Calculated Neutron Exposure of Unit 1 and Unit 2 Core Shroud/Pressure Vessel

The fuel cycle specific calculated neutron exposure of the core shroud, reactor pressure vessel, top guide, and core plate are listed in Tables 2.2-1 to 2.2-50. Neutron exposure values are fast neutron (E > 1.0 Mev) fluence and iron atom displacements (dpa) experienced at key locations, welds and shell plates in the core shroud, reactor pressure vessel (RPV), top guide, and core plate of the Unit 1 and Unit 2 reactor systems. The predicted neutron exposure at the Unit 1 core shroud key locations are listed in Tables 2.2-1 to 2.2-15. Unit 1 neutron exposure values for key locations at the RPV and N-16 nozzles are provided in Tables 2.2-16 to Tables 2.2-23. Table 2.2-24 and Table 2.2-25 list the Unit 1 top guide and core plate neutron exposure values. Values are provided for plant operation up to and including the end of operating license fuel cycle and projected values for 36 and 54 efpy of operation. Predicted neutron exposure data at the Unit 2 core shroud key locations are listed in Tables 2.2-26 to 2.2-40. Unit 2 neutron exposure values for key locations at the RPV and N-16 nozzles are provided in Tables 2.2-41 to Tables 2.2-48. Table 2.2-49 and Table 2.2-50 list the Unit 2 top guide and core plate neutron exposure values.

The first eight columns of each table are the predicted neutron fluence and dpa at the conclusion of the current and planned operating cycles. The last two columns of data in each table are projected fluence and dpa based on operation in an equilibrium cycle to 36 and 54 effective full power years of operation. The tabulated values provided in all tables are the predicted/projected values at azimuths, radii, or elevations in the analytical model. The azimuths are in angles (degrees) and radii and elevations are in centimeters. All elevation values are from the bottom of the active core region.

Table 2.2-1

Unit 1 Shroud Horizontal Weld H1 Neutron Exposure Predictions

	Cycle 14	Cycle 15	Cycle 16	Cycle 17	Cycle 18	Cycle 19	Cycle 20	Cycle 21	Projected	Projected
Time,s >	5.77E+07	5.82E+07	5.95E+07	5.99E+07	5.99E+07	5.99E+07	5.99E+07	5.99E+07	1.55E+08	5.68E+08
EFPY >	17.87	19.71	21.60	23.50	25.40	27.30	29.20	31.10	36.00	54.00
Azimuth	Fast Neutron Fluence (E > 1.0 Mev)									
0	1.27E+19	1.40E+19	1.53E+19	1.67E+19	1.80E+19	1.94E+19	2.07E+19	2.21E+19	2.56E+19	3.84E+19
15	2.04E+19	2.26E+19	2.48E+19	2.70E+19	2.92E+19	3.14E+19	3.36E+19	3.59E+19	4.16E+19	6.26E+19
30	1.56E+19	1.73E+19	1.91E+19	2.08E+19	2.26E+19	2.44E+19	2.62E+19	2.79E+19	3.25E+19	4.94E+19
45	3.41E+19	3.80E+19	4.20E+19	4.60E+19	5.00E+19	5.41E+19	5.81E+19	6.21E+19	7.25E+19	1.11E+20
Azimuth	Iron Atom Displacements, dpa									
0	1.72E-02	1.89E-02	2.08E-02	2.26E-02	2.44E-02	2.63E-02	2.81E-02	2.99E-02	3.46E-02	5.20E-02
15	2.85E-02	3.15E-02	3.46E-02	3.76E-02	4.07E-02	4.38E-02	4.69E-02	5.00E-02	5.80E-02	8.74E-02
30	2.11E-02	2.34E-02	2.58E-02	2.82E-02	3.06E-02	3.30E-02	3.54E-02	3.78E-02	4.40E-02	6.68E-02
45	4.78E-02	5.33E-02	5.89E-02	6.45E-02	7.01E-02	7.58E-02	8.14E-02	8.71E-02	1.02E-01	1.55E-01
Note: Azimuth is Angle in First Octant										

Table 2.2-2

Unit 1 Shroud Horizontal Weld H2 Neutron Exposure Predictions

	Cycle 14	Cycle 15	Cycle 16	Cycle 17	Cycle 18	Cycle 19	Cycle 20	Cycle 21	Projected	Projected
Time,s >	5.77E+07	5.82E+07	5.95E+07	5.99E+07	5.99E+07	5.99E+07	5.99E+07	5.99E+07	1.55E+08	5.68E+08
EFPY >	17.87	19.71	21.60	23.50	25.40	27.30	29.20	31.10	36.00	54.00
Azimuth	Fast Neutron Fluence (E > 1.0 Mev)									
0	1.02E+19	1.15E+19	1.27E+19	1.40E+19	1.53E+19	1.66E+19	1.79E+19	1.92E+19	2.25E+19	3.47E+19
15	1.65E+19	1.86E+19	2.07E+19	2.28E+19	2.49E+19	2.70E+19	2.92E+19	3.13E+19	3.67E+19	5.68E+19
30	1.26E+19	1.43E+19	1.59E+19	1.76E+19	1.93E+19	2.10E+19	2.27E+19	2.44E+19	2.88E+19	4.49E+19
45	2.76E+19	3.14E+19	3.52E+19	3.90E+19	4.29E+19	4.67E+19	5.05E+19	5.44E+19	6.43E+19	1.01E+20
Azimuth	Iron Atom Displacements, dpa									
0	1.59E-02	1.78E-02	1.98E-02	2.18E-02	2.38E-02	2.58E-02	2.78E-02	2.98E-02	3.50E-02	5.39E-02
15	2.65E-02	2.98E-02	3.31E-02	3.65E-02	3.99E-02	4.32E-02	4.66E-02	5.00E-02	5.87E-02	9.07E-02
30	1.96E-02	2.21E-02	2.47E-02	2.74E-02	3.00E-02	3.26E-02	3.52E-02	3.79E-02	4.46E-02	6.95E-02
45	4.45E-02	5.05E-02	5.66E-02	6.27E-02	6.89E-02	7.50E-02	8.12E-02	8.73E-02	1.03E-01	1.62E-01
Note: Azimuth is Angle in First Octant										

Table 2.2-3

Unit 1 Shroud Horizontal Weld H3 Neutron Exposure Predictions

	Cycle 14	Cycle 15	Cycle 16	Cycle 17	Cycle 18	Cycle 19	Cycle 20	Cycle 21	Projected	Projected
Time,s >	5.77E+07	5.82E+07	5.95E+07	5.99E+07	5.99E+07	5.99E+07	5.99E+07	5.99E+07	1.55E+08	5.68E+08
EFPY >	17.87	19.71	21.60	23.50	25.40	27.30	29.20	31.10	36.00	54.00
Azimuth	Fast Neutron Fluence (E > 1.0 Mev)									
0	1.25E+20	1.40E+20	1.56E+20	1.72E+20	1.87E+20	2.03E+20	2.19E+20	2.35E+20	2.75E+20	4.24E+20
15	2.32E+20	2.61E+20	2.91E+20	3.21E+20	3.51E+20	3.80E+20	4.10E+20	4.40E+20	5.17E+20	8.00E+20
30	1.44E+20	1.63E+20	1.82E+20	2.01E+20	2.20E+20	2.40E+20	2.59E+20	2.78E+20	3.28E+20	5.10E+20
45	4.45E+20	5.05E+20	5.65E+20	6.26E+20	6.88E+20	7.49E+20	8.10E+20	8.71E+20	1.03E+21	1.61E+21
Azimuth	Iron Atom Displacements, dpa									
0	1.82E-01	2.04E-01	2.27E-01	2.50E-01	2.73E-01	2.96E-01	3.19E-01	3.42E-01	4.01E-01	6.18E-01
15	3.40E-01	3.83E-01	4.26E-01	4.70E-01	5.13E-01	5.57E-01	6.00E-01	6.44E-01	7.56E-01	1.17E+00
30	2.10E-01	2.37E-01	2.65E-01	2.93E-01	3.21E-01	3.49E-01	3.77E-01	4.05E-01	4.77E-01	7.43E-01
45	6.57E-01	7.44E-01	8.33E-01	9.23E-01	1.01E+00	1.10E+00	1.19E+00	1.28E+00	1.51E+00	2.37E+00
Note: Azimuth is Angle in First Octant										

Table 2.2-4

Unit 1 Shroud Horizontal Weld H4 Neutron Exposure Predictions

	Cycle 14	Cycle 15	Cycle 16	Cycle 17	Cycle 18	Cycle 19	Cycle 20	Cycle 21	Projected	Projected
Time,s >	5.77E+07	5.82E+07	5.95E+07	5.99E+07	5.99E+07	5.99E+07	5.99E+07	5.99E+07	1.55E+08	5.68E+08
EFPY >	17.87	19.71	21.60	23.50	25.40	27.30	29.20	31.10	36.00	54.00
Azimuth	Fast Neutron Fluence (E > 1.0 Mev)									
0	3.25E+20	3.65E+20	4.05E+20	4.46E+20	4.87E+20	5.27E+20	5.68E+20	6.09E+20	7.14E+20	1.10E+21
15	6.09E+20	6.84E+20	7.60E+20	8.37E+20	9.14E+20	9.91E+20	1.07E+21	1.15E+21	1.34E+21	2.07E+21
30	3.75E+20	4.24E+20	4.73E+20	5.23E+20	5.73E+20	6.22E+20	6.72E+20	7.22E+20	8.50E+20	1.32E+21
45	1.16E+21	1.31E+21	1.47E+21	1.63E+21	1.79E+21	1.94E+21	2.10E+21	2.26E+21	2.67E+21	4.16E+21
Azimuth	Iron Atom Displacements, dpa									
0	4.70E-01	5.27E-01	5.86E-01	6.45E-01	7.03E-01	7.62E-01	8.21E-01	8.79E-01	1.03E+00	1.59E+00
15	8.84E-01	9.92E-01	1.10E+00	1.22E+00	1.33E+00	1.44E+00	1.55E+00	1.66E+00	1.95E+00	3.01E+00
30	5.42E-01	6.12E-01	6.83E-01	7.55E-01	8.27E-01	8.99E-01	9.71E-01	1.04E+00	1.23E+00	1.91E+00
45	1.69E+00	1.92E+00	2.15E+00	2.38E+00	2.61E+00	2.84E+00	3.07E+00	3.30E+00	3.89E+00	6.07E+00
Note: Azimuth is Angle in First Octant										

Table 2.2-5

Unit 1 Shroud Horizontal Weld H5 Neutron Exposure Predictions

	Cycle 14	Cycle 15	Cycle 16	Cycle 17	Cycle 18	Cycle 19	Cycle 20	Cycle 21	Projected	Projected
Time,s >	5.77E+07	5.82E+07	5.95E+07	5.99E+07	5.99E+07	5.99E+07	5.99E+07	5.99E+07	1.55E+08	5.68E+08
EFPY >	17.87	19.71	21.60	23.50	25.40	27.30	29.20	31.10	36.00	54.00
Azimuth	Fast Neutron Fluence (E > 1.0 Mev)									
0	1.11E+20	1.25E+20	1.40E+20	1.55E+20	1.69E+20	1.84E+20	1.99E+20	2.14E+20	2.52E+20	3.92E+20
15	2.08E+20	2.35E+20	2.63E+20	2.91E+20	3.19E+20	3.47E+20	3.75E+20	4.03E+20	4.75E+20	7.40E+20
30	1.28E+20	1.45E+20	1.63E+20	1.82E+20	2.00E+20	2.18E+20	2.36E+20	2.54E+20	3.01E+20	4.72E+20
45	3.96E+20	4.52E+20	5.09E+20	5.66E+20	6.24E+20	6.81E+20	7.38E+20	7.96E+20	9.44E+20	1.49E+21
Azimuth	Iron Atom Displacements, dpa									
0	1.60E-01	1.80E-01	2.02E-01	2.23E-01	2.44E-01	2.65E-01	2.87E-01	3.08E-01	3.63E-01	5.65E-01
15	3.01E-01	3.40E-01	3.80E-01	4.21E-01	4.61E-01	5.02E-01	5.42E-01	5.83E-01	6.87E-01	1.07E+00
30	1.84E-01	2.10E-01	2.35E-01	2.62E-01	2.88E-01	3.14E-01	3.40E-01	3.66E-01	4.33E-01	6.80E-01
45	5.77E-01	6.58E-01	7.41E-01	8.25E-01	9.08E-01	9.92E-01	1.08E+00	1.16E+00	1.38E+00	2.17E+00
Note: Azimuth is Angle in First Octant										

Table 2.2-6

Unit 1 Shroud Horizontal Weld H6A Neutron Exposure Predictions

	Cycle 14	Cycle 15	Cycle 16	Cycle 17	Cycle 18	Cycle 19	Cycle 20	Cycle 21	Projected	Projected
Time,s >	5.77E+07	5.82E+07	5.95E+07	5.99E+07	5.99E+07	5.99E+07	5.99E+07	5.99E+07	1.55E+08	5.68E+08
EFPY >	17.87	19.71	21.60	23.50	25.40	27.30	29.20	31.10	36.00	54.00
Azimuth	Fast Neutron Fluence (E > 1.0 Mev)									
0	1.39E+17	1.55E+17	1.72E+17	1.89E+17	2.05E+17	2.22E+17	2.39E+17	2.56E+17	2.99E+17	4.57E+17
15	2.61E+17	2.92E+17	3.23E+17	3.55E+17	3.86E+17	4.18E+17	4.50E+17	4.81E+17	5.63E+17	8.63E+17
30	1.61E+17	1.80E+17	2.01E+17	2.21E+17	2.42E+17	2.62E+17	2.83E+17	3.03E+17	3.56E+17	5.50E+17
45	4.98E+17	5.62E+17	6.26E+17	6.90E+17	7.56E+17	8.20E+17	8.85E+17	9.49E+17	1.12E+18	1.73E+18
Azimuth	Iron Atom Displacements, dpa									
0	2.12E-04	2.36E-04	2.62E-04	2.87E-04	3.12E-04	3.38E-04	3.63E-04	3.89E-04	4.54E-04	6.95E-04
15	3.98E-04	4.45E-04	4.93E-04	5.42E-04	5.90E-04	6.38E-04	6.86E-04	7.35E-04	8.59E-04	1.32E-03
30	2.44E-04	2.74E-04	3.05E-04	3.36E-04	3.67E-04	3.98E-04	4.29E-04	4.60E-04	5.41E-04	8.35E-04
45	7.65E-04	8.62E-04	9.62E-04	1.06E-03	1.16E-03	1.26E-03	1.36E-03	1.46E-03	1.72E-03	2.66E-03
Note: Azimuth is Angle in First Octant										

Table 2.2-7

Unit 1 Shroud Horizontal Weld H6B Neutron Exposure Predictions

	Cycle 14	Cycle 15	Cycle 16	Cycle 17	Cycle 18	Cycle 19	Cycle 20	Cycle 21	Projected	Projected
Time,s >	5.77E+07	5.82E+07	5.95E+07	5.99E+07	5.99E+07	5.99E+07	5.99E+07	5.99E+07	1.55E+08	5.68E+08
EFPY >	17.87	19.71	21.60	23.50	25.40	27.30	29.20	31.10	36.00	54.00
Azimuth	Fast Neutron Fluence (E > 1.0 Mev)									
0	5.04E+16	5.63E+16	6.23E+16	6.84E+16	7.44E+16	8.05E+16	8.65E+16	9.26E+16	1.08E+17	1.66E+17
15	9.45E+16	1.06E+17	1.17E+17	1.28E+17	1.40E+17	1.51E+17	1.63E+17	1.74E+17	2.04E+17	3.12E+17
30	5.81E+16	6.53E+16	7.27E+16	8.01E+16	8.75E+16	9.49E+16	1.02E+17	1.10E+17	1.29E+17	1.99E+17
45	1.80E+17	2.03E+17	2.27E+17	2.50E+17	2.74E+17	2.97E+17	3.20E+17	3.44E+17	4.05E+17	6.27E+17
Azimuth	Iron Atom Displacements, dpa									
0	7.78E-05	8.69E-05	9.62E-05	1.06E-04	1.15E-04	1.24E-04	1.34E-04	1.43E-04	1.67E-04	2.56E-04
15	1.47E-04	1.64E-04	1.81E-04	1.99E-04	2.17E-04	2.35E-04	2.53E-04	2.70E-04	3.16E-04	4.85E-04
30	8.97E-05	1.01E-04	1.12E-04	1.24E-04	1.35E-04	1.47E-04	1.58E-04	1.69E-04	1.99E-04	3.07E-04
45	2.82E-04	3.17E-04	3.54E-04	3.90E-04	4.27E-04	4.64E-04	5.00E-04	5.37E-04	6.31E-04	9.79E-04
Note: Azimuth is Angle in First Octant										

Table 2.2-8

Unit 1 Shroud Horizontal Weld H7 Neutron Exposure Predictions

	Cycle 14	Cycle 15	Cycle 16	Cycle 17	Cycle 18	Cycle 19	Cycle 20	Cycle 21	Projected	Projected
Time,s >	5.77E+07	5.82E+07	5.95E+07	5.99E+07	5.99E+07	5.99E+07	5.99E+07	5.99E+07	1.55E+08	5.68E+08
EFPY >	17.87	19.71	21.60	23.50	25.40	27.30	29.20	31.10	36.00	54.00
Azimuth	Fast Neutron Fluence (E > 1.0 Mev)									
0	5.26E+11	5.87E+11	6.50E+11	7.13E+11	7.76E+11	8.40E+11	9.03E+11	9.66E+11	1.13E+12	1.73E+12
15	9.86E+11	1.10E+12	1.22E+12	1.34E+12	1.46E+12	1.58E+12	1.70E+12	1.82E+12	2.13E+12	3.26E+12
30	6.07E+11	6.82E+11	7.58E+11	8.36E+11	9.13E+11	9.90E+11	1.07E+12	1.14E+12	1.34E+12	2.08E+12
45	1.88E+12	2.12E+12	2.36E+12	2.61E+12	2.85E+12	3.10E+12	3.34E+12	3.59E+12	4.22E+12	6.54E+12
Azimuth	Iron Atom Displacements, dpa									
0	8.98E-10	1.00E-09	1.11E-09	1.22E-09	1.33E-09	1.43E-09	1.54E-09	1.65E-09	1.93E-09	2.95E-09
15	1.69E-09	1.89E-09	2.09E-09	2.30E-09	2.50E-09	2.71E-09	2.92E-09	3.12E-09	3.65E-09	5.59E-09
30	1.04E-09	1.16E-09	1.30E-09	1.43E-09	1.56E-09	1.69E-09	1.82E-09	1.95E-09	2.30E-09	3.55E-09
45	3.25E-09	3.66E-09	4.08E-09	4.51E-09	4.93E-09	5.35E-09	5.77E-09	6.20E-09	7.29E-09	1.13E-08
Note: Azimuth is Angle in First Octant										

Table 2.2-9

Unit 1 Shroud Vertical Welds V1 and V2 Neutron Exposure Predictions

	Cycle 14	Cycle 15	Cycle 16	Cycle 17	Cycle 18	Cycle 19	Cycle 20	Cycle 21	Projected	Projected
Time,s >	5.77E+07	5.82E+07	5.95E+07	5.99E+07	5.99E+07	5.99E+07	5.99E+07	5.99E+07	1.55E+08	5.68E+08
EFPY >	17.87	19.71	21.60	23.50	25.40	27.30	29.20	31.10	36.00	54.00
Elevation	Fast Neutron Fluence (E > 1.0 Mev)									
376.09	2.63E+19	2.99E+19	3.36E+19	3.73E+19	4.10E+19	4.47E+19	4.84E+19	5.20E+19	6.16E+19	9.66E+19
391.33	1.43E+19	1.61E+19	1.80E+19	1.98E+19	2.17E+19	2.36E+19	2.55E+19	2.74E+19	3.22E+19	5.01E+19
406.57	8.54E+18	9.58E+18	1.07E+19	1.17E+19	1.28E+19	1.39E+19	1.49E+19	1.60E+19	1.88E+19	2.90E+19
421.81	2.55E+19	2.85E+19	3.15E+19	3.45E+19	3.76E+19	4.06E+19	4.37E+19	4.67E+19	5.46E+19	8.34E+19
437.05	3.48E+19	3.88E+19	4.29E+19	4.71E+19	5.12E+19	5.54E+19	5.95E+19	6.37E+19	7.44E+19	1.14E+20
452.29	3.42E+19	3.81E+19	4.22E+19	4.62E+19	5.03E+19	5.44E+19	5.85E+19	6.25E+19	7.31E+19	1.12E+20
457.37	3.24E+19	3.62E+19	4.00E+19	4.39E+19	4.78E+19	5.17E+19	5.55E+19	5.94E+19	6.94E+19	1.06E+20
Elevation	Iron Atom Displacements, dpa									
376.09	4.20E-02	4.77E-02	5.36E-02	5.94E-02	6.53E-02	7.12E-02	7.70E-02	8.29E-02	9.81E-02	1.54E-01
391.33	2.11E-02	2.38E-02	2.66E-02	2.94E-02	3.22E-02	3.50E-02	3.78E-02	4.05E-02	4.77E-02	7.42E-02
406.57	1.28E-02	1.44E-02	1.60E-02	1.76E-02	1.92E-02	2.08E-02	2.25E-02	2.41E-02	2.82E-02	4.35E-02
421.81	3.69E-02	4.12E-02	4.56E-02	5.00E-02	5.44E-02	5.88E-02	6.32E-02	6.76E-02	7.90E-02	1.21E-01
437.05	4.93E-02	5.50E-02	6.09E-02	6.67E-02	7.26E-02	7.85E-02	8.44E-02	9.03E-02	1.05E-01	1.61E-01
452.29	4.77E-02	5.32E-02	5.88E-02	6.45E-02	7.02E-02	7.59E-02	8.16E-02	8.73E-02	1.02E-01	1.56E-01
457.37	4.51E-02	5.03E-02	5.57E-02	6.11E-02	6.64E-02	7.18E-02	7.72E-02	8.26E-02	9.65E-02	1.47E-01
Note: Elevation is Distance (cm) from Bottom of Active Core										

Table 2.2-10

Unit 1 Shroud Vertical Welds V3 and V4 Neutron Exposure Predictions

	Cycle 14	Cycle 15	Cycle 16	Cycle 17	Cycle 18	Cycle 19	Cycle 20	Cycle 21	Projected	Projected
Time,s >	5.77E+07	5.82E+07	5.95E+07	5.99E+07	5.99E+07	5.99E+07	5.99E+07	5.99E+07	1.55E+08	5.68E+08
EFPY >	17.87	19.71	21.60	23.50	25.40	27.30	29.20	31.10	36.00	54.00
Elevation	Fast Neutron Fluence (E > 1.0 Mev)									
277.03	1.07E+21	1.21E+21	1.36E+21	1.51E+21	1.66E+21	1.81E+21	1.95E+21	2.10E+21	2.49E+21	3.89E+21
292.27	1.03E+21	1.17E+21	1.31E+21	1.45E+21	1.59E+21	1.73E+21	1.88E+21	2.02E+21	2.38E+21	3.73E+21
307.51	9.63E+20	1.10E+21	1.23E+21	1.36E+21	1.50E+21	1.64E+21	1.77E+21	1.91E+21	2.26E+21	3.54E+21
322.75	8.71E+20	9.91E+20	1.11E+21	1.24E+21	1.36E+21	1.49E+21	1.61E+21	1.73E+21	2.06E+21	3.23E+21
337.99	7.38E+20	8.41E+20	9.47E+20	1.05E+21	1.16E+21	1.27E+21	1.37E+21	1.48E+21	1.75E+21	2.76E+21
353.23	5.71E+20	6.52E+20	7.34E+20	8.16E+20	8.99E+20	9.81E+20	1.06E+21	1.15E+21	1.36E+21	2.14E+21
368.47	4.08E+20	4.64E+20	5.21E+20	5.79E+20	6.36E+20	6.93E+20	7.51E+20	8.08E+20	9.57E+20	1.50E+21
Elevation	Iron Atom Displacements, dpa									
277.03	1.56E+00	1.78E+00	1.99E+00	2.21E+00	2.42E+00	2.64E+00	2.86E+00	3.07E+00	3.63E+00	5.69E+00
292.27	1.50E+00	1.70E+00	1.91E+00	2.12E+00	2.33E+00	2.53E+00	2.74E+00	2.95E+00	3.49E+00	5.46E+00
307.51	1.41E+00	1.60E+00	1.80E+00	2.00E+00	2.19E+00	2.39E+00	2.59E+00	2.79E+00	3.30E+00	5.17E+00
322.75	1.27E+00	1.45E+00	1.63E+00	1.81E+00	1.99E+00	2.18E+00	2.36E+00	2.54E+00	3.01E+00	4.73E+00
337.99	1.08E+00	1.23E+00	1.39E+00	1.54E+00	1.70E+00	1.85E+00	2.01E+00	2.16E+00	2.57E+00	4.04E+00
353.23	8.37E-01	9.54E-01	1.07E+00	1.20E+00	1.32E+00	1.44E+00	1.56E+00	1.68E+00	1.99E+00	3.14E+00
368.47	6.03E-01	6.85E-01	7.69E-01	8.54E-01	9.38E-01	1.02E+00	1.11E+00	1.19E+00	1.41E+00	2.21E+00
Note: Elevation is Distance (cm) from Bottom of Active Core										

Table 2.2-11

Unit 1 Shroud Vertical Welds V5 and V6 Neutron Exposure Predictions

	Cycle 14	Cycle 15	Cycle 16	Cycle 17	Cycle 18	Cycle 19	Cycle 20	Cycle 21	Projected	Projected
Time,s >	5.77E+07	5.82E+07	5.95E+07	5.99E+07	5.99E+07	5.99E+07	5.99E+07	5.99E+07	1.55E+08	5.68E+08
EFPY >	17.87	19.71	21.60	23.50	25.40	27.30	29.20	31.10	36.00	54.00
Elevation	Fast Neutron Fluence (E > 1.0 Mev)									
27.79	3.66E+20	4.18E+20	4.72E+20	5.25E+20	5.79E+20	6.33E+20	6.87E+20	7.41E+20	8.80E+20	1.39E+21
43.03	4.76E+20	5.45E+20	6.16E+20	6.87E+20	7.58E+20	8.30E+20	9.01E+20	9.72E+20	1.16E+21	1.83E+21
58.27	5.69E+20	6.53E+20	7.38E+20	8.25E+20	9.11E+20	9.97E+20	1.08E+21	1.17E+21	1.39E+21	2.21E+21
73.51	6.49E+20	7.47E+20	8.46E+20	9.46E+20	1.05E+21	1.15E+21	1.25E+21	1.35E+21	1.61E+21	2.56E+21
88.75	6.94E+20	8.01E+20	9.09E+20	1.02E+21	1.13E+21	1.24E+21	1.35E+21	1.46E+21	1.74E+21	2.78E+21
103.99	7.30E+20	8.45E+20	9.62E+20	1.08E+21	1.20E+21	1.32E+21	1.43E+21	1.55E+21	1.85E+21	2.97E+21
119.23	7.86E+20	9.10E+20	1.04E+21	1.17E+21	1.29E+21	1.42E+21	1.55E+21	1.68E+21	2.01E+21	3.22E+21
134.47	8.50E+20	9.86E+20	1.13E+21	1.27E+21	1.40E+21	1.54E+21	1.68E+21	1.82E+21	2.18E+21	3.51E+21
149.71	8.88E+20	1.03E+21	1.18E+21	1.32E+21	1.47E+21	1.61E+21	1.76E+21	1.91E+21	2.28E+21	3.67E+21
164.95	9.24E+20	1.07E+21	1.22E+21	1.37E+21	1.52E+21	1.67E+21	1.82E+21	1.97E+21	2.36E+21	3.78E+21
180.19	9.81E+20	1.13E+21	1.29E+21	1.44E+21	1.60E+21	1.76E+21	1.91E+21	2.07E+21	2.47E+21	3.95E+21
195.43	1.04E+21	1.20E+21	1.36E+21	1.52E+21	1.68E+21	1.84E+21	2.00E+21	2.17E+21	2.58E+21	4.11E+21
210.67	1.06E+21	1.22E+21	1.38E+21	1.54E+21	1.70E+21	1.86E+21	2.02E+21	2.18E+21	2.59E+21	4.11E+21
225.91	1.08E+21	1.23E+21	1.38E+21	1.54E+21	1.70E+21	1.85E+21	2.01E+21	2.17E+21	2.57E+21	4.05E+21
241.15	1.09E+21	1.24E+21	1.40E+21	1.55E+21	1.70E+21	1.86E+21	2.01E+21	2.17E+21	2.57E+21	4.04E+21
256.39	1.10E+21	1.25E+21	1.40E+21	1.56E+21	1.71E+21	1.87E+21	2.02E+21	2.17E+21	2.57E+21	4.03E+21
271.63	1.08E+21	1.23E+21	1.38E+21	1.53E+21	1.68E+21	1.83E+21	1.98E+21	2.13E+21	2.52E+21	3.94E+21
277.03	1.07E+21	1.21E+21	1.36E+21	1.51E+21	1.66E+21	1.81E+21	1.95E+21	2.10E+21	2.49E+21	3.89E+21
Note: Elevation is Distance (cm) from Bottom of Active Core										

Table 2.2-11 (Continued

Unit 1 Shroud Vertical Welds V5 and V6 Neutron Exposure Predictions

	Cycle 14	Cycle 15	Cycle 16	Cycle 17	Cycle 18	Cycle 19	Cycle 20	Cycle 21	Projected	Projected
Time,s >	5.77E+07	5.82E+07	5.95E+07	5.99E+07	5.99E+07	5.99E+07	5.99E+07	5.99E+07	1.55E+08	5.68E+08
EFPY >	17.87	19.71	21.60	23.50	25.40	27.30	29.20	31.10	36.00	54.00
Elevation	Iron Atom Displacements, dpa									
27.79	5.33E-01	6.10E-01	6.88E-01	7.66E-01	8.45E-01	9.24E-01	1.00E+00	1.08E+00	1.28E+00	2.03E+00
43.03	6.94E-01	7.95E-01	8.98E-01	1.00E+00	1.11E+00	1.21E+00	1.31E+00	1.42E+00	1.69E+00	2.67E+00
58.27	8.30E-01	9.52E-01	1.08E+00	1.20E+00	1.33E+00	1.46E+00	1.58E+00	1.71E+00	2.03E+00	3.23E+00
73.51	9.47E-01	1.09E+00	1.23E+00	1.38E+00	1.53E+00	1.67E+00	1.82E+00	1.97E+00	2.34E+00	3.73E+00
88.75	1.01E+00	1.17E+00	1.33E+00	1.49E+00	1.65E+00	1.81E+00	1.97E+00	2.13E+00	2.54E+00	4.05E+00
103.99	1.07E+00	1.23E+00	1.40E+00	1.58E+00	1.75E+00	1.92E+00	2.09E+00	2.26E+00	2.71E+00	4.33E+00
119.23	1.15E+00	1.33E+00	1.52E+00	1.70E+00	1.89E+00	2.08E+00	2.26E+00	2.45E+00	2.93E+00	4.71E+00
134.47	1.24E+00	1.44E+00	1.64E+00	1.85E+00	2.05E+00	2.25E+00	2.46E+00	2.66E+00	3.19E+00	5.12E+00
149.71	1.30E+00	1.50E+00	1.72E+00	1.93E+00	2.14E+00	2.36E+00	2.57E+00	2.78E+00	3.33E+00	5.35E+00
164.95	1.35E+00	1.56E+00	1.78E+00	2.00E+00	2.22E+00	2.44E+00	2.66E+00	2.88E+00	3.44E+00	5.52E+00
180.19	1.43E+00	1.65E+00	1.88E+00	2.11E+00	2.34E+00	2.56E+00	2.79E+00	3.02E+00	3.61E+00	5.77E+00
195.43	1.52E+00	1.75E+00	1.99E+00	2.22E+00	2.46E+00	2.69E+00	2.93E+00	3.16E+00	3.77E+00	6.00E+00
210.67	1.56E+00	1.78E+00	2.02E+00	2.25E+00	2.48E+00	2.72E+00	2.95E+00	3.18E+00	3.79E+00	6.00E+00
225.91	1.57E+00	1.79E+00	2.02E+00	2.25E+00	2.48E+00	2.71E+00	2.94E+00	3.16E+00	3.76E+00	5.92E+00
241.15	1.60E+00	1.81E+00	2.04E+00	2.27E+00	2.49E+00	2.72E+00	2.94E+00	3.17E+00	3.75E+00	5.90E+00
256.39	1.61E+00	1.83E+00	2.05E+00	2.28E+00	2.50E+00	2.73E+00	2.95E+00	3.18E+00	3.76E+00	5.89E+00
271.63	1.58E+00	1.79E+00	2.01E+00	2.23E+00	2.45E+00	2.67E+00	2.89E+00	3.11E+00	3.68E+00	5.76E+00
277.03	1.56E+00	1.78E+00	1.99E+00	2.21E+00	2.42E+00	2.64E+00	2.86E+00	3.07E+00	3.63E+00	5.69E+00
Note: Elevation is Distance (cm) from Bottom of Active Core										

Table 2.2-12

Unit 1 Shroud Vertical Welds V7 and V8 Neutron Exposure Predictions

	Cycle 14	Cycle 15	Cycle 16	Cycle 17	Cycle 18	Cycle 19	Cycle 20	Cycle 21	Projected	Projected
Time,s >	5.77E+07	5.82E+07	5.95E+07	5.99E+07	5.99E+07	5.99E+07	5.99E+07	5.99E+07	1.55E+08	5.68E+08
EFPY >	17.87	19.71	21.60	23.50	25.40	27.30	29.20	31.10	36.00	54.00
Elevation	Fast Neutron Fluence (E > 1.0 Mev)									
-63.65	4.59E+17	5.18E+17	5.79E+17	6.40E+17	7.00E+17	7.61E+17	8.22E+17	8.83E+17	1.04E+18	1.62E+18
-48.41	1.98E+18	2.24E+18	2.50E+18	2.76E+18	3.02E+18	3.29E+18	3.55E+18	3.81E+18	4.49E+18	6.99E+18
-33.17	8.59E+18	9.70E+18	1.08E+19	1.20E+19	1.31E+19	1.43E+19	1.54E+19	1.65E+19	1.95E+19	3.03E+19
-17.93	3.33E+19	3.77E+19	4.22E+19	4.67E+19	5.12E+19	5.57E+19	6.02E+19	6.48E+19	7.64E+19	1.19E+20
-2.69	1.06E+20	1.20E+20	1.34E+20	1.49E+20	1.64E+20	1.78E+20	1.93E+20	2.08E+20	2.45E+20	3.84E+20
12.55	2.26E+20	2.58E+20	2.90E+20	3.22E+20	3.54E+20	3.87E+20	4.19E+20	4.51E+20	5.35E+20	8.41E+20
27.79	3.66E+20	4.18E+20	4.72E+20	5.25E+20	5.79E+20	6.33E+20	6.87E+20	7.41E+20	8.80E+20	1.39E+21
Elevation	Iron Atom Displacements, dpa									
-63.65	7.06E-04	7.97E-04	8.90E-04	9.84E-04	1.08E-03	1.17E-03	1.27E-03	1.36E-03	1.60E-03	2.49E-03
-48.41	2.98E-03	3.37E-03	3.76E-03	4.16E-03	4.55E-03	4.95E-03	5.35E-03	5.74E-03	6.77E-03	1.05E-02
-33.17	1.27E-02	1.43E-02	1.60E-02	1.77E-02	1.94E-02	2.11E-02	2.28E-02	2.45E-02	2.88E-02	4.48E-02
-17.93	4.87E-02	5.51E-02	6.17E-02	6.83E-02	7.49E-02	8.15E-02	8.81E-02	9.48E-02	1.12E-01	1.75E-01
-2.69	1.54E-01	1.75E-01	1.96E-01	2.17E-01	2.39E-01	2.60E-01	2.82E-01	3.03E-01	3.58E-01	5.60E-01
12.55	3.30E-01	3.76E-01	4.23E-01	4.70E-01	5.17E-01	5.64E-01	6.11E-01	6.58E-01	7.80E-01	1.23E+00
27.79	5.33E-01	6.10E-01	6.88E-01	7.66E-01	8.45E-01	9.24E-01	1.00E+00	1.08E+00	1.28E+00	2.03E+00
Note: Elevation is Distance (cm) from Bottom of Active Core										

Table 2.2-13

Unit 1 Shroud Vertical Weld V9 Neutron Exposure Predictions

	Cycle 14	Cycle 15	Cycle 16	Cycle 17	Cycle 18	Cycle 19	Cycle 20	Cycle 21	Projected	Projected
Time,s >	5.77E+07	5.82E+07	5.95E+07	5.99E+07	5.99E+07	5.99E+07	5.99E+07	5.99E+07	1.55E+08	5.68E+08
EFPY >	17.87	19.71	21.60	23.50	25.40	27.30	29.20	31.10	36.00	54.00
Elevation	Fast Neutron Fluence (E > 1.0 Mev)									
-206.69	1.73E+12	1.96E+12	2.19E+12	2.42E+12	2.65E+12	2.88E+12	3.11E+12	3.34E+12	3.93E+12	6.11E+12
-191.45	6.01E+12	6.79E+12	7.58E+12	8.38E+12	9.18E+12	9.98E+12	1.08E+13	1.16E+13	1.36E+13	2.12E+13
-176.21	2.13E+13	2.40E+13	2.68E+13	2.97E+13	3.25E+13	3.53E+13	3.81E+13	4.10E+13	4.83E+13	7.51E+13
-160.97	7.66E+13	8.64E+13	9.65E+13	1.07E+14	1.17E+14	1.27E+14	1.37E+14	1.47E+14	1.74E+14	2.70E+14
-145.73	2.80E+14	3.16E+14	3.53E+14	3.90E+14	4.28E+14	4.65E+14	5.02E+14	5.39E+14	6.35E+14	9.88E+14
-130.49	1.04E+15	1.18E+15	1.32E+15	1.46E+15	1.59E+15	1.73E+15	1.87E+15	2.01E+15	2.37E+15	3.68E+15
-115.25	3.99E+15	4.50E+15	5.03E+15	5.56E+15	6.09E+15	6.62E+15	7.15E+15	7.67E+15	9.04E+15	1.41E+16
-100.01	1.57E+16	1.77E+16	1.98E+16	2.19E+16	2.40E+16	2.61E+16	2.81E+16	3.02E+16	3.56E+16	5.54E+16
-84.77	6.36E+16	7.19E+16	8.02E+16	8.87E+16	9.71E+16	1.06E+17	1.14E+17	1.22E+17	1.44E+17	2.24E+17
-74.45	1.66E+17	1.88E+17	2.10E+17	2.32E+17	2.54E+17	2.76E+17	2.98E+17	3.20E+17	3.77E+17	5.86E+17
Elevation	Iron Atom Displacements, dpa									
-206.69	3.00E-09	3.38E-09	3.78E-09	4.18E-09	4.58E-09	4.98E-09	5.37E-09	5.77E-09	6.80E-09	1.06E-08
-191.45	1.03E-08	1.17E-08	1.30E-08	1.44E-08	1.58E-08	1.71E-08	1.85E-08	1.99E-08	2.34E-08	3.64E-08
-176.21	3.62E-08	4.09E-08	4.57E-08	5.05E-08	5.53E-08	6.01E-08	6.49E-08	6.97E-08	8.22E-08	1.28E-07
-160.97	1.29E-07	1.46E-07	1.63E-07	1.80E-07	1.97E-07	2.14E-07	2.32E-07	2.49E-07	2.93E-07	4.56E-07
-145.73	4.68E-07	5.28E-07	5.90E-07	6.52E-07	7.14E-07	7.77E-07	8.39E-07	9.01E-07	1.06E-06	1.65E-06
-130.49	1.73E-06	1.95E-06	2.18E-06	2.40E-06	2.63E-06	2.86E-06	3.09E-06	3.32E-06	3.91E-06	6.09E-06
-115.25	6.51E-06	7.35E-06	8.21E-06	9.07E-06	9.94E-06	1.08E-05	1.17E-05	1.25E-05	1.48E-05	2.30E-05
-100.01	2.53E-05	2.86E-05	3.19E-05	3.53E-05	3.86E-05	4.20E-05	4.54E-05	4.87E-05	5.74E-05	8.93E-05
-84.77	1.01E-04	1.14E-04	1.27E-04	1.41E-04	1.54E-04	1.67E-04	1.81E-04	1.94E-04	2.29E-04	3.56E-04
-74.45	2.60E-04	2.93E-04	3.28E-04	3.62E-04	3.97E-04	4.31E-04	4.66E-04	5.00E-04	5.89E-04	9.16E-04
Note: Elevation is Distance (cm) from Bottom of Active Core										

Table 2.2-14

Unit 1 Shroud Vertical Welds V10 Neutron Exposure Predictions

	Cycle 14	Cycle 15	Cycle 16	Cycle 17	Cycle 18	Cycle 19	Cycle 20	Cycle 21	Projected	Projected
Time,s >	5.77E+07	5.82E+07	5.95E+07	5.99E+07	5.99E+07	5.99E+07	5.99E+07	5.99E+07	1.55E+08	5.68E+08
EFPY >	17.87	19.71	21.60	23.50	25.40	27.30	29.20	31.10	36.00	54.00
Elevation	Fast Neutron Fluence (E > 1.0 Mev)									
-206.69	7.24E+11	8.08E+11	8.94E+11	9.81E+11	1.07E+12	1.15E+12	1.24E+12	1.33E+12	1.55E+12	2.37E+12
-191.45	2.51E+12	2.80E+12	3.10E+12	3.40E+12	3.71E+12	4.01E+12	4.31E+12	4.61E+12	5.38E+12	8.24E+12
-176.21	8.89E+12	9.92E+12	1.10E+13	1.20E+13	1.31E+13	1.42E+13	1.52E+13	1.63E+13	1.91E+13	2.91E+13
-160.97	3.20E+13	3.57E+13	3.95E+13	4.33E+13	4.72E+13	5.10E+13	5.48E+13	5.86E+13	6.85E+13	1.05E+14
-145.73	1.17E+14	1.31E+14	1.45E+14	1.59E+14	1.73E+14	1.87E+14	2.01E+14	2.15E+14	2.51E+14	3.84E+14
-130.49	4.36E+14	4.87E+14	5.39E+14	5.91E+14	6.43E+14	6.95E+14	7.48E+14	8.00E+14	9.35E+14	1.43E+15
-115.25	1.67E+15	1.86E+15	2.06E+15	2.26E+15	2.46E+15	2.66E+15	2.86E+15	3.05E+15	3.57E+15	5.46E+15
-100.01	6.56E+15	7.32E+15	8.10E+15	8.89E+15	9.67E+15	1.05E+16	1.12E+16	1.20E+16	1.41E+16	2.15E+16
-84.77	2.66E+16	2.97E+16	3.28E+16	3.60E+16	3.92E+16	4.24E+16	4.56E+16	4.87E+16	5.70E+16	8.71E+16
-74.45	6.94E+16	7.75E+16	8.57E+16	9.40E+16	1.02E+17	1.11E+17	1.19E+17	1.27E+17	1.49E+17	2.28E+17
Elevation	Iron Atom Displacements, dpa									
-206.69	1.24E-09	1.38E-09	1.53E-09	1.68E-09	1.83E-09	1.97E-09	2.12E-09	2.27E-09	2.65E-09	4.06E-09
-191.45	4.26E-09	4.76E-09	5.27E-09	5.78E-09	6.29E-09	6.80E-09	7.31E-09	7.82E-09	9.14E-09	1.40E-08
-176.21	1.50E-08	1.67E-08	1.85E-08	2.03E-08	2.21E-08	2.39E-08	2.56E-08	2.74E-08	3.21E-08	4.91E-08
-160.97	5.33E-08	5.95E-08	6.59E-08	7.23E-08	7.87E-08	8.51E-08	9.14E-08	9.78E-08	1.14E-07	1.75E-07
-145.73	1.93E-07	2.16E-07	2.39E-07	2.62E-07	2.85E-07	3.08E-07	3.31E-07	3.55E-07	4.14E-07	6.34E-07
-130.49	7.12E-07	7.95E-07	8.80E-07	9.66E-07	1.05E-06	1.14E-06	1.22E-06	1.31E-06	1.53E-06	2.34E-06
-115.25	2.69E-06	3.00E-06	3.32E-06	3.64E-06	3.97E-06	4.29E-06	4.61E-06	4.93E-06	5.76E-06	8.82E-06
-100.01	1.04E-05	1.17E-05	1.29E-05	1.42E-05	1.54E-05	1.67E-05	1.79E-05	1.92E-05	2.24E-05	3.43E-05
-84.77	4.16E-05	4.65E-05	5.14E-05	5.64E-05	6.14E-05	6.64E-05	7.14E-05	7.64E-05	8.93E-05	1.37E-04
-74.45	1.07E-04	1.20E-04	1.32E-04	1.45E-04	1.58E-04	1.71E-04	1.84E-04	1.97E-04	2.30E-04	3.52E-04

Note: Elevation is Distance (cm) from Bottom of Active Core

Table 2.2-15

Unit 1 Shroud Vertical Welds V11 Neutron Exposure Predictions

	Cycle 14	Cycle 15	Cycle 16	Cycle 17	Cycle 18	Cycle 19	Cycle 20	Cycle 21	Projected	Projected
Time,s >	5.77E+07	5.82E+07	5.95E+07	5.99E+07	5.99E+07	5.99E+07	5.99E+07	5.99E+07	1.55E+08	5.68E+08
EFPY >	17.87	19.71	21.60	23.50	25.40	27.30	29.20	31.10	36.00	54.00
Elevation	Fast Neutron Fluence (E > 1.0 Mev)									
-206.69	1.16E+12	1.30E+12	1.44E+12	1.58E+12	1.72E+12	1.86E+12	2.00E+12	2.14E+12	2.50E+12	3.83E+12
-191.45	4.03E+12	4.50E+12	4.98E+12	5.47E+12	5.96E+12	6.44E+12	6.93E+12	7.41E+12	8.67E+12	1.33E+13
-176.21	1.43E+13	1.59E+13	1.76E+13	1.94E+13	2.11E+13	2.28E+13	2.45E+13	2.62E+13	3.07E+13	4.70E+13
-160.97	5.13E+13	5.73E+13	6.34E+13	6.96E+13	7.58E+13	8.20E+13	8.82E+13	9.43E+13	1.10E+14	1.69E+14
-145.73	1.88E+14	2.10E+14	2.32E+14	2.55E+14	2.77E+14	3.00E+14	3.23E+14	3.45E+14	4.04E+14	6.18E+14
-130.49	6.99E+14	7.81E+14	8.65E+14	9.50E+14	1.03E+15	1.12E+15	1.20E+15	1.29E+15	1.50E+15	2.30E+15
-115.25	2.67E+15	2.98E+15	3.30E+15	3.63E+15	3.95E+15	4.27E+15	4.59E+15	4.91E+15	5.75E+15	8.80E+15
-100.01	1.05E+16	1.18E+16	1.30E+16	1.43E+16	1.55E+16	1.68E+16	1.81E+16	1.93E+16	2.26E+16	3.46E+16
-84.77	4.26E+16	4.76E+16	5.27E+16	5.79E+16	6.30E+16	6.82E+16	7.33E+16	7.84E+16	9.17E+16	1.40E+17
-74.45	1.11E+17	1.24E+17	1.38E+17	1.51E+17	1.65E+17	1.78E+17	1.91E+17	2.05E+17	2.40E+17	3.67E+17
Elevation	Iron Atom Displacements, dpa									
-206.69	2.00E-09	2.23E-09	2.47E-09	2.71E-09	2.95E-09	3.19E-09	3.43E-09	3.68E-09	4.30E-09	6.58E-09
-191.45	6.88E-09	7.68E-09	8.51E-09	9.34E-09	1.02E-08	1.10E-08	1.18E-08	1.27E-08	1.48E-08	2.27E-08
-176.21	2.41E-08	2.70E-08	2.99E-08	3.28E-08	3.57E-08	3.86E-08	4.15E-08	4.44E-08	5.19E-08	7.95E-08
-160.97	8.61E-08	9.61E-08	1.06E-07	1.17E-07	1.27E-07	1.38E-07	1.48E-07	1.58E-07	1.85E-07	2.84E-07
-145.73	3.12E-07	3.48E-07	3.86E-07	4.23E-07	4.61E-07	4.99E-07	5.36E-07	5.74E-07	6.71E-07	1.03E-06
-130.49	1.15E-06	1.28E-06	1.42E-06	1.56E-06	1.70E-06	1.84E-06	1.98E-06	2.12E-06	2.47E-06	3.79E-06
-115.25	4.34E-06	4.85E-06	5.37E-06	5.89E-06	6.41E-06	6.94E-06	7.46E-06	7.98E-06	9.34E-06	1.43E-05
-100.01	1.69E-05	1.88E-05	2.09E-05	2.29E-05	2.49E-05	2.70E-05	2.90E-05	3.10E-05	3.63E-05	5.55E-05
-84.77	6.72E-05	7.51E-05	8.31E-05	9.12E-05	9.93E-05	1.07E-04	1.16E-04	1.24E-04	1.45E-04	2.21E-04
-74.45	1.73E-04	1.93E-04	2.14E-04	2.35E-04	2.56E-04	2.77E-04	2.98E-04	3.18E-04	3.72E-04	5.70E-04

