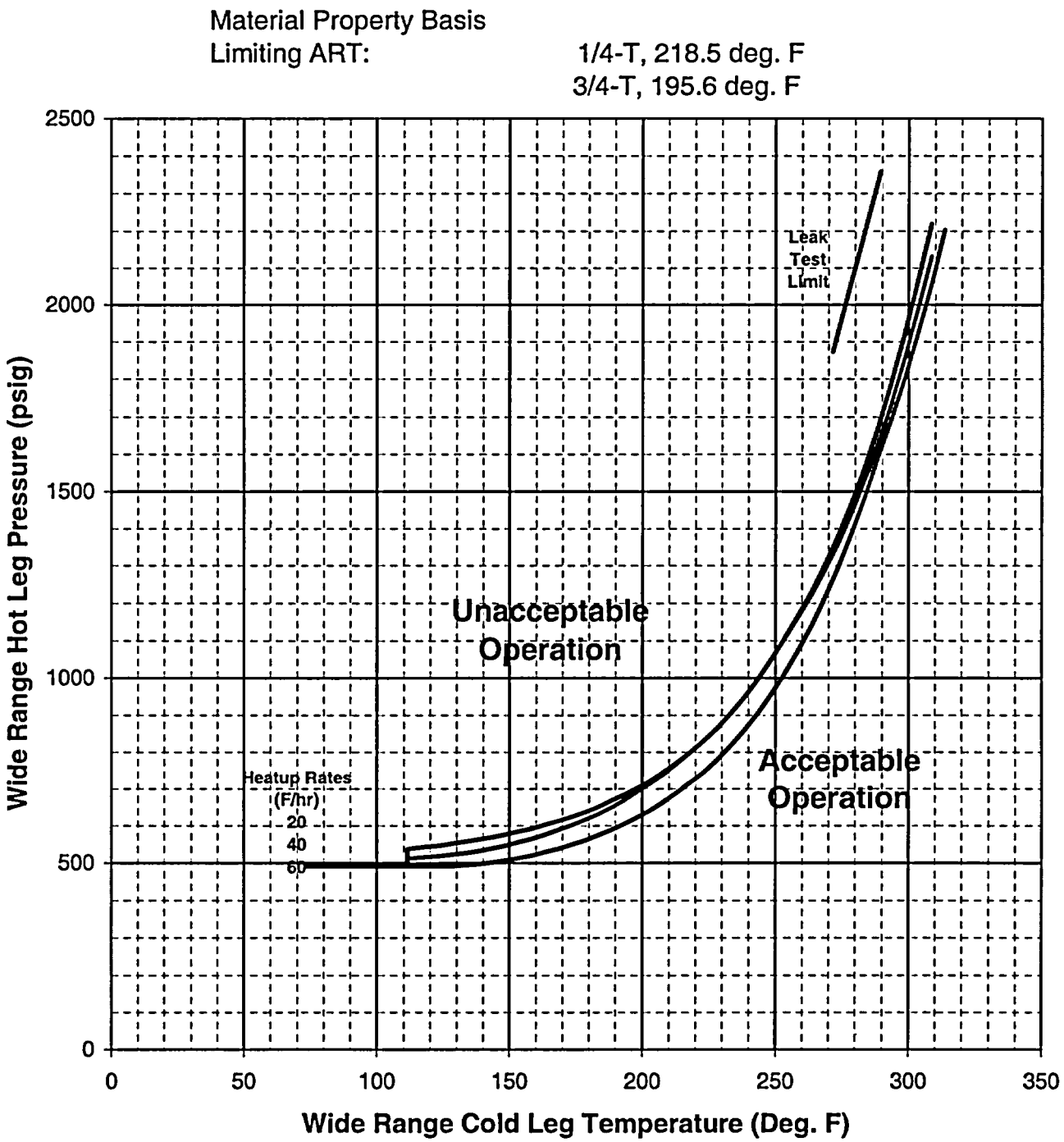

Figure 3.4.3-1: North Anna Units 1 and 2 Reactor Coolant System Heatup Limitations (Heatup Rates up to 60 F/hr) Applicable for the first 50.3 EFPY for Unit 1 and 52.3 EFPY for Unit 2 (Including Margins for Instrumentation Errors)

North Anna Units 1 and 2
Reactor Coolant System Cooldown Limitations

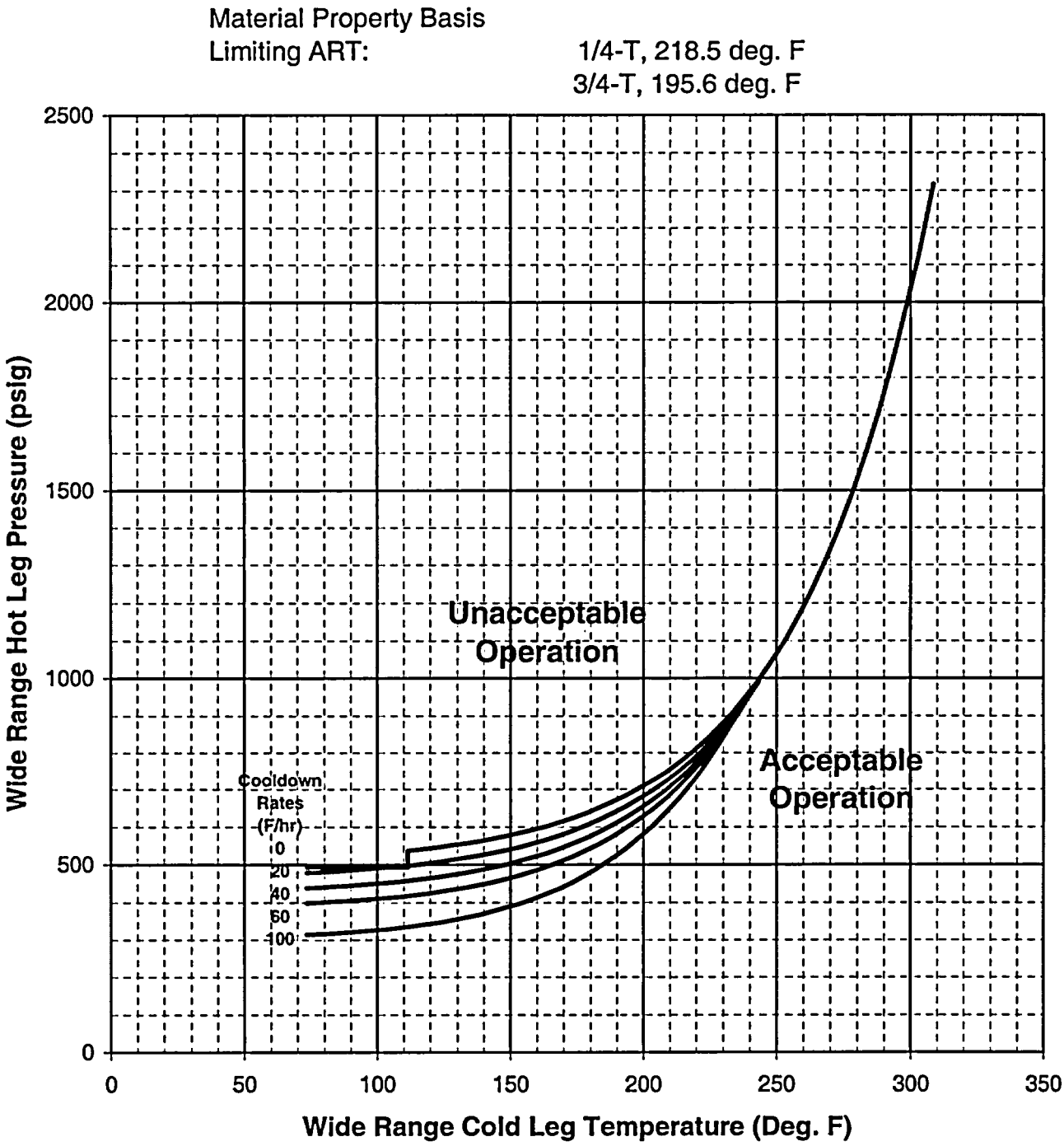

Figure 3.4.3-2: North Anna Units 1 and 2 Reactor Coolant System Cooldown Limitations (Cooldown Rates up to 100 F/hr) Applicable for the first 50.3 EFPY for Unit 1 and 52.3 EFPY for Unit 2 (Including Margins for Instrumentation Errors)

Table 1	North Anna Units 1 and 2 Heatup Data with Margins of 13.5 Degrees F and 70.1 psi for Instrumentation Errors (WCAP-15112 Rev. 1 and VRA-01-012) and 57 psi for Pressure Measurement Bias

Heatup Rate = 20 Deg. F/hr

	Indicated Temperature (Deg. F)	Indicated Pressure (psig)
1	73.5	493.90
2	78.5	493.90
3	98.5	493.90
4	103.5	493.90
5	108.5	493.90
6	111.5	493.90
7	111.5	536.90
8	113.5	538.90
9	118.5	542.90
10	123.5	546.90
11	128.5	551.90
12	133.5	556.90
13	138.5	562.90
14	143.5	568.90
15	148.5	575.90
16	153.5	583.90
17	158.5	591.90
18	163.5	601.90
19	168.5	611.90
20	173.5	623.90
21	178.5	636.90
22	183.5	650.90
23	188.5	666.90
24	193.5	683.90
25	198.5	702.90
26	203.5	723.90
27	208.5	747.90
28	213.5	773.90
29	218.5	801.90
30	223.5	833.90
31	228.5	867.90
32	233.5	906.90
33	238.5	949.90
34	243.5	996.90
35	248.5	1048.90
36	253.5	1105.90
37	258.5	1163.90
38	263.5	1228.90
39	268.5	1299.90
40	273.5	1378.90
41	278.5	1465.90
42	283.5	1562.90
43	288.5	1668.90
44	293.5	1785.90
45	298.5	1915.90
46	303.5	2059.90
47	308.5	2217.90

Heatup Rate = 40 Deg. F/hr

	Indicated Temperature (Deg. F)	Indicated Pressure (psig)
1	73.5	493.9
2	78.5	493.9
3	98.5	493.9
4	103.5	493.9
5	108.5	493.9
6	111.5	493.9
7	111.5	512.9
8	113.5	512.9
9	118.5	514.9
10	123.5	517.9
11	128.5	521.9
12	133.5	526.9
13	138.5	532.9
14	143.5	538.9
15	148.5	546.9
16	153.5	555.9
17	158.5	564.9
18	163.5	575.9
19	168.5	587.9
20	173.5	600.9
21	178.5	615.9
22	183.5	631.9
23	188.5	649.9
24	193.5	669.9
25	198.5	691.9
26	203.5	715.9
27	208.5	742.9
28	213.5	772.9
29	218.5	801.9
30	223.5	833.9
31	228.5	867.9
32	233.5	906.9
33	238.5	949.9
34	243.5	996.9
35	248.5	1048.9
36	253.5	1105.9
37	258.5	1161.9
38	263.5	1221.9
39	268.5	1287.9
40	273.5	1359.9
41	278.5	1439.9
42	283.5	1528.9
43	288.5	1626.9
44	293.5	1734.9
45	298.5	1853.9
46	303.5	1985.9
47	308.5	2130.9

Heatup Rate = 60 Deg. F/hr

	Indicated Temperature (Deg. F)	Indicated Pressure (psig)
1	73.5	490.9
2	78.5	490.9
3	98.5	490.9
4	103.5	490.9
5	108.5	490.9
6	113.5	490.9
7	118.5	490.9
8	123.5	490.9
9	128.5	491.9
10	133.5	493.9
11	138.5	496.9
12	143.5	501.9
13	148.5	506.9
14	153.5	512.9
15	158.5	519.9
16	163.5	528.9
17	168.5	537.9
18	173.5	548.9
19	178.5	560.9
20	183.5	573.9
21	188.5	588.9
22	193.5	604.9
23	198.5	623.9
24	203.5	643.9
25	208.5	665.9
26	213.5	690.9
27	218.5	718.9
28	223.5	748.9
29	228.5	782.9
30	233.5	819.9
31	238.5	860.9
32	243.5	905.9
33	248.5	955.9
34	253.5	1010.9
35	258.5	1071.9
36	263.5	1138.9
37	268.5	1212.9
38	273.5	1294.9
39	278.5	1385.9
40	283.5	1485.9
41	288.5	1591.9
42	293.5	1690.9
43	298.5	1800.9
44	303.5	1921.9
45	308.5	2055.9
46	313.5	2202.9

Table 2	North Anna Units 1 and 2 Cooldown Data with Margins of 13.5 Degrees F and 70.1 psi for Instrumentation Errors (WCAP-15112 Rev. 1, Modified) and 57 psi for Pressure Measurement Bias

Cooldown Rate = 0 Deg. F/hr

	Indicated Temperature (Deg. F)	Indicated Pressure (psig)
1	73.5	493.90
2	78.5	493.90
3	83.5	493.90
4	88.5	493.90
5	93.5	493.90
6	98.5	493.90
7	103.5	493.90
8	108.5	493.90
9	111.5	493.90
10	111.5	537.33
11	113.5	538.73
12	118.5	542.59
13	123.5	546.86
14	128.5	551.58
15	133.5	556.79
16	138.5	562.55
17	143.5	568.92
18	148.5	575.96
19	153.5	583.74
20	158.5	592.34
21	163.5	601.84
22	168.5	612.34
23	173.5	623.95
24	178.5	636.78
25	183.5	650.95
26	188.5	666.62
27	193.5	683.93
28	198.5	703.07
29	203.5	724.21
30	208.5	747.58
31	213.5	773.41
32	218.5	801.96
33	223.5	833.51
34	228.5	868.37
35	233.5	906.90
36	238.5	949.49
37	243.5	996.55
38	248.5	1048.57
39	253.5	1106.05
40	258.5	1169.58
41	263.5	1239.79
42	268.5	1317.38
43	273.5	1403.14
44	278.5	1497.91
45	283.5	1602.66
46	288.5	1718.41
47	293.5	1846.35
48	298.5	1987.73
49	303.5	2143.99
50	308.5	2316.68

Cooldown Rate = 20 Deg. F/hr

	Indicated Temperature (Deg. F)	Indicated Pressure (psig)
1	73.5	479.07
2	78.5	480.80
3	83.5	482.69
4	88.5	484.81
5	93.5	487.16
6	98.5	489.78
7	103.5	492.69
8	108.5	493.90
9	111.5	493.90
10	111.5	498.10
11	113.5	499.54
12	118.5	503.55
13	123.5	507.98
14	128.5	512.92
15	133.5	518.38
16	138.5	524.45
17	143.5	531.16
18	148.5	538.62
19	153.5	546.87
20	158.5	556.03
21	163.5	566.15
22	168.5	577.37
23	173.5	589.78
24	178.5	603.54
25	183.5	618.75
26	188.5	635.60
27	193.5	654.23
28	198.5	674.87
29	203.5	697.67
30	208.5	722.93
31	213.5	750.85
32	218.5	781.75
33	223.5	815.92
34	228.5	853.72
35	233.5	895.51
36	238.5	941.76
37	243.5	992.88

