

VIRGINIA ELECTRIC AND POWER COMPANY
RICHMOND, VIRGINIA 23261

March 22, 2001

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

Serial No. 01-168
NL&OS/GSS/ETS R0
Docket Nos. 50-338
50-339
License Nos. NPF-4
NPF-7

Gentlemen:

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

By letters dated June 22, 2000 and January 4, 2001, Virginia Electric and Power Company (Dominion) submitted a Technical Specification Change Request (TSCR) involving the Reactor Coolant System (RCS) Pressure/Temperature (P/T) operating limits, the Low Temperature Overpressure Protection System (LTOPS) setpoints, and the LTOPS enable temperature. During a teleconference on Monday, February 26, 2001, Westinghouse informed Dominion and the NRC of a computer code error that affects this TSCR. The net effect of the computer code error is a slight non-conservatism in the high temperature region of the heatup curves previously submitted.

This submittal addresses the computer code error by revising the proposed North Anna Units 1 and 2 Technical Specification RCS P/T limit curves applicable to heatup (i.e., North Anna Units 1 and 2 Technical Specification Figures 3.4-2). The heatup curves documented herein replace those previously provided in our letter of January 4, 2001. The LTOPS setpoint analysis previously submitted is unaffected by the changes to the heatup curves, since the LTOPS setpoint analysis uses the isothermal P/T limit curve as a design limit. Similarly, the LTOPS enable temperature analysis previously submitted is unaffected by the changes to the heatup curves, since the proposed LTOPS enable temperature is a function of the design value of RT_{NDT} only, which is unaffected by the changes to the heatup curves. The previously submitted cooldown curves are unaffected by this computer code error. Therefore, with the exception of the previously proposed Technical Specification RCS P/T limit curves applicable to heatup, the previously submitted Technical Specification change request remains valid. Please substitute the attached revised RCS P/T limit heatup curves for those provided in our January 4, 2001 submittal to complete your review.

A001

We have evaluated the revised proposed changes and have determined that they do not impact the significant hazards consideration determination provided in our letter dated January 4, 2001 (Serial No. 01-020). We have also determined that operation with the revised proposed changes will not result in any significant increases in the amounts of effluents that may be released offsite and in any significant increases in individual or cumulative occupational radiation exposure. Therefore, the proposed amendment remains eligible for categorical exclusion as set forth in 10 CFR 51.22(c)(9). Pursuant to 10 CFR 51.22(b), no environmental impact statement or environmental assessment is needed in connection with the approval of the proposed changes.

The revised cumulative core burnup applicability limit of 17.2 EFPY for the North Anna Unit 1 P/T limits, LTOPS setpoints, and LTOPS enable temperature is predicted to be reached on May 15, 2001. North Anna Unit 2 is predicted to reach the cumulative core burnup applicability limit for the Technical Specification P/T limits, LTOPS setpoints, and LTOPS enable temperature in September 2001. Therefore, we request approval of the proposed Technical Specification changes, associated bases, and exemption requests by mid-April 2001 in order to facilitate an orderly implementation of the changes into plant equipment and procedures and provide training by the existing May 15, 2001 limit date.

If you have any further questions or require additional information, please contact us.

Very truly yours,



William R. Matthews
Vice President Nuclear Operations

Attachments:

Attachment 1	Discussion of Change
Attachment 2	Mark-up of Units 1 and 2 Technical Specifications Changes
Attachment 3	Proposed Units 1 and 2 Technical Specifications Changes

Commitments made in this letter:

1. There are no commitments in this letter

cc: U.S. Nuclear Regulatory Commission
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Attachment 1
Discussion of Change

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

Background

During a teleconference on Monday, February 26, 2001, Westinghouse informed Dominion and the NRC of a computer code error that adversely affected the Reactor Coolant System (RCS) pressure/temperature (P/T) limits used in the North Anna Units 1 and 2 RCS P/T limits Technical Specification Change Request (TSCR) [1] [2]. The Westinghouse OPERLIM computer code calculates RCS P/T limits by calculating the combined pressure and thermal stresses in the reactor vessel during normal operation heatup and cooldown. According to Westinghouse, the computer code was modified to incorporate changes associated with the 1996 Addenda to ASME Section XI Appendix G, including separate membrane (i.e., "pressure") stress formulations for the 1/4-thickness (1/4-T) and 3/4-thickness (3/4-T) reactor vessel locations. During heatup conditions, it is possible for the location of limiting combined stresses to change from the 3/4-T location to the 1/4-T location. Although the computer code modifications were intended to account for this situation, the computer code did not include correct logic to switch the membrane stress formulation from that which applies at the 3/4-T location to that which applies at the 1/4-T location when the location of limiting stresses changes from the 3/4-T location to the 1/4-T location. The net effect of this error is a slight non-conservatism in the high temperature region of the heatup curves generated for the TSCR described above.