Note: Elevation is Distance (cm) from Bottom of Active Core

Table 2.2-16

Unit 1 RPV Girth Weld GH Neutron Exposure Predictions

	Cycle 14	Cycle 15	Cycle 16	Cycle 17	Cycle 18	Cycle 19	Cycle 20	Cycle 21	Projected	Projected
Time,s >	5.77E+07	5.82E+07	5.95E+07	5.99E+07	5.99E+07	5.99E+07	5.99E+07	5.99E+07	1.55E+08	5.68E+08
EFPY >	17.87	19.71	21.60	23.50	25.40	27.30	29.20	31.10	36.00	54.00
Azimuth	Fast Neutron Fluence (E > 1.0 Mev)									
0	6.29E+11	7.08E+11	7.88E+11	8.69E+11	9.49E+11	1.03E+12	1.11E+12	1.19E+12	1.40E+12	2.16E+12
15	9.86E+11	1.11E+12	1.24E+12	1.36E+12	1.49E+12	1.62E+12	1.74E+12	1.87E+12	2.20E+12	3.40E+12
30	7.70E+11	8.72E+11	9.76E+11	1.08E+12	1.18E+12	1.29E+12	1.39E+12	1.50E+12	1.77E+12	2.76E+12
45	1.44E+12	1.64E+12	1.84E+12	2.04E+12	2.25E+12	2.45E+12	2.65E+12	2.86E+12	3.38E+12	5.30E+12
Azimuth	Iron Atom Displacements, dpa									
0	5.96E-09	6.71E-09	7.47E-09	8.24E-09	9.00E-09	9.77E-09	1.05E-08	1.13E-08	1.33E-08	2.05E-08
15	9.25E-09	1.04E-08	1.16E-08	1.28E-08	1.40E-08	1.52E-08	1.64E-08	1.76E-08	2.07E-08	3.20E-08
30	7.26E-09	8.23E-09	9.21E-09	1.02E-08	1.12E-08	1.22E-08	1.32E-08	1.42E-08	1.67E-08	2.61E-08
45	1.34E-08	1.53E-08	1.72E-08	1.91E-08	2.10E-08	2.28E-08	2.48E-08	2.67E-08	3.16E-08	4.95E-08
Note: Azimuth is Angle in First Octant										

Table 2.2-17

Unit 1 RPV Girth Weld FG Neutron Exposure Predictions

	Cycle 14	Cycle 15	Cycle 16	Cycle 17	Cycle 18	Cycle 19	Cycle 20	Cycle 21	Projected	Projected
Time,s >	5.77E+07	5.82E+07	5.95E+07	5.99E+07	5.99E+07	5.99E+07	5.99E+07	5.99E+07	1.55E+08	5.68E+08
EFPY >	17.87	19.71	21.60	23.50	25.40	27.30	29.20	31.10	36.00	54.00
Azimuth	Fast Neutron Fluence (E > 1.0 Mev)									
0	3.50E+17	4.00E+17	4.50E+17	5.01E+17	5.52E+17	6.03E+17	6.54E+17	7.05E+17	8.36E+17	1.32E+18
15	5.48E+17	6.26E+17	7.05E+17	7.85E+17	8.66E+17	9.46E+17	1.03E+18	1.11E+18	1.31E+18	2.07E+18
30	4.28E+17	4.92E+17	5.58E+17	6.24E+17	6.90E+17	7.56E+17	8.23E+17	8.89E+17	1.06E+18	1.69E+18
45	8.02E+17	9.27E+17	1.05E+18	1.18E+18	1.31E+18	1.44E+18	1.57E+18	1.70E+18	2.03E+18	3.24E+18
Azimuth	Iron Atom Displacements, dpa									
0	5.53E-04	6.31E-04	7.11E-04	7.91E-04	8.71E-04	9.51E-04	1.03E-03	1.11E-03	1.32E-03	2.08E-03
15	8.57E-04	9.79E-04	1.10E-03	1.23E-03	1.35E-03	1.48E-03	1.60E-03	1.73E-03	2.05E-03	3.24E-03
30	6.73E-04	7.74E-04	8.77E-04	9.81E-04	1.09E-03	1.19E-03	1.29E-03	1.40E-03	1.67E-03	2.65E-03
45	1.25E-03	1.44E-03	1.64E-03	1.84E-03	2.04E-03	2.23E-03	2.43E-03	2.63E-03	3.15E-03	5.03E-03
Note: Azimuth is Angle in First Octant										

Table 2.2-18

Unit 1 RPV Girth Weld EF Neutron Exposure Predictions

	Cycle 14	Cycle 15	Cycle 16	Cycle 17	Cycle 18	Cycle 19	Cycle 20	Cycle 21	Projected	Projected
Time,s >	5.77E+07	5.82E+07	5.95E+07	5.99E+07	5.99E+07	5.99E+07	5.99E+07	5.99E+07	1.55E+08	5.68E+08
EFPY >	17.87	19.71	21.60	23.50	25.40	27.30	29.20	31.10	36.00	54.00
Azimuth	Fast Neutron Fluence (E > 1.0 Mev)									
0	3.26E+16	3.61E+16	3.98E+16	4.34E+16	4.71E+16	5.08E+16	5.45E+16	5.81E+16	6.76E+16	1.02E+17
15	5.06E+16	5.62E+16	6.20E+16	6.77E+16	7.35E+16	7.93E+16	8.51E+16	9.09E+16	1.06E+17	1.61E+17
30	3.96E+16	4.42E+16	4.89E+16	5.37E+16	5.85E+16	6.32E+16	6.80E+16	7.28E+16	8.51E+16	1.30E+17
45	9.40E+16	1.05E+17	1.17E+17	1.29E+17	1.41E+17	1.52E+17	1.64E+17	1.76E+17	2.06E+17	3.17E+17
Azimuth	Iron Atom Displacements, dpa									
0	5.03E-05	5.58E-05	6.15E-05	6.72E-05	7.29E-05	7.86E-05	8.43E-05	9.00E-05	1.05E-04	1.59E-04
15	7.74E-05	8.61E-05	9.49E-05	1.04E-04	1.13E-04	1.22E-04	1.30E-04	1.39E-04	1.62E-04	2.47E-04
30	6.08E-05	6.80E-05	7.54E-05	8.27E-05	9.01E-05	9.75E-05	1.05E-04	1.12E-04	1.31E-04	2.01E-04
45	1.12E-04	1.26E-04	1.40E-04	1.54E-04	1.68E-04	1.83E-04	1.97E-04	2.11E-04	2.47E-04	3.81E-04
Note: Azimuth is Angle in First Octant										

Table 2.2-19

Unit 1 RPV Vertical Welds G1 and G2 Neutron Exposure Predictions

	Cycle 14	Cycle 15	Cycle 16	Cycle 17	Cycle 18	Cycle 19	Cycle 20	Cycle 21	Projected	Projected
Time,s >	5.77E+07	5.82E+07	5.95E+07	5.99E+07	5.99E+07	5.99E+07	5.99E+07	5.99E+07	1.55E+08	5.68E+08
EFPY >	17.87	19.71	21.60	23.50	25.40	27.30	29.20	31.10	36.00	54.00
Elevation	Fast Neutron Fluence (E > 1.0 Mev)									
-250.24	9.86E+11	1.11E+12	1.24E+12	1.36E+12	1.49E+12	1.62E+12	1.74E+12	1.87E+12	2.20E+12	3.40E+12
-219.76	2.10E+13	2.37E+13	2.63E+13	2.90E+13	3.17E+13	3.45E+13	3.72E+13	3.99E+13	4.68E+13	7.25E+13
-189.28	3.45E+13	3.88E+13	4.32E+13	4.76E+13	5.20E+13	5.65E+13	6.09E+13	6.53E+13	7.68E+13	1.19E+14
-158.80	6.17E+13	6.95E+13	7.74E+13	8.53E+13	9.32E+13	1.01E+14	1.09E+14	1.17E+14	1.38E+14	2.13E+14
-128.32	1.72E+14	1.93E+14	2.15E+14	2.37E+14	2.59E+14	2.81E+14	3.03E+14	3.25E+14	3.82E+14	5.92E+14
-97.84	8.75E+14	9.85E+14	1.10E+15	1.21E+15	1.32E+15	1.43E+15	1.55E+15	1.66E+15	1.95E+15	3.02E+15
-67.36	5.26E+15	5.92E+15	6.59E+15	7.26E+15	7.94E+15	8.62E+15	9.29E+15	9.97E+15	1.17E+16	1.81E+16
-36.88	2.62E+16	2.94E+16	3.28E+16	3.61E+16	3.95E+16	4.28E+16	4.62E+16	4.96E+16	5.82E+16	9.01E+16
-6.40	1.05E+17	1.19E+17	1.33E+17	1.46E+17	1.60E+17	1.74E+17	1.88E+17	2.02E+17	2.37E+17	3.68E+17
24.08	2.38E+17	2.69E+17	3.01E+17	3.33E+17	3.65E+17	3.97E+17	4.29E+17	4.61E+17	5.44E+17	8.48E+17
54.56	3.78E+17	4.29E+17	4.81E+17	5.34E+17	5.86E+17	6.38E+17	6.91E+17	7.43E+17	8.79E+17	1.38E+18
85.04	4.77E+17	5.43E+17	6.11E+17	6.79E+17	7.47E+17	8.15E+17	8.83E+17	9.51E+17	1.13E+18	1.77E+18
114.91	5.48E+17	6.26E+17	7.05E+17	7.85E+17	8.66E+17	9.46E+17	1.03E+18	1.11E+18	1.31E+18	2.07E+18
Note: Elevation is Distance (cm) from Bottom of Active Core										

Table 2.2-19 (Continued)

Unit 1 RPV Vertical Welds G1 and G2 Neutron Exposure Predictions

	Cycle 14	Cycle 15	Cycle 16	Cycle 17	Cycle 18	Cycle 19	Cycle 20	Cycle 21	Projected	Projected
Time,s >	5.77E+07	5.82E+07	5.95E+07	5.99E+07	5.99E+07	5.99E+07	5.99E+07	5.99E+07	1.55E+08	5.68E+08
EFPY >	17.87	19.71	21.60	23.50	25.40	27.30	29.20	31.10	36.00	54.00
Elevation	Iron Atom Displacements, dpa									
-250.24	9.25E-09	1.04E-08	1.16E-08	1.28E-08	1.40E-08	1.52E-08	1.64E-08	1.76E-08	2.07E-08	3.20E-08
-219.76	1.89E-07	2.13E-07	2.37E-07	2.61E-07	2.86E-07	3.10E-07	3.35E-07	3.59E-07	4.22E-07	6.53E-07
-189.28	3.00E-07	3.38E-07	3.76E-07	4.15E-07	4.54E-07	4.92E-07	5.31E-07	5.70E-07	6.70E-07	1.04E-06
-158.80	4.73E-07	5.32E-07	5.92E-07	6.53E-07	7.14E-07	7.75E-07	8.36E-07	8.97E-07	1.05E-06	1.63E-06
-128.32	8.42E-07	9.47E-07	1.06E-06	1.16E-06	1.27E-06	1.38E-06	1.49E-06	1.60E-06	1.88E-06	2.91E-06
-97.84	2.27E-06	2.56E-06	2.85E-06	3.14E-06	3.44E-06	3.73E-06	4.02E-06	4.32E-06	5.08E-06	7.86E-06
-67.36	9.71E-06	1.09E-05	1.22E-05	1.34E-05	1.47E-05	1.59E-05	1.72E-05	1.84E-05	2.17E-05	3.36E-05
-36.88	4.30E-05	4.84E-05	5.39E-05	5.95E-05	6.50E-05	7.06E-05	7.61E-05	8.17E-05	9.60E-05	1.49E-04
-6.40	1.67E-04	1.89E-04	2.11E-04	2.33E-04	2.54E-04	2.76E-04	2.98E-04	3.20E-04	3.77E-04	5.85E-04
24.08	3.73E-04	4.22E-04	4.72E-04	5.23E-04	5.73E-04	6.23E-04	6.73E-04	7.24E-04	8.54E-04	1.33E-03
54.56	5.92E-04	6.72E-04	7.53E-04	8.35E-04	9.17E-04	9.99E-04	1.08E-03	1.16E-03	1.38E-03	2.15E-03
85.04	7.46E-04	8.50E-04	9.55E-04	1.06E-03	1.17E-03	1.28E-03	1.38E-03	1.49E-03	1.76E-03	2.77E-03
114.91	8.57E-04	9.79E-04	1.10E-03	1.23E-03	1.35E-03	1.48E-03	1.60E-03	1.73E-03	2.05E-03	3.24E-03
Note: Elevation is Distance (cm) from Bottom of Active Core										

Table 2.2-20

Unit 1 RPV Vertical Welds F1 and F2 Neutron Exposure Predictions

	Cycle 14	Cycle 15	Cycle 16	Cycle 17	Cycle 18	Cycle 19	Cycle 20	Cycle 21	Projected	Projected
Time,s >	5.77E+07	5.82E+07	5.95E+07	5.99E+07	5.99E+07	5.99E+07	5.99E+07	5.99E+07	1.55E+08	5.68E+08
EFPY >	17.87	19.71	21.60	23.50	25.40	27.30	29.20	31.10	36.00	54.00
Elevation	Fast Neutron Fluence (E > 1.0 Mev)									
114.91	5.48E+17	6.26E+17	7.05E+17	7.85E+17	8.66E+17	9.46E+17	1.03E+18	1.11E+18	1.31E+18	2.07E+18
145.39	6.10E+17	6.97E+17	7.86E+17	8.76E+17	9.65E+17	1.06E+18	1.14E+18	1.23E+18	1.47E+18	2.31E+18
175.87	6.66E+17	7.59E+17	8.54E+17	9.49E+17	1.05E+18	1.14E+18	1.24E+18	1.33E+18	1.58E+18	2.48E+18
206.35	7.08E+17	8.03E+17	8.99E+17	9.97E+17	1.09E+18	1.19E+18	1.29E+18	1.39E+18	1.64E+18	2.56E+18
236.83	7.24E+17	8.17E+17	9.13E+17	1.01E+18	1.10E+18	1.20E+18	1.30E+18	1.39E+18	1.64E+18	2.55E+18
267.31	7.08E+17	7.97E+17	8.88E+17	9.79E+17	1.07E+18	1.16E+18	1.25E+18	1.34E+18	1.58E+18	2.44E+18
297.79	6.44E+17	7.24E+17	8.06E+17	8.89E+17	9.71E+17	1.05E+18	1.14E+18	1.22E+18	1.43E+18	2.22E+18
328.27	5.16E+17	5.81E+17	6.48E+17	7.15E+17	7.82E+17	8.49E+17	9.16E+17	9.83E+17	1.16E+18	1.79E+18
358.75	3.21E+17	3.62E+17	4.04E+17	4.46E+17	4.87E+17	5.29E+17	5.71E+17	6.13E+17	7.22E+17	1.12E+18
389.23	1.00E+17	1.12E+17	1.25E+17	1.38E+17	1.51E+17	1.63E+17	1.76E+17	1.89E+17	2.22E+17	3.43E+17
419.71	5.10E+16	5.66E+16	6.24E+16	6.82E+16	7.40E+16	7.99E+16	8.57E+16	9.15E+16	1.07E+17	1.62E+17
450.19	6.47E+16	7.19E+16	7.93E+16	8.66E+16	9.40E+16	1.01E+17	1.09E+17	1.16E+17	1.35E+17	2.05E+17
480.37	5.06E+16	5.62E+16	6.20E+16	6.77E+16	7.35E+16	7.93E+16	8.51E+16	9.09E+16	1.06E+17	1.61E+17
Note: Elevation is Distance (cm) from Bottom of Active Core										

Table 2.2-20 (Continued)

Unit 1 RPV Vertical Welds F1 and F2 Neutron Exposure Predictions

	Cycle 14	Cycle 15	Cycle 16	Cycle 17	Cycle 18	Cycle 19	Cycle 20	Cycle 21	Projected	Projected
Time,s >	5.77E+07	5.82E+07	5.95E+07	5.99E+07	5.99E+07	5.99E+07	5.99E+07	5.99E+07	1.55E+08	5.68E+08
EFPY >	17.87	19.71	21.60	23.50	25.40	27.30	29.20	31.10	36.00	54.00
Elevation	Iron Atom Displacements, dpa)									
114.91	8.57E-04	9.79E-04	1.10E-03	1.23E-03	1.35E-03	1.48E-03	1.60E-03	1.73E-03	2.05E-03	3.24E-03
145.39	9.54E-04	1.09E-03	1.23E-03	1.37E-03	1.51E-03	1.65E-03	1.79E-03	1.93E-03	2.29E-03	3.62E-03
175.87	1.04E-03	1.19E-03	1.33E-03	1.48E-03	1.63E-03	1.78E-03	1.93E-03	2.08E-03	2.47E-03	3.88E-03
206.35	1.11E-03	1.25E-03	1.40E-03	1.56E-03	1.71E-03	1.86E-03	2.01E-03	2.17E-03	2.56E-03	4.00E-03
236.83	1.13E-03	1.28E-03	1.42E-03	1.57E-03	1.72E-03	1.87E-03	2.02E-03	2.17E-03	2.56E-03	3.97E-03
267.31	1.10E-03	1.24E-03	1.38E-03	1.53E-03	1.67E-03	1.81E-03	1.95E-03	2.10E-03	2.46E-03	3.81E-03
297.79	1.00E-03	1.13E-03	1.26E-03	1.39E-03	1.51E-03	1.64E-03	1.77E-03	1.90E-03	2.23E-03	3.45E-03
328.27	8.04E-04	9.06E-04	1.01E-03	1.11E-03	1.22E-03	1.32E-03	1.43E-03	1.53E-03	1.80E-03	2.79E-03
358.75	5.02E-04	5.66E-04	6.31E-04	6.96E-04	7.62E-04	8.28E-04	8.93E-04	9.59E-04	1.13E-03	1.75E-03
389.23	1.59E-04	1.79E-04	1.99E-04	2.19E-04	2.40E-04	2.60E-04	2.80E-04	3.01E-04	3.53E-04	5.46E-04
419.71	7.94E-05	8.83E-05	9.73E-05	1.07E-04	1.16E-04	1.25E-04	1.34E-04	1.43E-04	1.67E-04	2.53E-04
450.19	9.86E-05	1.10E-04	1.21E-04	1.32E-04	1.44E-04	1.55E-04	1.66E-04	1.77E-04	2.07E-04	3.14E-04
480.37	7.74E-05	8.61E-05	9.49E-05	1.04E-04	1.13E-04	1.22E-04	1.30E-04	1.39E-04	1.62E-04	2.47E-04
Note: Elevation is Distance (cm) from Bottom of Active Core										

Table 2.2-21

Unit 1 RPV Lower Shell Plate Neutron Exposure Predictions

	Cycle 14	Cycle 15	Cycle 16	Cycle 17	Cycle 18	Cycle 19	Cycle 20	Cycle 21	Projected	Projected
Time,s >	5.77E+07	5.82E+07	5.95E+07	5.99E+07	5.99E+07	5.99E+07	5.99E+07	5.99E+07	1.55E+08	5.68E+08
EFPY >	17.87	19.71	21.60	23.50	25.40	27.30	29.20	31.10	36.00	54.00
Elevation	Fast Neutron Fluence (E > 1.0 Mev)									
-250.24	1.44E+12	1.64E+12	1.84E+12	2.04E+12	2.25E+12	2.45E+12	2.65E+12	2.86E+12	3.38E+12	5.30E+12
-219.76	3.08E+13	3.50E+13	3.93E+13	4.36E+13	4.79E+13	5.22E+13	5.66E+13	6.09E+13	7.21E+13	1.13E+14
-189.28	5.04E+13	5.73E+13	6.44E+13	7.15E+13	7.86E+13	8.56E+13	9.27E+13	9.98E+13	1.18E+14	1.85E+14
-158.80	9.03E+13	1.03E+14	1.15E+14	1.28E+14	1.41E+14	1.53E+14	1.66E+14	1.79E+14	2.12E+14	3.32E+14
-128.32	2.51E+14	2.85E+14	3.21E+14	3.56E+14	3.91E+14	4.27E+14	4.62E+14	4.97E+14	5.88E+14	9.23E+14
-97.84	1.28E+15	1.46E+15	1.63E+15	1.81E+15	1.99E+15	2.17E+15	2.35E+15	2.53E+15	3.00E+15	4.71E+15
-67.36	7.69E+15	8.74E+15	9.82E+15	1.09E+16	1.20E+16	1.31E+16	1.41E+16	1.52E+16	1.80E+16	2.83E+16
-36.88	3.83E+16	4.35E+16	4.88E+16	5.42E+16	5.96E+16	6.50E+16	7.04E+16	7.57E+16	8.96E+16	1.41E+17
-6.40	1.54E+17	1.76E+17	1.98E+17	2.20E+17	2.42E+17	2.64E+17	2.86E+17	3.08E+17	3.65E+17	5.75E+17
24.08	3.48E+17	3.98E+17	4.49E+17	5.00E+17	5.52E+17	6.03E+17	6.54E+17	7.05E+17	8.38E+17	1.32E+18
54.56	5.54E+17	6.35E+17	7.18E+17	8.02E+17	8.86E+17	9.70E+17	1.05E+18	1.14E+18	1.35E+18	2.15E+18
85.04	6.98E+17	8.04E+17	9.13E+17	1.02E+18	1.13E+18	1.24E+18	1.35E+18	1.46E+18	1.74E+18	2.77E+18
114.91	8.02E+17	9.27E+17	1.05E+18	1.18E+18	1.31E+18	1.44E+18	1.57E+18	1.70E+18	2.03E+18	3.24E+18
Note: Elevation is Distance (cm) from Bottom of Active Core										

Table 2.2-21 (Continued

Unit 1 RPV Lower Shell Plate Neutron Exposure Predictions

	Cycle 14	Cycle 15	Cycle 16	Cycle 17	Cycle 18	Cycle 19	Cycle 20	Cycle 21	Projected	Projected
Time,s >	5.77E+07	5.82E+07	5.95E+07	5.99E+07	5.99E+07	5.99E+07	5.99E+07	5.99E+07	1.55E+08	5.68E+08
EFPY >	17.87	19.71	21.60	23.50	25.40	27.30	29.20	31.10	36.00	54.00
Elevation	Iron Atom Displacements, dpa									
-250.24	1.34E-08	1.53E-08	1.72E-08	1.91E-08	2.10E-08	2.28E-08	2.48E-08	2.67E-08	3.16E-08	4.95E-08
-219.76	2.75E-07	3.12E-07	3.51E-07	3.90E-07	4.28E-07	4.67E-07	5.06E-07	5.45E-07	6.45E-07	1.01E-06
-189.28	4.36E-07	4.96E-07	5.57E-07	6.18E-07	6.80E-07	7.41E-07	8.03E-07	8.64E-07	1.02E-06	1.61E-06
-158.80	6.86E-07	7.80E-07	8.77E-07	9.74E-07	1.07E-06	1.17E-06	1.26E-06	1.36E-06	1.61E-06	2.53E-06
-128.32	1.22E-06	1.39E-06	1.56E-06	1.73E-06	1.91E-06	2.08E-06	2.25E-06	2.42E-06	2.87E-06	4.50E-06
-97.84	3.30E-06	3.76E-06	4.22E-06	4.69E-06	5.15E-06	5.62E-06	6.09E-06	6.55E-06	7.76E-06	1.22E-05
-67.36	1.41E-05	1.60E-05	1.80E-05	2.00E-05	2.20E-05	2.40E-05	2.60E-05	2.80E-05	3.31E-05	5.20E-05
-36.88	6.25E-05	7.10E-05	7.98E-05	8.86E-05	9.74E-05	1.06E-04	1.15E-04	1.24E-04	1.47E-04	2.30E-04
-6.40	2.43E-04	2.77E-04	3.12E-04	3.47E-04	3.81E-04	4.16E-04	4.51E-04	4.86E-04	5.76E-04	9.07E-04
24.08	5.42E-04	6.20E-04	6.99E-04	7.79E-04	8.59E-04	9.39E-04	1.02E-03	1.10E-03	1.31E-03	2.06E-03
54.56	8.60E-04	9.86E-04	1.12E-03	1.25E-03	1.38E-03	1.51E-03	1.64E-03	1.77E-03	2.10E-03	3.34E-03
85.04	1.08E-03	1.25E-03	1.42E-03	1.59E-03	1.76E-03	1.92E-03	2.09E-03	2.26E-03	2.70E-03	4.30E-03
114.91	1.25E-03	1.44E-03	1.64E-03	1.84E-03	2.04E-03	2.23E-03	2.43E-03	2.63E-03	3.15E-03	5.03E-03
Note: Elevation is Distance (cm) from Bottom of Active Core										

Table 2.2-22

Unit 1 RPV Lower Intermediate Shell Plate Neutron Exposure Predictions

	Cycle 14	Cycle 15	Cycle 16	Cycle 17	Cycle 18	Cycle 19	Cycle 20	Cycle 21	Projected	Projected
Time,s >	5.77E+07	5.82E+07	5.95E+07	5.99E+07	5.99E+07	5.99E+07	5.99E+07	5.99E+07	1.55E+08	5.68E+08
EFPY >	17.87	19.71	21.60	23.50	25.40	27.30	29.20	31.10	36.00	54.00
Elevation	Fast Neutron Fluence (E > 1.0 Mev)									
114.91	8.02E+17	9.27E+17	1.05E+18	1.18E+18	1.31E+18	1.44E+18	1.57E+18	1.70E+18	2.03E+18	3.24E+18
145.39	8.93E+17	1.03E+18	1.18E+18	1.32E+18	1.46E+18	1.61E+18	1.75E+18	1.89E+18	2.26E+18	3.62E+18
175.87	9.74E+17	1.12E+18	1.28E+18	1.43E+18	1.58E+18	1.73E+18	1.89E+18	2.04E+18	2.44E+18	3.89E+18
206.35	1.04E+18	1.19E+18	1.34E+18	1.50E+18	1.65E+18	1.81E+18	1.97E+18	2.12E+18	2.53E+18	4.00E+18
236.83	1.06E+18	1.21E+18	1.36E+18	1.51E+18	1.67E+18	1.82E+18	1.97E+18	2.13E+18	2.52E+18	3.98E+18
267.31	1.03E+18	1.18E+18	1.32E+18	1.47E+18	1.61E+18	1.76E+18	1.91E+18	2.05E+18	2.43E+18	3.81E+18
297.79	9.40E+17	1.07E+18	1.20E+18	1.33E+18	1.47E+18	1.60E+18	1.73E+18	1.86E+18	2.20E+18	3.46E+18
328.27	7.54E+17	8.59E+17	9.65E+17	1.07E+18	1.18E+18	1.29E+18	1.39E+18	1.50E+18	1.78E+18	2.80E+18
358.75	4.70E+17	5.35E+17	6.02E+17	6.69E+17	7.36E+17	8.03E+17	8.70E+17	9.37E+17	1.11E+18	1.75E+18
389.23	1.46E+17	1.66E+17	1.87E+17	2.07E+17	2.27E+17	2.48E+17	2.68E+17	2.89E+17	3.41E+17	5.35E+17
419.71	7.45E+16	8.36E+16	9.29E+16	1.02E+17	1.12E+17	1.21E+17	1.30E+17	1.39E+17	1.64E+17	2.52E+17
450.19	9.47E+16	1.06E+17	1.18E+17	1.30E+17	1.42E+17	1.53E+17	1.65E+17	1.77E+17	2.08E+17	3.20E+17
480.37	9.40E+16	1.05E+17	1.17E+17	1.29E+17	1.41E+17	1.52E+17	1.64E+17	1.76E+17	2.06E+17	3.17E+17
Note: Elevation is Distance (cm) from Bottom of Active Core										

Table 2.2-22 (Continued

Unit 1 RPV Lower Intermediate Shell Plate Neutron Exposure Predictions

	Cycle 14	Cycle 15	Cycle 16	Cycle 17	Cycle 18	Cycle 19	Cycle 20	Cycle 21	Projected	Projected
Time,s >	5.77E+07	5.82E+07	5.95E+07	5.99E+07	5.99E+07	5.99E+07	5.99E+07	5.99E+07	1.55E+08	5.68E+08
EFPY >	17.87	19.71	21.60	23.50	25.40	27.30	29.20	31.10	36.00	54.00
Elevation	Iron Atom Displacements, dpa									
114.91	1.25E-03	1.44E-03	1.64E-03	1.84E-03	2.04E-03	2.23E-03	2.43E-03	2.63E-03	3.15E-03	5.03E-03
145.39	1.39E-03	1.60E-03	1.82E-03	2.05E-03	2.27E-03	2.49E-03	2.71E-03	2.94E-03	3.51E-03	5.62E-03
175.87	1.51E-03	1.74E-03	1.98E-03	2.21E-03	2.45E-03	2.69E-03	2.93E-03	3.16E-03	3.78E-03	6.02E-03
206.35	1.60E-03	1.84E-03	2.08E-03	2.32E-03	2.56E-03	2.81E-03	3.05E-03	3.29E-03	3.91E-03	6.21E-03
236.83	1.64E-03	1.87E-03	2.11E-03	2.34E-03	2.58E-03	2.82E-03	3.06E-03	3.29E-03	3.91E-03	6.16E-03
267.31	1.60E-03	1.82E-03	2.05E-03	2.27E-03	2.50E-03	2.72E-03	2.95E-03	3.18E-03	3.76E-03	5.90E-03
297.79	1.45E-03	1.65E-03	1.86E-03	2.06E-03	2.27E-03	2.47E-03	2.68E-03	2.88E-03	3.41E-03	5.35E-03
328.27	1.17E-03	1.33E-03	1.49E-03	1.66E-03	1.83E-03	1.99E-03	2.16E-03	2.32E-03	2.75E-03	4.33E-03
358.75	7.29E-04	8.30E-04	9.34E-04	1.04E-03	1.14E-03	1.25E-03	1.35E-03	1.45E-03	1.72E-03	2.71E-03
389.23	2.31E-04	2.63E-04	2.95E-04	3.27E-04	3.59E-04	3.91E-04	4.24E-04	4.56E-04	5.39E-04	8.46E-04
419.71	1.15E-04	1.29E-04	1.44E-04	1.58E-04	1.73E-04	1.87E-04	2.02E-04	2.16E-04	2.54E-04	3.91E-04
450.19	1.43E-04	1.61E-04	1.79E-04	1.97E-04	2.15E-04	2.33E-04	2.50E-04	2.69E-04	3.15E-04	4.86E-04
480.37	1.12E-04	1.26E-04	1.40E-04	1.54E-04	1.68E-04	1.83E-04	1.97E-04	2.11E-04	2.47E-04	3.81E-04
Note: Elevation is Distance (cm) from Bottom of Active Core										

Table 2.2-23

Unit 1 RPV N16 Nozzle/Nozzle Forging Neutron Exposure Predictions

	Cycle 14	Cycle 15	Cycle 16	Cycle 17	Cycle 18	Cycle 19	Cycle 20	Cycle 21	Projected	Projected
Time,s >	5.77E+07	5.82E+07	5.95E+07	5.99E+07	5.99E+07	5.99E+07	5.99E+07	5.99E+07	1.55E+08	5.68E+08
EFPY >	17.87	19.71	21.60	23.50	25.40	27.30	29.20	31.10	36.00	54.00
Elevation	Fast Neutron Fluence (E > 1.0 Mev)									
363.52	3.71E+17	4.23E+17	4.75E+17	5.28E+17	5.81E+17	6.34E+17	6.87E+17	7.40E+17	8.77E+17	1.38E+18
371.55	2.94E+17	3.35E+17	3.77E+17	4.19E+17	4.61E+17	5.03E+17	5.45E+17	5.87E+17	6.95E+17	1.09E+18
379.58	2.00E+17	2.28E+17	2.56E+17	2.84E+17	3.13E+17	3.41E+17	3.69E+17	3.98E+17	4.71E+17	7.40E+17
387.5	1.38E+17	1.57E+17	1.76E+17	1.95E+17	2.14E+17	2.34E+17	2.53E+17	2.72E+17	3.22E+17	5.04E+17
395.43	1.05E+17	1.19E+17	1.33E+17	1.48E+17	1.62E+17	1.76E+17	1.91E+17	2.05E+17	2.42E+17	3.78E+17
Elevation	Iron Atom Displacements, dpa									
363.52	5.78E-04	6.58E-04	7.40E-04	8.23E-04	9.05E-04	9.88E-04	1.07E-03	1.15E-03	1.37E-03	2.15E-03
371.55	4.60E-04	5.24E-04	5.90E-04	6.55E-04	7.21E-04	7.87E-04	8.52E-04	9.18E-04	1.09E-03	1.71E-03
379.58	3.14E-04	3.58E-04	4.02E-04	4.47E-04	4.91E-04	5.36E-04	5.80E-04	6.25E-04	7.40E-04	1.16E-03
387.5	2.18E-04	2.48E-04	2.78E-04	3.08E-04	3.39E-04	3.69E-04	4.00E-04	4.30E-04	5.09E-04	7.98E-04
395.43	1.67E-04	1.89E-04	2.12E-04	2.35E-04	2.58E-04	2.80E-04	3.03E-04	3.26E-04	3.85E-04	6.02E-04
Note: Elevation is Distance (cm) from Bottom of Active Core										

Table 2.2-24

Unit 1 Top Guide Neutron Exposure Predictions

	Cycle 14	Cycle 15	Cycle 16	Cycle 17	Cycle 18	Cycle 19	Cycle 20	Cycle 21	Projected	Projected
Time,s >	5.77E+07	5.82E+07	5.95E+07	5.99E+07	5.99E+07	5.99E+07	5.99E+07	5.99E+07	1.55E+08	5.68E+08
EFPY >	17.87	19.71	21.60	23.50	25.40	27.30	29.20	31.10	36.00	54.00
Radius	Fast Neutron Fluence (E > 1.0 Mev)									
5.01	1.06E+22	1.15E+22	1.24E+22	1.33E+22	1.43E+22	1.52E+22	1.61E+22	1.7E+22	1.93E+22	2.79E+22
30.48	1.3E+22	1.41E+22	1.53E+22	1.64E+22	1.76E+22	1.87E+22	1.99E+22	2.1E+22	2.4E+22	3.49E+22
60.96	1.29E+22	1.41E+22	1.53E+22	1.65E+22	1.77E+22	1.89E+22	2.01E+22	2.13E+22	2.44E+22	3.58E+22
91.44	1.22E+22	1.34E+22	1.47E+22	1.59E+22	1.71E+22	1.84E+22	1.96E+22	2.08E+22	2.4E+22	3.58E+22
121.92	1.3E+22	1.42E+22	1.55E+22	1.67E+22	1.8E+22	1.92E+22	2.05E+22	2.17E+22	2.49E+22	3.67E+22
152.4	1.18E+22	1.3E+22	1.41E+22	1.53E+22	1.65E+22	1.77E+22	1.89E+22	2E+22	2.31E+22	3.43E+22
182.88	7.98E+21	8.85E+21	9.73E+21	1.06E+22	1.15E+22	1.24E+22	1.33E+22	1.42E+22	1.65E+22	2.49E+22
213.36	1.44E+21	1.63E+21	1.82E+21	2.01E+21	2.2E+21	2.39E+21	2.58E+21	2.77E+21	3.26E+21	5.06E+21
221.615	3.47E+20	3.94E+20	4.41E+20	4.89E+20	5.37E+20	5.84E+20	6.32E+20	6.8E+20	8.03E+20	1.26E+21
225.425	1.98E+20	2.24E+20	2.51E+20	2.79E+20	3.06E+20	3.33E+20	3.6E+20	3.88E+20	4.58E+20	7.16E+20
236.855	2.76E+19	3.14E+19	3.52E+19	3.9E+19	4.29E+19	4.67E+19	5.05E+19	5.44E+19	6.43E+19	1.01E+20
240.665	1.34E+19	1.52E+19	1.71E+19	1.89E+19	2.08E+19	2.27E+19	2.45E+19	2.64E+19	3.12E+19	4.89E+19
Note: Radius (cm) from Core Centerline										

Table 2.2-24 Continued)

Unit 1 Top Guide Neutron Exposure Predictions

	Cycle 14	Cycle 15	Cycle 16	Cycle 17	Cycle 18	Cycle 19	Cycle 20	Cycle 21	Projected	Projected
Time,s >	5.77E+07	5.82E+07	5.95E+07	5.99E+07	5.99E+07	5.99E+07	5.99E+07	5.99E+07	1.55E+08	5.68E+08
EFPY >	17.87	19.71	21.60	23.50	25.40	27.30	29.20	31.10	36.00	54.00
Radius	Iron Atom Displacements, dpa									
5.01	1.64E+01	1.78E+01	1.92E+01	2.06E+01	2.20E+01	2.34E+01	2.48E+01	2.61E+01	2.98E+01	4.30E+01
30.48	2.02E+01	2.19E+01	2.37E+01	2.55E+01	2.72E+01	2.90E+01	3.08E+01	3.25E+01	3.71E+01	5.39E+01
60.96	2.01E+01	2.19E+01	2.37E+01	2.56E+01	2.74E+01	2.93E+01	3.11E+01	3.30E+01	3.77E+01	5.52E+01
91.44	1.90E+01	2.09E+01	2.28E+01	2.47E+01	2.66E+01	2.85E+01	3.04E+01	3.23E+01	3.72E+01	5.51E+01
121.92	2.02E+01	2.21E+01	2.40E+01	2.59E+01	2.78E+01	2.97E+01	3.16E+01	3.35E+01	3.84E+01	5.65E+01
152.4	1.83E+01	2.00E+01	2.18E+01	2.36E+01	2.54E+01	2.72E+01	2.90E+01	3.08E+01	3.55E+01	5.26E+01
182.88	1.23E+01	1.36E+01	1.49E+01	1.63E+01	1.76E+01	1.90E+01	2.03E+01	2.17E+01	2.52E+01	3.80E+01
213.36	2.09E+00	2.36E+00	2.63E+00	2.90E+00	3.17E+00	3.45E+00	3.72E+00	3.99E+00	4.70E+00	7.29E+00
221.615	5.20E-01	5.89E-01	6.60E-01	7.31E-01	8.02E-01	8.73E-01	9.44E-01	1.02E+00	1.20E+00	1.87E+00
225.425	3.00E-01	3.40E-01	3.81E-01	4.22E-01	4.63E-01	5.04E-01	5.46E-01	5.87E-01	6.93E-01	1.08E+00
236.855	4.45E-02	5.05E-02	5.66E-02	6.27E-02	6.89E-02	7.50E-02	8.12E-02	8.73E-02	1.03E-01	1.62E-01
240.665	2.18E-02	2.47E-02	2.77E-02	3.07E-02	3.37E-02	3.68E-02	3.98E-02	4.28E-02	5.06E-02	7.92E-02
Note: Radius (cm) from Core Centerline										

Table 2.2-25

Unit 1 Core Plate Neutron Exposure Predictions

	Cycle 14	Cycle 15	Cycle 16	Cycle 17	Cycle 18	Cycle 19	Cycle 20	Cycle 21	Projected	Projected
Time,s >	5.77E+07	5.82E+07	5.95E+07	5.99E+07	5.99E+07	5.99E+07	5.99E+07	5.99E+07	1.55E+08	5.68E+08
EFPY >	17.87	19.71	21.60	23.50	25.40	27.30	29.20	31.10	36.00	54.00
Radius	Fast Neutron Fluence (E > 1.0 Mev)									
5.01	1.81E+20	1.98E+20	2.15E+20	2.32E+20	2.49E+20	2.66E+20	2.83E+20	3.01E+20	3.45E+20	5.08E+20
30.48	2.1E+20	2.31E+20	2.51E+20	2.72E+20	2.93E+20	3.14E+20	3.35E+20	3.55E+20	4.09E+20	6.06E+20
60.96	2.1E+20	2.32E+20	2.53E+20	2.75E+20	2.97E+20	3.19E+20	3.41E+20	3.62E+20	4.19E+20	6.26E+20
91.44	2E+20	2.21E+20	2.44E+20	2.66E+20	2.89E+20	3.11E+20	3.34E+20	3.56E+20	4.14E+20	6.28E+20
121.92	2.12E+20	2.34E+20	2.57E+20	2.8E+20	3.02E+20	3.25E+20	3.48E+20	3.71E+20	4.29E+20	6.45E+20
152.4	1.9E+20	2.11E+20	2.32E+20	2.54E+20	2.75E+20	2.97E+20	3.18E+20	3.4E+20	3.96E+20	6E+20
182.88	1.31E+20	1.47E+20	1.63E+20	1.79E+20	1.95E+20	2.12E+20	2.28E+20	2.44E+20	2.86E+20	4.41E+20
213.36	9.6E+19	1.08E+20	1.2E+20	1.32E+20	1.44E+20	1.57E+20	1.69E+20	1.81E+20	2.13E+20	3.28E+20
221.615	3.61E+19	4.08E+19	4.56E+19	5.04E+19	5.52E+19	6E+19	6.48E+19	6.96E+19	8.2E+19	1.28E+20
225.425	2.05E+19	2.31E+19	2.59E+19	2.86E+19	3.13E+19	3.41E+19	3.68E+19	3.95E+19	4.66E+19	7.26E+19
236.855	4.33E+18	4.91E+18	5.5E+18	6.1E+18	6.69E+18	7.28E+18	7.88E+18	8.47E+18	1E+19	1.56E+19
240.665	2.88E+18	3.27E+18	3.66E+18	4.06E+18	4.45E+18	4.85E+18	5.25E+18	5.64E+18	6.67E+18	1.04E+19
Note: Radius (cm) from Core Centerline										

Table 2.2-25 Continued)

Unit 1 Core Plate Neutron Exposure Predictions

	Cycle 14	Cycle 15	Cycle 16	Cycle 17	Cycle 18	Cycle 19	Cycle 20	Cycle 21	Projected	Projected
Time,s >	5.77E+07	5.82E+07	5.95E+07	5.99E+07	5.99E+07	5.99E+07	5.99E+07	5.99E+07	1.55E+08	5.68E+08
EFPY >	17.87	19.71	21.60	23.50	25.40	27.30	29.20	31.10	36.00	54.00
Radius	Iron Atom Displacements, dpa									
5.01	2.63E-01	2.88E-01	3.13E-01	3.38E-01	3.63E-01	3.88E-01	4.13E-01	4.38E-01	5.02E-01	7.40E-01
30.48	3.08E-01	3.38E-01	3.68E-01	3.98E-01	4.29E-01	4.59E-01	4.89E-01	5.20E-01	5.98E-01	8.87E-01
60.96	3.08E-01	3.39E-01	3.71E-01	4.03E-01	4.34E-01	4.66E-01	4.98E-01	5.30E-01	6.13E-01	9.15E-01
91.44	2.93E-01	3.25E-01	3.58E-01	3.91E-01	4.23E-01	4.56E-01	4.89E-01	5.22E-01	6.07E-01	9.18E-01
121.92	3.10E-01	3.42E-01	3.76E-01	4.09E-01	4.42E-01	4.75E-01	5.08E-01	5.42E-01	6.27E-01	9.42E-01
152.4	2.78E-01	3.09E-01	3.40E-01	3.72E-01	4.03E-01	4.35E-01	4.66E-01	4.98E-01	5.79E-01	8.78E-01
182.88	1.91E-01	2.15E-01	2.38E-01	2.62E-01	2.86E-01	3.10E-01	3.34E-01	3.57E-01	4.19E-01	6.45E-01
213.36	1.39E-01	1.56E-01	1.73E-01	1.91E-01	2.09E-01	2.26E-01	2.44E-01	2.62E-01	3.07E-01	4.75E-01
221.615	5.28E-02	5.96E-02	6.66E-02	7.36E-02	8.07E-02	8.77E-02	9.47E-02	1.02E-01	1.20E-01	1.86E-01
225.425	3.00E-02	3.39E-02	3.79E-02	4.19E-02	4.59E-02	4.99E-02	5.39E-02	5.79E-02	6.83E-02	1.06E-01
236.855	6.74E-03	7.64E-03	8.56E-03	9.48E-03	1.04E-02	1.13E-02	1.23E-02	1.32E-02	1.56E-02	2.43E-02
240.665	4.48E-03	5.08E-03	5.69E-03	6.31E-03	6.93E-03	7.54E-03	8.16E-03	8.78E-03	1.04E-02	1.62E-02
Note: Radius (cm) from Core Centerline										

Table 2.2-26

Unit 2 Shroud Horizontal Weld H1 Neutron Exposure Predictions

	Cycle 13	Cycle 14	Cycle 15	Cycle 16	Cycle 17	Cycle 18	Cycle 19	Cycle 20	Projected	Projected
Time,s >	4.50E+07	5.33E+07	5.90E+07	5.95E+07	5.76E+07	5.89E+07	5.99E+07	5.99E+07	2.93E+08	5.68E+08
EFPY >	13.77	15.46	17.33	19.21	21.04	22.91	24.81	26.71	36.00	54.00
Azimuth	Fast Neutron Fluence (E > 1.0 Mev)									
0	6.02E+18	6.28E+18	6.72E+18	7.48E+18	8.24E+18	9.03E+18	9.82E+18	1.06E+19	1.45E+19	2.21E+19
15	9.89E+18	1.03E+19	1.11E+19	1.23E+19	1.36E+19	1.48E+19	1.62E+19	1.75E+19	2.39E+19	3.63E+19
30	7.62E+18	7.99E+18	8.53E+18	9.53E+18	1.05E+19	1.16E+19	1.26E+19	1.37E+19	1.88E+19	2.87E+19
45	1.71E+19	1.80E+19	1.92E+19	2.14E+19	2.37E+19	2.61E+19	2.84E+19	3.08E+19	4.24E+19	6.49E+19
Azimuth	Iron Atom Displacements, dpa									
0	1.39E-02	1.45E-02	1.55E-02	1.72E-02	1.90E-02	2.08E-02	2.26E-02	2.44E-02	3.34E-02	5.08E-02
15	2.34E-02	2.45E-02	2.62E-02	2.91E-02	3.21E-02	3.51E-02	3.82E-02	4.13E-02	5.65E-02	8.58E-02
30	1.75E-02	1.83E-02	1.96E-02	2.19E-02	2.42E-02	2.66E-02	2.90E-02	3.14E-02	4.31E-02	6.59E-02
45	4.07E-02	4.27E-02	4.56E-02	5.10E-02	5.64E-02	6.19E-02	6.76E-02	7.32E-02	1.01E-01	1.54E-01
Note: Azimuth is Angle in First Octant										