Cooldown Rate = 40 Deg. F/hr

	Indicated Temperature (Deg. F)	Indicated Pressure (psig)
1	73.5	438.97
2	78.5	440.62
3	83.5	442.50
4	88.5	444.62
5	93.5	446.99
6	98.5	449.66
7	103.5	452.65
8	108.5	455.99
9	113.5	459.72
10	118.5	463.89
11	123.5	468.53
12	128.5	473.71
13	133.5	479.47
14	138.5	485.89
15	143.5	493.01
16	148.5	500.93
17	153.5	509.72
18	158.5	519.49
19	163.5	530.32
20	168.5	542.35
21	173.5	555.67
22	178.5	570.46
23	183.5	586.84
24	188.5	605.01
25	193.5	625.12
26	198.5	647.42
27	203.5	672.09
28	208.5	699.44
29	213.5	729.70
30	218.5	763.22
31	223.5	800.31
32	228.5	841.38
33	233.5	886.81
34	238.5	937.12
35	243.5	992.76

Table 2 (Cont'd)	North Anna Units 1 and 2 Cooldown Data with Margins of 13.5 Degrees F and 70.1 psi for Instrumentation Errors (WCAP-15112 Rev. 1, Modified) and 57 psi for Pressure Measurement Bias

Cooldown Rate = 60 Deg. F/hr

	Indicated Temperature (Deg. F)	Indicated Pressure (psig)
1	73.5	398.04
2	78.5	399.67
3	83.5	401.54
4	88.5	403.68
5	93.5	406.10
6	98.5	408.83
7	103.5	411.91
8	108.5	415.38
9	113.5	419.27
10	118.5	423.63
11	123.5	428.51
12	128.5	433.98
13	133.5	440.07
14	138.5	446.88
15	143.5	454.46
16	148.5	462.92
17	153.5	472.32
18	158.5	482.79
19	163.5	494.42
20	168.5	507.35
21	173.5	521.70
22	178.5	537.65
23	183.5	555.34
24	188.5	574.98
25	193.5	596.75
26	198.5	620.90
27	203.5	647.67
28	208.5	677.34
29	213.5	710.22
30	218.5	746.66
31	223.5	787.01
32	228.5	831.72
33	233.5	881.23
34	238.5	936.06

Cooldown Rate = 100 Deg. F/hr

	Indicated Temperature (Deg. F)	Indicated Pressure (psig)
1	73.5	313.74
2	78.5	315.36
3	83.5	317.28
4	88.5	319.50
5	93.5	322.05
6	98.5	324.98
7	103.5	328.32
8	108.5	332.12
9	113.5	336.42
10	118.5	341.29
11	123.5	346.78
12	128.5	352.95
13	133.5	359.88
14	138.5	367.66
15	143.5	376.37
16	148.5	386.11
17	153.5	396.99
18	158.5	409.14
19	163.5	422.68
20	168.5	437.79
21	173.5	454.60
22	178.5	473.31
23	183.5	494.12
24	188.5	517.27
25	193.5	542.98
26	198.5	571.55
27	203.5	603.26
28	208.5	638.48
29	213.5	677.55
30	218.5	720.91
31	223.5	769.00
32	228.5	822.34
33	233.5	881.46
34	238.5	947.01

Appendix B

North Anna Units 1 and 2 LTOPS Margin Assessment

Cooldown Rate = 0 Deg. F/hr
WCAP-15112 R1 (Modified)

	Indicated Temperature (Deg. F)	Indicated Pressure (psig)
1	73.5	518.00
2	78.5	518.00
3	83.5	518.00
4	88.5	518.00
5	93.5	518.00
6	98.5	518.00
7	103.5	518.00
8	108.5	518.00
9	111.5	518.00
10	111.5	561.43
11	113.5	562.83
12	118.5	566.69
13	123.5	570.96
14	128.5	575.68
15	133.5	580.89
16	138.5	586.65
17	143.5	593.02
18	148.5	600.06
19	153.5	607.84
20	158.5	616.44
21	163.5	625.94
22	168.5	636.44
23	173.5	648.05
24	178.5	660.88
25	183.5	675.05
26	188.5	690.72
27	193.5	708.03
28	198.5	727.17
29	203.5	748.31
30	208.5	771.68
31	213.5	797.51
32	218.5	826.06
33	223.5	857.61
34	228.5	892.47
35	233.5	931.00
36	238.5	973.59
37	243.5	1020.65
38	248.5	1072.67
39	253.5	1130.15
40	258.5	1193.68
41	263.5	1263.89
42	268.5	1341.48
43	273.5	1427.24
44	278.5	1522.01
45	283.5	1626.76
46	288.5	1742.51
47	293.5	1870.45
48	298.5	2011.83
49	303.5	2168.09
50	308.5	2340.78

PORV Setpoint Overshoot

	Indicated Temperature (Deg. F)	Pressure (psi)
1	73.5	142.00
2	78.5	142.00
3	83.5	142.00
4	88.5	142.00
5	93.5	142.00
6	98.5	142.00
7	103.5	142.00
8	108.5	142.00
9	111.5	142.00
10	111.5	142.00
11	113.5	142.00
12	118.5	142.00
13	123.5	142.00
14	128.5	142.00
15	133.5	142.00
16	138.5	142.00
17	143.5	142.00
18	148.5	142.00
19	153.5	130.90
20	158.5	130.90
21	163.5	130.90
22	168.5	130.90
23	173.5	130.90
24	178.5	130.90
25	183.5	130.90
26	188.5	130.90
27	193.5	130.90
28	198.5	130.90
29	203.5	101.80
30	208.5	101.80
31	213.5	101.80
32	218.5	101.80
33	223.5	101.80
34	228.5	101.80
35	233.5	101.80
36	238.5	101.80
37	243.5	101.80
38	248.5	101.80
39	253.5	72.40
40	258.5	72.40
41	263.5	72.40
42	268.5	72.40
43	273.5	72.40
44	278.5	72.40
45	283.5	
46	288.5	
47	293.5	
48	298.5	
49	303.5	
50	308.5	

0 deg. F/hr Curve minus
PORV Setpoint Overshoot

	Indicated Temperature (Deg. F)	Indicated Pressure (psig)
1	73.5	376.00
2	78.5	376.00
3	83.5	376.00
4	88.5	376.00
5	93.5	376.00
6	98.5	376.00
7	103.5	376.00
8	108.5	376.00
9	111.5	376.00
10	111.5	419.43
11	113.5	420.83
12	118.5	424.69
13	123.5	428.96
14	128.5	433.68
15	133.5	438.89
16	138.5	444.65
17	143.5	451.02
18	148.5	458.06
19	153.5	476.94
20	158.5	485.54
21	163.5	495.04
22	168.5	505.54
23	173.5	517.15
24	178.5	529.98
25	183.5	544.15
26	188.5	559.82
27	193.5	577.13
28	198.5	596.27
29	203.5	646.51
30	208.5	669.88
31	213.5	695.71
32	218.5	724.26
33	223.5	755.81
34	228.5	790.67
35	233.5	829.20
36	238.5	871.79
37	243.5	918.85
38	248.5	970.87
39	253.5	1057.75
40	258.5	1121.28
41	263.5	1191.49
42	268.5	1269.08
43	273.5	1354.84
44	278.5	1449.61
45	283.5	
46	288.5	
47	293.5	
48	298.5	
49	303.5	
50	308.5	

	PORV Setpoint Indicated Temperature (Deg. F)	Indicated Pressure (psig)		Margin (Positive = Acceptable) Indicated Temperature (Deg. F)	Pressure (psig)	Minimum Margin (psig)
1	73.5	375	1	73.5	1.00	1.00
2	78.5	375	2	78.5	1.00	
3	83.5	375	3	83.5	1.00	
4	88.5	375	4	88.5	1.00	
5	93.5	375	5	93.5	1.00	
6	98.5	375	6	98.5	1.00	
7	103.5	375	7	103.5	1.00	
8	108.5	375	8	108.5	1.00	
9	111.5	375	9	111.5	1.00	
10	111.5	375	10	111.5	44.43	
11	113.5	375	11	113.5	45.83	
12	118.5	375	12	118.5	49.69	
13	123.5	375	13	123.5	53.96	
14	128.5	375	14	128.5	58.68	
15	133.5	375	15	133.5	63.89	
16	138.5	375	16	138.5	69.65	
17	143.5	375	17	143.5	76.02	
18	148.5	375	18	148.5	83.06	
19	153.5	375	19	153.5	101.94	
20	158.5	375	20	158.5	110.54	
21	163.5	375	21	163.5	120.04	
22	168.5	375	22	168.5	130.54	
23	173.5	375	23	173.5	142.15	
24	178.5	375	24	178.5	154.98	
25	183.5	540	25	183.5	4.15	
26	188.5	540	26	188.5	19.82	
27	193.5	540	27	193.5	37.13	
28	198.5	540	28	198.5	56.27	
29	203.5	540	29	203.5	106.51	
30	208.5	540	30	208.5	129.88	
31	213.5	540	31	213.5	155.71	
32	218.5	540	32	218.5	184.26	
33	223.5	540	33	223.5	215.81	
34	228.5	540	34	228.5	250.67	
35	233.5	540	35	233.5	289.20	
36	238.5	540	36	238.5	331.79	
37	243.5	540	37	243.5	378.85	
38	248.5	540	38	248.5	430.87	
39	253.5	540	39	253.5	517.75	
40	258.5	540	40	258.5	581.28	
41	263.5	540	41	263.5	651.49	
42	268.5	540	42	268.5	729.08	
43	273.5	540	43	273.5	814.84	
44	278.5	540	44	278.5	909.61	
45	283.5	2250	45	283.5		
46	288.5	2250	46	288.5		
47	293.5	2250	47	293.5		
48	298.5	2250	48	298.5		
49	303.5	2250	49	303.5		
50	308.5	2250	50	308.5		

[redacted]

Attachment 2

Virginia Electric and Power Company
North Anna Power Station Units 1 and 2
Proposed Technical Specification Changes for
Reactor Coolant System Pressure/Temperature Limits
LTOPS Setpoints and LTOPS Enable Temperatures

Mark-Up of Proposed Changes

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

3.4 REACTOR COOLANT SYSTEM (RCS)

3.4.3 RCS Pressure and Temperature (P/T) Limits

LCO 3.4.3 RCS pressure, RCS temperature, and RCS heatup and cooldown rates shall be maintained within the limits specified in Figures 3.4.3-1 and 3.4.3-2 ~~(Unit 1) and Figures 3.4.3-3 and 3.4.3-4 (Unit 2)~~ with:

a. A maximum heatup of 60°F in any one hour period;

b. A maximum cooldown of 100°F in any one hour period; and

c. A maximum temperature change of 10°F in any one hour period during inservice hydrostatic and leak testing operations above the heatup and cooldown limit curves.

APPLICABILITY: At all times.

ACTIONS

CONDITION	REQUIRED ACTION		COMPLETION TIME
A. ---------NOTE--------- Required Action A.2 shall be completed whenever this Condition is entered. ---------- Requirements of LCO not met in MODE 1, 2, 3, or 4.	A.1	Restore parameter(s) to within limits.	30 minutes
	AND		
	A.2	Determine RCS is acceptable for continued operation.	72 hours
B. Required Action and associated Completion Time of Condition A not met.	B.1	Be in MODE 3.	6 hours
	AND		
	B.2	Be in MODE 5 with RCS pressure < 500 psig.	36 hours

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FIGURE 3.4.3.1

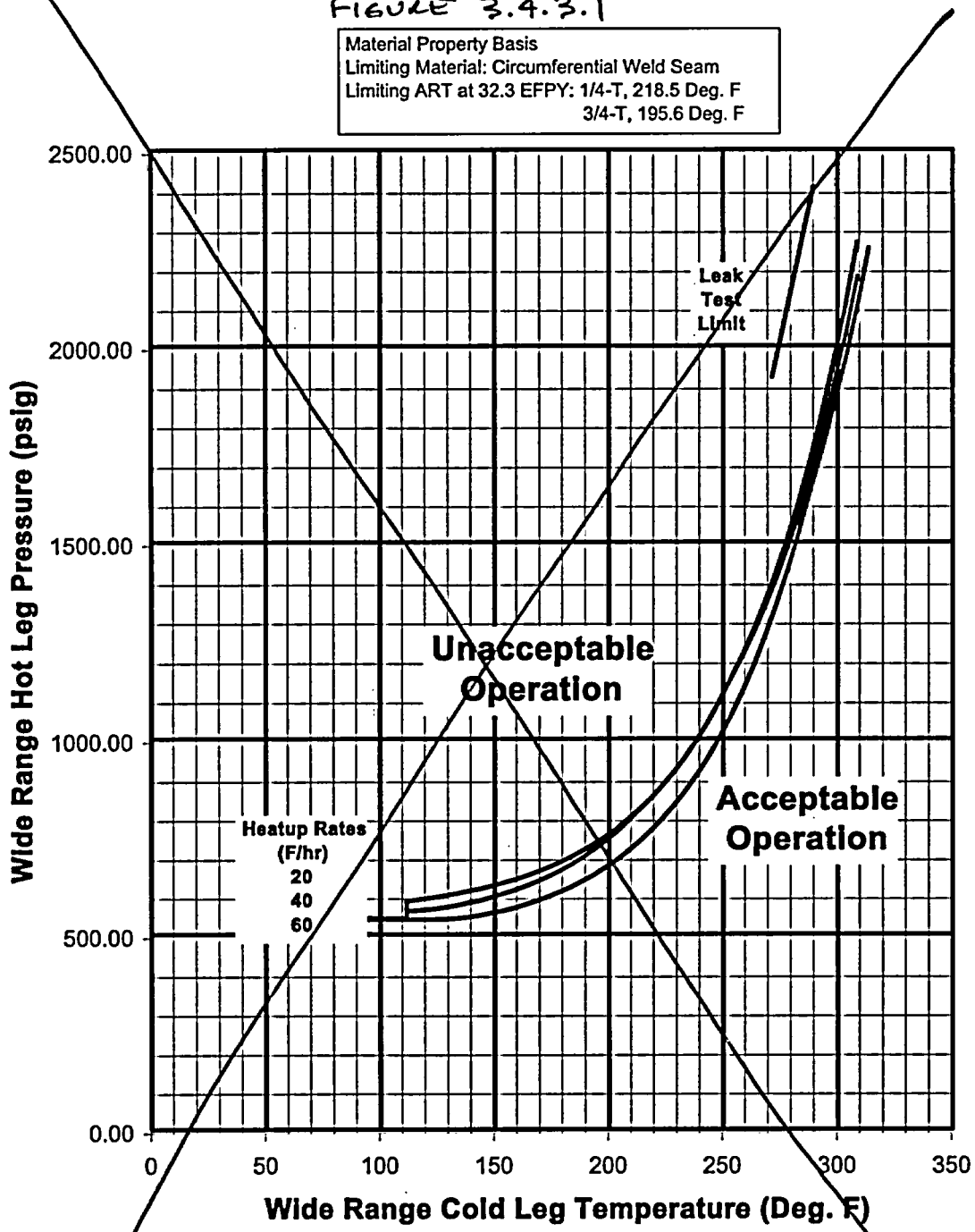

Figure 3.4.3-1 (page 1 of 1)
Unit 1 RCS Heatup Limitations
Heatup Rates up to 60°F/hr, Applicable for the first 32.3 EFPY,
Including Margins for Instrumentation Errors

