R.E. Ginna Nuclear Power Plant

Core Operating Limits Report

Cycle 25

Draft B

Note: This report is not part of the Technical Specifications. This report is referenced in the Technical Specifications.

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1.0 CORE OPERATING LIMITS REPORT

This Core Operating Limits Report (COLR) for Ginna Station has been prepared in accordance with the requirements of Technical Specification 5.6.5.

The Technical Specifications affected by this report are listed below:

3.1.1	"SHUTDOWN MARGIN (SDM)"
3.1.3	"MODERATOR TEMPERATURE COEFFICIENT (MTC)"
3.1.5	"Shutdown Bank Insertion Limit"
3.1.6	"Control Bank Insertion Limits"
3.2.1	"Heat Flux Hot Channel Factor (F_Q)"
3.2.2	"Nuclear Enthalpy Rise Hot Channel Factor ($F^N_{\Delta H}$)"
3.2.3	"AXIAL FLUX DIFFERENCE (AFD)"
3.4.1	"RCS Pressure, Temperature, and Flow Departure from Nucleate Boiling (DNB) Limits"
3.9.1	"Boron Concentration"

2.0 OPERATING LIMITS

The cycle-specific parameter limits for the specifications listed in Section 1.0 are presented in the following subsections. These limits have been developed using the NRC approved methodologies specified in Technical Specification 5.6.5. All items that appear in capitalized type are defined in Technical Specification 1.1, "Definitions."

2.1 SHUTDOWN MARGIN (LCO 3.1.1)
(Limits generated using Reference 1)

2.1.1 The SHUTDOWN MARGIN in MODE 2 with $K_{eff} < 1.0$ and MODES 3 and 4 when the reactor coolant pumps are OPERABLE and in operation shall be greater than or equal to the limits specified in Figure 1.

2.1.2 The SHUTDOWN MARGIN in MODE 4 when the reactor coolant pumps are not OPERABLE and in MODE 5 shall be greater than or equal to the one loop operation curve of Figure 1.

2.2 MODERATOR TEMPERATURE COEFFICIENT (LCO 3.1.3)
(Limits generated using Reference 1)

2.2.1 The Moderator Temperature Coefficient (MTC) limits are:

The ARO/HZP - MTC shall be less positive than +5.0 pcm/°F for power levels below 70% RTP and less than or equal to 0 pcm/°F for power levels at or above 70% RTP.

The ARO/RTP - MTC shall be less negative than -42.9 pcm/°F.

where: ARO stands for All Rods Out
HZP stands for Hot Zero THERMAL POWER
RTP stands for RATED THERMAL POWER

2.3 Shutdown Bank Insertion Limit (LCO 3.1.5)
(Limits generated using Reference 1)

2.3.1 The shutdown bank shall be fully withdrawn which is defined as > 221 steps.

2.4 Control Bank Insertion Limits (LCO 3.1.6)
(Limits generated using Reference 1)

2.4.1 The control banks shall be limited in physical insertion as shown in Figure 2.

2.4.2 The control banks shall be moved sequentially with a 100 (±5) step overlap between successive banks.

2.5 Heat Flux Hot Channel Factor (F_Q) (LCO 3.2.1)
(Limits generated using References 1 and 2)

2.5.1 $F_Q(Z) \leq \frac{(F_Q)}{P} * K(Z)$ when P > 0.5

$F_Q(Z) \leq \frac{(F_Q)}{0.5} * K(Z)$ when P ≤ 0.5

where: Z is the height in the core,

$F_Q = 2.32$,

K(Z) is provided in Figure 3, and

$P = \frac{\text{THERMAL POWER}}{\text{RATED THERMAL POWER}}$

2.6 Nuclear Enthalpy Rise Hot Channel Factor ($F^N_{\Delta H}$) (LCO 3.2.2)
(Limits generated using Reference 1)

2.6.1 $F^N_{\Delta H} \leq F^{RTP}_{\Delta H} * (1 + PF_{\Delta H} * (1-P))$

where: $F^{RTP}_{\Delta H} = 1.66$,

$PF_{\Delta H} = 0.3$, and

$P = \frac{\text{THERMAL POWER}}{\text{RATED THERMAL POWER}}$

2.7 AXIAL FLUX DIFFERENCE (LCO 3.2.3)
(Limits generated using References 1 and 3)

2.7.1 The AXIAL FLUX DIFFERENCE (AFD) target band is ± 5%.

2.7.2 The AFD acceptable operation limits are provided in Figure 4.

2.8 <u>RCS Pressure, Temperature, and Flow Departure from Nucleate Boiling (DNB) Limits</u> (LCO 3.4.1)
(Limits generated using Reference 4)

2.8.1 The pressurizer pressure shall be ≥ 2205 psig.

2.8.2 The RCS average temperature shall be ≤ 577.5 °F.

2.8.3 The RCS total flow rate shall be ≥ 170,200 gpm.

2.9 <u>Boron Concentration</u> (LCO 3.9.1)
(Limits generated using References 1 and 5)

2.9.1 The boron concentrations of the hydraulically coupled Reactor Coolant System, the refueling canal, and the refueling cavity shall be ≥ 2000 ppm.

3.0 <u>UFSAR CHAPTER 15 ANALYSIS SETPOINTS AND INPUT PARAMETERS</u>

The setpoints and input parameters for the UFSAR Chapter 15 accident analyses are presented in Table 1. The values presented in this table are organized based on system and major components within each system. The failure of a component or system to meet the specified Table 1 value does not necessarily mean that the plant is outside the accident analyses since: (1) an indicated value above or below the Table 1 values may be bounded by the Table 1 values, and (2) the setpoint or parameter may not significantly contribute to the accident analyses final results. The major sections within Table 1 are:

1.0 Reactor Coolant System (RCS)
2.0 Main Feedwater (MFW)
3.0 Auxiliary Feedwater (AFW)
4.0 Main Steam (MS) System
5.0 Turbine Generator (TG)
6.0 Chemical and Volume Control System (CVCS)
7.0 Emergency Core Cooling System (ECCS)
8.0 Containment
9.0 Control Systems
10.0 Safety System Setpoints
11.0 Steam Generators

4.0 REFERENCES

1. WCAP-9272-P-A, Westinghouse Reload Safety Evaluation Methodology, July 1985.

2. WCAP-9220-P-A, Westinghouse ECCS Evaluation Model-1981 Version, Rev. 1, February 1982.

   OR

   WCAP-10054-P-A and WCAP-10081, "Westinghouse Small Break ECCS Evaluation Model Using the NOTRUMP Code," August 1985.

   WCAP-10924-P-A, Volume 1, Rev. 1, and Addenda 1,2,3, "Westinghouse Large-Break LOCA Best-Estimate Methodology, Volume 1: Model Description and Validation," December 1988.

   WCAP-10924-P-A, Volume 2, Rev. 2, and Addenda, "Westinghouse Large-Break LOCA Best-Estimate Methodology, Volume 2: Application to Two-Loop PWRs Equipped with Upper Plenum Injection," December 1988.

   WCAP-10924-P-A, Rev. 2 and WCAP-12071, "Westinghouse Large-Break LOCA Best Estimate Methodology, Volume 2: Application to Two-Loop PWRs Equipped With Upper Plenum Injection, Addendum 1: Responses to NRC Questions," December 1988.

   WCAP-10924-P, Volume 1, Rev. 1, Addendum 4, "Westinghouse LBLOCA Best Estimate Methodology; Model Description and Validation; Model Revisions," August 1990.