Table 2.2-27

Unit 2 Shroud Horizontal Weld H2 Neutron Exposure Predictions

	Cycle 13	Cycle 14	Cycle 15	Cycle 16	Cycle 17	Cycle 18	Cycle 19	Cycle 20	Projected	Projected
Time,s >	4.50E+07	5.33E+07	5.90E+07	5.95E+07	5.76E+07	5.89E+07	5.99E+07	5.99E+07	2.93E+08	5.68E+08
EFPY >	13.77	15.46	17.33	19.21	21.04	22.91	24.81	26.71	36.00	54.00
Azimuth	Fast Neutron Fluence (E > 1.0 Mev)									
0	7.92E+18	8.44E+18	9.24E+18	1.05E+19	1.17E+19	1.30E+19	1.43E+19	1.56E+19	2.19E+19	3.41E+19
15	1.30E+19	1.39E+19	1.52E+19	1.72E+19	1.92E+19	2.13E+19	2.34E+19	2.56E+19	3.59E+19	5.60E+19
30	1.00E+19	1.07E+19	1.17E+19	1.34E+19	1.50E+19	1.66E+19	1.83E+19	2.00E+19	2.83E+19	4.44E+19
45	2.24E+19	2.41E+19	2.63E+19	3.00E+19	3.37E+19	3.75E+19	4.13E+19	4.51E+19	6.39E+19	1.00E+20
Azimuth	Iron Atom Displacements, dpa									
0	1.23E-02	1.31E-02	1.44E-02	1.63E-02	1.82E-02	2.02E-02	2.22E-02	2.42E-02	3.39E-02	5.29E-02
15	2.08E-02	2.23E-02	2.43E-02	2.75E-02	3.08E-02	3.41E-02	3.75E-02	4.09E-02	5.74E-02	8.94E-02
30	1.55E-02	1.67E-02	1.82E-02	2.07E-02	2.32E-02	2.58E-02	2.84E-02	3.11E-02	4.39E-02	6.88E-02
45	3.61E-02	3.88E-02	4.23E-02	4.82E-02	5.41E-02	6.02E-02	6.63E-02	7.25E-02	1.03E-01	1.61E-01
Note: Azimuth is Angle in First Octant										

Table 2.2-28

Unit 2 Shroud Horizontal Weld H3 Neutron Exposure Predictions

	Cycle 13	Cycle 14	Cycle 15	Cycle 16	Cycle 17	Cycle 18	Cycle 19	Cycle 20	Projected	Projected
Time,s >	4.50E+07	5.33E+07	5.90E+07	5.95E+07	5.76E+07	5.89E+07	5.99E+07	5.99E+07	2.93E+08	5.68E+08
EFPY >	13.77	15.46	17.33	19.21	21.04	22.91	24.81	26.71	36.00	54.00
Azimuth	Fast Neutron Fluence (E > 1.0 Mev)									
0	9.66E+19	1.03E+20	1.13E+20	1.28E+20	1.43E+20	1.58E+20	1.74E+20	1.90E+20	2.67E+20	4.16E+20
15	1.82E+20	1.95E+20	2.13E+20	2.42E+20	2.70E+20	3.00E+20	3.29E+20	3.59E+20	5.05E+20	7.88E+20
30	1.14E+20	1.22E+20	1.34E+20	1.52E+20	1.70E+20	1.89E+20	2.09E+20	2.28E+20	3.22E+20	5.05E+20
45	3.64E+20	3.91E+20	4.26E+20	4.84E+20	5.43E+20	6.03E+20	6.64E+20	7.25E+20	1.02E+21	1.60E+21
Azimuth	Iron Atom Displacements, dpa									
0	1.41E-01	1.50E-01	1.64E-01	1.86E-01	2.08E-01	2.31E-01	2.54E-01	2.77E-01	3.89E-01	6.06E-01
15	2.67E-01	2.86E-01	3.12E-01	3.54E-01	3.96E-01	4.38E-01	4.82E-01	5.26E-01	7.39E-01	1.15E+00
30	1.66E-01	1.78E-01	1.95E-01	2.21E-01	2.48E-01	2.76E-01	3.04E-01	3.32E-01	4.69E-01	7.35E-01
45	5.37E-01	5.76E-01	6.28E-01	7.13E-01	8.00E-01	8.88E-01	9.78E-01	1.07E+00	1.51E+00	2.36E+00
Note: Azimuth is Angle in First Octant										

Table 2.2-29

Unit 2 Shroud Horizontal Weld H4 Neutron Exposure Predictions

	Cycle 13	Cycle 14	Cycle 15	Cycle 16	Cycle 17	Cycle 18	Cycle 19	Cycle 20	Projected	Projected
Time,s >	4.50E+07	5.33E+07	5.90E+07	5.95E+07	5.76E+07	5.89E+07	5.99E+07	5.99E+07	2.93E+08	5.68E+08
EFPY >	13.77	15.46	17.33	19.21	21.04	22.91	24.81	26.71	36.00	54.00
Azimuth	Fast Neutron Fluence (E > 1.0 Mev)									
0	2.37E+20	2.65E+20	3.03E+20	3.42E+20	3.81E+20	4.21E+20	4.61E+20	5.02E+20	7.01E+20	1.09E+21
15	4.46E+20	5.02E+20	5.72E+20	6.46E+20	7.20E+20	7.95E+20	8.72E+20	9.49E+20	1.33E+21	2.06E+21
30	2.78E+20	3.15E+20	3.59E+20	4.06E+20	4.54E+20	5.03E+20	5.53E+20	6.03E+20	8.46E+20	1.32E+21
45	8.81E+20	1.00E+21	1.14E+21	1.29E+21	1.44E+21	1.59E+21	1.75E+21	1.91E+21	2.68E+21	4.17E+21
Azimuth	Iron Atom Displacements, dpa									
0	3.43E-01	3.83E-01	4.38E-01	4.94E-01	5.50E-01	6.08E-01	6.67E-01	7.25E-01	1.01E+00	1.57E+00
15	6.47E-01	7.29E-01	8.30E-01	9.37E-01	1.04E+00	1.15E+00	1.27E+00	1.38E+00	1.92E+00	2.98E+00
30	4.02E-01	4.55E-01	5.19E-01	5.87E-01	6.56E-01	7.27E-01	7.99E-01	8.70E-01	1.22E+00	1.90E+00
45	1.29E+00	1.46E+00	1.66E+00	1.88E+00	2.10E+00	2.33E+00	2.56E+00	2.79E+00	3.91E+00	6.10E+00
Note: Azimuth is Angle in First Octant										

Table 2.2-30

Unit 2 Shroud Horizontal Weld H5 Neutron Exposure Predictions

	Cycle 13	Cycle 14	Cycle 15	Cycle 16	Cycle 17	Cycle 18	Cycle 19	Cycle 20	Projected	Projected
Time,s >	4.50E+07	5.33E+07	5.90E+07	5.95E+07	5.76E+07	5.89E+07	5.99E+07	5.99E+07	2.93E+08	5.68E+08
EFPY >	13.77	15.46	17.33	19.21	21.04	22.91	24.81	26.71	36.00	54.00
Azimuth	Fast Neutron Fluence (E > 1.0 Mev)									
0	8.16E+19	9.24E+19	1.04E+20	1.18E+20	1.33E+20	1.47E+20	1.62E+20	1.77E+20	2.49E+20	3.89E+20
15	1.54E+20	1.76E+20	1.98E+20	2.25E+20	2.51E+20	2.79E+20	3.07E+20	3.35E+20	4.72E+20	7.37E+20
30	9.63E+19	1.10E+20	1.24E+20	1.42E+20	1.59E+20	1.77E+20	1.95E+20	2.13E+20	3.02E+20	4.73E+20
45	3.06E+20	3.52E+20	3.95E+20	4.50E+20	5.05E+20	5.61E+20	6.19E+20	6.76E+20	9.57E+20	1.50E+21
Azimuth	Iron Atom Displacements, dpa									
0	1.18E-01	1.33E-01	1.50E-01	1.71E-01	1.91E-01	2.12E-01	2.33E-01	2.55E-01	3.59E-01	5.61E-01
15	2.23E-01	2.54E-01	2.86E-01	3.25E-01	3.64E-01	4.04E-01	4.44E-01	4.85E-01	6.83E-01	1.07E+00
30	1.39E-01	1.59E-01	1.79E-01	2.04E-01	2.29E-01	2.55E-01	2.81E-01	3.07E-01	4.34E-01	6.81E-01
45	4.46E-01	5.13E-01	5.76E-01	6.55E-01	7.36E-01	8.18E-01	9.01E-01	9.85E-01	1.39E+00	2.19E+00
Note: Azimuth is Angle in First Octant										

Table 2.2-31

Unit 2 Shroud Horizontal Weld H6A Neutron Exposure Predictions

	Cycle 13	Cycle 14	Cycle 15	Cycle 16	Cycle 17	Cycle 18	Cycle 19	Cycle 20	Projected	Projected
Time,s >	4.50E+07	5.33E+07	5.90E+07	5.95E+07	5.76E+07	5.89E+07	5.99E+07	5.99E+07	2.93E+08	5.68E+08
EFPY >	13.77	15.46	17.33	19.21	21.04	22.91	24.81	26.71	36.00	54.00
Azimuth	Fast Neutron Fluence (E > 1.0 Mev)									
0	1.10E+17	1.22E+17	1.35E+17	1.51E+17	1.67E+17	1.84E+17	2.00E+17	2.17E+17	2.99E+17	4.57E+17
15	2.07E+17	2.31E+17	2.57E+17	2.87E+17	3.17E+17	3.48E+17	3.80E+17	4.11E+17	5.66E+17	8.66E+17
30	1.29E+17	1.45E+17	1.61E+17	1.80E+17	2.00E+17	2.20E+17	2.41E+17	2.61E+17	3.61E+17	5.55E+17
45	4.13E+17	4.65E+17	5.14E+17	5.75E+17	6.38E+17	7.02E+17	7.66E+17	8.31E+17	1.15E+18	1.76E+18
Azimuth	Iron Atom Displacements, dpa									
0	1.67E-04	1.85E-04	2.06E-04	2.30E-04	2.54E-04	2.79E-04	3.05E-04	3.30E-04	4.54E-04	6.95E-04
15	3.16E-04	3.53E-04	3.91E-04	4.37E-04	4.84E-04	5.31E-04	5.80E-04	6.28E-04	8.64E-04	1.32E-03
30	1.96E-04	2.21E-04	2.45E-04	2.74E-04	3.04E-04	3.35E-04	3.66E-04	3.97E-04	5.49E-04	8.44E-04
45	6.34E-04	7.14E-04	7.89E-04	8.84E-04	9.80E-04	1.08E-03	1.18E-03	1.28E-03	1.76E-03	2.71E-03
Note: Azimuth is Angle in First Octant										

Table 2.2-32

Unit 2 Shroud Horizontal Weld H6B Neutron Exposure Predictions

	Cycle 13	Cycle 14	Cycle 15	Cycle 16	Cycle 17	Cycle 18	Cycle 19	Cycle 20	Projected	Projected
Time,s >	4.50E+07	5.33E+07	5.90E+07	5.95E+07	5.76E+07	5.89E+07	5.99E+07	5.99E+07	2.93E+08	5.68E+08
EFPY >	13.77	15.46	17.33	19.21	21.04	22.91	24.81	26.71	36.00	54.00
Azimuth	Fast Neutron Fluence (E > 1.0 Mev)									
0	3.97E+16	4.41E+16	4.90E+16	5.47E+16	6.06E+16	6.65E+16	7.26E+16	7.86E+16	1.08E+17	1.66E+17
15	7.49E+16	8.37E+16	9.29E+16	1.04E+17	1.15E+17	1.26E+17	1.38E+17	1.49E+17	2.05E+17	3.14E+17
30	4.68E+16	5.26E+16	5.83E+16	6.54E+16	7.25E+16	7.98E+16	8.72E+16	9.46E+16	1.31E+17	2.01E+17
45	1.50E+17	1.68E+17	1.86E+17	2.08E+17	2.31E+17	2.54E+17	2.77E+17	3.01E+17	4.16E+17	6.38E+17
Azimuth	Iron Atom Displacements, dpa									
0	6.13E-05	6.80E-05	7.56E-05	8.45E-05	9.35E-05	1.03E-04	1.12E-04	1.21E-04	1.67E-04	2.56E-04
15	1.16E-04	1.30E-04	1.44E-04	1.61E-04	1.78E-04	1.95E-04	2.13E-04	2.31E-04	3.18E-04	4.87E-04
30	7.23E-05	8.11E-05	9.00E-05	1.01E-04	1.12E-04	1.23E-04	1.35E-04	1.46E-04	2.02E-04	3.10E-04
45	2.33E-04	2.63E-04	2.90E-04	3.25E-04	3.61E-04	3.97E-04	4.33E-04	4.70E-04	6.49E-04	9.97E-04
Note: Azimuth is Angle in First Octant										

Table 2.2-33

Unit 2 Shroud Horizontal Weld H7 Neutron Exposure Predictions

	Cycle 13	Cycle 14	Cycle 15	Cycle 16	Cycle 17	Cycle 18	Cycle 19	Cycle 20	Projected	Projected
Time,s >	4.50E+07	5.33E+07	5.90E+07	5.95E+07	5.76E+07	5.89E+07	5.99E+07	5.99E+07	2.93E+08	5.68E+08
EFPY >	13.77	15.46	17.33	19.21	21.04	22.91	24.81	26.71	36.00	54.00
Azimuth	Fast Neutron Fluence (E > 1.0 Mev)									
0	4.14E+11	4.60E+11	5.11E+11	5.71E+11	6.32E+11	6.94E+11	7.57E+11	8.20E+11	1.13E+12	1.73E+12
15	7.82E+11	8.73E+11	9.69E+11	1.08E+12	1.20E+12	1.32E+12	1.44E+12	1.55E+12	2.14E+12	3.27E+12
30	4.89E+11	5.48E+11	6.08E+11	6.82E+11	7.56E+11	8.32E+11	9.10E+11	9.87E+11	1.36E+12	2.10E+12
45	1.56E+12	1.76E+12	1.94E+12	2.17E+12	2.41E+12	2.65E+12	2.89E+12	3.14E+12	4.34E+12	6.66E+12
Azimuth	Iron Atom Displacements, dpa									
0	7.07E-10	7.85E-10	8.73E-10	9.76E-10	1.08E-09	1.19E-09	1.29E-09	1.40E-09	1.93E-09	2.95E-09
15	1.34E-09	1.50E-09	1.66E-09	1.86E-09	2.05E-09	2.26E-09	2.46E-09	2.67E-09	3.67E-09	5.62E-09
30	8.34E-10	9.36E-10	1.04E-09	1.16E-09	1.29E-09	1.42E-09	1.55E-09	1.69E-09	2.33E-09	3.58E-09
45	2.69E-09	3.03E-09	3.35E-09	3.75E-09	4.16E-09	4.58E-09	5.00E-09	5.42E-09	7.49E-09	1.15E-08

Note: Azimuth is Angle in First Octant

Table 2.2-34

Unit 2 Shroud Vertical Welds V1 and V2 Neutron Exposure Predictions

	Cycle 13	Cycle 14	Cycle 15	Cycle 16	Cycle 17	Cycle 18	Cycle 19	Cycle 20	Projected	Projected
Time,s >	4.50E+07	5.33E+07	5.90E+07	5.95E+07	5.76E+07	5.89E+07	5.99E+07	5.99E+07	2.93E+08	5.68E+08
EFPY >	13.77	15.46	17.33	19.21	21.04	22.91	24.81	26.71	36.00	54.00
Elevation	Fast Neutron Fluence (E > 1.0 Mev)									
376.09	2.12E+19	2.28E+19	2.49E+19	2.84E+19	3.20E+19	3.56E+19	3.93E+19	4.30E+19	6.10E+19	9.60E+19
391.33	1.17E+19	1.25E+19	1.35E+19	1.53E+19	1.71E+19	1.89E+19	2.08E+19	2.27E+19	3.19E+19	4.97E+19
406.57	7.13E+18	7.51E+18	8.07E+18	9.09E+18	1.01E+19	1.12E+19	1.23E+19	1.33E+19	1.86E+19	2.87E+19
421.81	2.15E+19	2.26E+19	2.42E+19	2.71E+19	3.00E+19	3.30E+19	3.60E+19	3.91E+19	5.40E+19	8.28E+19
437.05	2.28E+19	2.39E+19	2.56E+19	2.86E+19	3.17E+19	3.49E+19	3.81E+19	4.13E+19	5.71E+19	8.76E+19
452.29	1.80E+19	1.89E+19	2.02E+19	2.26E+19	2.51E+19	2.76E+19	3.01E+19	3.26E+19	4.51E+19	6.92E+19
457.37	1.62E+19	1.69E+19	1.81E+19	2.03E+19	2.25E+19	2.47E+19	2.70E+19	2.93E+19	4.05E+19	6.21E+19
Elevation	Iron Atom Displacements, dpa									
376.09	3.38E-02	3.64E-02	3.97E-02	4.53E-02	5.09E-02	5.67E-02	6.26E-02	6.85E-02	9.72E-02	1.53E-01
391.33	1.74E-02	1.84E-02	1.99E-02	2.26E-02	2.53E-02	2.80E-02	3.08E-02	3.36E-02	4.73E-02	7.37E-02
406.57	1.07E-02	1.13E-02	1.21E-02	1.37E-02	1.52E-02	1.68E-02	1.84E-02	2.00E-02	2.79E-02	4.32E-02
421.81	3.12E-02	3.27E-02	3.50E-02	3.91E-02	4.34E-02	4.77E-02	5.21E-02	5.65E-02	7.81E-02	1.20E-01
437.05	4.16E-02	4.37E-02	4.67E-02	5.23E-02	5.79E-02	6.37E-02	6.96E-02	7.55E-02	1.04E-01	1.60E-01
452.29	4.02E-02	4.22E-02	4.51E-02	5.05E-02	5.60E-02	6.16E-02	6.73E-02	7.30E-02	1.01E-01	1.55E-01
457.37	3.81E-02	4.00E-02	4.27E-02	4.78E-02	5.30E-02	5.83E-02	6.37E-02	6.91E-02	9.54E-02	1.46E-01

Note: Elevation is Distance (cm) from Bottom of Active Core

Table 2.2-35

Unit 2 Shroud Vertical Welds V3 and V4 Neutron Exposure Predictions

	Cycle 13	Cycle 14	Cycle 15	Cycle 16	Cycle 17	Cycle 18	Cycle 19	Cycle 20	Projected	Projected
Time,s >	4.50E+07	5.33E+07	5.90E+07	5.95E+07	5.76E+07	5.89E+07	5.99E+07	5.99E+07	2.93E+08	5.68E+08
EFPY >	13.77	15.46	17.33	19.21	21.04	22.91	24.81	26.71	36.00	54.00
Elevation	Fast Neutron Fluence (E > 1.0 Mev)									
277.03	7.98E+20	9.08E+20	1.04E+21	1.18E+21	1.32E+21	1.47E+21	1.61E+21	1.76E+21	2.49E+21	3.89E+21
292.27	7.77E+20	8.80E+20	1.00E+21	1.14E+21	1.27E+21	1.41E+21	1.56E+21	1.70E+21	2.39E+21	3.74E+21
307.51	7.38E+20	8.31E+20	9.42E+20	1.07E+21	1.20E+21	1.33E+21	1.47E+21	1.60E+21	2.27E+21	3.55E+21
322.75	6.71E+20	7.50E+20	8.47E+20	9.65E+20	1.08E+21	1.21E+21	1.33E+21	1.45E+21	2.06E+21	3.24E+21
337.99	5.73E+20	6.34E+20	7.10E+20	8.12E+20	9.14E+20	1.02E+21	1.13E+21	1.23E+21	1.75E+21	2.76E+21
353.23	4.50E+20	4.91E+20	5.43E+20	6.22E+20	7.01E+20	7.83E+20	8.65E+20	9.48E+20	1.35E+21	2.14E+21
368.47	3.28E+20	3.53E+20	3.86E+20	4.40E+20	4.95E+20	5.52E+20	6.09E+20	6.67E+20	9.48E+20	1.49E+21
Elevation	Iron Atom Displacements, dpa									
277.03	1.17E+00	1.33E+00	1.51E+00	1.72E+00	1.93E+00	2.14E+00	2.36E+00	2.58E+00	3.64E+00	5.69E+00
292.27	1.14E+00	1.29E+00	1.46E+00	1.66E+00	1.86E+00	2.07E+00	2.27E+00	2.48E+00	3.50E+00	5.47E+00
307.51	1.08E+00	1.22E+00	1.38E+00	1.57E+00	1.76E+00	1.95E+00	2.15E+00	2.35E+00	3.32E+00	5.19E+00
322.75	9.82E-01	1.10E+00	1.24E+00	1.41E+00	1.59E+00	1.77E+00	1.95E+00	2.13E+00	3.02E+00	4.74E+00
337.99	8.39E-01	9.28E-01	1.04E+00	1.19E+00	1.34E+00	1.49E+00	1.65E+00	1.80E+00	2.56E+00	4.04E+00
353.23	6.60E-01	7.19E-01	7.96E-01	9.11E-01	1.03E+00	1.15E+00	1.27E+00	1.39E+00	1.98E+00	3.12E+00
368.47	4.84E-01	5.21E-01	5.69E-01	6.50E-01	7.31E-01	8.14E-01	8.99E-01	9.83E-01	1.40E+00	2.20E+00
Note: Elevation is Distance (cm) from Bottom of Active Core										

Table 2.2-36

Unit 2 Shroud Vertical Welds V5 and V6 Neutron Exposure Predictions

	Cycle 13	Cycle 14	Cycle 15	Cycle 16	Cycle 17	Cycle 18	Cycle 19	Cycle 20	Projected	Projected
Time,s >	4.50E+07	5.33E+07	5.90E+07	5.95E+07	5.76E+07	5.89E+07	5.99E+07	5.99E+07	2.93E+08	5.68E+08
EFPY >	13.77	15.46	17.33	19.21	21.04	22.91	24.81	26.71	36.00	54.00
Elevation	Fast Neutron Fluence (E > 1.0 Mev)									
27.79	2.77E+20	3.19E+20	3.60E+20	4.11E+20	4.63E+20	5.16E+20	5.70E+20	6.24E+20	8.88E+20	1.40E+21
43.03	3.55E+20	4.10E+20	4.63E+20	5.31E+20	5.99E+20	6.69E+20	7.40E+20	8.12E+20	1.16E+21	1.84E+21
58.27	4.18E+20	4.83E+20	5.46E+20	6.28E+20	7.11E+20	7.96E+20	8.82E+20	9.69E+20	1.39E+21	2.21E+21
73.51	4.71E+20	5.43E+20	6.15E+20	7.10E+20	8.07E+20	9.05E+20	1.01E+21	1.11E+21	1.60E+21	2.55E+21
88.75	4.98E+20	5.74E+20	6.52E+20	7.56E+20	8.61E+20	9.69E+20	1.08E+21	1.19E+21	1.72E+21	2.76E+21
103.99	5.19E+20	5.99E+20	6.81E+20	7.93E+20	9.06E+20	1.02E+21	1.14E+21	1.26E+21	1.83E+21	2.95E+21
119.23	5.53E+20	6.39E+20	7.26E+20	8.48E+20	9.72E+20	1.10E+21	1.23E+21	1.35E+21	1.98E+21	3.20E+21
134.47	5.94E+20	6.86E+20	7.81E+20	9.14E+20	1.05E+21	1.19E+21	1.33E+21	1.46E+21	2.15E+21	3.47E+21
149.71	6.21E+20	7.16E+20	8.15E+20	9.54E+20	1.09E+21	1.24E+21	1.38E+21	1.53E+21	2.24E+21	3.63E+21
164.95	6.47E+20	7.46E+20	8.48E+20	9.91E+20	1.14E+21	1.28E+21	1.43E+21	1.58E+21	2.32E+21	3.74E+21
180.19	6.89E+20	7.94E+20	9.02E+20	1.05E+21	1.20E+21	1.35E+21	1.51E+21	1.67E+21	2.43E+21	3.91E+21
195.43	7.37E+20	8.49E+20	9.64E+20	1.12E+21	1.27E+21	1.43E+21	1.59E+21	1.75E+21	2.54E+21	4.07E+21
210.67	7.60E+20	8.74E+20	9.94E+20	1.15E+21	1.30E+21	1.46E+21	1.62E+21	1.78E+21	2.56E+21	4.07E+21
225.91	7.74E+20	8.89E+20	1.01E+21	1.16E+21	1.31E+21	1.47E+21	1.62E+21	1.78E+21	2.55E+21	4.03E+21
241.15	7.92E+20	9.08E+20	1.04E+21	1.18E+21	1.33E+21	1.48E+21	1.64E+21	1.79E+21	2.55E+21	4.02E+21
256.39	8.08E+20	9.23E+20	1.05E+21	1.20E+21	1.35E+21	1.50E+21	1.65E+21	1.81E+21	2.56E+21	4.02E+21
271.63	8.03E+20	9.15E+20	1.04E+21	1.19E+21	1.33E+21	1.48E+21	1.63E+21	1.78E+21	2.51E+21	3.94E+21
277.03	7.98E+20	9.08E+20	1.04E+21	1.18E+21	1.32E+21	1.47E+21	1.61E+21	1.76E+21	2.49E+21	3.89E+21
Note: Elevation is Distance (cm) from Bottom of Active Core										

Table 2.2-36 (Continued)

Unit 2 Shroud Vertical Welds V5 and V6 Neutron Exposure Predictions

	Cycle 13	Cycle 14	Cycle 15	Cycle 16	Cycle 17	Cycle 18	Cycle 19	Cycle 20	Projected	Projected
Time,s >	4.50E+07	5.33E+07	5.90E+07	5.95E+07	5.76E+07	5.89E+07	5.99E+07	5.99E+07	2.93E+08	5.68E+08
EFPY >	13.77	15.46	17.33	19.21	21.04	22.91	24.81	26.71	36.00	54.00
Elevation	Iron Atom Displacements, dpa									
27.79	4.04E-01	4.65E-01	5.25E-01	5.99E-01	6.75E-01	7.52E-01	8.31E-01	9.10E-01	1.30E+00	2.04E+00
43.03	5.17E-01	5.98E-01	6.75E-01	7.74E-01	8.74E-01	9.76E-01	1.08E+00	1.18E+00	1.69E+00	2.68E+00
58.27	6.10E-01	7.04E-01	7.96E-01	9.16E-01	1.04E+00	1.16E+00	1.29E+00	1.41E+00	2.03E+00	3.22E+00
73.51	6.87E-01	7.92E-01	8.97E-01	1.04E+00	1.18E+00	1.32E+00	1.47E+00	1.61E+00	2.33E+00	3.71E+00
88.75	7.26E-01	8.38E-01	9.51E-01	1.10E+00	1.26E+00	1.41E+00	1.57E+00	1.73E+00	2.52E+00	4.03E+00
103.99	7.57E-01	8.74E-01	9.93E-01	1.16E+00	1.32E+00	1.49E+00	1.66E+00	1.83E+00	2.68E+00	4.30E+00
119.23	8.07E-01	9.32E-01	1.06E+00	1.24E+00	1.42E+00	1.60E+00	1.79E+00	1.98E+00	2.89E+00	4.67E+00
134.47	8.67E-01	1.00E+00	1.14E+00	1.33E+00	1.53E+00	1.73E+00	1.93E+00	2.14E+00	3.14E+00	5.07E+00
149.71	9.06E-01	1.05E+00	1.19E+00	1.39E+00	1.60E+00	1.81E+00	2.02E+00	2.23E+00	3.28E+00	5.30E+00
164.95	9.45E-01	1.09E+00	1.24E+00	1.45E+00	1.66E+00	1.87E+00	2.09E+00	2.31E+00	3.39E+00	5.47E+00
180.19	1.01E+00	1.16E+00	1.32E+00	1.53E+00	1.75E+00	1.98E+00	2.21E+00	2.43E+00	3.55E+00	5.71E+00
195.43	1.08E+00	1.24E+00	1.41E+00	1.63E+00	1.86E+00	2.09E+00	2.33E+00	2.56E+00	3.72E+00	5.95E+00
210.67	1.11E+00	1.28E+00	1.45E+00	1.68E+00	1.90E+00	2.13E+00	2.36E+00	2.60E+00	3.74E+00	5.95E+00
225.91	1.13E+00	1.30E+00	1.48E+00	1.70E+00	1.92E+00	2.14E+00	2.37E+00	2.60E+00	3.72E+00	5.89E+00
241.15	1.16E+00	1.33E+00	1.51E+00	1.73E+00	1.95E+00	2.17E+00	2.40E+00	2.62E+00	3.73E+00	5.87E+00
256.39	1.18E+00	1.35E+00	1.54E+00	1.76E+00	1.97E+00	2.19E+00	2.42E+00	2.64E+00	3.75E+00	5.88E+00
271.63	1.18E+00	1.34E+00	1.53E+00	1.74E+00	1.95E+00	2.16E+00	2.38E+00	2.60E+00	3.68E+00	5.76E+00
277.03	1.17E+00	1.33E+00	1.51E+00	1.72E+00	1.93E+00	2.14E+00	2.36E+00	2.58E+00	3.64E+00	5.69E+00

Note: Elevation is Distance (cm) from Bottom of Active Core

Table 2.2-37

Unit 2 Shroud Vertical Welds V7 and V8 Neutron Exposure Predictions

	Cycle 13	Cycle 14	Cycle 15	Cycle 16	Cycle 17	Cycle 18	Cycle 19	Cycle 20	Projected	Projected
Time,s >	4.50E+07	5.33E+07	5.90E+07	5.95E+07	5.76E+07	5.89E+07	5.99E+07	5.99E+07	2.93E+08	5.68E+08
EFPY >	13.77	15.46	17.33	19.21	21.04	22.91	24.81	26.71	36.00	54.00
Elevation	Fast Neutron Fluence (E > 1.0 Mev)									
-63.65	3.73E+17	4.21E+17	4.67E+17	5.25E+17	5.83E+17	6.43E+17	7.04E+17	7.65E+17	1.06E+18	1.64E+18
-48.41	1.61E+18	1.82E+18	2.01E+18	2.27E+18	2.52E+18	2.78E+18	3.04E+18	3.30E+18	4.59E+18	7.09E+18
-33.17	6.99E+18	7.87E+18	8.73E+18	9.82E+18	1.09E+19	1.20E+19	1.32E+19	1.43E+19	1.99E+19	3.07E+19
-17.93	2.67E+19	3.02E+19	3.36E+19	3.79E+19	4.23E+19	4.67E+19	5.12E+19	5.57E+19	7.79E+19	1.21E+20
-2.69	8.36E+19	9.50E+19	1.06E+20	1.20E+20	1.34E+20	1.48E+20	1.63E+20	1.78E+20	2.49E+20	3.88E+20
12.55	1.76E+20	2.01E+20	2.25E+20	2.56E+20	2.87E+20	3.19E+20	3.51E+20	3.83E+20	5.41E+20	8.47E+20
27.79	2.77E+20	3.19E+20	3.60E+20	4.11E+20	4.63E+20	5.16E+20	5.70E+20	6.24E+20	8.88E+20	1.40E+21
Elevation	Iron Atom Displacements, dpa									
-63.65	5.74E-04	6.47E-04	7.18E-04	8.07E-04	8.97E-04	9.89E-04	1.08E-03	1.18E-03	1.64E-03	2.52E-03
-48.41	2.43E-03	2.73E-03	3.03E-03	3.41E-03	3.79E-03	4.18E-03	4.58E-03	4.97E-03	6.91E-03	1.07E-02
-33.17	1.03E-02	1.16E-02	1.29E-02	1.45E-02	1.61E-02	1.78E-02	1.95E-02	2.12E-02	2.94E-02	4.54E-02
-17.93	3.91E-02	4.42E-02	4.92E-02	5.55E-02	6.19E-02	6.84E-02	7.50E-02	8.16E-02	1.14E-01	1.77E-01
-2.69	1.22E-01	1.39E-01	1.55E-01	1.75E-01	1.96E-01	2.17E-01	2.38E-01	2.59E-01	3.64E-01	5.66E-01
12.55	2.56E-01	2.93E-01	3.28E-01	3.73E-01	4.18E-01	4.65E-01	5.12E-01	5.59E-01	7.90E-01	1.24E+00
27.79	4.04E-01	4.65E-01	5.25E-01	5.99E-01	6.75E-01	7.52E-01	8.31E-01	9.10E-01	1.30E+00	2.04E+00

Note: Elevation is Distance (cm) from Bottom of Active Core

Table 2.2-38

Unit 2 Shroud Vertical Weld V9 Neutron Exposure Predictions

	Cycle 13	Cycle 14	Cycle 15	Cycle 16	Cycle 17	Cycle 18	Cycle 19	Cycle 20	Projected	Projected
Time,s >	4.50E+07	5.33E+07	5.90E+07	5.95E+07	5.76E+07	5.89E+07	5.99E+07	5.99E+07	2.93E+08	5.68E+08
EFPY >	13.77	15.46	17.33	19.21	21.04	22.91	24.81	26.71	36.00	54.00
Elevation	Fast Neutron Fluence (E > 1.0 Mev)									
-206.69	1.41E+12	1.59E+12	1.76E+12	1.98E+12	2.20E+12	2.43E+12	2.66E+12	2.89E+12	4.02E+12	6.20E+12
-191.45	4.89E+12	5.51E+12	6.12E+12	6.88E+12	7.65E+12	8.43E+12	9.23E+12	1.00E+13	1.39E+13	2.15E+13
-176.21	1.73E+13	1.95E+13	2.16E+13	2.43E+13	2.71E+13	2.98E+13	3.27E+13	3.55E+13	4.93E+13	7.61E+13
-160.97	6.23E+13	7.02E+13	7.78E+13	8.75E+13	9.73E+13	1.07E+14	1.17E+14	1.28E+14	1.77E+14	2.74E+14
-145.73	2.28E+14	2.57E+14	2.85E+14	3.20E+14	3.56E+14	3.93E+14	4.30E+14	4.67E+14	6.49E+14	1.00E+15
-130.49	8.49E+14	9.57E+14	1.06E+15	1.19E+15	1.33E+15	1.46E+15	1.60E+15	1.74E+15	2.42E+15	3.73E+15
-115.25	3.24E+15	3.66E+15	4.05E+15	4.56E+15	5.07E+15	5.59E+15	6.12E+15	6.65E+15	9.24E+15	1.43E+16
-100.01	1.28E+16	1.44E+16	1.60E+16	1.80E+16	2.00E+16	2.20E+16	2.41E+16	2.62E+16	3.64E+16	5.62E+16
-84.77	5.18E+16	5.83E+16	6.47E+16	7.28E+16	8.09E+16	8.92E+16	9.77E+16	1.06E+17	1.47E+17	2.28E+17
-74.45	1.35E+17	1.52E+17	1.69E+17	1.90E+17	2.11E+17	2.33E+17	2.55E+17	2.77E+17	3.85E+17	5.94E+17
Elevation	Iron Atom Displacements, dpa									
-206.69	2.44E-09	2.75E-09	3.05E-09	3.43E-09	3.81E-09	4.20E-09	4.60E-09	5.00E-09	6.95E-09	1.07E-08
-191.45	8.40E-09	9.46E-09	1.05E-08	1.18E-08	1.31E-08	1.45E-08	1.58E-08	1.72E-08	2.39E-08	3.69E-08
-176.21	2.95E-08	3.32E-08	3.68E-08	4.14E-08	4.60E-08	5.08E-08	5.56E-08	6.04E-08	8.39E-08	1.30E-07
-160.97	1.05E-07	1.18E-07	1.31E-07	1.48E-07	1.64E-07	1.81E-07	1.98E-07	2.15E-07	2.99E-07	4.62E-07
-145.73	3.81E-07	4.29E-07	4.76E-07	5.35E-07	5.95E-07	6.56E-07	7.18E-07	7.80E-07	1.08E-06	1.67E-06
-130.49	1.40E-06	1.58E-06	1.75E-06	1.97E-06	2.19E-06	2.42E-06	2.65E-06	2.88E-06	4.00E-06	6.17E-06
-115.25	5.30E-06	5.97E-06	6.62E-06	7.44E-06	8.27E-06	9.13E-06	9.99E-06	1.09E-05	1.51E-05	2.33E-05
-100.01	2.06E-05	2.32E-05	2.57E-05	2.89E-05	3.22E-05	3.55E-05	3.88E-05	4.22E-05	5.86E-05	9.05E-05
-84.77	8.20E-05	9.24E-05	1.03E-04	1.15E-04	1.28E-04	1.41E-04	1.55E-04	1.68E-04	2.34E-04	3.61E-04
-74.45	2.11E-04	2.38E-04	2.64E-04	2.97E-04	3.30E-04	3.64E-04	3.99E-04	4.33E-04	6.02E-04	9.29E-04

Note: Elevation is Distance (cm) from Bottom of Active Core

Table 2.2-39

Unit 2 Shroud Vertical Welds V10 Neutron Exposure Predictions

	Cycle 13	Cycle 14	Cycle 15	Cycle 16	Cycle 17	Cycle 18	Cycle 19	Cycle 20	Projected	Projected
Time,s >	4.50E+07	5.33E+07	5.90E+07	5.95E+07	5.76E+07	5.89E+07	5.99E+07	5.99E+07	2.93E+08	5.68E+08
EFPY >	13.77	15.46	17.33	19.21	21.04	22.91	24.81	26.71	36.00	54.00
Elevation	Fast Neutron Fluence (E > 1.0 Mev)									
-206.69	5.74E+11	6.39E+11	7.09E+11	7.92E+11	8.75E+11	9.60E+11	1.05E+12	1.13E+12	1.56E+12	2.38E+12
-191.45	1.99E+12	2.22E+12	2.46E+12	2.75E+12	3.04E+12	3.33E+12	3.63E+12	3.93E+12	5.41E+12	8.26E+12
-176.21	7.05E+12	7.85E+12	8.70E+12	9.72E+12	1.07E+13	1.18E+13	1.29E+13	1.39E+13	1.91E+13	2.92E+13
-160.97	2.53E+13	2.82E+13	3.13E+13	3.50E+13	3.86E+13	4.24E+13	4.62E+13	5.01E+13	6.88E+13	1.05E+14
-145.73	9.28E+13	1.03E+14	1.15E+14	1.28E+14	1.41E+14	1.55E+14	1.69E+14	1.83E+14	2.52E+14	3.85E+14
-130.49	3.46E+14	3.85E+14	4.27E+14	4.77E+14	5.27E+14	5.78E+14	6.31E+14	6.83E+14	9.38E+14	1.43E+15
-115.25	1.32E+15	1.47E+15	1.63E+15	1.82E+15	2.01E+15	2.21E+15	2.41E+15	2.61E+15	3.58E+15	5.47E+15
-100.01	5.20E+15	5.79E+15	6.42E+15	7.17E+15	7.93E+15	8.70E+15	9.48E+15	1.03E+16	1.41E+16	2.16E+16
-84.77	2.11E+16	2.35E+16	2.60E+16	2.91E+16	3.21E+16	3.53E+16	3.84E+16	4.16E+16	5.72E+16	8.74E+16
-74.45	5.50E+16	6.13E+16	6.79E+16	7.59E+16	8.39E+16	9.21E+16	1.00E+17	1.09E+17	1.49E+17	2.28E+17
Elevation	Iron Atom Displacements, dpa									
-206.69	9.81E-10	1.09E-09	1.21E-09	1.35E-09	1.50E-09	1.64E-09	1.79E-09	1.94E-09	2.66E-09	4.07E-09
-191.45	3.38E-09	3.76E-09	4.17E-09	4.66E-09	5.15E-09	5.65E-09	6.16E-09	6.68E-09	9.18E-09	1.40E-08
-176.21	1.19E-08	1.32E-08	1.46E-08	1.63E-08	1.81E-08	1.98E-08	2.16E-08	2.34E-08	3.22E-08	4.92E-08
-160.97	4.23E-08	4.71E-08	5.22E-08	5.83E-08	6.44E-08	7.07E-08	7.71E-08	8.35E-08	1.15E-07	1.75E-07
-145.73	1.53E-07	1.71E-07	1.89E-07	2.11E-07	2.34E-07	2.56E-07	2.79E-07	3.03E-07	4.16E-07	6.35E-07
-130.49	5.65E-07	6.29E-07	6.97E-07	7.79E-07	8.61E-07	9.45E-07	1.03E-06	1.12E-06	1.53E-06	2.34E-06
-115.25	2.13E-06	2.37E-06	2.63E-06	2.94E-06	3.25E-06	3.57E-06	3.89E-06	4.21E-06	5.79E-06	8.84E-06
-100.01	8.28E-06	9.22E-06	1.02E-05	1.14E-05	1.26E-05	1.39E-05	1.51E-05	1.64E-05	2.25E-05	3.43E-05
-84.77	3.30E-05	3.67E-05	4.08E-05	4.55E-05	5.03E-05	5.52E-05	6.02E-05	6.52E-05	8.96E-05	1.37E-04
-74.45	8.50E-05	9.46E-05	1.05E-04	1.17E-04	1.30E-04	1.42E-04	1.55E-04	1.68E-04	2.31E-04	3.53E-04

Note: Elevation is Distance (cm) from Bottom of Active Core

Table 2.2-40

Unit 2 Shroud Vertical Welds V11 Neutron Exposure Predictions

	Cycle 13	Cycle 14	Cycle 15	Cycle 16	Cycle 17	Cycle 18	Cycle 19	Cycle 20	Projected	Projected
Time,s >	4.50E+07	5.33E+07	5.90E+07	5.95E+07	5.76E+07	5.89E+07	5.99E+07	5.99E+07	2.93E+08	5.68E+08
EFPY >	13.77	15.46	17.33	19.21	21.04	22.91	24.81	26.71	36.00	54.00
Elevation	Fast Neutron Fluence (E > 1.0 Mev)									
-206.69	9.23E+11	1.03E+12	1.15E+12	1.28E+12	1.42E+12	1.55E+12	1.69E+12	1.83E+12	2.52E+12	3.85E+12
-191.45	3.20E+12	3.59E+12	3.99E+12	4.45E+12	4.92E+12	5.39E+12	5.88E+12	6.36E+12	8.74E+12	1.33E+13
-176.21	1.13E+13	1.27E+13	1.41E+13	1.57E+13	1.74E+13	1.91E+13	2.08E+13	2.25E+13	3.09E+13	4.72E+13
-160.97	4.07E+13	4.57E+13	5.07E+13	5.66E+13	6.26E+13	6.86E+13	7.48E+13	8.10E+13	1.11E+14	1.70E+14
-145.73	1.49E+14	1.67E+14	1.86E+14	2.07E+14	2.29E+14	2.51E+14	2.74E+14	2.96E+14	4.07E+14	6.22E+14
-130.49	5.56E+14	6.23E+14	6.92E+14	7.72E+14	8.53E+14	9.36E+14	1.02E+15	1.10E+15	1.52E+15	2.32E+15
-115.25	2.12E+15	2.38E+15	2.64E+15	2.95E+15	3.26E+15	3.58E+15	3.90E+15	4.22E+15	5.79E+15	8.85E+15
-100.01	8.36E+15	9.37E+15	1.04E+16	1.16E+16	1.28E+16	1.41E+16	1.53E+16	1.66E+16	2.28E+16	3.49E+16
-84.77	3.39E+16	3.80E+16	4.22E+16	4.71E+16	5.20E+16	5.71E+16	6.22E+16	6.73E+16	9.25E+16	1.41E+17
-74.45	8.84E+16	9.92E+16	1.10E+17	1.23E+17	1.36E+17	1.49E+17	1.62E+17	1.76E+17	2.41E+17	3.69E+17
Elevation	Iron Atom Displacements, dpa									
-206.69	1.59E-09	1.78E-09	1.98E-09	2.20E-09	2.44E-09	2.67E-09	2.92E-09	3.16E-09	4.33E-09	6.62E-09
-191.45	5.46E-09	6.12E-09	6.80E-09	7.59E-09	8.39E-09	9.21E-09	1.00E-08	1.09E-08	1.49E-08	2.28E-08
-176.21	1.92E-08	2.15E-08	2.39E-08	2.66E-08	2.94E-08	3.23E-08	3.52E-08	3.81E-08	5.24E-08	8.00E-08
-160.97	6.83E-08	7.66E-08	8.51E-08	9.50E-08	1.05E-07	1.15E-07	1.26E-07	1.36E-07	1.87E-07	2.85E-07
-145.73	2.48E-07	2.78E-07	3.08E-07	3.44E-07	3.80E-07	4.17E-07	4.55E-07	4.93E-07	6.77E-07	1.03E-06
-130.49	9.13E-07	1.02E-06	1.14E-06	1.27E-06	1.40E-06	1.54E-06	1.68E-06	1.82E-06	2.49E-06	3.81E-06
-115.25	3.44E-06	3.86E-06	4.29E-06	4.79E-06	5.29E-06	5.81E-06	6.33E-06	6.85E-06	9.41E-06	1.44E-05
-100.01	1.34E-05	1.50E-05	1.67E-05	1.86E-05	2.06E-05	2.26E-05	2.46E-05	2.66E-05	3.66E-05	5.59E-05
-84.77	5.33E-05	5.98E-05	6.65E-05	7.42E-05	8.19E-05	9.00E-05	9.81E-05	1.06E-04	1.46E-04	2.23E-04
-74.45	1.37E-04	1.54E-04	1.71E-04	1.91E-04	2.11E-04	2.32E-04	2.53E-04	2.73E-04	3.75E-04	5.73E-04

Note: Elevation is Distance (cm) from Bottom of Active Core

Table 2.2-41

Unit 2 RPV Girth Weld GH Neutron Exposure Predictions

	Cycle 13	Cycle 14	Cycle 15	Cycle 16	Cycle 17	Cycle 18	Cycle 19	Cycle 20	Projected	Projected
Time,s >	4.50E+07	5.33E+07	5.90E+07	5.95E+07	5.76E+07	5.89E+07	5.99E+07	5.99E+07	2.93E+08	5.68E+08
EFPY >	13.77	15.46	17.33	19.21	21.04	22.91	24.81	26.71	36.00	54.00
Azimuth	Fast Neutron Fluence (E > 1.0 Mev)									
0	4.79E+11	5.39E+11	6.03E+11	6.80E+11	7.58E+11	8.37E+11	9.17E+11	9.98E+11	1.39E+12	2.16E+12
15	7.52E+11	8.51E+11	9.53E+11	1.07E+12	1.20E+12	1.32E+12	1.45E+12	1.57E+12	2.19E+12	3.40E+12
30	5.96E+11	6.77E+11	7.58E+11	8.58E+11	9.58E+11	1.06E+12	1.17E+12	1.27E+12	1.78E+12	2.77E+12
45	1.13E+12	1.29E+12	1.44E+12	1.64E+12	1.83E+12	2.03E+12	2.23E+12	2.44E+12	3.43E+12	5.36E+12
Azimuth	Iron Atom Displacements, dpa									
0	4.53E-09	5.09E-09	5.71E-09	6.44E-09	7.17E-09	7.93E-09	8.69E-09	9.46E-09	1.32E-08	2.05E-08
15	7.04E-09	7.97E-09	8.93E-09	1.01E-08	1.12E-08	1.24E-08	1.36E-08	1.48E-08	2.06E-08	3.19E-08
30	5.61E-09	6.38E-09	7.14E-09	8.08E-09	9.04E-09	1.00E-08	1.10E-08	1.20E-08	1.68E-08	2.62E-08
45	1.05E-08	1.20E-08	1.34E-08	1.52E-08	1.70E-08	1.89E-08	2.08E-08	2.27E-08	3.20E-08	5.00E-08
Note: Azimuth is Angle in First Octant										

Table 2.2-42

Unit 2 RPV Girth Weld FG Neutron Exposure Predictions

	Cycle 13	Cycle 14	Cycle 15	Cycle 16	Cycle 17	Cycle 18	Cycle 19	Cycle 20	Projected	Projected
Time,s >	4.50E+07	5.33E+07	5.90E+07	5.95E+07	5.76E+07	5.89E+07	5.99E+07	5.99E+07	2.93E+08	5.68E+08
EFPY >	13.77	15.46	17.33	19.21	21.04	22.91	24.81	26.71	36.00	54.00
Azimuth	Fast Neutron Fluence (E > 1.0 Mev)									
0	2.44E+17	2.76E+17	3.14E+17	3.63E+17	4.12E+17	4.62E+17	5.13E+17	5.64E+17	8.13E+17	1.30E+18
15	3.82E+17	4.36E+17	4.96E+17	5.72E+17	6.49E+17	7.28E+17	8.08E+17	8.88E+17	1.28E+18	2.04E+18
30	3.02E+17	3.47E+17	3.94E+17	4.57E+17	5.21E+17	5.86E+17	6.52E+17	7.18E+17	1.04E+18	1.67E+18
45	5.73E+17	6.60E+17	7.49E+17	8.71E+17	9.95E+17	1.12E+18	1.25E+18	1.38E+18	2.01E+18	3.22E+18
Azimuth	Iron Atom Displacements, dpa									
0	3.85E-04	4.37E-04	4.96E-04	5.73E-04	6.50E-04	7.29E-04	8.09E-04	8.90E-04	1.28E-03	2.04E-03
15	5.98E-04	6.82E-04	7.75E-04	8.95E-04	1.02E-03	1.14E-03	1.26E-03	1.39E-03	2.00E-03	3.19E-03
30	4.75E-04	5.46E-04	6.20E-04	7.19E-04	8.19E-04	9.21E-04	1.03E-03	1.13E-03	1.64E-03	2.62E-03
45	8.90E-04	1.03E-03	1.16E-03	1.35E-03	1.54E-03	1.74E-03	1.94E-03	2.14E-03	3.11E-03	5.00E-03
Note: Azimuth is Angle in First Octant										

