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U. S. Nuclear Regulatory Commission
Attn: Document Control Desk
Washington, DC 20555

SUBJECT: COMANCHE PEAK NUCLEAR POWER PLANT
DOCKET NOS. 50-445 AND 50-446
PRESSURE AND TEMPERATURE LIMITS REPORT

Dear Sir or Madam:

Enclosed is Revision 3 of the Pressure and Temperature Limits Report for Comanche Peak Nuclear Power Plant (CPNPP) Units 1 and 2. This report is prepared and submitted pursuant to Technical Specification 5.6.6.

This communication contains no new licensing basis commitments regarding CPNPP Units 1 and 2.

Should you have any questions, please contact Mr. J. D. Seawright at (254) 897-0140.

Sincerely,

Luminant Generation Company LLC

Rafael Flores

By: _____
Fred W. Madden
Director, External Affairs

Enclosure – Pressure and Temperature Limits Report, Revision 3

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Balwant K. Singal, NRR
Resident Inspectors, Comanche Peak

A001
NRR

COMANCHE PEAK NUCLEAR POWER PLANT (CPNPP)

PRESSURE AND TEMPERATURE LIMITS REPORT

(APPLICABLE UP TO 36 EFPY)

March 2014

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1.0 INTRODUCTION

This report presents the Reactor Coolant System (RCS) Pressure and Temperature (P/T) limits for Comanche Peak Nuclear Power Plant (CPNPP) Unit 1 and Unit 2 in accordance with the requirements of Technical Specification 5.6.6. A description of the Low Temperature Overpressure Protection (LTOP) System power-operated relief valve (PORV) setpoints is also provided in this report. In addition, the requirements of the reactor vessel material surveillance program are discussed.

The following two Technical Specification Limiting Conditions of Operation (LCO) are addressed in this report:

LCO 3.4.3 RCS Pressure and Temperature (P/T) Limits
LCO 3.4.12 Low Temperature Overpressure Protection (LTOP) System

The analytical methods used to determine the RCS pressure and temperature limits are described in Reference 1. The methods used to develop the LTOP System PORV setpoints are also described in Reference 1.

This report covers CPNPP Unit 1 and Unit 2 operation for 36 Effective Full Power Years (EFPY).

Note that Revision 0 of this PTLR was submitted to the NRC in support of Operating License Amendment 132. The NRC reviewed the submittal and has determined that the PTLR meets the requirements set forth in GL 96-03 for plant-specific PTLRs; therefore, it is acceptable for use at CPNPP.

In Revision 1, the LTOP System PORV setpoints for CPNPP Unit 2 with the D5 steam generators are changed to those of Table 14 of Reference 5.

In Revision 2 of this PTLR, the LTOP System PORV setpoints for CPNPP Unit 1 with the Δ76 steam generators are changed to those of Table 12 of Reference 5.

2.0 OPERATING LIMITS

RCS P/T Limits

The RCS P/T limits presented in this report consist of the RCS (except the pressurizer) temperature rate-of-change limits and P/T limits during heatup, cooldown, inservice leak and hydrostatic testing, and criticality. The P/T limits for both CPNPP units are based on the approved methodology presented in Reference 1.

The RCS P/T limits are based on the results of the evaluations of the most recently analyzed reactor vessel specimen capsules as presented in References 2 and 3 for Units 1 and 2, respectively. The more limiting material is used to develop RCS P/T limits that bound both CPNPP units.

The RCS P/T limits calculated for selected heatup and cooldown rates for CPNPP Unit 1 and Unit 2 are extracted from Reference 6.

LTOP System

The LTOP System acts as a backup to the reactor operators to mitigate RCS pressurization transients at low temperatures so the integrity of reactor coolant pressure boundary (RCPB) is not compromised by violating the pressure and temperature limits of Appendix G of 10 CFR 50. The reactor vessel is the limiting RCPB component for demonstrating such protection.

The LTOP System provides reduced setpoints for the pressurizer Power-Operated Relief Valves (PORVs) as a function of the RCS temperature. The methodology used to select the setpoint pressures is described in Reference 1. Allowances for instrument uncertainties have been included in the development of these setpoints.

The LTOP System PORV setpoints for CPNPP Unit 1 (with the Δ76 steam generators) and those for CPNPP Unit 2 (with the D5 steam generators) are extracted from Reference 5.