3. WCAP-8395, "Power Distribution Control and Load Following Procedures - Topical Report," September 1974.

4. WCAP-11397-P-A, "Improved Thermal Design Procedure", April 1989.

5. WCAP-11596-P-A, "Qualification of the PHOENIX-P/ANC Nuclear Design System for Pressurized Water Reactor Cores," June 1988.

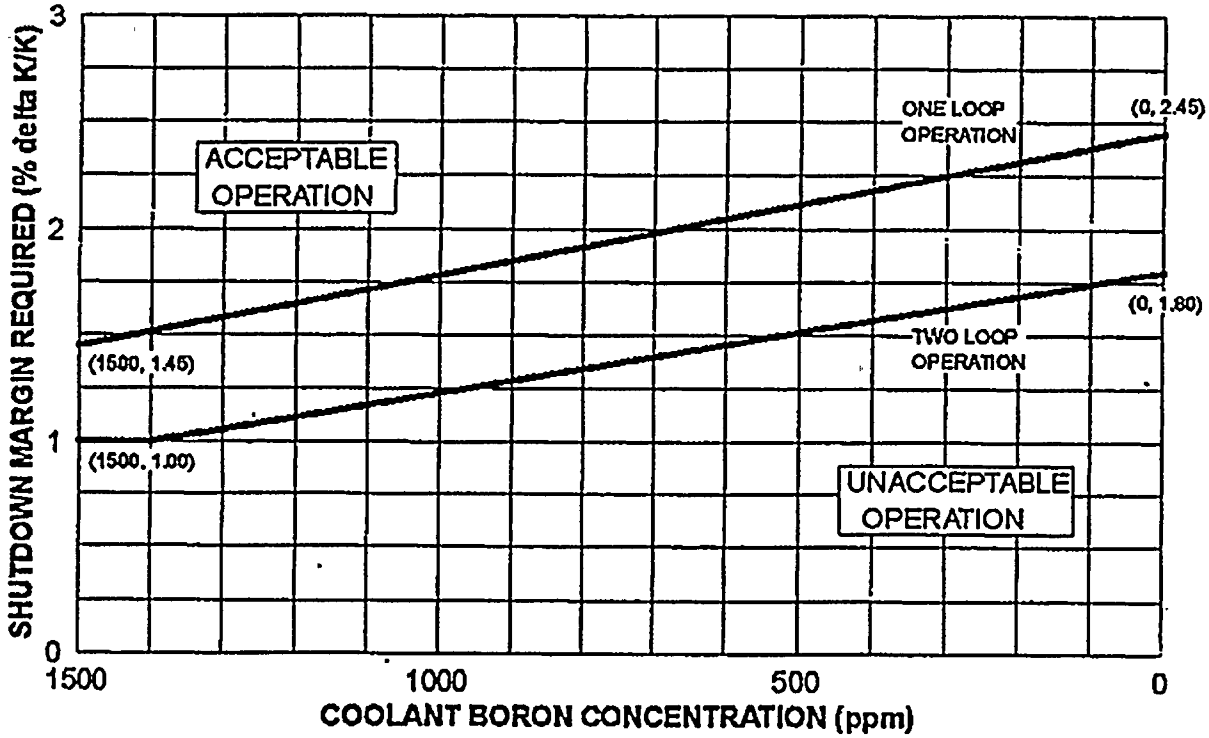
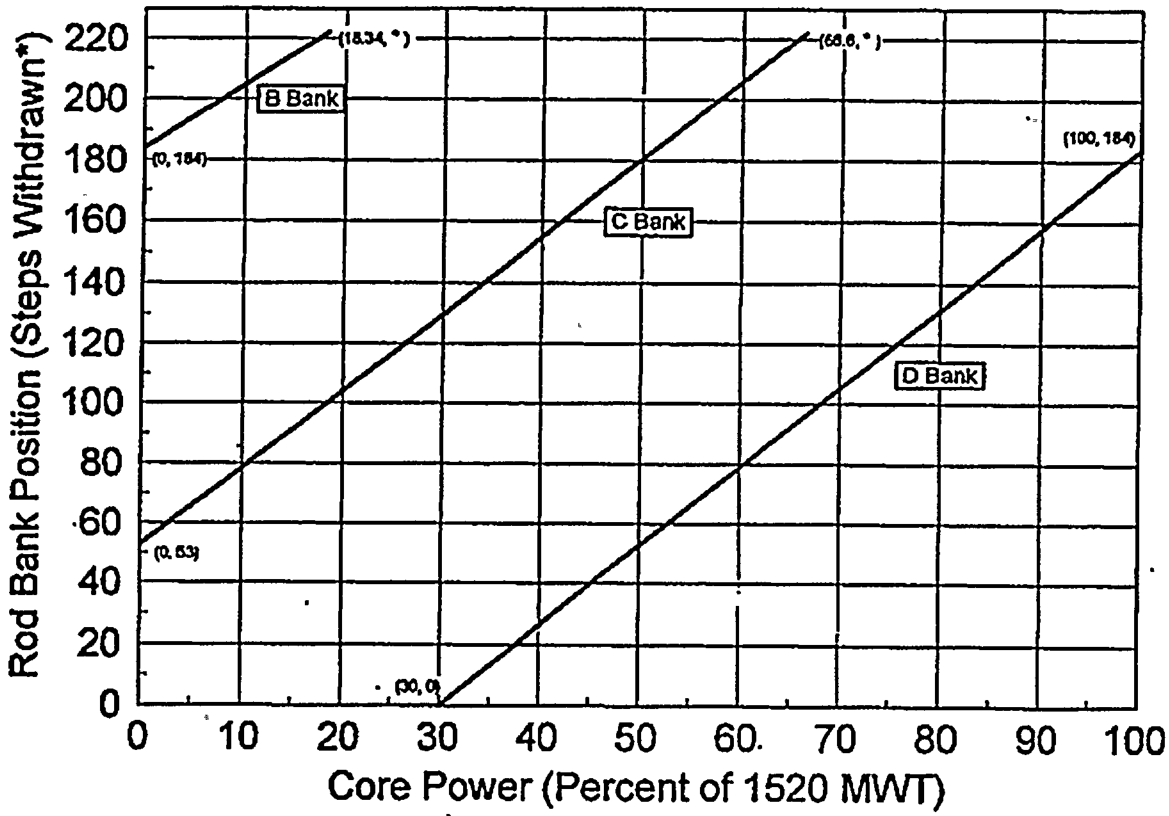


FIGURE 1
REQUIRED SHUTDOWN MARGIN



* The fully withdrawn position is defined as ≥222 steps.