NEW FIGURE 3.4.3-1

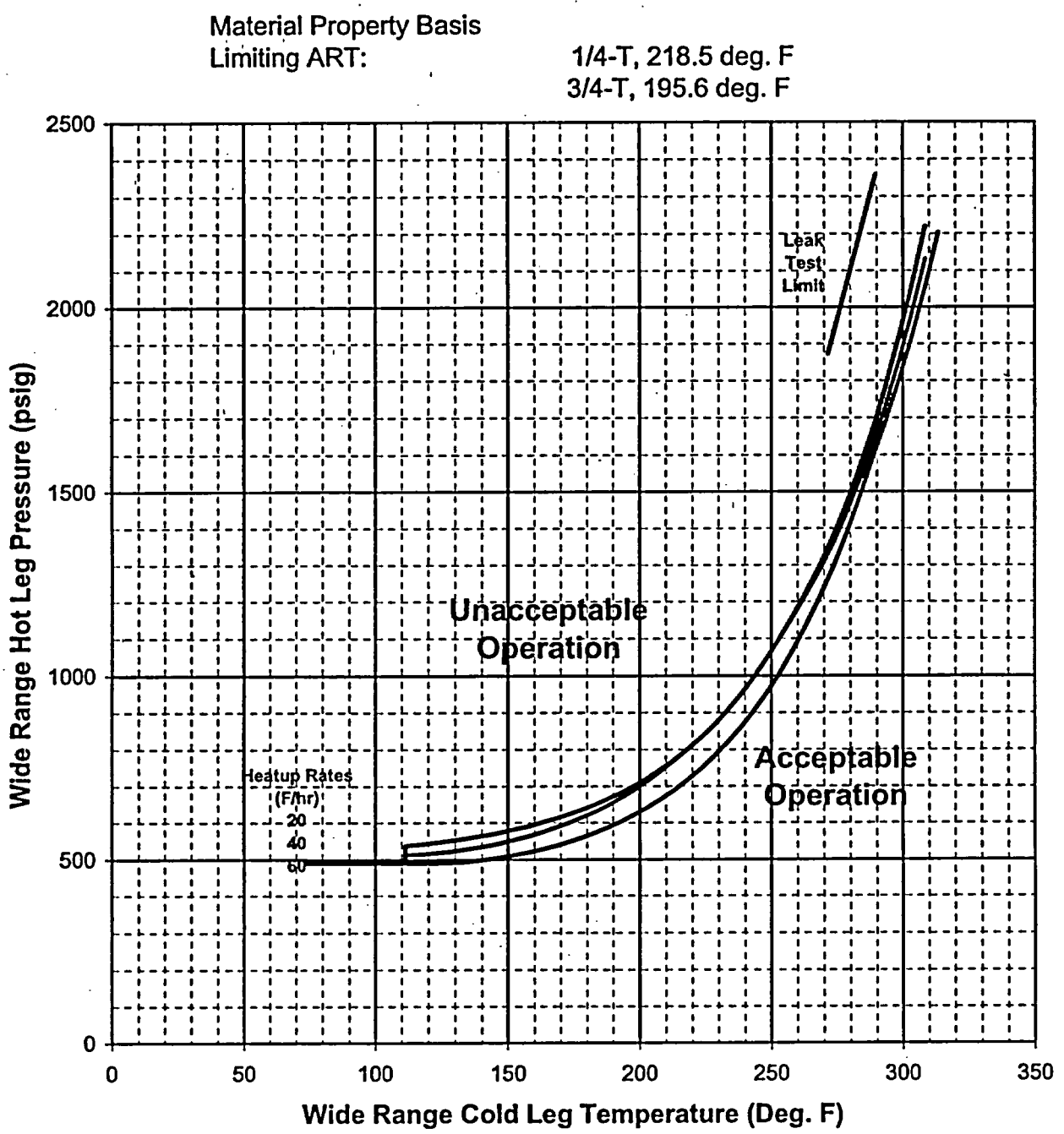

Figure 3.4.3-1 (page 1 of 1)
North Anna Units 1 and 2 Reactor Coolant System Heatup Limitations
(Heatup Rates up to 60°F/hr),
Applicable for the first 50.3 EFPY for Unit 1, and 52.3 EFPY for Unit 2
(Including Margins for Instrumentation Errors)

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Figure 3.4.3-2

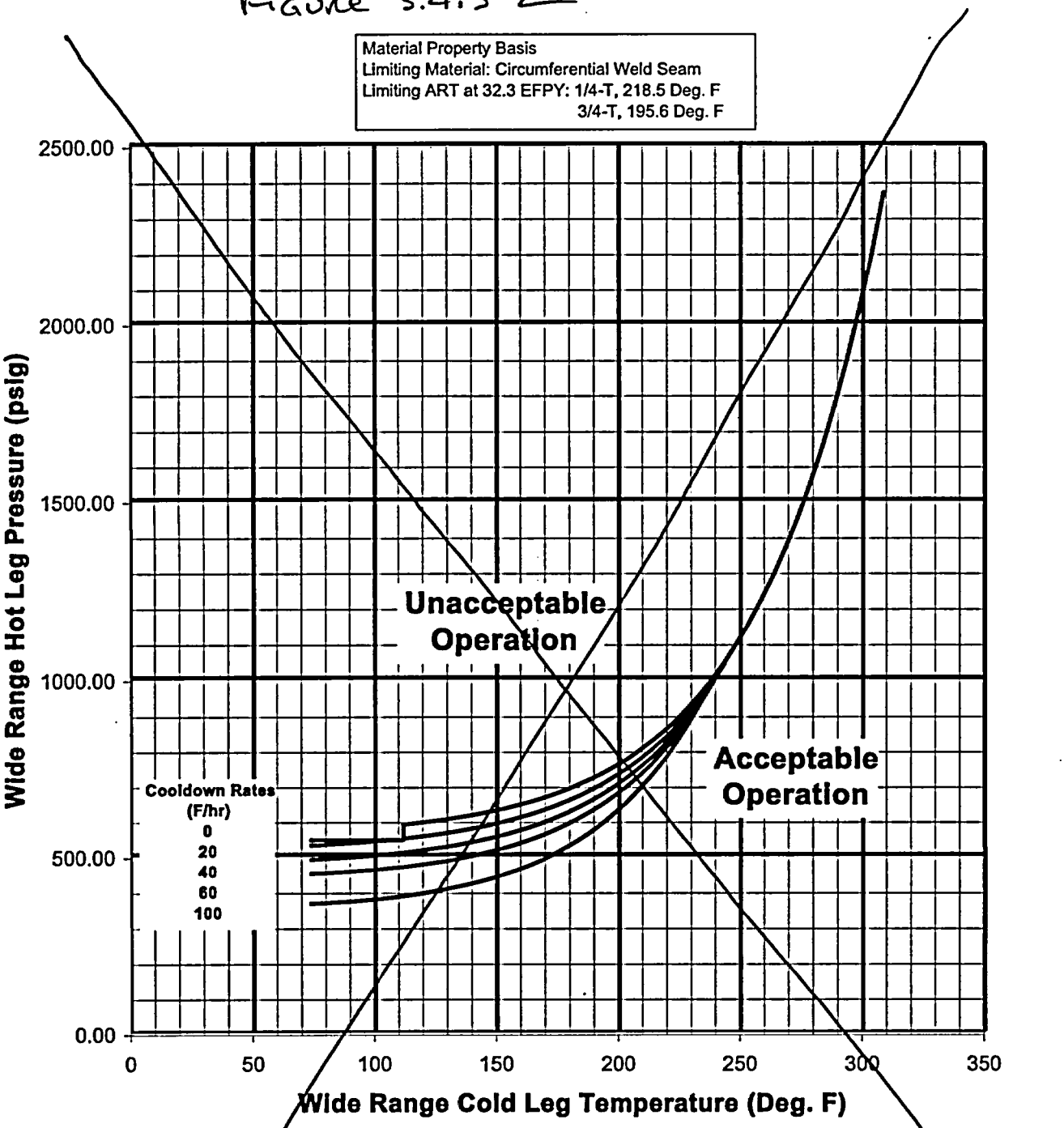

Figure 3.4.3-2 (page 1 of 1)
Unit 1 RCS Cooldown Limitations
Cooldown Rates up to 100°F/hr, Applicable for the first 32.3 EFPY,
Including Margins for Instrumentation Errors

NEW FIGURE 3.4.3-2

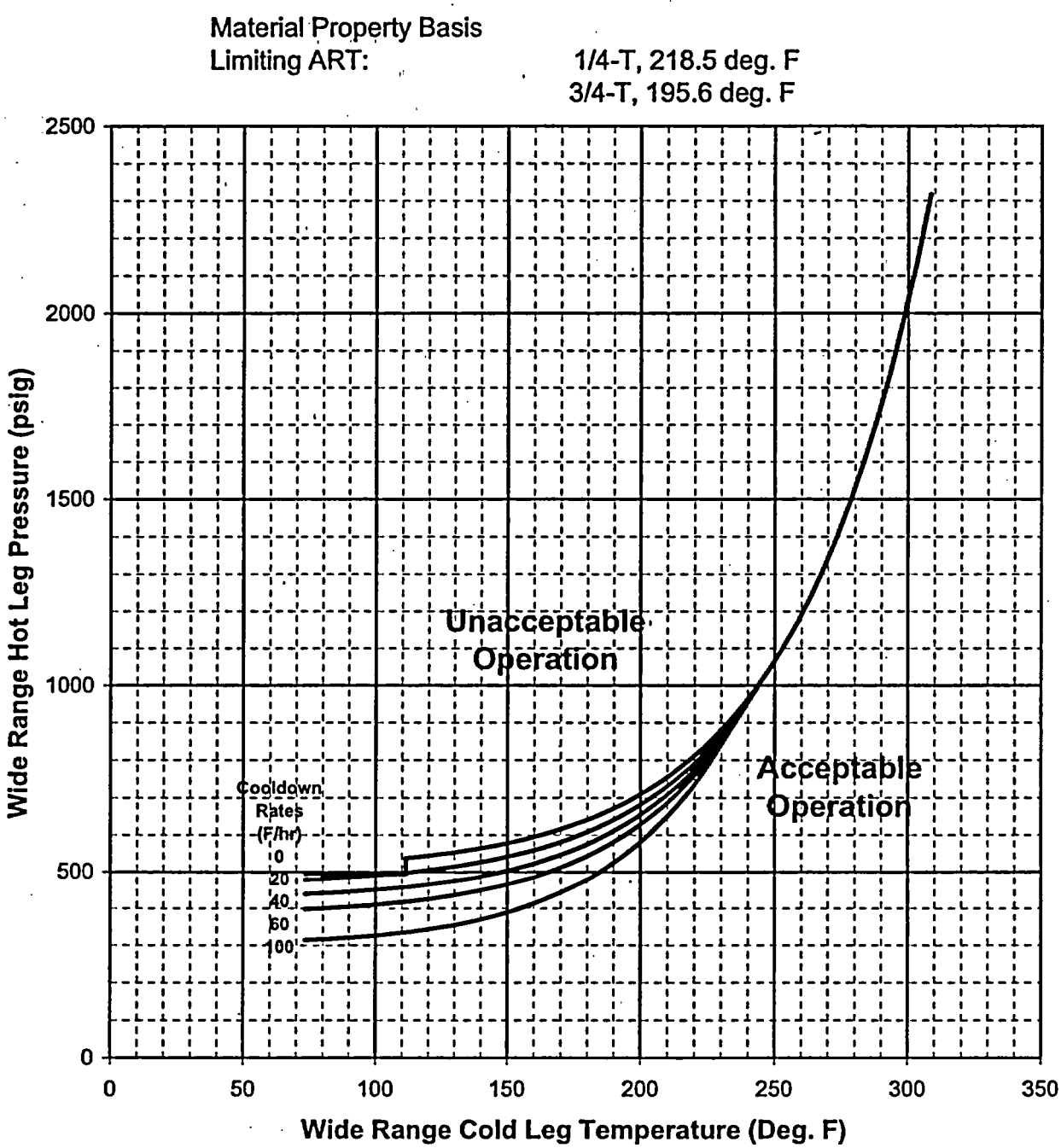

Figure 3.4.3-2 (page 1 of 1)
North Anna Units 1 and 2 Reactor Coolant System Cooldown Limitations
(Cooldown Rates up to 1000°F/hr),
Applicable for the first 50.3 EFPY for Unit 1, and 52.3 EFPY for Unit 2
(Including Margins for Instrumentation Errors)

