Amendment 33 - Supplemental Page Change Instruction

REMOVE PAGE NO.	ADD PAGE NO.
CHAPTER 1	
1.9-5, 6	1.9-**5**, **6**
CHAPTER 2	
2.0-1, 2	2.0-1, **2**
2.0-3/4	2.0-**3/4**
CHAPTER 3	
3.2-17, 18 thru 3.2-61, 62	3.2-**17**, **18** **thru 3.2-61**, 62
3A-xvii/xviii	3A-**xvii/xviii**
3B-37, 38	3B-37, **38**
3B-45, 46	3B-**45**, **46**
3B-49, 50 thru 3B-69, 70	3B-**49**, **50** **thru 3B-69, 70**
CHAPTER 4	
4.3-3, 4	4.3-3, **4**
CHAPTER 6	
6.0-i,ii thru 6.0-xi, xii	6.0-**i**, **ii** **thru 6.0-xi, xii**
6.1-3, 4	6.1-**3**, **4**
6.2-53, 54	6.2-**53**, **54**
6.3-15, 16	6.3-15, **16**
6.3-29, 30	6.3-**29**, 30
6.3-45, 46	6.3-**45**, 46
6.3-49, 50	6.3-49, 50
6.3-83, 84	6.3-83, **84**
6.3-85, 86	6.3-**85**, **86**
6.3-87	6.3-**87**
6.5-1, 2	6.5-1, **2**
CHAPTER 7	
7.5-11, 12	7.5-**11**, **12**
CHAPTER 9	
9.2-75, 76	9.2-**75**, **76**
9B-15/16	9B-**15/16**
CHAPTER 14	
14.2-17, 18	14.2-**17**, 18
CHAPTER 15	
15.7-13, 14	15.7-**13**, **14**
CHAPTER 19	
19.8-9, 10	19.8-**9**, **10**
19.9-3, 4	19.9-**3**, **4**
19D.6-73, 74	19D.6-73, **74**
CHAPTER 20	
20.3.10-21, 22	20.3.10-**21**, 22

LTRBK 93-83

Table 1.9-1 Summary of ABWR Standard Plant COL License Information (Continued)

Item No.	Subject	Subsection
3.30	Audits of Design Specifications and Design Reports	3.9.7.4
3.31	ASME Class 1, 2, and 3 Piping System Clearance Requirements	3.9.7.5
3.32	As-Built Reconciliation Analysis for ASME Class 1, 2 and 3 Piping Systems	3.9.7.6
3.33	Pipe Support Baseplate and Anchor Bolt Design	3.9.7.7
3.34	Pipe-Mounted Equipment Allowable Loads	3.9.7.8
3.35	Benchmark Requirements for Computer Codes Used to Perform Piping Dynamic Analysis	3.9.7.9
3.36	ASME Class 1, 2, and 3 Piping System Design Requirements for Thermal Stratification of Fluids	3.9.7.10
3.37	Equipment Qualification	3.10.5.1
3.38	Dynamic Qualification Report	3.10.5.2
3.39	Qualification by Experience	3.10.5.3
3.40	Environmental Qualification Document (EQD)	3.11.6.1
3.41	Environmental Qualification Records	3.11.6.2
3.42	Surveillance, Maintenance, and Experience Information	3.11.6.3
3.43	Radiation Environment Conditions	3I.3.3.1
4.1	Thermal Hydraulic Stability	4.3.5.1
4.2	Power/Flow Operating Map	4.4.7.1
4.3	Thermal Limits	4.4.7.2
4.4	CRD Inspection Program	4.5.3.1
5.1	Conversion of Indicators	5.2.6.1
5.2	Plant Specific ISI/PSI	5.2.6.2
5.3	Reactor Vessel Water Level Instrumentation	5.2.6.3
5.4	Fracture Toughness Data	5.3.4.1
5.5	Materials and Surveillance Capsule	5.3.4.2
5.6	Plant Specific Pressure-Temperature Information	5.3.4.3
5.7	Testing of Mainsteam Isolation Valves	5.4.15.1
5.8	Analyses of 8-hour RCIC Capacity	5.4.15.2
5.9	ACIWA Flow Reduction	5.4.15.3
6.1	Protection Coatings and Organic Materials	6.1.3.1
6.2	Alternate Hydrogen Control	6.2.7.1

Table 1.9-1 Summary of ABWR Standard Plant COL License Information (Continued)

Item No.	Subject	Subsection
6.3	Administrative Control Maintaining Containment Isolation	6.2.7.2
6.4	Suppression Pool Cleanliness	6.2.7.3
6.5	Wetwell-to-Drywell Vacuum Breaker Protection	6.2.7.4
6.6	ECCS Performance Results	6.3.6.1
6.7	ECCS Testing Requirements	6.3.6.2
6.8	Toxic Gases	6.4.7.1
6.9	SGTS Performance	6.5.5.1
6.10	PSI and ISI Program Plans	6.6.9.1
6.11	Access Requirement	6.6.9.2
7.1	Cooling Temperature Profiles for Class 1E Digital Equipment	7.3.3.1
7.2	APRM Oscillation Monitoring Logic	7.6.3.1
7.3	Effects of Station Blackout on HVAC	7.8.1
7.4	Electrostatic Discharge on Exposed Equipment Components	7.8.2
7.5	Localized High Heat Spots in Semiconductor Material for Computing Devices	7.8.3
8.1	Diesel Generator Reliability	8.1.4.1
8.2	Periodic Testing of Offsite Equipment	8.2.4.1
8.3	Procedures When a Reserve or Unit Auxiliary Transformer is Out of Service	8.2.4.2
8.4	Offsite Power Systems Design Bases	8.2.4.3
8.5	Offsite Power Systems Scope Split	8.2.4.4
8.6	Capacity of Auxiliary Transformers	8.2.4.5
8.7	Deleted	8.3.4.1
8.8	Diesel Generator Design Details	8.3.4.2
8.9	Certified Proof Tests on Cable Samples	8.3.4.3
8.10	Protective Devices for Electrical Penetration Assemblies	8.3.4.4
8.11	Deleted	8.3.4.5
8.12	DC Voltage Analysis	8.3.4.6
8.13	Deleted	8.3.4.7
8.14	Deleted	8.3.4.8

2.0 Site Characteristics

2.0.1 Summary

This section defines the envelope of site-related parameters which the ABWR Standard Plant is designed to accommodate. These parameters envelope most potential sites in the U.S. A summary of the site envelope design parameters is given in Table 2.0-1.

Table 2.0-1
Envelope of ABWR Standard Plant Site Design Parameters

Maximum Ground Water Level:	61.0 cm below grade	
Extreme Wind:	Basic Wind Speed: 177 km/hr* / 197 km/hr†	
Maximum Flood (or Tsunami) Level:‡	30.5 cm below grade	
Tornado:	– Maximum Tornado Wind Speed:	483 km/hr
	– Maximum Rotational Speed:	386 km/hr
	– Translational Velocity:	97 km/hr
	– Radius:	45.7m
	– Maximum Pressure Drop:	0.141 kg/cm^{2}d
	– Rate of Pressure Drop:	0.0846 kg/cm^2/sec
	– Missile Spectra:	Spectrum I^f
Precipitation (for Roof Design):	– Maximum Rainfall Rate:	49.3 cm/hr**
	– Maximum Snow Load:	0.024 kg/cm^2
Ambient Design Temperature:	1% Exceedance Values – Maximum: 37.8°C dry bulb 25°C wet bulb (coincident) 26.6°C wet bulb (non-coincident) – Minimum: –23.3°C 0% Exceedance Values (Historical limit) – Maximum 46.1°C dry bulb 26.7°C wet bulb (coincident) 27.2°C wet bulb (non-coincident) – Minimum: –40°C	
Soil Properties:	– Minimum Static Bearing Capacity:	7.32 kg/cm^2††
	– Minimum Shear Wave Velocity:	305 m/sec‡‡
	– Liquification Potential:	None at plant site resulting from site specific SSE ground motion

Table 2.0-1
Envelope of ABWR Standard Plant Site Design Parameters (Continued)

Seismology:	– SSE Peak Ground Acceleration:	0.30g[ff]
	– SSE Response Spectra:	per RG 1.60
	– SSE Time History:	Envelope SSE Response Spectra
Hazards in Site Vicinity:	– Site Proximity Missiles and Aircraft	$\leq 10^{-7}$ per year
	–Toxic Gases	None
	– Volcanic Activity	None
Exclusion Area Boundary: (EAB)	- An area whose boundary has a Chi/Q less than or equal to 1.37×10^{-3} sec/m^3	
Meteorological Dispersion (Chi/Q):	– Maximum 2-hour 95% EAB	1.37×10^{-3} sec/m^3
	– Maximum 2-hour 95% LPZ	4.11×10^{-4} sec/m^3
	– Maximum annual average (8760 hour) LPZ	1.17×10^{-6} sec/m^3

* 50–year recurrence interval; value to be utilized for design of non-safety-related structures only.

† 100–year recurrence interval; value to be utilized for design for safety-related structures only.

‡ Probable maximum flood level (PMF), as defined in ANSI/ANS-2.8, "Determining Design Basis Flooding at Power Reactor Sites."

f Spectrum1 missiles consist of a massive high kinetic energy missile which derforms on impact, a rigid missile to test penetration resistance, and a small rigid missile of a size sufficient to just pass through any openings in protective barriers. These missiles consists of an 1800 kg automobile, a 125 kg, 20 cm diameter armor piercing artillery shell, and a 2.54 cm diameter solid steel sphere, all impacting at 35% of the maximum horizontal windspeed of the design basis tornado. The first two missiles are assumed to impact at normal incidence, the last to impinge upon openings in the most damaging directions.

** Maximum value for 1 hour over 2.6 km^2 probable maximum precipitation (PMP) with ratio of 5 minutes to 1 hour PMP of 0.32 as found in National Weather Source Publication HMR No. 52. Maximum short term rate: 15.7 cm/5 min.

†† At foundation level of the reactor and control buildings.

‡‡ This is the minimum shear wave velocity at low strains after the soil property uncertainties have been applied.

ff Free-field, at plant grade elevation.

Table 3.2-1 Classification Summary (Continued)

Principal Component[a]	Safety Class[b]	Location[c]	Quality Group Classification[d]	Quality Assurance Requirement[e]	Seismic Category[f]	Notes
B1 Reactor Pressure Vessel System						
1. Reactor pressure vessel (RPV)	1	C	A	B	I	
2. Reactor vessel support skirt and stabilizer	1	C	A	B	I	
3. RPV appurtenances—reactor coolant pressure boundary portions (RCPB)	1	C	A	B	I	
4. Lateral supports for CRD housing and in-core housing	1	C	A	B	I	
5. Reactor internal structures, spargers, for feedwater, RHR shutdown cooling low pressure flooder, and high pressure core flooder systems (see Subsection 3.9.5)	2	C	—	B	I	
6. Reactor internal structures—safety-related components (except spargers) including core support structures (See Subsection 3.9.5)	2	C	—	B	I	
7. Reactor internal structures—non-safety-related components (See Subsection 3.9.5)	N	C	—	E	—	
8. Deleted						
9. Deleted						
10. Deleted						
11. Reactor Internal Pump Motor Casing (a part of RPV boundary)	1	C	A	B	I	

Notes and footnotes are listed on pages 3.2-54 through 3.2-61

Table 3.2-1 Classification Summary (Continued)

Principal Component[a]	Safety Class[b]	Location[c]	Quality Group Classification[d]	Quality Assurance Requirement[e]	Seismic Category[f]	Notes
B2 Nuclear Boiler System						
1. Vessels—level instrumentation condensing chambers	1	C	A	B	I	
2. Vessel-nitrogen accumulators (for ADS and SRVs)	3/N	C	C	B	I	
3. Piping including supports—safety/relief valve discharge and quencher	3	C	C	B	I	(h)
4. Piping including supports main steamline (MSL) and feedwater (FW) line up to and including the outermost isolation valve	1	C,SC	A	B	I	
5. Piping including supports						
a. MSL (including branch lines to first valve) from outermost isolation valve up to and including seismic interface restraint	2	SC	B	B	I	(r)
b. FW (including branch lines to first valve) from outermost isolation valve to and including the shutoff valve	2	SC	B	B	I	(r)

Notes and footnotes are listed on pages 3.2-54 through 3.2-61

Table 3.2-1 Classification Summary (Continued)

Principal Component[a]	Safety Class[b]	Location[c]	Quality Group Classification[d]	Quality Assurance Requirement[e]	Seismic Category[f]	Notes
6. Piping including supports—MSL (including branch lines to first valve) from the seismic interface restraint up to but not including the turbine stop valve and turbine bypass valve	N	SC,T	B	F	—	(r)
7. Piping from FW shutoff valve to seismic interface restraint	N	SC	D	E	I	(ee)
8. Deleted						
9. Deleted						
10. Pipe whip restraint—MSL/FW	3	SC,C	—	B	—	
11. Piping including supports—other within outermost isolation valves						
a. RPV head vent	1	C	A	B	I	(g)
b. Main steam drains	1	C,SC	A	B	I	(g)
12. Piping including supports—other beyond outermost isolation or shutoff valves						
a. RPV head vent beyond shutoff valves	N	C	C	E	—	
b. Main steam drains to first valve	2/N	SC,T	B	B	I/—	(r)
c. Main steam drains beyond first valve	N	SC, T	D	E	—	(r)

Notes and footnotes are listed on pages 3.2-54 through 3.2-61

Table 3.2-1 Classification Summary (Continued)

Principal Component[a]	Safety Class[b]	Location[c]	Quality Group Classification[d]	Quality Assurance Requirement[e]	Seismic Category[f]	Notes
13. Piping including supports—instrumentation up to and beyond outermost isolation valves	2/N	C,SC	B/D	B/E	I/—	(g)
14. Safety/relief valves	1	C	A	B	I	
15. Valves—MSL and FW isolation valves, and other FW valves within containment	1	C,M	A	B	I	
16. Valves—FW, other beyond outermost isolation valves up to and including shutoff valves	2	SC	B	B	I	(ee)
17. Valves—within outermost isolation valves						
a. RPV head vent	1	C	A	B	I	(g)
b. Main steam drains	1	C,SC	A	B	I	(g)
18. Valves, other						
a. RPV head vent	3	C	C	B	I	
b. First main steam drain valves	2/N	SC	B	B	I/—	(r)
c. Other main steam drain valves	N	SC	D	E	—	(r)
19. Deleted						
20. Mechanical modules—instrumentation with safety-related function	3	C,SC	—	B	I	
21. Electrical modules with safety-related function	3	C,SC,X	—	B	I	(i)

Notes and footnotes are listed on pages 3.2-54 through 3.2-61

Table 3.2-1 Classification Summary (Continued)

Principal Component[a]		Safety Class[b]	Location[c]	Quality Group Classification[d]	Quality Assurance Requirement[e]	Seismic Category[f]	Notes
22.	Cable with safety-related function	3	C,SC,X	—	B	I	
B3 Reactor Recirculation System							
1.	Piping, Valves and all their supports—Purge System, heat exchanger and primary side of recirculation motor cooling system (RMCS)	2	C	B	B	I	(s)(g)
2.	Pump motor cover, bolts and nuts	1	C	A	A	I	
3.	Pump non-pressure retaining parts including motor, instruments, electrical cables, and seals	N	C	—	E	—	
4.	ATWS equipment associated with the pump trip function	N	C	—	E	—	(cc)
C1 Rod Control and Information System							
1.	Electrical Modules	N	RZ,X	D	E	—	
2.	Cable	N	SC,RZ,X	D	E	—	
C2 CRD System							
1.	Valves with no safety-related function (not part of HCU)	N	SC	D	E	—	
2.	Piping including supports-insert line	2	C,SC	B	B	I	(j)

Notes and footnotes are listed on pages 3.2-54 through 3.2-61

Table 3.2-1 Classification Summary (Continued)

Principal Component[a]	Safety Class[b]	Location[c]	Quality Group Classification[d]	Quality Assurance Requirement[e]	Seismic Category[f]	Notes
3. Piping-other (pump suction, pump discharge, drive header)	N	SC	D	E	—	(g)
4. Hydraulic control unit	2	SC	—	B	I	(k)
5. Fine motion drive motor	N	C	—	E	—	
6. CRD water pumps	N	SC	D	E	—	
7. Control Rod Drive	1/3	C	A/—	B	I	
8. Electrical modules with safety-related function	3	C,SC	—	B	I	
9. Cable with safety-related function	3	C,SC,X	—	B	I	
10. ATWS Equipment associated with the Alternate Rod Insert (ARI) functions	N	SC	—	E	—	(cc)
C3 Feedwater Control System	N	C,T,SC, X	—	E	—	
C4 Standby Liquid Control System						
1. Standby liquid control tank including supports	2	SC	B	B	I	(u)
2. Pump including supports	2	SC	B	B	I	(u)
3. Pump motor	2	SC	—	B	I	
4. Valves—injection	1	SC	A	B	I	(u)
5. Valves within injection valves	1	C,SC	A	B	I	(u)
6. Valves beyond injection valves	2	SC	B	B	I	(u)

Notes and footnotes are listed on pages 3.2-54 through 3.2-61

Table 3.2-1 Classification Summary (Continued)

Principal Component[a]	Safety Class[b]	Location[c]	Quality Group Classification[d]	Quality Assurance Requirement[e]	Seismic Category[f]	Notes
7. Piping including supports within injection valves	1	C,SC	A	B	I	(g,u)
8. Piping including supports beyond injection valves	2	SC	B	B	I	(g,u)
9. Electrical equipment and devices	3/N	SC,X	—	B/E	I/—	(cc)
10. Cable	3/N	SC,X	—	B/E	I/—	(cc)
C5 Neutron Monitoring System						
1. Electrical modules—SRNM, LPRM and APRM	3	SC,X	—	B	I	
2. Cable—SRNM and LPRM	3	C,SC,X, RZ	—	B	I	
3. Detector and tube assembly	2/3	C	B/C	B	I	
C6 Remote Shutdown System						
Components of this system are included under B2, E1, E4, G3, H4, and P2.						
1. Electrical modules with safety-related functions	3	C,SC,RZ, X	—	B	I	
2. Cable with safety-related functions	3	RZ	—	B	I	

Notes and footnotes are listed on pages 3.2-54 through 3.2-61

Table 3.2-1 Classification Summary (Continued)

Principal Component[a]	Safety Class[b]	Location[c]	Quality Group Classification[d]	Quality Assurance Requirement[e]	Seismic Category[f]	Notes
C7 Reactor Protection System						
1. Electrical modules with safety-related functions	3	SC,X,T, RZ	—	B	I	
2. Cable with safety-related functions	3	SC,X,T, RZ,	—	B	I	
3. Deleted						
4. Deleted						
C8 Recirculation Flow Control System	N	X	—	E	—	
C9 Automatic Power Regulator System	N	X	—	E	—	
C10 Steam Bypass and Pressure Control System	N	X	—	E	—	
C11 Process Computer (includes PMCS & PGCS)	N	X	—	E	—	
C12 Refueling Platform Control Computer	N	SC	—	E	—	
C13 CRD Removal Machine Control Computer	N	SC	—	E	—	

Notes and footnotes are listed on pages 3.2-54 through 3.2-61

Table 3.2-1 Classification Summary (Continued)

Principal Component[a]	Safety Class[b]	Location[c]	Quality Group Classification[d]	Quality Assurance Requirement[e]	Seismic Category[f]	Notes
D1 Process Radiation Monitoring System (includes gaseous and liquid effluent monitoring)						
1. Electrical modules—with safety-related functions (including monitors)	3	SC,X,RZ	—	B	I	
2. Cable with safety-related functions	3	SC,X,RZ	—	B	I	
3. Electrical Modules, other	N	T,SC,RZ, X,W	—	E	—	(u)
4. Cables, other	N	T,SC,RZ, X,W	—	E	—	(u)
D2 Area Radiation Monitoring System	N	X,T,W, SC,RZ,H	—	E	—	
D3 Containment Atmospheric Monitoring System						
1. Component with safety-related function	3	C,SC,X	—	B	I	

Notes and footnotes are listed on pages 3.2-54 through 3.2-61

Table 3.2-1 Classification Summary (Continued)

Principal Component[a]	Safety Class[b]	Location[c]	Quality Group Classification[d]	Quality Assurance Requirement[e]	Seismic Category[f]	Notes
E1 RHR System						
1. Heat exchangers—primary side	2	SC	B	B	I	
2. Deleted						
3. Piping including supports within outermost isolation valves*	1	C,SC	A	B	I	(g)
4. Containment spray piping including supports and spargers, within and including the outer most isolation valves 2	2	C,SC	B	B	1	
4a. Piping including supports beyond outermost isolation valves	2	SC	B	B	I	(g)
5. Main Pumps including supports	2	SC	B	B	I	
6. Main Pump motors	2	SC	B	B	I	
7. Valves—isolation, (LPFL line) including shutdown suction line isolation valves	1	C,SC	A	B	I	(g)
8. Valves—isolation, other (pool suction valves and pool test return valves)	2	SC	B	B	I	(g)
9. Valves beyond isolation valves	2	SC	B	B	I	(g)
10. Jockey pumps and motors including supports	2	SC	B	B	I	

Notes and footnotes are listed on pages 3.2-54 through 3.2-61

Table 3.2-1 Classification Summary (Continued)

Principal Component[a]		Safety Class[b]	Location[c]	Quality Group Classification[d]	Quality Assurance Requirement[e]	Seismic Category[f]	Notes
11.	Valves to fire protection, Subsystem C (F100C, F103C and F104C)	N	SC	—	E	—	
E2 High Pressure Core Flooder System							
1.	Reactor pressure vessel injection line and connected piping including supports within outermost isolation valve†	1/2	C,SC	A/B	B	I	(g)
2.	All other piping including supports‡	2	SC,O	B	B	I	(g)
3.	Main Pump	2	SC	B	B	I	
4.	Main Pump Motor	3	SC	—	B	I	
5.	Valves—other isolation and within the reactor pressure vessel injection line and connected lines	1	C,SC	A	B	I	(g)
6.	All other valves	2/3	SC	B/C	B	I	(g)
7.	Electrical modules with safety-related functions	3	C,SC,X	—	B	I	
8.	Cable with safety-related functions	3	C,SC,X	—	B	I	
E3 Leak Detection and Isolation System							
1.	Temperature sensors	3/N	C,SC,T	—	B/E	I/—	(z)
2.	Pressure transmitters	3	C,SC	—	B	I/—	(z)
3.	Differential pressure transmitters (flow)	3	C,SC	—	B	I/—	(z)
4.	Fission Product Monitor	N	SC	—	E	I	
5.	Isolation Valves	2/N	SC	B/C	B/E	I	

Notes and footnotes are listed on pages 3.2-54 through 3.2-61

Table 3.2-1 Classification Summary (Continued)

Principal Component[a]		Safety Class[b]	Location[c]	Quality Group Classification[d]	Quality Assurance Requirement[e]	Seismic Category[f]	Notes
6.	Instrument lines	3	C,SC	B	B	I	
7.	Sample lines[f]	2/N	C,SC	C/D/—	B/E	I/—	
8.	Flow transmitters	N	SC	—	E	—	
9.	Electrical modules	3/N	SC,RZ,X	—	B/E	I/—	
10.	Cables	3/N	SC,RZ,X	—	B/E	I/—	
E4 RCIC System							
1.	Piping including supports within outermost isolation valves	1/2	C,SC	A/B	B	I	
2.	Piping including supports—discharge line from vacuum pump to containment isolation valves, and discharge line from condensate pump to the first globe valve	N	SC	C	E	—	(g)
3.	Piping including supports beyond outermost isolation valves up to the turbine exhaust line to the suppression pool, including turbine inlet and outlet drain lines	2/3	C,SC	B/C	B	I	(g)
4.	RCIC Pump and piping including support, CST suction line from the first RCIC motorized valve, S/P suction line to the pump, discharge line up to the FW line "B" thermal sleeve	2	SC	B	B	I	(g)
5.	Pump motors	N	SC	—	E	I	

Notes and footnotes are listed on pages 3.2-54 through 3.2-61

Table 3.2-1 Classification Summary (Continued)

Principal Component[a]	Safety Class[b]	Location[c]	Quality Group Classification[d]	Quality Assurance Requirement[e]	Seismic Category[f]	Notes
6. Valves—outer isolation and within	1/2	C,SC	A/B	B	I	(g)
7. Valves—outside the PCV (except item 8)	2	SC	B	B	I	(g)
8. Valves—beyond turbine inlet drain line second shutoff	N	SC	C	E	I	(g)
9. Turbine including supports	2	SC	—	B	I	(m)
10. Electrical modules with safety-related functions	3	C,SC,X	—	B	I	
11. Cable with safety-related functions	3	C,SC,X	—	B	I	
12. Other mechanical and electrical modules	N	SC,X	—	E	—	
F1 Fuel Servicing Equipment	N/2	SC	—/B	E/B	—	(x)
F2 Miscellaneous Servicing Equipment	N	SC,RZ	—	E	—	
F3 RPV Servicing Equipment	N/2	SC	—/B	E/B	—/I	(gg)
F4 RPV Internal Servicing Equipment	N	SC	—	E	—	
F5 Refueling Equipment						
1. Refueling equipment machine assembly	N	SC	—	E	I	(bb)

Notes and footnotes are listed on pages 3.2-54 through 3.2-61

Table 3.2-1 Classification Summary (Continued)