REACTOR VESSEL MATERIAL SURVEILLANCE PROGRAM

The reduction in ductility that results from neutron radiation manifests itself as an increase in the Nil Ductility Reference Temperature (RT_{NDT}) and a reduction of the upper-shelf energy of reactor vessel beltline materials, including welds. At CPNPP, these quantities were predicted at 36 EFPY using the methods of WCAP-14040-NP-A, Revision 4 [1]. The predictions showed that the materials in the Unit 1 and Unit 2 reactor vessels responded similarly to neutron irradiation but at 36 EFPY, the plate material in the Unit 1 beltline was most limiting. Forecast properties of the limiting material were used to establish P/T limits for heatup and cooldown curves and LTOP setpoints.

The reactor vessel specimen capsules are withdrawn when the projected neutron fluence would exceed one-times the projected end-of-life vessel fluence and less than two-times the projected end-of-life vessel fluence, in accordance with Reference 7.

For Unit 1, the required specimen capsules U and Y have been withdrawn and evaluated [2]. The third required specimen capsule, Capsule X, was withdrawn during 1RF11 in the fall of 2005, with a fluence within the range of one-times to two-times the 52 EFPY Peak Fluence [2], but has not yet been evaluated. Two of the standby capsules (Capsules V and W) were withdrawn in 1RF09 and stored for later evaluation, if necessary. The third standby capsule was withdrawn during 1RF11 in the fall of 2005 and stored for later evaluation, if necessary. Because all reactor vessel surveillance capsules have been withdrawn and stored, a capsule removal schedule is not required for Unit 1.

For Unit 2, the required specimen capsules U and X have been withdrawn and evaluated [3]. The third required specimen capsule, Capsule W, is scheduled to be withdrawn during 2RF11 in the fall of 2009, with a fluence within the range of one-times to two-times the 54 EFPY Peak Fluence [3]. The schedule for the third capsule withdrawal differs from the specific recommendations contained in Reference 3, but satisfies the requirements of Reference 7 based on an expected end-of-life fluence corresponding to the 54 EFPY Peak Fluence. Two of the standby capsules (Capsules V and Y) were withdrawn in 2RF07 and stored for later evaluation, if necessary. The third standby capsule is scheduled to be withdrawn during 2RF11 and stored for later evaluation, if necessary.

2.1 RCS Temperature Rate-of-Change Limits (LCO 3.4.3)

2.1.1 Maximum Heatup Rate

The RCS heatup rate limit is 100°F in any 1-hour period.

2.1.2 Maximum Cooldown Rate

The RCS cooldown rate limit is 100°F in any 1-hour period.

2.1.3 Maximum Temperature Change During Inservice Leak and Hydrostatic Testing

During inservice leak and hydrostatic testing operations above the heatup and cooldown limit curves, the RCS temperature change limit is 10°F in any 1-hour period.

2.2 P/T Limits for Heatup, Cooldown, Inservice Leak & Hydrostatic Testing, and Criticality (LCO 3.4.3)

The limiting materials and adjusted reference temperatures at the 1/4t and 3/4t locations for each unit's reactor vessel are extracted from Reference 4 and are presented in Table 2-1. These values are based on the evaluation of two surveillance capsule specimens for each unit which include evaluations of the credibility of data per Regulatory Guide 1.99, Revision 2. All surveillance data for Unit 1 is credible. For Unit 2, the surveillance plate data (for the intermediate shell plate R3807-1) is not credible, while the surveillance weld data is credible.

The limiting reference temperatures for pressurized thermal shock (RT_{PTS}) values for each unit's reactor vessel were previously docketed in accordance with 10CFR50.61 and are extracted from References 8 and 9 for presentation in Table 2-1. Analyses of the withdrawn surveillance capsules from the Unit 1 and Unit 2 reactor vessels have confirmed the similarity between the two vessels in irradiated and non-irradiated material properties. The results of these surveillance capsule evaluations have confirmed that the early projections for CPNPP vessel materials were conservative. In addition, the majority of the irradiation-induced shift in vessel material properties occurs early in life. Therefore, with substantial margin to the RT_{PTS} screening criteria, the conservative fluence projections for the CPNPP vessel materials, and the

absence of a significant change in the projected values of RT_{PTS}, the Pressurized Thermal Shock reports have not been revised.

2.2.1 Calculation of Chemistry Factors using Surveillance Capsule Test Results

Best-estimate, plant-specific, copper and nickel weight percent values were used to calculate the chemistry factors in accordance with Regulatory Guide 1.99, Revision 2. Additionally, surveillance capsule data is available for two capsules already removed from both Comanche Peak reactor vessels; this data was used to calculate chemistry factor values per Position 2.1 of the Regulatory Guide. The calculations of the Chemistry Factors for the Unit 1 and Unit 2 reactor vessels are summarized in Table 2-2 and Table 2-3, respectively.