Table 2.2-43

Unit 2 RPV Girth Weld EF Neutron Exposure Predictions

	Cycle 13	Cycle 14	Cycle 15	Cycle 16	Cycle 17	Cycle 18	Cycle 19	Cycle 20	Projected	Projected
Time,s >	4.50E+07	5.33E+07	5.90E+07	5.95E+07	5.76E+07	5.89E+07	5.99E+07	5.99E+07	2.93E+08	5.68E+08
EFPY >	13.77	15.46	17.33	19.21	21.04	22.91	24.81	26.71	36.00	54.00
Azimuth	Fast Neutron Fluence (E > 1.0 Mev)									
0	2.61E+16	2.74E+16	2.96E+16	3.31E+16	3.66E+16	4.02E+16	4.39E+16	4.75E+16	6.55E+16	1.00E+17
15	4.10E+16	4.32E+16	4.66E+16	5.21E+16	5.77E+16	6.33E+16	6.91E+16	7.49E+16	1.03E+17	1.58E+17
30	3.24E+16	3.43E+16	3.70E+16	4.15E+16	4.61E+16	5.08E+16	5.56E+16	6.03E+16	8.37E+16	1.29E+17
45	7.83E+16	8.29E+16	8.93E+16	1.00E+17	1.12E+17	1.23E+17	1.35E+17	1.47E+17	2.04E+17	3.16E+17
Azimuth	Iron Atom Displacements, dpa									
0	4.02E-05	4.23E-05	4.57E-05	5.11E-05	5.66E-05	6.22E-05	6.79E-05	7.36E-05	1.01E-04	1.56E-04
15	6.25E-05	6.60E-05	7.13E-05	7.98E-05	8.83E-05	9.71E-05	1.06E-04	1.15E-04	1.58E-04	2.43E-04
30	4.98E-05	5.27E-05	5.69E-05	6.39E-05	7.10E-05	7.83E-05	8.56E-05	9.30E-05	1.29E-04	1.99E-04
45	9.34E-05	9.90E-05	1.07E-04	1.20E-04	1.34E-04	1.48E-04	1.62E-04	1.76E-04	2.45E-04	3.79E-04
Note: Azimuth is Angle in First Octant										

Table 2.2-44

Unit 2 RPV Vertical Welds G1 and G2 Neutron Exposure Predictions

	Cycle 13	Cycle 14	Cycle 15	Cycle 16	Cycle 17	Cycle 18	Cycle 19	Cycle 20	Projected	Projected
Time,s >	4.50E+07	5.33E+07	5.90E+07	5.95E+07	5.76E+07	5.89E+07	5.99E+07	5.99E+07	2.93E+08	5.68E+08
EFPY >	13.77	15.46	17.33	19.21	21.04	22.91	24.81	26.71	36.00	54.00
Elevation	Fast Neutron Fluence (E > 1.0 Mev)									
-250.24	7.52E+11	8.51E+11	9.53E+11	1.07E+12	1.20E+12	1.32E+12	1.45E+12	1.57E+12	2.19E+12	3.40E+12
-219.76	1.60E+13	1.81E+13	2.03E+13	2.29E+13	2.55E+13	2.82E+13	3.09E+13	3.36E+13	4.68E+13	7.24E+13
-189.28	2.63E+13	2.97E+13	3.33E+13	3.75E+13	4.18E+13	4.62E+13	5.06E+13	5.50E+13	7.67E+13	1.19E+14
-158.80	4.71E+13	5.33E+13	5.97E+13	6.72E+13	7.49E+13	8.27E+13	9.06E+13	9.85E+13	1.37E+14	2.13E+14
-128.32	1.31E+14	1.48E+14	1.66E+14	1.87E+14	2.08E+14	2.30E+14	2.52E+14	2.74E+14	3.82E+14	5.91E+14
-97.84	6.68E+14	7.55E+14	8.46E+14	9.53E+14	1.06E+15	1.17E+15	1.28E+15	1.40E+15	1.95E+15	3.01E+15
-67.36	4.01E+15	4.54E+15	5.08E+15	5.73E+15	6.38E+15	7.04E+15	7.72E+15	8.39E+15	1.17E+16	1.81E+16
-36.88	2.00E+16	2.26E+16	2.53E+16	2.85E+16	3.17E+16	3.50E+16	3.84E+16	4.17E+16	5.82E+16	9.00E+16
-6.40	7.93E+16	8.99E+16	1.01E+17	1.14E+17	1.28E+17	1.41E+17	1.55E+17	1.69E+17	2.36E+17	3.67E+17
24.08	1.76E+17	2.00E+17	2.25E+17	2.56E+17	2.87E+17	3.18E+17	3.50E+17	3.82E+17	5.39E+17	8.43E+17
54.56	2.73E+17	3.12E+17	3.53E+17	4.02E+17	4.53E+17	5.04E+17	5.57E+17	6.09E+17	8.66E+17	1.36E+18
85.04	3.38E+17	3.85E+17	4.37E+17	5.02E+17	5.68E+17	6.35E+17	7.03E+17	7.71E+17	1.10E+18	1.75E+18
114.91	3.82E+17	4.36E+17	4.96E+17	5.72E+17	6.49E+17	7.28E+17	8.08E+17	8.88E+17	1.28E+18	2.04E+18
Note: Elevation is Distance (cm) from Bottom of Active Core										

Table 2.2-44 (Continued)

Unit 2 RPV Vertical Welds G1 and G2 Neutron Exposure Predictions

	Cycle 13	Cycle 14	Cycle 15	Cycle 16	Cycle 17	Cycle 18	Cycle 19	Cycle 20	Projected	Projected
Time,s >	4.50E+07	5.33E+07	5.90E+07	5.95E+07	5.76E+07	5.89E+07	5.99E+07	5.99E+07	2.93E+08	5.68E+08
EFPY >	13.77	15.46	17.33	19.21	21.04	22.91	24.81	26.71	36.00	54.00
Elevation	Iron Atom Displacements, dpa									
-250.24	7.04E-09	7.97E-09	8.93E-09	1.01E-08	1.12E-08	1.24E-08	1.36E-08	1.48E-08	2.06E-08	3.19E-08
-219.76	1.44E-07	1.63E-07	1.82E-07	2.06E-07	2.29E-07	2.53E-07	2.78E-07	3.02E-07	4.21E-07	6.53E-07
-189.28	2.28E-07	2.58E-07	2.89E-07	3.26E-07	3.64E-07	4.02E-07	4.40E-07	4.79E-07	6.69E-07	1.04E-06
-158.80	3.60E-07	4.07E-07	4.56E-07	5.14E-07	5.73E-07	6.33E-07	6.94E-07	7.55E-07	1.05E-06	1.63E-06
-128.32	6.41E-07	7.24E-07	8.12E-07	9.15E-07	1.02E-06	1.13E-06	1.24E-06	1.34E-06	1.87E-06	2.90E-06
-97.84	1.73E-06	1.96E-06	2.19E-06	2.47E-06	2.76E-06	3.04E-06	3.34E-06	3.63E-06	5.07E-06	7.85E-06
-67.36	7.39E-06	8.36E-06	9.37E-06	1.06E-05	1.18E-05	1.30E-05	1.43E-05	1.55E-05	2.16E-05	3.35E-05
-36.88	3.27E-05	3.70E-05	4.15E-05	4.68E-05	5.21E-05	5.76E-05	6.31E-05	6.87E-05	9.58E-05	1.48E-04
-6.40	1.26E-04	1.43E-04	1.60E-04	1.81E-04	2.02E-04	2.24E-04	2.46E-04	2.68E-04	3.76E-04	5.84E-04
24.08	2.75E-04	3.14E-04	3.54E-04	4.02E-04	4.50E-04	5.00E-04	5.50E-04	6.00E-04	8.46E-04	1.32E-03
54.56	4.27E-04	4.87E-04	5.52E-04	6.30E-04	7.08E-04	7.89E-04	8.71E-04	9.53E-04	1.35E-03	2.13E-03
85.04	5.28E-04	6.03E-04	6.84E-04	7.85E-04	8.88E-04	9.92E-04	1.10E-03	1.21E-03	1.73E-03	2.74E-03
114.91	5.98E-04	6.82E-04	7.75E-04	8.95E-04	1.02E-03	1.14E-03	1.26E-03	1.39E-03	2.00E-03	3.19E-03
Note: Elevation is Distance (cm) from Bottom of Active Core										

Table 2.2-45

Unit 2 RPV Vertical Welds F1 and F2 Neutron Exposure Predictions

	Cycle 13	Cycle 14	Cycle 15	Cycle 16	Cycle 17	Cycle 18	Cycle 19	Cycle 20	Projected	Projected
Time,s >	4.50E+07	5.33E+07	5.90E+07	5.95E+07	5.76E+07	5.89E+07	5.99E+07	5.99E+07	2.93E+08	5.68E+08
EFPY >	13.77	15.46	17.33	19.21	21.04	22.91	24.81	26.71	36.00	54.00
Elevation	Fast Neutron Fluence (E > 1.0 Mev)									
114.91	3.82E+17	4.36E+17	4.96E+17	5.72E+17	6.49E+17	7.28E+17	8.08E+17	8.88E+17	1.28E+18	2.04E+18
145.39	4.23E+17	4.82E+17	5.48E+17	6.34E+17	7.20E+17	8.08E+17	8.97E+17	9.87E+17	1.43E+18	2.27E+18
175.87	4.63E+17	5.28E+17	6.00E+17	6.91E+17	7.83E+17	8.77E+17	9.72E+17	1.07E+18	1.54E+18	2.44E+18
206.35	4.98E+17	5.66E+17	6.44E+17	7.37E+17	8.31E+17	9.27E+17	1.02E+18	1.12E+18	1.60E+18	2.52E+18
236.83	5.17E+17	5.86E+17	6.69E+17	7.60E+17	8.52E+17	9.47E+17	1.04E+18	1.14E+18	1.61E+18	2.51E+18
267.31	5.15E+17	5.81E+17	6.63E+17	7.50E+17	8.38E+17	9.27E+17	1.02E+18	1.11E+18	1.56E+18	2.42E+18
297.79	4.78E+17	5.35E+17	6.08E+17	6.87E+17	7.66E+17	8.48E+17	9.30E+17	1.01E+18	1.42E+18	2.20E+18
328.27	3.90E+17	4.31E+17	4.86E+17	5.50E+17	6.15E+17	6.81E+17	7.48E+17	8.15E+17	1.14E+18	1.78E+18
358.75	2.46E+17	2.69E+17	3.00E+17	3.40E+17	3.80E+17	4.21E+17	4.63E+17	5.05E+17	7.10E+17	1.11E+18
389.23	7.79E+16	8.41E+16	9.28E+16	1.05E+17	1.17E+17	1.30E+17	1.43E+17	1.55E+17	2.18E+17	3.39E+17
419.71	4.13E+16	4.35E+16	4.69E+16	5.25E+16	5.81E+16	6.38E+16	6.96E+16	7.54E+16	1.04E+17	1.59E+17
450.19	5.24E+16	5.53E+16	5.96E+16	6.66E+16	7.37E+16	8.10E+16	8.84E+16	9.58E+16	1.32E+17	2.02E+17
480.37	4.10E+16	4.32E+16	4.66E+16	5.21E+16	5.77E+16	6.33E+16	6.91E+16	7.49E+16	1.03E+17	1.58E+17

Note: Elevation is Distance (cm) from Bottom of Active Core

Table 2.2-45 (Continued)

Unit 2 RPV Vertical Welds F1 and F2 Neutron Exposure Predictions

	Cycle 13	Cycle 14	Cycle 15	Cycle 16	Cycle 17	Cycle 18	Cycle 19	Cycle 20	Projected	Projected
Time,s >	4.50E+07	5.33E+07	5.90E+07	5.95E+07	5.76E+07	5.89E+07	5.99E+07	5.99E+07	2.93E+08	5.68E+08
EFPY >	13.77	15.46	17.33	19.21	21.04	22.91	24.81	26.71	36.00	54.00
Elevation	Iron Atom Displacements, dpa)									
114.91	5.98E-04	6.82E-04	7.75E-04	8.95E-04	1.02E-03	1.14E-03	1.26E-03	1.39E-03	2.00E-03	3.19E-03
145.39	6.61E-04	7.54E-04	8.57E-04	9.90E-04	1.13E-03	1.26E-03	1.40E-03	1.54E-03	2.23E-03	3.55E-03
175.87	7.24E-04	8.24E-04	9.37E-04	1.08E-03	1.22E-03	1.37E-03	1.52E-03	1.67E-03	2.40E-03	3.81E-03
206.35	7.77E-04	8.83E-04	1.01E-03	1.15E-03	1.30E-03	1.45E-03	1.60E-03	1.75E-03	2.50E-03	3.94E-03
236.83	8.07E-04	9.14E-04	1.04E-03	1.19E-03	1.33E-03	1.48E-03	1.63E-03	1.78E-03	2.51E-03	3.93E-03
267.31	8.03E-04	9.06E-04	1.03E-03	1.17E-03	1.31E-03	1.45E-03	1.59E-03	1.73E-03	2.43E-03	3.78E-03
297.79	7.44E-04	8.33E-04	9.47E-04	1.07E-03	1.19E-03	1.32E-03	1.45E-03	1.58E-03	2.21E-03	3.43E-03
328.27	6.07E-04	6.72E-04	7.58E-04	8.57E-04	9.58E-04	1.06E-03	1.17E-03	1.27E-03	1.78E-03	2.77E-03
358.75	3.84E-04	4.20E-04	4.69E-04	5.31E-04	5.94E-04	6.59E-04	7.24E-04	7.90E-04	1.11E-03	1.73E-03
389.23	1.24E-04	1.34E-04	1.48E-04	1.67E-04	1.87E-04	2.07E-04	2.27E-04	2.47E-04	3.47E-04	5.39E-04
419.71	6.42E-05	6.77E-05	7.32E-05	8.18E-05	9.06E-05	9.96E-05	1.09E-04	1.18E-04	1.62E-04	2.49E-04
450.19	7.97E-05	8.41E-05	9.08E-05	1.02E-04	1.13E-04	1.24E-04	1.35E-04	1.46E-04	2.02E-04	3.09E-04
480.37	6.25E-05	6.60E-05	7.13E-05	7.98E-05	8.83E-05	9.71E-05	1.06E-04	1.15E-04	1.58E-04	2.43E-04
Note: Elevation is Distance (cm) from Bottom of Active Core										

Table 2.2-46

Unit 2 RPV Lower Shell Plate Neutron Exposure Predictions

	Cycle 13	Cycle 14	Cycle 15	Cycle 16	Cycle 17	Cycle 18	Cycle 19	Cycle 20	Projected	Projected
Time,s >	4.50E+07	5.33E+07	5.90E+07	5.95E+07	5.76E+07	5.89E+07	5.99E+07	5.99E+07	2.93E+08	5.68E+08
EFPY >	13.77	15.46	17.33	19.21	21.04	22.91	24.81	26.71	36.00	54.00
Elevation	Fast Neutron Fluence (E > 1.0 Mev)									
-250.24	1.13E+12	1.29E+12	1.44E+12	1.64E+12	1.83E+12	2.03E+12	2.23E+12	2.44E+12	3.43E+12	5.36E+12
-219.76	2.41E+13	2.75E+13	3.08E+13	3.49E+13	3.91E+13	4.33E+13	4.76E+13	5.20E+13	7.31E+13	1.14E+14
-189.28	3.96E+13	4.51E+13	5.04E+13	5.72E+13	6.40E+13	7.10E+13	7.81E+13	8.52E+13	1.20E+14	1.87E+14
-158.80	7.09E+13	8.08E+13	9.03E+13	1.02E+14	1.15E+14	1.27E+14	1.40E+14	1.53E+14	2.15E+14	3.35E+14
-128.32	1.97E+14	2.25E+14	2.51E+14	2.85E+14	3.19E+14	3.54E+14	3.89E+14	4.24E+14	5.97E+14	9.32E+14
-97.84	1.00E+15	1.15E+15	1.28E+15	1.45E+15	1.63E+15	1.80E+15	1.98E+15	2.16E+15	3.04E+15	4.75E+15
-67.36	6.04E+15	6.88E+15	7.69E+15	8.72E+15	9.77E+15	1.08E+16	1.19E+16	1.30E+16	1.83E+16	2.86E+16
-36.88	3.00E+16	3.42E+16	3.83E+16	4.34E+16	4.86E+16	5.39E+16	5.92E+16	6.46E+16	9.10E+16	1.42E+17
-6.40	1.19E+17	1.36E+17	1.53E+17	1.74E+17	1.95E+17	2.17E+17	2.39E+17	2.61E+17	3.70E+17	5.79E+17
24.08	2.64E+17	3.03E+17	3.41E+17	3.90E+17	4.39E+17	4.90E+17	5.41E+17	5.93E+17	8.44E+17	1.33E+18
54.56	4.10E+17	4.72E+17	5.33E+17	6.13E+17	6.94E+17	7.76E+17	8.60E+17	9.44E+17	1.36E+18	2.15E+18
85.04	5.07E+17	5.84E+17	6.61E+17	7.65E+17	8.70E+17	9.77E+17	1.09E+18	1.20E+18	1.73E+18	2.76E+18
114.91	5.73E+17	6.60E+17	7.49E+17	8.71E+17	9.95E+17	1.12E+18	1.25E+18	1.38E+18	2.01E+18	3.22E+18
Note: Elevation is Distance (cm) from Bottom of Active Core										

Table 2.2-46 (Continued

Unit 2 RPV Lower Shell Plate Neutron Exposure Predictions

	Cycle 13	Cycle 14	Cycle 15	Cycle 16	Cycle 17	Cycle 18	Cycle 19	Cycle 20	Projected	Projected
Time,s >	4.50E+07	5.33E+07	5.90E+07	5.95E+07	5.76E+07	5.89E+07	5.99E+07	5.99E+07	2.93E+08	5.68E+08
EFPY >	13.77	15.46	17.33	19.21	21.04	22.91	24.81	26.71	36.00	54.00
Elevation	Iron Atom Displacements, dpa									
-250.24	1.05E-08	1.20E-08	1.34E-08	1.52E-08	1.70E-08	1.89E-08	2.08E-08	2.27E-08	3.20E-08	5.00E-08
-219.76	2.15E-07	2.45E-07	2.74E-07	3.11E-07	3.48E-07	3.87E-07	4.25E-07	4.64E-07	6.54E-07	1.02E-06
-189.28	3.41E-07	3.89E-07	4.35E-07	4.94E-07	5.53E-07	6.13E-07	6.75E-07	7.36E-07	1.04E-06	1.62E-06
-158.80	5.37E-07	6.12E-07	6.85E-07	7.77E-07	8.71E-07	9.66E-07	1.06E-06	1.16E-06	1.63E-06	2.55E-06
-128.32	9.56E-07	1.09E-06	1.22E-06	1.38E-06	1.55E-06	1.72E-06	1.89E-06	2.06E-06	2.91E-06	4.55E-06
-97.84	2.58E-06	2.95E-06	3.30E-06	3.74E-06	4.19E-06	4.65E-06	5.11E-06	5.58E-06	7.86E-06	1.23E-05
-67.36	1.10E-05	1.26E-05	1.41E-05	1.60E-05	1.79E-05	1.99E-05	2.18E-05	2.38E-05	3.36E-05	5.25E-05
-36.88	4.89E-05	5.57E-05	6.24E-05	7.07E-05	7.92E-05	8.79E-05	9.67E-05	1.06E-04	1.49E-04	2.32E-04
-6.40	1.88E-04	2.15E-04	2.41E-04	2.74E-04	3.08E-04	3.42E-04	3.77E-04	4.12E-04	5.83E-04	9.14E-04
24.08	4.11E-04	4.72E-04	5.31E-04	6.07E-04	6.84E-04	7.63E-04	8.43E-04	9.23E-04	1.31E-03	2.07E-03
54.56	6.37E-04	7.33E-04	8.28E-04	9.52E-04	1.08E-03	1.21E-03	1.34E-03	1.47E-03	2.10E-03	3.34E-03
85.04	7.87E-04	9.07E-04	1.03E-03	1.19E-03	1.35E-03	1.52E-03	1.69E-03	1.86E-03	2.68E-03	4.29E-03
114.91	8.90E-04	1.03E-03	1.16E-03	1.35E-03	1.54E-03	1.74E-03	1.94E-03	2.14E-03	3.11E-03	5.00E-03
Note: Elevation is Distance (cm) from Bottom of Active Core										

Table 2.2-47

Unit 2 RPV Lower Intermediate Shell Plate Neutron Exposure Predictions

	Cycle 13	Cycle 14	Cycle 15	Cycle 16	Cycle 17	Cycle 18	Cycle 19	Cycle 20	Projected	Projected
Time,s >	4.50E+07	5.33E+07	5.90E+07	5.95E+07	5.76E+07	5.89E+07	5.99E+07	5.99E+07	2.93E+08	5.68E+08
EFPY >	13.77	15.46	17.33	19.21	21.04	22.91	24.81	26.71	36.00	54.00
Elevation	Fast Neutron Fluence (E > 1.0 Mev)									
114.91	5.73E+17	6.60E+17	7.49E+17	8.71E+17	9.95E+17	1.12E+18	1.25E+18	1.38E+18	2.01E+18	3.22E+18
145.39	6.33E+17	7.29E+17	8.28E+17	9.64E+17	1.10E+18	1.24E+18	1.39E+18	1.53E+18	2.23E+18	3.59E+18
175.87	6.93E+17	7.97E+17	9.05E+17	1.05E+18	1.20E+18	1.35E+18	1.50E+18	1.65E+18	2.40E+18	3.85E+18
206.35	7.45E+17	8.55E+17	9.72E+17	1.12E+18	1.27E+18	1.42E+18	1.58E+18	1.74E+18	2.50E+18	3.98E+18
236.83	7.74E+17	8.85E+17	1.01E+18	1.15E+18	1.30E+18	1.45E+18	1.61E+18	1.76E+18	2.51E+18	3.96E+18
267.31	7.71E+17	8.77E+17	9.99E+17	1.14E+18	1.28E+18	1.42E+18	1.57E+18	1.71E+18	2.43E+18	3.81E+18
297.79	7.15E+17	8.07E+17	9.16E+17	1.04E+18	1.17E+18	1.30E+18	1.43E+18	1.56E+18	2.21E+18	3.47E+18
328.27	5.83E+17	6.50E+17	7.33E+17	8.35E+17	9.38E+17	1.04E+18	1.15E+18	1.26E+18	1.78E+18	2.80E+18
358.75	3.69E+17	4.05E+17	4.52E+17	5.16E+17	5.80E+17	6.46E+17	7.14E+17	7.81E+17	1.11E+18	1.75E+18
389.23	1.17E+17	1.27E+17	1.40E+17	1.59E+17	1.79E+17	1.99E+17	2.20E+17	2.40E+17	3.40E+17	5.34E+17
419.71	6.21E+16	6.57E+16	7.08E+16	7.97E+16	8.87E+16	9.78E+16	1.07E+17	1.16E+17	1.62E+17	2.50E+17
450.19	7.89E+16	8.35E+16	8.99E+16	1.01E+17	1.13E+17	1.24E+17	1.36E+17	1.48E+17	2.06E+17	3.18E+17
480.37	7.83E+16	8.29E+16	8.93E+16	1.00E+17	1.12E+17	1.23E+17	1.35E+17	1.47E+17	2.04E+17	3.16E+17

Note: Elevation is Distance (cm) from Bottom of Active Core

Table 2.2-47 (Continued

Unit 2 RPV Lower Intermediate Shell Plate Neutron Exposure Predictions

	Cycle 13	Cycle 14	Cycle 15	Cycle 16	Cycle 17	Cycle 18	Cycle 19	Cycle 20	Projected	Projected
Time,s >	4.50E+07	5.33E+07	5.90E+07	5.95E+07	5.76E+07	5.89E+07	5.99E+07	5.99E+07	2.93E+08	5.68E+08
EFPY >	13.77	15.46	17.33	19.21	21.04	22.91	24.81	26.71	36.00	54.00
Elevation	Iron Atom Displacements, dpa									
114.91	8.90E-04	1.03E-03	1.16E-03	1.35E-03	1.54E-03	1.74E-03	1.94E-03	2.14E-03	3.11E-03	5.00E-03
145.39	9.83E-04	1.13E-03	1.29E-03	1.50E-03	1.71E-03	1.93E-03	2.15E-03	2.37E-03	3.46E-03	5.57E-03
175.87	1.08E-03	1.24E-03	1.40E-03	1.63E-03	1.86E-03	2.09E-03	2.33E-03	2.57E-03	3.73E-03	5.97E-03
206.35	1.15E-03	1.32E-03	1.51E-03	1.74E-03	1.97E-03	2.21E-03	2.45E-03	2.69E-03	3.87E-03	6.17E-03
236.83	1.20E-03	1.37E-03	1.56E-03	1.79E-03	2.02E-03	2.25E-03	2.49E-03	2.73E-03	3.89E-03	6.14E-03
267.31	1.19E-03	1.36E-03	1.55E-03	1.76E-03	1.98E-03	2.20E-03	2.43E-03	2.65E-03	3.76E-03	5.90E-03
297.79	1.11E-03	1.25E-03	1.42E-03	1.61E-03	1.81E-03	2.01E-03	2.21E-03	2.42E-03	3.42E-03	5.36E-03
328.27	9.02E-04	1.01E-03	1.13E-03	1.29E-03	1.45E-03	1.61E-03	1.78E-03	1.95E-03	2.76E-03	4.33E-03
358.75	5.71E-04	6.28E-04	7.01E-04	8.00E-04	9.01E-04	1.00E-03	1.11E-03	1.21E-03	1.72E-03	2.71E-03
389.23	1.84E-04	2.00E-04	2.21E-04	2.52E-04	2.83E-04	3.15E-04	3.47E-04	3.79E-04	5.37E-04	8.43E-04
419.71	9.58E-05	1.02E-04	1.10E-04	1.23E-04	1.37E-04	1.52E-04	1.66E-04	1.81E-04	2.51E-04	3.89E-04
450.19	1.19E-04	1.26E-04	1.36E-04	1.53E-04	1.71E-04	1.88E-04	2.06E-04	2.24E-04	3.12E-04	4.83E-04
480.37	9.34E-05	9.90E-05	1.07E-04	1.20E-04	1.34E-04	1.48E-04	1.62E-04	1.76E-04	2.45E-04	3.79E-04

Note: Elevation is Distance (cm) from Bottom of Active Core

Table 2.2-48

Unit 2 RPV N16 Nozzle/Nozzle Forging Neutron Exposure Predictions

	Cycle 13	Cycle 14	Cycle 15	Cycle 16	Cycle 17	Cycle 18	Cycle 19	Cycle 20	Projected	Projected
Time,s >	4.50E+07	5.33E+07	5.90E+07	5.95E+07	5.76E+07	5.89E+07	5.99E+07	5.99E+07	2.93E+08	5.68E+08
EFPY >	13.77	15.46	17.33	19.21	21.04	22.91	24.81	26.71	36.00	54.00
Elevation	Fast Neutron Fluence (E > 1.0 Mev)									
363.52	2.91E+17	3.20E+17	3.56E+17	4.06E+17	4.57E+17	5.10E+17	5.62E+17	6.15E+17	8.75E+17	1.38E+18
371.55	2.31E+17	2.53E+17	2.82E+17	3.22E+17	3.62E+17	4.03E+17	4.45E+17	4.87E+17	6.93E+17	1.09E+18
379.58	1.58E+17	1.73E+17	1.91E+17	2.18E+17	2.46E+17	2.73E+17	3.02E+17	3.30E+17	4.69E+17	7.38E+17
387.5	1.10E+17	1.19E+17	1.32E+17	1.50E+17	1.68E+17	1.87E+17	2.07E+17	2.26E+17	3.20E+17	5.03E+17
395.43	8.45E+16	9.12E+16	1.00E+17	1.14E+17	1.28E+17	1.42E+17	1.56E+17	1.70E+17	2.41E+17	3.77E+17
Elevation	Iron Atom Displacements, dpa									
363.52	4.53E-04	4.97E-04	5.54E-04	6.33E-04	7.12E-04	7.93E-04	8.76E-04	9.58E-04	1.36E-03	2.14E-03
371.55	3.62E-04	3.96E-04	4.41E-04	5.03E-04	5.66E-04	6.31E-04	6.97E-04	7.63E-04	1.08E-03	1.71E-03
379.58	2.48E-04	2.71E-04	3.00E-04	3.43E-04	3.86E-04	4.30E-04	4.74E-04	5.19E-04	7.37E-04	1.16E-03
387.5	1.73E-04	1.88E-04	2.08E-04	2.37E-04	2.66E-04	2.96E-04	3.27E-04	3.57E-04	5.06E-04	7.95E-04
395.43	1.34E-04	1.45E-04	1.59E-04	1.81E-04	2.03E-04	2.25E-04	2.48E-04	2.71E-04	3.83E-04	5.99E-04

Note: Elevation is Distance (cm) from Bottom of Active Core

Table 2.2-49

Unit 2 Top Guide Neutron Exposure Predictions

	Cycle 13	Cycle 14	Cycle 15	Cycle 16	Cycle 17	Cycle 18	Cycle 19	Cycle 20	Projected	Projected
Time,s >	4.50E+07	5.33E+07	5.90E+07	5.95E+07	5.76E+07	5.89E+07	5.99E+07	5.99E+07	2.93E+08	5.68E+08
EFPY >	13.77	15.46	17.33	19.21	21.04	22.91	24.81	26.71	36.00	54.00
Radius	Fast Neutron Fluence (E > 1.0 Mev)									
5.01	8.71E+21	9.08E+21	9.66E+21	1.05E+22	1.14E+22	1.23E+22	1.32E+22	1.41E+22	1.86E+22	2.72E+22
30.48	1.1E+22	1.14E+22	1.22E+22	1.33E+22	1.44E+22	1.55E+22	1.66E+22	1.78E+22	2.34E+22	3.43E+22
60.96	1.1E+22	1.14E+22	1.21E+22	1.33E+22	1.44E+22	1.56E+22	1.68E+22	1.8E+22	2.39E+22	3.53E+22
91.44	1.01E+22	1.05E+22	1.11E+22	1.23E+22	1.35E+22	1.47E+22	1.59E+22	1.72E+22	2.32E+22	3.49E+22
121.92	1.11E+22	1.16E+22	1.22E+22	1.34E+22	1.46E+22	1.58E+22	1.71E+22	1.83E+22	2.44E+22	3.62E+22
152.4	1.02E+22	1.05E+22	1.11E+22	1.23E+22	1.34E+22	1.46E+22	1.58E+22	1.69E+22	2.27E+22	3.39E+22
182.88	6.81E+21	7.09E+21	7.49E+21	8.33E+21	9.18E+21	1.01E+22	1.09E+22	1.18E+22	1.62E+22	2.46E+22
213.36	1.2E+21	1.28E+21	1.38E+21	1.56E+21	1.74E+21	1.93E+21	2.12E+21	2.31E+21	3.24E+21	5.04E+21
221.615	2.84E+20	3.05E+20	3.31E+20	3.76E+20	4.22E+20	4.69E+20	5.17E+20	5.65E+20	7.98E+20	1.25E+21
225.425	1.62E+20	1.73E+20	1.88E+20	2.14E+20	2.4E+20	2.67E+20	2.95E+20	3.22E+20	4.55E+20	7.14E+20
236.855	2.24E+19	2.41E+19	2.63E+19	3E+19	3.37E+19	3.75E+19	4.13E+19	4.51E+19	6.39E+19	1E+20
240.665	1.09E+19	1.17E+19	1.28E+19	1.46E+19	1.64E+19	1.82E+19	2.01E+19	2.19E+19	3.11E+19	4.87E+19
Note: Radius (cm) from Core Centerline										

Table 2.2-49 (Continued)

Unit 2 Top Guide Neutron Exposure Predictions

	Cycle 13	Cycle 14	Cycle 15	Cycle 16	Cycle 17	Cycle 18	Cycle 19	Cycle 20	Projected	Projected
Time,s >	4.50E+07	5.33E+07	5.90E+07	5.95E+07	5.76E+07	5.89E+07	5.99E+07	5.99E+07	2.93E+08	5.68E+08
EFPY >	13.77	15.46	17.33	19.21	21.04	22.91	24.81	26.71	36.00	54.00
Radius	Iron Atom Displacements, dpa									
5.01	1.35E+01	1.41E+01	1.50E+01	1.63E+01	1.77E+01	1.90E+01	2.04E+01	2.18E+01	2.86E+01	4.19E+01
30.48	1.71E+01	1.78E+01	1.89E+01	2.06E+01	2.23E+01	2.40E+01	2.58E+01	2.76E+01	3.62E+01	5.30E+01
60.96	1.71E+01	1.78E+01	1.89E+01	2.06E+01	2.24E+01	2.42E+01	2.61E+01	2.79E+01	3.70E+01	5.45E+01
91.44	1.58E+01	1.64E+01	1.74E+01	1.92E+01	2.10E+01	2.29E+01	2.48E+01	2.67E+01	3.60E+01	5.39E+01
121.92	1.73E+01	1.80E+01	1.90E+01	2.08E+01	2.27E+01	2.45E+01	2.65E+01	2.84E+01	3.77E+01	5.58E+01
152.4	1.58E+01	1.63E+01	1.73E+01	1.90E+01	2.07E+01	2.25E+01	2.43E+01	2.61E+01	3.50E+01	5.21E+01
182.88	1.05E+01	1.10E+01	1.16E+01	1.29E+01	1.42E+01	1.55E+01	1.68E+01	1.82E+01	2.48E+01	3.76E+01
213.36	1.74E+00	1.85E+00	2.00E+00	2.26E+00	2.52E+00	2.79E+00	3.06E+00	3.34E+00	4.67E+00	7.26E+00
221.615	4.26E-01	4.56E-01	4.95E-01	5.63E-01	6.32E-01	7.01E-01	7.72E-01	8.44E-01	1.19E+00	1.87E+00
225.425	2.46E-01	2.63E-01	2.86E-01	3.25E-01	3.65E-01	4.05E-01	4.46E-01	4.87E-01	6.89E-01	1.08E+00
236.855	3.61E-02	3.88E-02	4.23E-02	4.82E-02	5.41E-02	6.02E-02	6.63E-02	7.25E-02	1.03E-01	1.61E-01
240.665	1.76E-02	1.90E-02	2.07E-02	2.36E-02	2.65E-02	2.95E-02	3.25E-02	3.55E-02	5.03E-02	7.90E-02

Note: Radius (cm) from Core Centerline

Table 2.2-50

Unit 2 Core Plate Neutron Exposure Predictions

	Cycle 13	Cycle 14	Cycle 15	Cycle 16	Cycle 17	Cycle 18	Cycle 19	Cycle 20	Projected	Projected
Time,s >	4.50E+07	5.33E+07	5.90E+07	5.95E+07	5.76E+07	5.89E+07	5.99E+07	5.99E+07	2.93E+08	5.68E+08
EFPY >	13.77	15.46	17.33	19.21	21.04	22.91	24.81	26.71	36.00	54.00
Radius	Fast Neutron Fluence (E > 1.0 Mev)									
5.01	1.53E+20	1.7E+20	1.88E+20	2.04E+20	2.21E+20	2.38E+20	2.55E+20	2.72E+20	3.56E+20	5.19E+20
30.48	1.81E+20	2E+20	2.21E+20	2.4E+20	2.6E+20	2.81E+20	3.02E+20	3.23E+20	4.24E+20	6.22E+20
60.96	1.82E+20	2.01E+20	2.22E+20	2.42E+20	2.63E+20	2.85E+20	3.07E+20	3.29E+20	4.35E+20	6.42E+20
91.44	1.66E+20	1.83E+20	2.01E+20	2.23E+20	2.45E+20	2.67E+20	2.89E+20	3.12E+20	4.22E+20	6.35E+20
121.92	1.84E+20	2.03E+20	2.23E+20	2.44E+20	2.66E+20	2.88E+20	3.11E+20	3.34E+20	4.45E+20	6.61E+20
152.4	1.63E+20	1.79E+20	1.97E+20	2.17E+20	2.38E+20	2.59E+20	2.81E+20	3.02E+20	4.08E+20	6.12E+20
182.88	1.11E+20	1.23E+20	1.35E+20	1.51E+20	1.66E+20	1.82E+20	1.99E+20	2.15E+20	2.95E+20	4.49E+20
213.36	8.03E+19	9.01E+19	9.95E+19	1.11E+20	1.23E+20	1.35E+20	1.47E+20	1.59E+20	2.19E+20	3.35E+20
221.615	2.96E+19	3.34E+19	3.7E+19	4.16E+19	4.62E+19	5.09E+19	5.57E+19	6.05E+19	8.4E+19	1.3E+20
225.425	1.67E+19	1.89E+19	2.09E+19	2.35E+19	2.62E+19	2.89E+19	3.16E+19	3.43E+19	4.77E+19	7.37E+19
236.855	3.48E+18	3.95E+18	4.39E+18	4.96E+18	5.53E+18	6.12E+18	6.71E+18	7.3E+18	1.02E+19	1.58E+19
240.665	2.3E+18	2.62E+18	2.91E+18	3.29E+18	3.67E+18	4.06E+18	4.46E+18	4.86E+18	6.8E+18	1.06E+19
Note: Radius (cm) from Core Centerline										

Table 2.2-50 (Continued)

Unit 2 Core Plate Neutron Exposure Predictions

	Cycle 13	Cycle 14	Cycle 15	Cycle 16	Cycle 17	Cycle 18	Cycle 19	Cycle 20	Projected	Projected
Time,s >	4.50E+07	5.33E+07	5.90E+07	5.95E+07	5.76E+07	5.89E+07	5.99E+07	5.99E+07	2.93E+08	5.68E+08
EFPY >	13.77	15.46	17.33	19.21	21.04	22.91	24.81	26.71	36.00	54.00
Radius	Iron Atom Displacements, dpa									
5.01	2.23E-01	2.48E-01	2.74E-01	2.97E-01	3.22E-01	3.46E-01	3.71E-01	3.96E-01	5.19E-01	7.56E-01
30.48	2.65E-01	2.93E-01	3.23E-01	3.52E-01	3.81E-01	4.11E-01	4.42E-01	4.72E-01	6.21E-01	9.09E-01
60.96	2.67E-01	2.94E-01	3.24E-01	3.55E-01	3.85E-01	4.17E-01	4.49E-01	4.80E-01	6.37E-01	9.39E-01
91.44	2.44E-01	2.70E-01	2.97E-01	3.28E-01	3.60E-01	3.92E-01	4.25E-01	4.58E-01	6.18E-01	9.30E-01
121.92	2.69E-01	2.96E-01	3.25E-01	3.57E-01	3.89E-01	4.22E-01	4.55E-01	4.88E-01	6.51E-01	9.66E-01
152.4	2.39E-01	2.62E-01	2.89E-01	3.19E-01	3.49E-01	3.80E-01	4.12E-01	4.43E-01	5.97E-01	8.96E-01
182.88	1.62E-01	1.81E-01	1.98E-01	2.21E-01	2.44E-01	2.67E-01	2.91E-01	3.15E-01	4.31E-01	6.57E-01
213.36	1.16E-01	1.30E-01	1.44E-01	1.60E-01	1.77E-01	1.95E-01	2.12E-01	2.30E-01	3.16E-01	4.84E-01
221.615	4.32E-02	4.88E-02	5.41E-02	6.08E-02	6.75E-02	7.44E-02	8.15E-02	8.85E-02	1.23E-01	1.89E-01
225.425	2.44E-02	2.76E-02	3.07E-02	3.45E-02	3.83E-02	4.23E-02	4.63E-02	5.03E-02	6.99E-02	1.08E-01
236.855	5.42E-03	6.14E-03	6.84E-03	7.72E-03	8.61E-03	9.52E-03	1.04E-02	1.14E-02	1.59E-02	2.46E-02
240.665	3.58E-03	4.07E-03	4.53E-03	5.12E-03	5.71E-03	6.32E-03	6.94E-03	7.56E-03	1.06E-02	1.64E-02

Note: Radius (cm) from Core Centerline

5.0 References

1. Code of Federal Regulations Title 10 Part 50, "Domestic Licensing of Production and Utilization Facilities".

2. Regulatory Guide 1.190, "Calculational and Dosimetry Methods for Determining Pressure Vessel Neutron Fluence", U. S. Nuclear Regulatory Commission, Office of Nuclear Regulatory Research, March 2001.

3. RSICC Computer Code Collection CCC-650, "DOORS 3.1, One-, Two-, and Three-Dimensional Discrete Ordinates Neutron/Photon Transport Code System," August 1996.

4. RSIC Data Library Collection DLC-185, "BUGLE-96, Coupled 47 Neutron, 20 Gamma-Ray Group Cross Section Library Derived from ENDF/B-VI for LWR Shielding and Pressure Vessel Dosimetry Applications," March 1996.

5. CP&L Letter 96A-0283, "Brunswick Unit 2 Fluence Data", J. M. Given to J. W. Voss Jr., May 17, 1996.

6. CP&L e-mail, "Brunswick Fluence Analysis", C. Stroupe to R. K. Disney, November 6, 2001.

7. CP&L e-mail, "Brunswick Fluence Analysis", C. Stroupe to R. K. Disney, November 7, 2001.

8. CP&L Memo, "RPV Fluence Evaluation", P. S. Gore to R. K. Disney, November 9, 2001.

9. CP&L e-mail, "Resolution of Active Core Height/Elevations", P. S. Gore to R. K. Disney, November 15, 2001.

10. CP&L e-mail, "Resolution of Active Core Height/Elevations", C. Stroupe to R. K. Disney, November 20, 2001.

11. CP&L e-mail, "Brunswick Cycle EFPD", C. Stroupe to R. K. Disney, November 20, 2001.

12. CP&L e-mail, "Brunswick Unit 2 Exposure Maps and Axial Distributions", C. Stroupe to R. K. Disney, November 21, 2001.

13. CP&L e-mail, "Resolution of Active Core Height/Elevations", C. Stroupe to R. K. Disney, November 26, 2001.

14. NUREG/CR-6115:BNL-NUREG-52395 (Draft), "PWR and BWR Pressure Vessel Fluence Calculation Benchmark Problems and Solutions" J. F. Carew, K. Hu, A. Aronson, A. Prince, and G. Zamonsky, Brookhaven National Laboratory, To be :Published.

ENCLOSURE 4

BRUNSWICK STEAM ELECTRIC PLANT, UNIT NOS. 1 AND 2
DOCKET NOS. 50-325 AND 50-324/LICENSE NOS. DPR-71 AND DPR-62
REQUEST FOR LICENSE AMENDMENTS TO REVISE TECHNICAL SPECIFICATION
PRESSURE-TEMPERATURE LIMITS CURVES

CP&L Calculation 0B21-1029, Revision 0,
"Instrument Uncertainty for RCS Pressure/Temperature Limits Curve"

CALCULATION TITLE AND APPROVAL COVER SHEET FORM 0ENP-303-1 (10/01)

SYSTEM# 1005
CALC. SUB-TYPE ICS
PRIORITY CODE 1
QUALITY CLASS D

CAROLINA POWER & LIGHT COMPANY

0B21-1029
(CALCULATION #)

Instrument Uncertainty for RCS Pressure / Temperature Limits Curve
(TITLE INCLUDING STRUCTURE/SYSTEM/COMPONENT)

BRUNSWICK NUCLEAR POWER PLANT

UNIT 1 & 2

APPROVAL

Revision 0

Prepared By: Jeff Suggs / [signature] Date: 4/18/02

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1.0 OBJECTIVE

The objective of this calculation is to determine the uncertainty associated with the instrumentation used to verify compliance with the Tech Spec 3.4.9 RCS Pressure and Temperature (P/T) Limits. The scope of instrumentation to be included in this calculation was defined by Nuclear Boiler System Engineering and Operations and is provided in below. Engineering and Operations may decide to restrict the use of some of the instruments currently included in the scope based on the results of the uncertainty analysis. The uncertainty associated with the final scope of instrumentation will be incorporated into the new P/T curves that are being developed by Nuclear Boiler System Engineering.

2.0 FUNCTIONAL DESCRIPTION

2.1 Function

The following instrument Loops currently may be used by Operations to verify compliance with the RCS P/T Limits required per Tech Spec 3.4.9.