Principal Component[a]	Safety Class[b]	Location[c]	Quality Group Classification[d]	Quality Assurance Requirement[e]	Seismic Category[f]	Notes
F6 Fuel Storage Equipment						
1. Fuel and equipment storage racks—new and spent	N	SC	—	E	I	(bb)
2. Defective fuel container	N	SC	—	E	—	(bb)
3. Spent fuel pool liner	N	SC	—	E	I	
F7 Under-Vessel Servicing Equipment	N	SC	—	E	—	(bb)
F8 CRD Maintenance Facility	N	SC	—	E	—	
F9 Internal Pump Maintenance Facility	N	SC	—	E	—	
F10 Fuel Cask Cleaning Facility	N	SC	—	E	—	
F11 Plant Start-up Test Equipment	N	M	—	E	—	
F12 Inservice Inspection Equipment	N	M	—	E	—	
G1 Reactor Water Cleanup System						
1. Vessels including supports (filter/demineralizer)	N	SC	C	E	—	
2. Regenerative heat exchangers including supports carrying reactor water	N	SC	C	E	—	

Notes and footnotes are listed on pages 3.2-54 through 3.2-61

Table 3.2-1 Classification Summary (Continued)

Principal Component[a]	Safety Class[b]	Location[c]	Quality Group Classification[d]	Quality Assurance Requirement[e]	Seismic Category[f]	Notes
3. Cleanup recirculation pump, motors	N	SC	C	E	—	
4. Piping including supports and valves within and including outermost containment isolation valves	1	C,SC	A	B	I	(g)
5. Pump suction and discharge piping including supports and valves from containment isolation valves back to and including shut-off valve at feedwater line connection	N	SC	C	E	—	
6. Piping including supports and valves leading to radwas' and main condense:	N	SC	C	E	—	
7. Non-regenerative heat exchanger tube inside and piping including supports and valves carrying process water	N	SC	C	E	—	
8. Non-regenerative heat exchanger shell and piping including supports carrying closed cooling water	N	SC	D	E	—	
9. Filter/demineralizer precoat subsystem	N	SC	D	E	—	
10. Filter demin holding pumps including supports—valves and piping including supports	N	SC	C	E	—	
11. Sample station	N	SC	D	E	—	

Notes and footnotes are listed on pages 3.2-54 through 3.2-61

Table 3.2-1 Classification Summary (Continued)

Principal Component[a]	Safety Class[b]	Location[c]	Quality Group Classification[d]	Quality Assurance Requirement[e]	Seismic Category[f]	Notes
12. Electrical modules and cable with no safety-related functions	N	SC,X	—	E	—	
13. Electrical modules and cable for isolation valves	3	SC	—	B	I	
G2 Fuel Pool Cooling and Cleanup System						
1. Vessels including supports—filter/demineralizers	N	SC	D	E	—	
2. Piping and valves including supports upstream of F/D outlet isolation valve	N	SC	D	E	—	
3. Piping and valves including supports downstream of F/D inlet isolation valve	N	SC	D	E	—	
4. Heat exchangers including supports	N	SC	C	E	I	
5. Pumps including supports	N	SC	C	E	I	
6. Pump motors	N	SC	—	E	—	
7. Piping including supports and valves—cooling portion	N	SC	C	E	I	
8. Makeup Water System (MUWC) connection including valves and supports	N	SC	C	E	I	
9. RHR piping connections and valves including supports for safety-related makeup and supplemental cooling	3	SC	C	B	I	

Notes and footnotes are listed on pages 3.2-54 through 3.2-61

Table 3.2-1 Classification Summary (Continued)

Principal Component[a]	Safety Class[b]	Location[c]	Quality Group Classification[d]	Quality Assurance Requirement[e]	Seismic Category[f]	Notes
10. SPCU piping connections and valves including supports	3	SC	C	B	I	
11. Electrical modules and cables with no safety-related function	N	SC, X	—	E	—	
G3 Suppression Pool Cleanup System						
1. Isolation valves and piping including supports within outermost isolation valves	2	SC	B	B	I	
2. Pump including supports	N	SC	C	E	I	
3. Pump motor	N	SC	—	E	—	
4. Piping and components beyond outermost-containment isolation valve including supports	N	SC	C	E	I	
5. Deleted						
6. Deleted						
7. Electrical modules and Cables with no safety-related function	N	SC,X	—	E	—	
8. Electrical modules and cables for isolation valves	3	SC,X	—	B	I	
H1 Main Control Room Panels						
1. Panels	3/N	X	—	B/E	I/—	(aa)

Notes and footnotes are listed on pages 3.2-54 through 3.2-61

Table 3.2-1 Classification Summary (Continued)

Principal Component[a]	Safety Class[b]	Location[c]	Quality Group Classification[d]	Quality Assurance Requirement[e]	Seismic Category[f]	Notes
2. Electrical Modules with safety-related functions	3	X	—	B	I	
3. Cable with safety-related functions	3	X	—	B	I	
4. Other mechanical and electrical modules	N	X	—	E	—	
H2 Control Room Back Panels						
1. Panels	3/N	X	—	B/E	I/—	(aa)
2. Electrical modules with safety-related function	3	X	—	B	I	
3. Cable with safety-related function	3	X	—	B	I	
4. Other mechanical and electrical modules	N	X	—	E	—	
H3 Radioactive Waste Control Panels	N	W	—	E	—	(p)
H4 Local Control Panels						
1. Panels and Racks	3/N	RZ,SC,X	—	B/E	I/—	(aa)
2. Electrical modules with safety-related functions	3	RZ,SC,X	—	B	I	
3. Cable with safety-related functions	3	RZ,SC,X	—	B	I	
4. Other mechanical and electrical modules	N	RZ,SC,X	—	E	—	
H5 Instrument Racks						

Notes and footnotes are listed on pages 3.2-54 through 3.2-61

Table 3.2-1 Classification Summary (Continued)

Principal Component[a]	Safety Class[b]	Location[c]	Quality Group Classification[d]	Quality Assurance Requirement[e]	Seismic Category[f]	Notes
H5 Instrument Racks						
1. Mechanical and electrical with safety-related functions	3	SC,RZ, X,W,M	—	B	—	
2. Other mechanical and selected modules	N	SC,RZ,X, T	—	E	—	
H6 Multiplexing System						
1. Electrical module with safety-related functions (Essential)	3	SC,RZ,X	—	B	I	
2. Cable with safety-related functions (Essential)	3	SC,RZ,X	—	B	I	
3. Other electrical modules and cables (Non-essential)	N	SC,RZ,X, W	—	E	—	
H7 Local Control Boxes						
1. Electrical modules with safety-related functions	3	SC,RZ,X, H,T,W,M	—	B	I	
2. Other electrical modules	N	SC,RZ,X, H,T,W,M,	—	E	—	
J1 Fuel Assembly						
1. Fuel assemblies	3	C,SC	—	B	I	
2. Control Rods	3	C,SC	—	B	I	
3. Loose Parts Monitoring System	N	C,SC	—	E	—	
J2 Fuel Channel	3	C,SC	—	B	I	

Notes and footnotes are listed on pages 3.2-54 through 3.2-61

Table 3.2-1 Classification Summary (Continued)

Principal Component[a]	Safety Class[b]	Location[c]	Quality Group Classification[d]	Quality Assurance Requirement[e]	Seismic Category[f]	Notes
K1 Radwaste System						
1. Drain piping including supports and valves—radioactive	N	C,H,SC,T, W,X	D	E	—	(p)
2. Deleted						
3. Piping and valves—containment isolation	2	C,SC	B	B	I	
4. Piping including supports and valves forming part of containment boundary	N	C,SC	B	B	I	
5. Pressure vessels including supports	N	W	—	E	—	(p)
6. Atmospheric tanks including supports	N	C,SC,H,T, W	—	E	—	(p)
7. 0-15 PSIG Tanks and supports	N	W	—	E	—	(p)
8. Heat exchangers and supports	N	C,SC,W	—	E	—	(p)
9. Piping including supports and valves	N	C,SC,H, T,W	—	E	—	(p)
10. Other mechanical and electrical modules	N	ALL	D	E	—	(p)
11. ECCS equipment room sump backflow protection check valves	N	SC	C	B	I	
N1 Turbine Main Steam System						
1. Deleted (see B2.5)						
2. Deleted (see B2.6)						

Notes and footnotes are listed on pages 3.2-54 through 3.2-61

Table 3.2-1 Classification Summary (Continued)

Principal Component[a]	Safety Class[b]	Location[c]	Quality Group Classification[d]	Quality Assurance Requirement[e]	Seismic Category[f]	Notes
N2 Condensate, Feedwater and Condensate Air Extraction System						
1. Feedwater system components beyond seismic interface restraint	N	SC,T	D	E	—	(ee)
N3 Heater, Drain and Vent System	N	T	—	E	—	
N4 Condensate Purification System	N	T	—	E	—	
N5 Condensate Filter Facility	N	T	—	E	—	
N6 Condensate Demineralizer	N	T	—	E	—	
N7 Main Turbine	N	T	—	E	—	
N8 Turbine Control System						
1. Turbine stop valve, turbine bypass valves, and the main steam leads from the turbine stop valve to the turbine casing	N	T	D	E	—	(l)(n) (o)(r)
N9 Turbine Gland Steam System	N	T	D	E	—	
N10 Turbine Lubricating Oil System	N	T	—	E	—	

Notes and footnotes are listed on pages 3.2-54 through 3.2-61

Table 3.2-1 Classification Summary (Continued)

Principal Component[a]	Safety Class[b]	Location[c]	Quality Group Classification[d]	Quality Assurance Requirement[e]	Seismic Category[f]	Notes
N11 Moisture Separator Heater	N	T	—	E	—	
N12 Extraction System	N	T	—	E	—	
N13 Turbine Bypass System						
1. Turbine bypass piping including supports up to the condenser	N	T	D	E	—	(r)
N14 Reactor Feedwater Pump Driver	N	T	—	E	—	
N15 Turbine Auxiliary Steam System	N	T	—	E	—	
N16 Generator	N	T	—	E	—	
N17 Hydrogen Gas Cooling System	N	T	—	E	—	
N18 Generator Cooling System	N	T	—	E	—	
N19 Generator Sealing Oil System	N	T	—	E	—	
N20 Exciter	N	T	—	E	—	
N21 Main Condenser	N	T	—	E	—	
N22 Offgas System	N	T	—	E	—	

Notes and footnotes are listed on pages 3.2-54 through 3.2-61

Table 3.2-1 Classification Summary (Continued)

Principal Component[a]	Safety Class[b]	Location[c]	Quality Group Classification[d]	Quality Assurance Requirement[e]	Seismic Category[f]	Notes
N23 Circulating Water System	N	T	D	E	—	
N24 Condenser Cleanup Facility	N	T	—	E	—	
P0 Makeup Water System (Preparation)	N	M	—	E	—	
P1 Makeup Water System (Purified)						
1. Piping including supports and valves forming part of the containment boundary	2	C	B	B	I	
2. Demineralizer water storage tank including supports	N	O	D	E	—	
3. Piping including supports and valves	N	O	D	E	—	
4. Other components	N	O	D	E	—	
P2 Makeup Water System (Condensate)						
1. Condensate storage tank including supports	N	O	D	E	—	(w)
2. Condensate header—piping including supports, level instrumentation and valves	2	SC	B	B	I	
3. Piping including supports and valves and other components	N	O	D	E	—	
P3 Reactor Building Cooling Water System						

Notes and footnotes are listed on pages 3.2-54 through 3.2-61

Table 3.2-1 Classification Summary (Continued)

Principal Component[a]	Safety Class[b]	Location[c]	Quality Group Classification[d]	Quality Assurance Requirement[e]	Seismic Category[f]	Notes
1. Piping and valves forming part of primary containment boundary	2	SC,C	B	B	I	(g)
2. Other safety-related piping including supports, pumps and valves	3	SC,C	C	B	I	
3. Electrical modules with safety-related functions	3	SC,C,X	—	B	I	
4. Cable with safety-related functions	3	SC,C,X	—	B	I	
5. Other mechanical and electrical modules	N	SC,C,X,M	D	E	—	
P4 Turbine Building Cooling Water System	N	T	D	E	—	
P5 HVAC Normal Cooling Water System						
1. Piping including supports and valves forming part of containment boundary	N	C,SC	B	E	I	
2. Other mechanical and electrical modules	N	C,SC,RZ T,X,	—	E	—	

Notes and footnotes are listed on pages 3.2-54 through 3.2-61

Table 3.2-1 Classification Summary (Continued)

Principal Component[a]	Safety Class[b]	Location[c]	Quality Group Classification[d]	Quality Assurance Requirement[e]	Seismic Category[f]	Notes
P6 HVAC Emergency Cooling Water System						
1. Chillers, pumps, valves, and piping, including supports	3	SC,X	C	B	I	
2. Electrical modules and cable with safety-related functions	3	RZ,X	—	B	I	
P7 Oxygen Injection System	N	T	—	E	—	
P8 Ultimate Heat Sink	3	O	C	B	I	
P9 Reactor Service Water System						
1. Safety-related piping including supports, piping and valves	3	U,O,X	C	B	I	
2. Electrical modules and cables with safety-related functions	3	U,O,X	—	B	I	
3. Other non-safety-related mechanical and electrical modules	N	U,O,X	—	E	—	
P10 Turbine Service Water System						
1. Non-safety-related piping including supports, piping and valves	N	P, O, T	—	E	—	
2. Electrical modules and cables with non-safety-related functions	N	P,O,T	—	E	—	

Notes and footnotes are listed on pages 3.2-54 through 3.2-61

Table 3.2-1 Classification Summary (Continued)

Principal Component[a]	Safety Class[b]	Location[c]	Quality Group Classification[d]	Quality Assurance Requirement[e]	Seismic Category[f]	Notes
P11 Station Service Air System						
1. Containment isolation including supports, valves and piping	2	C,SC	B	B	I	
2. Other non-safety-related mechanical and electrical components	N	SC,RZ, X,T,H, W,C	—	E	—	
P12 Instrument Air Service						
1. Containment isolation including supports, valves and piping	2	C,SC	B	B	I	
2. Other non-safety-related mechanical components	N	SC,X	C	B	—	
3. Other non-safety-related electrical components	N	SC,RZ,X, T,H, W,C	—	E	—	
P13 High Pressure Nitrogen Gas Supply Systems						
1. Containment isolation including supports, valves and piping	2	C,SC	B	B	I	
2. Gas bottles, piping and valves including supports with safety-related functions	3	SC,C	C	B	I	
3. Electric modules with safety-related functions	3	SC,RZ,X	—	B	I	
4. Cable with safety-related functions	3	SC,RZ,X	—	B	I	
5. Other non-safety-related mechanical components	N	SC,RZ,X	C	E	—	

Notes and footnotes are listed on pages 3.2-54 through 3.2-61

Table 3.2-1 Classification Summary (Continued)

Principal Component[a]	Safety Class[b]	Location[c]	Quality Group Classification[d]	Quality Assurance Requirement[e]	Seismic Category[f]	Notes
6. Other non-safety-related electrical components	N	SC,RZ,X	—	E	—	
P14 Heating Steam and Condensate Water Return System	N	ALL	—	E	—	
P15 House Boiler	N	T	—	E	—	
P16 Hot Water Heating System	N	ALL	—	E	—	
P17 Hydrogen Water Chemistry System	N	T	—	E	—	
P18 Zinc Injection System	N	T	—	E	—	
P19 Breathing Air System	N	C,SC,T	—	E	—	
P20 Sampling System (Includes PASS)	N	SC,RZ,T	—	E	—	
P21 Freeze Protection System	N	O	—	E	—	
P22 Iron Injection System	N	T	—	E	—	
R1 Electrical Power Distribution System						
1. 120 VAC safety-related distribution equipment including inverters	3	SC,C,X, RZ	—	B	I	
2. Safety-related Motors	3	SC,C,X,Z, RZ	—	B	I	

Notes and footnotes are listed on pages 3.2-54 through 3.2-61

Table 3.2-1 Classification Summary (Continued)

Principal Component[a]	Safety Class[b]	Location[c]	Quality Group Classification[d]	Quality Assurance Requirement[e]	Seismic Category[f]	Notes
3. Safety-related Protective relays and control panels	3	SC,X,RZ	—	B	I	
4. Safety-related Valve operators	3	SC,C, X, RZ	—	B	I	
R2 Unit Auxiliary Transformers						
1. Unit Auxiliary Transformers	N	O	—	E	—	
2. Safety-related Transformers	3	SC,X,RZ	—	B	I	
R3 Isolated Phase Bus	N	O,T	—	E	—	
R4 Non-Segregated Phase Bus	N	O,T	—	E	—	
R5 Metalclad Switchgear						
1. Safety-related 6900 Volt switchgear	3	SC,RZ	—	B	I	
R6 Power Center						
1. Safety-related 480 Volt power centers	3	SC,RZ	—	B	I	
R7 Motor Control Center						
1. Safety-related 480 Volt motor control centers	3	SC,X,RZ	—	B	I	

Notes and footnotes are listed on pages 3.2-54 through 3.2-61

Table 3.2-1 Classification Summary (Continued)

Principal Component[a]	Safety Class[b]	Location[c]	Quality Group Classification[d]	Quality Assurance Requirement[e]	Seismic Category[f]	Notes
R8 Raceway System						
1. Safety-related control and power cables (including underground cable systems, cable splices, connectors and terminal blocks	3	SC, C, X, RZ	—	B	I	
2. Safety-related conduit and cable trays and their supports	3	SC,C,X RZ	—	B	I	
R9 Grounding Wire	N	SC,C,X,O	—	—	—	
R10 Safety-related Electrical Wiring Penetrations	3	SC,C	—	B	I	
R11 Combustion Turbine Generator	N	T	—	E	—	
R12 Safety-related Direct Current Power Supply						
1. 125 Volt batteries, battery racks, battery chargers, and distribution equipment	3	SC,C,X, RZ	—	B	I	
2. Protective relays and control panels	3	SC,X,RZ	—	B	I	
3. Motors	3	SC,C,X, RZ	—	B	I	

Notes and footnotes are listed on pages 3.2-54 through 3.2-61

Table 3.2-1 Classification Summary (Continued)

Principal Component[a]	Safety Class[b]	Location[c]	Quality Group Classification[d]	Quality Assurance Requirement[e]	Seismic Category[f]	Notes
R13 Emergency Diesel Generator System						
1. Starting air receiver tanks piping including supports from and including check valve and downstream piping including supports, valves, and compressors.	3	RZ	C	B	I	(y)
2. Starting air compressor motors	3	RZ	—	B	I	
3. Combustion air intake and exhaust system	3	RZ,O	C	B	I	
4. Safety-related piping including supports, valves—fuel oil system, diesel cooling water system, and lube oil system	3	RZ	C	B	I	
5. Pump motors—fuel oil system, diesel cooling water system and lube oil system	3	RZ	—	B	I	
6. Diesel generators	3	RZ	—	B	I	(y)
7. Mechanical and electrical modules with safety-related functions	3	RZ,X	—	B	I	
8. Cable with safety-related functions	3	RZ,O,X	—	B	I	
9. Other mechanical and electrical modules	N	RZ,O	—	E	—	
R14 Safety-related Vital AC Power Supply	3	X	—	B	I	

Notes and footnotes are listed on pages 3.2-54 through 3.2-61

Table 3.2-1 Classification Summary (Continued)

Principal Component[a]		Safety Class[b]	Location[c]	Quality Group Classi-fication[d]	Quality Assur-ance Require-ment[e]	Seismic Category[f]	Notes
R15	Safety-related Instrument and Control Power Supply	3	X	—	B	I	
R16	Communication System	N	SC,C,RZ, X	—	B	I	
R17	Lighting and Servicing Power Supply						
	1. Normal Lighting	N	ALL	—	E	—	
	2. Standby Lighting	3/N	ALL	C/—	B/E	I/—	(hh)
	3. DC Emergency Lighting	3/N	SC,X,W	C/—	B/E	I/—	(hh)
	4. Guide Lamp Lighting	3/N	SC,X	C/—	B/E	I/—	
S1	Reserve Auxiliary Transformer	N	O	—	E	—	
T0	Primary Containment System						
	1. Suppression chamber/drywell vacuum breakers	2	C	B	B	I	
T1	Primary Containment Vessel						
	1. Primary containment vessel (PCV)—reinforced concrete containment vessel (RCCV)	2	C	B	B	I	
	2. Vent system (vertical flow channels and horizontal discharges	2	C	B	B	I	
	3. PCV penetrations and drywell steel head	2	C	B	B	I	
	4. Upper and lower drywell airlocks	2	C,SC	—	B	I	

Notes and footnotes are listed on pages 3.2-54 through 3.2-61

Table 3.2-1 Classification Summary (Continued)

Principal Component[a]	Safety Class[b]	Location[c]	Quality Group Classification[d]	Quality Assurance Requirement[e]	Seismic Category[f]	Notes
5. Upper and lower drywell equipment hatches	2	C,SC	—	B	I	
6. Lower drywell access tunnels	2	C	—	B	I	
7. Suppression chamber access hatch	2	C,SC	—	B	I	
8. Safety-related instrumentation	3	C,SC	—	B	I	
T2 Containment Internal Structures						
1. RPV stabilizer truss (see B1.2)						
2. Support structures and equipment for safety-related piping	3	C	—	B	I	
3. Diaphragm Floor	3	C	—	B	I	
4. L/D equipment and personnel tunnels	3	C	—	B	I	
5. Miscellaneous Platforms	3	C	—	B	I	
T3 RPV Pedestal						
1. RPV pedestal and shield wall	3	C	—	B	I	
T4 Standby Gas Treatment System						
1. All equipment except deluge piping and valves	3	SC,RZ	C	B	I	
T5 PCV Pressure and Leak Testing Facility	N	SC	—	E	—	

Notes and footnotes are listed on pages 3.2-54 through 3.2-61

Table 3.2-1 Classification Summary (Continued)

Principal Component[a]	Safety Class[b]	Location[c]	Quality Group Classification[d]	Quality Assurance Requirement[e]	Seismic Category[f]	Notes
T6 Atmospheric Control System						
1. Nitrogen Storage Tanks	N	O	—	E	—	
2. Vaporizers and controls	N	O	—	E	—	
3. Piping including supports and valves forming part of containment boundary	2	SC	B	B	I	
4. Piping including supports and valves beyond the first rupture disk up to and including the second rupture disk	3	SC	C	B	I	
5. Electrical modules with safety-related functions	3	SC,X	—	B	I	
6. Cables with safety-related function	3	SC,X	—	B	I	
7. Other non-safety-related mechanical and electrical components	N	SC,RZ,O, X	—	E	—	
T7 Drywell Cooling System						
1. Motors	N	C	—	E	—	
2. Fans	N	C	—	E	—	
3. Coils, cooling	N	C	—	E	—	
4. Other mechanical and electrical modules	N	C,X	—	E	—	
T8 Flammability Control System	2	SC	B	B	I	

Notes and footnotes are listed on pages 3.2-54 through 3.2-61

Table 3.2-1 Classification Summary (Continued)

Principal Component[a]	Safety Class[b]	Location[c]	Quality Group Classification[d]	Quality Assurance Requirement[e]	Seismic Category[f]	Notes
T9 Suppression Pool Temperature Monitoring System						
1. Electrical modules with safety-related functions	3	C,X,SC, RZ	—	B	I	
2. Cable with safety-related functions	3	C,X,SC, RZ	—	B	I	
U1 Foundation Work	2/3	C,SC,RZ	—	B	I	
U2 Turbine Pedestal	N	T	—	E	—	
U3 Cranes and Hoists						
1. Reactor Building crane	N	SC	—	E	—	(x)
2. Refueling Platform	N	SC	—	E	—	(x)
3. Upper Drywell Servicing	N	C	—	E	I	
4. Lower Drywell Servicing	N	C	—	E	I	
5. Main Steam Tunnel Servicing	N	M	—	E	—	
6. Special Service Rooms	N	SC,RZ,T, W,X	—	E	—	
U4 Elevator	N	SC,RZ	—	E	—	
U5 Heating, Ventilating and Air Conditioning[**]						
1. Safety-related equipment[††]						
a. Fan-coil cooling units	3	SC,X	—	B	I	

Notes and footnotes are listed on pages 3.2-54 through 3.2-61

Table 3.2-1 Classification Summary (Continued)

Principal Component[a]	Safety Class[b]	Location[c]	Quality Group Classification[d]	Quality Assurance Requirement[e]	Seismic Category[f]	Notes
b. Heating units—electrical or water	3	SC,RZ,X	—	B	I	
c. Blowers—Air supply or	3	SC,RZ,X	—	B	I	
d. Ductwork	3	SC,RZ,X	—	B	I	
e. Filters—Equipment areas	3	SC,RZ,X	—	B	I	
f. HEPA Filters, Charcoal Adsorbers—Control Rooms and Secondary Containment	3	SC,X	—	B	I	
g. Valves and Dampers—secondary containment isolation	3	SC,RZ	—	B	I	
h. Other safety-related valves and dampers	3	H,Z	—	B	I	
i. Electrical modules with safety-related functions	3	SC,RZ, H,X	—	B	I	
j. Cable with safety-related functions	3	SC,RZ, H,X	—	B	I	

Notes and footnotes are listed on pages 3.2-54 through 3.2-61

Table 3.2-1 Classification Summary (Continued)

Principal Component[a]	Safety Class[b]	Location[c]	Quality Group Classification[d]	Quality Assurance Requirement[e]	Seismic Category[f]	Notes
2. Non-safety-related equipment[‡‡]						
a. HVAC mechanical or electrical components with non-safety-related functions	N	SC,RZ,H X,W,T	—	E	—	
b. Non-safety-related fire protection valves and dampers	N	SC,RZ,H, X,W,T	—	E	—	(t)(u)
U5.1 Potable and Sanitary Water System						
1. Potable and sanitary water equipment	N	All (except C, M)	—	E	—	
2. Drain piping including supports and valves—nonradioactive	N	All (except C, M,X)	D	E	—	
U6 Fire Protection System						
1. Other piping including supports and valves	N	SC,C,X, RZ,H,T, W,O	D	E	—	(t) (u)
2. Water storage tank	N	F	D	E	—	(t) (u)
3. Pumps	N	F	D	E	—	(t) (u)
a. Motor Driven	N	F	D	E	I	(ff)
b. Engine Driven	N	F	D	E	—	(t)(u)
4. Pump motors	N	F	—	E	I	(ff)
5. Electrical Modules	N	C,SC,X RZ,H, T,W	—	E	—	(t) (u)
6. Deleted						

Notes and footnotes are listed on pages 3.2-54 through 3.2-61

Table 3.2-1 Classification Summary (Continued)

Principal Component[a]	Safety Class[b]	Location[c]	Quality Group Classification[d]	Quality Assurance Requirement[e]	Seismic Category[f]	Notes
7. Cables	N	SC,C,X	—	E	—	(t) (u)
8. Sprinklers or deluge water	N	H,W,SC, X,RZ,T	D	E	—	(t) (u)
9. Foam, reaction or deluge	N	RZ,T	—	E	—	(t) (u)
U7 Floor Leakage Detection System	N	SC,RZ	—	E	—	
U8 Vacuum Sweep System	N	C,SC	—	E	—	
U9 Decontamination System	N	C,SC,RZ T,W,S,X	—	E	—	
U10 Reactor Building	3	SC,RZ	—	B	I	
U11 Turbine Building	N	T	—	E	—	(v)
U12 Control Building	3	X	—	B	I	
U13 Radwaste Building						
1. Structural walls and slabs above grade level (see Subsection 3H.3.3)	N	W	—	E	—	
2. Radwaste Building Substructure	3	W	—	B	I	
U14 Service Building	N	H	—	E	—	
Y1 Stack	N	RZ	—	E	—	

Notes and footnotes are listed on pages 3.2-54 through 3.2-61

Table 3.2-1 Classification Summary (Continued)

Principal Component[a]	Safety Class[b]	Location[c]	Quality Group Classification[d]	Quality Assurance Requirement[e]	Seismic Category[f]	Notes
Y2 Diesel Generator Fuel Oil Storage and Transfer System	3	O,RZ	—	B	I	
Y3 Site Security	N	ALL	—	E	—	

Notes and footnotes are listed on pages 3.2-54 through 3.2-61

Table 3.2-1 Notes and Footnotes

* The RHR/ECCS low pressure flooder spargers are part of the reactor pressure vessel system, see Item B1.5.