DELETE

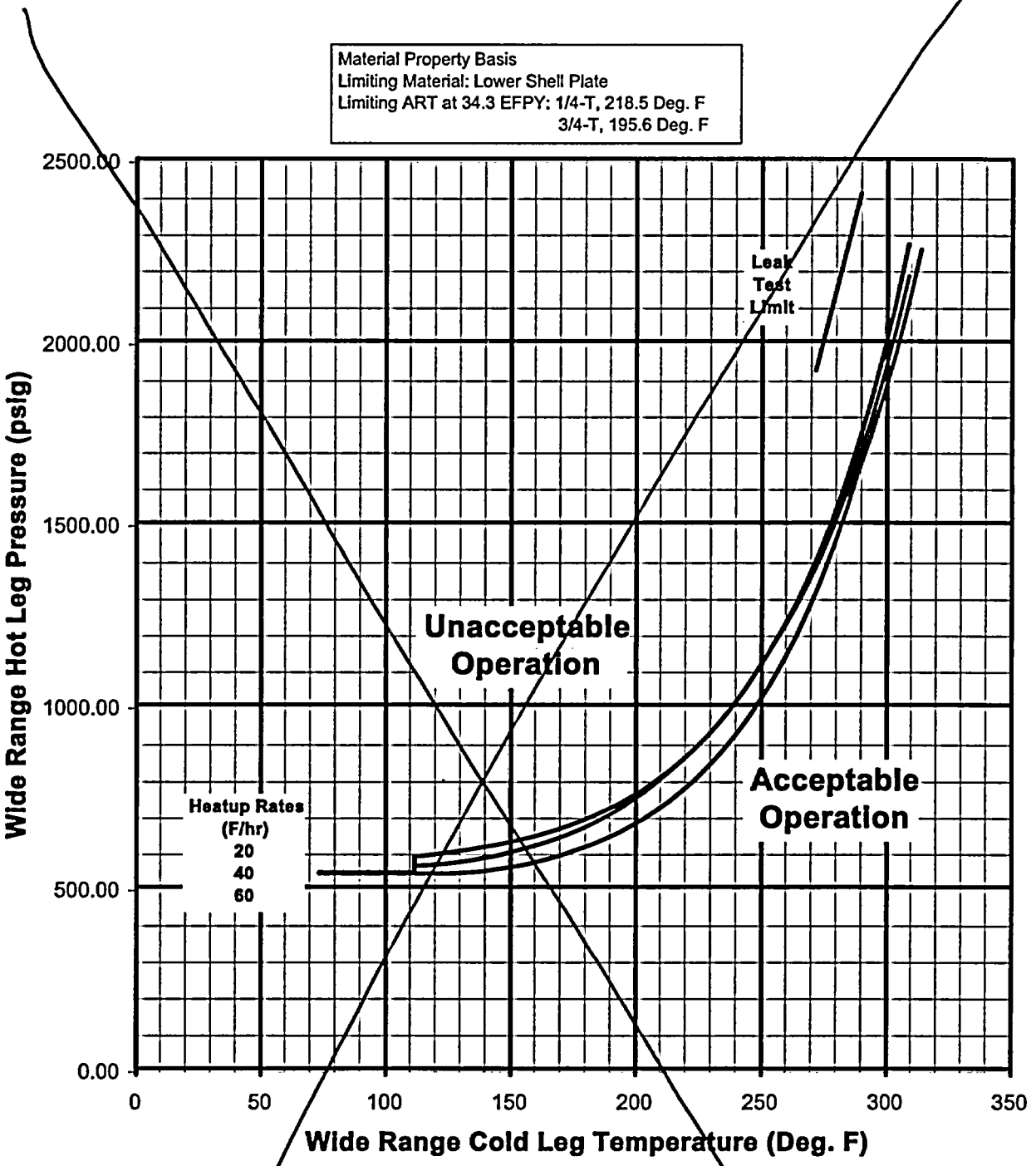

Figure 3.4.3-3 (page 1 of 1)
Unit 2 RCS Heatup Limitations
Heatup Rates up to 60°F/hr, Applicable for the first 34.3 EFPY,
Including Margins for Instrumentation Errors

DELETE

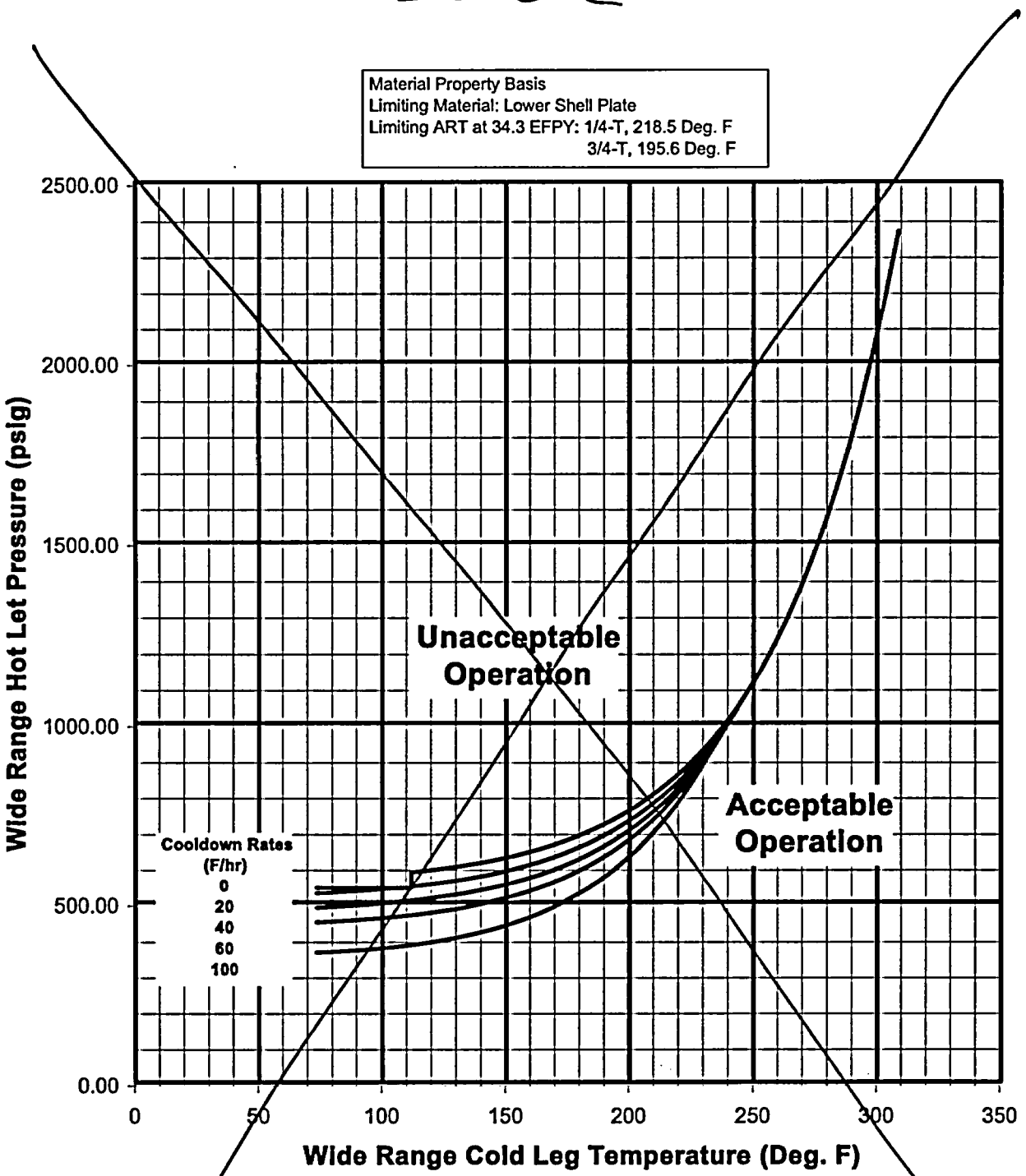

Figure 3.4.3-4 (page 1 of 1)
Unit 2 RCS Cooldown Limitations
Cooldown Rates up to 100°F/hr, Applicable for the first 34.3 EFPY,
Including Margins for Instrumentation Errors

3.4 REACTOR COOLANT SYSTEM (RCS)

3.4.6 RCS Loops—MODE 4

LCO 3.4.6 Two loops consisting of any combination of RCS loops and residual heat removal (RHR) loops shall be OPERABLE, and one loop shall be in operation.

- - - - - - - - - - - - - - NOTE - - - - - - - - - - - - - -

1. All reactor coolant pumps (RCPs) and RHR pumps may be removed from operation for ≤ 1 hour per 8 hour period provided:

   a. No operations are permitted that would cause introduction into the RCS, coolant with boron concentration less than required to meet SDM of LCO 3.1.1; and

   b. Core outlet temperature is maintained at least 10°F below saturation temperature.

2. No RCP shall be started with any RCS cold leg temperature ≤ ~~235~~°F ~~(Unit 1), 270°F (Unit 2)~~ unless the secondary side water temperature of each steam generator (SG) is ≤ 50°F above each of the RCS cold leg temperatures.

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APPLICABILITY: MODE 4.

ACTIONS

CONDITION	REQUIRED ACTION		COMPLETION TIME
A. One required loop inoperable.	A.1	Initiate action to restore a second loop to OPERABLE status.	Immediately
	AND		
	A.2	---------NOTE--------- Only required if RHR loop is OPERABLE. ---------- Be in MODE 5.	24 hours

3.4 REACTOR COOLANT SYSTEM (RCS)

3.4.7 RCS Loops—MODE 5, Loops Filled

LCO 3.4.7 One residual heat removal (RHR) loop shall be OPERABLE and in operation, and either:

a. One additional RHR loop shall be OPERABLE; or

b. The secondary side water level of one steam generator (SG) shall be ≥ 17%.

- - - - - - - - - - - - - - NOTE - - - - - - - - - - - - - - -

1. The RHR pump of the loop in operation may be removed from operation for ≤ 1 hour per 8 hour period provided:

   a. No operations are permitted that would cause introduction into the RCS, coolant with boron concentration less than required to meet SDM of LCO 3.1.1; and

   b. Core outlet temperature is maintained at least 10°F below saturation temperature.

2. One required RHR loop may be inoperable for up to 2 hours for surveillance testing provided that the other RHR loop is OPERABLE and in operation.

3. No reactor coolant pump shall be started with one or more RCS cold leg temperatures ≤ ~~235~~ 280°F ~~(Unit 1), 270°F (Unit 2)~~ unless the secondary side water temperature of each SG is ≤ 50°F above each of the RCS cold leg temperatures.

4. All RHR loops may be removed from operation during planned heatup to MODE 4 when at least one RCS loop is in operation.

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APPLICABILITY: MODE 5 with RCS loops filled.

3.4 REACTOR COOLANT SYSTEM (RCS)

3.4.10 Pressurizer Safety Valves

LCO 3.4.10 Three pressurizer safety valves shall be OPERABLE with lift settings of 2485 psig, +2%/-3% average with no single valve outside ±3%.

APPLICABILITY: MODES 1, 2, and 3,
MODE 4 with all RCS cold leg temperatures > ~~235~~ 280°F ~~(Unit 1), 270°F (Unit 2)~~.

- - - - - - - - - - - - - - NOTE - - - - - - - - - - - - - -

The lift settings are not required to be within the LCO limits during MODES 3 and 4 for the purpose of setting the pressurizer safety valves under ambient (hot) conditions. This exception is allowed for 54 hours following entry into MODE 3 provided a preliminary cold setting was made prior to heatup.

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ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One pressurizer safety valve inoperable.	A.1 Restore valve to OPERABLE status.	15 minutes
B. Required Action and associated Completion Time not met.	B.1 Be in MODE 3.	6 hours
	AND	
OR	B.2 Be in MODE 4 with any RCS cold leg temperatures ≤ 280°F ~~235°F (Unit 1), 270°F (Unit 2)~~.	24 hours
Two or more pressurizer safety valves inoperable.		

3.4 REACTOR COOLANT SYSTEM (RCS)

3.4.12 Low Temperature Overpressure Protection (LTOP) System

LCO 3.4.12 An LTOP System shall be OPERABLE with a maximum of one charging pump and one low head safety injection (LHSI) pump capable of injecting into the RCS and the accumulators isolated, with power removed from the isolation valve operators, and one of the following pressure relief capabilities:

a. Two power operated relief valves (PORVs) with lift setting accurable values of:

1. ≤ ~~500~~ 540 psig ~~(Unit 1), 415 psig (Unit 2)~~ when any RCS cold leg temperature ≤ ~~235~~ 280°F ~~(Unit 1), 270°F (Unit 2);~~ and

2. ≤ ~~395 psig (Unit 1)~~ 375 psig ~~(Unit 2)~~ when any RCS cold leg temperature ≤ ~~150~~ 180°F ~~(Unit 1), 130°F (Unit 2)~~.

b. The RCS depressurized and an RCS vent of ≥ 2.07 square inches.

- - - - - - - - - - - - - - NOTES - - - - - - - - - - - - - -

1. Two charging pumps may be made capable of injecting for ≤ 1 hour for pump swapping operations.

2. Accumulator isolation with power removed from the isolation valve operators is only required when accumulator pressure is greater than the PORV lift setting.

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APPLICABILITY: MODE 4 when any RCS cold leg temperature is ≤ ~~235~~ 280°F ~~(Unit 1), 270°F (Unit 2)~~,
MODE 5,
MODE 6 when the reactor vessel head is on.

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. Two LHSI pumps capable of injecting into the RCS.	A.1 Initiate action to verify a maximum of one LHSI pump is capable of injecting into the RCS.	Immediately

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
B. Two or more charging pumps capable of injecting into the RCS.	B.1 Initiate action to verify a maximum of one charging pump is capable of injecting into the RCS.	Immediately
C. --------NOTE--------- Only applicable when accumulator pressure is greater than PORV lift setting. ---------- An accumulator not isolated. <u>OR</u> Power available to one or more accumulator isolation valve operators.	C.1 Isolate affected accumulator. <u>AND</u> C.2 Remove power from affected accumulator isolation valve operators.	Immediately 1 hour
D. Required Action and associated Completion Time of Condition C not met.	D.1 Increase RCS cold leg temperature to > ~~235~~°F ~~(Unit 1), 270~~°F 280 ~~(Unit 2).~~ <u>OR</u> D.2 Depressurize affected accumulator to less than PORV lift setting.	12 hours 12 hours
E. One required PORV inoperable in MODE 4.	E.1 Restore required PORV to OPERABLE status.	7 days
F. One required PORV inoperable in MODE 5 or 6.	F.1 Restore required PORV to OPERABLE status.	24 hours

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.4.12.4	Verify required RCS vent ≥ 2.07 square inches open.	12 hours for unlocked open vent valve(s) AND 31 days for other vent paths
SR 3.4.12.5	Verify PORV block valve is open for each required PORV and PORV keyswitch is in AUTO.	72 hours
SR 3.4.12.6	Verify required PORV backup nitrogen supply pressure is within limit.	7 days
SR 3.4.12.7	----------NOTE---------- Not required to be met until 12 hours after decreasing RCS cold leg temperature to ≤ ~~235~~ 280°F ~~(Unit 1), 270°F (Unit 2)~~. ---------- Perform a COT on each required PORV, excluding actuation.	31 days
SR 3.4.12.8	Perform CHANNEL CALIBRATION for each required PORV actuation channel.	18 months

BASES

LCO

The two elements of this LCO are:

a. The limit curves for heatup, cooldown, and ISLH testing; and

b. Limits on the rate of change of temperature.

The LCO limits apply to all components of the RCS, except the pressurizer. These limits define allowable operating regions and permit a large number of operating cycles while providing a wide margin to nonductile failure.

The limits for the rate of change of temperature control the thermal gradient through the vessel wall and are used as inputs for calculating the heatup, cooldown, and ISLH testing P/T limit curves. Thus, the LCO for the rate of change of temperature restricts stresses caused by thermal gradients and also ensures the validity of the P/T limit curves.

The reactor vessel beltline is the most limiting region of the reactor vessel for the determination of P/T limit curves. The P/T curves include a correction for the difference between the pressure at the point of measurement (hot leg or pressurizer) and the reactor vessel beltline. The P/T limits ~~do not~~ include instrument uncertainties, ~~since these uncertainties are insignificant when compared to the margin included in the Reference 1 methods.~~ for pressure and temperature.

Violating the LCO limits places the reactor vessel ~~outside~~ of the bounds of the stress analyses and can increase stresses in other RCPB components. The consequences depend on several factors, as follow:

a. The severity of the departure from the allowable operating P/T regime or the severity of the rate of change of temperature;

b. The length of time the limits were violated (longer violations allow the temperature gradient in the thick vessel walls to become more pronounced); and

c. The existences, sizes, and orientations of flaws in the vessel material.

BASES

LCO (continued)

≤ ~~235~~ 280°F ~~(Unit 1), 270°F (Unit 2)~~. This restraint is to prevent a low temperature overpressure event due to a thermal transient when an RCP is started.