MONITORED VARIABLE	INSTRUMENTS	LOCATION	MODEL	CAL PROCEDURE	VENDOR MANUAL / DWG	DWG
REACTOR PRESSURE (Press. Loop 1)	1(2)-C32-PT-N008	RB EL050	GE 551	0PIC-PT001	FP-50714,Vol.X	D-25020(02520)-3A
	1(2)-C32-PR-R609	CTB EL049	ESTERLINE ANGUS TIGRAPH 200A	0PIC-UR004	FP-82052	
REACTOR PRESSURE (Press. Loop 2)	1(2)-C32-PT-N008	RB EL050	GE 551	0PIC-PT001	FP-50714,Vol.X	D-25020(02520)-3A
	1(2)-C32PA103	CTB EL049	NA - ERFIS	0PIC-PT001	NA	
REACTOR PRESSURE (Press. Loop 3)	1(2)-C32-PT-N005A(B)	RB EL050	ROSEMOUNT 1153GB5PA	0LP-PT016	FP-70262	D-25022(02522)-2A,-2C, D-25020(02520)-3A,-3D
	1(2)-C32-LC-R602A(B)	CTB EL049	FOXBORO	0LP-PT016	FP-84200	
	1(2)-C32-LPR-R608	CTB EL049	L&N SPEEDOMAX	0LP-PT016	FP-82886	
REACTOR PRESSURE (Press. Loop 4)	1(2)-C32-PT-N005A(B)	RB EL050	ROSEMOUNT 1153GB5PA	0LP-PT016	FP-70262	D-25022(02522)-2A,-2C, D-25020(02520)-3A,-3D
	1(2)-C32-LC-R602A(B) (DFCS)	CTB EL049	FOXBORO	0LP-PT016	FP-84200	
	1(2)-C32PA100(101) & 1(2)-A1693-B016	CTB EL049	NA - ERFIS/PPC	0LP-PT016	NA	
REACTOR PRESSURE (Press. Loop 5)	1(2)-B21-PT-N045A(D)	RB EL050	ROSEMOUNT 1153GB9PA	1(2)MST-ATWS22R	FP-70262	D-25022(02522)-2A, D-25020(02520)-3A
	1(2)-B21-PTM-N045A(D)	CTB EL049	GE 9040CNV00155	1(2)MST-ATWS22R	FP-83130	
	1(2)-B21-PI-R605A(B)	CTB EL049	INTERNATIONAL INSTRUMENTS 1151-V-B-DCV1-5	1(2)MST-ATWS22R	FP-75090	

MONITORED	INSTRUMENTS	LOCATION	MODEL	CAL PROCEDURE	VENDOR MANUAL / DWG	DWG
RECIRC SUCTION TEMPERATURE (Temp Loop 1)	1(2)-B32-TE-N035A(B)	RB	GE 9040T/C00051	0PIC-T/C001	0-FP-50704	D-25048(02548)-2A
	1(2)-B32-TY-K640A(B)	CTB EL049	GE 550	0PIC-CNV008	FP-7396	
	1(2)-B32-TR-R650	CTB EL049	L&N SPEEDOMAX 100H	0PIC-UR021	FP-82886	
RHR HX INLET AND DISCHARGE TEMPERATURE (Temp Loop 2)	1(2)-E11-TE-N004A(B)	RB EL032	NECI 9040T/C00024	0PIC-T/C001	FP-219	1(2)-FP-50039-6
	1-E11-TE-N027A	RB EL 000	PYCO 102-9039-08-6	0PIC-T/C001	FP-219	
	1-E11-TE-N027B		PYCO 102-3171-P07-		0-FP-50346, 252-064, FP-	
	2-E11-TE-N027A(B)		ROSEMOUNT 177HM		0-FP-50346, 252-064, FP-	
	1(2)-E41-TR-R605 Points 1-4	CTB EL049	L&N SPEEDOMAX	0PIC-UR001B	FP-81309	
REACTOR BOTTOM DRAIN TEMPERATURE (Temp Loop 3)	1(2)-G31-TE-N042	RB EL023	PYCO 102-3171-P08-	0PIC-T/C001	FP-9301 0-FP-50350	D-25027(02527)-1A
	1(2)-G31-CS-N601	CTB EL049	LEWIS ELECTR	NA	NA	
	1(2)-G31-TY-K601	CTB EL049	GE	0PIC-CNV008	FP-7396	
	1(2)-G31-TI-R607	CTB EL049	GE 180	0PIC-UI002	FP-82021	
REACTOR BOTTOM DRAIN TEMPERATURE (Temp Loop 4)	1(2)-G31-TE-N042	RB EL023	PYCO 102-3171-P08-	0PIC-T/C001	FP-9301 0-FP-50350	D-25027(02527)-1A
	1(2)-G31-CS-N601	CTB EL049	LEWIS ELECTR	NA	NA	
	1(2)-G31-TY-K601	CTB EL049	GE	0PIC-CNV008	FP-7396	
	1(2)-G31TA018	CTB EL049	NA - ERFIS	0SPP-ERF002	NA	

MONITORED	INSTRUMENTS	LOCATION	MODEL	CAL PROCEDURE	VENDOR MANUAL / DWG	DWG
VESSEL TOP HEAD ADJ TO FLANGE	1-B21-TE-N028A1	RB EL094	GE 9040T/C00031	0PIC-T/C001A	0-FP-50438	F-95085-2
	2-B21-TE-N028A1		GE 9040T/C00060			F-09585-2
VESSEL TOP HEAD FLANGE	1-B21-TE-N028B1	RB EL094	GE 9040T/C00031	0PIC-T/C001A	0-FP-50438	F-95085-2
	2-B21-TE-N028B1		GE 9040T/C00060			F-09585-2
VESSEL BOTTOM HEAD	1-B21-TE-N030L3	RB EL033	GE 9040T/C00034	0PIC-T/C001A	0-FP-50445	F-95085-2
	2-B21-TE-N030L2					F-09585-2
VESSEL FLANGE	1(2)-B21-TE-N050A2	RB EL094	GE 9040T/C00036	0PIC-T/C001A	0-FP-50445	F-95085(09585)-2
REACTOR BOTTOM HEAD	1(2)-G31-TE-N042	RB EL023	PYCO 102-3171-P08-1.8-4	0PIC-T/C001	FP-9301 0-FP-50350	F-95085(09585)-2
VESSEL WALL ADJ TO FLANGE	1(2)-B21-TE-N030B2	RB EL090	GE 9040T/C00033	0PIC-T/C001A	0-FP-50445	F-95085(09585)-2
VESSEL WALL ADJ TO FLANGE	1(2)-B21-TE-N030B3	RB EL090	GE 9040T/C00033	0PIC-T/C001A	0-FP-50445	F-95085(09585)-2
VESSEL FLANGE	1(2)-B21-TE-N050A3	RB EL094	GE 9040T/C00036	0PIC-T/C001A	0-FP-50445	F-95085(09585)-2
CRD & RX VESSEL TEMPERATURE RECORDER (Temp Loop 5)	1-C11-TR-R018, 2-C12-TR-R018 CH. 148, 149, 151, 152, 153, 154, 159, 160	RB EL020	MOLYTEK INC 2702C	0PIC-UR011D	FP-83860	D-25017(02517)-2A, F-95085 (09585)-2
REACTOR TEMPERATURE VESSEL WALL ADJ TO FLANGE (Temp Loop 6)	1(2)-G31-TE-N030B2(B3)	RB EL090	GE 9040T/C00033	0PIC-T/C001A	0-FP-50445	F-95085 (09585)-2, 1(2)-FP-81890 18
	1(2)B21TA117(118)	CTB EL049	NA - ERFIS	NA	NA	

2.2 Safety Significance

The P/T limits are not derived from Design Basis Accident (DBA) analyses. They are prescribed during normal operation to avoid encountering pressure, temperature, and temperature rate of change conditions that might cause undetected flaws to propagate and cause nonductile failure of the Reactor Coolant Pressure Boundary, a condition that is unanalyzed. Since the P/T limits are not derived from any DBA, there are no acceptance limits related to the P/T limits. Rather, the P/T limits are acceptance limits themselves since they preclude operation in an unanalyzed condition. RCS P/T limits satisfy Criterion 2 of 10 CFR 50.36(c)(2)(ii). This calculation establishes the uncertainty associated with the instrument loops used to verify compliance with the P/T curve. Incorporating instrument uncertainty into the P/T Limits curve provides additional assurance that the P/T Limits will not be exceeded.

2.3 Plant Conditions

The P/T limits are applicable in all modes of plant operation.

2.4 Process effects to be considered

For the Pressure Loops, consider the effects of changes in RCS pressure and ambient temperature on density of the water in the pressure transmitter sensing lines. There are no process effects on the Temperature Loops.

2.5 Primary Element Effects to be considered

For the Pressure Loops, the sensing lines are connected to the Reactor Level condensing chambers (CDU). Any uncertainty associated with the CDU will impact the uncertainty of the Pressure Loop. For the Temperature Loops, the thermocouple (TC) is the Primary Element, there are no other Primary Element Effects.

2.6 General Design Basis

2.6.1 Function

The instrumentation listed above is used to verify compliance with the Tech Spec 3.4.9 RCS Pressure and Temperature (P/T) Limits.

2.6.3 Instrument Locations

See section 2.1 for instrument locations.

2.6.4 Environments

Based on Section 2.2, this calculation is performed for normal expected environmental conditions.

2.6.5 Seismic

Based on Section 2.2, this calculation is performed for Normal environmental conditions. Seismic Effects will not be considered in determination of instrument uncertainties.

3.0 LOOP DIAGRAMS

Loop diagrams are not provided. Section 2.1 identifies the instrument Loops within the scope of this calculation.

4.0 REFERENCES

4.1 EGR-NGGC-0153, Rev.8, Engineering Instrument Setpoints
4.2 CP&L Equipment Database (EDB)
4.3 CP&L Environmental Data Drawing, D-03056 Revision 6.
4.4 0ENP-303, Rev. 8; Preparation and Control of Design Analyses and Calculations.
4.5 0EGR-NGGC-0003, Rev 7; Design Review Requirements.
4.6 FP-82052, REV. E, RECORDER, TIGRAPH 200A
4.7 FP-75090, REV. G, INSTRUMENTS , SWITCHBOARD , EDGEWISE
4.8 FP-82886, REV. A, SPEEDOMAX 100 SERIES AND 100H SERIES RECORDERS
4.9 FP-70262, REV. H, TRANSMITTERS, PRESSURE/DP
4.10 FP-50714, VOL. 10, PT. 3, REV. A, RADWASTE SYSTEMS ADDENDUM
4.11 FP-82146, REV. D, TRIP/CALIBRATION SYSTEMS
4.12 0B21-0077, REV. 2, POWER UPRATED STEAM DOME PRESSURE HIGH (ATWS-RPT) UNCERTAINTY AND SCALING CALC
4.13 1C11-0003, REV. 0, POWER UPRATED ROD WORTH MINIMIZER LOW POWER INTERLOCK UNCERTAINTY AND SCALING CALC
4.14 2C12-0002, REV. 0, POWER UPRATED ROD WORTH MINIMIZER LOW POWER INTERLOCK UNCERTAINTY AND SCALING CALC
4.15 0PIC-PT001, CALIBRATION OF GE TYPE 551 AND 552 PRESSURE TRANSMITTERS, REVISION 30

4.16 0PIC-T/C001, CALIBRATION CHECK OF TYPE T THERMOCOUPLES, REVISION 9
4.17 0PIC-T/C001A, ONE POINT CALIBRATION CHECK OF TEMPERATURE ELEMENTS, REVISION 5
4.18 0PIC-UI002, CALIBRATION OF GE TYPE 180 INDICATOR, REVISION 17
4.19 0PIC-UR001B, LEEDS AND NORTHRUP 2500 SERIES MULTIPOINT RECORDER CALIBRATION, REVISION 11
4.20 0PIC-UR004, CALIBRATION OF TIGRAPH MODEL 200 AND 200A RECORDERS, REVISION 25
4.21 0PIC-UR011D, CALIBRATION OF MOLYTEK 2702C RECORDER 1-C11(2-C12)-TR-R018 AND RTU UNITS, REVISION 7
4.22 0PIC-UR021, CALIBRATION OF LEEDS & NORTHRUP SERIES 100 AND 100H RECORDERS, REVISION 15
4.23 0LP-PT016, DFCS RX PRESS LOOP CALIBRATION, REVISION 0
4.24 1MST-ATWS22R, ATWS REACTOR HIGH PRESSURE RPT AND ARI SCRAM INST CHAN CAL, REVISION 5
4.25 2MST-ATWS22R, ATWS REACTOR HIGH PRESSURE RPT AND ARI SCRAM INST CHAN CAL, REVISION 7
4.26 0PIC-CNV008, CALIBRATION OF GE AND TOSMAC MODEL 550 MV/I TRANSMITTERS, REVISION 19
4.27 SPEC 252-064, THERMAL ELEMENT ASSEMBLIES, REVISION 6
4.28 D-25020, SH. 3A, REACTOR BUILDING PIPING DIAGRAM NUCLEAR STEAM SUPPLY SYSTEM SHEET 3A - UNIT 1, REVISION 36
4.29 D-02520, SH. 3A, REACTOR BUILDING PIPING DIAGRAM NUCLEAR STEAM SUPPLY SYSTEM SHEET 3A - UNIT 2, REVISION 39
4.30 D-25022, SH. 3A, REACTOR BUILDING PIPING DIAGRAM NUCLEAR STEAM SUPPLY SYSTEM SHEET 2A - UNIT 1, REVISION 39
4.31 D-02522, SH. 3A, REACTOR BUILDING PIPING DIAGRAM NUCLEAR STEAM SUPPLY SYSTEM SHEET 2A - UNIT 2, REVISION 43
4.32 D-25048, SHEET 2A REACTOR BUILDING PIPING DIAGRAM REACTOR COOLANT RECIRCULATION SYS. SHEET 2A - UNIT 1,
4.33 D-02548, SHEET 2A REACTOR BUILDING PIPING DIAGRAM REACTOR COOLANT RECIRCULATION SYS. SHEET 2A - UNIT 2,
4.34 D-25027, SHEET 1A, REACTOR BUILDING, PIPING DIAGRAM REACTOR WATER CLEAN-UP SYSTEM SHEET 1A - UNIT 1, REVISION 24
4.35 D-02527, SHEET 1A, REACTOR BUILDING, PIPING DIAGRAM REACTOR WATER CLEAN-UP SYSTEM SHEET 1A - UNIT 2, REVISION 34
4.36 1-FP-50039, SHEET 6, HPCI SYSTEM ELEMENTARY WIRING DIAGRAM, REVISION Q
4.37 2-FP-50039, SHEET 6, HPCI SYSTEM ELEMENTARY WIRING DIAGRAM, REVISION P
4.38 D-25017, SHEET 2A, REACTOR BUILDING, PIPING DIAGRAM, CONTROL ROD DRIVE HYD. SYSTEM SHEET 2A - UNIT 1, REVISION 22
4.39 D-02517, SHEET 2A, REACTOR BUILDING, PIPING DIAGRAM, CONTROL ROD DRIVE HYD. SYSTEM SHEET 2A - UNIT 2, REVISION 26
4.40 F-95085, SHEET 2, CRD-REACTOR VESSEL TEMPERATURE RECORDER PANEL 1-H21-P007 INTERCONNECTION WIRING DIAGRAM, REVISION 2
4.41 F-09585, SHEET 2, U-2 CRD-REACTOR VESSEL TEMPERATURE RECORDER PANEL 2-H21-P007 INTERCONNECTION WIRING DIAGRAM, REVISION 0

5.0 INPUTS & ASSUMPTIONS

5.1 Where the vendor does not specify an uncertainty (such as Drift, Temperature Effect, Power Supply Effect), it is assumed that the vendor specified Reference Accuracy is bounding. This is further validated by a review of historical calibration data. If historical calibration data shows that the instrument is typically found within the As-Left tolerance, this indicates the tolerance bounds any other effects.

5.2 Some of the recorders within the scope of this calculation will eventually be replaced with digital recorders. It is assumed that the uncertainty of the existing analog recorders will bound the uncertainty of the replacement digital recorders. This is reasonable because digital instrumentation is typically more accurate than analog and because the digital recorders will not have a readability error.

5.3 The calibration tolerance for ERFIS Points C32PA100(101) and PPC Point A1693-B016 will be changed from 30 psig to 9 psig. Reference PAR 2002-0092. This tolerance is acceptable because the calibration only consists of the transmitter and the computer points. The 30 psig tolerance was intended for the associated analog indicator which has a 2 percent accuracy.

5.4 The Thermocouples associated with Temperature Loop 5 are all currently calibrated to a tolerance of 9 °F. The Reference Accuracy for these Thermocouples is 4.5 °F. The calibration tolerance for these Thermocouples will be changed to 4.5 °F per PAR 2002-0093. This tolerance is consistent with other Thermocouple applications.

5.5 The calibration tolerance for ERFIS Point G31TA018 is currently 12 °F. This will be changed to 3 °F per PAR 2002-0094. This tolerance is acceptable because the calibration only consists of the thermocouple, converter and the computer point. The 12 °F tolerance was intended for the associated analog indicator which has a 2 percent accuracy.

6.0 CALCULATION OF UNCERTAINTIES

6.1 Calculation of Loop Uncertainties

This calculation is performed on an instrument Loop basis. Each Loop uncertainty is determined by combining the individual Loop instrument uncertainties using the Square Root Sum of the Square Methodology (SRSS). The Total Loop Uncertainty (TLU) is then determined by combining the individual Loop uncertainties using SRSS.

6.1.1 Calculation of Loop Uncertainties for Pressure Loops

6.1.1.1 Process Measurement Error (PME)

For the RCS Pressure Loops, PME consists of density changes in the pressure transmitter sensing lines due to changes in ambient temperature and RCS pressure. PME for pressure transmitters B21-PT-N045A(D) (Loop 5) is addressed in calculation 0B21-0077 for the ATWS-RPT Trip Function. The sensing lines for pressure transmitters C32-PT-N008 (Loop 1&2) and C32-PT-N005A(B) (Loop 3&4) are routed similarly to the N045 loops and the transmitters are mounted at the same elevation. Therefore, the PME for pressure transmitters C32-PT-N008 and C32-PT-N005A(B) will be considered the same as the PME for pressure transmitters B21-PT-N045A(D).

	Instrument	PME (±psig)	REF	Loop PME (±psig)
Loop 1	1(2)-C32-PT-N008	0.5	0B21-0077	0.5
	1(2)-C32-PR-R609	NA	NA	
Loop 2	1(2)-C32-PT-N008	0.5	0B21-0077	0.5
	1(2)-C32PA103	NA	NA	
Loop 3	1(2)-C32-PT-N005A(B)	0.5	0B21-0077	0.5
	1(2)-C32-LC-R602A(B) (DFCS)	NA	NA	
	1(2)-C32-LPR-R608	NA	NA	
Loop 4	1(2)-C32-PT-N005A(B)	0.5	0B21-0077	0.5
	1(2)-C32-LC-R602A(B) (DFCS)	NA	NA	
	1(2)-C32PA100(101) & 1(2)-A1693-B016	NA	NA	
Loop 5	1(2)-B21-PT-N045A(D)	0.5	0B21-0077	0.5
	1(2)-B21-PTM-N045A(D)	NA	NA	
	1(2)-B21-PI-R605A(B)	NA	NA	

6.1.1.2 Primary Element Error (PE)

For the RCS Pressure Loops, the sensing lines are connected to the Reactor Level condensing chambers (CDU). Any uncertainty associated with the CDU will impact the uncertainty of the Pressure Loop. PE for pressure transmitters B21-PT-N045A(D) (Loop 5) is addressed in calculation 0B21-0077 for the ATWS-RPT Trip Function. The CDU for for pressure transmitters C32-PT-N008 (Loop 1&2) and C32-PT-N005A(B) (Loop 3&4) are similar to the N045 loops. Therefore, the PE for pressure transmitters C32-PT-N008 and C32-PT-N005A(B) will be considered the same as the PE for pressure transmitters B21-PT-N045A(D).

	Instrument	PE (±psig)	REF	Loop PE(±psig)
Loop 1	1(2)-C32-PT-N008	0.02	0B21-0077	0.02
	1(2)-C32-PR-R609	NA	NA	
Loop 2	1(2)-C32-PT-N008	0.02	0B21-0077	0.02
	1(2)-C32PA103	NA	NA	
Loop 3	1(2)-C32-PT-N005A(B)	0.02	0B21-0077	0.02
	1(2)-C32-LC-R602A(B) (DFCS)	NA	NA	
	1(2)-C32-LPR-R608	NA	NA	
Loop 4	1(2)-C32-PT-N005A(B)	0.02	0B21-0077	0.02
	1(2)-C32-LC-R602A(B) (DFCS)	NA	NA	
	1(2)-C32PA100(101) & 1(2)-A1693-B016	NA	NA	
Loop 5	1(2)-B21-PT-N045A(D)	0.02	0B21-0077	0.02
	1(2)-B21-PTM-N045A(D)	NA	NA	
	1(2)-B21-PI-R605A(B)	NA	NA	

6.1.1.3 Instrument Span Input

The following instrument spans (SPAN), Upper Range Limit (URL), and Full Scale (FS) data is used in the calculation of Loop Uncertainties.

	Instrument	SPAN (psig)	URL OR FS (psig)	REF
Loop 1	1(2)-C32-PT-N008	300	3000	FP-50714,0PIC-PT001
	1(2)-C32-PR-R609	300	1100	FP-82052, 0PIC-UR004
Loop 2	1(2)-C32-PT-N008	300	3000	FP-50714,0PIC-PT001
	1(2)-C32PA103	300	1100	0PIC-PT001
Loop 3	1(2)-C32-PT-N005A(B)	1500	3000	FP-70262, 0LP-PT016
	1(2)-C32-LC-R602A(B) (DFCS)	1500	1500	0LP-PT016
	1(2)-C32-LPR-R608	1500	1500	0LP-PT016
Loop 4	1(2)-C32-PT-N005A(B)	1500	3000	FP-70262, 0LP-PT016
	1(2)-C32-LC-R602A(B) (DFCS)	1500	1500	0LP-PT016
	1(2)-C32PA100(101) & 1(2)-A1693-B016	1500	1500	0LP-PT016
Loop 5	1(2)-B21-PT-N045A(D)	1500	3000	FP-70262, 1(2)-MST-ATWS22R
	1(2)-B21-PTM-N045A(D)	1500	1500	1(2)-MST-ATWS22R
	1(2)-B21-PI-R605A(B)	1500	1500	1(2)-MST-ATWS22R

6.1.1.4 Reference Accuracy (RA)

Accuracy is normally specified by the vendor. Per EGR-NGGC-0153, RA consists of Linearity, Repeatability, and Hysteresis. Also, per EGR-NGGC-0153, the individual components of RA can be combined using SRSS to determine an overall device RA. For C32-PT-N008, the vendor specifies Accuracy(A) of 0.5%, Hysteresis(H) of 0.1%, and Repeatability(R) of 0.1%. Combining these components by SRSS results in an RA of 0.52% span. Similarly, for B21-PI-R605A(B), the vendor specifies Accuracy(A) of 1.5%, and Repeatability(R) of 2.0%. Combining these components by SRSS results in an RA of 2.5% FS.

	Instrument	RA EQUATION	RA (±psig)	REF	Loop RA (±psig)
Loop 1	1(2)-C32-PT-N008	0.52% SPAN	1.56	FP-50714	5.72
	1(2)-C32-PR-R609	0.50% FS	5.50	FP-82052	
Loop 2	1(2)-C32-PT-N008	0.52% SPAN	1.56	FP-50714	1.56
	1(2)-C32PA103	Negligible	NA	FP-82052	
Loop 3	1(2)-C32-PT-N005A(B)	0.25% SPAN	3.75	FP-70262	8.42
	1(2)-C32-LC-R602A(B) (DFCS)	0.05% SPAN	0.75	1C11-0003, 2C12-0002	
	1(2)-C32-LPR-R608	0.50% SPAN	7.50	FP-82886	
Loop 4	1(2)-C32-PT-N005A(B)	0.25% SPAN	3.75	FP-70262	3.82
	1(2)-C32-LC-R602A(B) (DFCS)	0.05% SPAN	0.75	1C11-0003, 2C12-0002	
	1(2)-C32PA100(101) & 1(2)-A1693-B016	Negligible	NA	FP-82886	
Loop 5	1(2)-B21-PT-N045A(D)	0.25% SPAN	3.75	FP-70262	37.81
	1(2)-B21-PTM-N045A(D)	0.20% SPAN	3.00	FP-82146	
	1(2)-B21-PI-R605A(B)	2.50% FS	37.50	FP-75090, SRSS(A,R)	

6.1.1.5 Drift (DR)

Any applicable Drift is normally specified by the vendor. The calibration interval for DR determination is 30 months (24 + 25%). Where the vendor does not provide a DR specification, it is assumed that any instrument drift is included in the RA for the calibration interval and the DR is specified as "NA". This is consistent with a review of historical calibration data that shows the instruments have performed within the calibration tolerance.

	Instrument	DR EQUATION	DR (±psig)	REF	Loop DR (±psig)
Loop 1	1(2)-C32-PT-N008	NA	NA	FP-50714	NA
	1(2)-C32-PR-R609	NA	NA	FP-82052	
Loop 2	1(2)-C32-PT-N008	NA	NA	FP-50714	NA
	1(2)-C32PA103	NA	NA	NA	
Loop 3	1(2)-C32-PT-N005A(B)	0.20% URL	6.00	FP-70262	6.22
	1(2)-C32-LC-R602A(B) (DFCS)	0.11% SPAN	1.65	FP-84200, 1C11-0003, 2C12-0002	
	1(2)-C32-LPR-R608	NA	NA	FP-82886	
Loop 4	1(2)-C32-PT-N005A(B)	0.20% URL	6.00	FP-70262	6.22
	1(2)-C32-LC-R602A(B) (DFCS)	0.11% SPAN	1.65	FP-84200, 1C11-0003, 2C12-0002	
	1(2)-C32PA100(101) & 1(2)-A1693-B016	NA	NA	FP-82886	
Loop 5	1(2)-B21-PT-N045A(D)	0.20% URL	6.00	FP-70262	6.71
	1(2)-B21-PTM-N045A(D)	0.20% SPAN	3.00	FP-82146	
	1(2)-B21-PI-R605A(B)	NA	NA	FP-75090	

6.1.1.6 Temperature Effect (TE)

Any applicable TE is normally specified by the vendor. There is no vendor TE specification for the instruments located in the Control Room. Therefore, it is assumed that the RA specification bounds any TE over the design temperature range. For the instruments located in the Reactor Building, the TE is calculated based on a temperature change from the calibration temperature. Per DR-227, the design temperature range for the Reactor Building is 40 to 104 °F. However, this maximum temperature range assumes no Reactor Building HVAC. In reality, Reactor Building HVAC maintains temperatures between about 55 and 80°F. Since this calculation is done for expected normal operating conditions, it is reasonable to assume a 25 °F change in Reactor Building temperature for the purposes of TE determination.

Maximum temperature change = 25.00 °F
Vendor specified TE is per 100.00 °F

	Instrument	TE EQUATION	TE (±psig)	REF	Loop TE (±psig)
Loop 1	1(2)-C32-PT-N008	1.00% SPAN	0.75	FP-50714	0.75
	1(2)-C32-PR-R609	NA	NA	FP-82052	
Loop 2	1(2)-C32-PT-N008	1.00% SPAN	0.75	FP-50714	0.75
	1(2)-C32PA103	NA	NA	FP-82052	
Loop 3	1(2)-C32-PT-N005A(B)	0.75% URL	7.50		7.50
		0.50% SPAN		FP-70262	
	1(2)-C32-LC-R602A(B)	NA	NA	FP-84200	
	1(2)-C32-LPR-R608	NA	NA	FP-82886	
Loop 4	1(2)-C32-PT-N005A(B)	0.75% URL	7.50		7.50
		0.50% SPAN		FP-70262	
	1(2)-C32-LC-R602A(B)	NA	NA	FP-84200	
	1(2)-C32PA100(101) & 1(2)-A1693-B016	NA	NA	FP-82886	
Loop 5	1(2)-B21-PT-N045A(D)	0.75% URL	7.50		7.50
		0.50% SPAN		FP-70262	
	1(2)-B21-PTM-N045A(D)	NA	NA	FP-82146	
	1(2)-B21-PI-R605A(B)	NA	NA	FP-75090	

6.1.1.7 Static Pressure Effect (SPE)

SPE is only applicable for DP transmitters. It is not applicable to the absolute pressure transmitters in the scope of this calc.

SPE = ± **N/A**

6.1.1.8 Overpressure Effect (OPE)

Per 2.6.4, this calculation is performed for normal conditions. OPE is not applicable to this calculation.

OPE = ± **N/A**

6.1.1.9 Power Supply Effect (PSE)

Any applicable PSE is normally specified by the vendor. Where there is no vendor PSE specification, it is assumed that the RA specification bounds any PSE over the design voltage range. Where a vendor PSE is applicable, the assumed power supply variation is 4 volts.

Normal Power Supply Variation = 4 Volts

	Instrument	PSE EQUATION	PSE (±psig)	REF	Loop PSE (±psig)
Loop 1	1(2)-C32-PT-N008	0.10% SPAN PER VOLT	0.30	FP-50714	0.30
	1(2)-C32-PR-R609	NA	NA	FP-82052	
Loop 2	1(2)-C32-PT-N008	0.10% SPAN PER VOLT	0.30	FP-50714	0.30
	1(2)-C32PA103	NA	NA	FP-82052	
Loop 3	1(2)-C32-PT-N005A(B)	0.005% SPAN PER VOLT	0.30	FP-70262	0.30
	1(2)-C32-LC-R602A(B) (DFCS)	NA	NA	FP-84200	
	1(2)-C32-LPR-R608	NA	NA	FP-82886	
Loop 4	1(2)-C32-PT-N005A(B)	0.005% SPAN PER VOLT	0.30	FP-70262	0.30
	1(2)-C32-LC-R602A(B) (DFCS)	NA	NA	FP-84200	
	1(2)-C32PA100(101) & 1(2)-A1693-B016	NA	NA	FP-82886	
Loop 5	1(2)-B21-PT-N045A(D)	0.005% SPAN PER VOLT	0.30	FP-70262	0.30
	1(2)-B21-PTM-N045A(D)	NA	NA	FP-82146	
	1(2)-B21-PI-R605A(B)	NA	NA	FP-75090	

6.1.1.10 Readability (RE)

Readability is only applicable to the recorders and indicators. Per EGR-NGGC-0153, RE for analog indicators should be one-half or one-quarter the smallest scale demarcation. Based on walkdown of these instruments, one-quarter RE is considered reasonable. RE for digital indicators is equal to the least significant digit. Since these digital indicators read out to the first or second decimal, RE is considered negligible.

	Instrument	Smallest Scale Demarcation	RE Factor	INDICATOR RE (±psig)	REF
Loop 1	1(2)-C32-PT-N008	NA	NA	NA. Digital Readout.	EGR-NGGC-0153
	1(2)-C32-PR-R609	NA	NA		
Loop 2	1(2)-C32-PT-N008	NA	NA	NA. Digital Readout.	EGR-NGGC-0153
	1(2)-C32PA103	NA	NA		
Loop 3	1(2)-C32-PT-N005A(B)	NA	NA	5.00	EGR-NGGC-0153
	1(2)-C32-LC-R602A(B) (DFCS)	NA	NA		
	1(2)-C32-LPR-R608	20	0.25		
Loop 4	1(2)-C32-PT-N005A(B)	NA	NA	NA. Digital Readout.	EGR-NGGC-0153
	1(2)-C32-LC-R602A(B) (DFCS)	NA	NA		
	1(2)-C32PA100(101) & 1(2)-A1693-B016	NA	NA		
Loop 5	1(2)-B21-PT-N045A(D)	NA	NA	12.50	EGR-NGGC-0153
	1(2)-B21-PTM-N045A(D)	NA	NA		
	1(2)-B21-PI-R605A(B)	50	0.25		

6.1.1.11 Calibration Tolerance (CAL)

The calibration for Loops 2, 3, 4 and 5 are done as a Loop CAL and the Loop tolerance is specified in the reference on the recorder or indicator output. For Loop 1 the calibration is done on the individual components only. The Cal tolerance for C32-PT-N008 is 0.2 MADC. This is converted to psig as follows ($CAL_{MADC}/SPAN_{MADC}$) = ($CAL_{PSIG}/SPAN_{PSIG}$).

CAL_{MADC}	0.20
$SPAN_{MADC}$	40.00
$SPAN_{PSIG}$	300.00
CAL_{PSIG}	1.50

	Instrument	CAL (±psig)	REF	Loop CAL (±psig)
Loop 1	1(2)-C32-PT-N008	1.50	0PIC-PT001	2.50
	1(2)-C32-PR-R609	2.00	0PIC-UR004	
Loop 2	1(2)-C32-PT-N008	6.00	0PIC-PT001	6.00
	1(2)-C32PA103			
Loop 3	1(2)-C32-PT-N005A(B)	30.00	0LP-PT016	30.00
	1(2)-C32-LC-R602A(B) (DFCS)			
	1(2)-C32-LPR-R608			
Loop 4	1(2)-C32-PT-N005A(B)	9.00	0LP-PT016 and 5.3	9.00
	1(2)-C32-LC-R602A(B) (DFCS)			
	1(2)-C32PA100(101) & 1(2)-A1693-B016			
Loop 5	1(2)-B21-PT-N045A(D)	30.00	1(2)-MST-ATWS22R	30.00
	1(2)-B21-PTM-N045A(D)			
	1(2)-B21-PI-R605A(B)			

6.1.1.12 Measuring and Test Equipment (MTE)

MTE information was obtained from the BNP MTE Lab.

C32-PT-N008 is calibrated using a 0-1500 psig Heise on the input and a Philips PM2525 on the output. The accuracy of the Heise is 0.12% range and the accuracy of the PM2525 on the 100 mADC range is ± 0.1% of reading and ± 0.05% of range. Conservatively combining these errors gives an overall PM2525 accuracy of ± 0.15% range or ± 0.15 MADC. Based on a 40 MADC / 300 psig span for this Loop, the PM2525 MTE is ± (0.15 MADC/40 MADC) *(300 PSIG) = ± 1.13 psig.

C32-PR-R609 is calibrated using a Tigraph 200/200A test fixture. There is no assigned accuracy for this device and calibration is not required. The assumed accuracy is ± 0.25% SPAN based on a ± 0.5% SPAN accuracy for the associated recorder. Therefore, the Tigraph 200/200A Test Fixture MTE is ±0.25%*(300 psig) =± 0.75 psig.

For Loops 3, 4, and 5, the entire Loop is calibrated using a 0-2000 psig Heise on the input. Accuracy is 0.12% range.

	Instrument	MTE EQUATION	MTE (±psig)	REF	Loop MTE (±psig)
Loop 1	1(2)-C32-PT-N008	0.15% Range	1.13	0PIC-PT001	1.36
	1(2)-C32-PR-R609	0.25% Span	0.75	0PIC-UR004	
Loop 2	1(2)-C32-PT-N008	0.15% Range	1.13	0PIC-PT001	1.13
	1(2)-C32PA103				
Loop 3	1(2)-C32-PT-N005A(B)	0.120% Range	2.40	0LP-PT016	2.40
	1(2)-C32-LC-R602A(B) (DFCS)				
	1(2)-C32-LPR-R608				
Loop 4	1(2)-C32-PT-N005A(B)	0.120% Range	2.40	0LP-PT016	2.40
	1(2)-C32-LC-R602A(B) (DFCS)				
	1(2)-C32PA100(101) & 1(2)-A1693-B016				
Loop 5	1(2)-B21-PT-N045A(D)	0.120% Range	2.40	1(2)-MST-ATWS22R	2.40
	1(2)-B21-PTM-N045A(D)				
	1(2)-B21-PI-R605A(B)				

6.1.1.13 Total Loop Uncertainty (TLU) for Pressure Loops

$$TLU = (RA^2 + DR^2 + TE^2 + SPE^2 + OPE^2 + PSE^2 + RE^2 + Cal^2 + MTE^2)^{1/2}$$

	TLU (±psig)
Loop 1	6.46
Loop 2	6.37
Loop 3	32.26
Loop 4	14.02
Loop 5	50.92

6.1.2 Calculation of Loop Uncertainties for Temperature Loops

6.1.2.1 Process Measurement Error (PME)

PME is not applicable to Temperature Loops.

6.1.2.2 Primary Element Error (PE)

The primary element in the temperature loop is the TE. There are no additional PE errors.

6.1.2.3 Instrument Span Input

Span for all Temperature Loops = 600 °F

6.1.2.4 Reference Accuracy (RA)

Accuracy is normally specified by the vendor. RA consists of Linearity, Repeatability, and Hysteresis. Also, per EGR-NGGC-0153, the individual components of RA can be combined using SRSS to determine an overall device RA. For B32-TY-K640A(B) and G31-TY-K601, the vendor specifies Accuracy(A) of 0.25%, Repeatability(R) of 0.1%, and Linearity of 0.1%. Combining these components by SRSS results in a RA of 0.29% span. Specification 252-064 provides an accuracy requirement of 0.4% for Type T Thermocouples. This Spec references ANSI C96.1 for Thermocouple requirements. Per ANSI C96.1, 0.4% is the requirement for Special applications. The ANSI spec for standard applications is 0.75%. Therefore, to ensure this calc bounds standard type TC's an accuracy of ±0.75% span will be evaluated.

	Instrument	RA EQUATION	RA (±°F)	REF	Loop RA (±°F)
Loop 1	1(2)-B32-TE-N035A(B)	0.75% SPAN	4.50	SPEC 252-064, ANSI C96.1	5.68
	1(2)-B32-TY-K640A(B)	0.29% SPAN	1.74	FP-7396, SRSS(A,R,L)	
	1(2)-B32-TR-R650	0.50% SPAN	3.00	FP-82886	
Loop 2	1(2)-E11-TE-N004A(B)	0.75% SPAN	4.50	SPEC 252-064, ANSI C96.1	4.66
	1-E11-TE-N027A	0.75% SPAN	4.50	SPEC 252-064, ANSI C96.1	
	1-E11-TE-N027B	0.75% SPAN	4.50	SPEC 252-064, ANSI C96.1	
	2-E11-TE-N027A(B)	0.75% SPAN	4.50	SPEC 252-064, ANSI C96.1	
	1(2)-E41-TR-R605	0.20% SPAN	1.20	FP-81309	
Loop 3	1(2)-G31-TE-N042	0.75% SPAN	4.50	SPEC 252-064	12.93
	1(2)-G31-TY-K601	0.29% SPAN	1.74	FP-7396, SRSS(A,R,L)	
	1(2)-G31-TI-R607	2.00% SPAN	12.00	FP-82021	
Loop 4	1(2)-G31-TE-N042	0.75% SPAN	4.50	SPEC 252-064	4.82
	1(2)-G31-TY-K601	0.29% SPAN	1.74	FP-7396, SRSS(A,R,L)	
	1(2)-G31TA018	NEGLIGIBLE	NA	FP-82021	
Loop 5	1(2)-B21-TE-N028A1	0.75% SPAN	4.50	SPEC 252-064, ANSI C96.1	5.41
	1(2)-B21-TE-N028B1	0.75% SPAN	4.50	SPEC 252-064, ANSI C96.1	
	1-B21-TE-N030L3, 2-B21-TE-N030L2	0.75% SPAN	4.50	SPEC 252-064, ANSI C96.1	
	1(2)-B21-TE-N050A2	0.75% SPAN	4.50	SPEC 252-064, ANSI C96.1	
	1(2)-G31-TE-N042	0.75% SPAN	4.50	SPEC 252-064, ANSI C96.1	
	1(2)-B21-TE-N030B2	0.75% SPAN	4.50	SPEC 252-064, ANSI C96.1	
	1(2)-B21-TE-N030B3	0.75% SPAN	4.50	SPEC 252-064, ANSI C96.1	
	1(2)-B21-TE-N050A3	0.75% SPAN	4.50	SPEC 252-064, ANSI C96.1	
	1-C11-TR-R018, 2-C12-TR-R018	0.50% SPAN	3.00	FP-83860	
Loop 6	1(2)-G31-TE-N030B2(B3)	0.75% SPAN	4.50	SPEC 252-064	4.50
	1(2)B21TA117(118)	NEGLIGIBLE	NA	NA	

6.1.2.5 Drift (DR)

No DR specifications are provided for the temperature loops. Based on historical performance, these instruments have demonstrated that they maintain within CAL tolerance for the calibration interval. Therefore, it is assumed that the CAL tolerance bounds any instrument drift.

6.1.2.6 Temperature Effect (TE)

No TE specifications are provided for the temperature loops. Based on historical performance, these instruments have demonstrated that they maintain within CAL tolerance for the calibration interval. Therefore, it is assumed that the CAL tolerance bounds any instrument TE.

6.1.2.7 Static Pressure Effect (SPE)

SPE is not applicable to temperature loops.

6.1.2.8 Overpressure Effect (OPE)

OPE is not applicable to temperature loops.

6.1.2.9 Power Supply Effect (PSE)

No PSE specifications are provided for the temperature loops. Therefore, it is assumed that the RA bounds any instrument PSE.

6.1.2.10 Readability (RE)

Readability is only applicable to the recorders and indicators. Per EGR-NGGC-0153, RE for analog indicators should be one-half or one-quarter the smallest scale demarcation. Based on walkdown of these instruments, one-quarter RE is considered reasonable. RE for digital indicators is equal to the least significant digit. Since these digital indicators read out to the first or second decimal, RE is considered negligible.

	Instrument	Smallest Scale Demarcation	RE Factor	Loop RE (±°F)	REF
Loop 1	1(2)-B32-TE-N035A(B)	NA	NA	2.50	EGR-NGGC-0153
	1(2)-B32-TY-K640A(B)	NA	NA		
	1(2)-B32-TR-R650	10	0.25		
Loop 2	1(2)-E11-TE-N004A(B)	NA	NA	1.25	EGR-NGGC-0153
	1-E11-TE-N027A	NA	NA		
	1-E11-TE-N027B	NA	NA		
	2-E11-TE-N027A(B)	NA	NA		
	1(2)-E41-TR-R605	5	0.25		
Loop 3	1(2)-G31-TE-N042	NA	NA	2.50	EGR-NGGC-0153
	1(2)-G31-TY-K601	NA	NA		
	1(2)-G31-TI-R607	10	0.25		
Loop 4	1(2)-G31-TE-N042	NA	NA	NA	EGR-NGGC-0153
	1(2)-G31-TY-K601	NA	NA		
	1(2)-G31TA018	NA. DIGITAL.	NA		
Loop 5	1(2)-B21-TE-N028A1	NA	NA	NA	EGR-NGGC-0153
	1(2)-B21-TE-N028B1	NA	NA		
	1-B21-TE-N030L3, 2-B21-TE-N030L2	NA	NA		
	1(2)-B21-TE-N050A2	NA	NA		
	1(2)-G31-TE-N042	NA	NA		
	1(2)-B21-TE-N030B2	NA	NA		
	1(2)-B21-TE-N030B3	NA	NA		
	1(2)-B21-TE-N050A3	NA	NA		
	1-C11-TR-R018, 2-C12-TR-R018	NA. DIGITAL.	NA		
Loop 6	1(2)-G31-TE-N030B2(B3)	NA		NA	EGR-NGGC-0153
	1(2)B21TA117(118)	NA. DIGITAL.			

6.1.2.11 Calibration Tolerance (CAL)

0PIC-T/C001 USES 0.75% as CAL tolerance. 0PIC-T/C001A uses 1.5% (2*0.75%) as CAL Tolerance. The 0PIC-T/C001a tolerance will be revised to 0.75%.

	Instrument	CAL EQUATION	CAL (±°F)	REF	Loop CAL (±°F)
Loop 1	1(2)-B32-TE-N035A(B)	0.75% SPAN	4.50	0PIC-T/C001A and 5.4	5.61
	1(2)-B32-TY-K640A(B)	(0.1MADC/40MADC)*(600°F)	1.50	0PIC-CNV008	
	1(2)-B32-TR-R650	NA	3.00	0PIC-UR021 and EDB	
Loop 2	1(2)-E11-TE-N004A(B)	0.75% SPAN	4.50	0PIC-T/C001A and 5.4	5.10
	1-E11-TE-N027A	0.75% SPAN	4.50	0PIC-T/C001A and 5.4	
	1-E11-TE-N027B	0.75% SPAN	4.50	0PIC-T/C001A and 5.4	
	2-E11-TE-N027A(B)	0.75% SPAN	4.50	0PIC-T/C001A and 5.4	
	1(2)-E41-TR-R605	NA	2.40	0PIC-UR001B	
Loop 3	1(2)-G31-TE-N042	0.75% SPAN	4.50	0PIC-T/C001A and 5.4	12.90
	1(2)-G31-TY-K601	(0.1MADC/40MADC)*(600°F)	1.50	0PIC-CNV008	
	1(2)-G31-TI-R607	NA	12.00	0PIC-UI002	
Loop 4	1(2)-G31-TE-N042	0.75% SPAN	4.50	0PIC-T/C001A and 5.4	5.41
	1(2)-G31-TY-K601	LOOP CAL	3.00	0SPP-ERF002 and 5.5	
	1(2)-G31TA018				
Loop 5	1(2)-B21-TE-N028A1	0.75% SPAN	4.50	0PIC-T/C001A and 5.4	7.50
	1(2)-B21-TE-N028B1	0.75% SPAN	4.50	0PIC-T/C001A and 5.4	
	1-B21-TE-N030L3, 2-B21-	0.75% SPAN	4.50	0PIC-T/C001A and 5.4	
	1(2)-B21-TE-N050A2	0.75% SPAN	4.50	0PIC-T/C001A and 5.4	
	1(2)-G31-TE-N042	0.75% SPAN	4.50	0PIC-T/C001A and 5.4	
	1(2)-B21-TE-N030B2	0.75% SPAN	4.50	0PIC-T/C001A and 5.4	
	1(2)-B21-TE-N030B3	0.75% SPAN	4.50	0PIC-T/C001A and 5.4	
	1(2)-B21-TE-N050A3	0.75% SPAN	4.50	0PIC-T/C001A and 5.4	
	1-C11-TR-R018, 2-C12-TR-R018	NA	6.00	0PIC-UR011D	
Loop 6	1(2)-G31-TE-N030B2(B3)	0.75% SPAN	4.50	0PIC-T/C001A and 5.4	4.50
	1(2)B21TA117(118)	NA	NA		

6.1.2.12 Measuring and Test Equipment (MTE)

MTE information was obtained from the BNP MTE Lab.

Recorders E41-TR-R605, C11(C12)-TR-R018 and Thermocouples are calibrated using a Versacal and a Type T test thermocouple. The accuracy of the

Converters B32-TY-K640A(B) and G31-TY-K601 are calibrated with a Versacal and test TC input and a Philips PM2525 on the output. MTE for the Versacal and Test TC are described above. MTE for the PM2525 per 0.15 MADC per 6.1.1.12. Based on a 40 MADC / 600 °F span for this Loop, the PM2525 MTE is ± (0.15 MADC/40 MADC) *(600 °F) = ± 2.25 °F. The overall MTE is SRSS(1°F, 2°F, 2.25 °F) = 3.17 °F.

Recorder B32-TR-R650 is calibrated with an L&N Test Fixture. There is no assigned accuracy for this device and calibration is not required. The assumed accuracy is ± 0.25% SPAN based on a ± 0.5% SPAN accuracy for the associated recorder. Therefore, the L&N Test Fixture MTE is ±0.25%*(600 °F) =± 1.50 °F.

G31-TI-R607 and B21TA117(118) are calibrated using a Ronan X85. The accuracy of the Ronan X85 on the 0-60 mADC range is ±0.04% of range ±0.025% of reading. Conservatively combining these errors, the overall MTE for the X85 is ±0.065% range. Therefore, MTE for the X85 is ±0.065%(60 MADC) = ±0.039 MADC. Based on a 40 MADC / 600 °F span, the X85 MTE is (0.039/40)*600 = ±0.59 °F.

	Instrument	MTE (±°F)	REF	Loop MTE (±°F)
Loop 1	1(2)-B32-TE-N035A(B)	2.24	Verscal, Test TC	4.16
	1(2)-B32-TY-K640A(B)	3.17	Philips PM2525, Versacal, Test TC	
	1(2)-B32-TR-R650	1.50	L&N Test Fixture	
Loop 2	1(2)-E11-TE-N004A(B)	2.24	Verscal, Test TC	3.17
	1-E11-TE-N027A	2.24	Verscal, Test TC	
	1-E11-TE-N027B	2.24	Verscal, Test TC	
	2-E11-TE-N027A(B)	2.24	Verscal, Test TC	
	1(2)-E41-TR-R605	2.24	Versacal, Test TC	
Loop 3	1(2)-G31-TE-N042	2.24	Verscal, Test TC	3.22
	1(2)-G31-TY-K601	2.24	Philips PM2525, Versacal, Test TC	
	1(2)-G31-TI-R607	0.59	Ronan	
Loop 4	1(2)-G31-TE-N042	2.24	Verscal, Test TC	3.17
	1(2)-G31-TY-K601	2.24	Versacal, Test TC	
	1(2)-G31TA018			
Loop 5	1(2)-B21-TE-N028A1	2.24	Verscal, Test TC	3.17
	1(2)-B21-TE-N028B1	2.24	Verscal, Test TC	
	1-B21-TE-N030L3, 2-B21-TE-N030L2	2.24	Verscal, Test TC	
	1(2)-B21-TE-N050A2	2.24	Verscal, Test TC	
	1(2)-G31-TE-N042	2.24	Verscal, Test TC	
	1(2)-B21-TE-N030B2	2.24	Verscal, Test TC	
	1(2)-B21-TE-N030B3	2.24	Verscal, Test TC	
	1(2)-B21-TE-N050A3	2.24	Verscal, Test TC	
	1-C11-TR-R018, 2-C12-TR-R018	2.24	Versacal, Test TC	
Loop 6	1(2)-G31-TE-N030B2(B3)	2.24	Verscal, Test TC	2.32
	1(2)B21TA117(118)	0.59	Ronan	

6.1.2.13 Total Loop Uncertainty (TLU) for Temperature Loops

$$TLU = (RA^2 + DR^2 + TE^2 + SPE^2 + OPE^2 + PSE^2 + RE^2 + Cal^2 + MTE^2)^{1/2}$$

	TLU (±°F)
Loop 1	9.35
Loop 2	7.70
Loop 3	18.72
Loop 4	7.91
Loop 5	9.77
Loop 6	6.77

7.0 RESULTS

Total Loop Uncertainty (TLU) for all Loops

PRESSURE	Instrument	TLU (±psig)
Loop 1	1(2)-C32-PT-N008	6.46
	1(2)-C32-PR-R609	
Loop 2	1(2)-C32-PT-N008	6.37
	1(2)-C32PA103	
Loop 3	1(2)-C32-PT-N005A(B)	32.26
	1(2)-C32-LC-R602A(B) (DFCS)	
	1(2)-C32-LPR-R608	
Loop 4	1(2)-C32-PT-N005A(B)	14.02
	1(2)-C32-LC-R602A(B) (DFCS)	
	1(2)-C32PA100(101) & 1(2)-A1693-B016	
Loop 5	1(2)-B21-PT-N045A(D)	50.92
	1(2)-B21-PTM-N045A(D)	
	1(2)-B21-PI-R605A(B)	

TEMPERATURE	Instrument	TLU (±°F)
Loop 1	1(2)-B32-TE-N035A(B)	9.35
	1(2)-B32-TY-K640A(B)	
	1(2)-B32-TR-R650	
Loop 2	1(2)-E11-TE-N004A(B)	7.70
	1-E11-TE-N027A	
	1-E11-TE-N027B	
	2-E11-TE-N027A(B)	
	1(2)-E41-TR-R605	
Loop 3	1(2)-G31-TE-N042	18.72
	1(2)-G31-TY-K601	
	1(2)-G31-TI-R607	
Loop 4	1(2)-G31-TE-N042	7.91
	1(2)-G31-TY-K601	
	1(2)-G31TA018	
Loop 5	1(2)-B21-TE-N028A1	9.77
	1(2)-B21-TE-N028B1	
	1-B21-TE-N030L3, 2-B21-TE-N030L2	
	1(2)-B21-TE-N050A2	
	1(2)-G31-TE-N042	
	1(2)-B21-TE-N030B2	
	1(2)-B21-TE-N030B3	
	1(2)-B21-TE-N050A3	
	1-C11-TR-R018, 2-C12-TR-R018	
Loop 6	1(2)-G31-TE-N030B2(B3)	6.77
	1(2)B21TA117(118)	

ENCLOSURE 5

BRUNSWICK STEAM ELECTRIC PLANT, UNIT NOS. 1 AND 2
DOCKET NOS. 50-325 AND 50-324/LICENSE NOS. DPR-71 AND DPR-62
REQUEST FOR LICENSE AMENDMENTS TO REVISE TECHNICAL SPECIFICATION
PRESSURE-TEMPERATURE LIMITS CURVES

10 CFR 50.92 Evaluation

Carolina Power & Light (CP&L) Company is requesting a change to the Brunswick Steam Electric Plant (BSEP), Unit Nos. 1 and 2 Technical Specifications (TS) to revise the reactor coolant system pressure-temperature limit curves for operation to 32 effective full power years (EFPY). CP&L has determined that these proposed changes do not involve a Significant Hazards Consideration. In support of this determination, an evaluation of each of the three (3) standards set forth in 10 CFR 50.92 is provided below.