† The ECCS high pressure core flooder spargers are part of the Reactor Pressure Vessel System, see Item B1.5.

‡ Pool suction piping, suction piping from condensate storage tank, test line to pool, pump discharge piping and return line to pool.

f These sample lines are totally within containment and the fission product monitor provides no isolation function.

** Includes Reactor Building, Control Building, and Service Building thermal and radiological environmental control functions within the ABWR Standard Plant.

†† Controls environment in Main and Local control rooms, diesel-generator rooms, battery rooms, ECCS-RCIC, pump rooms within the ABWR Standard Plant.

‡‡ Controls environment in rooms or areas containing non-safety-related equipment within the ABWR Standard Plant.

a. A module is an assembly of interconnected components which constitute an identifiable device or piece of equipment. For example, electrical modules include sensors, power supplies, signal processors, and mechanical modules include turbines, strainers, and orifices.

b. 1, 2, 3, N = Nuclear safety-related function designation defined in Subsections 3.2.3 and 3.2.5.

c. C = Primary Containment
H = Service building
M = Reactor building steam tunnel
O = Outside onsite
RZ = Reactor Building Clean Zone (balance portion of the reactor building outside the Secondary Containment Zone)
SC = Secondary Containment portion of the reactor building
T = Turbine Building

W	=	Radwaste Building
X	=	Control Building
F	=	Firewater Pump House*
U	=	Ultimate Heat Sink Pump House*
P	=	Power Cycle Heat Sink Pump House*

d. A,B,C,D= Quality groups defined in Regulatory Guide 1.26 and Subsection 3.2.2. The structures, systems and components are designed and constructed in accordance with the requirements identified in Tables 3.2-2 and 3.2-3.

— = Quality Group Classification not applicable to this equipment.

e. B = The quality assurance requirements of 10CFR50, Appendix B are applied in accordance with the quality assurance program described in Chapter 17.

E = Elements of 10CFR50, Appendix B are generally applied, commensurate with the importance of the equipment's function.

f. I = The design requirements of Seismic Category I structures and equipment are applied as described in Section 3.7, Seismic Design.

— = The seismic design requirements for the safe shutdown earthquake (SSE) are not applicable to the equipment. However, the equipment that is not safety-related but which could damage Seismic Category I equipment if its structural integrity failed is checked analytically and designed to assure its integrity under seismic loading resulting from the SSE.

g. 1. Lines one inch and smaller which are part of the reactor coolant pressure boundary and are ASME Code Section III, Class 2 and Seismic Category I.

2. All instrument lines which are connected to the reactor coolant pressure boundary and are utilized to actuate and monitor safety systems shall be Safety Class 2 from the outer isolation valve or the process shutoff valve (root valve) to the sensing instrumentation.

3. All instrument lines which are connected to the reactor coolant pressure boundary and are not utilized to actuate and monitor safety systems shall

* Pump House structures are out of the ABWR Standard Plant scope.

be Code Group D from the outer isolation valve or the process shutoff valve (root valve) to the sensing instrumentation.

4. All other instrument lines:

   i. Through the root valve the lines shall be of the same classification as the system to which they are attached.

   ii. Beyond the root valve, if used to actuate a safety system, the lines shall be of the same classification as the system to which they are attached.

   iii. Beyond the root valve, if not used to actuate a safety system, the lines may be Code Group D.

5. All sample lines from the outer isolation valve or the process root valve through the remainder of the sampling system may be Code Group D.

6. All safety-related instrument sensing lines shall be in conformance with the criteria of Regulatory Guides 1.11 and 1.151.

h. Safety/Relief valve discharge line (SRVDL) piping to the quencher shall be Quality Group C and Seismic Category I. In addition, all welds in the SRVDL piping in the wetwell above the surface of the suppression pool shall be non-destructively examined to the requirements of ASME Boiler and Pressure Vessel Code, Section III, Class 2.

SRVDL piping from the safety/relief valve to the quenchers in the suppression pool consists of two parts: the first part is located in the drywell and is attached at one end to the safety/relief valve and attached at its other end to the diaphragm floor penetration. This first part of the SRVDL is analyzed with the main steam piping as a complete system. The second part of the SRVDL is in the wetwell and extends from the penetration to the quenchers in the suppression pool. Because of the penetration on this part of the line, it is physically decoupled from the main steam piping and the first part of the SRVDL piping and is, therefore, analyzed as a separate piping system.

i. Electrical devices include components such as switches, controllers, solenoids, fuses, junction boxes, and transducers which are discrete components of a larger subassembly/module. Nuclear safety-related devices are Seismic Category I. Fail-safe devices are non-Seismic Category I.

j. The control rod driver insert lines from the drive flange up to and including the first valve on the hydraulic control unit are Safety Class 2, and non-safety-related beyond the first valve.

k. The hydraulic control unit (HCU) is a factory-assembled engineered module of valves, tubing, piping, and stored water which controls two control rod drives by the application of pressures and flows to accomplish rapid insertion for reactor scram.

Although the hydraulic control unit, as a unit, is field installed and connected to process piping, many of its internal parts differ markedly from process piping components because of the more complex functions they must provide. Thus, although the codes and standards invoked by Groups A, B, C, and D pressure integrity quality levels clearly apply at all levels to the interfaces between the HCU and the connection to conventional piping components (e.g., pipe nipples, fittings, simple hand valves, etc.), it is considered that they do not apply to the specialty parts (e.g., solenoid valves, pneumatic components, and instruments).

The design and construction specifications for the HCU do invoke such codes and standards as can be reasonably applied to individual parts in developing required quality levels, but of the remaining parts and details. For example: (1) all welds are LP inspected; (2) all socket welds are inspected for gap between pipe and socket bottom; (3) all welding is performed by qualified welders; and (4) all work is done per written procedures. Quality Group D is generally applicable because the codes and standards invoked by that group contain clauses which permit the use of manufacturer standards and proven design techniques which are not explicitly defined within the codes for Quality Groups A, B, or C. This is supplemented by the QC technique described.

l. The turbine stop valve is designed to withstand the SSE and maintain its integrity.

m. The RCIC turbine is not included in the scope of standard codes. To assure that the turbine is fabricated to the standards commensurate with safety and performance requirements, General Electric has established specific design requirements for this component which are as follows:

   1. All welding shall be qualified in accordance with Section IX, ASME Boiler and Pressure Vessel Code.

   2. All pressure-containing castings and fabrications shall be hydrotested at 1.5 times the design pressure.

3. All high-pressure castings shall be radiographed according to:

ASTM E-94	
E-141	
E-142	Maximum feasible volume
E-446, 186 or 280	Severity level 3

4. As-cast surfaces shall be magnetic-particle or liquid-penetrant tested according to ASME Code, Section III, Paragraphs NB-2545, NC-2545, or NB-2546, and NC-2546.

5. Wheel and shaft forgings shall be ultrasonically tested according to ASTM A-388.

6. Butt welds in forgings shall be radiographed and magnetic particle or liquid penetrant tested according to the ASME Boiler and Pressure Vessel Code, Section III Paragraph NB-2575, NC-2575, NB-2545, NC-2545, NB-2546, NC-2546 respectively. Acceptance standards shall be in accordance with ASME Boiler and Pressure Vessel Code Section III, Paragraph NB-5320, NC-5320, NB-5340, NC-5340, NB-5350, NC-5350, respectively.

7. Notification shall be made on major repairs and records maintained thereof.

8. Record system and traceability shall be according to ASME Section III, NCA-4000.

9. Quality control and identification shall be according to ASME Section III, NCA-4000.

10. Authorized inspection procedures shall conform to ASME Section III, NB-5100 and NC-5100.

11. Non-destructive examination personnel shall be qualified and certified according to ASME Section III, NB-5500 and NC-5500.

n. All cast pressure-retaining parts of a size and configuration for which volumetric methods are effective are examined by radiographic methods by qualified personnel. Ultrasonic examination to equivalent standards is used as an alternate to radiographic methods. Examination procedures and acceptance standards are at least equivalent to those defined in Paragraph 136.4, Nonboiler External Piping, ANSI B31.1.

o. The following qualifications are met with respect to the certification requirements:

1. The manufacturer of the turbine stop valves, turbine control valves, turbine bypass valves, and main steam leads from turbine control valve to turbine casing utilizes quality control procedures equivalent to those defined in GE Publication GEZ-4982A, General Electric Large Steam Turbine Generator Quality Control Program.

2. A certification obtained from the manufacturer of these valves and steam loads demonstrates that the quality control program as defined has been accomplished.

The following requirements shall be met in addition to the Quality Group D requirements:

1. All longitudinal and circumferential butt weld joints shall be radiographed (or ultrasonically tested to equivalent standards). Where size or configuration does not permit effective volumetric examination, magnetic particle or liquid penetrate examination may be substituted. Examination procedures and acceptance standards shall be at least equivalent to those specified as supplementary types of examinations, Paragraph 136.4 in ANSI B31.1.

2. All fillet and socket welds shall be examined by either magnetic particle or liquid penetrant methods. All structural attachment welds to pressure retaining materials shall be examined by either magnetic particle or liquid penetrate methods. Examination procedures and acceptance standards shall be at least equivalent to those specified as supplementary types of examinations, Paragraph 136.4 in ANSI B31.1

3. All inspection records shall be maintained for the life of the plant. These records shall include data pertaining to qualification of inspection personnel, examination procedures, and examination results.

p. A quality assurance program meeting the guidance of Regulatory Guide 1.143 will be applied during design and construction.

q. Detailed seismic design criteria for the offgas system are provided in Subsection 11.3.4.8.

r. See Subsection 3.2.5.3.

s. The recirculation motor cooling system (RMCS) is classified Quality Group B and Safety Class 2 which is consistent with the requirements of 10CFR50.55a. The RMCS, which is part of the reactor coolant pressure boundary (RCPB) meets 10CFR50.55a (c)(2). Postulated failure of the RMCS piping cannot cause a loss of reactor coolant in excess of normal makeup (CRD return or RCIC flow), and the RMCS is not an engineered safety feature. Thus, in the event of a postulated failure of the RMCS piping during normal operation, the reactor can be shutdown and cooled down in an orderly manner, and reactor coolant makeup can be provided by a normal make up system (e.g., CRD return or RCIC system). Thus, per 10CFR50.55a(c)(2), the RMCS need not be classified Quality Group A or Safety Class 1, however, for plant availability, the system is designed, fabricated and constructed in accordance with ASME Boiler and Pressure Vessel Code, Section III, Class 1 criteria as specified in Subsection 3.9.3.1.4 and Figure 5.4-4.

t. A quality assurance program for the Fire Protection System meeting the guidance of Branch Technical Position CMEB 9.5-1 (NUREG-0800), is applied.

u. Special seismic qualification and quality assurance requirements are applied.

v. See Regulatory Guide 1.143, Paragraph C.5 for the offgas vault seismic requirements.

w. The condensate storage tank will be designed, fabricated, and tested to meet the intent of API Standard API 650. In addition, the specification for this tank will require: (1) 100% surface examination of the side wall to bottom joint and (2) 100% volumetric examination of the side wall weld joints.

x. The cranes and safety class 2 fuel servicing equipment are designed to hold up their loads and to maintain their positions over the units under conditions of SSE.

y. All off-engine components are constructed to the extent possible to the ASME Code, Section III, Class 3.

z. Components associated with safety-related function (e.g., isolation) are safety-related.

aa. Structures which support or house safety-related mechanical or electrical components are safety-related.

bb. All quality assurance requirements shall be applied to ensure that the design, construction and testing requirements are met.

cc. A quality assurance program, which meets or exceeds the guidance of Generic Letter 85-06, is applied to all non-safety-related ATWS equipment.

dd. Deleted.

ee. Figure 3.2-2 depicts the classification requirements for the feedwater system. At the interface between Seismic and non-Seismic Category I feedwater piping system, the Seismic Category I dynamic analyses will be extended to either the first anchor point in the non-seismic system or to sufficient distance in the non-seismic system so as not to degrade the validity of the Seismic Category I analysis.

ff. The equipment is not required to be classified as Seismic Category I. However, it is marked as Seismic Category I per PRA recommendation.

gg. The Head Holding Pedestal is non-safety related and Seismic Category I. All other reactor vessel servicing equipment is non-seismic categorygr.nol

hh. Light fixtures and bulbs are not seismically qualified but fixtures which receive Class 1E power are seismically supported (see Subsections 9.5.3.2.2.1 and 9.5.3.2.3.1).

Table 3.2-2 Minimum Design Requirements for an Assigned Safety Designation

Safety Designation†	Minimum Design Requirements*			
	Quality Group‡	Seismic Category*f*	Electrical Classification**	Quality Assurance††
SC-1	A	I	—	B
SC-2	B	I	—	B
SC-3	C	I	1E	B
NNS	†	‡	*f*	**

* For structural design requirements that are not covered here and in Table 3.2-3, see Section 3.8.

† Safety designations are defined in Subsections 3.2.3 and 3.2.5.

‡ Table 3.2-3 shows applicable codes and standards for components and structures in accordance with their quality group identified in Table 3.2-1.

Non-nuclear safety (NNS) related structures, systems and equipment that are not assigned a Quality Group in Table 3.2-1 are designed to requirements of applicable industry codes and standards (see Subsection 3.2.5.2).

Some NNS structures, systems, and components are optionally designed to Quality Group C or D requirements of Table 3.2-3, per Quality Group designation on Table 3.2-1.

f Seismic Category I structures, systems and components meet design and analysis requirements of Subsection 3.7.

Some NNS structures, systems and components are optionally designed to Seismic Category I design criteria as noted on Table 3.2-1. Some safety-related components (e.g., Pipe whip restraints) have no safety-related function in the event of an SSE, and are not Seismic Category I.

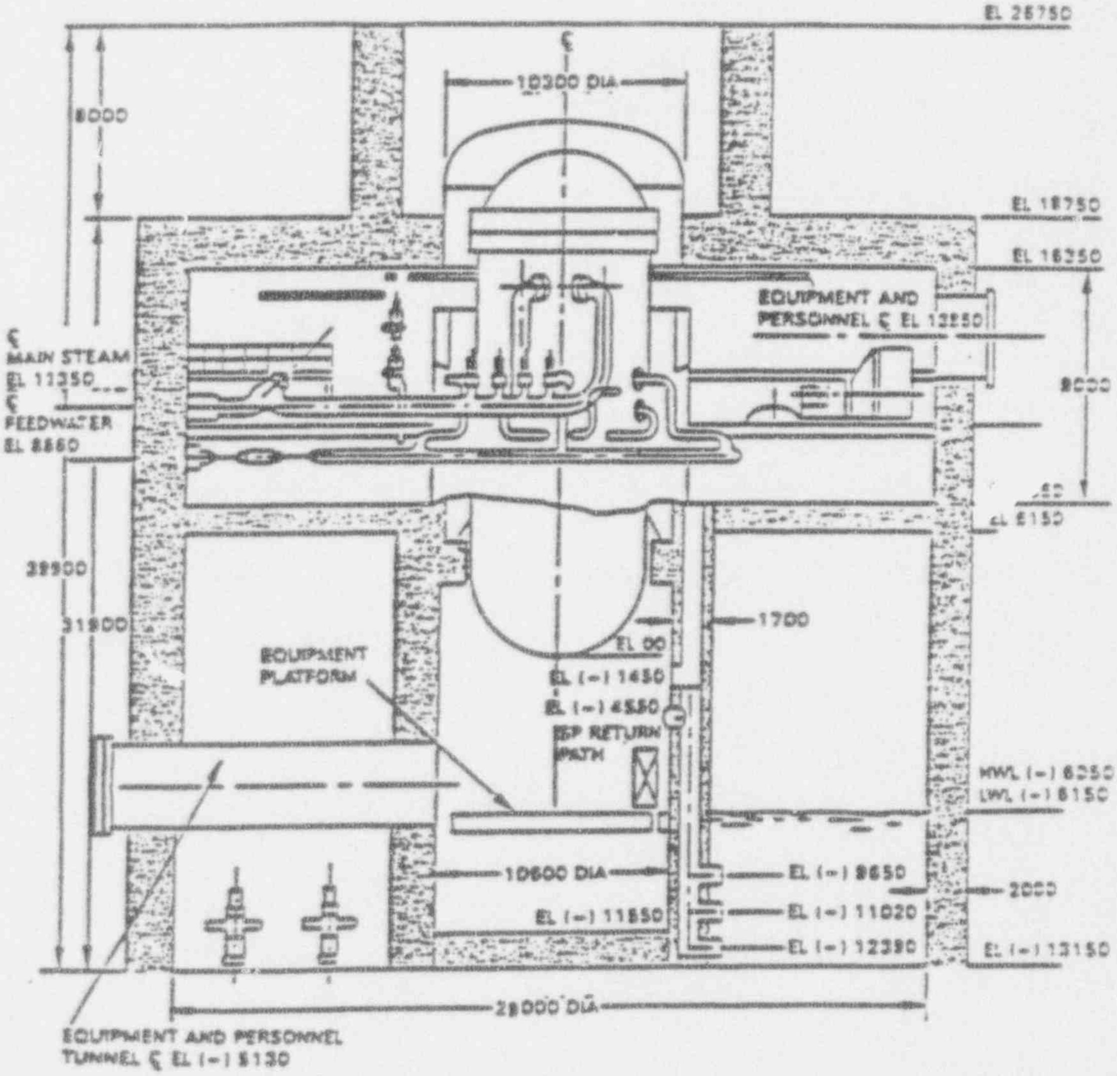
** Safety-related electrical equipment and instrumentation are designated SC-3 and are designed to meet IEEE Class 1E (as well as Seismic Category I) design requirements.

Some NNS electrical equipment and instrumentation are optionally designed to IEEE Class 1E requirements as noted on Table 3.2-1.

†† Safety-related structures, systems and components meet the quality assurance requirements of 10CFR50, Appendix B, as described in Chapter 17.

Some NNS structures, systems, and components meet the QA requirements as noted on Table 3.2-1.

List of Figures (Continued)



NOTES: Dimensions are in millimeters
Elevations are with respect to RPV "0"

Figure 3B-1 ABWR Primary Containment Configuration

Figure 3B-2 [Proprietary information provided under separate cover]

Figure 3B-9 [Proprietary infomation provided under separate cover]

Figure 3B-10 [Proprietary information provided under separate cover]

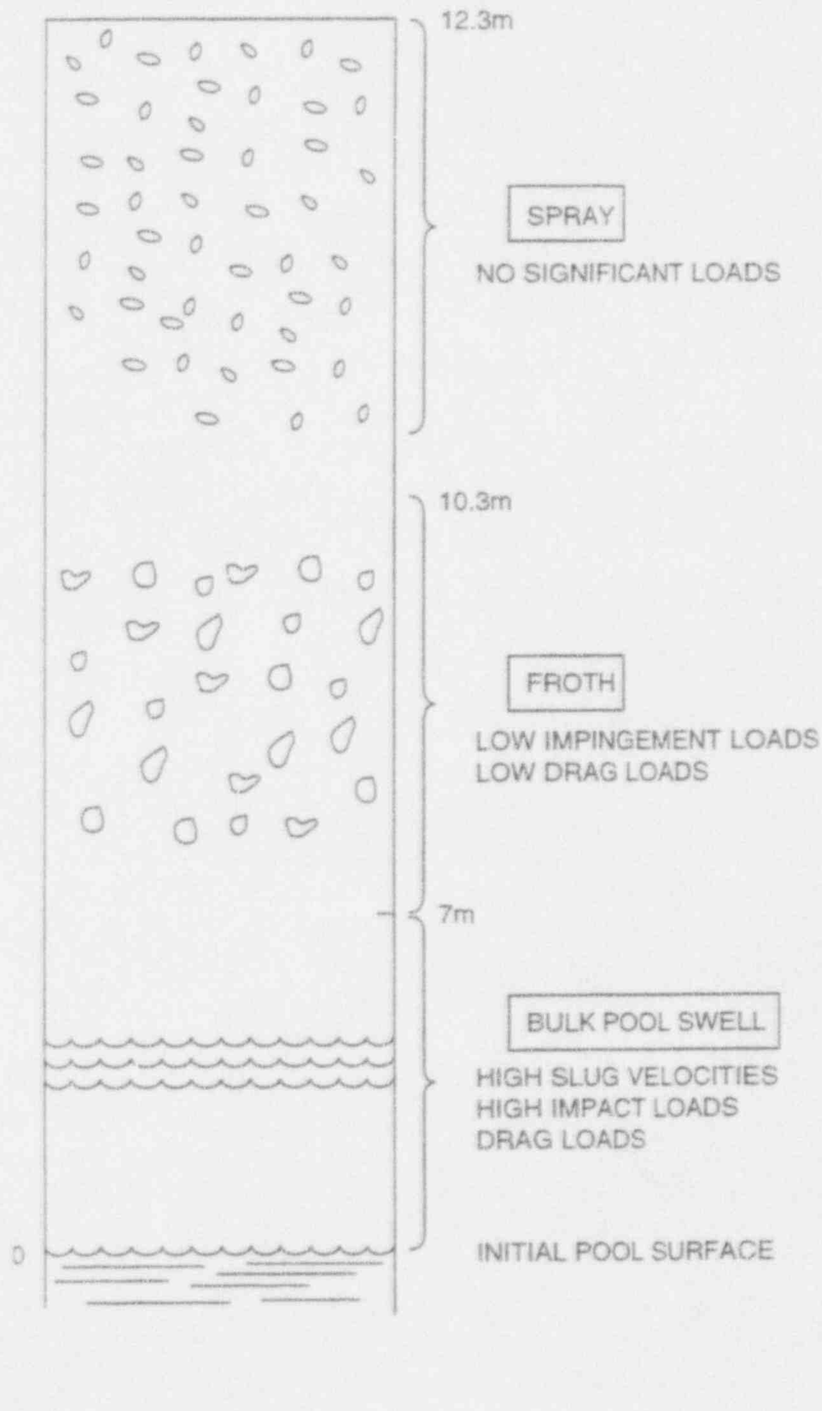


Figure 3B-13 Schematic of the Pool Swell Phenomenon

Figure 3B-14 [Proprietary information provided under separate cover]

Figure 3B-15 [Proprietary information provided under separate cover]

Figure 3B-16 [Proprietary information provided under separate cover]

Figure 3B-17 [Proprietary information provided under separate cover]

Figure 3B-18 [Proprietary information provided under separate cover]

Figure 3B-19 [Proprietary information provided under separate cover]

Figure 3B-20 [Proprietary information provided under seprate cover]