An OPERABLE RCS loop is comprised of an OPERABLE RCP and an OPERABLE SG in accordance with the Steam Generator Tube Surveillance Program, which has the minimum water level specified in SR 3.4.6.2.

Similarly for the RHR System, an OPERABLE RHR loop is comprised of an OPERABLE RHR pump capable of providing forced flow to an OPERABLE RHR heat exchanger. RCPs and RHR pumps are OPERABLE if they are capable of being powered and are able to provide forced flow if required.

APPLICABILITY

In MODE 4, this LCO ensures forced circulation of the reactor coolant to remove decay heat from the core and to provide proper boron mixing. One loop of either RCS or RHR provides sufficient circulation for these purposes. However, two loops consisting of any combination of RCS and RHR loops are required to be OPERABLE to provide redundancy for heat removal.

Operation in other MODES is covered by:

LCO 3.4.4, "RCS Loops—MODES 1 and 2";
LCO 3.4.5, "RCS Loops—MODE 3";
LCO 3.4.7, "RCS Loops—MODE 5, Loops Filled";
LCO 3.4.8, "RCS Loops—MODE 5, Loops Not Filled";
LCO 3.9.5, "Residual Heat Removal (RHR) and Coolant Circulation—High Water Level" (MODE 6); and
LCO 3.9.6, "Residual Heat Removal (RHR) and Coolant Circulation—Low Water Level" (MODE 6).

ACTIONS

A.1

If one required loop is inoperable, redundancy for heat removal is lost. Action must be initiated to restore a second RCS or RHR loop to OPERABLE status. The immediate Completion Time reflects the importance of maintaining the availability of two paths for heat removal.

BASES

LCO (continued)

Utilization of Note 1 is permitted provided the following conditions are met, along with any other conditions imposed by initial startup test procedures:

a. No operations are permitted that would dilute the RCS boron concentration with coolant at boron concentrations less than required to meet the SDM of LCO 3.1.1, therefore maintaining the margin to criticality. Boron reduction with coolant at boron concentrations less than required to assure the SDM is maintained is prohibited because a uniform concentration distribution throughout the RCS cannot be ensured when in natural circulation; and

b. Core outlet temperature is maintained at least 10°F below saturation temperature, so that no vapor bubble may form and possibly cause a natural circulation flow obstruction.

Note 2 allows one RHR loop to be inoperable for a period of up to 2 hours, provided that the other RHR loop is OPERABLE and in operation. This permits periodic surveillance tests to be performed on the inoperable loop during the only time when such testing is safe and possible.

Note 3 requires that the secondary side water temperature of each SG be ≤ 50°F above each of the RCS cold leg temperatures before the start of a reactor coolant pump (RCP) with an RCS cold leg temperature ≤ ~~235~~ 280°F ~~(Unit 1), 270°F (Unit 2)~~. This restriction is to prevent a low temperature overpressure event due to a thermal transient when an RCP is started.

Note 4 provides for an orderly transition from MODE 5 to MODE 4 during a planned heatup by permitting removal of RHR loops from operation when at least one RCS loop is in operation. This Note provides for the transition to MODE 4 where an RCS loop is permitted to be in operation and replaces the RCS circulation function provided by the RHR loops with circulation provided by an RCP.

RHR pumps are OPERABLE if they are capable of being powered and are able to provide flow if required. An OPERABLE SG can perform as a heat sink via natural circulation when it has an adequate water level and is OPERABLE in accordance with the Steam Generator Tube Surveillance Program.

B 3.4 REACTOR COOLANT SYSTEM (RCS)

B 3.4.10 Pressurizer Safety Valves

BASES

BACKGROUND

The pressurizer safety valves provide, in conjunction with the Reactor Protection System, overpressure protection for the RCS. The pressurizer safety valves are totally enclosed pop type, spring loaded, self actuated valves with backpressure compensation. The safety valves are designed to prevent the system pressure from exceeding the system Safety Limit (SL), 2735 psig, which is 110% of the design pressure.

Because the safety valves are totally enclosed and self actuating, they are considered independent components. The relief capacity for each valve, 380,000 lb/hr, is based on postulated overpressure transient conditions resulting from a complete loss of steam flow to the turbine, a locked reactor coolant pump rotor, and reactivity insertion due to control rod withdrawal. The complete loss of steam flow is typically the limiting event. The limiting event results in the maximum surge rate into the pressurizer, which specifies the minimum relief capacity for the safety valves. The discharge flow from the pressurizer safety valves is directed to the pressurizer relief tank. This discharge flow is indicated by an increase in temperature downstream of the pressurizer safety valves, increase in the pressurizer relief tank temperature or level, or by the acoustic monitors located on the relief line.

Overpressure protection is required in MODES 1, 2, 3, 4, and 5; however, in MODE 4, with one or more RCS cold leg temperatures ≤ ~~235~~ 280°F ~~(Unit 1), 270°F (Unit 2)~~, and MODE 5 and MODE 6 with the reactor vessel head on, overpressure protection is provided by operating procedures and by meeting the requirements of LCO 3.4.12, "Low Temperature Overpressure Protection (LTOP) System."

The safety valve pressure tolerance limit is expressed as an average value. 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%. The lift setting is for the ambient conditions associated with MODES 1, 2, and 3. This requires

(continued)

BASES

LCO

The three pressurizer safety valves are set to open at the RCS design pressure (2485 psig), and within the ASME specified tolerance, to avoid exceeding the maximum design pressure SL, to maintain accident analyses assumptions, and to comply with ASME requirements. The safety valve pressure tolerance limit is expressed as an average value. 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%. The limit protected by this Specification is the reactor coolant pressure boundary (RCPB) SL of 110% of design pressure. Inoperability of one or more valves could result in exceeding the SL if a transient were to occur. The consequences of exceeding the ASME pressure limit could include damage to one or more RCS components, increased leakage, or additional stress analysis being required prior to resumption of reactor operation.

APPLICABILITY

In MODES 1, 2, and 3, and portions of MODE 4 above the LTOP ~~arming~~ enabling temperature, OPERABILITY of three valves is required because the combined capacity is required to keep reactor coolant pressure below 110% of its design value during certain accidents. MODE 3 and portions of MODE 4 are conservatively included, although the listed accidents may not require the safety valves for protection.

The LCO is not applicable in MODE 4 when any RCS cold leg temperatures are ≤ ~~235~~ 280°F ~~(Unit 1), 270°F (Unit 2)~~ or in MODE 5 because LTOP is provided. Overpressure protection is not required in MODE 6 with reactor vessel head detensioned.

The Note allows entry into MODES 3 and 4 with the lift settings outside the LCO limits. This permits testing and examination of the safety valves at high pressure and temperature near their normal operating range, but only after the valves have had a preliminary cold setting. The cold setting gives assurance that the valves are OPERABLE near their design condition. This method of testing is not currently used at North Anna, but it is an accepted method. Only one valve at a time may be removed from service for testing. The 54 hour exception is based on 18 hour outage time for each of the three valves. The 18 hour period is derived from industry experience that hot testing can be performed in this timeframe.

BASES

ACTIONS

A.1

With one pressurizer safety valve inoperable, restoration must take place within 15 minutes. The Completion Time of 15 minutes reflects the importance of maintaining the RCS Overpressure Protection System. An inoperable safety valve coincident with an RCS overpressure event could challenge the integrity of the pressure boundary.

B.1 and B.2

If the Required Action of A.1 cannot be met within the required Completion Time or if two or more pressurizer safety valves are inoperable, the unit must be brought to a MODE in which the requirement does not apply. To achieve this status, the unit must be brought to at least MODE 3 within 6 hours and to MODE 4 with any RCS cold leg temperatures ≤ ~~235~~°F ~~(Unit 1), 270°F (Unit 2)~~ within 24 hours. The allowed Completion Times are reasonable, based on operating experience, to reach the required unit conditions from full power conditions in an orderly manner and without challenging unit systems. With any RCS cold leg temperatures at or below ~~235~~°F ~~(Unit 1), 270°F (Unit 2)~~, overpressure protection is provided by the LTOP System. The change from MODE 1, 2, or 3 to MODE 4 reduces the RCS energy (core power and pressure), lowers the potential for large pressurizer insurges, and thereby removes the need for overpressure protection by three pressurizer safety valves.

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SURVEILLANCE REQUIREMENTS

SR 3.4.10.1

SRs are specified in the Inservice Testing Program. Pressurizer safety valves are to be tested in accordance with the requirements of the ASME Code (Ref. 4), which provides the activities and Frequencies necessary to satisfy the SRs. No additional requirements are specified.

The pressurizer safety valve lift setting given in the LCO is for OPERABILITY; however, the valves are reset to ±1% during the Surveillance to allow for drift.

REFERENCES

1. ASME, Boiler and Pressure Vessel Code, Section III.

2. UFSAR, Chapter 15.

3. WCAP-7769, Rev. 1, June 1972.

B 3.4 REACTOR COOLANT SYSTEM (RCS)

B 3.4.12 Low Temperature Overpressure Protection (LTOP) System

BASES

BACKGROUND

The LTOP System controls RCS pressure at low temperatures so the integrity of the reactor coolant pressure boundary (RCPB) is not compromised by violating the LTOP System design basis pressure and temperature (P/T) limit curve (i.e., ~~110%~~ 100 of the isothermal P/T limit curve determined to satisfy the requirements of 10 CFR 50, Appendix G, Ref. 1). The reactor vessel is the limiting RCPB component for demonstrating such protection. This specification provides the maximum allowable actuation logic setpoints for the power operated relief valves (PORVs) and LCO 3.4.3, "RCS Pressure and Temperature (P/T) Limits," provides the maximum RCS pressure for the existing RCS cold leg temperature during cooldown, shutdown, and heatup to meet the Reference 1 requirements during the LTOP MODES.

The reactor vessel material is less tough at low temperatures than at normal operating temperature. As the vessel neutron exposure accumulates, the material toughness decreases and becomes less resistant to pressure stress at low temperatures (Ref. 2). RCS pressure, therefore, is maintained low at low temperatures and is increased only as temperature is increased.

The potential for vessel overpressurization is most acute when the RCS is water solid, occurring only while shutdown; a pressure fluctuation can occur more quickly than an operator can react to relieve the condition. Exceeding the RCS P/T limits by a significant amount could cause brittle cracking of the reactor vessel. LCO 3.4.3, "RCS Pressure and Temperature (P/T) Limits," requires administrative control of RCS pressure and temperature during heatup and cooldown to prevent exceeding the P/T limits.

This LCO provides RCS overpressure protection by limiting coolant input capability and having adequate pressure relief capacity. Limiting coolant input capability requires all but one low head safety injection (LHSI) pump and one charging pump incapable of injection into the RCS and isolating the accumulators when accumulator pressure is greater than the PORV lift setting. The pressure relief capacity requires either two redundant RCS PORVs or a depressurized RCS and an

(continued)

BASES

BACKGROUND

PORV Requirements (continued)

When a PORV is opened in an increasing pressure transient, the release of coolant will cause the pressure increase to slow and reverse. As the PORV releases coolant, the RCS pressure decreases until a reset pressure is reached and the valve is signaled to close. The pressure continues to decrease below the reset pressure as the valve closes.

RCS Vent Requirements

Once the RCS is depressurized, a vent exposed to the containment atmosphere will maintain the RCS within the LTOP design basis P/T limit curve in an RCS overpressure transient, if the relieving requirements of the transient do not exceed the capabilities of the vent. Thus, the vent path must be capable of relieving the flow resulting from the limiting LTOP mass or heat input transient, and maintaining pressure below the LTOP System design basis P/T limit curve. The required vent capacity may be provided by one or more vent paths.

For an RCS vent to meet the flow capacity requirement, it requires removing a pressurizer safety valve, blocking open a PORV and its block valve, or similarly establishing a vent by opening an RCS vent valve. The vent path(s) must be above the level of reactor coolant, so as not to drain the RCS when open.

APPLICABLE SAFETY ANALYSES

Safety analyses (Ref. 3) demonstrate that the reactor vessel is adequately protected against exceeding the LTOP System design basis P/T limit curve (i.e., ~~110%~~ 100 of the isothermal P/T limit curve determined to satisfy the requirements of 10 CFR 50, Appendix G, Ref. 1). In MODES 1, 2, and 3, and in MODE 4 with RCS cold leg temperature exceeding ~~235~~°F 280 ~~(Unit 1), 270°F (Unit 2)~~, the pressurizer safety valves will prevent RCS pressure from exceeding the Reference 1 limits. At ~~235~~°F 280 ~~(Unit 1), 270°F (Unit 2)~~ and below, overpressure prevention falls to two OPERABLE RCS PORVs or to a depressurized RCS and a sufficient sized RCS vent. Each of these means has a limited overpressure relief capability.

The RCS cold leg temperature below which LTOP protection must be provided increases as the reactor vessel material toughness decreases due to neutron embrittlement. Each time the P/T curves are revised, the LTOP System must be

(continued)

BASES

APPLICABLE SAFETY ANALYSES

Heat Input Type Transients (continued)

Reference 3 analyses do not explicitly model actuation of the LHSI pump, since the RCS pressurization resulting from inadvertent safety injection by a single charging pump against a water-solid RCS would not be made more severe by such actuation. Since the LTOP analyses assume that the accumulators do not cause a mass addition transient, when RCS temperature is low, the LCO also requires the accumulators to be isolated when accumulator pressure is greater than the PORV lift setting. The isolated accumulators must have their discharge valves closed and the valve power supply breakers fixed in their open positions.

Fracture mechanics analyses established the temperature of LTOP Applicability at ~~235~~ 220°F ~~(Unit 1), 270°F (Unit 2).~~

The consequences of a small break loss of coolant accident (LOCA) in LTOP MODE 4 conform to 10 CFR 50.46 (Ref. 4), requirements by having a maximum of one LHSI pump and one charging pump OPERABLE.

PORV Performance

The fracture mechanics analyses show that the vessel is protected when the PORVs are set to open at or below the setpoint allowable values limits shown in the LCO. The ~~setpoints~~ are derived by analyses that model the performance of the LTOP System, assuming the limiting LTOP transient of one charging pump injecting into the RCS. These analyses consider pressure overshoot beyond the PORV opening and closing, resulting from signal processing and valve stroke times. The PORV setpoints at or below the derived ~~limit~~ value ensure the RCS pressure at the reactor vessel beltline will not exceed the LTOP design P/T limit curve.

The PORV ~~setpoints~~ setpoint allowable values are evaluated when the P/T limits are modified. The P/T limits are periodically modified as the reactor vessel material toughness decreases due to neutron embrittlement caused by neutron irradiation. Revised limits are determined using neutron fluence projections and the results of examinations of the reactor vessel material irradiation surveillance specimens. The Bases for LCO 3.4.3 discuss these examinations.

The PORVs are considered active components. Thus, the failure of one PORV is assumed to represent the worst case, single active failure.