Discussion of Changes

Westinghouse has provided corrected design basis P/T limit curves applicable to heatup for North Anna Units 1 and 2. (See Appendix A of this document. Changed values relative to the Reference [2] submittal, are presented in bold.) These curves were developed with the same design inputs as those used in the development of the end-of-license-extension heatup curves in WCAP-15112 Revision 1 [3]. The Appendix A curves supersede the end-of-license-extension heatup curves presented in WCAP-15112 Revision 1 [3]. Dominion has modified these curves 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). An allowance of 70 psi was applied to accommodate the Channel Statistical Accuracy (CSA) for Wide Range RCS pressure measurement. An allowance of 13.5°F was applied to accommodate the CSA for Wide Range RCS temperature measurement. Finally, an allowance of 10 psi has been applied to accommodate the pressure difference between the point of measurement (RCS hot leg) and the point of interest (reactor vessel beltline). These CSA and measurement location bias values are unchanged from those previously applied in Reference [2]. The resulting proposed revised North Anna Units 1 and 2 Technical Specification P/T limit curves applicable to heatup are presented in Appendix B of this document.

Changes to North Anna Units 1 and 2 Technical Specifications

Revised North Anna Units 1 and 2 Technical Specification RCS P/T limits applicable to heatup (i.e., North Anna Units 1 and 2 Technical Specification Figures 3.4-2) were proposed in Reference [2]. The RCS P/T limits applicable to heatup presented in Appendix B replace those previously

proposed in Reference [2]. This replacement corrects the error introduced into the previously proposed curves by the computer code error described above.

Conclusions

This submittal provides revised proposed North Anna Units 1 and 2 Technical Specification RCS P/T limit curves applicable to heatup (i.e., North Anna Units 1 and 2 Technical Specification Figures 3.4-2). The revised proposed Technical Specification heatup curves documented herein replace the heatup curves previously provided in Reference [2]. The proposed revised heatup curves have been corrected to address the Westinghouse OPERLIM computer code error described above. The curves have been modified to include allowances for temperature and pressure measurement instrument uncertainties, and for the pressure difference between the point of measurement (RCS hot leg) and the point of interest (reactor vessel beltline).

The LTOPS setpoint analysis presented in Reference [2] is unaffected by the changes to the heatup curves, since the LTOPS setpoint analysis uses the isothermal P/T limit curve as a design limit. Similarly, the LTOPS enable temperature analysis presented in Reference [2] is unaffected by the changes to the heatup curves, since the proposed LTOPS enable temperature is a function of the design value of RT_{NDT} only, which is unaffected by the changes to the heatup curves. Only the proposed Technical Specification RCS P/T limit curves applicable to heatup are affected by the changes described herein. Therefore, with the exception of the previously proposed Technical Specification heatup curves presented in Reference [2], the TSCR presented in Reference [1] and supplemented in Reference [2] remains valid.

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 10 CFR 50.60(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, Requests for Exemption per 10 CFR 50.60(b), Reactor Coolant System Pressure/Temperature Limits, LTOPS Setpoints, and LTOPS Enable Temperatures," Serial No. 01-020, dated January 4, 2001.
- [3] WCAP-15112, Revision 1, "North Anna Units 1 and 2 WOG Reactor Vessel 60-Year Evaluation Minigroup Heatup and Cooldown Limit Curves for Normal Operation," dated October, 1998.