1. The proposed license amendments do not involve a significant increase in the probability or consequences of an accident previously evaluated.

   Development of the revised BSEP, Unit 1 and 2 pressure-temperature limits was performed using the approved fracture toughness methodologies of 10 CFR 50, Appendix G; the American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code, Section XI, Appendix G; and ASME Code Case N-640, "Alternative Reference Fracture Toughness for Development of P-T Limit Curves for ASME Section XI, Division 1." The revised pressure-temperature limits were also developed using NRC Regulatory Guide 1.190, "Calculational and Dosimetry Methods for Determining Pressure Vessel Neutron Fluence," March 2001, for evaluating neutron fluence and NRC Regulatory Guide 1.99, Revision 2, "Radiation Embrittlement of Reactor Vessel Materials," for evaluating predicted irradiation effects on vessel beltline materials. Use of these methods provides compliance with the intent of 10 CFR 50, Appendix G, and provides adequate protection against nonductile-type fractures of the reactor pressure vessel. Therefore, the probability of occurrence of a previously analyzed event is not significantly increased.

   The consequences of a previously evaluated accident are dependent on the initial conditions assumed for the analysis, the behavior of the fuel during the accident, the availability and successful functioning of the equipment assumed to operate in response to the accident, and the setpoints at which these actions are initiated. The proposed revisions do not impact the source term or pathways assumed in accidents previously evaluated. No analysis assumptions are violated, and there are no adverse effects on the factors contributing to offsite and onsite dose. The proposed changes to the pressure-

temperature limits curves do not affect the performance of any equipment used to mitigate the consequences of a previously evaluated accident. Also, the proposed changes do not affect setpoints that initiate protective or mitigative actions. Based on the above, the proposed changes to the pressure-temperature limits curves do not significantly increase the consequences of a previously evaluated accident.

2. The proposed license amendments will not create the possibility of a new or different kind of accident from any accident previously evaluated.

   The changes extend the pressure-temperature limits for use up to 32 EFPY of operation while providing adequate protection against a nonductile-type fracture of the reactor pressure vessel. Creation of the possibility of a new or different kind of accident would require the creation of one or more new precursors of that accident. New accident precursors may be created by modifications of the plant configuration, including changes in allowable modes of operation. This proposed license amendment does not involve any facility modifications, and plant equipment will not be operated in a different manner. Also, no new initiating events or transients result from the pressure-temperature limits curves changes. As a result, no new failure modes are being introduced. Therefore, the proposed changes to the pressure-temperature limits curves will not create the possibility of a new or different kind of accident from any accident previously evaluated.

3. The proposed license amendments do not involve a significant reduction in a margin of safety.

   The margin of safety is established through the design of the plant structures, systems, and components; through the parameters within which the plant is operated; through the establishment of setpoints for actuation of equipment relied upon to respond to an event; and through margins contained within the safety analyses. The proposed changes to the pressure-temperature limit curves do not adversely impact the performance of plant structures, systems, components, and setpoints relied upon to respond to mitigate an accident. The revised pressure-temperature limits were developed using the approved fracture toughness methodologies of 10 CFR 50, Appendix G; the American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code, Section XI, Appendix G; and ASME Code Case N-640, "Alternative Reference Fracture Toughness for Development of P-T Limit Curves for ASME Section XI, Division 1." The proposed changes are acceptable because the ASME guidance maintains the relative margin of safety commensurate with that which existed at the time that the ASME Boiler and Pressure Vessel Code, Section XI, Appendix G, was approved in 1974. In addition, the revised pressure-temperature limits were also developed using NRC Regulatory Guide 1.190, "Calculational and Dosimetry Methods for Determining Pressure Vessel Neutron Fluence," March 2001, for evaluating neutron fluence and NRC Regulatory Guide 1.99, Revision 2, "Radiation Embrittlement of Reactor Vessel Materials" for evaluating predicted irradiation effects on vessel beltline materials. Use of these methods

has provided revised pressure-temperature limit curves that will ensure that the reactor pressure vessel materials continue to behave in a non-brittle manner, thereby preserving the original safety design bases No plant safety limits, setpoints, or design parameters are adversely affected by the proposed changes to the pressure-temperature limit curves. Therefore, the proposed changes do not involve a significant reduction in a margin of safety.

ENCLOSURE 6

BRUNSWICK STEAM ELECTRIC PLANT, UNIT NOS. 1 AND 2
DOCKET NOS. 50-325 AND 50-324/LICENSE NOS. DPR-71 AND DPR-62
REQUEST FOR LICENSE AMENDMENTS TO REVISE TECHNICAL SPECIFICATION
PRESSURE-TEMPERATURE LIMITS CURVES

Environmental Considerations

Carolina Power & Light (CP&L) Company has concluded that the proposed license amendments revising the reactor coolant system pressure-temperature (P-T) limit curves contained in Specification 3.4.9 are eligible for categorical exclusion from performing an environmental assessment. In support of this determination, an evaluation of each of the three (3) criteria set forth in 10 CFR 51.22(c)(9) is provided below.

1. The proposed P-T limit curve changes do not involve a Significant Hazards Consideration, as shown in Enclosure 5.

2. The proposed changes do not result in a significant change in the types or a significant increase in the amounts of any effluent that may be released offsite. The proposed changes do not introduce any new equipment nor require any existing equipment or systems to perform a different type of function than they are presently designed to perform. The proposed changes do not alter the function of existing equipment and will ensure that the consequences of any previously evaluated accident do not increase. Therefore, CP&L has concluded that there will not be a significant increase in the types or amounts of any effluent that may be released offsite and, as such, the changes do not involve irreversible environmental consequences beyond those already associated with normal operation.

3. Use of the methods in NRC Regulatory Guide 1.190, "Calculational and Dosimetry Methods for Determining Pressure Vessel Neutron Fluence," March 2001, for evaluating neutron fluence and NRC Regulatory Guide 1.99, Revision 2, "Radiation Embrittlement of Reactor Vessel Materials" for evaluating predicted irradiation effects on vessel beltline materials provides compliance with the intent of 10 CFR 50, Appendix G, and will ensure the integrity of the reactor pressure vessel is maintained during normal operation and anticipated operational occurrences. Therefore, the proposed P-T limit curves changes do not result in an increase in individual or cumulative occupational radiation exposure.

ENCLOSURE 7

BRUNSWICK STEAM ELECTRIC PLANT, UNIT NOS. 1 AND 2
DOCKET NOS. 50-325 AND 50-324/LICENSE NOS. DPR-71 AND DPR-62
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Page Change Instructions

UNIT 1	
Removed page	Inserted page
3.4-21	3.4-21
3.4-23	3.4-23
3.4-24	3.4-24
3.4-25	3.4-25
3.4-26	3.4-26
---	3.4-27
---	3.4-28

UNIT 2	
Removed page	Inserted page
3.4-21	3.4-21
3.4-23	3.4-23
3.4-24	3.4-24
3.4-25	3.4-25
3.4-26	3.4-26
---	3.4-27
---	3.4-28

ENCLOSURE 8

BRUNSWICK STEAM ELECTRIC PLANT, UNIT NOS. 1 AND 2
DOCKET NOS. 50-325 AND 50-324/LICENSE NOS. DPR-71 AND DPR-62
REQUEST FOR LICENSE AMENDMENTS TO REVISE TECHNICAL SPECIFICATION
PRESSURE-TEMPERATURE LIMITS CURVES

Typed Technical Specification Pages - Unit 1

SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE		FREQUENCY
SR 3.4.9.2	----------NOTE---------- Only required to be performed during RCS inservice leak and hydrostatic testing. ---------- Verify: a. RCS pressure and RCS temperature are within the applicable limits specified in Figure 3.4.9-3, 3.4.9-4, or 3.4.9-5, as applicable b. RCS heatup and cooldown rates are ≤ 30°F in any 1 hour period.	30 minutes
SR 3.4.9.3	Verify RCS pressure and RCS temperature are within the criticality limits specified in Figure 3.4.9-2.	Once within 15 minutes prior to control rod withdrawal for the purpose of achieving criticality
SR 3.4.9.4	----------NOTE---------- Only required to be met in MODES 1, 2, 3, and 4 during recirculation pump start. ---------- Verify the difference between the bottom head coolant temperature and the reactor pressure vessel (RPV) coolant temperature is ≤ 145°F.	Once within 30 minutes prior to each startup of a recirculation pump

(continued)

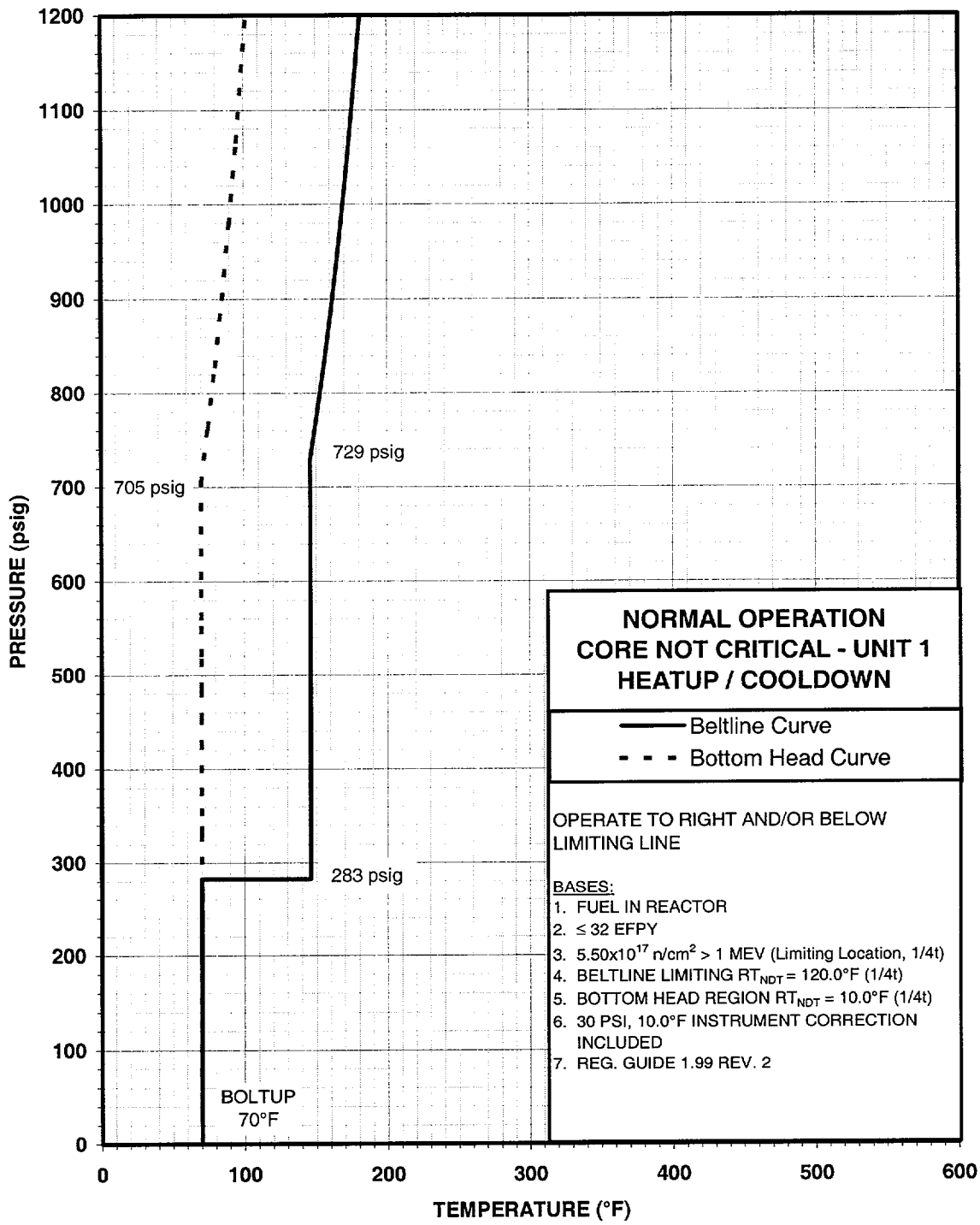

Figure 3.4.9-1 (page 1 of 1)
RCS Pressure and Temperature Limits
Normal Operation with Core Not Critical

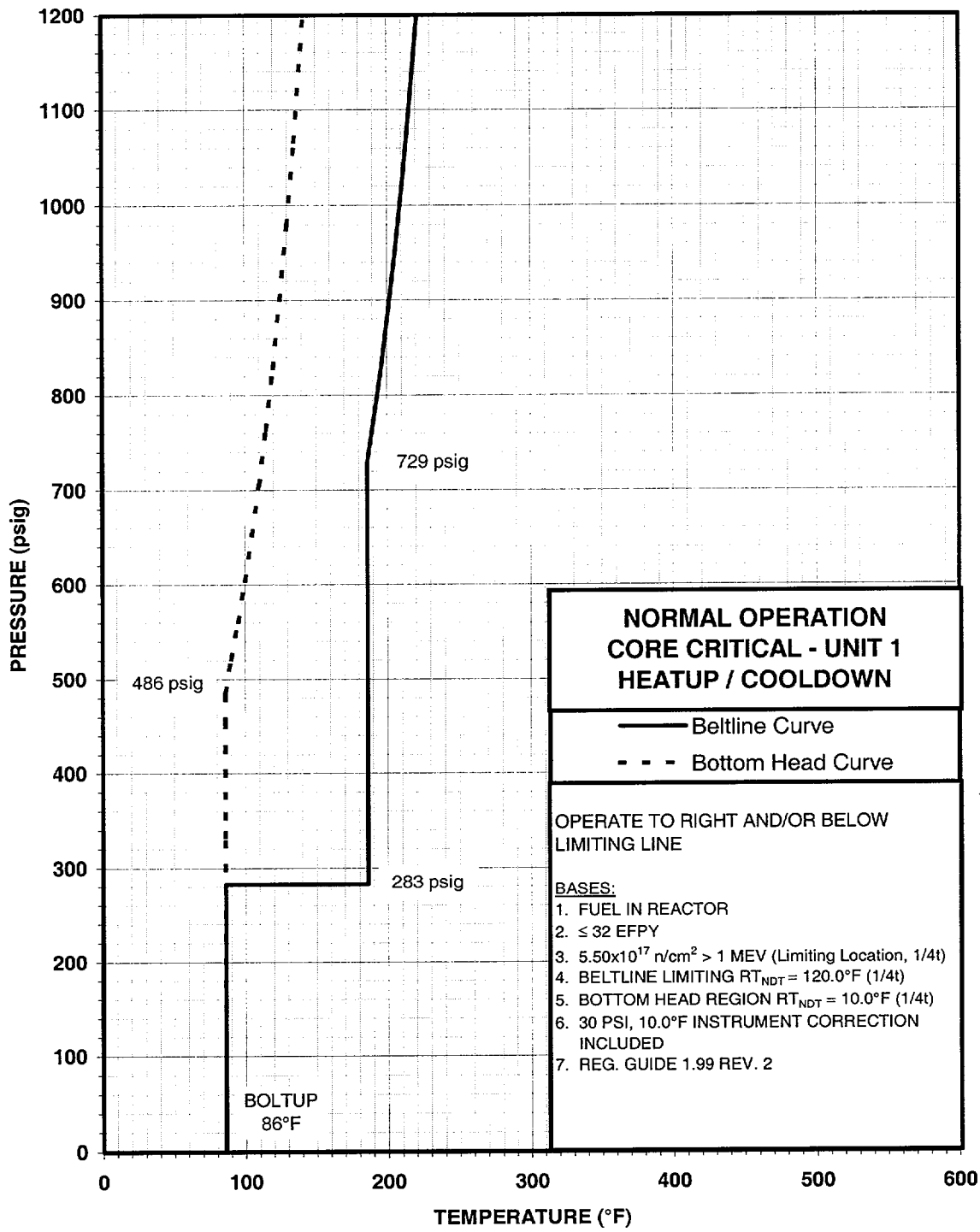

Figure 3.4.9-2 (page 1 of 1)
RCS Pressure and Temperature Limits
Normal Operation with Core Critical

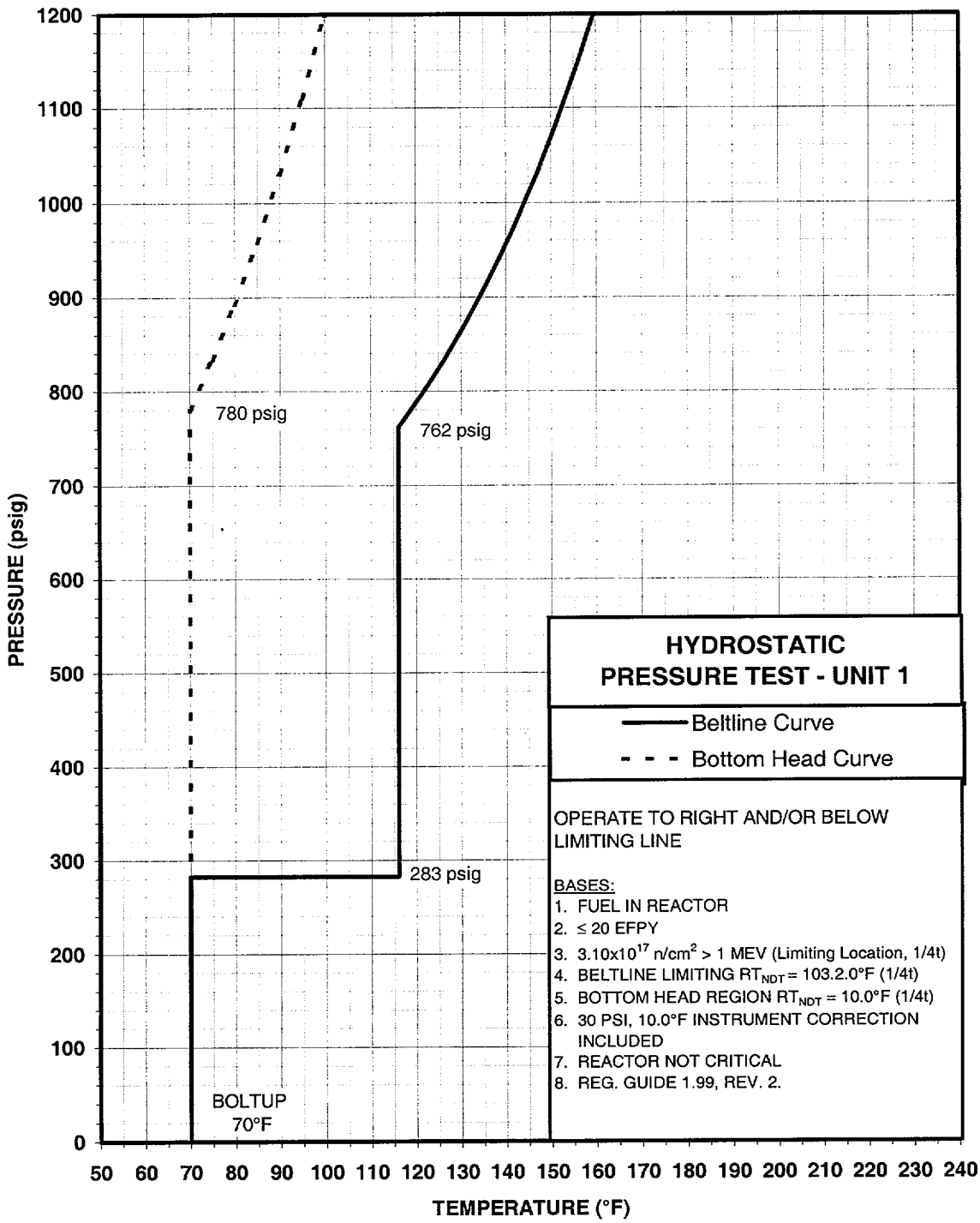

Figure 3.4.9-3 (page 1 of 1)
RCS Pressure and Temperature Limits
Hydrostatic and Leak Tests

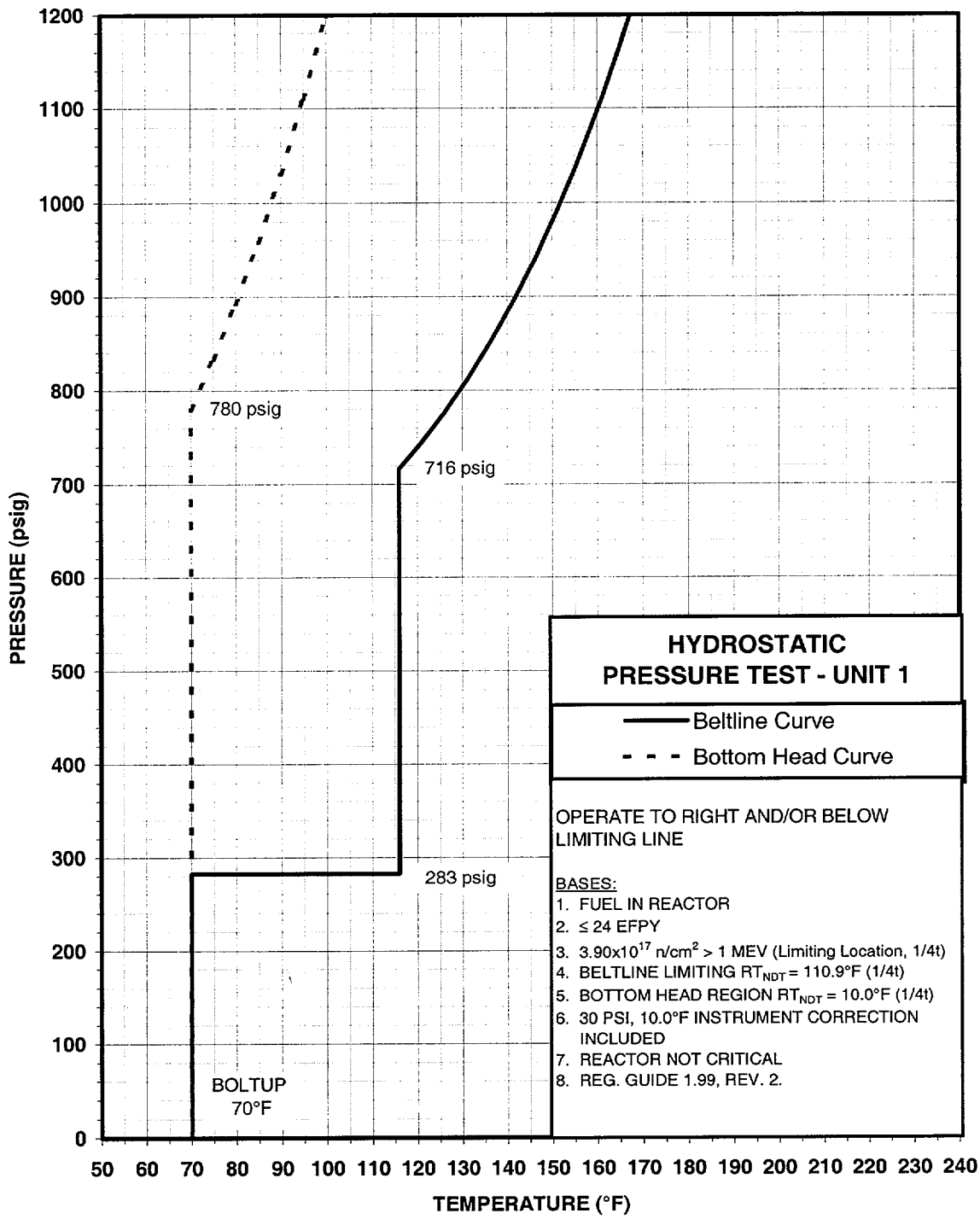

Figure 3.4.9-4 (page 1 of 1)
RCS Pressure and Temperature Limits
Hydrostatic and Leak Tests

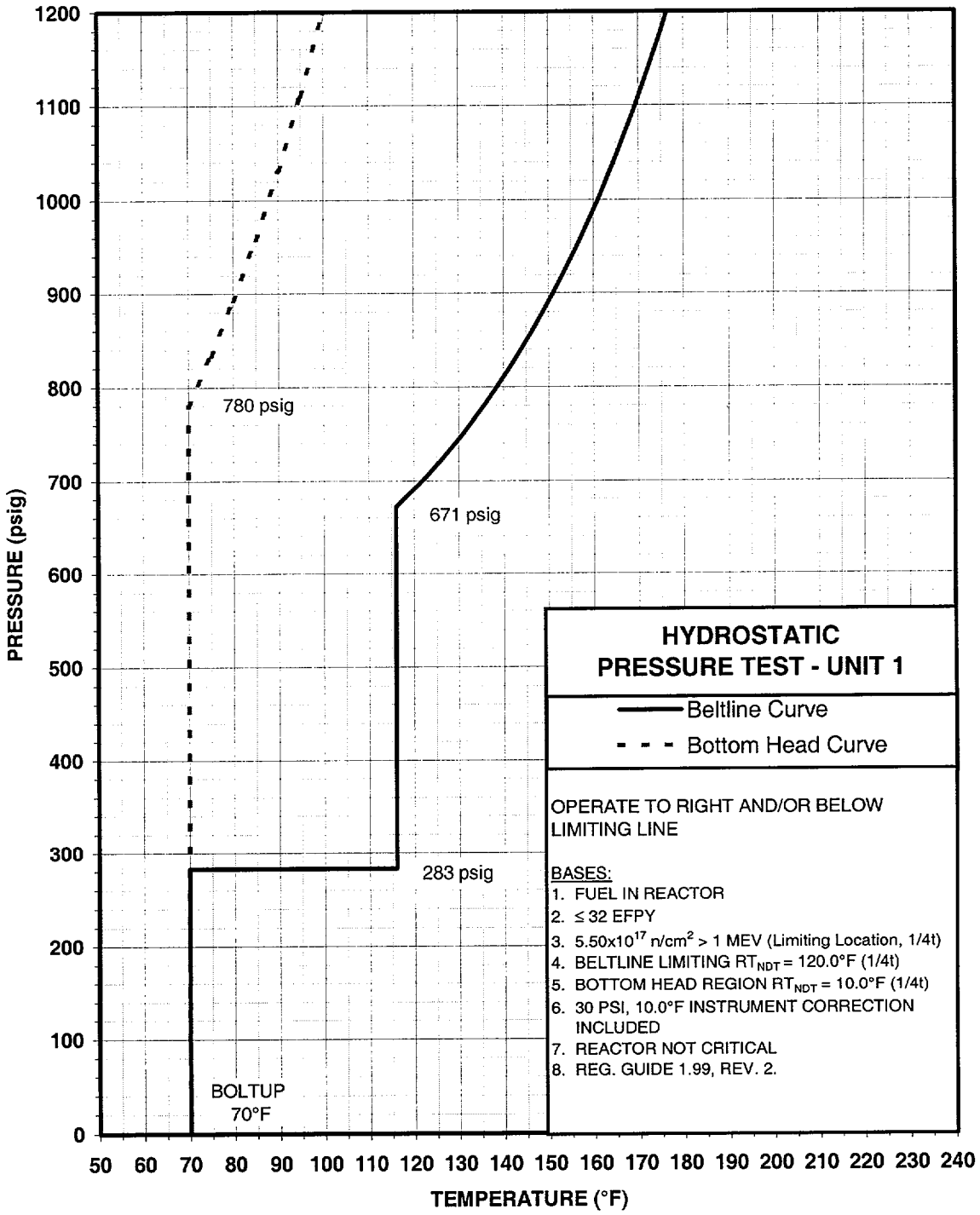

Figure 3.4.9-5 (page 1 of 1)
RCS Pressure and Temperature Limits
Hydrostatic and Leak Tests

3.4 REACTOR COOLANT SYSTEM (RCS)

3.4.10 Reactor Steam Dome Pressure

LCO 3.4.10 The reactor steam dome pressure shall be ≤ 1045 psig.

APPLICABILITY: MODES 1 and 2.

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. Reactor steam dome pressure not within limit.	A.1 Restore reactor steam dome pressure to within limit.	15 minutes
B. Required Action and associated Completion Time not met.	B.1 Be in MODE 3.	12 hours

SURVEILLANCE REQUIREMENTS

SURVEILLANCE	FREQUENCY
SR 3.4.10.1 Verify reactor steam dome pressure is ≤ 1045 psig.	12 hours

ENCLOSURE 9

BRUNSWICK STEAM ELECTRIC PLANT, UNIT NOS. 1 AND 2
DOCKET NOS. 50-325 AND 50-324/LICENSE NOS. DPR-71 AND DPR-62
REQUEST FOR LICENSE AMENDMENTS TO REVISE TECHNICAL SPECIFICATION
PRESSURE-TEMPERATURE LIMITS CURVES

Typed Technical Specification Pages - Unit 2

SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE		FREQUENCY
SR 3.4.9.2	----------NOTE---------- Only required to be performed during RCS inservice leak and hydrostatic testing. ---------- Verify: a. RCS pressure and RCS temperature are within the applicable limits specified in Figure 3.4.9-3, 3.4.9-4, or 3.4.9-5, as applicable; b. RCS heatup and cooldown rates are ≤ 30°F in any 1 hour period.	30 minutes
SR 3.4.9.3	Verify RCS pressure and RCS temperature are within the criticality limits specified in Figure 3.4.9-2.	Once within 15 minutes prior to control rod withdrawal for the purpose of achieving criticality
SR 3.4.9.4	----------NOTE---------- Only required to be met in MODES 1, 2, 3, and 4 during recirculation pump start. ---------- Verify the difference between the bottom head coolant temperature and the reactor pressure vessel (RPV) coolant temperature is ≤ 145°F.	Once within 30 minutes prior to each startup of a recirculation pump

(continued)

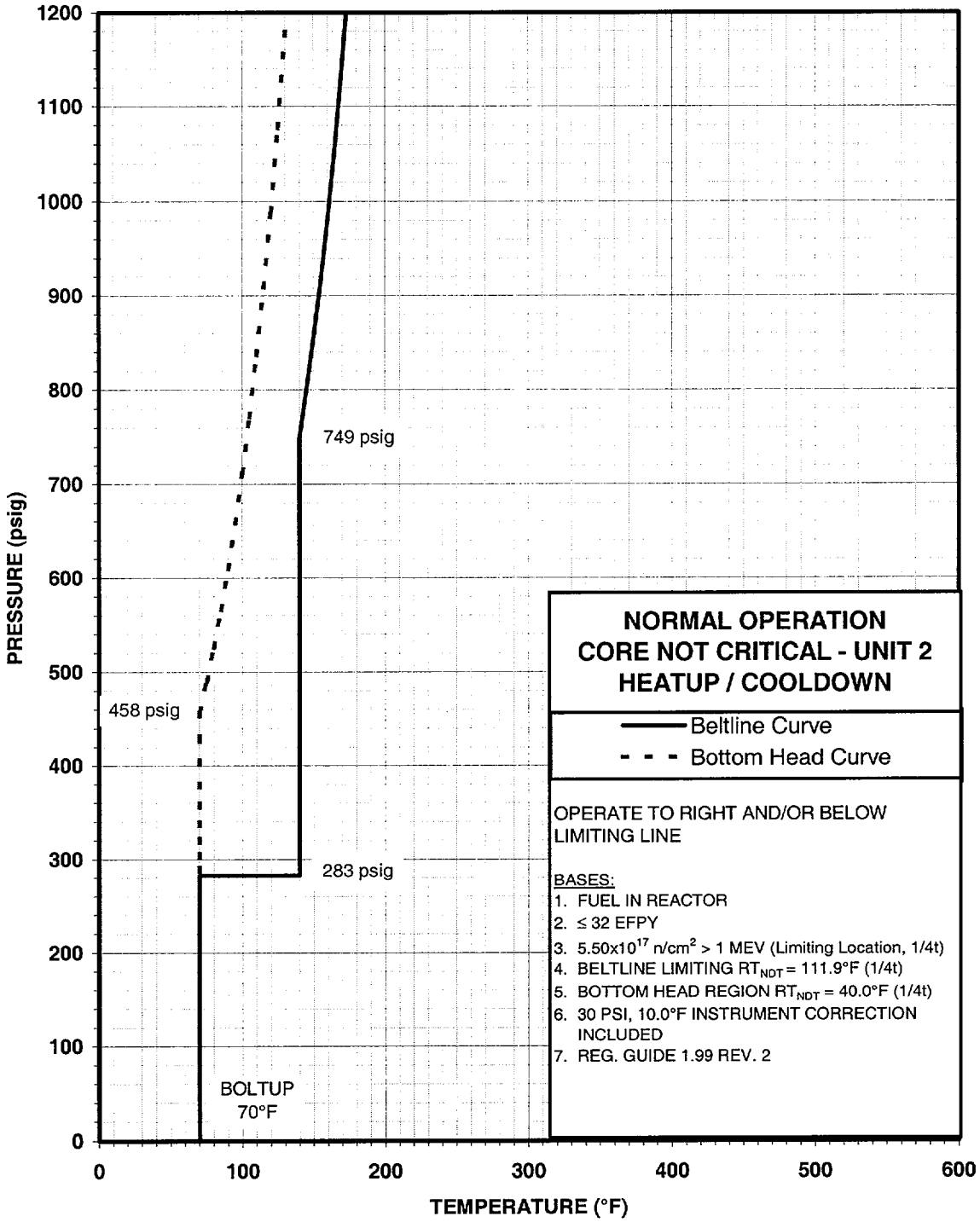

Figure 3.4.9-1 (page 1 of 1)
RCS Pressure and Temperature Limits
Normal Operation with Core Not Critical

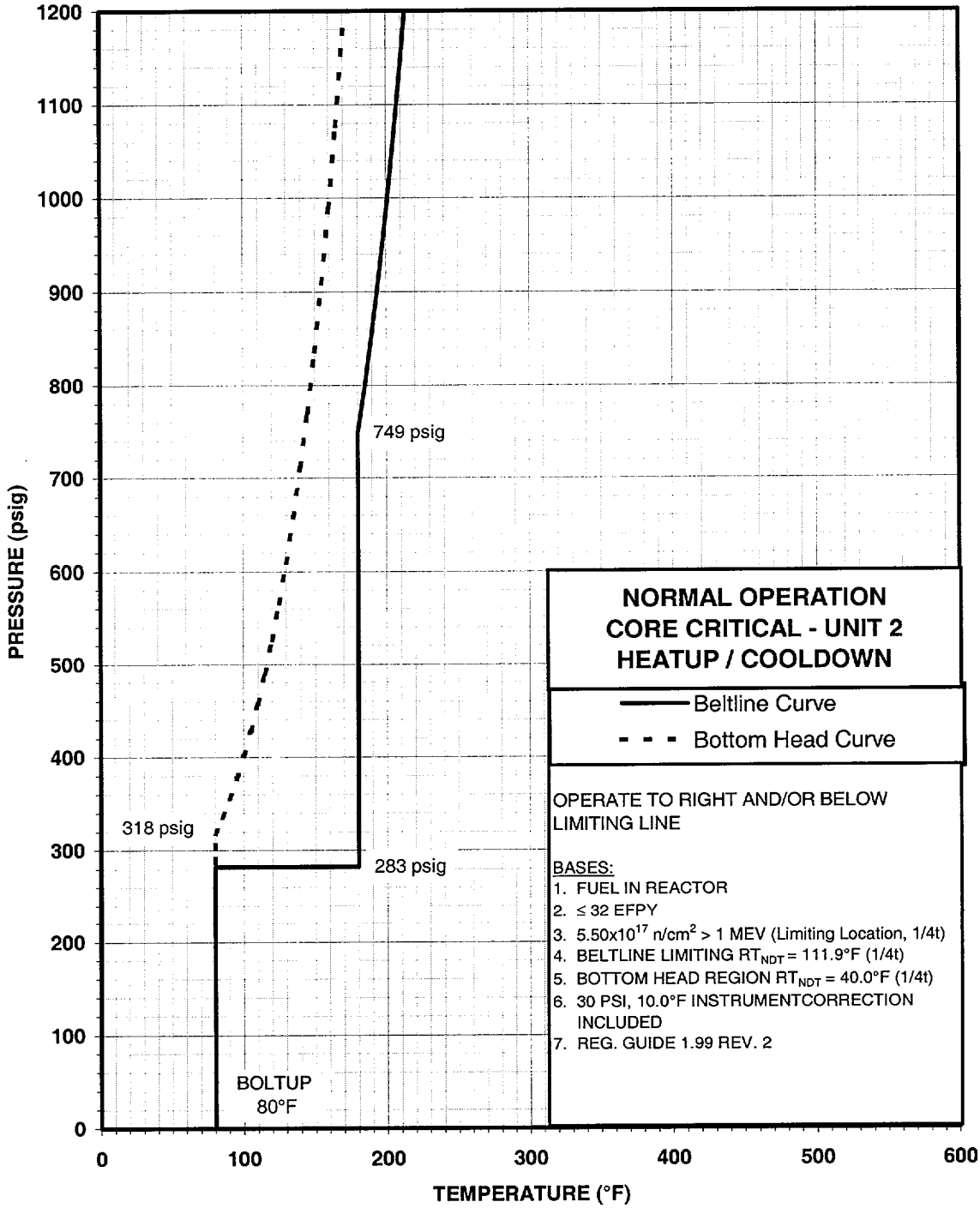

Figure 3.4.9-2 (page 1 of 1)
RCS Pressure and Temperature Limits
Normal Operation with Core Critical

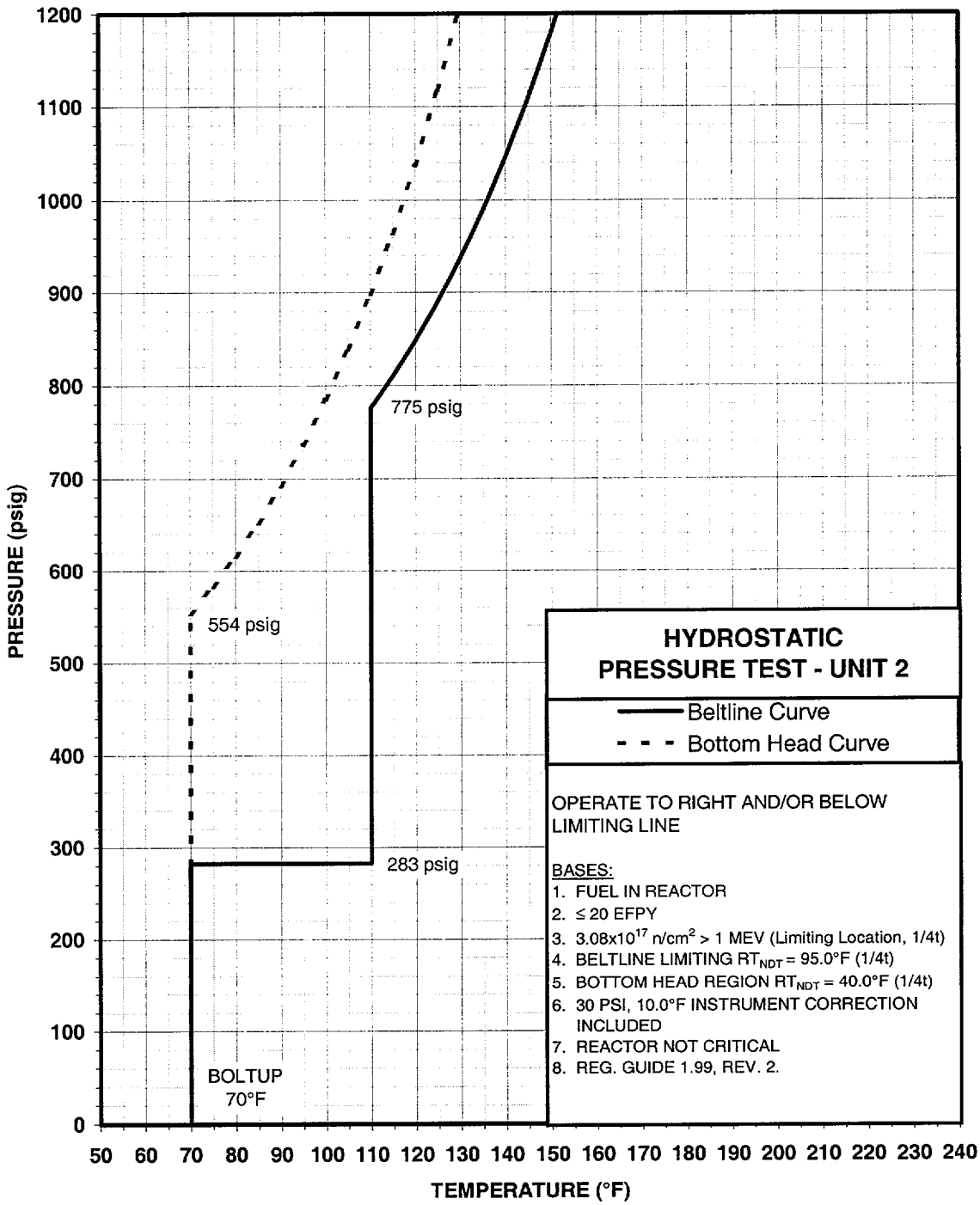

Figure 3.4.9-3 (page 1 of 1)
RCS Pressure and Temperature Limits
Hydrostatic and Leak Tests

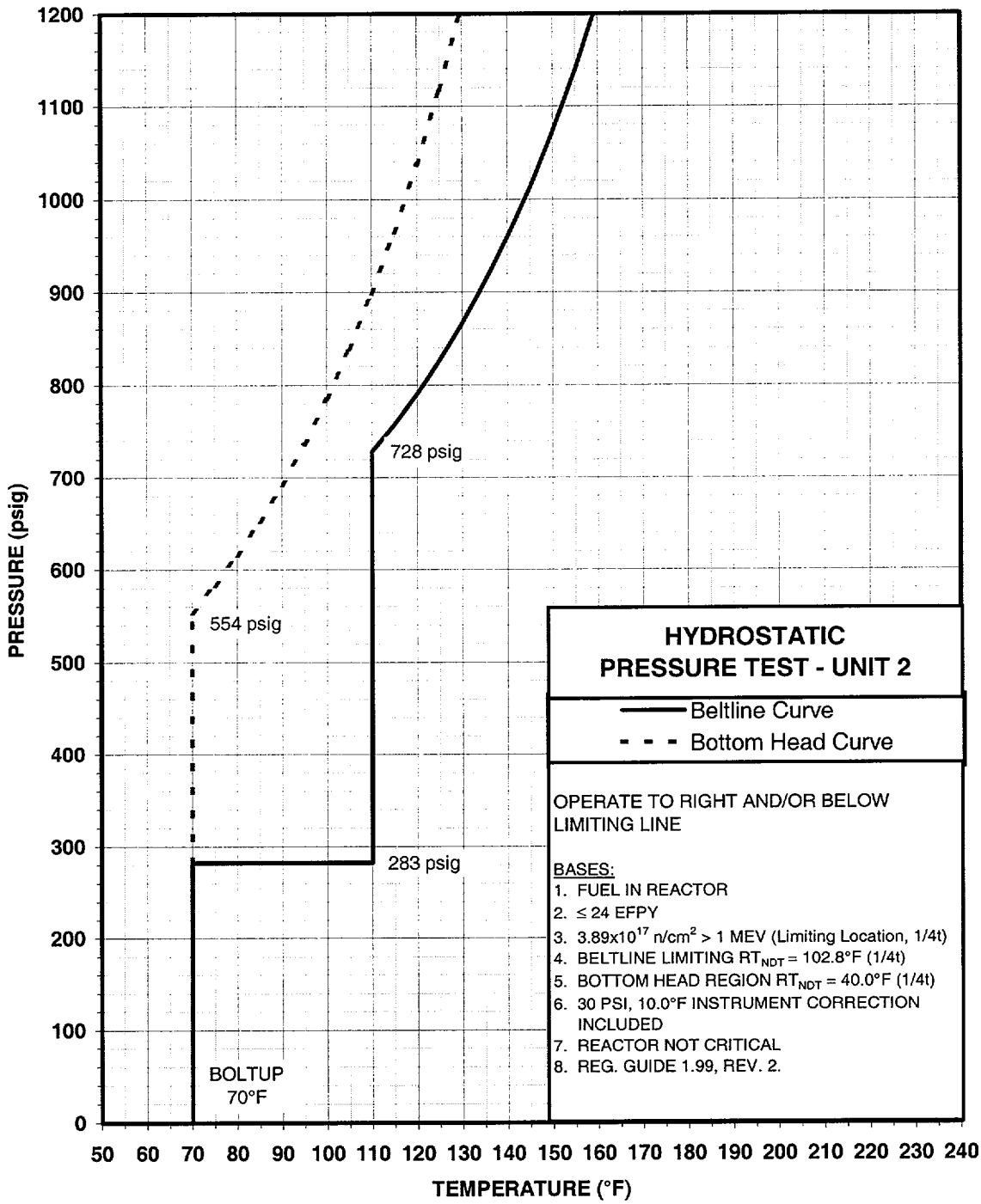

Figure 3.4.9-4 (page 1 of 1)
RCS Pressure and Temperature Limits
Hydrostatic and Leak Tests

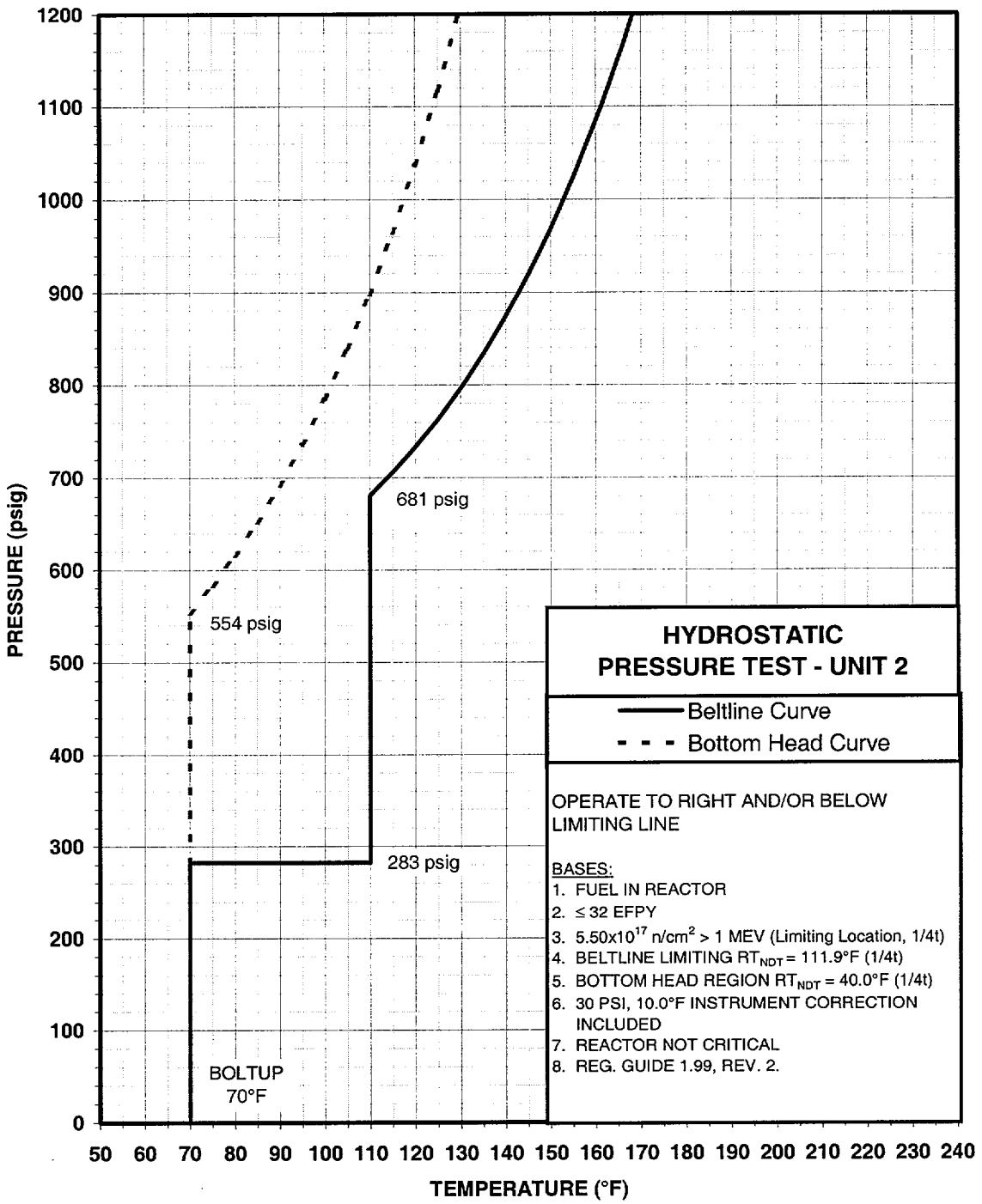

Figure 3.4.9-5 (page 1 of 1)
RCS Pressure and Temperature Limits
Hydrostatic and Leak Tests

3.4 REACTOR COOLANT SYSTEM (RCS)

3.4.10 Reactor Steam Dome Pressure

LCO 3.4.10 The reactor steam dome pressure shall be ≤ 1045 psig.