FIGURE 2
CONTROL BANK INSERTION LIMITS

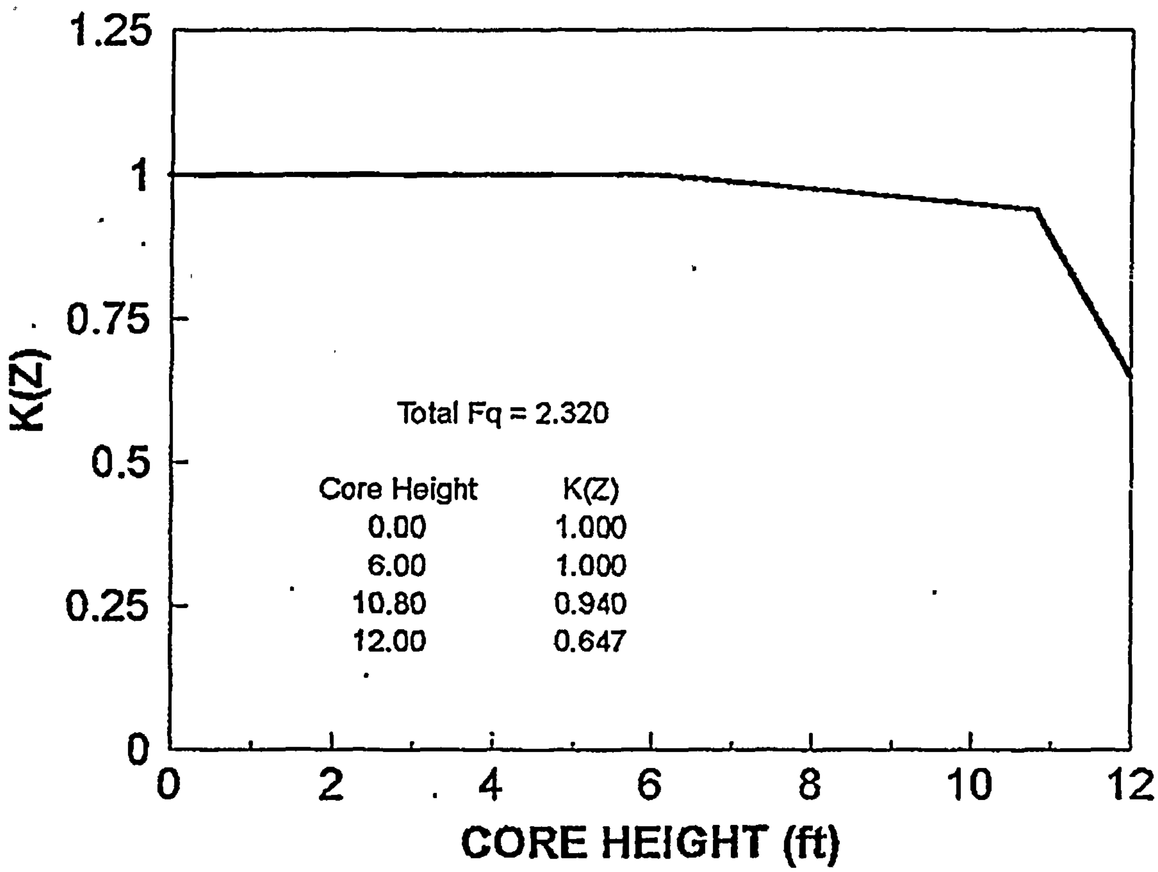


FIGURE 3
K(Z) - NORMALIZED $F_Q(Z)$ AS A FUNCTION OF CORE HEIGHT

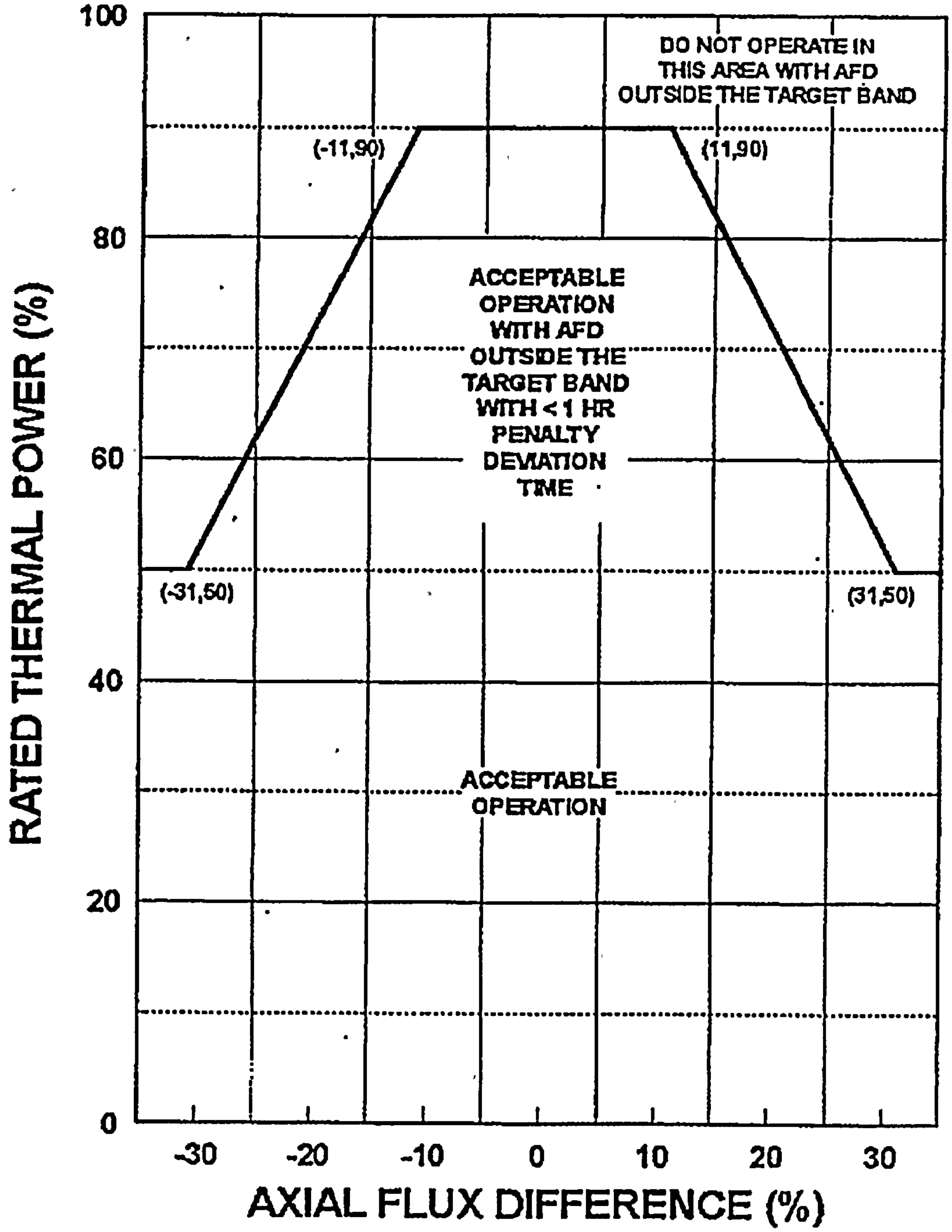


FIGURE 4
AXIAL FLUX DIFFERENCE ACCEPTABLE OPERATION LIMITS
AND TARGET BAND LIMITS AS A FUNCTION OF RATED THERMAL POWER

Item #	Item/Name	Value	Remarks:
1.0	Reactor Coolant System (RCS)		
	Upper head volume, ft^3	300.0	Above upper support plate.
	Upper Plenum volume, ft^3	580.2	Bottom of upper core plate to top of upper support plate. Includes outlet holes in the barrel.
	Top of fuel volume, ft^3	50.3	Top of active fuel to bottom of upper core plate, inside barrel baffle.
	Inlet nozzle(s) volume, total of two, ft^3	43.2	
	Outlet nozzle(s) volume, total of two, ft^3	37.4	Includes nozzle forging protrusion into vessel. Does not include mating hole in barrel, this is included in the Upper Plenum volume.
	Active fuel volume, ft^3	367.6	Bottom of fuel to top of fuel
	Bottom of fuel volume, ft^3	11.0	Top of lower core plate to bottom of active fuel.
	Lower Plenum volume, ft^3	514.3	Below top of lower core plate
	Downcomer volume, above bottom of cold leg, ft^3	138.4	Above bottom of cold leg elevation to bottom of upper support plate
	Downcomer, lower core plate to elevation of the bottom of the cold leg volume, ft^3	278.2	Top of lower core plate to elevation of bottom of cold leg
	Barrel baffle, lower core plate to upper core plate volume, ft^3	128.5	Top of lower core plate to bottom of upper core plate.
	Total volume, ft^3	2449.1	Includes nozzles
	Hot leg pipe volume per loop volume, ft^3	78.7	
	Cold leg volume per loop + cross over, ft^3	cross over = 140.7 cold leg = 46.8	
	RC pump volume per pump, ft^3	192	
	Cold leg pipe ID, in./Pump suction ID, in.	27.5/31	
	Hot leg pipe ID, in.	29 (28.969)	
	Design pressure, psig	2485	
	Design temperature, F	650	
	Cold Leg and Hot Leg Centerline Elevation	246' 10"	
1.1	Reactor Coolant Pump		
	Head-Capacity and NPSH curves for reactor coolant pumps/Homologous Curves	See NS&L	Homologous Curves are available in RETRAN
	Rated RC pump head and flow, ft & gpm	252; 90,000	
	Rated RC pump torque and efficiency @ rated head/flow, ft-lb, fraction	84% efficiency at hot conditions	
	RCP Pump Rated Power (hot, 556 degrees F)	4842 BHP	
	RCP Motor Rated Speed, RPM	1189	
	Moment of inertia of pump and motor, lb-ft^2	80,000	
	RC pump power, MWt (max/min)	10, 8	Pump power varies with RCS temp from approx 8 MWt to 10 MWt
1.2	Core		

Table 1: UFSAR Chapter 15 Analysis Setpoints and Input Parameters

Item #	Item/Name	Value	Remarks:
	Rated power, MWt	1520	
	Reactor power uncertainty, % RTP	2	
	Bypass prior to Thimble Plug Deletion, %	4.5	Needs to be updated to account for thimble plug deletion
	Upper head bypass, %	W proprietary	
	Upper head temperature, degrees F	596	Temperature can be used to back out the upper head bypass flow
	Heat transfer area, ft^2	26,669	
	Average core heat flux, Btu/hr-ft^2	189,440	
1.3	Fuel Assemblies		
1.3.1	Height		
	Total, inches (length from bottom of assembly to top nozzle)	159.935	
	Fuel Rod Length, inches (length from bottom of pin to top of pin)	149.138	
	Active, inches	141.4	
1.3.2	Fuel Assembly Geometry		
	Mass of fuel, lbm	105,500	
	Mass of clad, lbm	25,927	
	Number of fuel pins per fuel assembly (FA)	179	
	No. of Fuel Assemblies	121	
	Fuel pin pitch, in.	0.556	
	Bottom nozzle weight and volume	9.1 lbs. 31.5 in^3	
	Top nozzle, w/ insert, weight and volume	18.15 lbs. 62.9 in^3	
	Fuel Assembly resistance [core dP f(flow)], psi f(lb/hr)	core delta P = 20.4 psi @ flow = 186400 gpm	Note:this value includes thimble plugs. Thimble plugs are being removed. No plug values are 20.0 at 170,200
	Fuel Assembly free flow area, in^2	34.75	single assembly
1.3.3	Fuel pin geometry		
	Pellet diameter, in.	0.3444	
	Clad OD/ID, in./in.	0.400/0.3514	
1.3.4	Control Rod & Instrument Guide Tubes		
	No. of control rod guide tubes	16	
	No. of instrument guide tubes	1	
	Control Rod Guide tube upper part OD/ID, in./in.	0.49/0.528	
	Instrument Guide tube OD/ID, in./in.	0.395/0.350	