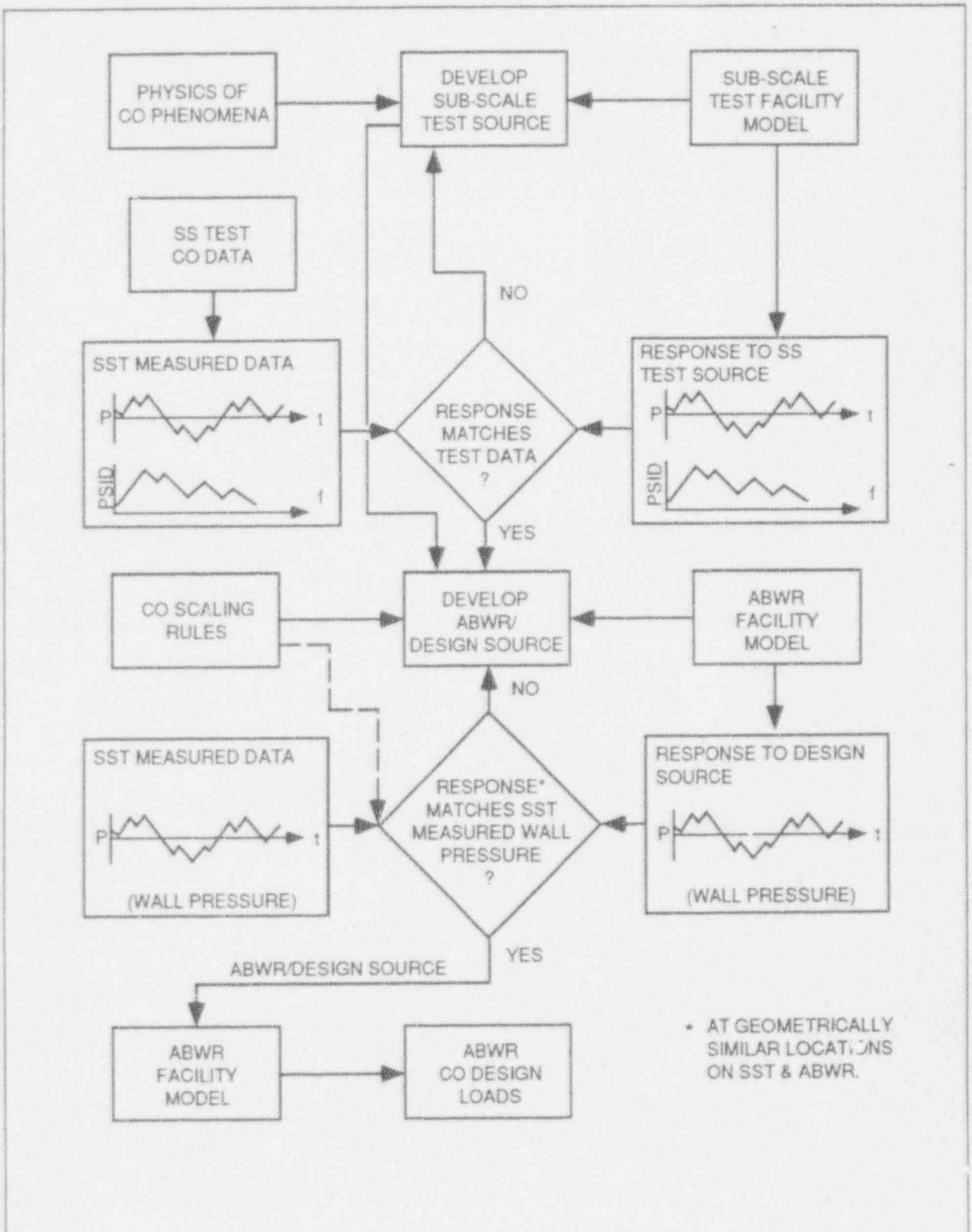


Figure 3B-21 ABWR CO Source Load Methodology

Figure 3B-22 [Proprietary information provided under separate cover]

Figure 3B-23 [Proprietary information provided under separate cover]

Figure 3B-24 [Proprietary information provided under separate cover]

Figure 3B-25 [Proprietary information provided under separate cover]

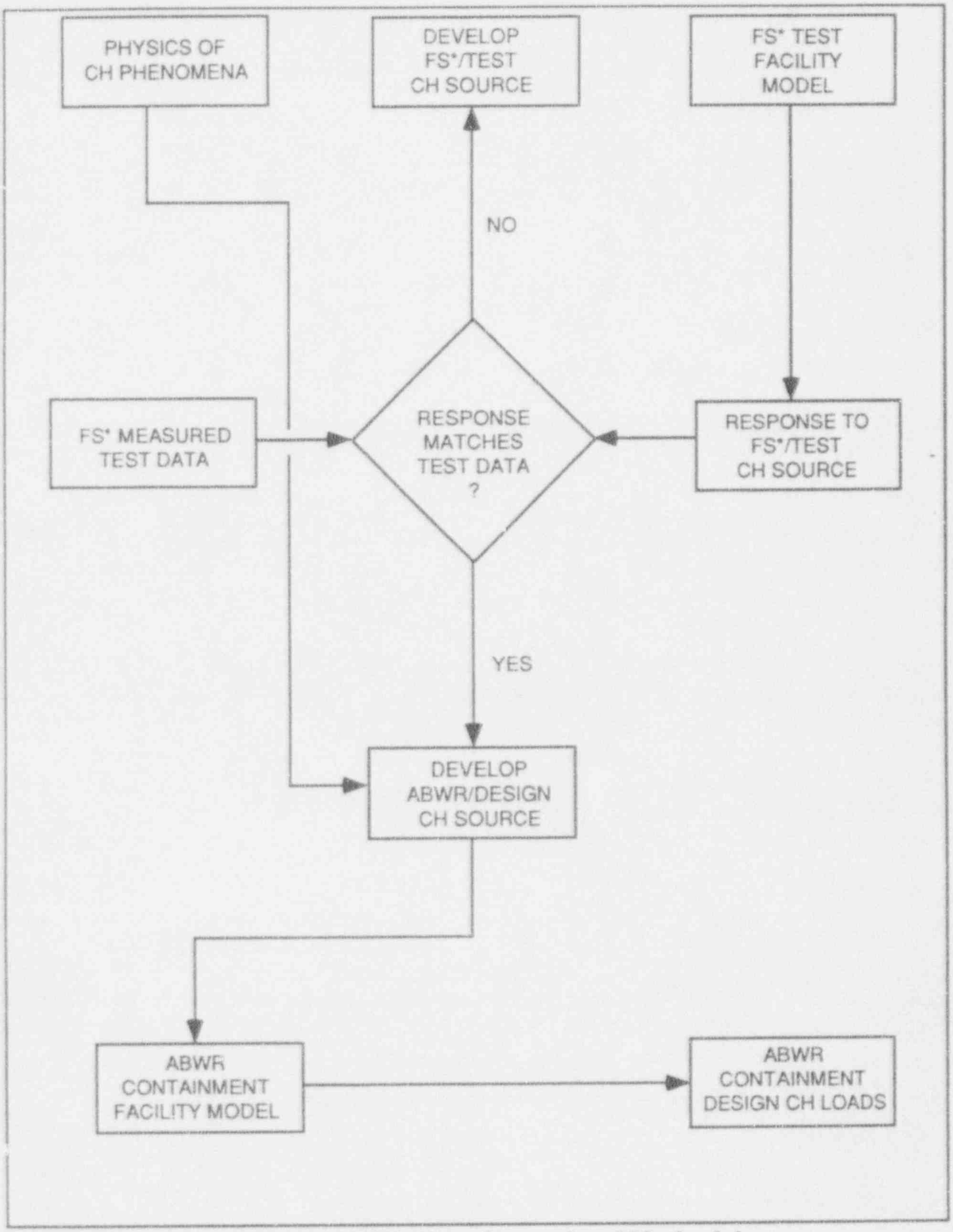


Figure 3B-26 ABWR Chug Source Load Methodology

Figure 3B-27 [Proprietary information provided under separate cover]

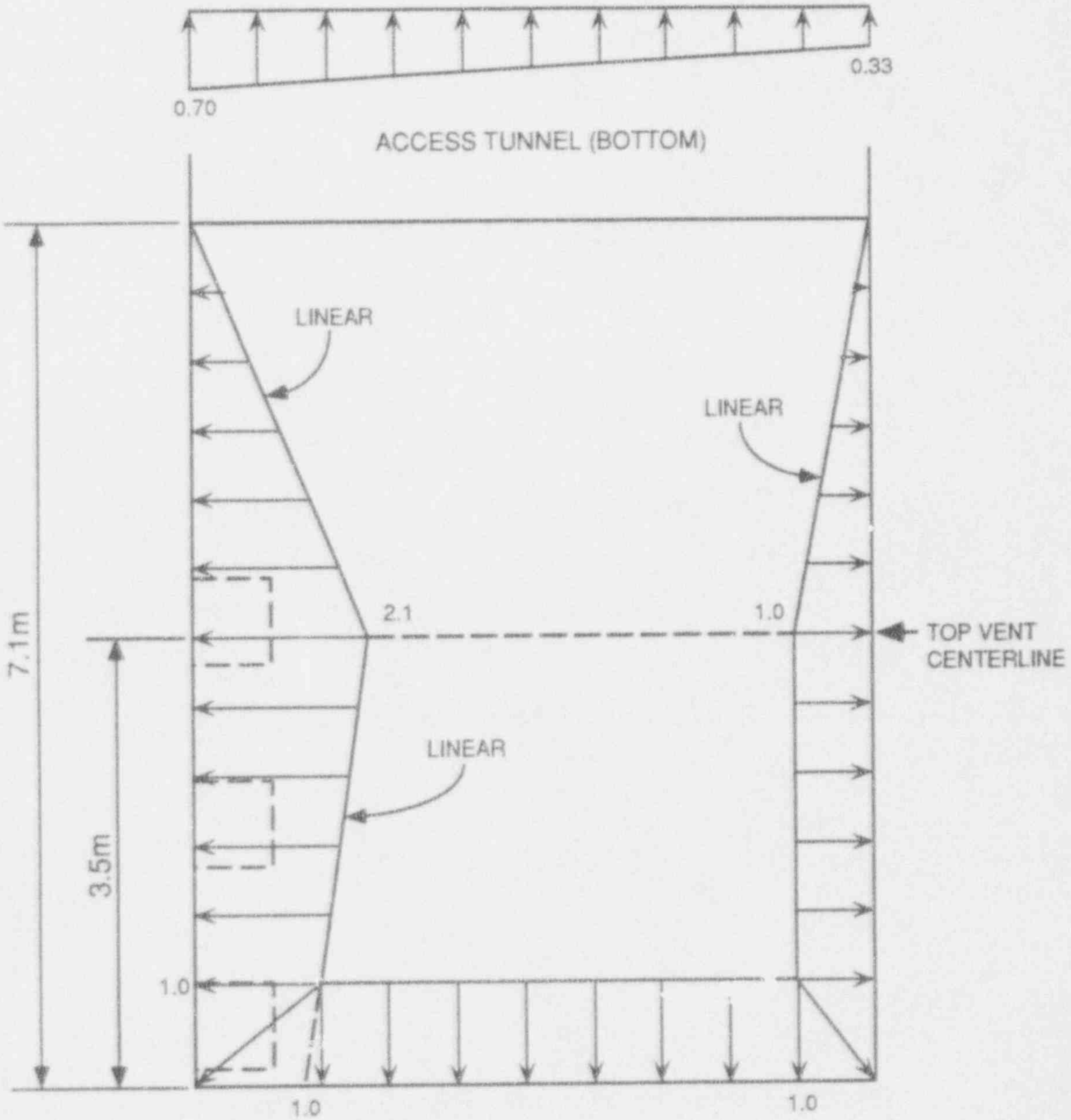


Figure 3B-28 Spatial Load Distribution for CH

Figure 3B-29 [Proprietary information provided under separate cover]

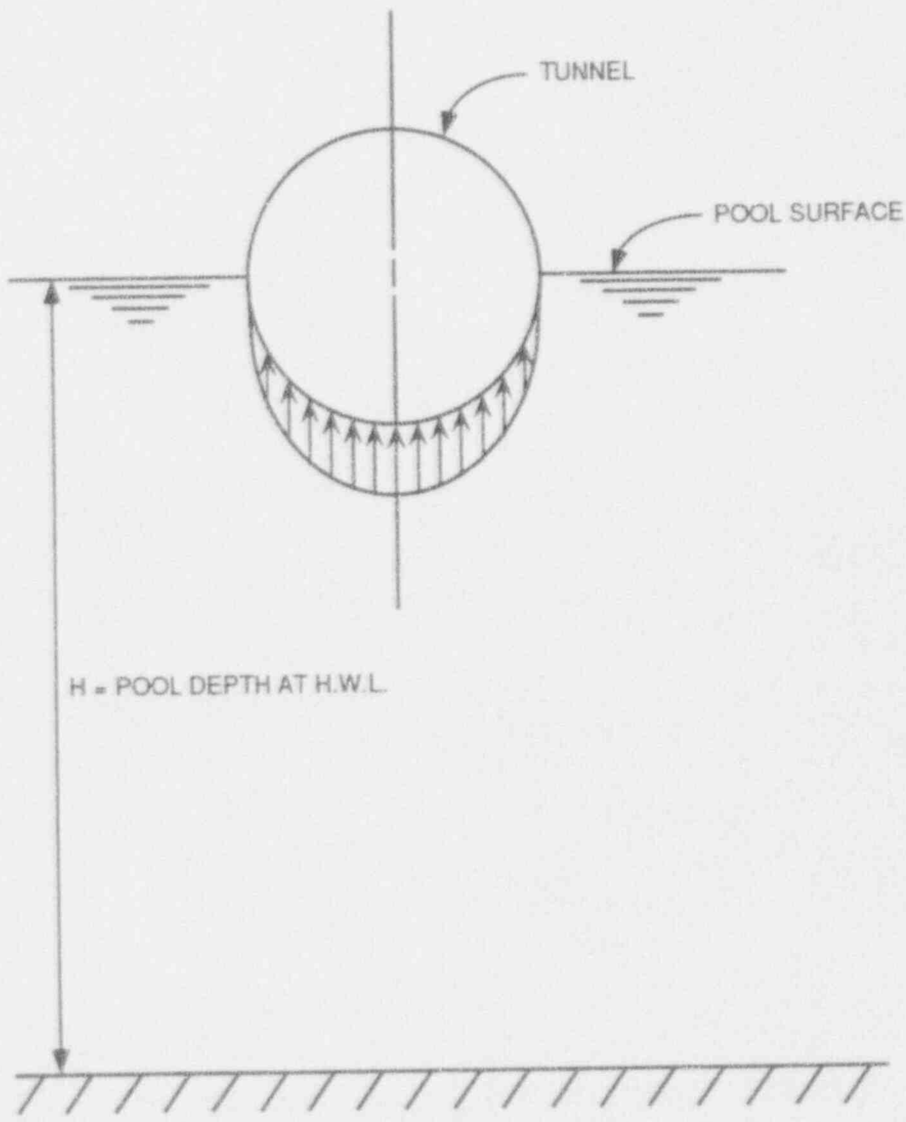


Figure 3B-30 Circumferential Pressure Distribution on Access Tunnel Due to CH

Figure 3B-31 [Proprietary information provided under separate cover]

Figure 3B-32 [Proprietary information provided under separate cover]

Figure 3B-33 [Proprietary information provided under separate cover]

Figure 3B-34 [Proprietary information provided under separate cover]

4.3.2.3 Reactivity Coefficients

Reactivity coefficients, the differential changes in reactivity produced by differential changes in core conditions, are useful in calculating stability and evaluating the response of the core to external disturbances. The base initial condition of the system and the postulated initiating event determine which of the several defined coefficients are significant in evaluating the response of the reactor. The coefficients of interest, relative to ABWR systems, are discussed here individually.

There are two primary reactivity coefficients that characterize the dynamic behavior of boiling water reactors: The Doppler reactivity coefficient and the moderator void reactivity coefficient. Also associated with the ABWR is a power reactivity coefficient and a temperature coefficient. The power coefficient is a combination of the Doppler and void reactivity coefficients in the power operating range, and the temperature coefficient is merely a combination of the Doppler and moderator temperature coefficients. Power and temperature coefficients are not specifically calculated for reload cores.

4.3.2.3.1 Doppler Reactivity Coefficient

The Doppler coefficient is of prime importance in reactor safety. The Doppler coefficient is a measure of the reactivity change associated with an increase in the absorption of resonance-energy neutrons caused by a change in the temperature of the material in question. The Doppler reactivity coefficient provides instantaneous negative reactivity feedback to any rise in fuel temperature, on either a gross or local basis. The magnitude of the Doppler coefficient is inherent in the fuel design and does not vary significantly among BWR designs. For most structural and moderator materials, resonance absorption is not significant, but in U-238 and Pu-240 an increase in temperature produces a comparatively large increase in the effective absorption cross-section. The resulting parasitic absorption of neutrons causes a significant loss in reactivity. In ABWR fuel, in which approximately 97% of the uranium in UO_2 is U-238, the Doppler coefficient provides an immediate negative reactivity response that opposes increased fuel fission rate changes.

Although the reactivity change caused by the Doppler effect is small compared to other power-related reactivity changes during normal operation, it becomes very important during postulated rapid power excursions in which large fuel temperature changes occur. The most severe power excursions are those associated with rod drop accidents. A local Doppler feedback associated with a 1650°C to 2760°C temperature rise is available for terminating the initial excursion.

The Doppler coefficient is determined using the theory and methods described in Reference 4.3-2.

4.3.2.3.2 Moderator Void Coefficient

The moderator void coefficient should be large enough to prevent power oscillation due to spatial xenon changes yet small enough that pressurization transients do not unduly limit plant operation. In addition, the void coefficient in the ABWR has the ability to flatten the radial power distribution and to provide ease of reactor control due to the void feedback mechanism The overall void coefficient is always negative over the complete operating range since the ABWR design is undermoderated.

A detailed discussion of the methods used to calculate void reactivity coefficients, their accuracy and their application to plant transient analyses, is presented in Reference 4.3-2.

4.3.2.4 Control Requirements

The General Electric ABWR control rod system is designed to provide adequate control of the maximum excess reactivity anticipated during the plant operation. The shutdown capability is evaluated assuming a cold, xenon-free core.

4.3.2.4.1 Shutdown Reactivity

The core must be capable of being made subcritical, with margin, in the most reactive condition throughout the operating cycle with the most reactive control rod fully withdrawn and all other rods fully inserted. The shutdown margin is determined by using the BWR simulator code (see Section 4.3.3) to calculate the core multiplication at selected exposure points with the strongest rod fully withdrawn. The shutdown margin is calculated based on the carryover of the minimum expected exposure at the end of the previous cycle. The core is assumed to be in the cold, xenon-free condition in order to ensure that the calculated values are conservative. Further discussion of the uncertainty of these calculations is given in Reference 4.3-3.

As exposure accumulates and burnable poison depletes in the lower exposure fuel bundles, an increase in core reactivity may occur. The nature of the increase depends on specifics of fuel loading and control state.

The cold k_{eff} is calculated with the strongest control rod out at various exposures through the cycle. A value R is defined as the difference between the strongest rod out k_{eff} at BOC and the maximum calculated strongest rod out k_{eff} at any exposure point. The strongest rod out k_{eff} at any exposure point in the cycle is equal to or less than:

where:

k_{eff} = k_{eff} (Strongest rod withdrawn)$_{BOC}$ + R,
R is always greater than or equal to 0. The value of R includes equilibrium Sm.

Chapter 6
Table of Contents

Table of Contents (Continued)

Chapter 6
List of Tables

List of Tables (Continued)

Chapter 6
List of Figures

List of Figures (Continued)

List of Figures (Continued)

List of Figures (Continued)

List of Figures (Continued)

List of Figures (Continued)

List of Figures (Continued)

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Because of the methods described above (coolant storage provisions, insulation materials requirements, and the like), as well as the fact that the containment has no significant stored quantities of acidic or basic materials, the post-LOCA aqueous phase pH in all areas of containment will have a flat time history. In other words, the liquid coolant will remain at its design basis pH throughout the event.

6.1.2 Organic Materials

6.1.2.1 Protective Coatings

The use of organic protective coatings within the containment has been kept to a minimum. The major use of such coatings is on the carbon steel containment liner, internal steel structures, and equipment inside the drywell and wetwell.

The epoxy coatings are specified to meet the requirements of Regulatory Guide 1.54 and are qualified using the standard ANSI tests, including ANSI N101.2. However, because of the impracticability of using these special coatings on all equipment, certain exemptions (e.g., electronic/elecurical trim, covers, face plates and valve handles) are allowed. The exemptions are restricted to small-size equipment where, in case of a LOCA, the paint debris is not a safety hazard. Other than these minor exemptions, all coatings within the containment are qualified to Regulatory Guide 1.54. See Subsection 6.1.3.1 for COL license information.

6.1.2.2 Other Organic Materials

Materials used in or on the ESF equipment have been reviewed and evaluated in respect to radiolytic and pyrolytic decomposition and attendant effects on safe operation of the system. For example, fluorocarbon plastic (Teflon) is not permitted in environments that attain temperatures greater than 148.8°C, or radiation exposures above 10^4 rads. The 10 reactor internal pump motors each contain less than 10 pounds of polyacrylic and polyethylene motor winding insulation. This material has a design life of 20 years in the environment of less than 6×10^7 rads at 60°C maximum.

Other organic materials in the containment are qualified to environmental conditions in the containment. See Subsection 6.1.3.1 for COL license information.

6.1.2.3 Safety Analysis

For each application the materials have been specified to withstand an appropriate radiation dose for their design life, without suffering any significant radiation-induced damage. The specified integrated radiation doses are consistent with those listed in Section 3.11. The various suppliers have indicated their compliance with these requirements.

In addition, since the containment post-accident environment consists of hot water, air and steam, no significant chemical degradation of these materials is expected because of strict applications of inspection and testing. No significant amount of solid debris is expected to be generated from these materials.

6.1.3 COL License Information

6.1.3.1 Protective Coatings and Organic Materials

(1) Indicate the total amount of protective coatings and organic materials used inside the containment that do not meet the requirements of ANSI N101.2 and Regulatory Guide 1.54.

(2) Evaluate the generation rate as a function of time of combustible gases that can be formed from these unqualified organic materials under DBA conditions that can reach the containment sump.

(3) Provide the technical basis and assumptions used for this evaluation (Subsection 6.1.2.1 and 6.1.2.2).

6.2.3.3.1.2.1 Reactor Core Isolation Cooling (RCIC) Compartment

The RCIC compartment is located in the secondary containment at El −8200 mm, in the 0–90° quadrant of the R/B. The design basis break for the RCIC compartment is determined to be the single-ended break of the 150A nominal pipe size steam supply line to the RCIC turbine. This line is a high-energy line out to the normally closed isolation valve inside the RCIC compartment. It supplies high-energy steam to the RCIC turbine in the event of reactor vessel isolation. In the event of a postulated design basis high-energy line break (HELB), the steam/air mixture from that compartment is directed into adjoining compartments and is eventually purged into the steam tunnel.

6.2.3.3.1.2.2 Reactor Water Cleanup (CUW) Equipment Rooms and Pipe Spaces

The RWCU equipment (pump, heat exchanger, filter/demineralizer, valves) and pipe spaces are located in the 0 - 270 degree quadrant of the reactor building, with floor elevations ranging from elevation -8200 mm to elevation 12300 mm. The design basis pipe break for the CUW System compartment network is determined to be a 200 mm double-ended break of the cleanup water suction line from the RPV. This high energy piping, which connects the CUW equipment, originates at the reactor pressure vessel. After being routed through the CUW System, this line is directed back to the RPV through special pipe spaces and the steam tunnel. In the event of a postulated design basis high energy line break in a compartment, the steam/air mixture from that compartment is directed into adjoining compartments and eventually purged into the turbine building through the steam tunnel.

6.2.3.3.1.2.3 Main Steam Tunnel

The Reactor Building main steam tunnel is located between the primary containment vessel and the Turbine Building at elevation 12300 mm and 0° azimuthal position. The DBA for the steam tunnel is the double-ended break of one of the 700 A main steamlines. These lines originate at the RPV and are routed through the main steam tunnel to the Turbine Building. In the event of a postulated design basis HELB, the steam/air mixture from the main steam tunnel is purged into the Turbine Building.

6.2.3.3.1.3 Design Evaluation

The compartment response to the postulated high energy line break was calculated using the engineering computer program SCAM. A detail discussion of methodology and assumptions used in this program can be found in Reference 6.2-4.

The initial conditions for the analysis include the assumption of 102% rated reactor power and the compartment pressures, temperatures and relative humidity as tabulated in Table 6.2-3. Blowout panels are used in place of open vent pathways when the environmental conditions of an compartment must be isolated from the environment in another compartment. The blowout panels are assumed to open fully against a differential pressure of 0.0352 kg/cm^2g, and are assumed to remain open.

For the postulated high energy line break, the blowdown mass and energy release rates from the break were determined using moody's homogeneous equilibrium model for critical flow described in Reference 6.2-2. The blowdown mass and energy release rate for the postulated High Energy Line Break (HELB) in a given compartment compromised of initial inventory depletion followed by steady critical flow from the ruptured pipe. After the inventory depletion period, break flow, limited by critical flow consideration, continues until the isolation valve is fully closed.

The following paragraphs describe the key assumptions and calculation of mass and energy release rates for the postulated HELB in the RCIC, CUW and Main Steam Tunnel compartments.

6.2.3.3.1.3.1 RCIC Compartment

For RCIC a single-ended pipe break, as noted earlier, was postulated. The mass and energy blowdown release rate comprised only of flow from the RPV side. The flow from the other side of the break was assumed to be negligible. The blowdown flow comprised of initial inventory depletion followed by steady critical flow from the RPV. In computing the critical flow rate, flow loss factors between RPV and break location were ignored for conservatism. Tabulated values of mass energy release rate for the postulated break is shown in Table 6.2-4b. The total blowdown duration of 41 seconds, as obvious from tabulated values, is based on assumption that the isolation valve starts closing at 11 seconds (1 second instrument response time and 10 seconds built-in logic time delay) after the break and is fully closed in 30 seconds. Considering that the isolation valve is a gate valve, non-linear flow area changes with respect to time were used during the valve closure period.