2.2.2 P/T Limits for Heatup, Inservice Leak & Hydrostatic Testing, and Criticality

The P/T limits for heatup, inservice leak & hydrostatic testing, and criticality, based on the limiting material from the Unit 1 and Unit 2 reactor vessels, are extracted from Reference 6 and presented in Figure 2-1.

2.2.3 P/T Limits for Cooldown

The P/T limits for cooldown, based on the limiting material from the Unit 1 and Unit 2 reactor vessels, are extracted from Reference 6 and presented in Figure 2-2.

2.3 LTOP System Setpoints (LCO 3.4.12)

The nominal PORV setpoints for use with the Low Temperature Overpressure (LTOP) System are shown in Table 2-4 and Table 2-5. The PORV setpoints in Table 2-4 are applicable to Unit 1 with Δ76 steam generators and were extracted from Table 12 of Reference 5. The PORV setpoints in Table 2-5 are applicable to Unit 2 with D5 steam generators and were extracted from Table 14 of Reference 5.

2.4 Reactor Vessel Material Surveillance Program

A withdrawal schedule for Unit 1 is not necessary, because all Unit 1 surveillance capsules have been withdrawn from the reactor vessel. The reactor vessel material surveillance capsule withdrawal schedule for Unit 2 is provided in Table 2-6.

3.0 REFERENCES

1. "Methodology used to Develop Cold Overpressure Mitigating System Setpoints and RCS Heatup and Cooldown Limit Curves," WCAP-14040-NP-A, Revision 4, May, 2004.

2. "Analysis of Capsule Y from the TU Electric Company Comanche Peak Unit 1 Reactor Vessel Radiation Surveillance Program," WCAP-15144-NP, Revision 0, January, 1999.

3. "Analysis of Capsule X from the TU Energy Comanche Peak Unit 2 Reactor Vessel Radiation Surveillance Program," WCAP-16277-NP, Revision 0, September, 2004.

4. "Comanche Peak Units 1 and 2 Heatup and Cooldown Limit Curves for Normal Operation," WCAP-16346-NP, Revision 0, October 2004.

5. TXU POWER - COMANCHE PEAK STEAM ELECTRIC STATION UNITS 1 AND 2 Revised LTOP System Setpoints – Final Report, WPT-16994, June 28, 2007, VL-07-001465.

6. "Luminant Comanche Peak Nuclear Power Plant Unit 1 and 2 Reactor Vessel Pressure-Temperature Limits," WPT-17774, March 13, 2014, VDRT-4804676.

7. ASTM E 185-82, "Standard Practice for Conducting Surveillance Tests for Light-Water Cooled Nuclear Power Reactor Vessels, E706 (IF)."

8. "Evaluation of Pressurized Thermal Shock for Comanche Peak Unit 1," WCAP-13437, docketed via TXU Electric letter logged TXX-92516, December 28, 1992.

9. "Evaluation of Pressurized Thermal Shock for Comanche Peak Unit 2," WCAP-14345, docketed via TXU Electric letter logged TXX-95243, dated September 19, 1995.

Table 2-1: Limiting Materials and Reference Temperatures for CPNPP Unit 1 and Unit 2 Reactor Vessels

Unit	Limiting Material	Adjusted Reference Temperature (ART)		Reference Temperature – Pressurized Thermal Shock (RT-PTS)
		1/4t	3/4t	
1	R-1107-1, Intermediate Shell Plate	92°F	80°F	100°F
2	R-3807-2, Intermediate Shell Plate	84°F	69°F	94°F

Table 2-2: Calculation of Chemistry Factor Values using Unit 1 Surveillance Capsule Test Results

Material	Capsule	$F^{(a)}$	$FF^{(b)}$	$\Delta RT_{NDT}{}^{(c)}$	FF x ΔRT_{NDT}	FF^2
Lower Shell R1108-2 (*Longitudinal*)	U	0.318	0.685	6.6	4.521	0.469
	Y	1.49	1.11	6.9	7.66	1.23
Lower Shell R1108-2 (*Transverse*)	U	0.318	0.685	21.3	14.591	0.469
	Y	1.49	1.11	25.3	28.08	1.23
				SUM	54.852	3.398
	$CF_{R1108-2} = \Sigma(FF \times \Delta RT_{NDT}) \div \Sigma(FF^2) = 54.852 \div 3.398 = 16.1°F$					
Weld Metal (*Heat # 88112*)	U	0.318	0.685	$0.0^{(d,e)}$	0.0	0.469
	Y	1.49	1.11	$17.6^{(d)}$	19.54	1.23
				SUM	19.54	1.699
	$CF_{WELD} = \Sigma(FF \times \Delta RT_{NDT}) \div \Sigma(FF^2) = 19.54 \div 1.699 = 11.5°F$					

Notes:

(a) F = Calculated Fluence (10^{19} n/cm^2, E > 1.0 MeV). See Table 2-2 of Reference 4.