	Guide tube lower part OD/ID, in./in.	0.4445/0.4825	
	Control Rod Drop Times, maximums, sec.	Non-LOCA 2.4 LOCA 3.0	Allowances are added to the Tech Spec allowable value.

Table 1: UFSAR Chapter 15 Analysis Setpoints and Input Parameters

Item #	Item/Name	Value	Remarks:
	Control rod maximum withdrawal rate, in./min.	45	
	Control rod maximum insertion rate, pcm/sec.	90	
	Control rod insertion limits	See COLR	
	Hot channel radial peaking factor	1.66	
	Heat Flux Hot channel factor FQ	2.32	
1.4	Pressurizer		
	Code safety valve flow capacity, lbm/hr	288,000	Rating at 2485 psig plus 3% accumulation
	Code safety valve open time	0.8 sec seal clearing time	Crosby Model HB-BP-86, size 4K26
	Code safety valve setpoint	2485 psig	Tolerance is ± 3%.
	Spray valve number	2	
	Spray valve flow capacity, gpm/valve	200	
	Spray valve setpoint- start open/full open	2260/2310	Proportional
	Spray valve time constant, sec.	5	Assumed value
	PORV number	2	
	PORV flow capacity, lbm/hr	179,000	Steam flow at 2335 psig
	PORV Cv	50 gpm/(psid)1/2	Rating is for liquid relief. Valve characteristic is quick opening see Copes Vulcan Selecting and Sizing Control Valves 8/75, page 8, Table 18 for Cv vs travel curve.
	PORV open time	1.87 sec + transmitter	LTOPs transmitter is Foxboro E11GM-HSAE1, with a time response of 1 sec (time to 90% of final value for step input)
	PORV close time	3.95 sec + transmitter	LTOPs transmitter is Foxboro E11GM-HSAE1, with a time response of 1 sec (time to 90% of final value for step input)
	PORV setpoint [normal] open/close, psig	2335/2315	
	PORV setpoint [LTOP] open/close, psig	424	
	PORV blowdown characteristic		
	Heater capacity w/ bank capacity and setpoints, kW	800	
	Control banks	0 kW at 2250 psig and 400 kW at 2220 psig	
	Backup Heaters	Full on at 2210 psig and resets at 2220 psig	
	Minimum heater capacity required for LOOP, kW	100	
	Heater bank controller type	proportional 400 kW	
1.4.1	Pressurizer volume(s) (100% / 0% power)		
	Water, ft^3 (100% / 0% power)	396/199	
	Steam, ft^3 (100% / 0% power)	404/601	
	Total, ft^3	800	
	Pressurizer ID, ft-in	83.624 in / cladding thickness is 0.188 in	

Table 1: UFSAR Chapter 15 Analysis Setpoints and Input Parameters

Item #	Item/Name	Value	Remarks:
	Surge line ID, in.	8.75	Surge line is 10 in schedule 140
	Spray line ID, in.	3.062	
	Surge line volume, ft^3	18.4	
1.4.2	Pressurizer Level		
	Lower level tap elevation	257' 7	
	Upper level tap elevation	275' 1	
	Pressurizer level vs % power	%power Level 0 % 19.5% 100 % 49%	Pressurizer level is ramped linearly between these points.
	Distance Hot Leg Centerline to Lower Tap, ft	10.750	
	Maximum level allowed for steam bubble, %	87	
1.5	RCS Flows, Temperature and Pressures		
	Total reactor coolant flow, gpm (15% plugging)	170,200	Use for non DNB
	Total reactor coolant flow, gpm (15% plugging)	173,800	Use for statistical DNB
	Average reactor coolant temperature, degrees F (Full power/HZP)	573.5/547	
	Reactor coolant pressure, psig	2235	
	Reactor coolant flow uncertainty, % nominal	3.1	
	Reactor coolant temperature uncertainty, degrees F	4	
	Reactor coolant pressure uncertainty, psi	± 30	
	DNB Limit (safety analysis)	1.52 typical cell 1.51 thimble cell	
1.6	Low Temperature Overpressure Protection (LTOP)		
	Minimum RCS vent size, square inches	1.1	
	No. of SI pumps capable of injection (PORVs/vent)	0/1	
	Maximum pressurizer level for RCP start, %	38	
1.7	Fuel Handling/Dose Calculations		
	Maximum reactor coolant gross specific activity	100/Ē μCi/gm	
	Maximum reactor coolant dose equivalent I-131	1.0 μCi/gm	
	Maximum secondary coolant dose equivalent I-131	0.1 μCi/gm	
	Minimum reactor coolant boron concentration, ppm	2000	
	Minimum reactor coolant level	23 ft above flange	
	Minimum spent fuel pool level	23 ft above fuel	
	Minimum spent fuel pool boron concentration, ppm	300	
	Spent fuel pool temperature, degrees F (min/max)	50/180	
	Minimum spent fuel pool charcoal filter efficiency, % iodine removal	90	
	Minimum post accident charcoal filter efficiency, % iodine removal	90	