BASES

APPLICABLE SAFETY ANALYSES (continued)

RCS Vent Performance

With the RCS depressurized, analyses show a vent size of 2.07 square inches is capable of mitigating the allowed LTOP overpressure transient. (A vent size of 2.07 square inches is the equivalent relief capacity of one PORV.) The capacity of a vent this size is greater than the flow of the limiting transient for the LTOP configuration, one LHSI pump and one charging pump OPERABLE, maintaining RCS pressure less than the LTOP design basis P/T limit curve.

The RCS vent size is re-evaluated for compliance each time the P/T limit curves are revised based on the results of the vessel material surveillance.

The RCS vent is passive and is not subject to active failure.

The LTOP System satisfies Criterion 2 of 10 CFR 50.36(c)(2)(ii).

LCO

This LCO requires that the LTOP System is OPERABLE. The LTOP System is OPERABLE when the minimum coolant input and pressure relief capabilities are OPERABLE. Violation of this LCO could lead to the loss of low temperature overpressure mitigation and violation of the LTOP System design basis P/T limit curve (i.e., ~~110%~~ 100 of the isothermal P/T limit curve determined to satisfy the requirements of 10 CFR 50, Appendix G, Ref. 1) ~~as a~~ result of an operational transient.

To limit the coolant input capability, the LCO requires a maximum of one LHSI pump and one charging pump capable of injecting into the RCS and all accumulator discharge isolation valves closed with power removed from the isolation valve operator, when accumulator pressure is greater than the PORV lift setting.

The LCO is modified by two Notes. Note 1 allows two charging pumps to be made capable of injection for ≤ 1 hour during pump swap operations. One hour provides sufficient time to safely complete the actual transfer and to complete the administrative controls and Surveillance requirements associated with the swap. The intent is to minimize the actual time that more than one charging pump is physically capable of injection.

(continued)

BASES

LCO (continued)

Note 2 states that accumulator isolation is only required when the accumulator pressure is more than the PORV lift setting. This Note permits the accumulator discharge isolation valves to be open if the accumulator cannot challenge the LTOP limits.

The elements of the LCO that provide low temperature overpressure mitigation through pressure relief are:

a. Two OPERABLE PORVs; or

A PORV is OPERABLE for LTOP when its block valve is open, its lift setpoint is set to the limits provided in the LCO and testing proves its ability to open at this setpoint, and backup nitrogen motive power is available to the PORVs and their control circuits.

b. A depressurized RCS and an RCS vent.

An RCS vent is OPERABLE when open with an area of ≥ 2.07 square inches.

Each of these methods of overpressure prevention is capable of mitigating the limiting LTOP transient.

APPLICABILITY

This LCO is applicable in MODE 4 when any RCS cold leg temperature is ≤ ~~235~~°F 280 ~~(Unit 1), 270°F (Unit 2)~~, in MODE 5, and in MODE 6 when the reactor vessel head is on. The pressurizer safety valves provide overpressure protection that meets the Reference 1 P/T limits above ~~235~~°F ~~(Unit 1)~~, ~~270°F (Unit 2)~~. When the reactor vessel head is off, 280 overpressurization cannot occur.

LCO 3.4.3 provides the operational P/T limits for all MODES. LCO 3.4.10, "Pressurizer Safety Valves," requires the OPERABILITY of the pressurizer safety valves that provide overpressure protection during MODES 1, 2, and 3, and MODE 4 above ~~235~~°F 280 ~~(Unit 1), 270°F (Unit 2).~~

Low temperature overpressure prevention is most critical during shutdown when the RCS is water solid, and a mass or heat input transient can cause a very rapid increase in RCS pressure when little or no time allows operator action to mitigate the event.

BASES

ACTIONS

A.1 and B.1

With more than one LHSI pump and one charging pump capable of injecting into the RCS, RCS overpressurization is possible.

To immediately initiate action to restore restricted coolant input capability to the RCS reflects the urgency of removing the RCS from this condition.

C.1, C.2, D.1, and D.2

An unisolated accumulator requires isolation immediately. Power available to an accumulator isolation valve operator must be removed in one hour. These ACTIONS are modified by a Note which states the Condition only applies if the accumulator pressure is more than the PORV lift setting.

If isolation is needed and cannot be accomplished, Required Action D.1 and Required Action D.2 provide two options, either of which must be performed in ~~the next 12 hours. By~~ increasing the RCS temperature to > ~~235°F (Unit 1), 270°F (Unit 2),~~ 280 the LCO is no longer Applicable. Depressurizing the accumulators below the PORV lift setting also exits the Condition.

The Completion Times are based on operating experience that these activities can be accomplished in these time periods and on engineering judgement indicating that an event requiring LTOP is not likely in the allowed times.

E.1

In MODE 4 when any RCS cold leg temperature is ≤ ~~235°F (Unit 1), 270°F (Unit 2),~~ 280, with one RCS PORV inoperable, the RCS PORV must be restored to OPERABLE status within a Completion Time of 7 days. Two PORVs are required to provide low temperature overpressure mitigation while withstanding a single failure of an active component.

The Completion Time considers the facts that only one of the PORVs is required to mitigate an overpressure transient and that the likelihood of an active failure of the remaining valve path during this time period is very low.

Attachment 3

Virginia Electric and Power Company
North Anna Power Station Units 1 and 2
Proposed Technical Specification Changes for
Reactor Coolant System Pressure/Temperature Limits
LTOPS Setpoints and LTOPS Enable Temperatures

Proposed Change

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

3.4 REACTOR COOLANT SYSTEM (RCS)

3.4.3 RCS Pressure and Temperature (P/T) Limits

LCO 3.4.3 RCS pressure, RCS temperature, and RCS heatup and cooldown rates shall be maintained within the limits specified in Figures 3.4.3-1 and 3.4.3-2 with:

a. A maximum heatup of 60°F in any one hour period;

b. A maximum cooldown of 100°F in any one hour period; and

c. A maximum temperature change of 10°F in any one hour period during inservice hydrostatic and leak testing operations above the heatup and cooldown limit curves.

APPLICABILITY: At all times.

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. ---------NOTE--------- Required Action A.2 shall be completed whenever this Condition is entered. ---------- Requirements of LCO not met in MODE 1, 2, 3, or 4.	A.1 Restore parameter(s) to within limits.	30 minutes
	AND	
	A.2 Determine RCS is acceptable for continued operation.	72 hours
B. Required Action and associated Completion Time of Condition A not met.	B.1 Be in MODE 3.	6 hours
	AND	
	B.2 Be in MODE 5 with RCS pressure < 500 psig.	36 hours

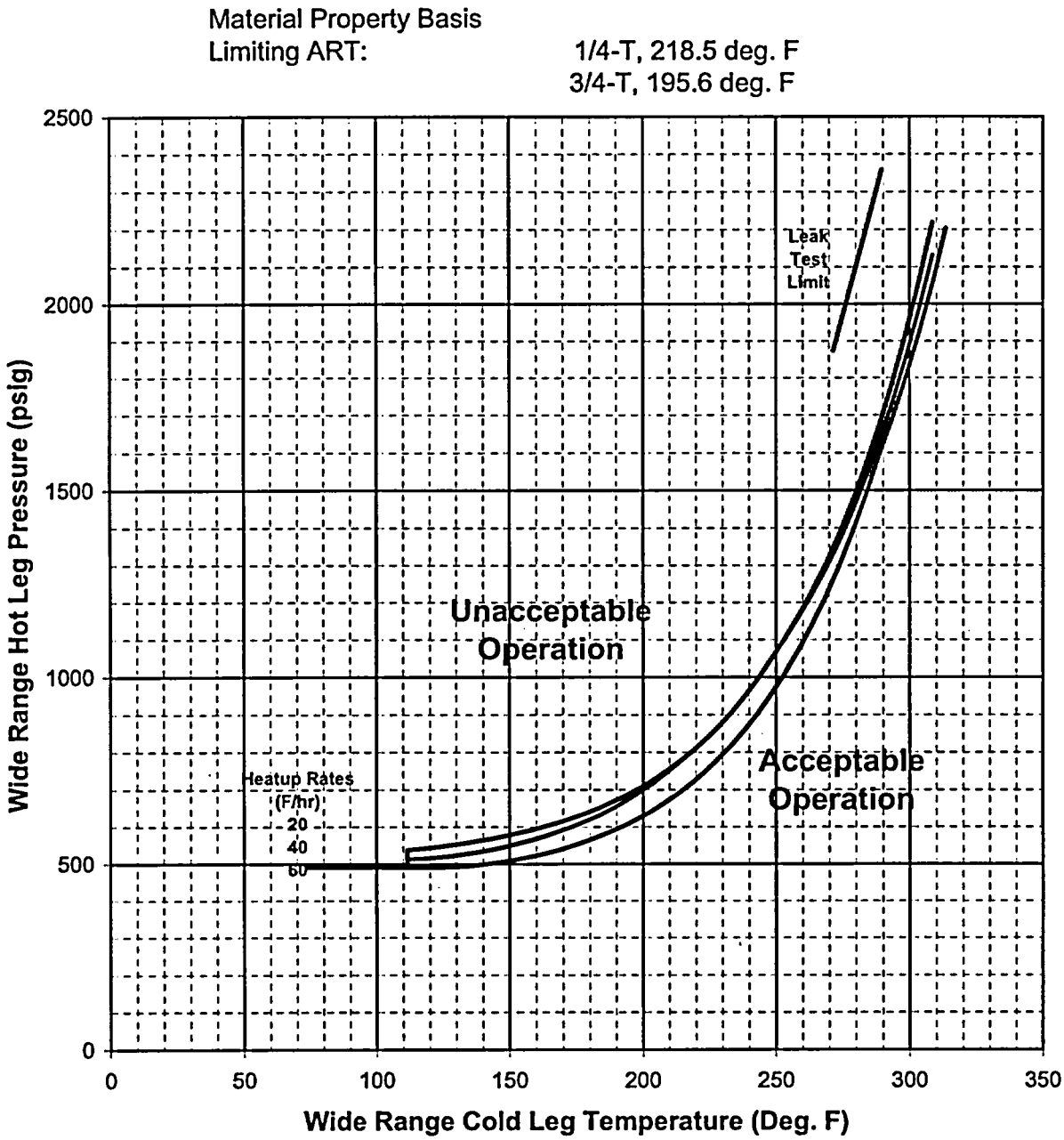

Figure 3.4.3-1 (page 1 of 1)
North Anna Units 1 and 2 Reactor Coolant System Heatup Limitations
(Heatup Rates up to 60°F/hr),
Applicable for the first 50.3 EFPY for Unit 1, and 52.3 EFPY for Unit 2
(Including Margins for Instrumentation Errors)

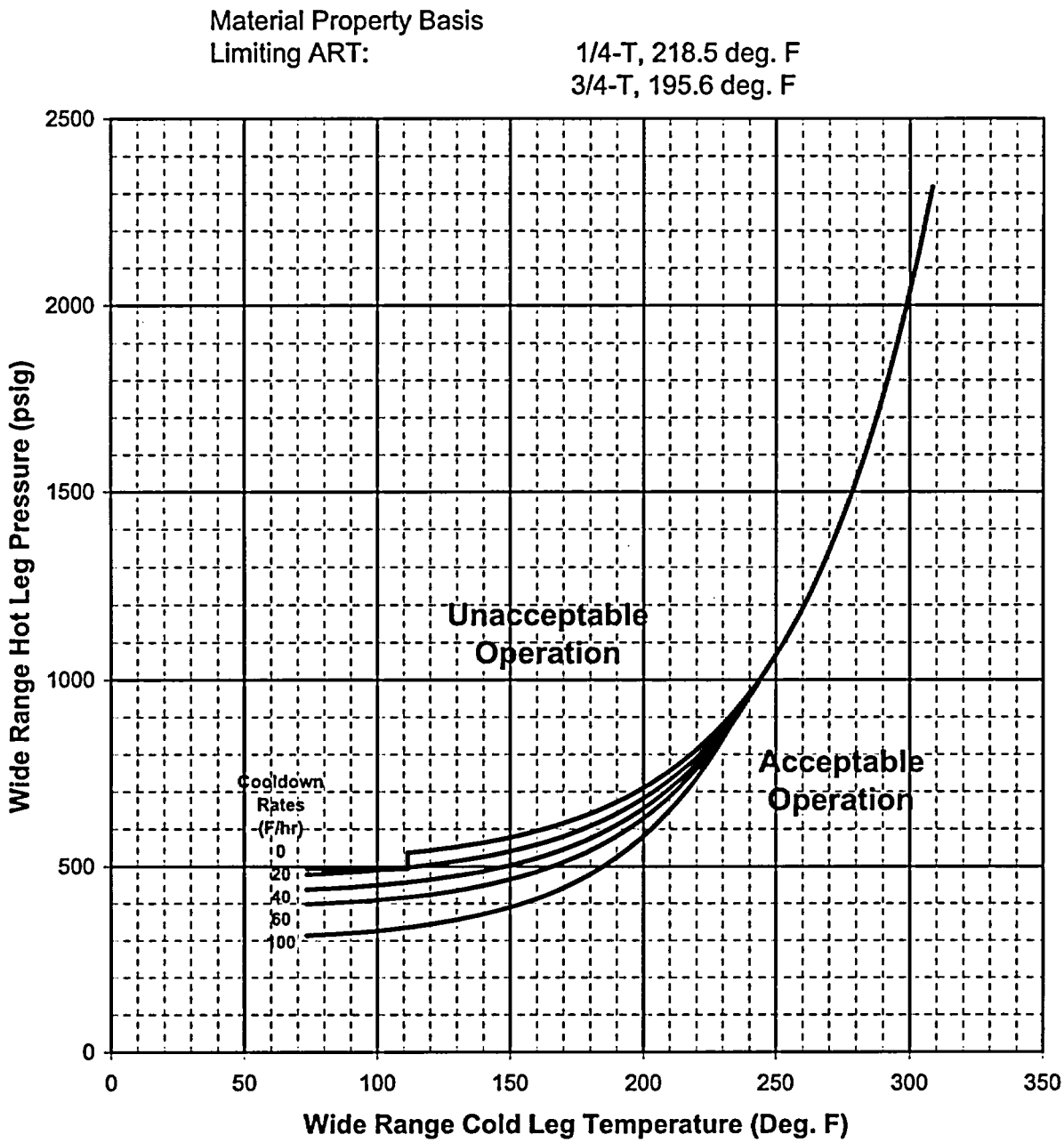

Figure 3.4.3-2 (page 1 of 1)
North Anna Units 1 and 2 Reactor Coolant System Cooldown Limitations
(Cooldown Rates up to 1000°F/hr),
Applicable for the first 50.3 EFPY for Unit 1, and 52.3 EFPY for Unit 2
(Including Margins for Instrumentation Errors)

3.4 REACTOR COOLANT SYSTEM (RCS)

3.4.6 RCS Loops—MODE 4

LCO 3.4.6 Two loops consisting of any combination of RCS loops and residual heat removal (RHR) loops shall be OPERABLE, and one loop shall be in operation.