Appendix A

Revised P/T Limit Curves Applicable to Heatup
For North Anna Units 1 and 2
(Unmodified for Instrument Uncertainties or Measurement Location Bias)

Table 1 | North Anna Units 1 and 2 Heatup Data with Margins of 0 Degrees F and 0 psi for Instrumentation Errors (VRA-01-012 * -- Correction to data previously provided in WCAP-15112 Rev. 1)

Heatup Rate = 20 Deg. F/hr		
	Indicated Temperature (Deg. F)	Indicated Pressure (psig)
1	60	621
2	65	621
3	85	621
4	90	621
5	95	621
6	98	621
7	98	664
8	100	666
9	105	670
10	110	674
11	115	679
12	120	684
13	125	690
14	130	696
15	135	703
16	140	711
17	145	719
18	150	729
19	155	739
20	160	751
21	165	764
22	170	778
23	175	794
24	180	811
25	185	830
26	190	851
27	195	875
28	200	901
29	205	929
30	210	961
31	215	995
32	220	1034
33	225	1077
34	230	1124
35	235	1176
36	240	1233
37	245	1291
38	250	1356
39	255	1427
40	260	1506
41	265	1593
42	270	1690
43	275	1796
44	280	1913
45	285	2043
46	290	2187
47	295	2345

Heatup Rate = 40 Deg. F/hr		
	Indicated Temperature (Deg. F)	Indicated Pressure (psig)
1	60	621
2	65	621
3	85	621
4	90	621
5	95	621
6	98	621
7	98	640
8	100	640
9	105	642
10	110	645
11	115	649
12	120	654
13	125	660
14	130	666
15	135	674
16	140	683
17	145	692
18	150	703
19	155	715
20	160	728
21	165	743
22	170	759
23	175	777
24	180	797
25	185	819
26	190	843
27	195	870
28	200	900
29	205	929
30	210	961
31	215	995
32	220	1034
33	225	1077
34	230	1124
35	235	1176
36	240	1233
37	245	1289
38	250	1349
39	255	1415
40	260	1487
41	265	1567
42	270	1656
43	275	1754
44	280	1862
45	285	1981
46	290	2113
47	295	2258

Heatup Rate = 60 Deg. F/hr		
	Indicated Temperature (Deg. F)	Indicated Pressure (psig)
1	60	618
2	65	618
3	85	618
4	90	618
5	95	618
6	100	618
7	105	618
8	110	618
9	115	619
10	120	621
11	125	624
12	130	629
13	135	634
14	140	640
15	145	647
16	150	656
17	155	665
18	160	676
19	165	688
20	170	701
21	175	716
22	180	732
23	185	751
24	190	771
25	195	793
26	200	818
27	205	846
28	210	876
29	215	910
30	220	947
31	225	988
32	230	1033
33	235	1083
34	240	1138
35	245	1199
36	250	1266
37	255	1340
38	260	1422
39	265	1513
40	270	1613
41	275	1719
42	280	1818
43	285	1928
44	290	2049
45	295	2183
46	300	2330

* Letter from M. P. Osborne (Westinghouse) to J. R. Harrell (Dominion), "Virginia Power, North Anna Power Station Units 1 & 2, Retrieval of Data for Heatup and Cooldown Curves Documented in WCAP-15112, Rev. 1," Serial No. VRA-01-012, dated March 1, 2001.

Appendix B

Revised P/T Limit Curves Applicable to Heatup

For North Anna Units 1 and 2

(Modified to Accommodate Instrument Uncertainties and Measurement Location Bias)

Table 2 | North Anna Units 1 and 2 Heatup Data with Margins of 13.5 Degrees F and 70 psi for Instrumentation Errors (VRA-01-012 *, Modified – Correction to data previously provided in WCAP-15112 Rev. 1)