Figure 6.2-37a shows the compartment nodalization scheme used for the pressurization analysis model for different break cases. Table 6.2-3 shows the free volume, initial environmental conditions and DBA characteristics for the compartments which were analyzed. Table 6.2-4 tabulates subcompartment vent path characteristics. The calculated peak differential pressure for the RCIC compartments are tabulated in Table 6.2-3.

6.2.3.3.1.3.2 CUW Compartment

For CUW a double-ended pipe break, as noted earlier, was postulated. The mass and energy blowdown release rate comprised of flow from both the RPV and BOP sides of the break location. The flow from the RPV side comprised of initial inventory depletion followed by steady critical flow. The flow from the BOP side is the depletion of inventory between the break location and the closest check valve. Flow loss factors due to pipe friction, and other mechanical devices such as valves, elbows, tees, etc. were accounted

Criterion 4: Coolable Geometry
"Calculated changes in core geometry shall be such that the core remains amenable to cooling." As described in Reference 6.2-1, Section III.A, conformance to Criterion 4 is demonstrated by conformance to Criteria 1 and 2.

Criterion 5: Long-Term Cooling
"After any calculated successful initial operation of the ECCS, the calculated core temperature shall be maintained at an acceptably low value and decay heat shall be removed for the extended period of time required by the long-lived radioactivity remaining in the core." Conformance to Criterion 5 is demonstrated generically for GE BWRs in Reference 6.2-1, Section III.A. Briefly summarized, for any LOCA, the water level can be restored to a level above the top of the core and maintained there indefinitely.

6.3.3.3 Single-Failure Considerations

The functional consequences of potential operator errors and single failures (including those which might cause any manually controlled electrically operated valve in the ECCS to move to a position which could adversely affect the ECCS) and the potential for submergence of valve motors in the ECCS are discussed in Subsection 6.3.2. There it was shown that all potential single failures are no more severe than one of the single failures identified in Table 6.3-3.

It is therefore only necessary to consider each of these single failures in the ECCS performance analyses. The worst failure for any LOCA event is the failure of one of the diesel generators which provide electrical power to one HPCF and one RHR/LPFL. This failure results in the elimination of the greatest amount of flooding capability at both high and low reactor pressures.

6.3.3.4 System Performance During the Accident

In general, the system response to an accident can be described as:

(1) Receiving an initiation signal

(2) A small lag time (to open all valves and have the pumps up to rated speed)

(3) The ECCS flow entering the vessel

Key ECCS actuation setpoints and time delays for all the ECCS systems are provided in Table 6.3-1. The minimization of the delay from the receipt of signal until the ECCS pumps have reached rated speed is limited by the physical constraints on accelerating the diesel-generators and pumps. The delay time due to valve motion in the case of the high pressure system provides a suitably conservative allowance for valves available for this application. In the case of the low pressure system, the time delay for valve motion is such that the pumps are at rated speed prior to the time the vessel pressure reaches the pump shutoff pressure.

The ADS actuation logic includes a 29-second delay timer to confirm the presence of Low Water Level 1 (LWL 1) initiation signal. This timer is initiated upon receipt of a high drywell pressure signal (which is sealed-in) and a LWL 1 signal. The timer setting is consistent with the startup time of the ECCS which also must be running before ADS operation can occur. Once the ADS timer is initiated, it is automatically reset if the reactor water level is restored above the LWL 1 setpoint before ADS operation occurs. For defense-in-depth protection against inventory decreasing events where a high drywell pressure is not present, the ADS actuation logic also includes an 8-minute high drywell bypass timer. This timer is initiated upon receipt of a LWL 1 signal and is automatically reset if the reactor water level is restored above the LWL 1. After this timer runs out, the need for a high drywell pressure signal to initiate the ADS 29-second delay timer is bypassed (i.e., the 29-second delay timer would require only a LWL 1 signal to initiate). The ADS control system also provides the operator with an ADS inhibit switch which can be used to prevent automatic ADS operation as covered by the engineering operating procedures (refer to Subsection 7.3).

The flow delivery rates analyzed in Subsection 6.3.3 can be determined from the vessel pressure versus system flow curves in Figures 6.3-4, 6.3-5 and 6.3-6 and the pressure versus time plots discussed in Subsection 6.3.3.7. Simplified piping and instrumentation and process diagrams for the ECCS are referenced in Subsection 6.3.2. The operational sequence of ECCS for the limiting case is shown in Table 6.3-2.

Operator action is not required, except as a monitoring function, during the short-term cooling period following the LOCA. During the long-term cooling period, the operator may need to take action as specified in Subsection 6.2.2.2 to place the containment cooling system into operation for some LOCA events.

6.3.3.5 Use of Dual Function Components for ECCS

With the exception of the LPFL systems, the systems of the ECCS are designed to accomplish only one function: to cool the reactor core following a loss of reactor coolant. To this extent, components or portions of these systems (except for pressure relief) are not required for operation of other systems which have emergency core cooling functions, or vice versa. Because either the ADS initiating signal or the overpressure signal opens the safety-relief valve, no conflict exists.

The LPFL Subsystem is configured from the RHR pumps and some of the RHR valves and piping. When the reactor water level is low, the LPFL Subsystem (line up) has priority through the valve control logic over the other RHR Subsystems for containment cooling. Immediately following a LOCA, the RHR System is directed to the LPFL mode.

Table 6.3-4 Summary of Results of LOCA Analysis

Break Location	Break Size (cm^2)	Systems Available	PCT (°C)	Maximum Local Oxidation
Based on Appendix K evaluation models:				
Steamline Inside Containment	985	1HPCF + RCIC +2 RHR/LPFL + 8 ADS	552	0.03%
Feedwater Line	839	1 HPCF + 2 RHR/LPFL + 8 ADS	542	0.03%
RHR Shutdown Cooling Suction Line	792	1 HPCF + RCIC + 2 RHR/LPFL+ 8 ADS	542	0.03%
RHR/LPFL Injection Line	205	1 HPCF + RCIC + 1RHR/LPFL + 8 ADS	542	0.03%
High Pressure Core Flooder	92	RCIC+2RHR/ LPFL + 8 ADS	542	0.03%
Bottom Head Drain Line	20.3	1HPCF + RCIC + 2 RHR/LPFL + 8 ADS	542	0.03%
Steamline Outside Containment	3939	1 HPCF + RCIC + 2 RHR/LPFL + 8 ADS	621	0.03%
Based on bounding values:				
Steamline Outside Containment	3939	1 HPCF + RCIC + 2 RHR/LPFL + 8 ADS	619	0.03%

Note: The core-wide metal-water reaction for this analysis has been calculated using method 1 described in Reference 6.3-1. This results in a core-wide metal-water reaction of 0.03%.

Table 6.3-5 Key to Figures

Appendix K Evaluation Models								
	Main Steamline Inside Contain-ment	Feedwater Line	RHR Suction Line	LPFL Injection Line	Core Flood Line	Bottom Drain Line	Main Steamline Outside Contain-ment	Bounding Values Main Steamline Outside Contain-ment
Core Flow	6.3-12	6.3-21	6.3-21	6.3-21	6.3-44	6.3-21	6.3-21	6.3-67
Minimum Critical Power Ratio	6.3-13	6.3-22	6.3-22	6.3-22	6.3-45	6.3-22	6.3-22	6.3-68
Water Level in Fuel Channel	6.3-14	6.3-23	6.3-30	6.3-37	6.3-46	6.3-53	6.3-60	6.3-69
Water Level Inside Shroud	6.3-15	6.3-24	6.3-31	6.3-38	6.3-47	6.3-54	6.3-61	6.3-70
Water Level Outside Shroud	6.3-16	6.3-25	6.3-32	6.3-39	6.3-48	6.3-55	6.3-62	6.3-71
Vessel Pressure	6.3-17	6.3-26	6.3-33	6.3-40	6.3-49	6.3-56	6.3-63	6.3-72
Flow out of Vessel	6.3-18	6.3-27	6.3-34	6.3-41	6.3-50	6.3-57	6.3-64	6.3-73
Flow into Vessel	6.3-19	6.3-28	6.3-35	6.3-42	6.3-51	6.3-58	6.3-65	6.3-74
Peak Cladding Temperature	6.3-20	6.3-29	6.3-36	6.3-43	6.3-52	6.3-59	6.3-66	6.3-75

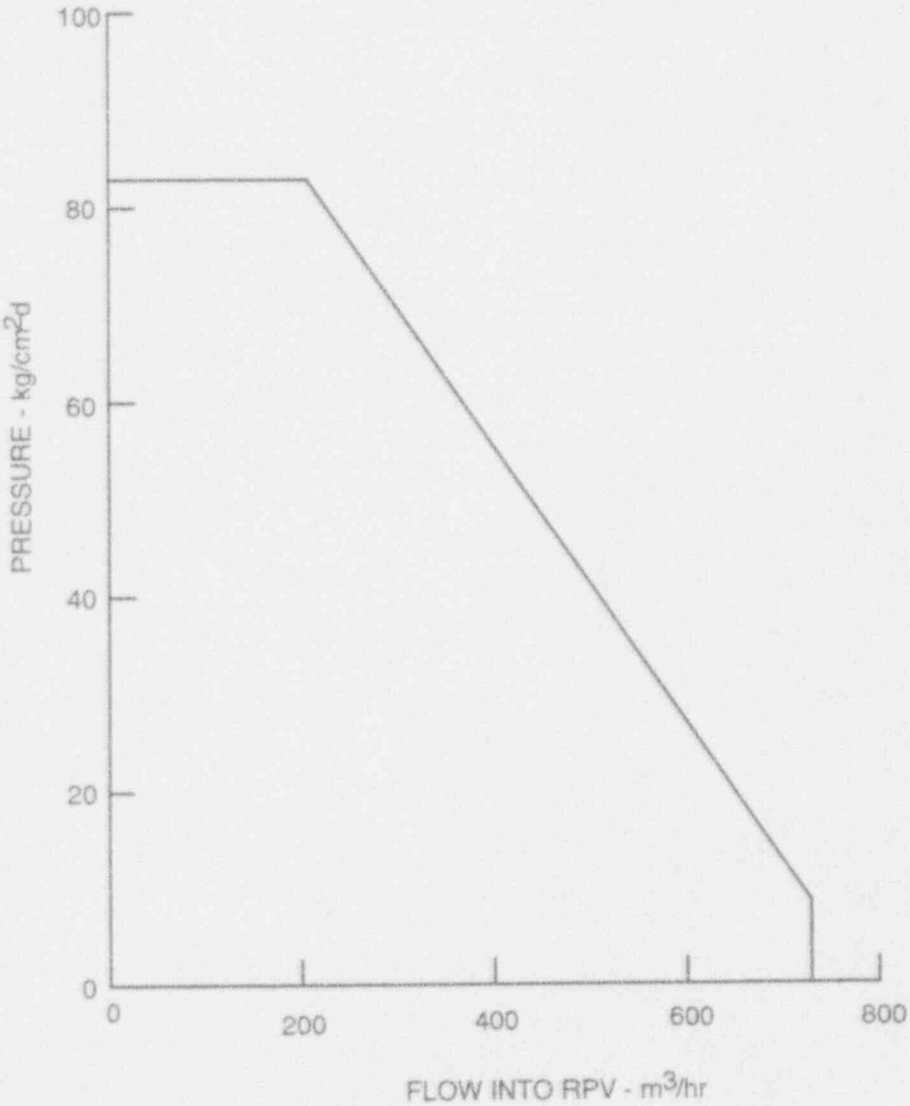


Figure 6.3-4 Pressure Versus High Pressure Core Flooder Flow (Per System) Used in LOCA Analysis

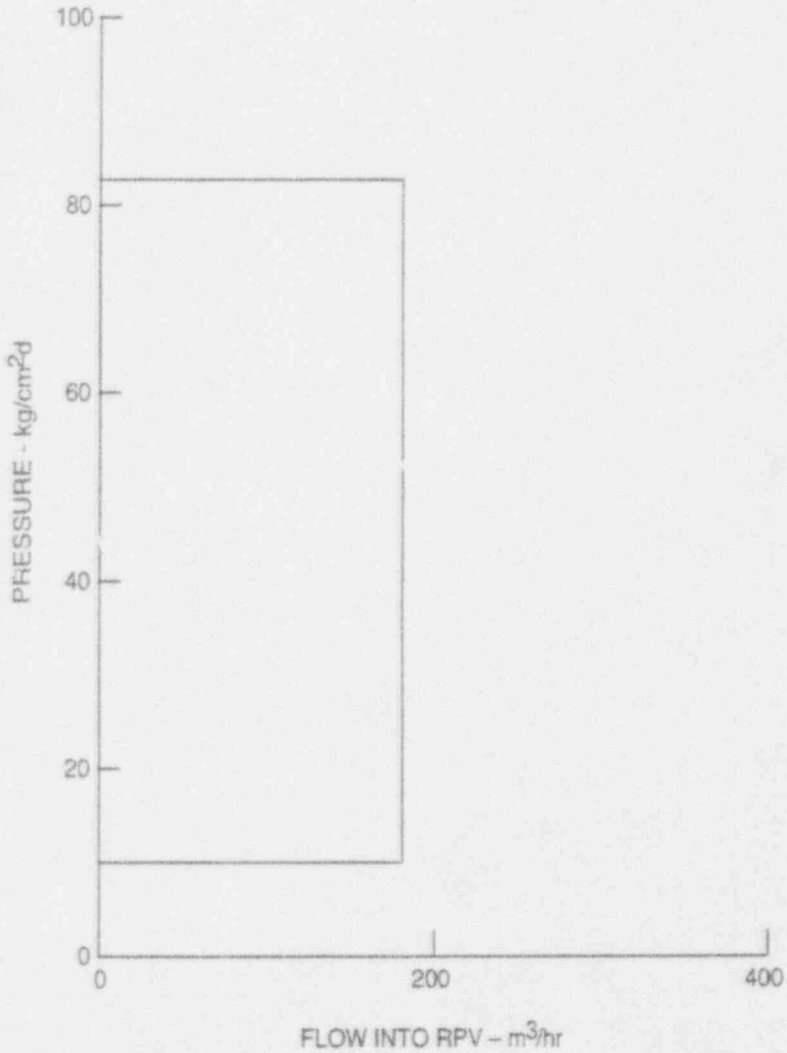


Figure 6.3-5 Pressure Versus Reactor Core Isolation Cooling Flow Used in LOCA Analysis

Figure 6.3-10 [Proprietary information provided under separate cover]

Figure 6.3-11 [Proprietary information provided under separate cover]

Figure 6.3-76 [Proprietary information provided under separate cover]

Figure 6.3-76[Proprietary information provided under separate cover]

Table 6.3-77 [Proprietary information provided under separate cover]

Table 6.3-78 [Proprietary information provided under separate cover]

Table 6.3-79 [Proprietary information provided under separate cover]

6.5 Fission Products Removal and Control Systems

6.5.1 Engineered Safety Features Filter Systems

The filter systems required to perform safety-related functions following a design basis accident are:

(1) Standby Gas Treatment System (SGTS)

(2) Control room portion of the HVAC System (HVAC)

The control room portion of the HVAC System is discussed in Section 6.4 and Subsection 9.4.1. The SGTS is discussed in this subsection (6.5.1).

6.5.1.1 Design Basis

6.5.1.1.1 Power Generation Design Basis

The SGTS has the capability to filter the gaseous effluent from the primary containment or from the secondary containment when required to limit the discharge of radioactivity to the environment to meet 10CFR100 requirements.

6.5.1.1.2 Safety Design Basis

The SGTS is designed to accomplish the following:

(1) Maintain a negative pressure in the secondary containment, relative to the outdoor atmosphere, to control the release of fission products to the environment.

(2) Filter airborne radioactivity (halogen and air particulates) in the effluent to reduce offsite doses to within the limits specified in 10CFR100.

(3) Ensure that failure of any active component, assuming loss of offsite power, cannot impair the ability of the system to perform its safety function.

(4) Remain intact and functional in the event of a safe shutdown earthquake (SSE).

(5) Meet environmental qualification requirements established for system operation.

(6) Filter airborne radioactivity (halogens and particulates) in the effluent to reduce offsite doses during normal and upset operations to within the limits of 10CFR20.

6.5.1.2 System Design

6.5.1.2.1 General

The SGTS P&ID is provided as Figure 6.5-1.

6.5.1.2.2 Component Description

Table 6.5-1 provides a summary of the major SGTS components. The SGTS consists of two parallel and redundant filter trains. The two SGTS trains are located in two adjacent rooms. Each train is protected for fire, flood, pipe break and missiles. The electrical separation is provided by connecting the two trains to Divisions 2 and 3 electric power. The two trains are mechanically separated also. Suction is taken from the secondary containment, including above the refueling area, or from the primary containment via the Atmospheric Control System (ACS). The treated discharge goes to the main plant stack.

The SGTS consists of the following principal components:

(1) Two filter trains, each consisting of a of a moisture separator, an electric process heater, a prefilter, a high efficiency particulate air (HEPA) filter, a charcoal adsorber, a second HEPA filter, space heaters, and a cooling fan for the removal of decay heat from the charcoal.

(2) Two independent process fans located downstream of each filter train.

6.5.1.2.3 SGTS Operation

6.5.1.2.3.1 Automatic

Upon receipt of a high drywell pressure signal or a low reactor water level signal, or when high radioactivity is detected in the secondary containment or refueling floor ventilation exhaust, both SGTS trains are automatically actuated and one train is manually placed in the Standby mode. When the operation of both the trains is assured, one train is placed in the Standby mode. In the event that a malfunction disables an operating train, the standby train is automatically initiated.

6.5.1.2.3.2 Manual

The SGTS is on standby during normal plant operation.It may be manually initiated for primary containment de-inerting in accordance with the Technical Specifications when required to limit the discharge of contaminants to the environment within 10CFR20 limits. Normal operation of the SGTS while the plant is in the startup, power, hot standby, and hot shutdown modes of operation is much less than 90 hours per year for both trains combined. However, if 90 hours of operation per year for either train (excluding tests) is to be exceeded, the COL applicant is required to demonstrate that

Surveillance monitoring of the temperatures in the drywell, is provided by multiple temperature sensors distributed throughout the drywell to detect local area "hot-spots" and to monitor the operability of the drywell cooling system. With this drywell air temperature monitoring system supplied by multiple temperature sensors throughout the drywell, the Regulatory Guide 1.97 requirements for monitoring of drywell air temperature are met and provides the ability to determine drywell bulk average temperature.

(k) Drywell/Wetwell Hydrogen/Oxygen Concentration

The Containment Atmospheric Monitoring System (CAMS) consists of two independent and redundant drywell/containment oxygen and hydrogen concentration monitoring channels. Emergency response actions regarding these variables are consistently directed toward minimizing the magnitude of these parameters (i.e., there are no safety actions which must be taken to increase the hydrogen/oxygen levels if they are low). Consequently, the two channel CAMS design provides adequate PAM indication, since, in the event that the two channels of information disagree, the operator can determine a correct and safe action based upon the higher of the two (in-range) indications.

(l) Wetwell Atmosphere Air Temperature

Surveillance monitoring of temperatures in the wetwell is provided by multiple temperature sensors dispersed throughout the wetwell, the required indication of bulk average wetwell atmosphere temperature.

(m) Standby Liquid Control Flow

No flow indication is provided for the ABWR design. The positive displacement SLC pumps are designed for constant flow. Any flow blockage or line break would be indicated by abnormal system pressure (high or low as compared to RCS pressure) following SLC initiation. Changing neutron flux, SLC and SLC tank level are substituted for SLC flow and are considered adequate to verify proper system function. One channel of SLC discharge pressure is provided in addition to the monitoring of neutron flux.

(n) Suppression Pool/Wetwell Water Level

Regulatory Guide 1.97 suggests two ranges for suppression pool water level (i.e., botom of ECCS suction to 1.5m above normal water level and top of vent to top of weir wall [BWR 6, Mark III Containment]). The ABWR provides:

(i) Four (4) divisions of narrow range suppression pool water (e.g., approximately 0.5 meters above and below normal water level) for control of normal water level and automatic transfer of RCIC and HPCF suctions.

(ii) Two (2) wide range suppression pool/wetwell water level instruments fro approximately the centerline of the ECCS suction piping to the wetwell spray spargers. This range allows for control of suppression pool/wetwell water level in the vicinity of the spray spargers at the high end and the ECCS pumps (vortex limits) at the low end.

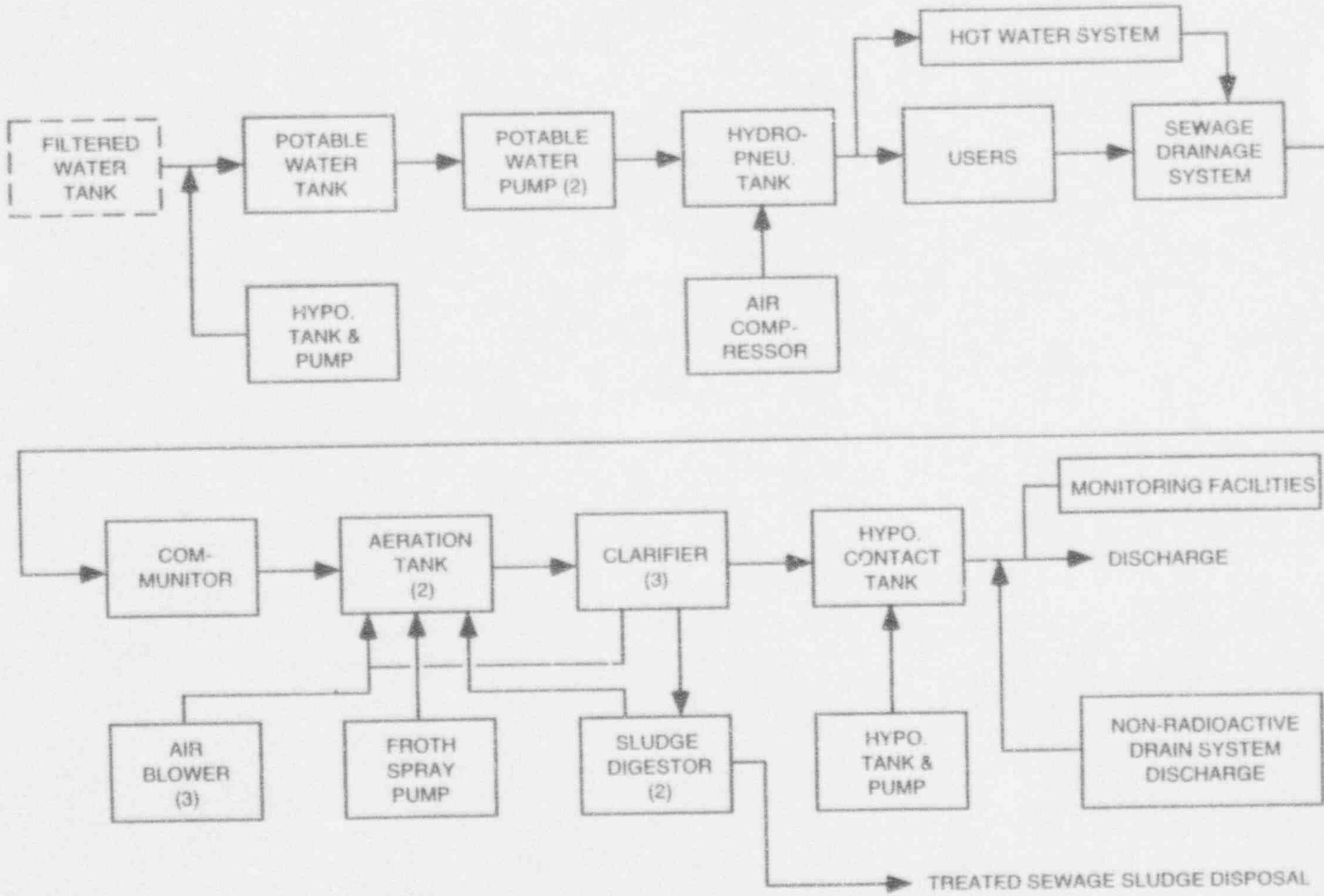
Two (2) wide range wetwell level instruments are sufficient to control water level at the high level and at the low level by using the highest reading and the lowest reading instruments, respectively, should the instruments disagree. In addition, The low end measurement to the centerline of the ECCS suction piping is considered sufficient since this level measurement is low enough to allow control of the pump vortex limits.

(Note: See drywell water level for instrument range overlap).

(o) Drywell Water Level

The lower drywell water level measurement below the RPV (other than sump level) is not warranted because of its ability to servive a severe accident (core melt) and because of the following: When the suppression pool level is increased to accommodate severe accident drywell flooding (per the ABWR EPGs), suppression pool level will stop increasing while the water spills into the lower drywell through the vents. Once drywell and wetwell water levels equalize, the increase in drywell level will be monitored by the wetwell water level monitors up to the bottom of the RPV. (See also upper drywell water level monitoring for instrument overlap.)