- - - - - - - - - - - - - - NOTE - - - - - - - - - - - - - -

1. All reactor coolant pumps (RCPs) and RHR pumps may be removed from operation for ≤ 1 hour per 8 hour period provided:

   a. No operations are permitted that would cause introduction into the RCS, coolant with boron concentration less than required to meet SDM of LCO 3.1.1; and

   b. Core outlet temperature is maintained at least 10°F below saturation temperature.

2. No RCP shall be started with any RCS cold leg temperature ≤ 280°F unless the secondary side water temperature of each steam generator (SG) is ≤ 50°F above each of the RCS cold leg temperatures.

- -

APPLICABILITY: MODE 4.

ACTIONS

CONDITION	REQUIRED ACTION		COMPLETION TIME
A. One required loop inoperable.	A.1	Initiate action to restore a second loop to OPERABLE status.	Immediately
	AND		
	A.2	---------NOTE--------- Only required if RHR loop is OPERABLE. ---------- Be in MODE 5.	24 hours

3.4 REACTOR COOLANT SYSTEM (RCS)

3.4.7 RCS Loops—MODE 5, Loops Filled

LCO 3.4.7 One residual heat removal (RHR) loop shall be OPERABLE and in operation, and either:

a. One additional RHR loop shall be OPERABLE; or

b. The secondary side water level of one steam generator (SG) shall be ≥ 17%.

- - - - - - - - - - - - - - NOTE - - - - - - - - - - - - - - -

1. The RHR pump of the loop in operation may be removed from operation for ≤ 1 hour per 8 hour period provided:

   a. No operations are permitted that would cause introduction into the RCS, coolant with boron concentration less than required to meet SDM of LCO 3.1.1; and

   b. Core outlet temperature is maintained at least 10°F below saturation temperature.

2. One required RHR loop may be inoperable for up to 2 hours for surveillance testing provided that the other RHR loop is OPERABLE and in operation.

3. No reactor coolant pump shall be started with one or more RCS cold leg temperatures ≤ 280°F unless the secondary side water temperature of each SG is ≤ 50°F above each of the RCS cold leg temperatures.

4. All RHR loops may be removed from operation during planned heatup to MODE 4 when at least one RCS loop is in operation.

- -

APPLICABILITY: MODE 5 with RCS loops filled.

3.4 REACTOR COOLANT SYSTEM (RCS)

3.4.10 Pressurizer Safety Valves

LCO 3.4.10 Three pressurizer safety valves shall be OPERABLE with lift settings of 2485 psig, +2%/-3% average with no single valve outside ±3%.

APPLICABILITY: MODES 1, 2, and 3,
MODE 4 with all RCS cold leg temperatures > 280°F.

- - - - - - - - - - - - - - NOTE - - - - - - - - - - - - - -

The lift settings are not required to be within the LCO limits during MODES 3 and 4 for the purpose of setting the pressurizer safety valves under ambient (hot) conditions. This exception is allowed for 54 hours following entry into MODE 3 provided a preliminary cold setting was made prior to heatup.

- -

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One pressurizer safety valve inoperable.	A.1 Restore valve to OPERABLE status.	15 minutes
B. Required Action and associated Completion Time not met. OR Two or more pressurizer safety valves inoperable.	B.1 Be in MODE 3. AND B.2 Be in MODE 4 with any RCS cold leg temperatures ≤ 280°F.	6 hours 24 hours

3.4 REACTOR COOLANT SYSTEM (RCS)

3.4.12 Low Temperature Overpressure Protection (LTOP) System

LCO 3.4.12 An LTOP System shall be OPERABLE with a maximum of one charging pump and one low head safety injection (LHSI) pump capable of injecting into the RCS and the accumulators isolated, with power removed from the isolation valve operators, and one of the following pressure relief capabilities:

a. Two power operated relief valves (PORVs) with lift setting allowable values of:

1. ≤ 540 psig when any RCS cold leg temperature ≤ 280°F; and

2. ≤ 375 psig when any RCS cold leg temperature ≤ 180°F.

b. The RCS depressurized and an RCS vent of ≥ 2.07 square inches.

- - - - - - - - - - - - - - NOTES - - - - - - - - - - - - - -

1. Two charging pumps may be made capable of injecting for ≤ 1 hour for pump swapping operations.

2. Accumulator isolation with power removed from the isolation valve operators is only required when accumulator pressure is greater than the PORV lift setting.

- -

APPLICABILITY: MODE 4 when any RCS cold leg temperature is ≤ 280°F,
MODE 5,
MODE 6 when the reactor vessel head is on.

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. Two LHSI pumps capable of injecting into the RCS.	A.1 Initiate action to verify a maximum of one LHSI pump is capable of injecting into the RCS.	Immediately

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
B. Two or more charging pumps capable of injecting into the RCS.	B.1 Initiate action to verify a maximum of one charging pump is capable of injecting into the RCS.	Immediately
C. --------NOTE--------- Only applicable when accumulator pressure is greater than PORV lift setting. ---------- An accumulator not isolated. <u>OR</u> Power available to one or more accumulator isolation valve operators.	C.1 Isolate affected accumulator. <u>AND</u> C.2 Remove power from affected accumulator isolation valve operators.	Immediately 1 hour
D. Required Action and associated Completion Time of Condition C not met.	D.1 Increase RCS cold leg temperature to > 280°F. <u>OR</u> D.2 Depressurize affected accumulator to less than PORV lift setting.	12 hours 12 hours
E. One required PORV inoperable in MODE 4.	E.1 Restore required PORV to OPERABLE status.	7 days
F. One required PORV inoperable in MODE 5 or 6.	F.1 Restore required PORV to OPERABLE status.	24 hours

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.4.12.4	Verify required RCS vent ≥ 2.07 square inches open.	12 hours for unlocked open vent valve(s) AND 31 days for other vent paths
SR 3.4.12.5	Verify PORV block valve is open for each required PORV and PORV keyswitch is in AUTO.	72 hours
SR 3.4.12.6	Verify required PORV backup nitrogen supply pressure is within limit.	7 days
SR 3.4.12.7	----------NOTE---------- Not required to be met until 12 hours after decreasing RCS cold leg temperature to ≤ 280°F. ---------- Perform a COT on each required PORV, excluding actuation.	31 days
SR 3.4.12.8	Perform CHANNEL CALIBRATION for each required PORV actuation channel.	18 months

BASES

LCO

The two elements of this LCO are:

a. The limit curves for heatup, cooldown, and ISLH testing; and

b. Limits on the rate of change of temperature.

The LCO limits apply to all components of the RCS, except the pressurizer. These limits define allowable operating regions and permit a large number of operating cycles while providing a wide margin to nonductile failure.

The limits for the rate of change of temperature control the thermal gradient through the vessel wall and are used as inputs for calculating the heatup, cooldown, and ISLH testing P/T limit curves. Thus, the LCO for the rate of change of temperature restricts stresses caused by thermal gradients and also ensures the validity of the P/T limit curves.

The reactor vessel beltline is the most limiting region of the reactor vessel for the determination of P/T limit curves. The P/T curves include a correction for the difference between the pressure at the point of measurement (hot leg or pressurizer) and the reactor vessel beltline. The P/T limits include instrument uncertainties for pressure and temperature.

Violating the LCO limits places the reactor vessel outside of the bounds of the stress analyses and can increase stresses in other RCPB components. The consequences depend on several factors, as follow:

a. The severity of the departure from the allowable operating P/T regime or the severity of the rate of change of temperature;

b. The length of time the limits were violated (longer violations allow the temperature gradient in the thick vessel walls to become more pronounced); and

c. The existences, sizes, and orientations of flaws in the vessel material.

BASES

LCO (continued)

≤ 280°F. This restraint is to prevent a low temperature overpressure event due to a thermal transient when an RCP is started.

An OPERABLE RCS loop is comprised of an OPERABLE RCP and an OPERABLE SG in accordance with the Steam Generator Tube Surveillance Program, which has the minimum water level specified in SR 3.4.6.2.

Similarly for the RHR System, an OPERABLE RHR loop is comprised of an OPERABLE RHR pump capable of providing forced flow to an OPERABLE RHR heat exchanger. RCPs and RHR pumps are OPERABLE if they are capable of being powered and are able to provide forced flow if required.

APPLICABILITY

In MODE 4, this LCO ensures forced circulation of the reactor coolant to remove decay heat from the core and to provide proper boron mixing. One loop of either RCS or RHR provides sufficient circulation for these purposes. However, two loops consisting of any combination of RCS and RHR loops are required to be OPERABLE to provide redundancy for heat removal.

Operation in other MODES is covered by:

LCO 3.4.4, "RCS Loops—MODES 1 and 2";
LCO 3.4.5, "RCS Loops—MODE 3";
LCO 3.4.7, "RCS Loops—MODE 5, Loops Filled";
LCO 3.4.8, "RCS Loops—MODE 5, Loops Not Filled";
LCO 3.9.5, "Residual Heat Removal (RHR) and Coolant Circulation—High Water Level" (MODE 6); and
LCO 3.9.6, "Residual Heat Removal (RHR) and Coolant Circulation—Low Water Level" (MODE 6).

ACTIONS

A.1

If one required loop is inoperable, redundancy for heat removal is lost. Action must be initiated to restore a second RCS or RHR loop to OPERABLE status. The immediate Completion Time reflects the importance of maintaining the availability of two paths for heat removal.

BASES

LCO (continued)

Utilization of Note 1 is permitted provided the following conditions are met, along with any other conditions imposed by initial startup test procedures:

a. No operations are permitted that would dilute the RCS boron concentration with coolant at boron concentrations less than required to meet the SDM of LCO 3.1.1, therefore maintaining the margin to criticality. Boron reduction with coolant at boron concentrations less than required to assure the SDM is maintained is prohibited because a uniform concentration distribution throughout the RCS cannot be ensured when in natural circulation; and

b. Core outlet temperature is maintained at least 10°F below saturation temperature, so that no vapor bubble may form and possibly cause a natural circulation flow obstruction.

Note 2 allows one RHR loop to be inoperable for a period of up to 2 hours, provided that the other RHR loop is OPERABLE and in operation. This permits periodic surveillance tests to be performed on the inoperable loop during the only time when such testing is safe and possible.

Note 3 requires that the secondary side water temperature of each SG be ≤ 50°F above each of the RCS cold leg temperatures before the start of a reactor coolant pump (RCP) with an RCS cold leg temperature ≤ 280°F. This restriction is to prevent a low temperature overpressure event due to a thermal transient when an RCP is started.

Note 4 provides for an orderly transition from MODE 5 to MODE 4 during a planned heatup by permitting removal of RHR loops from operation when at least one RCS loop is in operation. This Note provides for the transition to MODE 4 where an RCS loop is permitted to be in operation and replaces the RCS circulation function provided by the RHR loops with circulation provided by an RCP.

RHR pumps are OPERABLE if they are capable of being powered and are able to provide flow if required. An OPERABLE SG can perform as a heat sink via natural circulation when it has an adequate water level and is OPERABLE in accordance with the Steam Generator Tube Surveillance Program.

B 3.4 REACTOR COOLANT SYSTEM (RCS)

B 3.4.10 Pressurizer Safety Valves

BASES

BACKGROUND

The pressurizer safety valves provide, in conjunction with the Reactor Protection System, overpressure protection for the RCS. The pressurizer safety valves are totally enclosed pop type, spring loaded, self actuated valves with backpressure compensation. The safety valves are designed to prevent the system pressure from exceeding the system Safety Limit (SL), 2735 psig, which is 110% of the design pressure.

Because the safety valves are totally enclosed and self actuating, they are considered independent components. The relief capacity for each valve, 380,000 lb/hr, is based on postulated overpressure transient conditions resulting from a complete loss of steam flow to the turbine, a locked reactor coolant pump rotor, and reactivity insertion due to control rod withdrawal. The complete loss of steam flow is typically the limiting event. The limiting event results in the maximum surge rate into the pressurizer, which specifies the minimum relief capacity for the safety valves. The discharge flow from the pressurizer safety valves is directed to the pressurizer relief tank. This discharge flow is indicated by an increase in temperature downstream of the pressurizer safety valves, increase in the pressurizer relief tank temperature or level, or by the acoustic monitors located on the relief line.

Overpressure protection is required in MODES 1, 2, 3, 4, and 5; however, in MODE 4, with one or more RCS cold leg temperatures ≤ 280°F, and MODE 5 and MODE 6 with the reactor vessel head on, overpressure protection is provided by operating procedures and by meeting the requirements of LCO 3.4.12, "Low Temperature Overpressure Protection (LTOP) System."

The safety valve pressure tolerance limit is expressed as an average value. 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%. The lift setting is for the ambient conditions associated with MODES 1, 2, and 3. This requires

(continued)

BASES

LCO

The three pressurizer safety valves are set to open at the RCS design pressure (2485 psig), and within the ASME specified tolerance, to avoid exceeding the maximum design pressure SL, to maintain accident analyses assumptions, and to comply with ASME requirements. The safety valve pressure tolerance limit is expressed as an average value. 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%. The limit protected by this Specification is the reactor coolant pressure boundary (RCPB) SL of 110% of design pressure. Inoperability of one or more valves could result in exceeding the SL if a transient were to occur. The consequences of exceeding the ASME pressure limit could include damage to one or more RCS components, increased leakage, or additional stress analysis being required prior to resumption of reactor operation.

APPLICABILITY

In MODES 1, 2, and 3, and portions of MODE 4 above the LTOP enabling temperature, OPERABILITY of three valves is required because the combined capacity is required to keep reactor coolant pressure below 110% of its design value during certain accidents. MODE 3 and portions of MODE 4 are conservatively included, although the listed accidents may not require the safety valves for protection.

The LCO is not applicable in MODE 4 when any RCS cold leg temperatures are ≤ 280°F or in MODE 5 because LTOP is provided. Overpressure protection is not required in MODE 6 with reactor vessel head detensioned.

The Note allows entry into MODES 3 and 4 with the lift settings outside the LCO limits. This permits testing and examination of the safety valves at high pressure and temperature near their normal operating range, but only after the valves have had a preliminary cold setting. The cold setting gives assurance that the valves are OPERABLE near their design condition. This method of testing is not currently used at North Anna, but it is an accepted method. Only one valve at a time may be removed from service for testing. The 54 hour exception is based on 18 hour outage time for each of the three valves. The 18 hour period is derived from industry experience that hot testing can be performed in this timeframe.

BASES

ACTIONS

A.1

With one pressurizer safety valve inoperable, restoration must take place within 15 minutes. The Completion Time of 15 minutes reflects the importance of maintaining the RCS Overpressure Protection System. An inoperable safety valve coincident with an RCS overpressure event could challenge the integrity of the pressure boundary.