Heatup Rate = 20 Deg. F/hr			Heatup Rate = 40 Deg. F/hr			Heatup Rate = 60 Deg. F/hr		
	Indicated Temperature (Deg. F)	Indicated Pressure (psig)		Indicated Temperature (Deg. F)	Indicated Pressure (psig)		Indicated Temperature (Deg. F)	Indicated Pressure (psig)
1	73.5	540.90	1	73.5	540.90	1	73.5	537.90
2	78.5	540.90	2	78.5	540.90	2	78.5	537.90
3	98.5	540.90	3	98.5	540.90	3	98.5	537.90
4	103.5	540.90	4	103.5	540.90	4	103.5	537.90
5	108.5	540.90	5	108.5	540.90	5	108.5	537.90
6	111.5	540.90	6	111.5	540.90	6	113.5	537.90
7	111.5	583.90	7	111.5	559.90	7	118.5	537.90
8	113.5	585.90	8	113.5	559.90	8	123.5	537.90
9	118.5	589.90	9	118.5	561.90	9	128.5	538.90
10	123.5	593.90	10	123.5	564.90	10	133.5	540.90
11	128.5	598.90	11	128.5	568.90	11	138.5	543.90
12	133.5	603.90	12	133.5	573.90	12	143.5	548.90
13	138.5	609.90	13	138.5	579.90	13	148.5	553.90
14	143.5	615.90	14	143.5	585.90	14	153.5	559.90
15	148.5	622.90	15	148.5	593.90	15	158.5	566.90
16	153.5	630.90	16	153.5	602.90	16	163.5	575.90
17	158.5	638.90	17	158.5	611.90	17	168.5	584.90
18	163.5	648.90	18	163.5	622.90	18	173.5	595.90
19	168.5	658.90	19	168.5	634.90	19	178.5	607.90
20	173.5	670.90	20	173.5	647.90	20	183.5	620.90
21	178.5	683.90	21	178.5	662.90	21	188.5	635.90
22	183.5	697.90	22	183.5	678.90	22	193.5	651.90
23	188.5	713.90	23	188.5	696.90	23	198.5	670.90
24	193.5	730.90	24	193.5	716.90	24	203.5	690.90
25	198.5	749.90	25	198.5	738.90	25	208.5	712.90
26	203.5	770.90	26	203.5	762.90	26	213.5	737.90
27	208.5	794.90	27	208.5	789.90	27	218.5	765.90
28	213.5	820.90	28	213.5	819.90	28	223.5	795.90
29	218.5	848.90	29	218.5	848.90	29	228.5	829.90
30	223.5	880.90	30	223.5	880.90	30	233.5	866.90
31	228.5	914.90	31	228.5	914.90	31	238.5	907.90
32	233.5	953.90	32	233.5	953.90	32	243.5	952.90
33	238.5	996.90	33	238.5	996.90	33	248.5	1002.90
34	243.5	1043.90	34	243.5	1043.90	34	253.5	1057.90
35	248.5	1095.90	35	248.5	1095.90	35	258.5	1118.90
36	253.5	1152.90	36	253.5	1152.90	36	263.5	1185.90
37	258.5	1210.90	37	258.5	1208.90	37	268.5	1259.90
38	263.5	1275.90	38	263.5	1268.90	38	273.5	1341.90
39	268.5	1346.90	39	268.5	1334.90	39	278.5	1432.90
40	273.5	1425.90	40	273.5	1406.90	40	283.5	1532.90
41	278.5	1512.90	41	278.5	1486.90	41	288.5	1638.90
42	283.5	1609.90	42	283.5	1575.90	42	293.5	1737.90
43	288.5	1715.90	43	288.5	1673.90	43	298.5	1847.90
44	293.5	1832.90	44	293.5	1781.90	44	303.5	1968.90
45	298.5	1962.90	45	298.5	1900.90	45	308.5	2102.90
46	303.5	2106.90	46	303.5	2032.90	46	313.5	2249.90
47	308.5	2264.90	47	308.5	2177.90			

* Letter from M. P. Osborne (Westinghouse) to J. R. Harrell (Dominion), "Virginia Power, North Anna Power Station Units 1 & 2, Retrieval of Data for Heatup and Cooldown Curves Documented in WCAP-15112, Rev. 1," Serial No. VRA-01-012, dated March 1, 2001.