Table 1: UFSAR Chapter 15 Analysis Setpoints and Input Parameters

Item #	Item/Name	Value	Remarks:
	Minimum control room charcoal filter efficiency, % iodine removal	90	
	Minimum time between reactor criticality and fuel movement, hrs.	100	
	Source Terms used for dose calculations	TID 14844, WCAP-7823	
	Maximum Gas Decay Tank Xenon-133 concentration, C:	100,000	
2.0	Main Feedwater (MFW)		
	Feedwater temperature versus load	Power / Temperature 102% / 425 F 70% / 385 F 30% / 322 F 0% / 100 F	100% design temp is 432 degrees F
	Feedwater Suction Temperature vs Power, nominal	Power / Temperature 98% / 345 F 70% / 319 F 50% / 295 F 30% / 259 F	
	Feedwater Suction Pressure vs Power, nominal	Power / Pressure 98% / 277 psig 70% / 282 psig 50% / 305 psig 30% / 370 psig	
2.1	Head-Capacity and NPSH curves		
	Head-Capacity and NPSH curves for main feedwater pumps	See NS&L	Selected flow splits are provided for model validation.
	Main Feedwater pump - Rated Head	2150'	
	Main Feedwater pump - Rated Torque		
	Main Feedwater pump - Moment of Inertia		
	Elevation of steam generator inlet nozzle	289.612	
	Elevation of main feedwater pump, ft	257.75	Elevation is at center of shaft
	Elevation of condensate pump, ft	250.833	
	MFW regulating valve open time on demand, sec	5	
	MFW regulating valve close time on demand, sec	10	MFW transients use 20 sec stroke time
	MFW regulating valve Cv, full stroke	990	Assumed value. Actual value = 493.6.
	Low load MFW regulating valve Cv, (bypass valves)	48.7	Effective Cv: includes bypass line
	MFW Heater resistance (delta P)	see NS&L	Design data on the High Pressure Heaters (2 in parallel) is provided
3.0	Auxiliary Feedwater (AFW)		
	Minimum design temperature of the water source service water / CST (degrees F)	32(*), 50	Initial AFW water source are the CSTs located in the Service Bldg. Safety Related source is the Service Water system (lake). * Value different for CNMT integrity.
	Maximum design temperature of the water source service water / CST (degrees F)	80, 100	Initial AFW water source are the CSTs located in the Service Bldg. Safety Related source is the Service Water system (lake).

Table 1: UFSAR Chapter 15 Analysis Setpoints and Input Parameters

Item #	Item/Name	Value	Remarks:
	Startup time for the auxiliary feedwater pumps, sec	*	*TDAFW starts on LO level (17%) in both gens or UV on both unit 4Kv busses. MDAFW starts on SI (seq), or LO level either SG, or trip of both MFP or AMSAC
	Minimum delay for AFW start, sec	TDAFW - 0, MDAFW - 1	MDAFW acceleration time test results show approximately 1.5 s.
	Maximum delay for AFW start, sec	MDAFW - 47, TDAFW at LO Level both SGs	For MDAFW, LOOP on sequencer is 47 sec. TDAFW starts at nominal 17% in both SGs
	AFW control valve open time on demand, sec	N/A	MDAFW control valves are normally open and throttle closed to control flow between 200-230 gpm
	AFW control valve Cv[flow is f(dP)]	*	MDAFWP valves are 3 Rockwell model # A4006JKMY stop check valves. TDAFW control valves (4297, 4298) are 3 Fisher #470-HS.
	TDAFWP, maximum flow, gpm	600	
	AFW, minimum flows, both generators intact, gpm	TDAFWP 200/SG MDAFWP 200/SG	SBLOCA assumes 300 gpm per SG with the failure of one DG
	Minimum delay for standby AFW start, min	10	
4.0	**Main Steam System (MS)**		
	Location (and elevation) of condenser dump valves and atmospheric relief valves	CSD - elev 256' 8.875 ARV - elev 289' 0.563	
	Full load steam line pressure drop, psi	approx 45	This estimate, to the governor valves, is provided for comparison purposes only.
	MS Isolation valve close time [full open to full close] close time, sec	MSIV - 5.0 check valve - 1.0	The check valve is assumed to close in 1 sec under reverse flow.
	MS Isolation valve Cv [flow is f(dP)]	MSIV - 23500 check valve - 17580	
4.1	**Main Steam Code Safety Valves**		
	Number of valves (4 per line)	8	
	Valve flow capacities - Total, lbm/hr	6621000	Rated flow (3% accumulation per ASME, Section III): 1085 psig .... 797,700 lbm/hr (each) 1140 psig .... 837,600 lbm/hr (each)
	Valve Flow vs SG pressure (psia), total per bank (4 valves), lbm/sec.	1110 0 1115 40 1120 91 1125 141 1131 191 1136 222 1141 223 1151 225 1161 227 1166 228 1173 342 1181 494 1190 646 1200 799 1205 859 1209 920 1211 931	

Table 1: UFSAR Chapter 15 Analysis Setpoints and Input Parameters

Item #	Item/Name	Value	Remarks:
	Number of valves in bank	4	
	Valve setpoint(s), (first/last three), nominal, psig	1085/1140	Valves are Crosby #HA-65 6R10 Setpoint tolerance is -1% / +3%. Model valve setpoint at 1.01 (nominal), and full flow at 1.04 (nominal).
	Valve blowdown characteristic	15% maximum	
4.2	Atmospheric relief valves		
	No. Atmospheric relief valves	2	
	Atmospheric relief valve setpoint/Air-operated, psig	1050	During Hot Standby operation setpoint is lowered to control no load Tavg
	Atmospheric relief valve setpoint/Booster, psig	1060	
	Atmospheric relief valve capacity, lbm/hr	313550 at 1060 psig	Max flow is 380000
5.0	Turbine Generator (TG)		
5.1	Condenser		
	No. of condenser dump valves	8	
	Condenser dump valve open time, sec	5	
	Condenser dump valve close time, sec	5	Assuming close time = opening time
	Condenser dump valve setpoint(s)	For TT: Tavg>555 4 valves, >563 4 valves; no TT: Tref +12 4 valves, Tref+20 4 valves	On TT valves control open at 6.7%/F (PID) above 547 with full open setpoints as described. On 10% step load decrease same ratio with a 6F deadband from Tref
	Condenser dump valve Cv [flow is f(dP)]	264	Design Cv (240) from design conditions (302,500 lbm/hr sat steam at 695 psig)
6.0	Chemical and Volume Control System (CVCS)		
	CVCS capacity/pump	3 pumps, 60 gpm max each	Normal ops: 2 charging pumps - one is manual at 15-20 gpm and the other in automatic. Charging pumps are PDPs w/ 46 gpm total - 8 gpm to seals - 3 gpm leakage + 5 gpm into RCS. 40 gpm letdown
	CVCS minimum/pump, gpm	15	
	Type of controller (e.g., P + I) and gains	PID 100%,180 sec,10 sec	
6.1	Reactor Makeup Water System (RMW)		
	RMW capacity/pump	2 pumps, 60 gpm each	
7.0	Emergency Core Cooling System (ECCS)		
7.1	ECCS Delivery vs RCS Pressure		
7.1.1	Residual Heat Removal (RHR) Delivery vs RCS Pressure		