(b) FF = Fluence Factor = $F^{(0.28 - 0.1 * \log F)}$

(c) All available data is from Comanche Peak Unit 1[2]. Therefore, no temperature adjustment is required.

(d) The measured ΔRT_{NDT} values for the weld metal have been adjusted by a ratio of 1.04.

(e) The CVGRAPH calculated value is -14.14°F. 0.0°F was used in the calculation for conservatism.

NOTE: The Chemistry Factor from the previous analysis in Reference 2 was 15.7°F for the surveillance lower shell plate and 10.7°F for the surveillance weld. As can be seen above, there is only a minor change (i.e., <1°F) to the Chemistry Factor values. Thus, the credibility evaluation from the previous analysis remains valid. All Unit 1 surveillance data is credible.

NOTE: The value of FF for CPNPP Unit 1 has been corrected to 0.685. The value reported in WCAP-16346-NP was incorrectly stated as 0.683.

Table 2-3: Calculation of Chemistry Factor Values using Unit 2 Surveillance Capsule Test Results

Material	Capsule	F[(a)]	FF[(b)]	ΔRT_{NDT}[(c)]	FF x ΔRT_{NDT}	FF^2
Inter. Shell R3807-2	U	0.315	0.683	1.6	1.093	0.466
(*Longitudinal*)	X	2.20	1.21	1.6	1.94	1.46
Inter. Shell R3807-2	U	0.315	0.683	23.4	15.982	0.466
(*Transverse*)	X	2.20	1.21	52.9	64.01	1.46
				SUM	83.025	3.852
	$CF_{R1108-2} = \Sigma(FF \times \Delta RT_{NDT}) \div \Sigma(FF^2) = 83.025 \div 3.852 = 21.6°F$					
Weld Metal	U	0.315	0.683	3.74[(d)]	2.55	0.466
(*Heat # 89833*)	X	2.20	1.21	50.13[(d)]	60.66	1.46
				SUM	63.21	1.926
	$CF_{WELD} = \Sigma(FF \times \Delta RT_{NDT}) \div \Sigma(FF^2) = 63.21 \div 1.926 = 32.8°F$					

Notes:

(a) F = Calculated Fluence. Units are x 10^{19} n/cm^2 (E > 1.0 MeV). See Table 2-2 of Reference 4.

(b) FF = Fluence Factor = $F^{(0.28 - 0.1*\log F)}$.

(c) All available data is from Comanche Peak Unit 2[3]. Therefore, no temperature adjustment is required.

(d) The measured ΔRT_{NDT} values for the weld metal have been adjusted by a ratio of 1.04.

NOTE: For Unit 2, the surveillance plate data (for the intermediate shell plate R3807-1) is not credible, while the surveillance weld data is credible.

Table 2-4: PORV Setpoints for Low Temperature Overpressure (LTOP) System For Unit 1 with Delta-76 Steam Generators - Applicable Up To 36 EFPY

Adjusted RCS Temperature (°F)	PORV #1 Setpoint (psig)	PORV #2 Setpoint (psig)
70	375	375
150	375	375
200	447	447
220	447	447
250	573	573
350	573	573
405	2335	2335

Table 2-5: PORV Setpoints for Low Temperature Overpressure (LTOP) System For Unit 2 with D5 Steam Generators - Applicable Up To 36 EFPY

Adjusted RCS Temperature (°F)	PORV #1 Setpoint (psig)	PORV #2 Setpoint (psig)
70	375	375
150	375	375
200	440	440
220	440	440
250	580	580
350	580	580
405	2335	2335

Table 2-6: Unit 2 Reactor Vessel Material Surveillance Program - Withdrawal Schedule

CAPSULE NUMBER	VESSEL LOCATION	LEAD FACTOR	WITHDRAWAL TIME	WITHDRAWAL OUTAGE
U	58.5°	3.93	1st Refueling	1st Refueling
X	238.5°	4.15	8.83 EFPY	2RF07
W	121.5°	4.11	13 EFPY	2RF11
Z	301.5°	4.11	Standby	2RF11
V	61.0°	3.87	Standby	2RF07
Y	241.0°	3.87	Standby	2RF07