Attachment 2

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

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

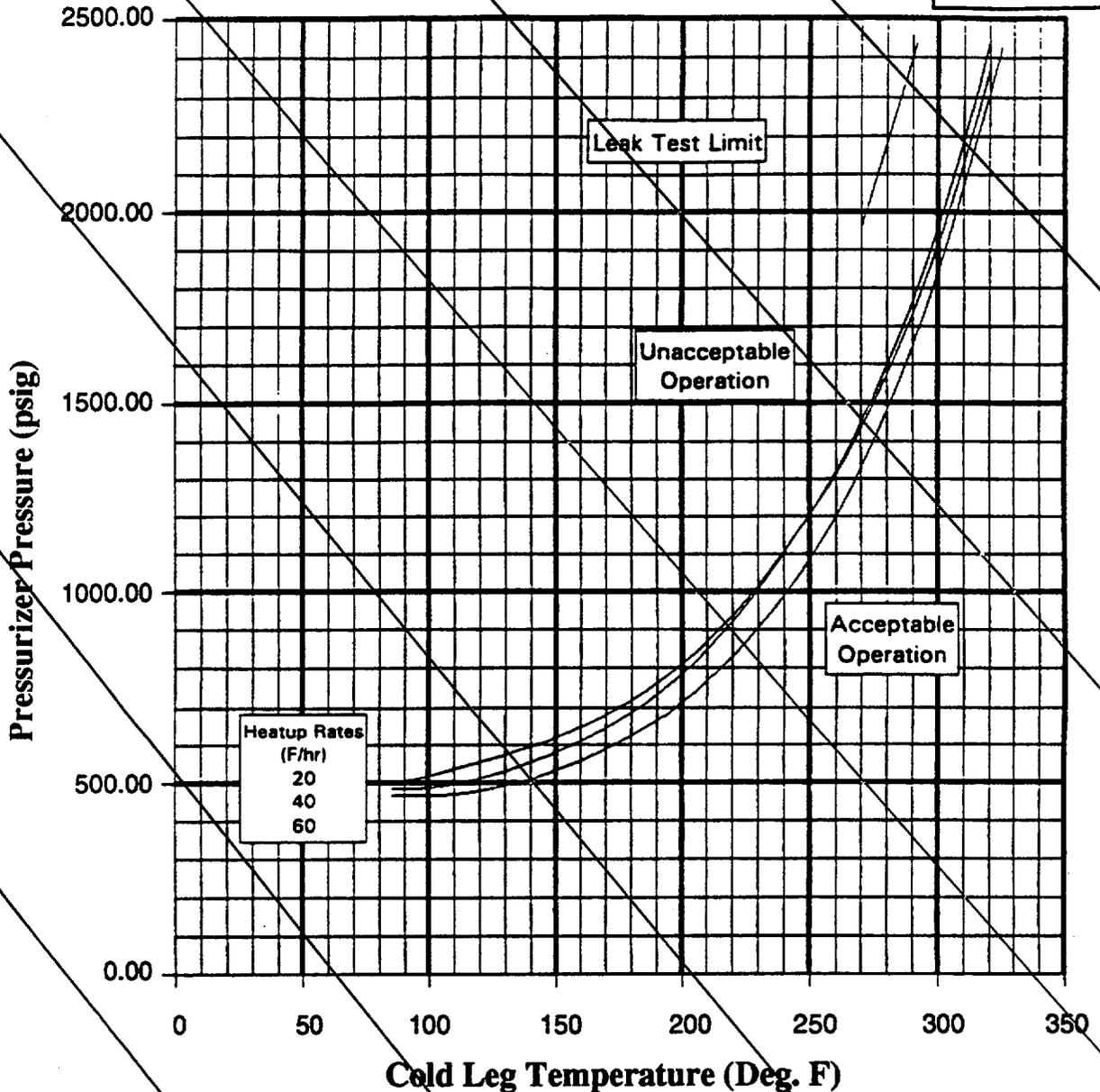
Replace w/new Figure 3.4-2

10-05-94

Figure 3.4-2 — North Anna Unit 1
Reactor Coolant System Heatup Limitations

Material Property Basis	
Limiting Material: Circumferential Weld Seam	
Limiting ART at 30.7 EFPY:	1/4-T, 162.9 F
	3/4-T, 139.9

Heatup Rates (F/hr)		
20	40	60



North Anna Unit 1 Reactor Coolant System Heatup Limitations (Heatup Rates up to 60 F/hr) Applicable for the First 30.7 EFPY (Without Margins for Instrumentation Errors)