In addition to the above discussion of lower drywell water level monitoring, the ABWR design provides for two (2) upper drywell water level monitors. The range of these instruments in from approximately 0.5 meters below the RPV (lower drywell and above wetwell to lower drywell vents) to the maximum primary containment water level limit (MPCWLL) (upper drywell and approximately five (5) meters above TAF.). This lower range provides an approximately 0.5 meter



Block Flow Diagram
(Interface Requirements)

Figure 9.2-9 Potable and Sanitary Water System

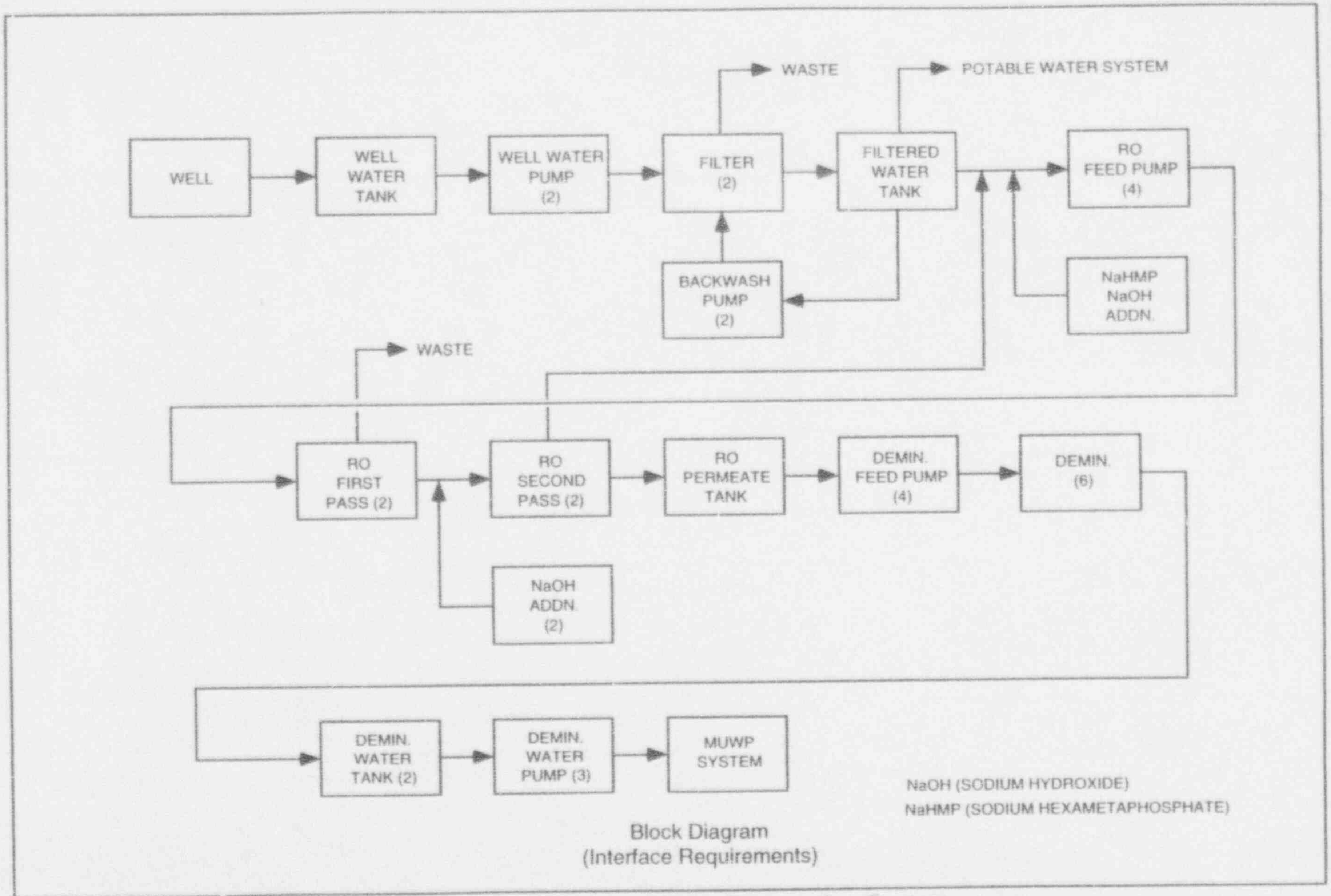
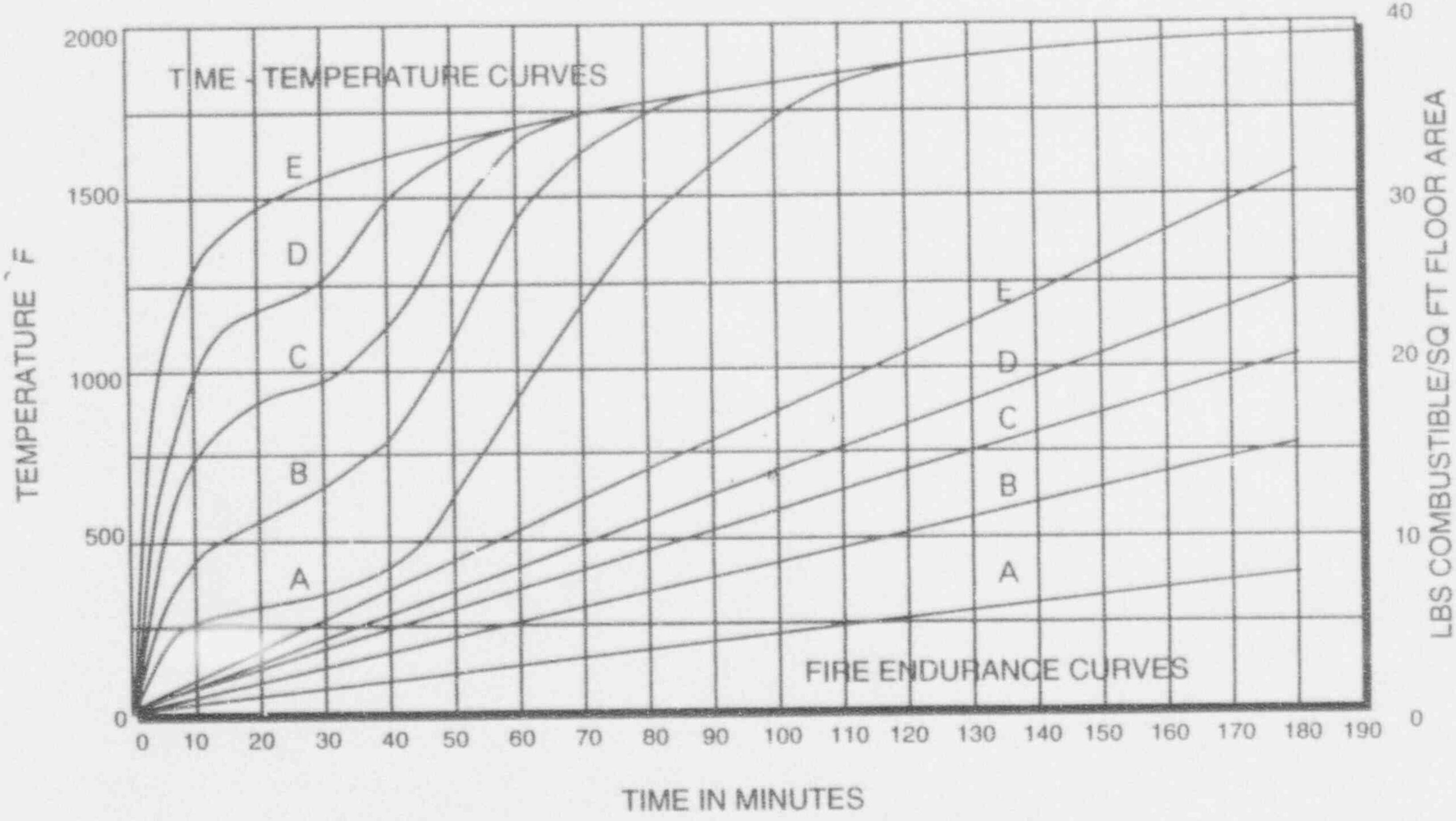


Figure 9.2-10 Makeup Water Preparation System



NOTE: THIS FIGURE REPRODUCED FROM REFERENCE 9B-2 FOR FIRST 120 MINUTES.

Figure 9B-1 Possible Classification of Building Contents for Fire Severity and Duration

14.2.12.1.3 Recirculation Flow Control System Preoperational Test

(1) Purpose

To verify that the operation of the Recirculation Flow Control (RFC) System, including that of the adjustable speed drives, RIP trip and runback logic, and the core flow measurement subsystem, is as specified.

(2) Prerequisites

The construction tests have been successfully completed, and the SCG has reviewed the test procedure and approved the initiation of testing. The following systems shall be available, as needed, to support the specified testing and the corresponding system configurations: Reactor Recirculation System, Feedwater Control System, Steam Bypass and Pressure Control System, electric power distribution system/instrumentation and control power supply, Process Computer System, Reactor Water Cleanup System, CRD System, RCIS, Neutron Monitoring System, automatic power regulation system, condensate and feedwater system and Reactor Protection System.

(3) General Test Methods and Acceptance Criteria

Some portions of the RFC System testing described below may be performed in conjunction with that of the recirculation system, as described in Subsection 14.2.12.1.2. In any case, close coordination of the testing specified for the two systems is required in order to demonstrate the proper integrated system response and operation.

Performance shall be observed and recorded during a series of individual component and integrated system tests. These tests shall demonstrate that the RFC System operates properly as specified in Subsection 7.7.1.3 and applicable RFC System design specification through the following testing:

(a) Proper operation of instrumentation and system controls in all combinations of logic and instrument channel trip, including stability control and protection (SCP), alternate rod insertion (ARI), recirculation flow block, recirculation pump trip (RPT) and runback circuity (RPT testing will specifically include its related ATWS function)

(b) Proper functioning of instrumentation, including calibration of process sensors, operator displays and alarm annunciation, confirmation of signal continuity, scaling and validation logic; and operator/technician interfaces and services

(c) Proper functioning of the core flow measurement subsystem

(d) Proper operation of the RFC System control algorithm in all design operating modes and all levels of controls

(e) Proper operation of the adjustable speed drives, recirculation pump and pump motor component

(f) Fault-tolerant capability of the redundant RFC digital controller upon a simulated single processor channel failure

(g) Capability of the self-test and online diagnostic features of the FTDC in identifying the presence of a fault and determining the location of a failure

(h) Proper operation of interlocks and trip logic and all control functions

(i) Proper operation of the technical interface unit (TIU) in the various provided operational modes as defined by the RFC design specification

(j) Proper steady-state and coastdown performance of M-G sets

(k) Capabilities of the FTDC cold and warm start features (i.e., self-starting following a power interruption to the full system and bringing a processing channel online with the other channels in operation without the need for operator or technician action)

(l) Proper operation of the RIPs trip function by verifying that RIPs trip in response to simulated high dome pressure, low water level, and both signals as specified by the appropriate RFC System design specification

14.2.12.1.4 Feedwater Control System Preoperational Test

(1) Purpose

To verify proper operation of the Feedwater Control System (FWCS), including individual components such as controllers, indicators, and controller software settings such as gains and function generator curves.

(2) Prerequisites

The construction tests have been successfully completed, and the SCG has reviewed the test procedures and approved the initiation of testing. Preoperational tests must be completed on lower level controllers that do not strictly belong to the FWCS but that may affect system response. All FWCS components shall have an initial calibration in accordance with vendor instructions. Appropriate instrumentation and control power supply, Turbine Control System, Reactor Recirculation Flow Control System, Condensate and Feedwater System, Process Computer System, Reactor Water Cleanup System,

Table 15.7-2 Isotopic Source and Release to the Environment in Curies

	Isotope Flow Rates (Design Basis)			Integrated Releases (at Max Tech Spec)		
	T=0	T=2 min	T=30 min	T=30 min	Charcoal Delay	Total
Isotope	(Ci/sec)	(Ci/sec)	(Ci/sec)	(Ci)	(Ci)	(Ci)
Kr-83m	3.42E-3	3.38E-3	2.84E-3	20.47	11.01	31.47
Kr-85m	6.02E-3	5.99E-3	5.57E-3	40.13	31.02	71.14
Kr-85	1.88E-5	1.88E-5	1.88E-5	0.14	0.14	0.27
Kr-87	2.07E-2	2.03E-2	1.57E-2	113.35	45.61	158.96
Kr-88	2.07E-2	2.05E-2	1.83E-2	131.68	87.23	218.90
Kr-89	1.28E-1	8.25E-2	1.77E-4	1.28	0.00	1.28
Kr-90	2.82E-1	2.15E-2	4.73E-18	0.00	0.00	0.00
Kr-91	3.42E-1	2.41E-5	0	0.00	0.00	0.00
Kr-92	3.42E-1	8E-21	0	0.00	0.00	0.00
Kr-93	9.03E-2	3.2E-30	0	0.00	0.00	0.00
Kr-94	2.22E-2	0	0	0.00	0.00	0.00
Kr-95	2.07E-3	0	0	0.00	0.00	0.00
Kr-97	1.35E-5	0	0	0.00	0.00	0.00
Total	1.26	0.15	4.26E-2	307.03	175.00	482.03
Xe-131m	1.47E-5	1.47E-5	1.47E-5	0.11	0.10	0.20
Xe-133m	2.82E-4	2.82E-4	2.80E-4	2.02	1.24	3.26
Xe-133	7.90E-3	7.90E-3	7.89E-3	56.78	48.57	105.35
Xe-135m	2.63E-2	2.41E-2	6.77E-3	48.72	0.00	48.72
Xe-135	2.26E-2	2.25E-2	2.17E-2	156.54	9.17	165.72
Xe-137	1.47E-1	1.02E-1	6.53E-4	4.70	0.00	4.70
Xe-138	8.66E-2	7.85E-2	2.00E-2	144.09	0.00	144.09
Xe-139	2.82E-1	3.60E-2	1.09E-14	0.00	0.00	0.00
Xe-140	3.01E-1	6.65E-4	0	0.00	0.00	0.00
Xe-141	2.45E-1	2.44E-22	0	0.00	0.00	0.00
Xe-132	7.15E-2	1.76E-31	0	0.00	0.00	0.00
Xe-143	1.20E-2	0	0	0.00	0.00	0.00
Xe-144	5.65E-4	0	0	0.00	0.00	0.00
Total	1.20	0.27	5.47E-2	412.97	59.08	472.05
Kr+XE	2.46	0.43	0.1	720.00	234.08	954.08

Table 15.7-3 Offgas System Failure Meteorology and Dose Results

Meteorology	Whole Body Dose
1.37E-3 sec/m3	0.275 Rem

Table 15.7-4
(Deleted)

Seismic failure of DC power also is assumed to lead directly to core damage. Without DC power, all instrument and equipment control power is lost and the reactor cannot be controlled or depressurized. In the seismic margins analysis it is assumed that this results in a high pressure core melt. The limiting components for DC power are the batteries (HCLPF = 1.13g) and the cable trays (HCLPF = 0.74g).

It is possible that a large seismic event could impair the ability to scram due to deformation of the channels that enclose each fuel bundle. In the event that the scram function is impaired, the only means of reactivity control would be the Standby Liquid Control (SLC) System. Seismic failure of the SLC system to insert borated solution into the reactor is controlled by the seismic capacity of the SLC pump (HCLPF = 0.62g) and the SLC system boron solution tank (HCLPF = 0.62g).

Emergency AC power and plant service water were both treated as having the same effects in the seismic margins analysis. Failure of either system would require only one additional failure to result in core damage. The limiting components for seismic failure of emergency AC power are the diesel generators (HCLPF = 0.62g), transformers (HCLPF = 0.62g), motor control centers (HCLPF = 0.62g), and circuit breakers (HCLPF = 0.63g). The limiting components for seismic failure of plant service water are the service water pumps (HCLPF = 0.63g), room air conditioners (HCLPF = 0.63g), and the service water pump house (HCLPF = 0.60g).

Most Sensitive Components

The HCLPFs of the accident sequences with the lowest HCLPFs could be increased by increasing the individual HCLPFs of the ACIWA pumps, the fuel channels, or the RHR heat exchangers. The HCLPFs of the appropriate accident sequences would be increased by an amount equal to the increase in the HCLPF of any of these components.

The only single item that could, by itself, decrease the HCLPF of any accident sequence below 0.60g is a Category I structure having a HCLPF below 0.60g. This would also decrease the HCLPF of accident class IE; ATWS with high pressure melt due to loss of inventory. The lowest HCLPFs for Category I structures are 1.11g and 1.12g.

The only system that could, by itself, result in lowering an accident sequence HCLPF below 0.60g is DC power. DC power has two components that could fail the sequence—the batteries (HCLPF = 1.13g) and the cable trays (HCLPF = 0.74g).

AC-Independent Water Addition (ACIWA)

The ACIWA provides a diverse capability to provide water to the reactor in the event that AC power is not available and is important in preventing and mitigating severe accidents. The system has a diesel driven pump with an independent water supply and all needed valves can be accessed and operated manually. In addition, support systems normally required for ECCS operation are not required to function for ACIWA operation. The ACIWA can provide either vessel injection or drywell spray in the event all AC power is unavailable. Although the system pumps are housed in an external building (shed), the collapse of the building would not prevent the diesel driven pump from starting and running.

Seismic Walkdown

In addition to the above identified features, it was judged important that the seismic walkdown noted in Subsection 19.9.5 be conducted to seek seismic vulnerabilities.

19.8.3 Important Features from Fire Analyses

19.8.3.1 Summary of Analysis Results

An ABWR fire risk screening analysis based on the EPRI Fire Induced Vulnerability Evaluation (FIVE) methodology was performed to assess vulnerability to fires within the plant. Each scena[illegible]ted was calculated to have a core damage frequency less than 1E-6.

19.8.3.2 Logical Process Used to Select Important Design Features

The screening criterion for EPRI's FIVE methodology provided the primary basis for systematically evaluating important design features. The FIVE methodology provides procedures for identifying fire compartments for evaluation purposes, defining fire ignition frequencies, and performing quantitative screening analyses. The criterion for screening acceptability and dismissal from any more detailed consideration is that the frequency of core damage from any postulated fire be less than 1E-6 per year.

Five bounding fire scenarios and corresponding ignition frequencies were developed on the basis of the FIVE methodology. Each scenario was calculated to have a core damage frequency less than 1E-6 and hence screened from further consideration. Validity of these outcomes is contingent upon specific assumptions regarding the design features and performance capabilities of structures and equipment.

Consequently, the study was systematically reviewed to identify those procedures, assumptions, and features which are necessary in the fire risk assessment analysis to achieve core damage frequencies less than 1E-6 and thus pass the FIVE methodology screen.

19.8.3.3 Features Selected

Table 19.8-3 lists the features selected and the basis for each feature being considered important. These features are those necessary to maintain fire initiated core damage frequencies below the 1E-6 screening criterion. The proper functioning of these features assures the capability to mitigate the postulated fires. Features identified as a result of the review of the Level 1 internal events analysis are also important in the fire analysis but they are not included here unless they have some fire unique significance susceptibility of external floods, plant and site specific procedures will be developed by the COL applicant for severe external flooding using the following guidelines:

(1) Check that the door between the turbine and service buildings is closed.

(2) Sandbag the external doors to the

(a) Reactor building,

(b) Control building,

(c) Service building,

(d) Pump house at the ultimate heat sink,

(e) Diesel generator fuel oil transfer pits, and

(f) Radwaste building.

(3) Close and dog all external water tight doors in the reactor and control buildings.

(4) Shut the plant down.

(5) Use power from the diesel generators or CTG if offsite power is lost.

Underground passages between buildings would not be affected because they are required to be watertight.

19.9.4 Confirmation of Seismic Capacities Beyond the Plant Design Bases

The seismic analysis assumed seismic capacities for some equipment for which information was not available. It is expected that these capacities can be achieved, but confirmation must be deferred to the COL applicant when sufficient design detail is available. The actions specified in Subsection 19H.5 will be taken by the COL applicant.

19.9.5 Plant Walkdowns

A plant walkdown to seek seismic vulnerabilities will be conducted by the COL applicant as noted in Subsection 19H.5.

Similar walkdowns will be conducted by the COL applicant for internal fire and flooding events.

19.9.6 Confirmation of Loss of AC Power Event

The COL applicant will confirm the frequency estimate for the loss of AC power event (Subsection 19D.3.1.2.4). This review will address site-specific parameters (as indicated in the staff's licensing review basis document) such as specific causes (e.g., a severe storm) of the loss of power, and their impact on a timely recovery of AC power.

19.9.7 Procedures and Training for Use of AC-Independent Water Addition System

Specific, detailed procedures will be developed by the COL applicant for use of the AC-independent Water Addition System (including use of the fire truck) to provide vessel injection and drywell spray. Training will be included in the COL applicant's crew training program.

The procedures to be developed by the applicant will address operation of the ACIWA for vessel injection or drywell spray operation. Operation of the ACIWA System in the vessel injection mode requires valves F005, F101, and F102 to be opened and valve F592 to be closed. Reactor depressurization to below ACIWA System operating pressure is required prior to ACIWA operation in the vessel injection mode. Operation of the ACIWA in the drywell spray mode requires valves F017, F018, F101, and F102 to be opened and valve F592 to be closed. These valves are shown on Figure 5.4-10. The diesel fire pump will start automatically when the ACIWA is properly aligned for vessel injection or drywell spray. If the normal firewater system water supply is unavailable, the alternate water supply can be made available by opening the manual valve between the diesel driven fire pump and the alternate water supply. This valve is shown in Figure 9.5-4. If it is necessary to use a fire truck for vessel injection or drywell spray, valve F103 must be opened in addition to operation of the valves discussed above for ACIWA operation. The valve for operation of the ACIWA using the fire truck is also shown on Figure 5.4-10. All of the valves required for ACIWA operation are manually operable.

If it is necessary to operate the ACIWA, radiation levels may be elevated in the rooms where the valves required for ACIWA operation are located. The applicant will make dose rate calculations for the specific configuration being constructed. These calculations will include the specific piping layout, shielding considerations, the potential for systems within the room to have recently been operated and thus contain radioactive coolant, and any other factors that significantly affect the dose rates. These dose rate calculations will be considered in the development of the specific plant procedures for ACIWA operation.

19.9.8 Actions to Avoid Common-Cause Failures in the Essential Multiplexing System (EMUX) and Other Common-Cause Failures

To reduce the potential for significant EMUX common cause failures, (Subsection 19N.4.12), the COL applicant will take the following actions:

(1) To eliminate remote multiplexing unit (RMU) miscalibration as a credible source of EMUX common cause failure, administrative procedures will be established to perform cross-channel checking of RMU outputs at the main

Table 19D.6-12 RPS Failure Data

Acronym	Event	Probability	Failure Rate (/h)	Beta Factor	Test Interval (h)	Mission or Restore (h)	Reference*	Note*
S22BF	LOAD DRIVER	1.87E-03	5.06E-06		730	4	8	
S23CF	LOAD DRIVER	1.87E-03	5.06E-06		730	4	8	
S24DF	LOAD DRIVER	1.87E-03	5.06E-06		730	4	8	
S31AF	LOAD DRIVER	1.87E-03	5.06E-06		730	4	8	
S32BF	LOAD DRIVER	1.87E-03	5.06E-06		730	4	8	
S33CF	LOAD DRIVER	1.87E-03	5.06E-06		730	4	8	
S34DF	LOAD DRIVER	1.87E-03	5.06E-06		730	4	8	
S41AF	LOAD DRIVER	1.87E-03	5.06E-06		730	4	8	
S42BF	LOAD DRIVER	1.87E-03	5.06E-06		730	4	8	
S43CF	LOAD DRIVER	1.87E-03	5.06E-06		730	4	8	
S44DF	LOAD DRIVER	1.87E-03	5.06E-06		730	4	8	
TFUSEA	BACKUP SCRAM LOGIC FUSE	3.29E-03	5.00E-07		13140	4	15	
TFUSEB	BACKUP SCRAM LOGIC FUSE	3.29E-03	5.00E-07		13140	4	15	
TLU1F	TRIP LOGIC UNIT	2.95E-04	5.00E-06		0.5	4	18	14
TLU2F	TRIP LOGIC UNIT	2.95E-04	5.00E-06		0.5	4	18	14
TLU3F	TRIP LOGIC UNIT	2.95E-04	5.00E-06		0.5	4	18	14
TLU4F	TRIP LOGIC UNIT	2.95E-04	5.00E-06		0.5	4	18	14

* See Table 19D.6-13 for References and Notes.

Table 19D.6-13 PRA Failure Rate Reference Documents and Notes

References:

1. *Failure Rate Data Manual*, NEDE 22056, Rev. 2, GE, 1986.
2. *GESSAR II PRA*, GE Document 22A7u07.
3. IEEE Standard 500, 1984.
4. *BWR Owner's Group Technical Specification Improvement Methodology, Part 1*, NEDC-30936-P, November 1985.
5. Notes from F.E. Cooke regarding the Nuclear Boiler System Logic Diagram (Interlock Block Diagram), 10 June 1987. GE DRF A00-05225, Volume 1.
6. *IPE Methodology for BWR's*, IDCOR Technical Report 86.3B1, Delian Corp., 1987.
7. *Common-Cause Fault Rates for Instrumentation and Control Assemblies*, NUREG/CR-2771, EG&G Idaho, Inc., February 1983.
8. *Clinton NSPS Self-Test Technical Specification*, DRF A00-2373, Page 155, 158, 159 and 633.
9. *Handbook of Human Reliability Analysis with Emphasis on Nuclear Power Plant Applications*, NUREG/CR-1278, August 1983.
10. Deleted.
11. Deleted.
12. *HPCF Technical Specification*, GE Document 22A6278, Rev. 2.
13. *Alto Lazio Station Reliability Analysis*, NEDE 30090, General Electric Company, December 1984.
14. *Data Summaries of Licensee Event Reports of Selected Instrumentation and Control Components at U.S. Commercial Nuclear Power Plants, January 1, 1976 to December 31, 1981*, NUREG/CR-1740, Rev. 1, July 1984.
15. *EPRI ALWR Assumptions and Groundrules for Evolutionary Plants.*
16. NEDC 30851P-A, page C-5, Note 7 (PB-3 for lamba, C-4 for CCF).
17. L.G. Frederick, Appendix 19N.
18. Study done by Barry Simon, Reference NUMAC Field Data.
19. *Joint Study Report of SSLC Reliability Analysis*, . No. IF-R-389, Page. 7.77 and MIL-HDBK-217C.
20. *Deleted.*
21. DOE/ID-10206, July 1988.
22. EPRI NP/2433.
23. Letter March 7, 1989, *Assumed ABWR Features for PRA*, from J.D. Duncan to R.P. Raftery and O. Gokcek.
24. C.D. Gentillon, *Component Failure Data Handbook*, EGG-EAST-8563, Idaho National Engineering Laboratory, April 1991.
25. *BWR Scram System Reliability Analysis - Part 1 Class III*, NEDE-21514-1 & 2, December 1976.

a sealing steam evaporator, the ABWR reference design generates this steam from the high pressure heater drain tanks using tank connections such that the incoming drains are routed via a liquid drain loop seal. Thus, only the minimal amount of cycle gases that may be dissolved in the condensed drains is allowed to enter the drain tanks. Sealing steam is taken from the drain tanks, through the tank vent, as the degassed drains are allowed to reboil at such a slow rate that no low volatility product can escape the liquid phase and contaminate the vented steam.