APPLICABILITY: MODES 1 and 2.

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. Reactor steam dome pressure not within limit.	A.1 Restore reactor steam dome pressure to within limit.	15 minutes
B. Required Action and associated Completion Time not met.	B.1 Be in MODE 3.	12 hours

SURVEILLANCE REQUIREMENTS

SURVEILLANCE	FREQUENCY
SR 3.4.10.1 Verify reactor steam dome pressure is ≤ 1045 psig.	12 hours

ENCLOSURE 10

BRUNSWICK STEAM ELECTRIC PLANT, UNIT NOS. 1 AND 2
DOCKET NOS. 50-325 AND 50-324/LICENSE NOS. DPR-71 AND DPR-62
REQUEST FOR LICENSE AMENDMENTS TO REVISE TECHNICAL SPECIFICATION
PRESSURE-TEMPERATURE LIMITS CURVES

Marked-up Technical Specification Pages - Unit 1

SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE		FREQUENCY
SR 3.4.9.2	----------NOTE---------- Only required to be performed during RCS inservice leak and hydrostatic testing. ---------- Verify: a. RCS pressure and RCS temperature are within the applicable limits specified in ~~Figure 3.4.9-3~~ Figure 3.4.9-3, 3.4.9-4, or 3.4.9-5, as applicable; and b. RCS heatup and cooldown rates are ≤ 30°F in any 1 hour period.	30 minutes
SR 3.4.9.3	Verify RCS pressure and RCS temperature are within the criticality limits specified in Figure 3.4.9-2.	Once within 15 minutes prior to control rod withdrawal for the purpose of achieving criticality
SR 3.4.9.4	----------NOTE---------- Only required to be met in MODES 1, 2, 3, and 4 during recirculation pump start. ---------- Verify the difference between the bottom head coolant temperature and the reactor pressure vessel (RPV) coolant temperature is ≤ 145°F.	Once within 30 minutes prior to each startup of a recirculation pump

(continued)

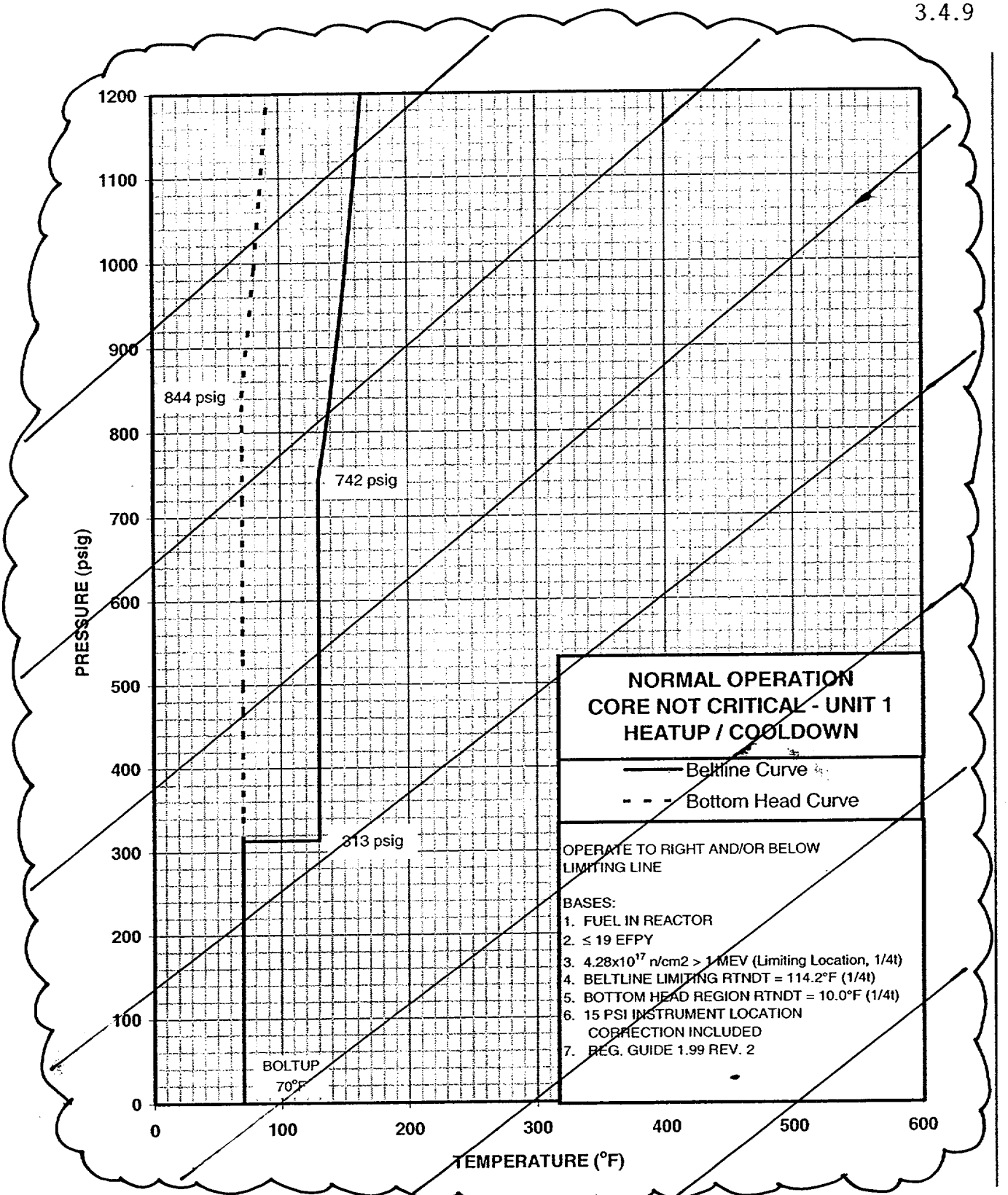

Figure 3.4.9-1 (page 1 of 1)
RCS Pressure and Temperature Limits
Normal Operation with Core Not Critical

Replace with attached

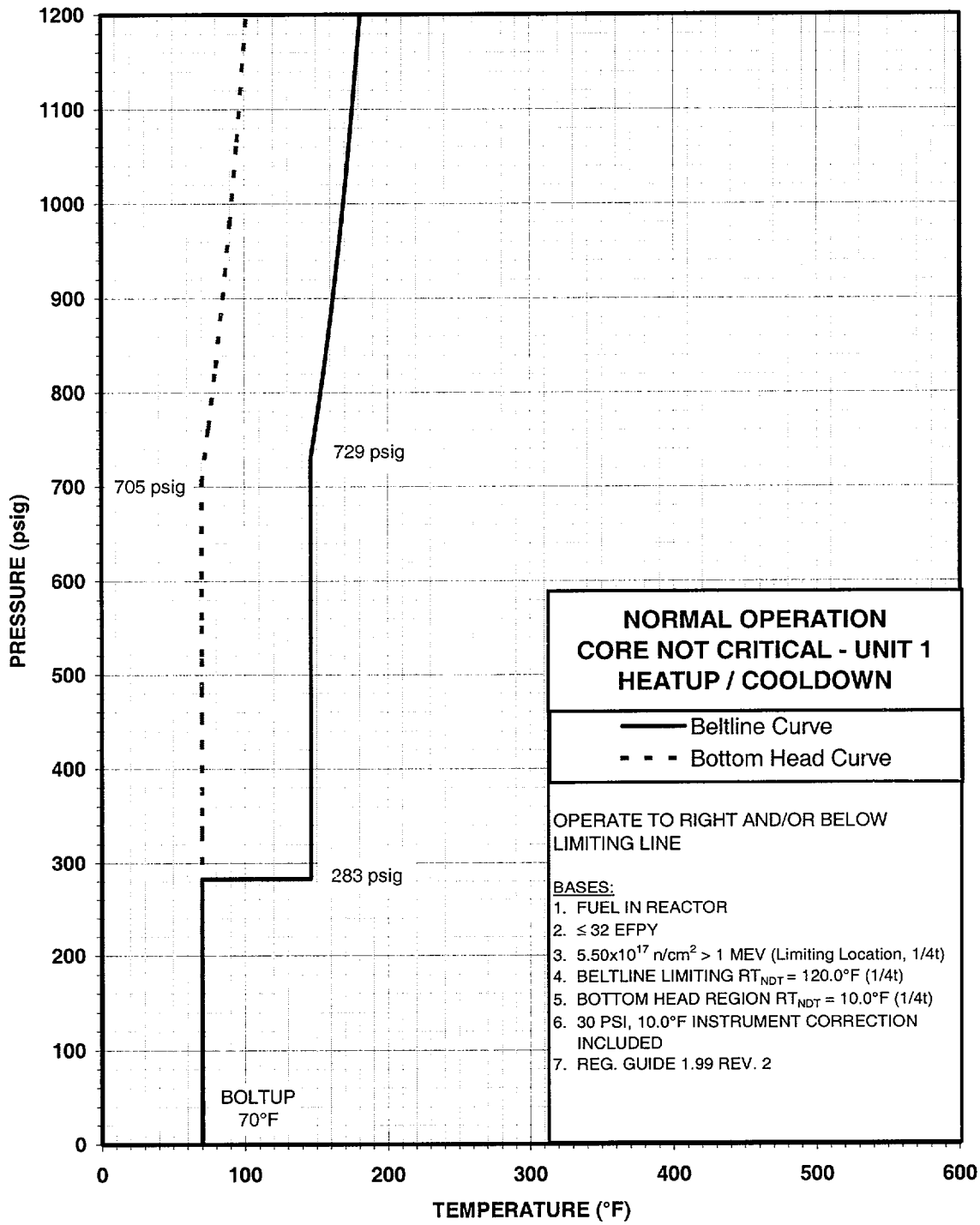

Figure 3.4.9-1 (page 1 of 1)
RCS Pressure and Temperature Limits
Normal Operation with Core Not Critical

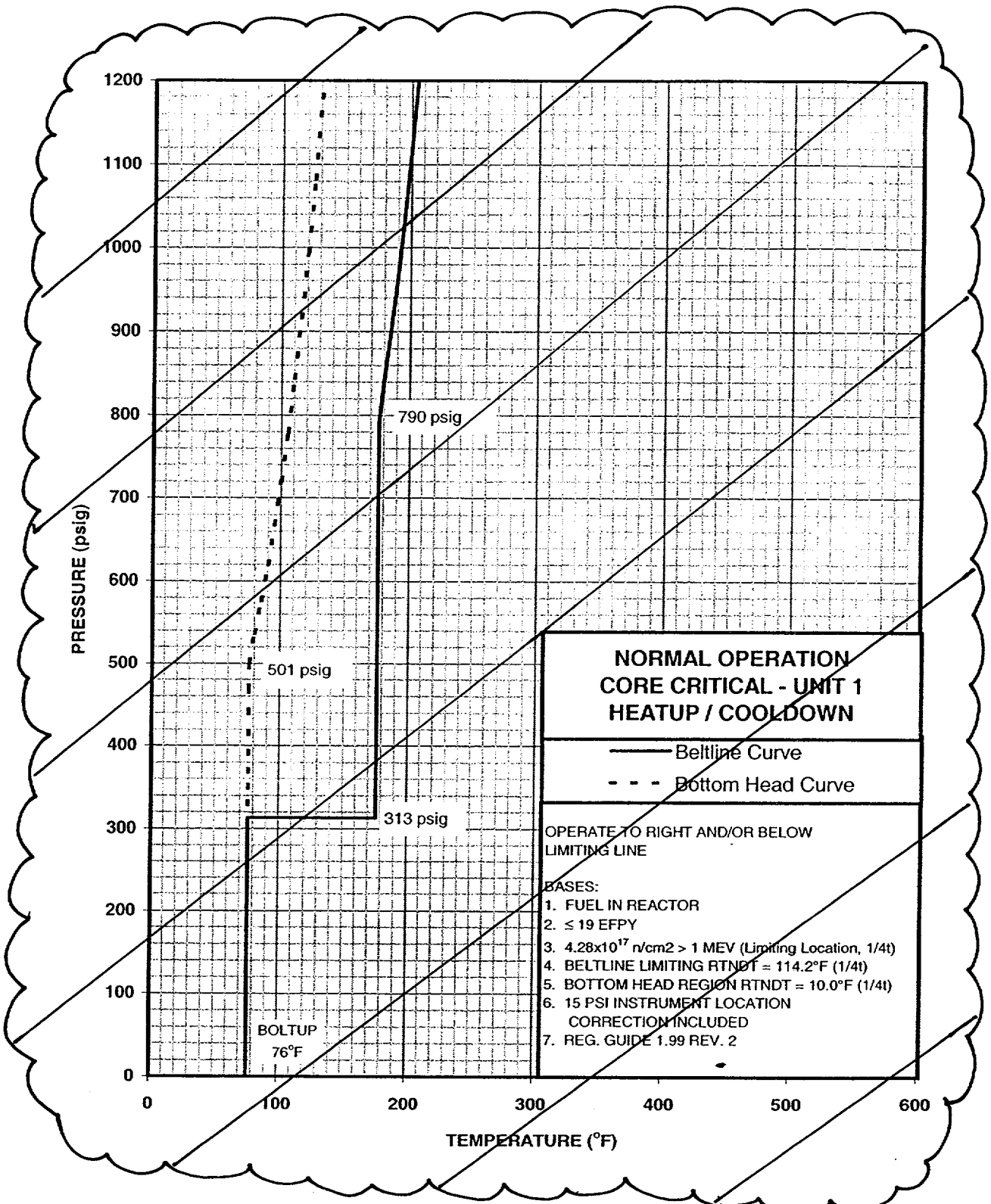

Figure 3.4.9-2 (page 1 of 1)
RCS Pressure and Temperature Limits
Normal Operation with Core Critical

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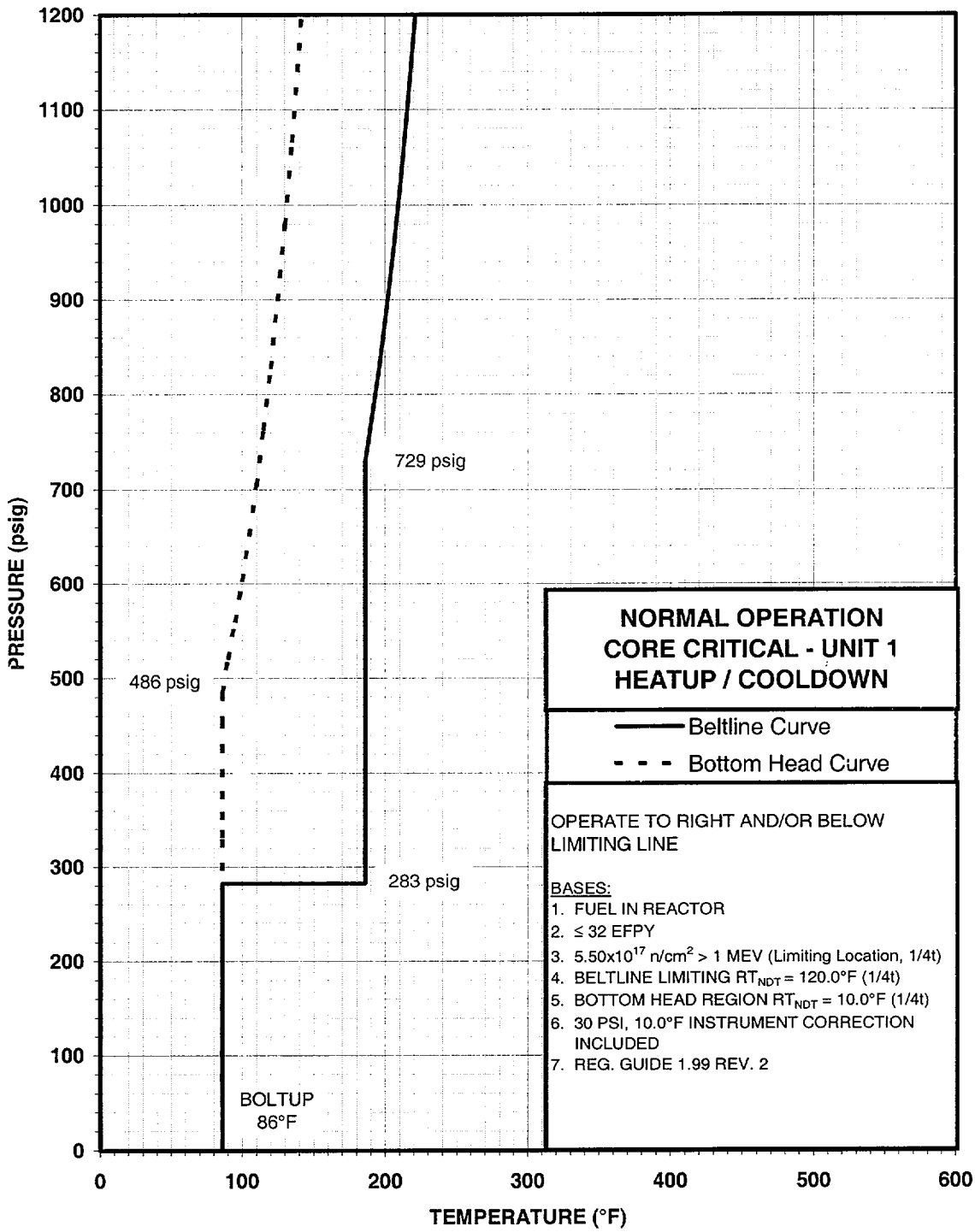

Figure 3.4.9-2 (page 1 of 1)
RCS Pressure and Temperature Limits
Normal Operation with Core Critical

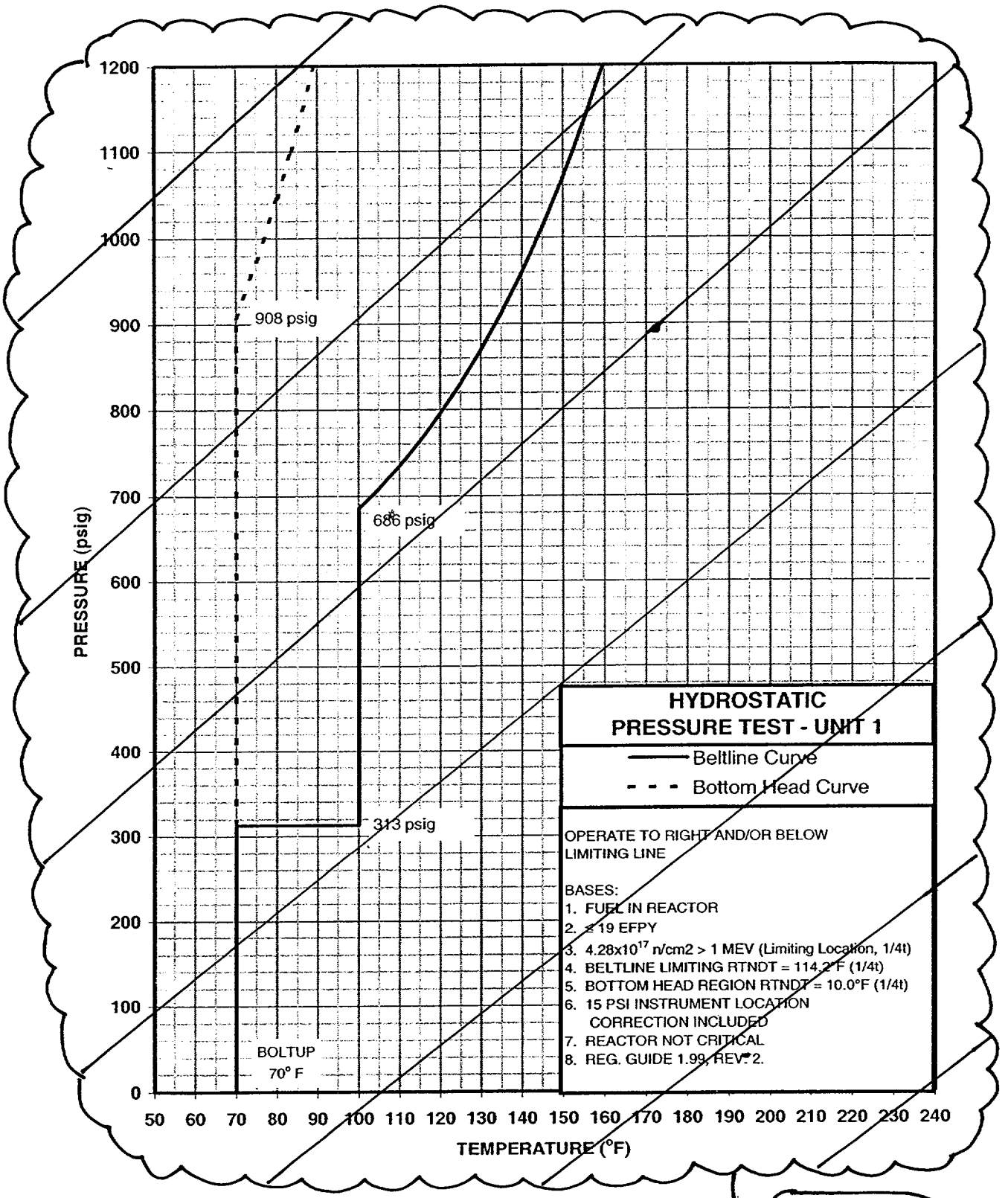

Figure 3.4.9-3 (page 1 of 1)
RCS Pressure and Temperature Limits
Hydrostatic and Leak Tests

Replace with attached

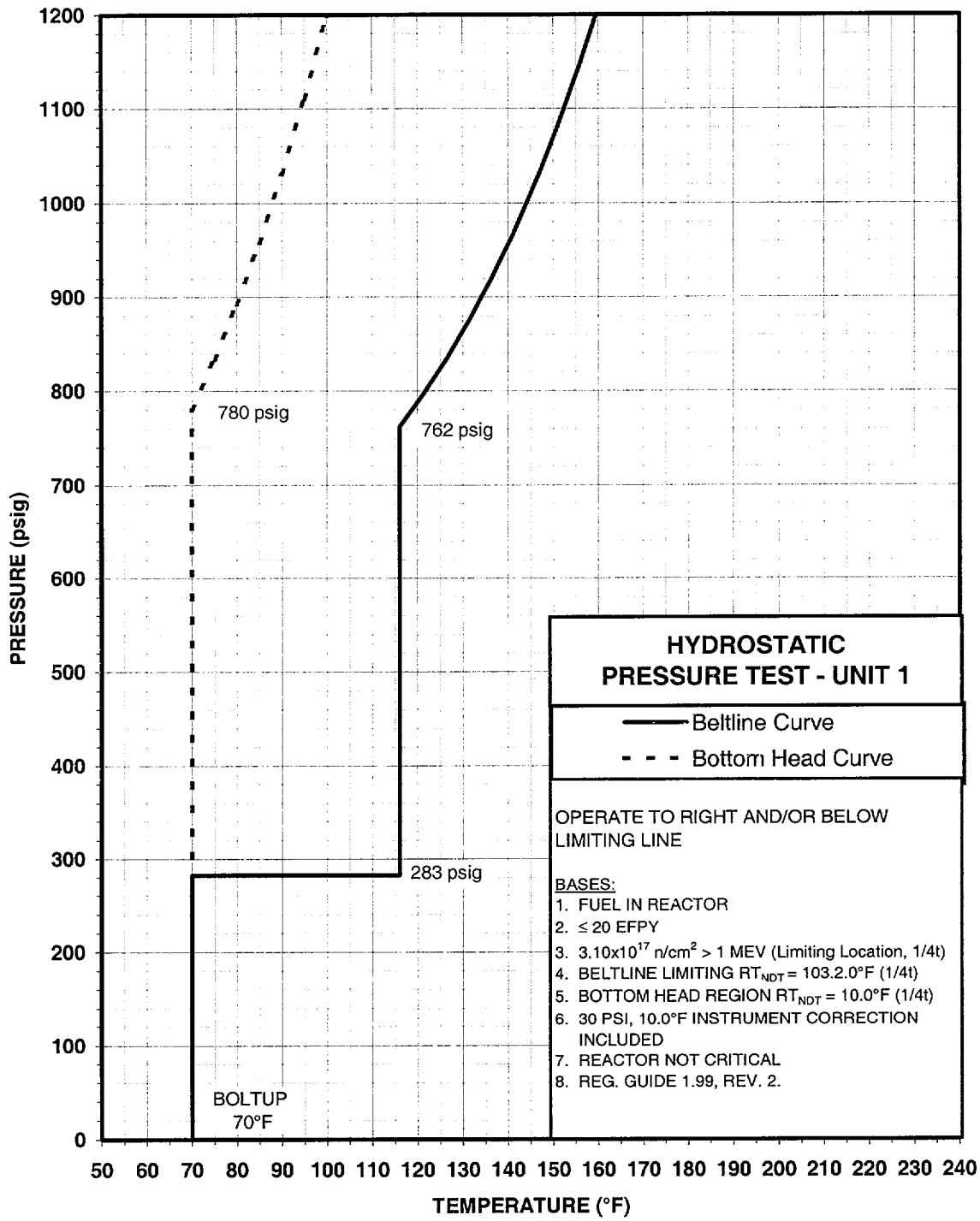

Figure 3.4.9-3 (page 1 of 1)
RCS Pressure and Temperature Limits
Hydrostatic and Leak Tests

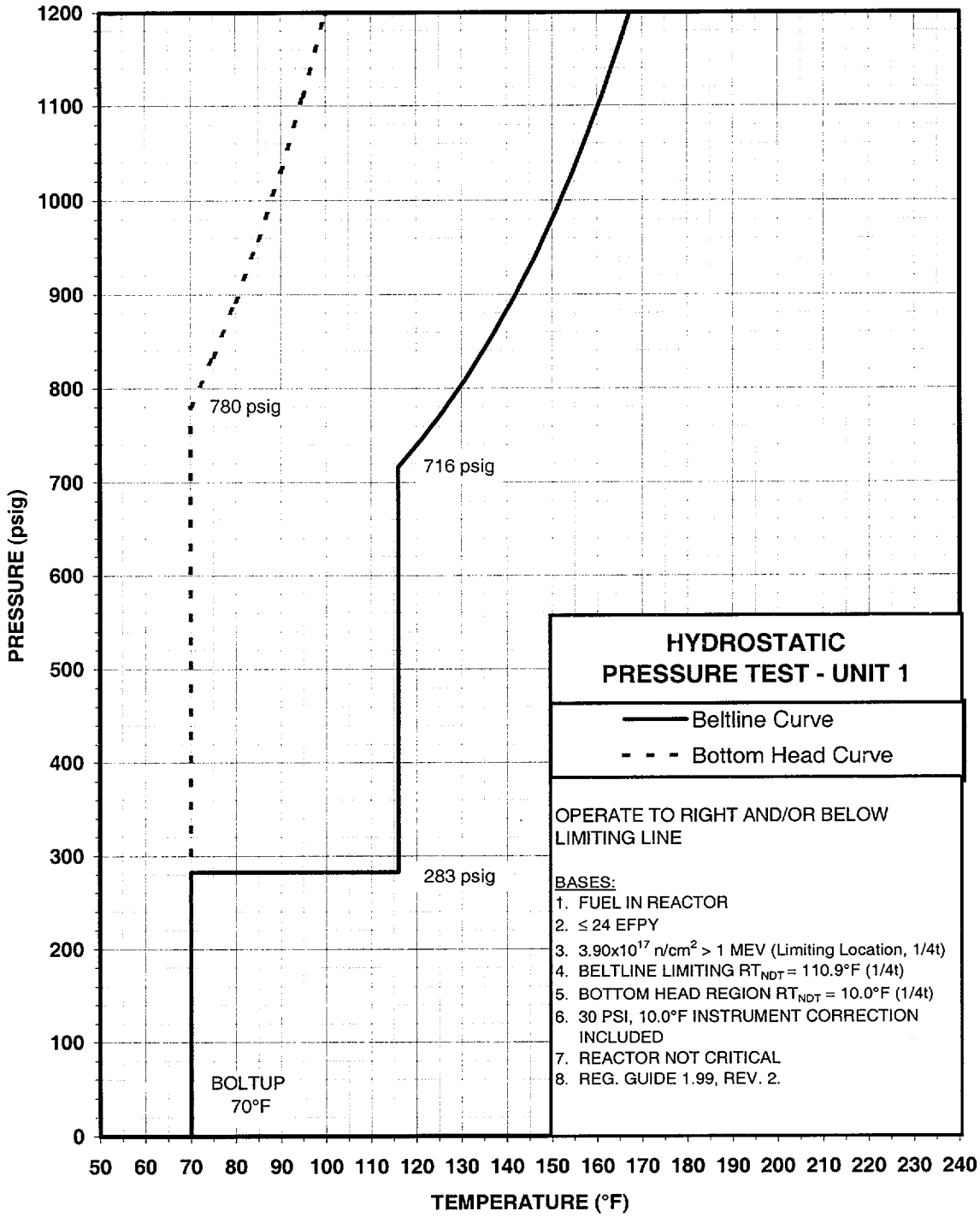

Figure 3.4.9-4 (page 1 of 1)
RCS Pressure and Temperature Limits
Hydrostatic and Leak Tests

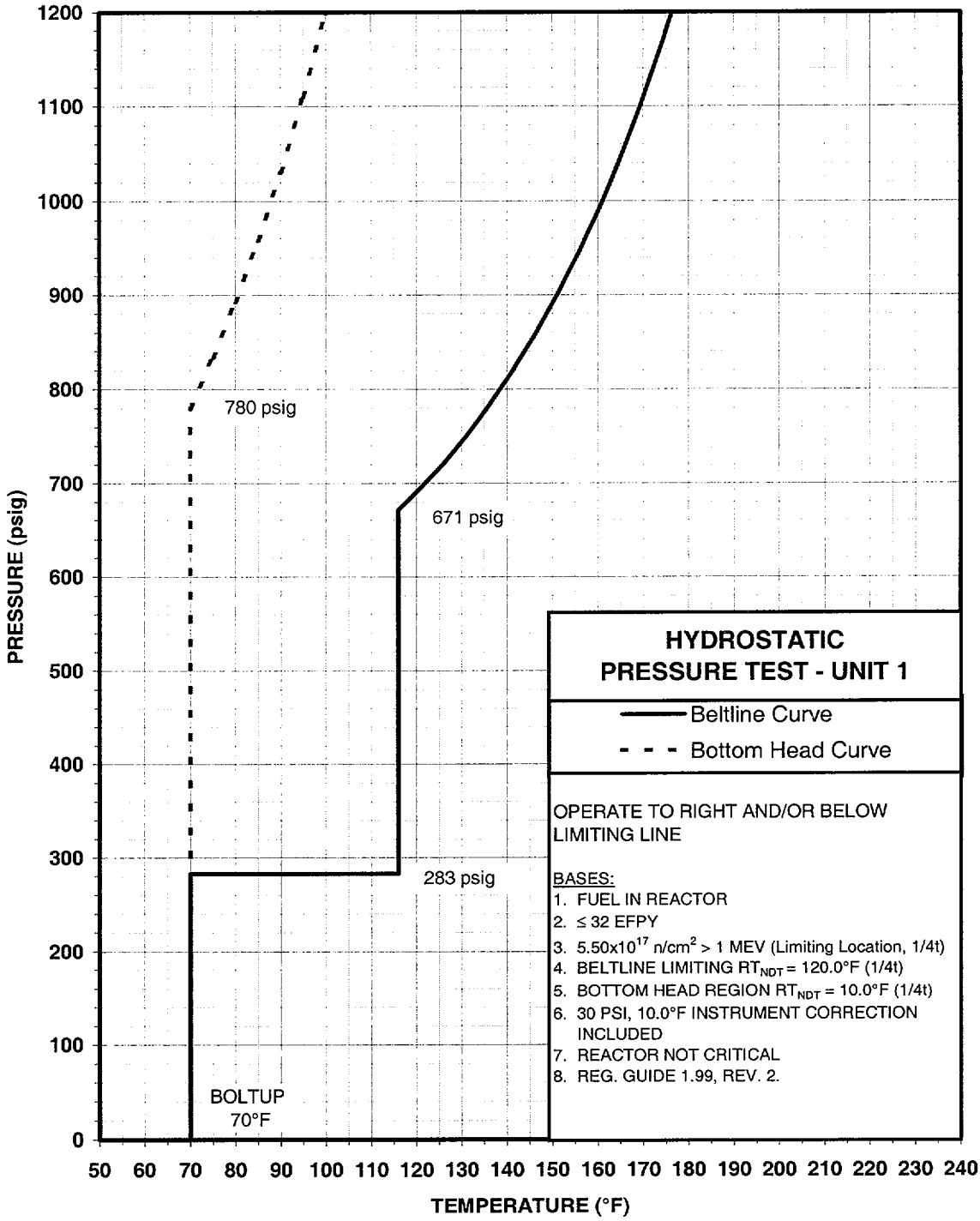

Figure 3.4.9-5 (page 1 of 1)
RCS Pressure and Temperature Limits
Hydrostatic and Leak Tests

3.4 REACTOR COOLANT SYSTEM (RCS)

3.4.10 Reactor Steam Dome Pressure

LCO 3.4.10 The reactor steam dome pressure shall be ≤ 1045 psig.

APPLICABILITY: MODES 1 and 2.

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. Reactor steam dome pressure not within limit.	A.1 Restore reactor steam dome pressure to within limit.	15 minutes
B. Required Action and associated Completion Time not met.	B.1 Be in MODE 3.	12 hours

SURVEILLANCE REQUIREMENTS

SURVEILLANCE	FREQUENCY
SR 3.4.10.1 Verify reactor steam dome pressure is ≤ 1045 psig.	12 hours

ENCLOSURE 11

BRUNSWICK STEAM ELECTRIC PLANT, UNIT NOS. 1 AND 2
DOCKET NOS. 50-325 AND 50-324/LICENSE NOS. DPR-71 AND DPR-62
REQUEST FOR LICENSE AMENDMENTS TO REVISE TECHNICAL SPECIFICATION
PRESSURE-TEMPERATURE LIMITS CURVES

Marked-up Technical Specification Pages - Unit 2

SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE		FREQUENCY
SR 3.4.9.2	----------NOTE---------- Only required to be performed during RCS inservice leak and hydrostatic testing. ---------- Verify: a. RCS pressure and RCS temperature are within the applicable limits specified in ~~Figure 3.4.9-3,~~ Figure 3.4.9-3, Figure 3.4.9-4, or Figure 3.4.9-5, as applicable; and b. RCS heatup and cooldown rates are ≤ 30°F in any 1 hour period.	30 minutes
SR 3.4.9.3	Verify RCS pressure and RCS temperature are within the criticality limits specified in Figure 3.4.9-2.	Once within 15 minutes prior to control rod withdrawal for the purpose of achieving criticality
SR 3.4.9.4	----------NOTE---------- Only required to be met in MODES 1, 2, 3, and 4 during recirculation pump start. ---------- Verify the difference between the bottom head coolant temperature and the reactor pressure vessel (RPV) coolant temperature is ≤ 145°F.	Once within 30 minutes prior to each startup of a recirculation pump

(continued)

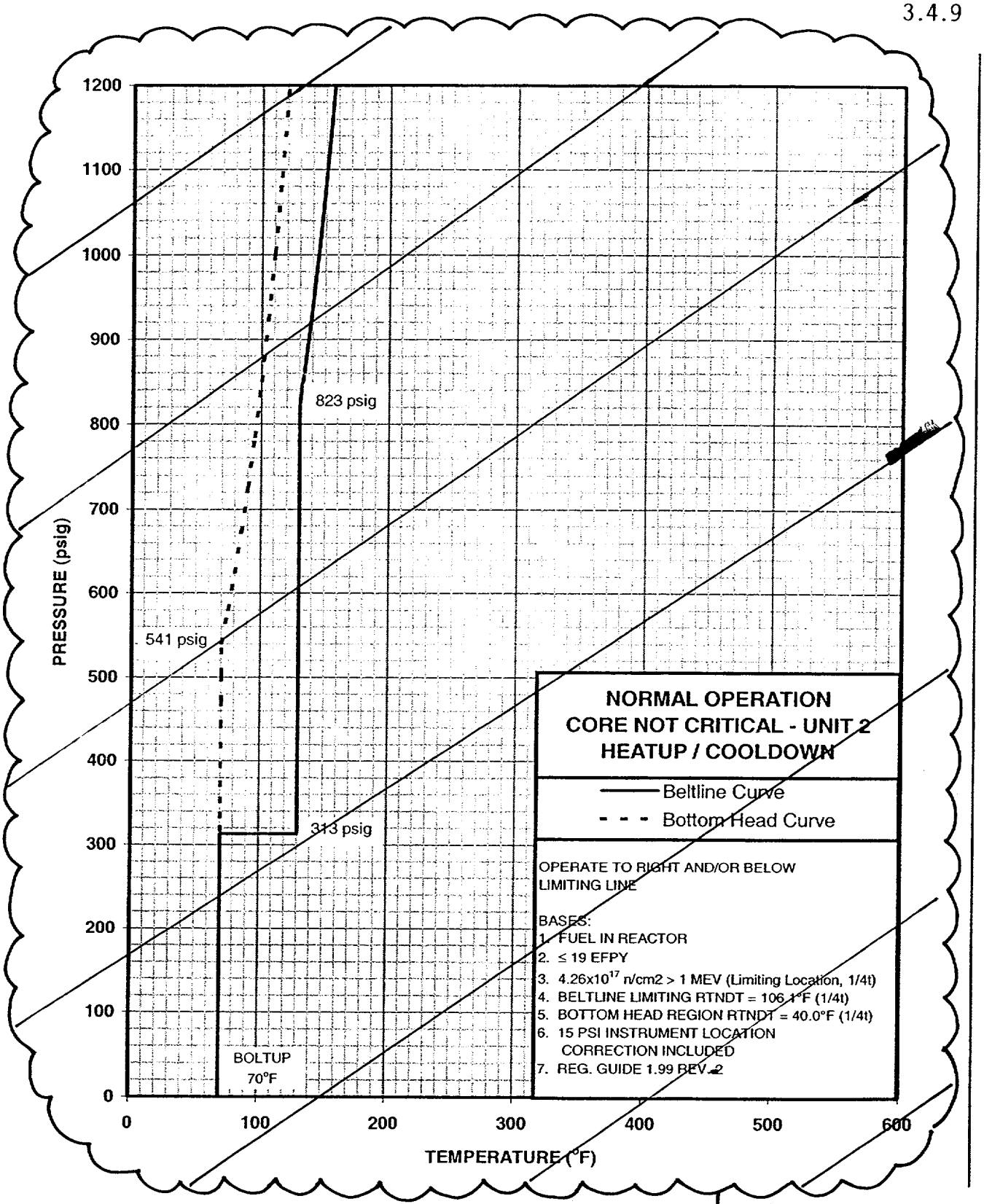

Figure 3.4.9-1 (page 1 of 1)
RCS Pressure and Temperature Limits
Normal Operation with Core Not Critical

Replace with attached

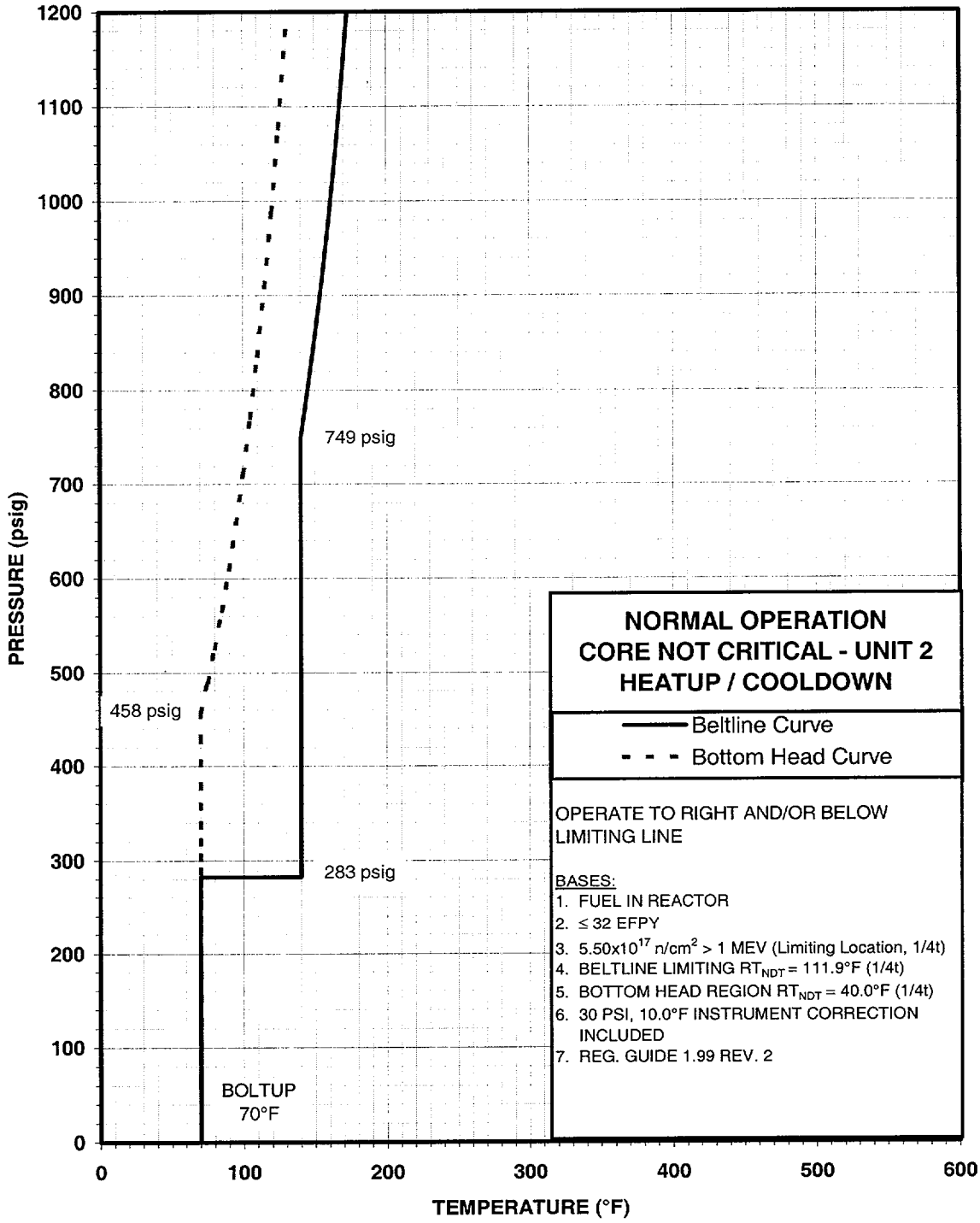

Figure 3.4.9-1 (page 1 of 1)
RCS Pressure and Temperature Limits
Normal Operation with Core Not Critical

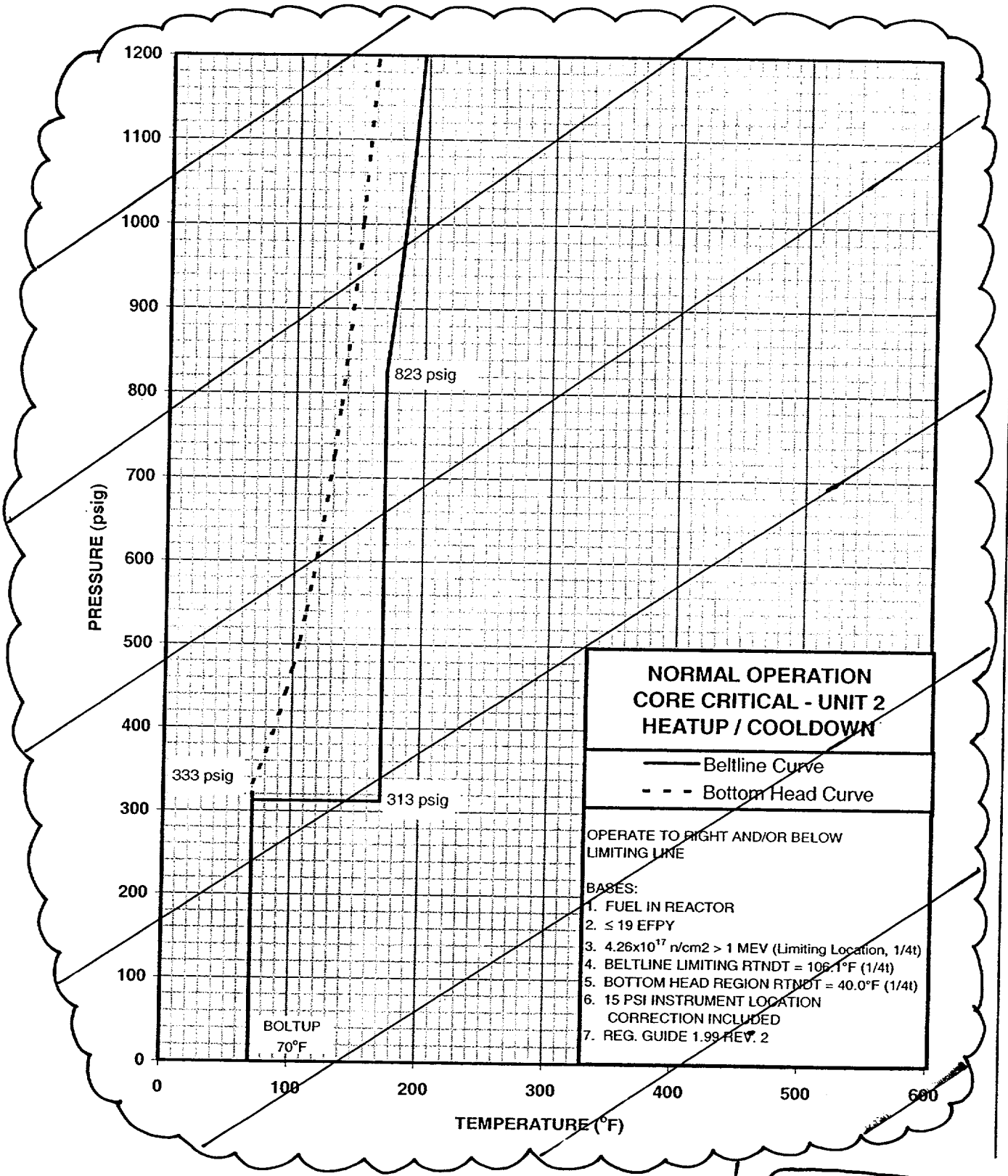

Figure 3.4.9-2 (page 1 of 1)
RCS Pressure and Temperature Limits
Normal Operation with Core Critical