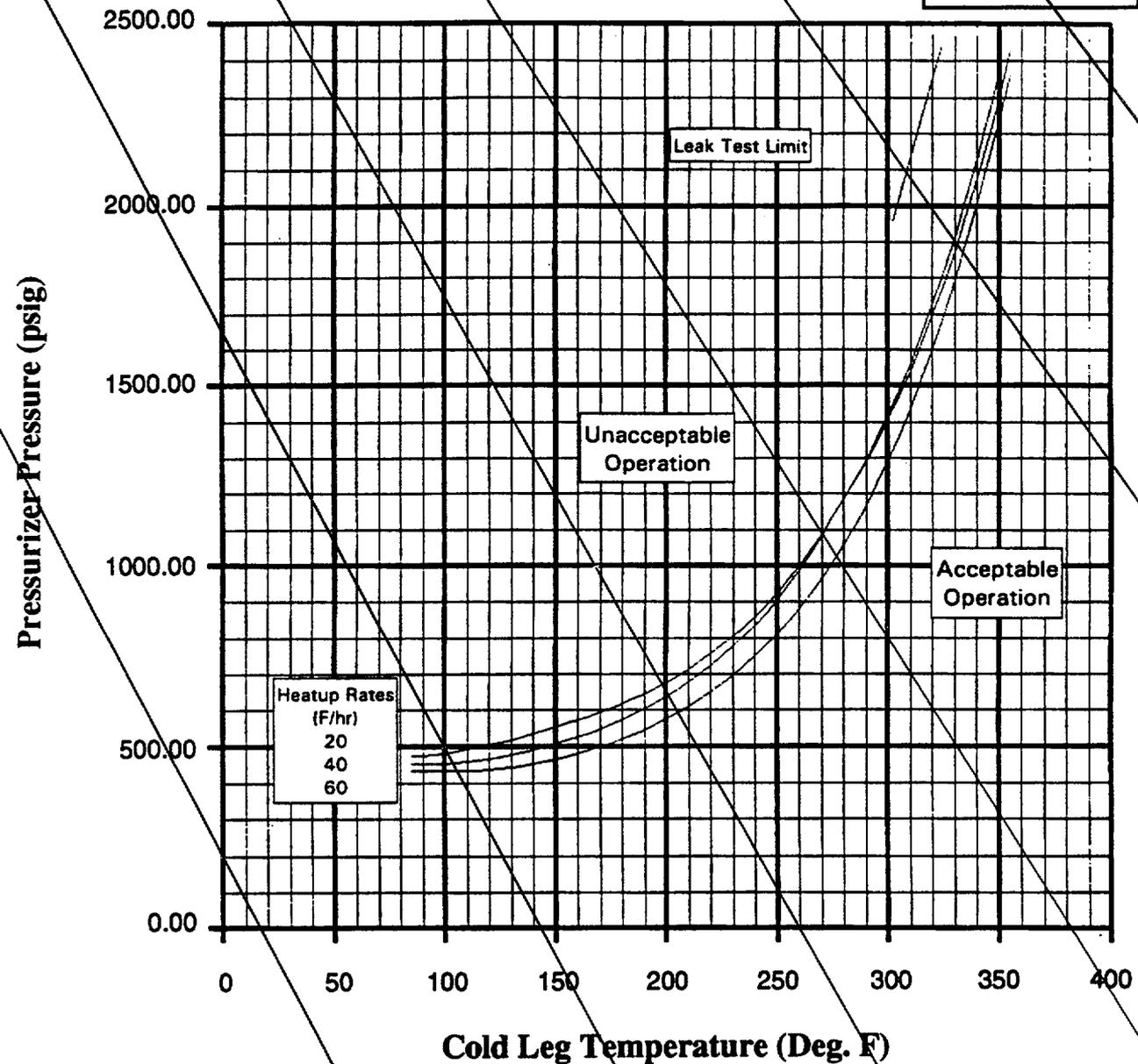
Replace w/ new Figure 3.4-2

10-05-94

Figure 3.4-2 — North Anna Unit 2
Reactor Coolant System Heatup Limitations

Material Property Basis	
Limiting Material: Lower Shell Plate	
Limiting ART at 17 EFPY:	1/4-T, 196 F
	3/4-T, 172 F

Heatup Rates (F/hr)		
20	40	60



North Anna Unit 2 Reactor Coolant System Heatup Limitations (Heatup Rates up to 60 F/hr) Applicable for the First 17 EFPY (Without Margins for Instrumentation Errors)