Figure 2-1 Reactor Coolant System Heatup Limitations for CPNPP Unit 1 and Unit 2 - Applicable for the First 36 EFPY (w/o Margins for Instrumentation Errors)

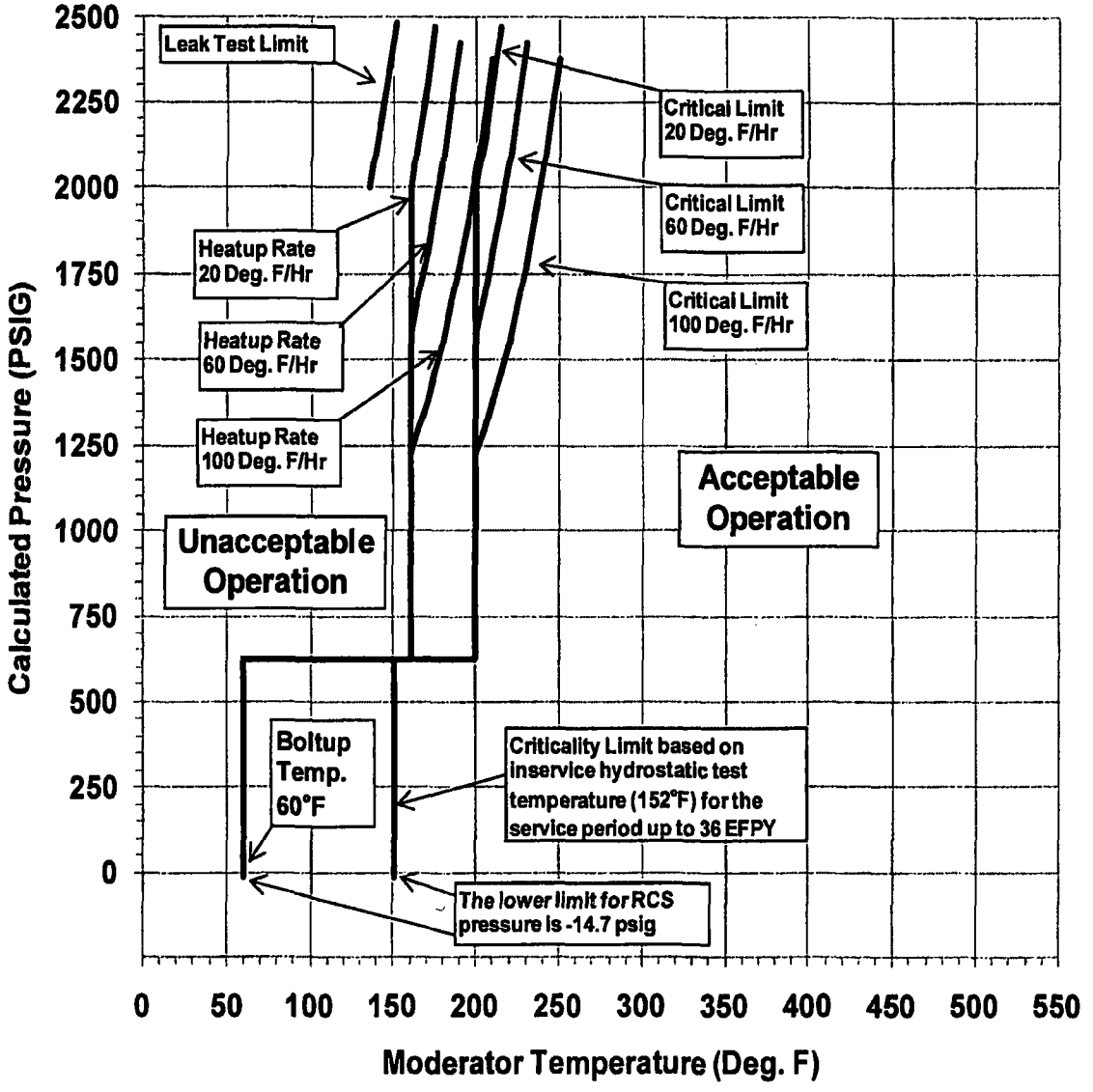

Figure 2-2 Reactor Coolant System Cooldown Limitations for CPNPP Unit 1 and Unit 2 - Applicable for the First 36 EFPY (w/o Margins for Instrumentation Errors)