Replace with attached

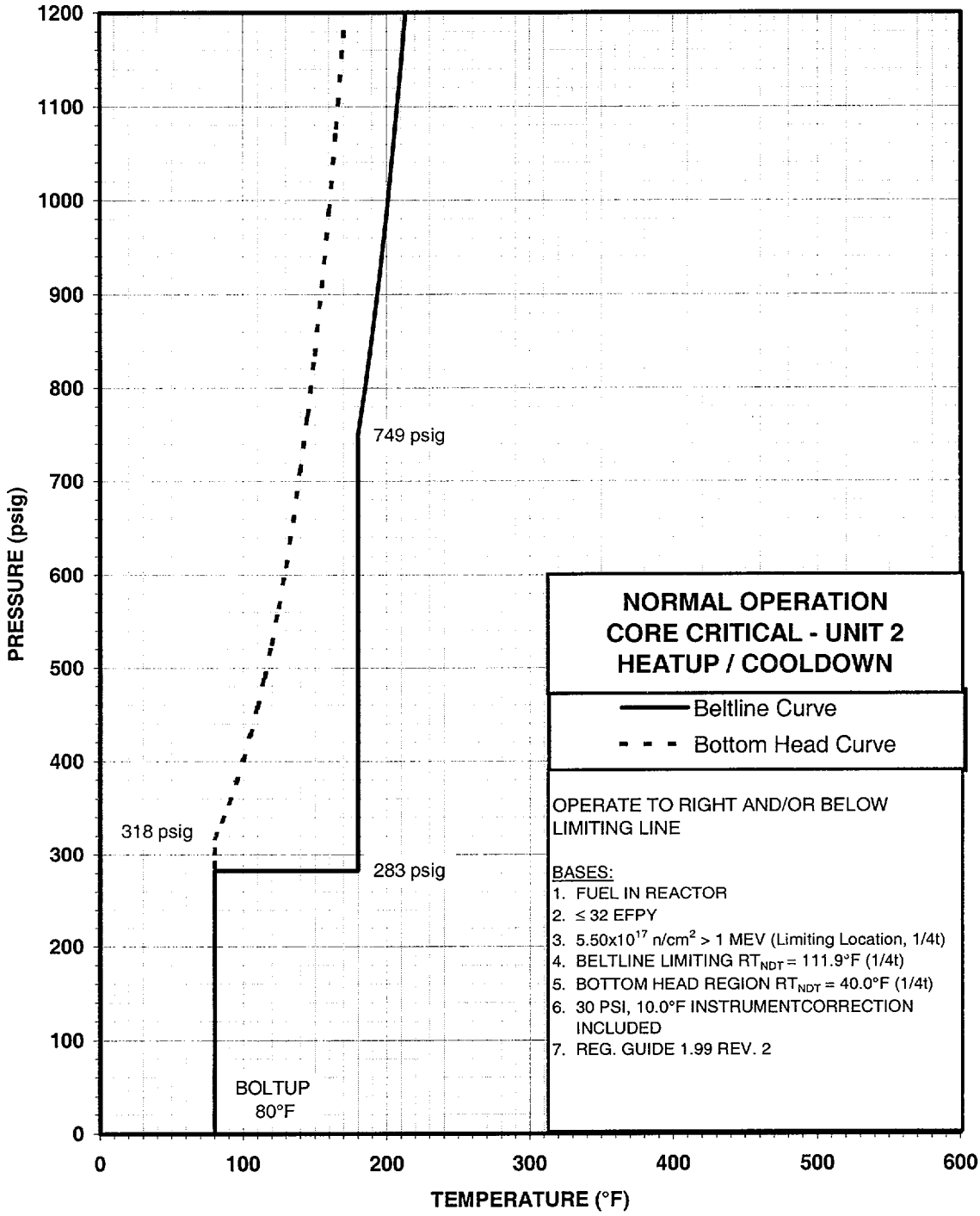

Figure 3.4.9-2 (page 1 of 1)
RCS Pressure and Temperature Limits
Normal Operation with Core Critical

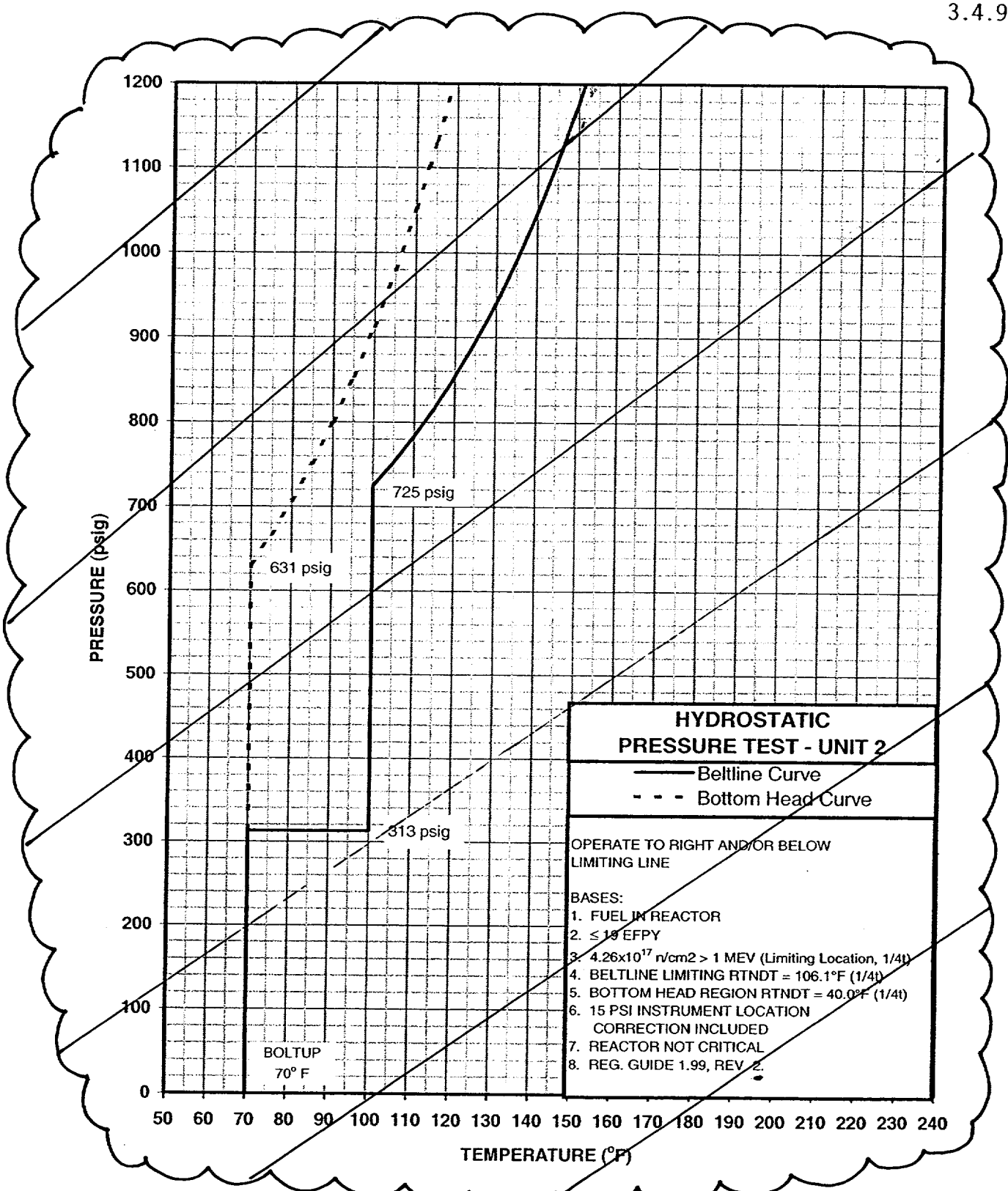

Figure 3.4.9-3 (page 1 of 1)
RCS Pressure and Temperature Limits
Hydrostatic and Leak Tests

Replace with attached

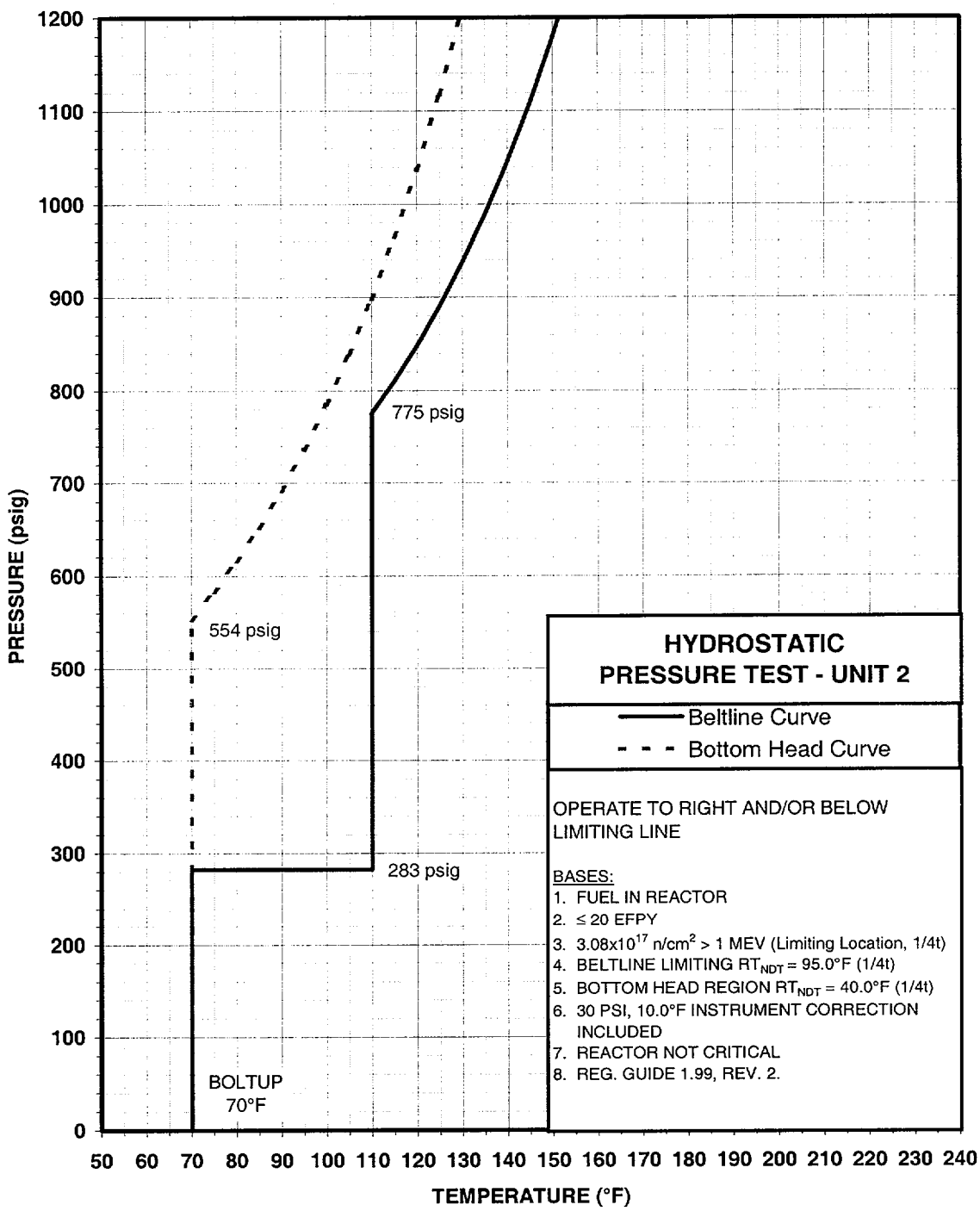

Figure 3.4.9-3 (page 1 of 1)
RCS Pressure and Temperature Limits
Hydrostatic and Leak Tests

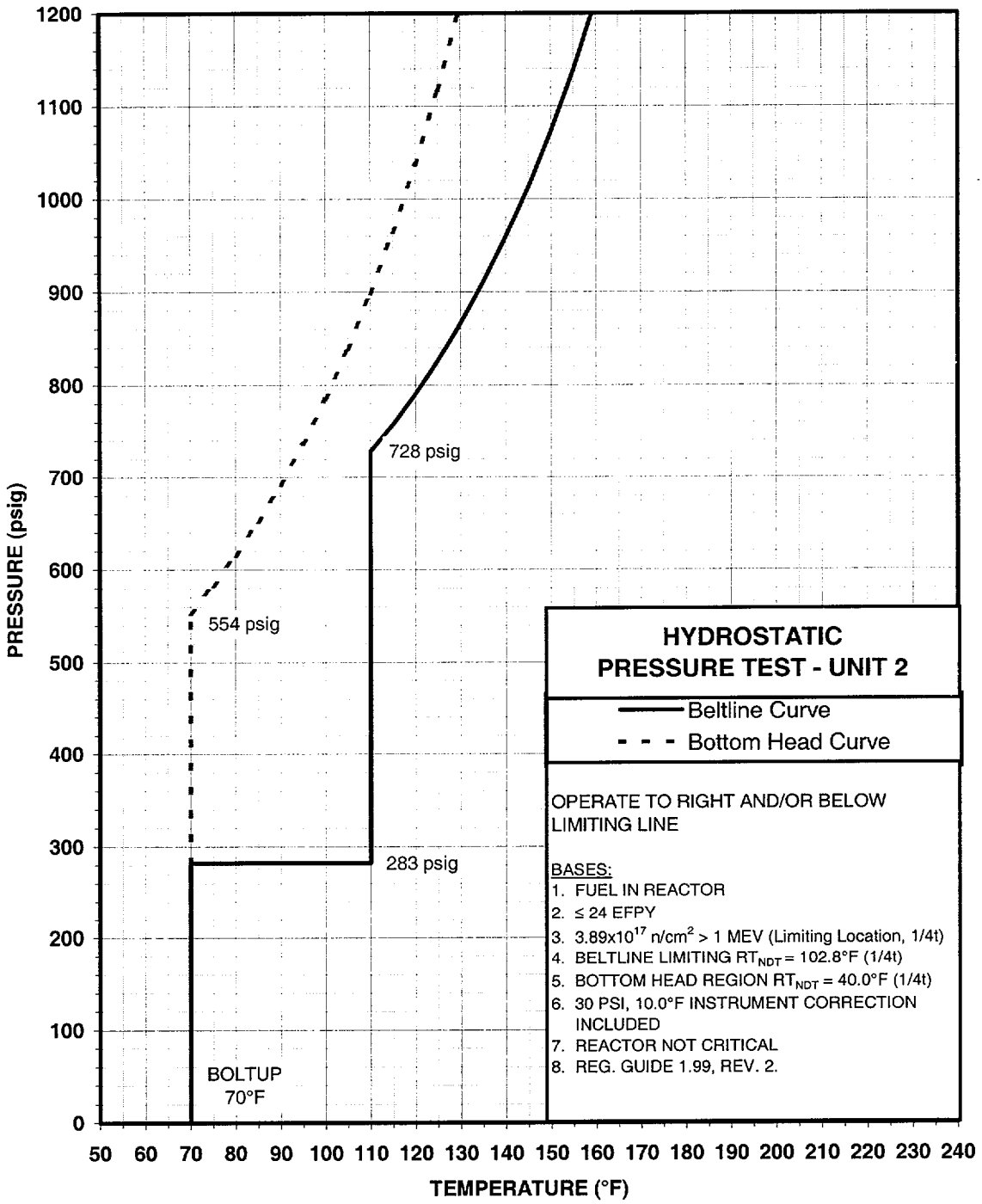

Figure 3.4.9-4 (page 1 of 1)
RCS Pressure and Temperature Limits
Hydrostatic and Leak Tests

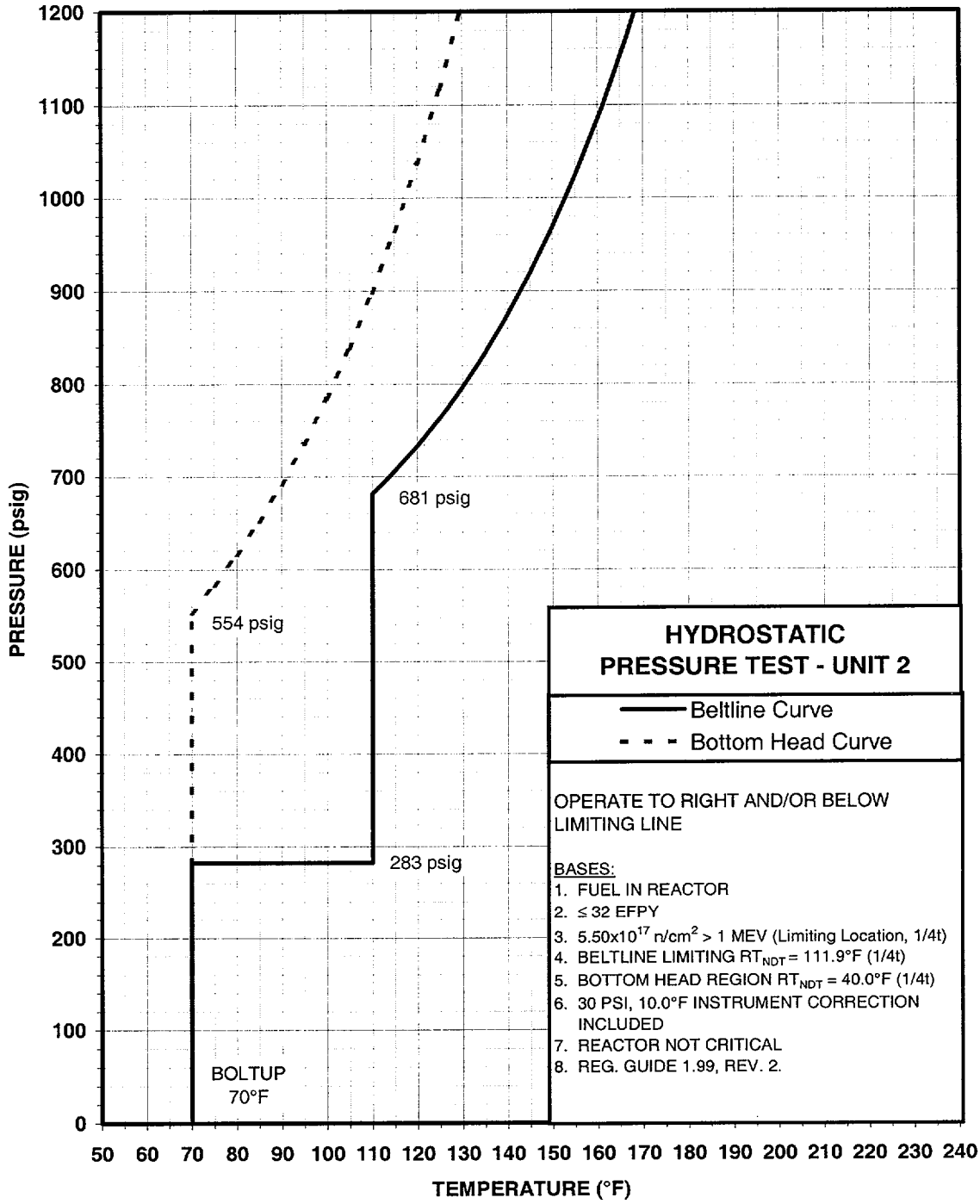

Figure 3.4.9-5 (page 1 of 1)
RCS Pressure and Temperature Limits
Hydrostatic and Leak Tests

3.4 REACTOR COOLANT SYSTEM (RCS)

3.4.10 Reactor Steam Dome Pressure

LCO 3.4.10 The reactor steam dome pressure shall be ≤ 1045 psig.

APPLICABILITY: MODES 1 and 2.

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. Reactor steam dome pressure not within limit.	A.1 Restore reactor steam dome pressure to within limit.	15 minutes
B. Required Action and associated Completion Time not met.	B.1 Be in MODE 3.	12 hours

SURVEILLANCE REQUIREMENTS

SURVEILLANCE	FREQUENCY
SR 3.4.10.1 Verify reactor steam dome pressure is ≤ 1045 psig.	12 hours

ENCLOSURE 12

BRUNSWICK STEAM ELECTRIC PLANT, UNIT NOS. 1 AND 2
DOCKET NOS. 50-325 AND 50-324/LICENSE NOS. DPR-71 AND DPR-62
REQUEST FOR LICENSE AMENDMENTS TO REVISE TECHNICAL SPECIFICATION
PRESSURE-TEMPERATURE LIMITS CURVES

Marked-up Technical Specification Bases Pages - Unit 1
(For Information Only)

B 3.4 REACTOR COOLANT SYSTEM (RCS)

B 3.4.9 RCS Pressure and Temperature (P/T) Limits

BASES

BACKGROUND

All components of the RCS are designed to withstand effects of cyclic loads due to system pressure and temperature changes. These loads are introduced by startup (heatup) and shutdown (cooldown) operations, power transients, and reactor trips. This LCO limits the pressure and temperature changes during RCS heatup and cooldown, within the design assumptions and the stress limits for cyclic operation.

This Specification contains P/T limit curves for heatup, cooldown, and inservice leakage and hydrostatic testing, and data for the maximum rate of change of reactor coolant temperature. The criticality curve provides limits for both heatup and cooldown during criticality.

INSERT #1

Each P/T limit curve defines an acceptable region for normal operation. The usual use of the curves is operational guidance during heatup or cooldown maneuvering, when pressure and temperature indications are monitored and compared to the applicable curve to determine that operation is within the allowable region.

The LCO establishes operating limits that provide a margin to brittle failure of the reactor vessel and piping of the reactor coolant pressure boundary (RCPB). The vessel (including its appurtenances) is the component most subject to brittle failure. Therefore, the LCO limits apply mainly to the vessel (including its appurtenances).

10 CFR 50, Appendix G (Ref. ~~1~~ 2), requires the establishment of P/T limits for material fracture toughness requirements of the RCPB materials. Reference ~~1~~ 1 requires an adequate margin to brittle failure during normal operation, anticipated operational occurrences, and system hydrostatic tests. It mandates the use of the ASME Code, Section ~~III~~ XI, Appendix G (Ref. ~~2~~ 3).

The P/T limit curves in this Specification were developed in accordance with the 1989 Edition of the ASME Code, Section XI, Appendix G (Ref. 3). These P/T limit curves were developed using the initiation fracture toughness, K_{Ic}, for the allowable material fracture toughness. The use of

(continued)

<u>INSERT #1</u> (Page B 3.4-39)

Development of the curves considered instrument uncertainty values of 10°F for temperature and 15 psig for pressure plus an additional 15 psig for pressure instrument location (Ref. 1).

BASES

BACKGROUND (continued)

K_{IC} for development of P/T limit curves has been approved by the ASME through Code Case N-640 (Ref. 4).

The actual shift in the RT_{NDT} of the vessel material will be established periodically by removing and evaluating the irradiated reactor vessel material specimens, in accordance with the UFSAR (Ref. 5) and Appendix H of 10 CFR 50 (Ref. 6). The operating P/T limit curves will be adjusted, as necessary, based on the evaluation findings and the recommendations of Reference 7.

INSERT #2

~~The P/T limit curves are composite curves established by superimposing limits derived from stress analyses of those portions of the reactor vessel and head that are the most restrictive. At any specific pressure, temperature, and temperature rate of change, one location within the reactor vessel will dictate the most restrictive limit. Across the span of the P/T limit curves, different locations are more restrictive, and, thus, the curves are composites of the most restrictive regions.~~

The heatup curve represents a different set of restrictions than the cooldown curve because the directions of the thermal gradients through the vessel wall are reversed. The thermal gradient reversal alters the location of the tensile stress between the outer and inner walls.

The criticality limits include the Reference ~~1~~ 2 requirement that they be at least 40°F above the noncritical heatup curve or the cooldown curve and not lower than the minimum permissible temperature for the inservice leakage and hydrostatic testing.

The consequence of violating the LCO limits is that the RCS has been operated under conditions that can result in brittle failure of the RCPB, possibly leading to a nonisolable leak or loss of coolant accident. In the event these limits are exceeded, an evaluation must be performed to determine the effect on the structural integrity of the RCPB components. ASME Code, Section XI, Appendix E (Ref. 8), provides a recommended methodology for evaluating an operating event that causes an excursion outside the limits.

(continued)

<u>INSERT #2</u> (Page B 3.4-40)

The bounding P/T limit curves are based on the N16 instrumentation nozzles. These nozzles are located at the top of the beltline region and were determined to be the limiting material with respect to the P/T curves.

BASES (continued)

APPLICABLE SAFETY ANALYSES

The P/T limits are not derived from Design Basis Accident (DBA) analyses. They are prescribed during normal operation to avoid encountering pressure, temperature, and temperature rate of change conditions that might cause undetected flaws to propagate and cause nonductile failure of the RCPB, a condition that is unanalyzed. Reference 9 provides the curves and limits in this Specification. Since the P/T limits are not derived from any DBA, there are no acceptance limits related to the P/T limits. Rather, the P/T limits are acceptance limits themselves since they preclude operation in an unanalyzed condition.

RCS P/T limits satisfy Criterion 2 of 10 CFR 50.36(c)(2)(ii) (Ref. 10).

LCO

The elements of this LCO are:

a. RCS pressure and temperature are within the applicable limits specified in Figures 3.4.9-1 and 3.4.9-2, and heatup or cooldown rates are ≤ 100°F in any 1 hour period, during RCS heatup and cooldown;

b. RCS pressure and temperature are within the applicable limits in Figure 3.4.9-3, 3.4.9-4, or 3.4.9-5 ~~3.4.9-3 or 3.4.9-4,~~ and heatup or cooldown rates are ≤ 30°F in any 1 hour period, during RCS inservice leak and hydrostatic testing;

c. The temperature difference between the reactor vessel bottom head coolant and the reactor pressure vessel (RPV) coolant is ≤ 145°F during recirculation pump startup;

d. The temperature difference between the reactor coolant in the respective recirculation loop and in the reactor vessel is ≤ 50°F during recirculation pump startup;

e. RCS pressure and temperature are within the criticality limits specified in Figure 3.4.9-2, prior to achieving criticality; and

f. The reactor vessel flange and the head flange temperatures are ≥ 70°F when tensioning the reactor vessel head bolting studs.

(continued)

BASES

LCO (continued)

These limits define allowable operating regions and permit a large number of operating cycles while also providing a wide margin to nonductile failure.

The rate of change of temperature limits control the thermal gradient through the vessel wall and are used as inputs for calculating the heatup, cooldown, and inservice leakage and hydrostatic 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.

Violation of the limits places the reactor vessel outside of the bounds of the stress analyses and can increase stresses in other RCS components. The consequences depend on several factors, as follows:

a. The severity of the departure from the allowable operating pressure temperature 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.

APPLICABILITY

The potential for violating a P/T limit exists at all times. For example, P/T limit violations could result from ambient temperature conditions that result in the reactor vessel metal temperature being less than the minimum allowed temperature for boltup. Therefore, this LCO is applicable even when fuel is not loaded in the core.

ACTIONS

A.1 and A.2

Operation outside the P/T limits while in MODES 1, 2, and 3 must be corrected so that the RCPB is returned to a condition that has been verified as safe by stress analyses.

The 30 minute Completion Time reflects the urgency of restoring the parameters to within the analyzed range. Most violations will not be severe, and the activity can be accomplished in this time in a controlled manner.

(continued)

BASES

ACTIONS

A.1 and A.2 (continued)

Besides restoring operation within acceptable limits, an engineering evaluation is required to determine if RCS operation can continue. This engineering evaluation will determine the effect of the P/T limit violation on the fracture toughness properties of the RCS. The evaluation must verify the RCPB integrity remains acceptable and must be completed if continued operation is desired. Several methods may be used, including comparison with pre-analyzed transients in the stress analyses, new analyses, or inspection of the components.

ASME Code, Section XI, Appendix E (Ref. 8), may be used to support the evaluation. However, its use is restricted to evaluation of the vessel beltline.

The 72 hour Completion Time is reasonable to accomplish the evaluation of a mild violation. More severe violations may require special, event specific stress analyses or inspections. A favorable evaluation must be completed if continued operation is desired.

Condition A is modified by a Note requiring Required Action A.2 be completed whenever the Condition is entered. The Note emphasizes the need to perform the evaluation of the effects of the excursion outside the allowable limits. Restoration alone per Required Action A.1 is insufficient because higher than analyzed stresses may have occurred and may have affected the RCPB integrity.

B.1 and B.2

If a Required Action and associated Completion Time of Condition A are not met, the plant must be placed in a lower MODE because either the RCS remained in an unacceptable P/T region for an extended period of increased stress, or a sufficiently severe event caused entry into an unacceptable region. Either possibility indicates a need for more careful examination of the event, best accomplished with the RCS at reduced pressure and temperature. With the reduced pressure and temperature conditions, the possibility of propagation of undetected flaws is decreased.

(continued)

BASES

ACTIONS

B.1 and B.2 (continued)

Pressure and temperature are reduced by placing the plant in at least MODE 3 within 12 hours and in MODE 4 within 36 hours. The allowed Completion Times are reasonable, based on operating experience, to reach the required plant conditions from full power conditions in an orderly manner and without challenging plant systems.

C.1 and C.2

Operation outside the P/T limits in other than MODES 1, 2, and 3 (including defueled conditions) must be corrected so that the RCPB is returned to a condition that has been verified as safe by stress analyses. The Required Action must be initiated without delay and continued until the limits are restored. With the applicable limits of Figure ~~3.4.9-3 or 3.4.9-4~~ 3.4.9-3, 3.4.9-4, or 3.4.9-5 exceeded during inservice hydrostatic and leak testing operations, the maximum temperature change shall be limited to 10°F in any 1 hour period during restoration of the P/T limit parameters to within limits.

Besides restoring the P/T limit parameters to within limits, an engineering evaluation is required to determine if RCS operation is allowed. This engineering evaluation will determine the effect of the P/T limit violation on the fracture toughness properties of the RCS. This evaluation must verify that the RCPB integrity is acceptable and must be completed before approaching criticality or heating up to > 212°F. Several methods may be used, including comparison with pre-analyzed transients, new analyses, or inspection of the components. ASME Code, Section XI, Appendix E (Ref. 8), may be used to support the evaluation; however, its use is restricted to evaluation of the beltline.

Condition C is modified by a Note requiring Required Action C.2 to be completed whenever the Condition is entered. The Note emphasizes the need to perform the evaluation of the effects of the excursion outside the allowable limits. Restoration alone per Required Action C.1 is insufficient because higher than analyzed stresses may have occurred and may have affected the RCPB integrity.

(continued)

BASES (continued)

SURVEILLANCE REQUIREMENTS

SR 3.4.9.1 and SR 3.4.9.2

Verification that operation is within limits is required every 30 minutes when RCS pressure and temperature conditions are undergoing planned changes. This Frequency is considered reasonable in view of the control room indication available to monitor RCS status. Also, since temperature rate of change limits are specified in hourly increments, 30 minutes permits a reasonable time for assessment and correction of minor deviations.

Surveillance for heatup, cooldown, or inservice leakage and hydrostatic testing may be discontinued when the criteria given in the relevant plant procedure for ending the activity are satisfied.

SR 3.4.9.1 is modified by a Note that requires the Surveillance to be performed only during system heatup and cooldown operations. SR 3.4.9.2 is modified by a Note that requires the Surveillance to be performed only during inservice leakage and hydrostatic testing.

SR 3.4.9.3

A separate limit is used when the reactor is approaching criticality. Consequently, the RCS pressure and temperature must be verified within the appropriate limits before withdrawing control rods that will make the reactor critical.

Performing the Surveillance within 15 minutes before control rod withdrawal for the purpose of achieving criticality provides adequate assurance that the limits will not be exceeded between the time of the Surveillance and the time of the control rod withdrawal.

SR 3.4.9.4 and SR 3.4.9.5

Differential temperatures within the applicable limits ensure that thermal stresses resulting from the startup of an idle recirculation pump will not exceed design allowances.

(continued)

BASES

SURVEILLANCE REQUIREMENTS

SR 3.4.9.4 and SR 3.4.9.5 (continued)

Performing the Surveillance within 30 minutes before starting the idle recirculation pump provides adequate assurance that the limits will not be exceeded between the time of the Surveillance and the time of the idle pump start.

An acceptable means of demonstrating compliance with the differential temperature requirement of SR 3.4.9.4 is to compare the temperature of the reactor coolant in the dome to the bottom head drain temperature.

As specified in procedures, an acceptable means of demonstrating compliance with the temperature differential requirement in SR 3.4.9.5 is to compare the temperatures of the operating recirculation loop and the idle loop.

SR 3.4.9.4 and SR 3.4.9.5 are modified by a Note that requires the Surveillance to be met only in MODES 1, 2, 3, and 4. In MODE 5, the overall stress on limiting components is lower. Therefore, ΔT limits are not required. The Note also states the SR is only required to be met during recirculation pump startup, since this is when the stresses occur.

SR 3.4.9.6, SR 3.4.9.7, and SR 3.4.9.8

Limits on the reactor vessel flange and head flange temperatures are generally bounded by the other P/T limits during system heatup and cooldown. However, operations approaching MODE 4 from MODE 5 and in MODE 4 with RCS temperature less than or equal to certain specified values require assurance that these temperatures meet the LCO limits.

The flange temperatures must be verified to be above the limits 30 minutes before and while tensioning the vessel head bolting studs to ensure that once the head is tensioned the limits are satisfied. When in MODE 4 with RCS temperature $\leq$ 80°F, 30 minute checks of the flange temperatures are required because of the reduced margin to the limits. When in MODE 4 with RCS temperature $\leq$ 100°F, monitoring of the flange temperature is required every 12 hours to ensure the temperature is within the specified limits.

(continued)

BASES

SURVEILLANCE REQUIREMENTS

SR 3.4.9.6, SR 3.4.9.7, and SR 3.4.9.8 (continued)

The 30 minute Frequency reflects the urgency of maintaining the temperatures within limits, and also limits the time that the temperature limits could be exceeded. The 12 hour Frequency is reasonable based on the rate of temperature change possible at these temperatures.

SR 3.4.9.6 is modified by a Note that requires the Surveillance to be performed only when tensioning the reactor vessel head bolting studs. SR 3.4.9.7 is modified by a Note that requires the Surveillance to be initiated 30 minutes after RCS temperature is ≤ 80°F in MODE 4. SR 3.4.9.8 is modified by a Note that requires the Surveillance to be initiated 12 hours after RCS temperature is ≤ 100°F in MODE 4. The Notes contained in these SRs are necessary to specify when the reactor vessel flange and head flange temperatures are required to be verified to be within the specified limits.

REFERENCES

2. → ~~1.~~ 10 CFR 50, Appendix G.

1. → ~~2.~~ ~~ASME, Boiler and Pressure Vessel Code, Section III, Appendix G.~~

Calculation OB21-1029, "Instrument Uncertainty for RCS Pressure/Temperature Limits Curve," Revision 0.

3. 1989 Edition of the ASME Code, Section XI, Appendix G.

4. ASME Code Case N-640. "Alternate References Fracture Toughness for Development of P-T Limit Curves Section XI. Division 1."

5. UFSAR, Section 5.3.1.6 and Appendix 5.3B.

6. 10 CFR 50, Appendix H.

7. Regulatory Guide 1.99, Revision 2, May 1988.

8. ASME, Boiler and Pressure Vessel Code, Section XI, Appendix E.

9. Calculation OB11-0005, Revision 1. "Development of RPV Pressure-Temperature Curves For BNP Units 1 and 2 For Up To 32 EFPY of Plant Operation," ~~dated November 8, 2000.~~

10. 10 CFR 50.36(c)(2)(ii).

Page	Revision
A-1	0
A-2	0
A-3	0
A-4	0
A-5	0

Record of Lead Review

Design Document 0B21-1029 Revision 0

The signature below of the Lead Reviewer records that:

- the review indicated below has been performed by the Lead Reviewer;
- appropriate reviews were performed and errors/deficiencies (for all reviews performed) have been resolved and these records are included in the design package;
- The review was performed in accordance with EGR-NGCC-0003.

___ **Design Verification Review** ✓ **Engineering Review** ___ **Owner's Review**

___ Design Review
___ Alternate Calculation
___ Qualification Testing

___ **Special Engineering Review**

___ **YES** ___ **N/A** Other Records are attached

Jim McPadden / See Cover Page — Lead Reviewer (print/sign)
I&C — Discipline
4/19/02 — Date

Item No.	Deficiency	Resolution
1	Page iv – Delete reference to Scaling Calculation. Technical Review (Non-Safety Related Document) should be listed as Appendix A	Appendix A is Record of Lead Review. Appendix B is Calc Index Table
2	Page 1 – Add drawings D-25020(02520)-3A, 3D to Loop 3 & 4.	Added Drawings
3	Page 3, Para 2.2 – The discussion on Acceptance Limits is not clear. Not sure what the relevance is. It would be helpful to include a discussion of safety significance of applying uncertainties to PT limits.	This discussion is directly from Tech Spec. 3.4.9 Bases, and is the bases for the P/T curve. Added discussion on instrument uncertainty.
4	Page 6, Para 5.3 – 0LP-PT016 specifies a tolerance of "30 psig for the recorder only. The process computer points and ERFIS tolerances are for the input signals only. This paragraph needs clarification to match the tolerance requirements stated in 0LP-PT016, Also, how can we take credit for a procedure change that we expect to take place some time in the future. There needs to be tight controls to ensure that this would happen prior to the time that this calc is invoked	0LP-PT016 is a loop cal. The tolerance on Pg. 30 is for the ERFIS point and is "30 psig. This tolerance is much too sloppy for a computer point. I have agreement from D. Dorsett and James Jeralds to change this to "9 psig with PAR 2002-0093, -0094

Record of Lead Review (Continued)

5	Page 6, Para. 5.4 and 5.5 – Need to ensure that a action is in place such as the initiation of a PAR. To make this assumption valid.	PAR 2002-0093, -0094 initiated.
6	Page 7, Para 6.1.1.1 – The description of what lines the transmitters tap into does not agree with P&ID D-25020 and D-02520.	PT-N0905 taps off the same sensing line as PT-N045. PT-N008 does not. However, sensing lines are similar. Therefore revised discussion to use same PME/PE based on similarity.
7	Page 8 Para 6.1.1.2 – Discussion on transmitter tap locations incorrect. Similar to above.	Same as above.
8	Page 9 URL:for 1(2)-C32PA103 should be 300	OK as is. Span = 300. URL = 1100 (800 to 1100)
9	Page 10 Para 6.1.1.4 – This writeup is confusing and it seems to be making a case for eliminating the accuracy term from RA because it is bounded by the cal tolerance. . NGGC-0153 Section 9.5.1 states that if the cal tolerance is greater than the RA, it may be used in place of the RA. This is not taken to mean that the RA can be eliminated from the uncertainties. Rather, it is stated that if the RA does not account for linearity, hysteresis and repeatability and the calibration methods test for these items, then the calibration tolerance can be used as the reference accuracy value. Then both terms would be included in the total uncertainty of the device.	Used both RA and CAL for conservatism.
10	Page 10 – Column heading RA EQUATION does not contain any equations below. Why not just have a heading of RA. This is typical throughout the tables.	The equation is % X Span or % X FS, etc. This is used to distinguish between the formula and the actual value of RA.
11	Page 11 Para 6.1.1.5 – The assumption that drift is included in the RA is not consistent with NGGC-0153 Section 9.4.2. If historical data is used, it should be documented as part of the calc and included as an Appendix.	This assumption is based on a review of the historical calibrations that show the devices have typically been found within the As-Left tolerances. A formal drift analysis is now deemed warranted for this non-safety related function.
12	Page 11 – the drift value for 1(2)-C32-LPR-R608 could not be found on reference FP-82886.	No drift value is specified. Removed the drift error.
13	Page 12 – TE for loops 3, 4, & 5 should be (0.0075)(3000) + (0.005)(1500)= 7.5	Corrected.
14	Page 15 – The cal tolerance for loop 3 only accounts for the recorder per 0LP-PT016. It does not cover the entire loop.	0PL-PT016 is a loop cal. The signal is input to xmtr and read at recorder.

Record of Lead Review (Continued)

15	Page 15 – See comment for Assumption 5.3	See resolution for 5.3
16	Page 15 – Need to define how the 30.00 cal tolerance value for loop 5 is calculated.	Loop 5 is a loop cal. Therefore tolerance is for the entire loop.
17	Page 7 – Need to review values pending resolution of previous comments.	See resolution to previous comment
18	Page 18 Para 6.1.2.4 – See previous comment #9 regarding issue of cal tolerance and reference accuracy	Included RA and Cal for conservatism.
19	Page 19 – No value is provided for reference accuracy of the T/Cs based on the fact that it is bounded by the cal tolerance. NGGC-0153 Section 9.5.1 states that if the cal tolerance is greater than the RA, it may be used in place of the RA. This is not taken to mean that the RA can be eliminated from the uncertainties. Rather, it is stated that if the RA does not account for linearity, hysteresis and repeatability and the calibration methods test for these items, then the calibration tolerance can be used as the reference accuracy value. Calibration tolerance and Reference Accuracy must be included	Added RA = 0.75%. Included RA and Cal for conservatism
20	Page 19 – It is unclear why the Reference Accuracy Column is identified as "RA EQUATION" No equations are provided. Also why is there a vertical line between the RA value and the word "SPAN"	RA equation is % X Span. This is used to distinguish between RA Equation and actual value calculated.
21	Page 22 – Step 6.1.2.11 states that 0PIC-T/C001 uses a tolerance of 0.75% as cal tolerance. This does not agree with the data sheets contained in the 0PIC.	This will be changed per PAR. See assumption 5.4.
22	Page 22 – Cal Tolerance for T/Cs are listed as "4.50. How is this derived?	See assumption 5.4.
23	Page 22 – 0PIC-UR021 does not provide a cal tolerance value for 1(2)-B32-TR-R650. Provide a basis for the 3 oF cal tolerance.	Cal tolerance is per EDB
24	Page 22 – A cal tolerance of 3.00 is listed for 1(2)-G31-TA018. Procedure –SPP-ERF002 specifies a tolerance of 12.	This will be changed per PAR.
25	Page 22 – 0PIC-T/C001 uses a variable tolerance that increases toward higher temp. values. Calc specifies a flat 0.75%.	Cal will be changed to 0.75% per PAR.

Record of Lead Review (Continued)

26	Page 22 – It is stated that 0PIC-T/C001a cal values will be revised at some time in the future. How can we use these values now without the revised procedure in place?	Par 2002-0093 added.
27	Page 22 – Need to reference Assumption 5.4 as the basis for the 3.00 calibration	Incorporated
28	Page 25 – Values must be reviewed pending resolution of previous comments	Comment noted
29	Page 26 - Values must be reviewed pending resolution of previous comments	Comment noted.

FORM EGR-NGGC-0003-2-5

This form is a QA Record when completed and included with a completed design package. Owner's Reviews may be processed as stand alone QA records when Owner's Review is completed

APPENDIX B

CALCULATION INDEX TABLE

Page	Revision
B-1	0
B-2	0
B-3	0

CALCULATION INDEXING TABLE

FORM OENP-303-2 (11/99)

Kind of Plant Document i.e. Calc, Dwg. Procedure, Etc.	Document, Software or Tag Number	Input or Output	Description of Relationship to Subject Calc. (Basis for Cross - Reference)
EQUIP	1(2)-C32-PT-N008	INPUT	EDB TAG
EQUIP	1(2)-C32-PR-R609	INPUT	EDB TAG
EQUIP	1(2)-C32-PT-N005A(B)	INPUT	EDB TAG
EQUIP	1(2)-C32-LC-R602A(B)	INPUT	EDB TAG
EQUIP	1(2)-C32-LPR-R608	INPUT	EDB TAG
EQUIP	1(2)-B21-PT-N045A(D)	INPUT	EDB TAG
EQUIP	1(2)-B21-PTM-N045A(D)	INPUT	EDB TAG
EQUIP	1(2)-B21-PI-R605A(B)	INPUT	EDB TAG
EQUIP	1(2)-B32-TE-N035A(B)	INPUT	EDB TAG
EQUIP	1(2)-B32-TY-K640A(B)	INPUT	EDB TAG
EQUIP	1(2)-B32-TR-R650	INPUT	EDB TAG
EQUIP	1(2)-E11-TE-N004A(B)	INPUT	EDB TAG
EQUIP	1-E11-TE-N027A	INPUT	EDB TAG
EQUIP	1-E11-TE-N027B	INPUT	EDB TAG
EQUIP	2-E11-TE-N027A(B)	INPUT	EDB TAG
EQUIP	1(2)-E41-TR-R605 Points	INPUT	EDB TAG
EQUIP	1(2)-G31-TE-N042	INPUT	EDB TAG
EQUIP	1(2)-G31-CS-N601	INPUT	EDB TAG
EQUIP	1(2)-G31-TY-K601	INPUT	EDB TAG
EQUIP	1(2)-G31-TI-R607	INPUT	EDB TAG
EQUIP	1-B21-TE-N028A1	INPUT	EDB TAG
EQUIP	2-B21-TE-N028A1	INPUT	EDB TAG
EQUIP	1-B21-TE-N028B1	INPUT	EDB TAG
EQUIP	2-B21-TE-N028B1	INPUT	EDB TAG
EQUIP	1-B21-TE-N030L3	INPUT	EDB TAG
EQUIP	2-B21-TE-N030L2	INPUT	EDB TAG
EQUIP	1(2)-B21-TE-N050A2	INPUT	EDB TAG
EQUIP	1(2)-G31-TE-N042	INPUT	EDB TAG
EQUIP	1(2)-B21-TE-N030B2	INPUT	EDB TAG
EQUIP	1(2)-B21-TE-N030B3	INPUT	EDB TAG
EQUIP	1(2)-B21-TE-N050A3	INPUT	EDB TAG
EQUIP	1-C11-TR-R018	INPUT	EDB TAG
EQUIP	2-C12-TR-R018	INPUT	EDB TAG
CALC		OUTPUT	RCS P/T LIMIT CURVES
POM	0PIC-PT001	INPUT	CAL PROCEDURE
POM	0PIC-UR004	INPUT	CAL PROCEDURE
POM	0LP-PT016	INPUT	CAL PROCEDURE
POM	1(2)MST-ATWS22R	INPUT	CAL PROCEDURE
POM	0PIC-T/C001	INPUT	CAL PROCEDURE
POM	0PIC-CNV008	INPUT	CAL PROCEDURE
POM	0PIC-UR021	INPUT	CAL PROCEDURE
POM	0PIC-UR001B	INPUT	CAL PROCEDURE
POM	0PIC-UI002	INPUT	CAL PROCEDURE
POM	0PIC-T/C001A	INPUT	CAL PROCEDURE

CALCULATION INDEXING TABLE **FORM OENP-303-2 (11/99)**

Kind of Plant Document i.e. Calc, Dwg. Procedure, Etc.	Document, Software or Tag Number	Input or Output	Description of Relationship to Subject Calc. (Basis for Cross - Reference)
POM	0PIC-UR011D	INPUT	CAL PROCEDURE
VTMA	FP-50714 V10 P02	INPUT	TECH MANUAL
VTMA	FP-82052	INPUT	TECH MANUAL
VTMA	FP-70262	INPUT	TECH MANUAL
VTMA	FP-84200	INPUT	TECH MANUAL
VTMA	FP-82886	INPUT	TECH MANUAL
VTMA	FP-83130	INPUT	TECH MANUAL
VTMA	FP-75090	INPUT	TECH MANUAL
VTMA	FP-7396	INPUT	TECH MANUAL
VTMA	FP-219	INPUT	TECH MANUAL
VTMA	FP-9301	INPUT	TECH MANUAL
VTMA	FP-81309	INPUT	TECH MANUAL
VTMA	FP-82021	INPUT	TECH MANUAL
VTMA	FP-83860	INPUT	TECH MANUAL
SPEC	252-064	INPUT	TC SPEC