Item #	Item/Name	Value	Remarks:
	Minimum RHR Delivery, train failure	RCS Pressure (psia) / Delivery (gpm) 155 / 0 152 / 0 150 / 0 140 / 250 120 / 648 100 / 836 80 / 985 60 / 1115 40 / 1232 20 / 1338 14.7 / 1365	LOCA Appendix K case. Train failure results in one pump running with 10% degradation with one line blocked.
	Minimum RHR Delivery, two pumps running, one line blocked	RCS Pressure (psia) / Delivery (gpm) 155 / 0 154 / 0 152 / 160 150 / 252 140 / 516 120 / 830 100 / 1056 80 / 1243 60 / 1406 40 / 1552 20 / 1686 14.7 / 1720	LOCA Appendix K case (offsite power available). Two pumps running with 10% degradation with one line blocked.
7.1.2	Safety Injection (SI) Delivery vs RCS Pressure		
	Minimum SI delivery, 2 pumps operating, one line spilling	Press (psig) / Delivery (gpm) / Spill (gpm) 1375 / 0.0 / 465 1300 / 62 / 465 1200 / 125 / 465 1100 / 167 / 465 1000 / 201 / 465 900 / 229 / 465 800 / 253 / 465 700 / 273 / 465 600 / 289 / 465 500 / 305 / 465 400 / 321 / 465 300 / 336 / 465 200 / 352 / 465 100 / 368 / 465 0 / 394 / 465	LOCA Appendix K case. Train failure results in two pumps running with 5% degradation with one line spilling to containment.
	Minimum SI delivery, 3 pumps operating, non-LOCA	Press (psia) / Delivery (gpm) Loop 'A' / Loop 'B' 1390 / 16 / 19 1315 / 87 / 97 1215 / 147 / 163 1115 / 193 / 214 1015 / 231 / 257 915 / 266 / 295 815 / 297 / 329 715 / 325 / 360 615 / 352 / 390 515 / 377 / 418 415 / 400 / 444 315 / 423 / 469 215 / 445 / 493 115 / 465 / 516 15 / 485 / 538	Used for non-LOCA transients, 5% pump degradation

Table 1: UFSAR Chapter 15 Analysis Setpoints and Input Parameters

Item #	Item/Name	Value			Remarks:
	Minimum SI delivery, 2 pumps operating non-LOCA	Press (psia)	Delivery Loop 'A' 'B'	(gpm) Loop	Used for non-LOCA transients, 5% pump degradation.
		1390	8	8	
		1315	69	71	
		1215	121	126	
		1115	162	169	
		1015	197	206	
		915	228	239	
		815	255	269	
		715	281	296	
		615	305	322	
		515	328	346	
		415	350	369	
		315	370	391	
		215	390	412	
		115	409	432	
		15	427	452	
	Maximum SI delivery, 3 pumps operating, SGTR	Press (psig)	Loop A (gpm)	Loop B (gpm)	The KYPIPE model assumes no pump degradation. Loop A and B pressures are set equal. Used for SGTR.
		1375	76	84	
		1300	128	141	
		1200	180	198	
		1100	221	245	
		1000	258	285	
		900	290	321	
		800	320	354	
		700	348	385	
		600	374	413	
		500	398	440	
		400	421	466	
		300	443	490	
		200	464	514	
		100	485	536	
		0	504	558	

Table 1: UFSAR Chapter 15 Analysis Setpoints and Input Parameters

Item #	Item/Name	Value	Remarks:
7.3	**Accumulators**		
	Number of accumulators	2	
	Total volume, each, ft^3	1750	
	Liquid volume, ft^3 - min/max	1126/1154	
	Liquid volume, ft^3 - Best Estimate	1140	
	Initial pressure, psig - Minimum / Maximum	700/790	
	Initial temperature, F	105	LBLOCA
	Boron concentration, ppm (min/max)	1800/2900	Note - EQ analyses use a maximum concentration of 3000 ppm
7.4	**RWST**		
	RWST Temperature, min / max, degrees F	60 / 80	
	Minimum RWST volume, gal	300,000	
	RWST boron concentration, ppm (min/max)	2000/2900	Note - EQ analyses use a maximum concentration of 3000 ppm
8.0	**Containment**		
	Initial containment pressure, psia	min - 14.5 max - 15.7	Minimum is used for LOCA analysis. Maximum is used for the containment integrity cases (SLB).
	Initial containment temperature (LOCA/SLB) degrees F	90/120	LOCA temperature lower for PCT calculations. SLB higher for containment integrity
	Initial relative humidity, %	20	
	SW temperature min/max, degrees F	35/80	
	Maximum containment leakage, wt%/day	0.2	
8.1	**Containment Heat Sinks**		
	Listing of Passive Heat Sinks, quantities, materials, and configurations	see NS&L	
8.2	**Densities, Thermal Conductivities and Heat Capacities of Heat Sinks**		
	Insulation density, conductivity, capacity	6.67 lbm/ft^3 0.0208 BTU/hr F ft 2.0 BTU/ft^3 F	
	Concrete density, conductivity, capacity	141 lbm/ft^3 to 150 lbm/ft^3 0.73 to 0.81 BTU/hrFft 0.21 BTU/lbm F	note: minimum conductivity corresponds to maximum density, and maximum conductivity corresponds to minimum density.
	Steel density, conductivity, capacity	490 lbm/ft^3 28 to 30 BTU/hrFft 0.111 BTU/lbm F	
	Stainless steel density, conductivity, capacity	496 lbm/ft^3 15 BTU/hrFft 0.11 BTU/lbm F	
	Containment free volume, min / max, cu. ft.	1,000,000 / 1,066,000	
	Ground Temperature (degrees F)	55	below grade temperature
	Outside Air Temperature, min / max, degrees F	-10 / 100	

Table 1: UFSAR Chapter 15 Analysis Setpoints and Input Parameters

Item #	Item/Name	Value	Remarks:
	HTC for outside surfaces	1.65 BTU/hr ft^2 degrees F	
	Containment fan cooler performance	Temp (deg F) / Min / Max (X106BTU/hr) 120 / 2.05 / 4.55 220 / 35.1 / 99.2 240 / 40.8 / 113.8 260 / 46.8 / 129.3 280 / 52.9 / 145.5 286 / 54.7 / 150.4	
	Containment spray flow , min`/ max, each, gpm	1300 / 1800	
8.3	Delays for CRFCs and Spray Pumps		
	CRFC delay, offsite power available, seconds	34	includes 2.0 sec SI delay
	CRFC delay, offsite power not available, seconds	44	includes 2.0 sec SI delay
	Containment Spray, 1300 gpm each pump, maximum delay, sec	28.5 - one pump 26.8 - two pumps	This delay is from the time Containment Hi-Hi setpoint is reached. It includes instrument delay and spray line fill time.
	Containment Spray, 1800 gpm each pump, minimum delay, sec	9 / (14 w LOOP)	This delay is from the time of break.
	Containment Design pressure, psig	60	
	Distance Basement floor to Springline, feet	95	
	Distance Springline to top of dome, feet	52.5	
8.4	Containment Sump		
	Minimum wt% of NaOH Tank	30	
9.0	Control Systems (Reactor, FW, Przr Level, Turbine, AFW)		
	Tavg versus power	N/A	Tavg ramps linearly from 547 degrees F at 0% power to 573.5 degrees F at 100% power
	Pressurizer pressure and level algorithms	N/A	Pressurizer pressure setpoint is constant at 2235 psig . Pressurizer level ramps from 19.5 % to 49% for 0 to 100 % power (547 - 573.5 degrees F).
	SG secondary level algorithm	N/A	Level ramps from 39% at 0% power to 52% at 20% power and remains constant at 52% to 100% power. (Power from turbine 1st stage press.)
10.0	Safety System Setpoints		
10.1	Reactor Protection System		
10.1.1	Power range high neutron flux, high setting		
	nominal	1.09	
	accident analysis	1.18	
	delay time, sec	0.5	
10.1.2	Power range high neutron flux, low setting		
	nominal	0.250	