Attachment 3

Proposed Unit 1 and Unit 2 Technical Specifications Changes

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

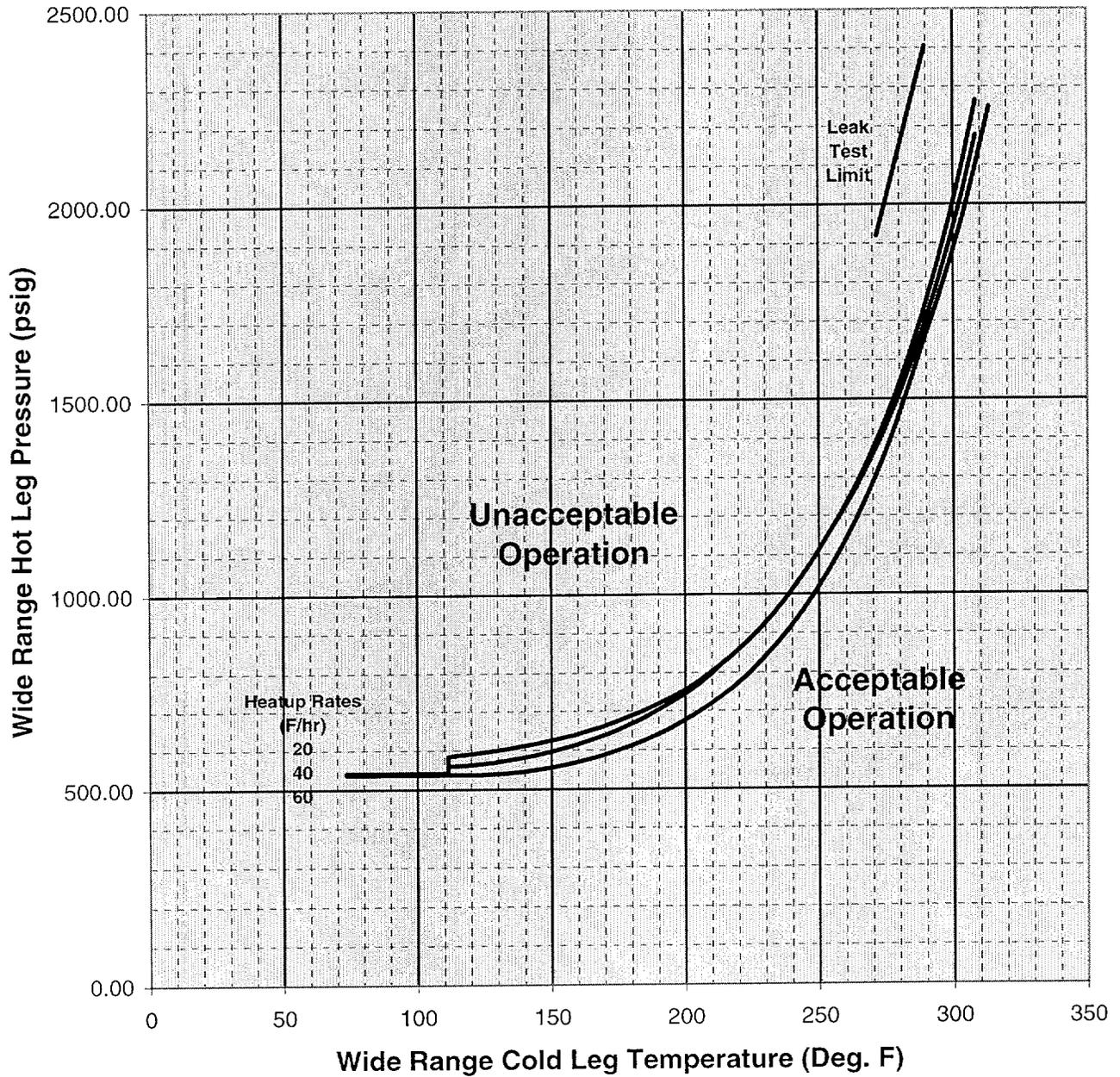
Figure 3.4-2

North Anna Unit 1
Reactor Coolant System Heatup Limitations

Material Property Basis

Limiting ART at 32.3 EFPY: 1/4-T, 218.5 deg. F

3/4-T, 195.6 deg. F



North Anna Unit 1 Reactor Coolant System Heatup Limitations (Heatup Rates up to 60 F/hr)
Applicable for the first 32.3 EFPY (Including Margins for Instrumentation Errors)