B.1 and B.2

If the Required Action of A.1 cannot be met within the required Completion Time or if two or more pressurizer safety valves are inoperable, the unit must be brought to a MODE in which the requirement does not apply. To achieve this status, the unit must be brought to at least MODE 3 within 6 hours and to MODE 4 with any RCS cold leg temperatures ≤ 280°F within 24 hours. The allowed Completion Times are reasonable, based on operating experience, to reach the required unit conditions from full power conditions in an orderly manner and without challenging unit systems. With any RCS cold leg temperatures at or below 280°F, overpressure protection is provided by the LTOP System. The change from MODE 1, 2, or 3 to MODE 4 reduces the RCS energy (core power and pressure), lowers the potential for large pressurizer insurges, and thereby removes the need for overpressure protection by three pressurizer safety valves.

SURVEILLANCE REQUIREMENTS

SR 3.4.10.1

SRs are specified in the Inservice Testing Program. Pressurizer safety valves are to be tested in accordance with the requirements of the ASME Code (Ref. 4), which provides the activities and Frequencies necessary to satisfy the SRs. No additional requirements are specified.

The pressurizer safety valve lift setting given in the LCO is for OPERABILITY; however, the valves are reset to ±1% during the Surveillance to allow for drift.

REFERENCES

1. ASME, Boiler and Pressure Vessel Code, Section III.

2. UFSAR, Chapter 15.

3. WCAP-7769, Rev. 1, June 1972.

B 3.4 REACTOR COOLANT SYSTEM (RCS)

B 3.4.12 Low Temperature Overpressure Protection (LTOP) System

BASES

BACKGROUND

The LTOP System controls RCS pressure at low temperatures so the integrity of the reactor coolant pressure boundary (RCPB) is not compromised by violating the LTOP System design basis pressure and temperature (P/T) limit curve (i.e., 100% of the isothermal P/T limit curve determined to satisfy the requirements of 10 CFR 50, Appendix G, Ref. 1). The reactor vessel is the limiting RCPB component for demonstrating such protection. This specification provides the maximum allowable actuation logic setpoints for the power operated relief valves (PORVs) and LCO 3.4.3, "RCS Pressure and Temperature (P/T) Limits," provides the maximum RCS pressure for the existing RCS cold leg temperature during cooldown, shutdown, and heatup to meet the Reference 1 requirements during the LTOP MODES.

The reactor vessel material is less tough at low temperatures than at normal operating temperature. As the vessel neutron exposure accumulates, the material toughness decreases and becomes less resistant to pressure stress at low temperatures (Ref. 2). RCS pressure, therefore, is maintained low at low temperatures and is increased only as temperature is increased.

The potential for vessel overpressurization is most acute when the RCS is water solid, occurring only while shutdown; a pressure fluctuation can occur more quickly than an operator can react to relieve the condition. Exceeding the RCS P/T limits by a significant amount could cause brittle cracking of the reactor vessel. LCO 3.4.3, "RCS Pressure and Temperature (P/T) Limits," requires administrative control of RCS pressure and temperature during heatup and cooldown to prevent exceeding the P/T limits.

This LCO provides RCS overpressure protection by limiting coolant input capability and having adequate pressure relief capacity. Limiting coolant input capability requires all but one low head safety injection (LHSI) pump and one charging pump incapable of injection into the RCS and isolating the accumulators when accumulator pressure is greater than the PORV lift setting. The pressure relief capacity requires either two redundant RCS PORVs or a depressurized RCS and an

(continued)

BASES

BACKGROUND

PORV Requirements (continued)

When a PORV is opened in an increasing pressure transient, the release of coolant will cause the pressure increase to slow and reverse. As the PORV releases coolant, the RCS pressure decreases until a reset pressure is reached and the valve is signaled to close. The pressure continues to decrease below the reset pressure as the valve closes.

RCS Vent Requirements

Once the RCS is depressurized, a vent exposed to the containment atmosphere will maintain the RCS within the LTOP design basis P/T limit curve in an RCS overpressure transient, if the relieving requirements of the transient do not exceed the capabilities of the vent. Thus, the vent path must be capable of relieving the flow resulting from the limiting LTOP mass or heat input transient, and maintaining pressure below the LTOP System design basis P/T limit curve. The required vent capacity may be provided by one or more vent paths.

For an RCS vent to meet the flow capacity requirement, it requires removing a pressurizer safety valve, blocking open a PORV and its block valve, or similarly establishing a vent by opening an RCS vent valve. The vent path(s) must be above the level of reactor coolant, so as not to drain the RCS when open.

APPLICABLE SAFETY ANALYSES

Safety analyses (Ref. 3) demonstrate that the reactor vessel is adequately protected against exceeding the LTOP System design basis P/T limit curve (i.e., 100% of the isothermal P/T limit curve determined to satisfy the requirements of 10 CFR 50, Appendix G, Ref. 1). In MODES 1, 2, and 3, and in MODE 4 with RCS cold leg temperature exceeding 280°F, the pressurizer safety valves will prevent RCS pressure from exceeding the Reference 1 limits. At 280°F and below, overpressure prevention falls to two OPERABLE RCS PORVs or to a depressurized RCS and a sufficient sized RCS vent. Each of these means has a limited overpressure relief capability.

The RCS cold leg temperature below which LTOP protection must be provided increases as the reactor vessel material toughness decreases due to neutron embrittlement. Each time the P/T curves are revised, the LTOP System must be

(continued)

BASES

APPLICABLE SAFETY ANALYSES

Heat Input Type Transients (continued)

Reference 3 analyses do not explicitly model actuation of the LHSI pump, since the RCS pressurization resulting from inadvertent safety injection by a single charging pump against a water-solid RCS would not be made more severe by such actuation. Since the LTOP analyses assume that the accumulators do not cause a mass addition transient, when RCS temperature is low, the LCO also requires the accumulators to be isolated when accumulator pressure is greater than the PORV lift setting. The isolated accumulators must have their discharge valves closed and the valve power supply breakers fixed in their open positions.

Fracture mechanics analyses established the temperature of LTOP Applicability at 280°F.

The consequences of a small break loss of coolant accident (LOCA) in LTOP MODE 4 conform to 10 CFR 50.46 (Ref. 4), requirements by having a maximum of one LHSI pump and one charging pump OPERABLE.

PORV Performance

The fracture mechanics analyses show that the vessel is protected when the PORVs are set to open at or below the allowable values shown in the LCO. The setpoint allowable values are derived by analyses that model the performance of the LTOP System, assuming the limiting LTOP transient of one charging pump injecting into the RCS. These analyses consider pressure overshoot beyond the PORV opening and closing, resulting from signal processing and valve stroke times. The PORV setpoints at or below the derived value ensure the RCS pressure at the reactor vessel beltline will not exceed the LTOP design P/T limit curve.

The PORV setpoint allowable values are evaluated when the P/T limits are modified. The P/T limits are periodically modified as the reactor vessel material toughness decreases due to neutron embrittlement caused by neutron irradiation. Revised limits are determined using neutron fluence projections and the results of examinations of the reactor vessel material irradiation surveillance specimens. The Bases for LCO 3.4.3 discuss these examinations.

The PORVs are considered active components. Thus, the failure of one PORV is assumed to represent the worst case, single active failure.

BASES

APPLICABLE SAFETY ANALYSES (continued)

RCS Vent Performance

With the RCS depressurized, analyses show a vent size of 2.07 square inches is capable of mitigating the allowed LTOP overpressure transient. (A vent size of 2.07 square inches is the equivalent relief capacity of one PORV.) The capacity of a vent this size is greater than the flow of the limiting transient for the LTOP configuration, one LHSI pump and one charging pump OPERABLE, maintaining RCS pressure less than the LTOP design basis P/T limit curve.

The RCS vent size is re-evaluated for compliance each time the P/T limit curves are revised based on the results of the vessel material surveillance.

The RCS vent is passive and is not subject to active failure.

The LTOP System satisfies Criterion 2 of 10 CFR 50.36(c)(2)(ii).

LCO

This LCO requires that the LTOP System is OPERABLE. The LTOP System is OPERABLE when the minimum coolant input and pressure relief capabilities are OPERABLE. Violation of this LCO could lead to the loss of low temperature overpressure mitigation and violation of the LTOP System design basis P/T limit curve (i.e., 100% of the isothermal P/T limit curve determined to satisfy the requirements of 10 CFR 50, Appendix G, Ref. 1) as a result of an operational transient.

To limit the coolant input capability, the LCO requires a maximum of one LHSI pump and one charging pump capable of injecting into the RCS and all accumulator discharge isolation valves closed with power removed from the isolation valve operator, when accumulator pressure is greater than the PORV lift setting.

The LCO is modified by two Notes. Note 1 allows two charging pumps to be made capable of injection for ≤ 1 hour during pump swap operations. One hour provides sufficient time to safely complete the actual transfer and to complete the administrative controls and Surveillance requirements associated with the swap. The intent is to minimize the actual time that more than one charging pump is physically capable of injection.

(continued)

BASES

LCO (continued)

Note 2 states that accumulator isolation is only required when the accumulator pressure is more than the PORV lift setting. This Note permits the accumulator discharge isolation valves to be open if the accumulator cannot challenge the LTOP limits.

The elements of the LCO that provide low temperature overpressure mitigation through pressure relief are:

a. Two OPERABLE PORVs; or

A PORV is OPERABLE for LTOP when its block valve is open, its lift setpoint is set to the limits provided in the LCO and testing proves its ability to open at this setpoint, and backup nitrogen motive power is available to the PORVs and their control circuits.

b. A depressurized RCS and an RCS vent.

An RCS vent is OPERABLE when open with an area of ≥ 2.07 square inches.

Each of these methods of overpressure prevention is capable of mitigating the limiting LTOP transient.

APPLICABILITY

This LCO is applicable in MODE 4 when any RCS cold leg temperature is ≤ 280°F, in MODE 5, and in MODE 6 when the reactor vessel head is on. The pressurizer safety valves provide overpressure protection that meets the Reference 1 P/T limits above 280°F. When the reactor vessel head is off, overpressurization cannot occur.

LCO 3.4.3 provides the operational P/T limits for all MODES. LCO 3.4.10, "Pressurizer Safety Valves," requires the OPERABILITY of the pressurizer safety valves that provide overpressure protection during MODES 1, 2, and 3, and MODE 4 above 280°F.

Low temperature overpressure prevention is most critical during shutdown when the RCS is water solid, and a mass or heat input transient can cause a very rapid increase in RCS pressure when little or no time allows operator action to mitigate the event.

BASES

ACTIONS

A.1 and B.1

With more than one LHSI pump and one charging pump capable of injecting into the RCS, RCS overpressurization is possible.

To immediately initiate action to restore restricted coolant input capability to the RCS reflects the urgency of removing the RCS from this condition.

C.1, C.2, D.1, and D.2

An unisolated accumulator requires isolation immediately. Power available to an accumulator isolation valve operator must be removed in one hour. These ACTIONS are modified by a Note which states the Condition only applies if the accumulator pressure is more than the PORV lift setting.

If isolation is needed and cannot be accomplished, Required Action D.1 and Required Action D.2 provide two options, either of which must be performed in the next 12 hours. By increasing the RCS temperature to > 280°F, the LCO is no longer Applicable. Depressurizing the accumulators below the PORV lift setting also exits the Condition.

The Completion Times are based on operating experience that these activities can be accomplished in these time periods and on engineering judgement indicating that an event requiring LTOP is not likely in the allowed times.

E.1

In MODE 4 when any RCS cold leg temperature is ≤ 280°F, with one RCS PORV inoperable, the RCS PORV must be restored to OPERABLE status within a Completion Time of 7 days. Two PORVs are required to provide low temperature overpressure mitigation while withstanding a single failure of an active component.

The Completion Time considers the facts that only one of the PORVs is required to mitigate an overpressure transient and that the likelihood of an active failure of the remaining valve path during this time period is very low.

Attachment 4

Virginia Electric and Power Company
North Anna Power Station Units 1 and 2
Proposed Technical Specification Changes for
Reactor Coolant System Pressure/Temperature Limits
LTOPS Setpoints and LTOPS Enable Temperatures

Significant Hazards Consideration Determination

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

Significant Hazards Consideration Determination

Virginia Electric and Power Company (Dominion) has reviewed the requirements of 10 CFR 50.92 as relate to the proposed changes for the North Anna Units 1 and 2 Technical Specifications, and determined that a Significant Hazards Consideration is not involved. The proposed amendments to the North Anna Units 1 and 2 Technical Specifications modify the Reactor Coolant System (RCS) pressure/temperature (P/T) limit curves, LTOPS setpoint allowable values, LTOPS T_{enable} values and extend the cumulative core burnup applicability limits for the Low Temperature Overpressure Protection System (LTOPS). The proposed P/T limit curves, LTOPS setpoint allowable values, and LTOPS T_{enable} values are valid to cumulative core burnups of 50.3 EFPY and 52.3 EFPY for North Anna Units 1 and 2, respectively.

The following is provided to support this conclusion that the proposed changes do not create a significant hazards consideration.

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

   The proposed changes modify the North Anna Units 1 and 2 RCS P/T limit curves, LTOPS setpoint allowable values, LTOPS T_{enable} and extend the cumulative core burnup applicability limits for the LTOPS. The allowable operating pressures and temperatures under the proposed RCS P/T limit curves are not significantly different from those allowed under the existing Technical Specification P/T limits. The revisions in the values for the LTOPS setpoint allowable values and LTOPS T_{enable} values do not significantly change the plant operating space. No changes to plant systems, structures or components are proposed, and no new operating modes are established. The P/T limits, LTOPS setpoint allowable values, and T_{enable} values do not contribute to the probability of occurrence or consequences of accidents previously analyzed. The revised licensing basis analyses utilize acceptable analytical methods, and continue to demonstrate that established accident analysis acceptance criteria are met. Therefore, there is no increase in the probability or consequences of any accident previously evaluated.

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

   The proposed changes modify the North Anna Units 1 and 2 RCS P/T limit curves, LTOPS setpoint allowable values, LTOPS T_{enable} values and extend the cumulative core burnup applicability limits for the LTOPS. The allowable operating pressures and temperatures under the proposed RCS P/T limit curves are not significantly different from those allowed under the existing Technical Specification P/T limits. No changes to plant systems, structures or components are proposed, and no new operating modes are established. Therefore, the

proposed changes do not create the possibility of any accident or malfunction of a different type previously evaluated.

3. Does the change involve a significant reduction in the margin of safety?

The proposed revised RCS P/T limit curves, LTOPS setpoint allowable values, and LTOPS T_{enable} analysis bases do not involve a significant reduction in the margin of safety for these parameters. The effects of RCS pressure and temperature measurement uncertainty continue to be considered in the supporting analyses. The proposed revised RCS P/T limit curves are valid to cumulative core burnups of 50.3 EFPY and 52.3 EFPY for North Anna Units 1 and 2 respectively. The proposed revised LTOPS setpoint allowable values and T_{enable} analyses support these same cumulative core burnup limits. The analyses demonstrate that established analysis acceptance criteria continue to be met. Specifically, the proposed P/T limit curves, LTOPS setpoint allowable values and LTOPS T_{enable} values provide acceptable margin to vessel fracture under both normal operation and LTOPS design basis (mass addition and heat addition) accident conditions. Therefore, the proposed changes do not result in a significant reduction in margin of safety.