Table 1: UFSAR Chapter 15 Analysis Setpoints and Input Parameters

Item #	Item/Name	Value	Remarks:
	accident analysis	0.350	
	delay time, sec	0.5	
10.1.3	Overtemperature delta T		
	nominal	Variable	
	accident analysis	Variable	
	delay time, sec	6.0	Total delay time - from the time the temperature difference in the coolant loops exceeds the trip setpoint until the rods are free to fall
10.1.4	Overpower delta T		
	nominal	Variable	
	accident analysis	Variable	Not explicitly modelled in safety analysis
	delay time, sec	2.0	
10.1.5	High pressurizer pressure		
	nominal, psig	2377	
	accident analysis, psia	2410	
	delay time, sec	2.0	
10.1.6	Low pressurizer pressure		
	nominal, psig	1873	
	accident analysis, psia	1760 (non-LOCA) 1715 (LOCA) 1890 (SGTR)	
	delay time, sec	2.0	
10.1.7	Low reactor coolant flow		
	nominal	91% of normal indicated flow	
	accident analysis	87% per loop	
	delay time, sec	1.0	
10.1.8	Low-low SG level		
	nominal	17% of the narrow range level span	While trip setpoint could be as low as 16%, AFW initiation limits to 17%
	accident analysis	0% of narrow range level span	
	delay time, sec	2.0	
10.1.9	Turbine Trip (low fluid oil pressure)		
	nominal, psig	45	
	accident analysis	N/A	Not explicitly modeled in safety analysis
	delay time, sec	2.0	

Table 1: UFSAR Chapter 15 Analysis Setpoints and Input Parameters

Item #	Item/Name	Value	Remarks:
10.1.10	**Undervoltage**		
	nominal, V	3150	
	accident analysis	N/A	Not explicitly modeled in safety analysis
	delay time. sec	N/A	
10.1.11	**Underfrequency**		
	nominal, Hz	57.7	
	accident analysis	N/A	Not explicitly modeled in safety analysis
	delay time	N/A	
10.1.12	**Intermediate range**		
	nominal	0.31	
	safety analysis	N/A	Not explicity modeled in safety analysis
	delay time, sec	N/A	
10.1.13	**Source Range**		
	nominal, cps	1.4E+5	
	accident analysis, cps	1.0E+	
	delay time, sec	2.0	
10.1.14	**High Pressurizer level**		
	nominal	0.90	
	accident analysis	0.938	
	delay time, sec	2.0	
10.2	**Engineered Safety Features Actuation System**		
10.2.1	**Safety Injection System**		
10.2.1.1	**High containment pressure**		
	Nominal setpoint, psig	4.0	
	Accident Analysis setpoint, psig	6.0 *	*only modeled in accident analysis for start of containment fan coolers.
	Delay time, sec	34 44 w/ LOOP	Time delays are for start of containment fan coolers.
10.2.1.2	**Low pressurizer pressure**		
	Nominal setpoint, psig	1723	
	Accident Analysis setpoint, psig	1715	
	Delay time, sec	2.0	
10.2.1.3	**Low steam line pressure**		
	Nominal setpoint, psig	514	
	Accident Analysis setpoint, psig	372.7	See NS&L

Table 1: UFSAR Chapter 15 Analysis Setpoints and Input Parameters

Item #	Item/Name	Value	Remarks:
	Delay time, sec	2.0	See NS&L
10.2.2	Containment Spray		
	Nominal Setpoint, psig	28	
	Accident analysis setpoint, psig	32.5	See NS&L
	Delay time, sec	28.5	Delay time includes time to fill lines. See NS&L
10.2.3	AFW System		
	Low-low steam generator water level		
	Nominal Setpoint	17 % of narrow range instrument span each steam generator	
	Accident analysis setpoint	0 % of narrow range instrument span each steam generator	A positive 11% error has been included to account for the SG level measurement system at a containment temperature of 286 F
	Delay time, sec	2.0	
10.2.4	Steam Line Isolation		
10.2.4.1	High containment pressure		
	Nominal Setpoint, psig	18	
	Accident analysis setpoint	N/A	Not explicitly modeled
	Delay time	N/A	Not explicitly modeled
10.2.4.2	High steam flow, coincident with low Tavg and SI		
	Nominal Setpoint	0.49E6 lb/hr equivalent steam flow at 755 psig and Tavg < 545 F	Note: flow setpoint is below nominal full power flow and therefore this portion of logic is made up at power
	Accident analysis setpoint	N/A	Not explicitly modeled
	Delay time	N/A	Not explicitly modeled. Steam line isolation is assumed concurrent with SI (i.e. 2 s delay + 5 s valve stroke)
10.2.4.3	High-high steam flow, coincident SI		
	Nominal Setpoint	3.6E6 lb/hr equivalent steam flow at 755 psig	
	Accident analysis setpoint	N/A	Not explicitly modeled
	Delay time	N/A	Not explicitly modeled. Steam line isolation is assumed concurrent with SI (i.e. 2 s delay + 5 s valve stroke)
10.2.5	Feedwater isolation		
10.2.5.1	High steam generator water level		
	Nominal Setpoint	67% of the narrow range instrument span each SG	

Table 1: UFSAR Chapter 15 Analysis Setpoints and Input Parameters

Item #	Item/Name	Value	Remarks:
	Accident analysis setpoint	100% of the narrow range instrument span each SG	
	Delay time	2.0	Instrument loop only
11.0	Original Steam Generators		
	OSG secondary outlet pressure at 0% full power, psig	1005	ASD setpoint to control Tavg at 547 F.
	Steam temperature at 0% full power, F	547	Assumed = to Tavg
	OSG collapsed liquid level at 0% full power, % NRS	39	Nominal value, analysis must justify assumed error band
	OSG total liquid mass per SG at 0% full power, lbm	130,120	CIRC run using new SG conditions with water level at 55.5% NRL (38.75' above tubesheet)
	OSG secondary outlet pressure at 100% full power, psig	815	This value is for 0% plugging and a fouling factor of .00002.
	Steam temperature at 100% full power, F	522.5	This value is for new SG conditions
	OSG collapsed liquid level above tube sheet at 100% full power, ft	38.75	This is a maximum value, used to generate this mass value below. A minimum value would be 35.5 %NRL.
	OSG total liquid mass per SG at 100% full power, lbm	85,410	Value considered steam generator new conditions, with water level at 55.5% narrow range (38.75' above tubesheet)
	Heat load per SG, Btu/hr	2602000000	
	Primary flow per SG, lb/hr - Design	33600000	
	Steam flow per SG, lb/hr - Design	3290000	
	Secondary design pressure, psig	1085	
	Secondary design temperature, F	556	
	No. of tubes per SG	3260	
	Tube OD, in.	0.875	
	Tube average wall thickness, in.	0.05	Minimum wall thickness not specified",
	Maximum moisture carryover, %	0.25	
	Secondary heat transfer area, ft^2 per SG	44,430	
	Primary heat transfer area, ft^2 per SG	39,406	
	Tube length(s)		
	Maximum, ft	71.365	Includes tube sheet (2*22)
	Minimum, ft	57.146	Includes tube sheet (2*22)
	Average effective length, ft	59.5	Above tube sheet
	Overall OSG bundle height, ft	elevation - 286.549 ft or 33.031 ft above bottom of tube sheet	Tube sheet thickness is 22 inches
	Narrow range level tap locations (elevations), ft	287.474/299.401	
	Wide range level tap locations (elevations), ft	256.349/299.401	
	Secondary nozzle to nozzle dP @ full power, psi	16.5	Estimate value
	Primary nozzle to nozzle dP with no plugged tubes	32.3 psi @ flow = 33.64E6 lb/hr	
	Secondary volume, ft^3 (water volume @ 1525/0 MWt) - nominal	1681/2821	