Through this process, relatively high purity sealing steam is generated for use during plant normal operation above approximately 50% load. During plant startup, sealing steam is provided directly by main steam but the long term average amount of radioactivity that may be released even with abnormally high levels of fuel failure is still quite small as plant startup radioactivity levels are relatively low and duration is relatively short. Finally, to permit continued plant operation even in the extremely unlikely presence of multiple fuel rod failures, the gland seal system includes a connection for supplying sealing steam from the plant auxiliary (startup) boiler.

Question 430.84

For turbine bypass system: (10.4.4)

(1) Provide figures which delineate the system and its components.

(2) Clarify whether the system includes pressure-reducer assemblies for the bypass valves to reduce steam pressure prior to steam discharge into the condenser.

Response 430.84

(1) Figures 10.4-9 and 10.4-10 have been added to delineate the system and its components.

(2) The detailed design will follow standard industry practice and reduce the pressure sequentially through orifices prior to entering the condenser. In addition, please note that the valves will be 22.9 cm dia globe type as shown in Figure 10.4-9 which also indicates the actuation mechanism and associated motive power.

Upon a turbine trip or generator load rejection, the start of the bypass valve flow is delayed no more than 0.1 seconds after the start of the main turbine stop or control valve fast closure. A minimum of 80% of the bypass system capacity is established within 0.3 seconds after the start of the stop or control valve closure.

The bypass system quality design codes are defined in Section 3.2.

Question 430.85

For the circulating water system: (10.4.5)

(1) Describe the function of the waterbox fill and drain subsystem mentioned in ABWR Subsection 10.4.5.2.1. Also, describe the "makeup water" shown in SSAR Figure 10.4-3.

(2) Provide the worst possible flood levels that can occur in the applicable plant buildings as a result of circulating water system failure and indicate how safety-related equipment located in the building is protected against such flooding.

Response 430.85

(1) The waterbox fill and drain subsystem performs the following two functions:

(a) Following circulating water system maintenance and/or inspection from the inside, the subsystem uses turbine service water outflow to completely refill any previously drained section of the circulating water system. Thus, the circulating water pump can be started without any difficult valve throttling being required and without risk of water hammer.

(b) The fill and drain subsystem is also used to permit rapid draining of the series connected condenser water boxes by gravity flow into the circulating water sump. The sump is provided with a vertical wet pit centrifugal pump which can discharge the collected drains, via the turbine service water system discharge header, to the power cycle heat sink (cooling tower basin, where applicable).

Overall, the subsystem function is to permit expeditious draining and refill of the condenser tube side and, thus, contribute to the plant ability to respond to potential circulating water leaks with minimal loss of availability.

"Make-upwater" to the circulating water system is provided from the site water supply, as required to compensate for cooling tower evaporation and drift water losses. Makeup water flow rate is normally controlled automatically to maintain a constant level in the cooling tower basin.

(2) As noted in Response to Question 430.73, the worst possible flood that can affect the turbine building would result in a flood level slightly higher than grade. Such a flood, however, would not impact any safety related equipment as no such equipment is located inside the turbine building and all plant safety related facilities are protected against external flooding.

ATTACHMENT 3

NRC Comments on ABWR SSAR Amendment 32 and Dispositions

Item No.	Comment	Disposition	Comment Type (See Legend)
	Chapter 2, Geosciences:		
1	Table 2.1 SRP Section 2.5.3 Surface Faulting The table indicates that there are no limits on surface faulting at a site. The SSAR table should state that a site is not acceptable of there is fault at or near the ground surface.	Incorporated	4
2	Typographical error page 2.3-1 Section 2.3.1.2, (1) SSE Ground Motion, third line ... 3.7-2 "of" should be ... 3.7-2 "for."	Incorporated	1
3	Typographical error page 2.3-4 Section 2.3.2.19 third line, ... "water/resources" ... should be ... "water resources" ...	Incorporated	1
	Chapter 3, Civil Engineering:		
4	(Editorial comment): Conventionally, in SI units, kg and kgf represent the mass and force, respectively. Use of kgf/cm^2 is more appropriate than kg/cm^2 for force in all SSAR sections.	To be provided to NRC prior to March 4, 1993 (NRC letter dated November 9, 1993).	1
5	Subsection 3.3.2.3: The title should include "systems," and read "Effect of Failure of Structures, Systems or Components Not Design for Tornado Loads."	Incorporated	1
6	Subsection 3.7.1.2: The term $(3.5/f)^{0.2}$ in Equation 3.7-1 should be $(f/3.5)^{0.2}$.	Incorporated	4
7	Subsection 3.7.2 and 3H: GE did not provide the analysis method and procedures for seismic sliding evaluation in the SSAR as committed in the resolution of DFSER Open Item 3.7.2-1.	Analysis method and procedures provided at 2/22-25/93 Structural Audit. Added to Subsection 3.8.5.5.	3
8	Subsection 3.7.5.4 should be revised to reflect a commitment for the COL applicant to describe the process for completion of the design of balance-of-plant and non-safety related systems to minimize II/I interactions and propose procedures for an inspection of the as-built plant for II/I interactions.	Incorporated.	3
9	(Editorial Comment): Subsection 3.8.2.1.1.4: The word "torospherical" should be "torispherical."	Incorporated	1

10	Subsection 3.8.4.1.5: The phrase "...combination of both. Various type of frames form a support system with transverse and longitudinal bracing to the nearest wall or ceiling to take the seismic loads." Should be added to the end of the second paragraph.	Incorporated	4
11	Appendix 3A: The title of Figures 3A-9 and 3A-10 should be switched with each other.	Incorporated	4
12	Subsection 3A.3.2: In Equation 3A-1, it appears that the value for the coefficient (1000) and the term (σ_m) need to be corrected to account for the conversion from British units to metric units.	Coefficient of Equation (3A-1) converted to 70.	1
13	Subsection 3H.1.4.5: The loading conditions "H" and "L" should be "H'" and "L_o", respectively.	Incorporated	1
14	Subsection 3H.2.4.5: The first seven lines on Page 3H.2-11 should be deleted.	Incorporated	1
15	Table 3H.2-5, page 3H.2-20: "E" should be "E'". E' and E are used differently in Section 3H.3.4.3.3.2. (Usually, e' is used for SSE and E for OBE). Similarly, Subsection 3H.3.4.5 and 3H.3.5.3.2, the loading Condition "E" on Pages 3H.3-9 and 3H.2-11 should read "E'."	Incorporated	1
	(Editorial Comment): Table 3H.2.4.5 is duplicated.		
	Chapter 3, Mechanical Engineering:		
16	Subsection 1A.2.9 - Coolant System Values Testing Requirements (II.D.1) Subsection 1A.3.7, "Testing of SRV and Discharge Piping," was added in Amendment 30, and then was deleted in amendment 31. It contained a requirement for the COL applicant to confirm that any SRVs of discharge piping not similar to those that were tested in the generic program will be tested in accordance with NUREG-0737 guidelines. As discussed in FSER Section 14.1.3.3.5.11, this information provided the basis for the resolution of COL Action Item 3.9.3.3-1 and 14.1.3.3.5.11-1. Therefore, it should be included in the SSAR.	Incorporated	4

17	Subsection 3.9.1.5 - Inelastic Analysis Methods The CRD outer tube was deleted from the list of components that prevent ejection of the CRD in the unlikely event of a failure of the ASME Class 1 weld that attaches the CRD housing to the stub tube in the bottom head of the reactor pressure vessel. This is now not consistent with the discussion in SSAR Subsection 4.5.1.2.2.9, "Integral Internal Blowout Support," which states that the CRD outer tube and middle flange is one of the safety-related components in the load path that provides the anti-ejection function during this postulated event. The staff's evaluation of this issue in the FSER Section 3.9.1 included the outer tube as part of the load path. In addition, based on information in previous SSAR amendments, the staff's discussion in FSER Section 3.9.1 stated that the cylindrical bodies of the CRD guide tube, housing, and outer tube were the only parts of these components that were analyzed by inelastic analysis. SSAR Subsection 3.9.1.5 has now been revised to state that only the cylindrical body of the guide tube was analyzed inelastic ally. The SSAR should be revised to eliminate the discrepancy between Subsections 3.9.1 and 4.5.1.2.2.9.	Subsection 3.9.1 revised to be consistent with Subsection 4.5.1.2.2.9.	4
18	Table 3.9-1 - Plant Events The number of cycles/events for most of the plant operating events and some of the dynamic loading events listed in this table have been reduced by a factor of approximately 1.5. This reduces the number of cycles/events back to those reported in the SSAR Amendment 1 numbers for a 60-year plant life. This was Open Item 3.9.1-1. In response to this request, GE submitted Amendments 21 and 23 which generally increased these numbers by a factor of 1.5. The staff reported this in its FSER, Section 3.9.1 and found it acceptable. The number of cycles/events reported in Amendments 21 and 23 should be retained unless GE can justify the reduced numbers for a 60 year life.	Addressed in October 22, 1993 GE letter to NRC justifying all Table 3.9-1 entries with the exception of Events 6 and 14 which were increased by a factor of 1.5.	4
	Table 3.9-8, Inservice Testing Safety-Related Pumps and Valves		
19	a. B21 Nuclear Boiler System Valves, P 3.9-101 The figure for Valve F039 should be 5.1-3 sh.4	Incorporated	4

20	b. C41 Standby Liquid Control System Valves, P 3.9-104 The test parameter for Valve F003 should be R. Valves F026 and F700 are missing.	Incorporated	4
21	c. C51 Neutron Monitoring (ATIP) System Valves, P 3.9-105 The Code category for Valve J004 should be A,C.	Valve data reorganized for better categorization.	3
22	d. D23 Containment Atmospheric Monitoring System Valves, P 3.9-105 The testing of Valves F001 should be L (test parameter) at RO (test frequency) and S (test parameter) at 3 month (test frequency). The testing of Valves F004 through F008 should be L, P (test parameter) at RO (test frequency) and S (test parameter) at 3 month (test frequency).	Incorporated	4
23	e. E1 Residual Heat Removal System Valves, P 3.9-111 Valves F718 and F720 are missing.	Added valves E11-F718 and F720.	4
24	f. P54 Instrument Air System Valves, P 3.9-132 A reference to note (h3) should be added to the description column and S should be added to the test parameter column for Valves F276 and F277.	Incorporated	4
25	g. P54 High Pressure Nitrogen Gas Supply System Valves, P 3.9-132 A reference to note (h1) should be added to the description column for Valve F008.	Incorporated	4

26	h. T31 Atmospheric Control System Valves, P 3.9-135 and 3.9-138 A reference to note (h2) should be added to the description column for Valves F001 through F004 and F006. The Code category for Valve D001 should be D and its valve function should be I, P. The Code category for Valve D002, the wetwell rupture disk, should be D.	Incorporated	4
27	i. U41 Heating, Ventilation and Air Conditioning System Valves, P 3.9-139 The valve function for Valves F001 and F002 should be A, I and their testing should be P, L (test parameter) at 3 month (test frequency). Valves F003 and F004 are missing.	HVAC does not penetrate containment. "I" is for primary containment isolation only; thus, the valve function is "A". "L" is leak test for "I" only; thus, testing is "P" only. Valves F003 and F004 added.	3
28	Subsection 3.10.2.1.3.3 - Seismic Qualification by Testing The next to last sentence should be revised to read: "Operability of equipment is verified as described in Subsection 3.7.3.2," and the last sentence should be deleted. These changes are necessary in order to become more consistent with the staff's position in SECY-93-087, Which was approved in the SRM dated July 21, 1993.	Incorporated	3
29	Subsection 3.10.2.2.2 - Seismic Qualification by Testing For the reasons stated in 7 above, this Subsection should be completely revised to be more consistent with the criteria in Subsection 3.7.3.2.	Subsection 3.10.2.2.2 revised to be more consistent with the criteria in Subsection 3.7.3.2..	3

	Editorial Comments:		
30	a. Subsection 3.9.3.3.1 - MS Safety/Relief Valves The revision which was added to this Subsection requires some editorial changes (e.g., missing spaces between words, misspelled words, incomplete sentences).	Edited accordingly.	1
31	b. Subsection 3.9.6.2.1(1) Part of one sentence in the second paragraph is missing. The sentence should read: "The testing of each size, type, and model shall include test data from the manufacturer, field test data for dedication by the COL applicant, empirical data supported by test, of test (such as prototype) of similar valves that support qualification of the required valve where similarity must be justified by technical data."	Incorporated	1
32	c. Subsection 3.9.7.9 - Benchmark Problems The references throughout this subsection were changed from 3.9-11 to 3.9-5. They should remain as 3.9-11.	Incorporated	1
33	d. Subsection 20.3.5 - Response to RAI 210.8 The last sentence should state: "... need not be classified Quality Group A or Safety Class I, ..."	Incorporated	1
34	Subsection 6.1.2.1 The SSAR erroneously refers to ANSI 101.4. The correct reference should be ANSI 101.2.	Incorporated	1
	Section 3.11 The staff concludes the tables in Appendix 3I is acceptable. However, the following are discrepancies discovered in Appendix 3I should be corrected:		
35	1. The equipment and zones are not clearly identified in the reference figures discussed in sections 3I.2.1 and 3I.2.2, the zones cannot be determined from given information.	Subsection 3I.2.2 clarified.	3

36	2. The is a typo in Section 3I.3.3I, the word "designated" should be "designed".	Incorporated	1
37	3. In Table 3I-8, the Gamma dose rate for the heat exchanger is listed as 2, it should be 20.	Incorporated	4
38	4. In table 3I-10, the integrated Gamma dose for the RCW pump and heat exchanger should be 2700 or more.	Incorporated	4
39	5. It is not clear how the integrated dose for Gamma and beta is determined in Tables 3I-16, 3I-17, 3I-18 and 3I-19.	Clarified in Subsection 3.11.5.2 how the integrated dose for Gamma and Beta is determined.	3
40	ECGB identified an unresolved COL Action Item in FSER Section 14.1.3.3.5.11 which apparently has not yet been transmitted to GE. During the staff's review of TMI Item II.D.1, SSAR Subsection 1a.3.7, "Testing of SRV and Discharge Piping" was added in Amendment 30 at the staff's request. It contained a commitment for COL applicant to confirm that any SRVs or discharge piping not similar to those that were tested in the EPRI generic program will be tested in accordance with NUREG-0737 guidelines. As discussed on FSER Section 14.1.3.3.5.11, this information provided the basis for the resolution of COL Action Items 3.9.3.3-1 and 14.1.3.3.5.11-1. In Amendment 31 32, Subsection 1A.3.7 was deleted. Please inform GE that Subsection 1A.3.7, as written in Amendment 30 should be included in the SSAR.	Same as Item 16.	2
41	In trying to resolve one of Mr. Michelson's concerns the Piping DAC, the staff discussed with GE (T. James and M. Herzog) the need to include the following new statement in the Tier 1 Piping Design Description (Chapter 3.3): "Structures, systems, and components that shall be required to be functional during and following an SSE shall be protected against the effects of spraying, flooding, pressure, and temperature due to postulated pipe breaks and cracks in seismic Category I and NNS piping systems."	Incorporated	3

	Chapter 4		
42	4.2 Fuel System design On page 4.2-1, third paragraph GE should revise to state that "each COL applicant referencing the ABWR design may have different fuel and core designs which will be provided by the COL applicant to USNRC for review and approval instead of information.	Incorporated	3
	Chapter 6		
43	Table 6.2-7 did not identify which CIV's are locked closed. (FSER Section 6.2.4)	The P&ID for each system is shown in Table 6.2-7. The P&IDs identify which CIVs are locked closed.	2
	The staff concludes that the control room habitability systems meet the acceptance criteria of SRP Section 6.4 and are, therefore, acceptable pending satisfactory resolution of the following discrepancies:		
44	1. SSAR Section 6.4.2.1 and 6.4.2.4 should be revised to state that the positive pressure is maintained with respect to the surrounding spaces.	It was agreed that these subsections can remain "relative to the outdoor atmosphere". (See Item 47).	2
45	2. SSAR Section 6.4.2.3 has dropped the reference to NAA-SR-10100 for performing the control room in-leakage analysis which was in previous SSAR Amendments.	Since a pressurization test is being performed as part of ITAAC, it was concluded that the in-leakage analysis in unnecessary.	2
46	3. SSAR Section 6.4.2.3 has dropped the list of the leak paths to and from the MCAE and its evaluated effects, as supported by the performed in-leakage analysis, on MCAE to conform with the requirements of GDC 19.	Same as Item 45.	2
	The staff concludes that the SGTS has a removal efficiency of 99% for all forms of radioiodine. The staff further concludes that the system meets the acceptance criteria of SRP Section 6.5.1 and is, therefore, acceptable pending satisfactory resolution of the following discrepancies:		

47	1. Revise SSAR Section 6.5.1.1.2 and 6.5.1.3.1 to state that the negative pressurization is maintained relative to the surrounding spaces.	It was agreed that these subsections can remain "relative to the outdoor atmosphere" since the instrumentation is located outside the building. There was no change made to Subsection 6.5.1.3.2, and Subsection 6.5.1.3.1 was modified.	3
48	2. Revise SSAR Section 6.5.1.3.3 to address IE Bulletin 80-03 to state that the charcoal tray and screen will be all welded construction to preclude the potential loss of charcoal from absorber cells per IE Bulletin 80-03.	Subsection 6.5.1.3.3 has been revised as requested.	3
49	3. Revise SSAR Appendix 6A, Design Criteria (4), Maintenance, to state that the design is in compliance with this position since the Surveillance Requirements in SSAR Chapter 14 meets the intent of the Standard Technical Specifications requirements for SGTS and that it is also stated in SSAR Page 6B-1.	Incorporated	3
50	4. Revise SSAR Appendix 6A, Design Criteria (5), In-Place Testing Criteria, to add reference to ASME N510 in addition to the "Industrial Ventilation" reference for any testing performed.	Incorporated	3
51	5. Revise SSAR Appendix 6B to state ASME "Footnote 3" not "Footnote 2" on page 6B-65.	Footnote 2 is correct.	2
52	6. Revise SSAR Appendix 6B, Page 6B-9/10 to state "SRP Table 6.5.1-1" not "STP Table 6.5.1-1"	Incorporated	1
53	7. Revise SSAR Appendix 6B, Page 6B-2 to state "Operation of SGTS to mitigate offsite releases will not be affected by the absence of high flow alarm at the MCR."	Incorporated	1
54	8. Revise SSAR Section 6.5.1, Table 6.5-1, and Appendices 6A and 6B to reflect two filter trains.	Two filter trains already reflected.	2
	Chapter 7		
55	Typographical Error in Table 7.5-2 on page 7.5-21. The correct range required for Drywell/Wetwell Hydrogen Concentration should be 0-10 Volume % instead of 0-0 Volume %.	Corrected to be 0-30 Volume.	1
	Chapter 8		

56	Section 9.5.3.2.3.1 of SSAR Amendment 32 indicates that the Class 1E Associated Emergency Lighting subsystem is classified "Associated" because the subsystem's bulbs are not seismically qualified. This definition for associated is not consistent with the definition for associated that is defined in Section 8.3.3.5.1 of SSAR Amendment 32.	Incorporated. Statement was not intended to be a definition. However, to avoid possible confusion, this sentence (and a similar are in Subsection 9.5.3.2.2.1) were deleted. Also, the word "However," has been added at the beginning of the sentences following these two deletions.	3
57	Section 8.3.1.1.6.4 of SSAR Amendment 32 indicates that the design for protective relays meets positions 7 of RG 1.9. This is true for Rev. 2 of the RG but not Rev. 3. There is no position 7 in RG 1.9 Rev. 3. GE in SSAR Amendment 32 revised their SSAR to indicate compliance with RG 1.9 Rev.3 from compliance with Rev.2 of RG 1.9.	Incorporated. Subsection 8.3.1.1.6.4 has been corrected from "position 7" to "position 8". Similarly, Paragraph 14, 15 and 16 of Subsection 8.3.1.1.8.2 have been corrected from "see C.4...." to see Position 1.4...". Also, titles the were corrected in Table 1.8-20, and Subsections 8.1.3.1.2.2(2) and 8.3.1.2(2)(b).	4
58	The last sentence of Section 8.3.4.14 of SSAR Amendment 32 states "Furthermore, annunciation shall be provided to alarm in the control room whenever the breakers are in for service" is within GE's scope of supply as indicated in Sections 8.3.1.1.1 and 8.3.2.1.0.1 of SSAR Amendment 32. The design for alarming is not within a COL applicant's scope of responsibility as indicated in Section 8.3.4.14.	Incorporated. This sentence is deleted in Subsection 8.3.4.14.	3
59	The first sentence of the 10th paragraph of Section 8.3.3.1 of SSAR Amendment 31 and the March 31, 1993 draft SSAR states "Associated Class 1E circuits remain with or are physically separated in the same manner as those Class 1E circuits with which they are associated;..." was deleted from Amendment 32. Amendment 31 was consistent with the guidelines of Section 5.5.2 of IEEE 384 and position 4 of RG 1.75. With the deletion of this sentence in Amendment 32, associated circuits which do not have isolation device such as lighting circuits are no longer explicitly addressed in the SSAR, the design description in the SSAR is now inconsistent with the commitment to IEEE 384 guidelines, the deletion may be inconsistent with the staff's safety evaluation report conclusions.	Incorporated. This first portion of the sentence was inadvertently deleted because it was thought to be redundant to the remaining portion. However, the complete sentence has been restored to the original sentence intact.	3

60	Section 8.3.4.21 of SSAR amendment 32 should be revised to explicitly state, consistent with other SSAR sections, that the COL applicant shall be required to provide appropriate plant procedures for periodic testing of the diesel generator loading capabilities and the interlocks which restore the DGs to standby in the event of a LOCA or LOPP.	The technical specifications already require periodic testing of the diesel genc ator loading capabilities, as stated in Subsection 8.3.4.21. Therefore, no additional plant operating procedures are necessary for this part of the comment. However, the second sentence regarding testing of the interlocks has been modified as follows: "Appropriate plant procedures shall be provided for periodic testing of the interlocks which restore the units to emergency standby on event of a LOCA or LOPP."	3
61	Section 8.3.4.17 of SSAR amendment 32 which addresses inclusion of regulatory codes and standards in purchase specifications may not be appropriate as a COL action item as specified in the SSAR. Specifying which regulatory codes and standards should be used to meet ABWR plant design requirements is a GE responsibility. Assuring their inclusion in purchase specifications also appears to be within GEs scope of responsibility. The SSAR should be revised to indicate that it is a GE responsibility to specify which regulatory codes and standards should be used for the purchase of equipment. This inconsistency affects SER findings addressed in Section 8.3.6.1 of the SER.	Subsection 8.3.4.17 does not address regulatory codes and standards. GE agrees that regulatory codes and standards are GE responsibility, but these are already addressed in the SSAR text in accordance with the SRP. Rather, Subsection 8.3.4.17 provides a listing of common industrial standards to be included in the purchase specifications, which would be in addition to the regulatory codes and standards. The content of this section was added in response to a previous NRC request; not as a licensing issue, but for quality assurance purposes.	2
62	The use of the word "redundant'" in Section 8.3.3.6.2.2 of SSAR amendment 32 and in the 2nd paragraph of Section 8.3.3.6.2.2.3 of SSAR amendment 32 incorrectly implies that safety related equipment need not be protected from design basis events if the event or missile only affects one of two redundant systems. The term "redundant" as used in these sections should be deleted.	Same as item 63	2
63	The use of the word "redundant" in Section 8.3.3.6.2.2 of SSAR amendment 32 and in the 2nd paragraph of Section 8.3.3.6.2.2.3 of SSAR amendment 32 incorrectly implies that safety related equipment need not be protected from design basis events if the event or missile affects one or two redundant systems. The term "redundant" as used in these section should be deleted. Similarly, the term "redundant" has been incorrectly used in item 2 of Section 8.3.3.6.1.1 of SSAR amendment 32.	Incorporated. The three references have been resolved as follows: Subsections 8.3.3.6.2.2 and 8.3.3.6.1.1: The word "redundant" was deleted from the two referenced sentences. Subsection 8.3.3.6.2.2.3: The word "redundant" was replaced with "Class 1E", so the sentence reads "....could jeopardize Class 1E cabinets and raceways."	3