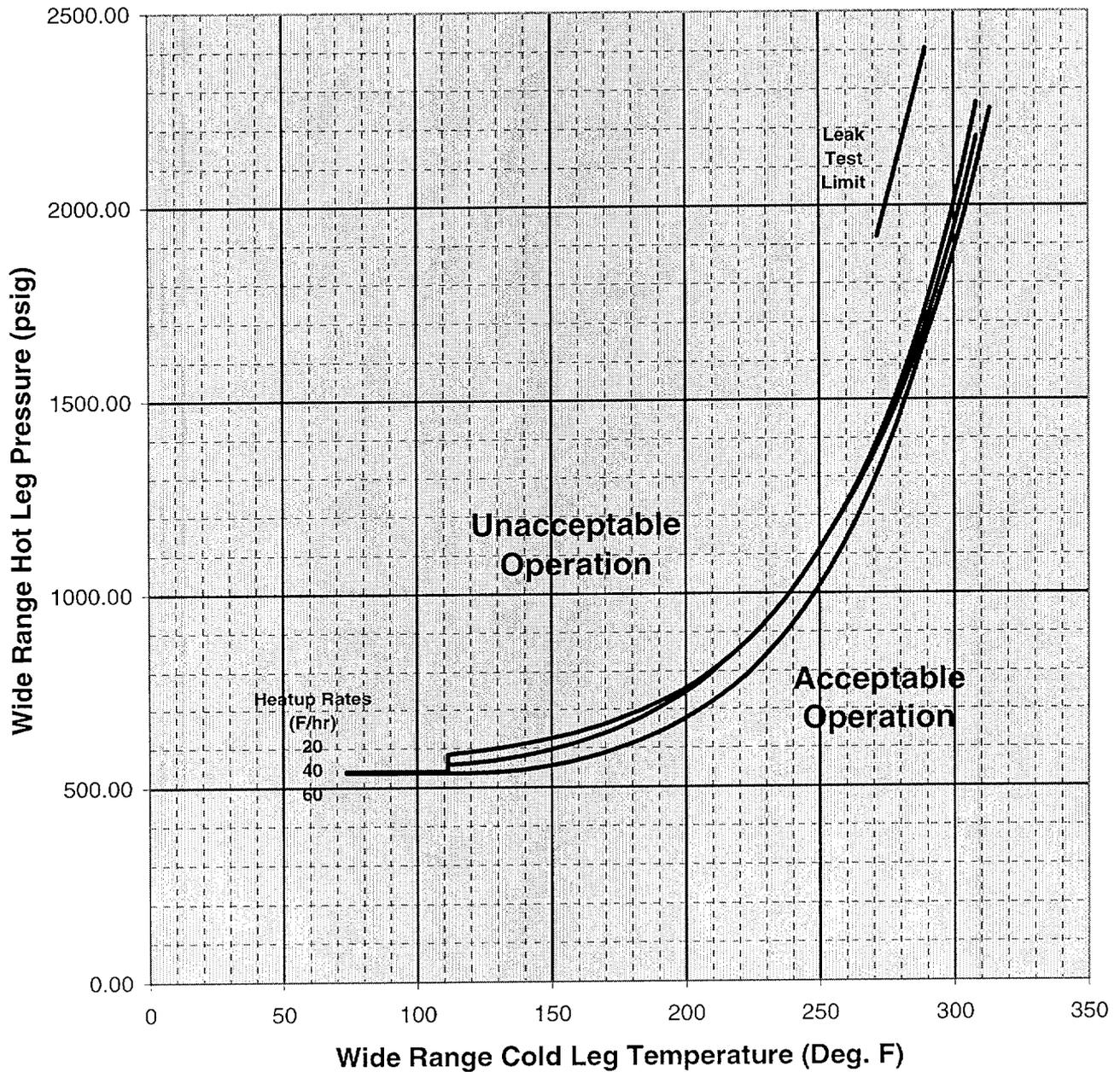
Figure 3.4-2

North Anna Unit 2
Reactor Coolant System Heatup Limitations

Material Property Basis

Limiting ART at 34.3 EFPY: 1/4-T, 218.5 deg. F

3/4-T, 195.6 deg. F



North Anna Unit 2 Reactor Coolant System Heatup Limitations (Heatup Rates up to 60 F/hr)
Applicable for the first 34.3 EFPY (Including Margins for Instrumentation Errors)