Table 1: UFSAR Chapter 15 Analysis Setpoints and Input Parameters

Item #	Item/Name	Value	Remarks:
	Secondary volume, ft^3 (steam volume @ 1525/0 MWt) - nominal	2898/1758	
	Primary total volume per SG, ft^3	942.3	
	Hot leg head volume per SG, ft^3	133.4	
	Cold leg head volume per SG, ft^3	133.4	
	Tube primary volume per SG, ft^3	675.5	
	Downcomer level versus downcomer volume profile	See NS&L	
	Circulation ratio (100% power)	4.4	An ATHOS model of the OSG's was used. The Circulation ratio is the downcomer flow divided by the outlet flow. Confirmed with CIRC run.
	Total volume versus level	See NS&L	
	SG Primary Head Cladding Thickness	5/16	
	Maximum SG tube leakage, gpm	0.5/SG	Actual value limited to 0.1 gpm/SG due to stress concerns

Attachment III

Revised Administrative Controls Program

5.6 Reporting Requirements (continued)

5.6.3 Radioactive Effluent Release Report

The Radioactive Effluent Release Report covering the operation of the plant shall be submitted in accordance with 10 CFR 50.36a. The report shall include a summary of the quantities of radioactive liquid and gaseous effluents and solid waste released from the plant. The material provided shall be consistent with the objectives outlined in the ODCM and in conformance with 10 CFR 50.36a and 10 CFR 50, Appendix I, Section IV.B.1.

5.6.4 Monthly Operating Reports

Routine reports of operating statistics and shutdown experience, including documentation of all challenges to the pressurizer power operated relief valves or pressurizer safety valves, shall be submitted on a monthly basis no later than the 15th of each month following the calendar month covered by the report.

5.6.5 CORE OPERATING LIMITS REPORT (COLR)

a. Core operating limits shall be established prior to each reload cycle, or prior to any remaining portion of a reload cycle, and shall be documented in the COLR for the following:

LCO 3.1.1, "SHUTDOWN MARGIN (SDM)";
LCO 3.1.3, "MODERATOR TEMPERATURE COEFFICIENT (MTC)";
LCO 3.1.5, "Shutdown Bank Insertion Limit";
LCO 3.1.6, "Control Bank Insertion Limits";
LCO 3.2.1, "Heat Flux Hot Channel Factor ($F_Q(Z)$)";
LCO 3.2.2, "Nuclear Enthalpy Rise Hot Channel Factor ($F^N_{\Delta H}$)";
LCO 3.2.3, "AXIAL FLUX DIFFERENCE (AFD)";
LCO 3.4.1, "RCS Pressure, Temperature, and Flow Departure from Nucleate Boiling (DNB) Limits"; and
LCO 3.9.1, "Boron Concentration."

(continued)

5.6 Reporting Requirements

5.6.5 COLR (continued)

b. The analytical methods used to determine the core operating limits shall be those previously reviewed and approved by the NRC, specifically those described in the following documents:

1. WCAP-9272-P-A, "Westinghouse Reload Safety Evaluation Methodology," July 1985.
(Methodology for LCO 3.1.1, LCO 3.1.3, LCO 3.1.5, LCO 3.1.6, LCO 3.2.1, LCO 3.2.2, LCO 3.2.3, and LCO 3.9.1.)

2. WCAP-9220-P-A, "Westinghouse ECCS Evaluation Model-1981 Version," Revision 1, February 1982.
(Methodology for LCO 3.2.1.)

3. WCAP-8385, "Power Distribution Control and Load Following Procedures - Topical Report," September 1974.
(Methodology for LCO 3.2.3.)

4. WCAP-8567-P-A, "Improved Thermal Design Procedure," February 1989.
(Methodology for LCO 3.4.1 when using ITDP.)

5. WCAP 11397-P-A, "Revised Thermal Design Procedure," April 1989.
(Methodology for LCO 3.4.1 when using RTDP.)

6. WCAP-10054-P-A and WCAP-10081, "Westinghouse Small Break ECCS Evaluation Model Using the NOTRUMP Code," August 1985.
(Methodology for LCO 3.2.1)

7. WCAP-10924-P-A, Volume 1, Rev. 1, and Addenda 1,2,3, "Westinghouse Large-Break LOCA Best-Estimate Methodology, Volume 1: Model Description and Validation," December 1988.
(Methodology for LCO 3.2.1)

8. WCAP-10924-P-A, Volume 2, Rev. 2, and Addenda, "Westinghouse Large-Break LOCA Best-Estimate Methodology, Volume 2: Application to Two-Loop PWRs Equipped with Upper Plenum Injection," December 1988.
(Methodology for LCO 3.2.1)

(continued)

5.6 Reporting Requirements

5.6.5 COLR (continued)

9. WCAP-10924-P-A, Rev. 2 and WCAP-12071, "Westinghouse Large-Break LOCA Best Estimate Methodology, Volume 2: Application to Two-Loop PWRs Equipped With Upper Plenum Injection, Addendum 1: Responses to NRC Questions," December 1988.
(Methodology for LCO 3.2.1)

10. WCAP-10924-P, Volume 1, Rev. 1, Addendum 4, "Westinghouse LBLOCA Best Estimate Methodology; Model Description and Validation; Model Revisions," August 1990.
(Methodology for LCO 3.2.1)

c. The core operating limits shall be determined such that all applicable limits (e.g., fuel thermal mechanical limits, core thermal hydraulic limits, Emergency Core Cooling Systems (ECCS) limits, nuclear limits such as SDM, transient analysis limits, and accident analysis limits) of the safety analysis are met.

d. The COLR, including any midcycle revisions or supplements, shall be provided upon issuance for each reload cycle to the NRC.

5.6.6 Reactor Coolant System (RCS) PRESSURE AND TEMPERATURE LIMITS REPORT (PTLR)

a. RCS pressure and temperature limits for heatup, cooldown, criticality, and hydrostatic testing as well as heatup and cooldown rates shall be established and documented in the PTLR for the following:

LCO 3.4.3, "RCS Pressure and Temperature (P/T) Limits"

b. The power operated relief valve lift settings required to support the Low Temperature Overpressure Protection (LTOP) System, and the LTOP enable temperature shall be established and documented in the PTLR for the following:

LCO 3.4.6, "RCS Loops - MODE 4";
LCO 3.4.7, "RCS Loops - MODE 5, Loops Filled";
LCO 3.4.10, "Pressurizer Safety Valves"; and
LCO 3.4.12, "LTOP System."

(continued)