64	The references 13.6.3 in Section 8.3.4.19 of SSAR amendment 32 should be 8.3.3.6.1.1(5).	Incorporated.	3
65	GE made a SSAR change due to ITAAC involving dc power supplies for the offsite circuits. Amendment 32 did not provide the bases to justify this change. This impacted a number of our safety findings regarding independence requirements of GDC 17. We have revised three FSER conclusions related this area to state that this aspect is now open.	Inserts at the end of the fifth paragraph of Subsection 8.2.3, and at second-to-last sentence in Paragraph (5) of Subsection 8.2.3: "The instrumentation and control circuits for the normal and alternate preferred power shall not rely on a single common DC power source [See Subsection 8.2.3 items (13) and (15)].	3
66	By SSAR Amendment 32, GE changed their design to specify that the I&C circuits at their dc power sources are routed in separate raceways separated to the extent practical versus are separated by floor, wall, or 50 feet at their power supplies. By draft SSAR 10/12/93, GE further revised Amendment 32 to indicate that the instrumentation and control circuits for the normal and alternate preferred power shall not rely on a single common dc power source. Based on these changes to the SSAR, the ABWR design will now permit sharing of dc power sources between offsite circuits. If the two offsite circuits share two or more common dc sources, by implication the I&C circuits for the independent offsite sources are interconnected. The 7th paragraph of SSAR Amendment 32 states that the feeder circuit breakers from the unit auxiliary and reserve auxiliary transformers to the medium voltage switchgear are interlocked to prevent paralleling the normal and alternate power sources. With the exception of these interlocks, there are no electrical interconnections between the instrument and control circuits associated with the normal preferred circuits. This statement in the SSAR is not consistent with the dc source interconnection defined above	Incorporated. The last sentence of the 7th paragraph has been deleted, since the "preferred" version of this information is already contained in the 5th paragraph. The remaining first sentence of the 7th paragraph has been moved just ahead of the 5th paragraph, because the commitment for the existence of the interlocks should proceed the statement that the interlocks are separated.	3

	Chapter 9		
	9.5.1.1 General Evaluation Fire Protection System		
	In **Amendment XX** GE indicates that they meet the design commitments as specified in the Branch Technical Position CMEB 9.5-1 except in four cases. GE identified the following deviations to the Branch Technical Position:		
67	1. Deviation from BTP CMEB 9.5-1, Section 7.j, Diesel Fuel Storage Areas. The staff finds GE's justification for having the diesel fuel oil day tanks inside the reactor building is acceptable pending satisfactory resolution of the following discrepancy: - Provide capacity in the fuel oil tank rooms to contain total contents of diesel fuel oil day tank and discharge from two fire hoses operating for 1/2 hour.	Justification provided under Subsection 9.5.1, new item (1).	3
	2. Deviation from BTP CMEB 9.5-1, Section 7.i, Diesel Generator Area. The staff finds GE's justification acceptable pending satisfactory resolution of the following discrepancies:		
68	a. GE is to provide information to demonstrate the adequacy of the foam system utilizing closed heads.	See Item 69.	3
69	b. Should GE change it's design to an open head system, then the resolution of GI-57 will need to be revisited.	Justification provided under Subsection 19B.2.36. Item 68 is related to this item and justification for Item 69 covers this.	3
70	c. As discussed with the applicant in a meeting held on September 21, 1993, the diked area in the DG room is to be designed to the appropriate section of NFPA 15. The diked area is to be capable of containing 100% capacity of the tank and 1/2 hour of water application from the automatic foam sprinkler system and 2 manual hose stations.	It was agreed that it was sufficient for the diked area to be capable of containing 100% capacity of the tank and 1/2 hour of water application from the automatic foam sprinkler (2 manual hose stations not required).	3

71	3. Deviation from BTP CMEB 9.5-1, Section 13, Control Room Complex. The staff finds GE's justification acceptable pending satisfactory resolution of the following discrepancy: - The applicant is also to provide the rationale for lack of suppression and drainage in the control room subfloor.	Justification provided under Subsection 9.5.1, new item (2).	3
72	4. Deviation from BTP CMEB 9.5-1, Section 13, Outdoor transformers. The staff finds GE's justification is acceptable pending satisfactory resolution of the following discrepancy: - Specify that the wall separating the turbine from the transformers will be masonry and rated for at least one hour. Diking will be provided as described in NFPA 15.	Subsection 9A.4.3.2.1 and 9A.4.6 specify that the wall separating the turbine from the transformers will be masonary and rated for a least one hour. NFPA 15 has been added to the list of codes and standards.	3
	9.5.1.3.4 Automatic Foam Fire Suppression Systems		
	GE committed to meet the design aspects of GDC 3, Branch Technical Position 9.5-1 and Generic Issue 57, therefore, the staff concluded that the automatic foam fire suppression systems are acceptable pending satisfactory resolution of the following discrepancies:		
73	1. GE proposes to utilize closed head sprinklers for the foam system and has not adequately demonstrated its acceptability to control and extinguish a fire. GE is to provide the technical justification to demonstrate the adequacy of the foam system.	Repeat of Item 68	2
74	2. Should GE change it's design to an open head system, then the resolution of GI-57 will need to be revisited.	Repeat of Item 69	2
75	3. As discussed with the applicant in a meeting held on September 21, 1993, the diked area is to be designed to the appropriate section of NFPA 15. The diked area is to be capable of containing 100% capacity of the tank and 1/2 hour of water application from the automatic foam sprinkler system and 2 manual hose stations.	Reat of Item 70	2

	9.4.1.1 Control Room Habitability Area Heating, Venting, and Air Conditioning system (CRHA HVACS)		
	GE has addressed IE Bulletin 80-03 compliance by providing **future SSAR Amendment --**, which revises SSAR Section 9.4.1.1.4 to state that the charcoal tray and screen will be all welded construction to preclude the potential loss of charcoal from adsorber cell per IE Bulletin 80-03. Therefore, the emergency air filtration system of the CHRA HVAC system precludes the potential loss of charcoal from adsorber cells. By SSAR amendments up to including **Amendment --**, GE provided the SSAR Appendices 9C and 9D, and has provided acceptable justifications for the deviations. By SSAR **Amendment --**, GE revised SSAR Sections 9.4.1.1.4 and 9.1.1.1.5, stating that the unfiltered inleakage is controlled by the use of welded ducts, except galvanized steel is used for outdoor air intake and exhaust, and unfiltered in-leakage testing will be performed periodically on all system ductwork outside MCAE in accordance with ASME N510, respectively. By amendments up to and including **Amendment --**,GE revised the SSAR Section 9.4.1.i and Table 9.4-4d to include electric heaters in the ESF filter trains. The staff concludes that the system is acceptable pending satisfactory resolutions of the following discrepancies:		
76	1. Revise SSAR Sections 9.4.1.1.3, 9.4.1.1.4, and 9.4.1.1.6 to state that the positive pressurization is maintained relative to the surrounding spaces.	It was agreed that these subsections can remain "relative to outdoor atmosphere". (See Item 47)	2
77	2. Revise SSAR Section 9.4.1.1.4 to state that the charcoal tray and screen will be all welded construction to preclude the potential loss of charcoal from adsorber cells per IE Bulletin 80-03.	Incorporated	3
78	3. SSAR Table 9.4-4 shows heating coil data in kcal/hr for each CRHA HVAC Division. Revise SSAR Table 9.4-4 to provide the electric heater ratings in kW.	Incorporated	3

79	4. The deleted SSAR Table 9.4-4d listed each division's electric heater capacity as 165 kW for MCR HVAC Divisions A and B emergency filtration units. Revise SSAR Section 9.4.1.1 to restore the above component data either in the tabulated form or in the SSAR text.	Table 9.4-4 updated to include all heaters.	3
80	5. Revise SSAR Section 9.4.1.2.6 to state that tests will be performed at a test facility to verify that the CRHA HVAC system fire dampers with fusible links close under anticipated air flow conditions.	Incorporated	3
81	6. Revise SSAR Appendix 9C, Section 9C.1.(4).(d) to state that the design is in compliance with this position since SR 3.4.3.1 SSAR Chapter 14 meets the intent of the Standard Technical Specifications requirements. Also, revise SSAR Section 9.4.1.1.7 to delete "except as noted in Appendix 9C."	Incorporated	1
82	7. Revise SSAR Appendix 9D to provide summation of pressure drop across the entire system as stated in the SSAR Section 9.4.1.1.6. Also, ASME N509 "Footnote 2" should be "Footnote 3" on Page 9D-5.	Incorporated	3
83	8. Revise SSAR Section 9.4.1.1.4, stating that the unfiltered inleakage is controlled by the use of "All welded black steel ducts except galvanized steel used for outdoor air intake and exhaust".	Inspection added to verify integrity of system.	3
84	9. Revise SSAR Section 9.1.1.1.5, stating that "The unfiltered inleakage testing will be performed periodically on all system ductwork outside MCAE in accordance with ASME N510", as agreed upon with GE for the resolution of USI B-66, Control Room Infiltration Measurements.	See Item 83.	3
85	10. Revise SSAR Figure 9.4-1, Sheet 2 of 5 to reflect an independent and separate discharge to MCAE and return from MCAE to each emergency filtration unit, as shown in Sheet 1 of 5. Also, revise SSAR text to include this.	Incorporated	4

86	11. Revise SSAR section 9.4.1.1.5 to state that "The charcoal filters will be tested with an acceptable gas for bypasses."	No change, already in Amendment 32	2
	9.4.1.2 Control Building Safety-Related Equipment AREA (CBSREA) HVAC System		
	The staff concludes that the CBSREA HVAC system is acceptable pending satisfactory resolution of the following discrepancies:		
87	1. SSAR Section 9.4.1.2.3 states that there is an electric heater for each of the CBSREA HVAC subsystems. However, SSAR Table 9.4-4d showing the electric heater capacity has been deleted.	Heater deleted from Subsection 9.4.1.2.3.	4
88	2. Provide rationale for maintaining a minimum temperature of 10°C in the winter.	Rationale provided to staff.	2
89	3. Reconcile the differences between ITAAC Figures 2.15.5b, 2.15.5c and 2.15.5d and SSAR Section 9.4.1.2.3 and SSAR Figures 9.4-1 Sheets 3,4, and 5 concerning the descriptions of the areas served.	It was agreed to provide this information with metrification (see Item 4).	4
90	4. Revise SSAR Section 9.4.1.2.6 to state that the test will be performed at test facility to verify that the CHRA HVAC system fire dampers with fusible links in HVAC ductwork are capable of closing under anticipated air flow conditions.	Repeat of Item 80.	3
	9.4.4 Turbine Island HVAC System		
	The staff concludes that the turbine island HVAC system meets the applicable acceptance criteria of SRP Section 9.4.4 and is, therefore, acceptable pending resolution of the following discrepancies:		
91	1. Revise titled captions of SSAR Tables 9.4-5 and 9.4-5a through 9.4-5c to confirm with SSAR Section 9.4.4. Reconcile SSAR section 9.4.4.2.1.5 areas with the areas shown in above tables.	Incorporated	4
92	2. Provide Capacity for the cooling coils serving SJAE A area recirculation unit air handler in SSAR Table 9.4-5b.	99,800 kcal/hr capacity provided.	3

93	3. Verify the capacity of cooling coils serving demineralizer pump and valves area recirculation unit air handler in SSAR Table 9.4-5a.	Verified	2
94	4. Revise Design Description in ITAAC Section 2.15.5 the turbine building (T/B) HVAC system to state "T/B lube oil area exhaust system with two fans.".	Incorporated. See ITAAC submittal.	4
	9.4.5.1 R/B Secondary Containment HVAC System		
	The staff concludes that the system complies with applicable SRP Section 9.4.5 acceptance criteria, and, therefore, is acceptable pending resolution of the following discrepancies:		
95	1. Section 9.4.5.1.1.2 should replace the words "outside atmosphere" by the words "surrounding spaces" in relation to the negative pressure of the secondary containment. ITAAC Table 2.15.5 should also be corrected to use the words "surrounding spaces".	It was agreed that this subsection can remain "relative to outdoor atmosphere". (See Item 47).	2
96	2. Table 9.4-4g should show that the exhaust fan flow rate is higher than the supply fan flow rate to ensure that the secondary containment is at a negative pressure with respect to surrounding spaces.	Incorporated	3
97	3. Table 9.4-4 filter capacity data for secondary containment exhaust should match with the exhaust fan capacity.	Incorporated	4
98	4. SSAR Section 9.4.5.1 should state that fire dampers with fusible links in the HVAC duct work are capable of closing under anticipated air flow conditions (ITAAC items).	Incorporated	3
	9.4.5.2 R/B Safety-Related Equipment HVAC System		
	The staff concludes that the R/B safety-related equipment HVAC system is acceptable pending the resolution of the following discrepancies:		
99	1. All the FCUs are automatically initiated upon secondary containment exhaust fan failure also since such a failure will result in the R/B secondary containment HVAC system isolation.	Text modified to match P&ID.	4

100	2. Section 9.4.5, Item 2 should delete the words "secondary containment" from the title of the HVAC system.	Incorporated	1
101	3. Section 9.4.5.2.2.1 should state that the FCUs will be sized to maintain the operational temperature of the subject rooms within 40°C.	Already included in Amendment 32	2
	9.4.5.3 R/B Non-Safety-Related Equipment HVAC System, R/B Mainsteam Tunnel HVAC System, and R/B RIP Power Supply Panel Room HVAC System		
	The staff concludes that the R/B non-safety-related equipment HVAC system, R/B main steam tunnel HVAC system, and R/B RIP power supply panel room HVAC system meet the applicable acceptance criteria of SRP Section 9.4.5 and are, therefore, acceptable pending the resolution of the following discrepancies:		
102	1. Section 9.4.5, Item 3 should read as "R/B Non-safety Related Equipment HVAC System".	Incorporated	1
103	2. Section 9.4.5, Item 3 and Section 9.4.5.8 should read as "Reactor Internal Pump Power Supply Panel HVAC System". SSAR Figure 9.4-5 shows that a closed cooling loop HVAC system cools the RIP power supply panels and not RIP ASD control panel rooms . Furthermore, RIP ASD control panel rooms are served by the safety related R/B electrical equipment HVAC system.	Clarification made in text.	3
104	3. Section 9.4.5.3.2 and Figure 9.4-3, do not match with respect to rooms for which FCUs are provided. GE should correct as appropriate so that the same names are used to identify the rooms both in the figure and the section.	See Item 89.	4
105	4. The SSAR tables do not list the quantity and capacity of all equipment for all the 10 rooms serviced by the R/B non-safety-related HVAC system (for example, fans and cooling coils for the 10 rooms are not listed).	Incorporated	3

106	5. Table 9.4-4h refers to filters for RIP ASD control panels. This should be deleted if it is an error. Equipment listing should be given for the R/B RIP power supply panel HVAC system.	It is not an error.	2
	9.4.5.4 R/B Safety-Related Electrical Equipment HVAC System		
	The staff concludes that the R/B safety-related electrical equipment HVAC system complies with applicable GDC referenced in of SRP Section 9.4.5 and, therefore, is acceptable pending the resolution as the following discrepancies:		
107	1. Section 9.4.5.4.2 sentence: "The divisional rooms....control panel rooms" is confusing and should be deleted.	Clarification provided.	3
108	2. Item 8 listed in the above section should be deleted. This is because as per Figure 9.4-5, the non-safety-related R/B RIP ASD power supply panel HVAC system takes care of the cooling needs of the power supply panel rooms.	Clarification provided.	4
109	3. Item 3 should be re-captioned as RIP ASD control panel rooms, Divisions B and C. GE should check whether HVAC Divisions A and B serve these control panel rooms since RCW Divisions A and B serve the RIP room coolers.	Clarification provided.	3
110	4. The system capability to maintain the rooms other than the DG engine rooms below 40°C identified in the ITAAC should be included in the SSAR section.	Provided in Amendment 32.	2
111	5. GE should explain why electric heaters needed to assure that the temperature in the subject rooms do not dip below 10°C are deleted in Amendment 32.	Justification provided to staff.	2
112	6. SSAR should state that the system has fire dampers with fusible links in the HVAC ductwork which are capable of closing under anticipated air flow conditions (ITAAC information).	Repeat of Item 80.	3

113	7. SSAR should state that Division B of the HVAC system serves electrical equipment rooms, Division II and IV and Figure 9.4-4, Sheet 2 should be revised to reflect the above.	Sheet 2 revised.	4
	9.4.8 Service Building Ventilation System		
	The staff concludes that the service building ventilation system meets the applicable acceptance criteria of SRP Section 9.4.3 and is, therefore, acceptable pending the resolution of the following discrepancies:		
114	1. Like the ITAAC, SSAR should identify 2 HVAC systems: TSC HVAC system and controlled area HVAC system. Staff prefers Section 11.5. - .4 language, i.e., " controlled area HVAC system". (ITAAC which says that one of the SB HVAC system is SB HVAC system should be corrected.) Staff has used the above wording in the write-up above.	SSAR modified to match wording of Section 11.5. ITAAC modified to be consistant.	3
115	2. Section 9.4.8.1.1 should be corrected since the TSC HVAC system operates during a high radiation mode in addition to operating during normal operation.	Incorporated	3
	3. SSAR Section 9.4.8 should include the following ITAAC information:		
116	a. High radiation mode of operation for the TSC HVAC system.	Incorporated	3
117	b. Location of both the HVAC systems (ITAAC should identify the location of the controlled area HVAC system).	Incorporated	3
118	c. Supply fan and ACU for the controlled area HVAC system.	ACU does not exist.	2
119	d. Toxic gas protection for applicable COL applicants (GE should provide COL license information).	Incorporated	3

120	e. Provision of 2 recirculation fans for the TSC HVAC system.	Incorporated	3
	4. SSAR Section 9.4.8 should be revised to include the following		
121	a. Which areas are the "clean areas".	TSC and OSC added.	3
122	b. Provision of a radiation monitor in the outside air intake for the TSC HVAC system.	Incorporated	3
123	c. The components of ACU (i.e. heating coil and cooling coil) for the controlled area HVAC system)>	It was agreed that the COL applicant will provide.	2
124	d. Cooling and Heating sources for the ACUs in both the HVAC systems.	It was agreed that the COL applicant will provide.	2
125	e. Common air intake for both the HVAC systems.	Incorporated	3
126	5. Both the ITAAC and Section 9.4.8.1.2 should state that the TSC and clean areas are maintained at a positive pressure with respect to surrounding spaces.	It was agreed that this subsection can remain "relative to outdoor atmosphere". (See Item 47).	2
	CHAPTER 11		
127	ABWR SSAR Table 11.1-6 gives the fraction of steam activity treated by the condensate demineralizer as 1. This is inconsistent with the design flow rate of 1022 Cu. Meter/hour per condensate polisher vessel given in SSAR Table 10.4-4. There are 6 such vessels one of which is standby. The design flow rate through all five vessels corresponds to 0.67 of the total steam activity being treated by the condensate demineralizer. This is not un-common, since most reactors have forward pumping. Also, the value of 0.67 agrees with the fractions 0.18 and 0.01 of steam activity of iodines and others treated by the condensate demineralizer given in SSAR Table 11.1-7. For the above reasons, the staff requires GE to correct the subject entry from 1 to 0.67 in the SSAR Table 11.1-6.	The value of "1" referred to in the comment is shown in column 2 of Table 11.1-6 and is for the ANS 18-1 "Reference Plant" as defined in ANS 18-1, Table 1, column 4 which is a non-pumped forward plant and not the ABWR. As noted in the comment, the ABWR values which are given in the final row of Table 11.1-7 are correctly indicative of a pumped forward plant . Therefore, Table 11.1-7 correctly indicates the values used as indicated by the asterisk in Table 11.6-6.	2

	CHAPTER 12		
128	1. Page 12.3-10: delete the first line on the page. It is repeated from the last line on page 12.3-9. Also change the Amend. no. back to 31, except for the first line, Amend. 32 does not appear to have changed this page.	Incorporated. However, the page change (even though it was an oversight), requires the page to go from Amendment 32 to Amendment 33.	1
129	2. Page 12.3-[illegible], line 11 from bottom: the last word should be "RWPs" not "raps".	Incorporated	1
130	3. Page 12.3-19, line 7 from bottom: line should start "the TIP spoolers" not "the TIP spoilers".	Incorporated	1
131	4. Page 12.3-22: sub-section 12.3.3.1(2) should reference the DAC Table 3.2(b). Suggest revising the penultimate sentence in this sub-section to state, "DAC Table 3.2(b) requires the COL Applicant to perform calculations for the expected airborne radionuclide concentrations to verify the adequacy of the ventilation system during the ITAAC stage of plant construction."	Incorporated	3
132	5. Figure 12.3-43: figure is missing the radiation zone designations.	Radiation zone designations added.	4
	CHAPTER 14		
	Preoperational Test Program		
133	In SSAR Section 14.2.3, Test Procedures, the last sentence should change the word power ascension tests to startup tests to make the sentence more correct with respect to the requirements of RG 1.68 which states that test procedures will be provided to the NRC 60 days before their intended use for preoperational tests and 60 days before fuel loading for startup tests (i.e., not power ascension tests).	Incorporated	3

134	In Section SSAR 14.2.10.2, 2nd sentence, GE states that "the procedure controlling this movement will specify that shutdown margin and subcritical checks be made at predetermined intervals throughout the loading, thus ensuring safe loading increments." To clarify this sentence, GE should revise this sentence to state "the procedure controlling this movement will specify that partial core shutdown margin demonstration and sub critical checks be made at predetermined intervals throughout the loading, thus ensuring safe loading increments as described in startup test abstract 14.2.12.2.3, Fuel Loading.	Incorporated	3
135	In Section SSAR 14.2.10.3., 1st sentence, GE should delete the first sentence from this section and insert this sentence at the beginning of the paragraph in section 14.2.10.4. The sentence currently states " Prior to initial criticality, the shutdown margin shall be verified for the fully loaded core. The sentence should be revised to state, "During initial criticality, the full core shutdown margin shall be verified for the fully loaded core as described in startup test abstract 14.2.12.2.4, Full Core Shutdown Margin Demonstration.	Incorporated	3
	<u>Test Abstract 14.2.12.1.8, RHR System Properational Test</u>		
136	The requirements of RG 1.139, Guidance for Residual Heat Removal, Position C.3, state that "to protect the RHR system against accidental over pressurization when it is in operation (not isolated from RCS), pressure relief in the RHR system should be provided with relieving capacity in accordance with the ASME boiler and pressure vessel code." Test Abstract 14.2.12.1.8, Acceptance Criteria (3)(c), should state "proper operation of system relief valves including timing, position indication, controlling function (if any for air operated valves), and verification of requirements" to meet the requirements of RG 1.139.	Incorporated	3

	Preoperational Test Abstract 14.2.12.1.41		
137	The staff's review identified that preoperational test abstract 14.2.12.1.41, " Pressure Suppression Containment Bypass Leakage Tests" removed reference to Subsection 6.2.6.2 for the applicable test procedures. Reference to subsection 6.2.1.1.5 was added for a description of and criteria for the test method. The acceptance criteria for the test method. The test abstract should be revised testing method and the acceptance criteria.	Incorporated	3
138	GE revised Section 6.2.1.1.5 in a markup dated September 30, 1993 to state that "the acceptance criteria for both the high and low pressure leakage tests shall be a measured bypass leakage area which is less than 10% of the suppression pool steam bypass capability specified in subsection 6.2.1.1.5.4 (i.e., 50 cm squared). GE also revised this section to discuss specific types of high and low pressure drywell to wetwell leakage tests that will be performed. GE plans to add cross reference 6.2.6. into test methods that would similarly be performed on the drywell for the high and low pressure suppression pool bypass leakage tests. The staff finds the incorporated into a future Chapter 14 SSAR amendment and the above changes to chapter 6 are incorporated in a future Chapter 6 SSAR amendment.	Incorporated	3
	Preoperational Test Abstract 14.2.12.1.43		
	GE removed much prerequisite and acceptance criteria information from Test Abstract 14.2.12.1.43, Wetwell to Drywell Vacuum Breaker System (WDVBS) Preoperational Test. GE removed prerequisite (2)(d), which requires approximate power sources are available for use to supply electrical power to all instrumentation. GE also removed the following acceptance criteria: (1) parts of acceptance criteria (3)(a), for testing of the system logic and timing features for proper operation of vacuum breaker valves, (2) parts of acceptance criteria (3) (b), verification on the operability conditions of instrumentation and alarms used to monitor WDVBS during loss of preferred power conditions, and (3) acceptance criteria (3)(d), "proper functioning of vacuum breakers test features".		

139	After Further review of Section 6.2.1.1.4, it was noted that the vacuum relief breaker valves are swing check valves which open passively due to negative pressure across the valve disk requiring no power source. Acceptance criteria for testing the system logic and timing feature are not needed for swing check valves (i.e., only required for MOVs). Acceptance criteria for vacuum breaker test features in Section 6.2.1.1.4. The prerequisite on the required more discussion is needed with GE to clarify the exact reason for all of the above deletions to this test abstract. The staff finds the above changes to the test abstract acceptable assuming the staff's interpretation of the information provided in Chapter 6 is correct as noted below. (1) Prerequisite (a) includes instrumentation used to monitor system and component parameters needed in this test is energized for the conduct of the test. (2) proper operation of any/all instrumentation under loss of offsite power is tested per preoperational test 14.2.12.1.45, "Electrical Systems Preoperational Test".	Clarification for the deletions have been provided to the staff. In addition, prerequisite (2)(d) pertaining to electrical power has been reinstated. Further clarification is contained in Subsection 6.2.11.5.8.1.	3
	Preoperational test Abstract 14.2.12.1.52		
140	The staff's review identified the following typographical error on page 14.2-94. Subsection (3) (b), fist paragraph, last sentence uses "my" which should be "may".	Incorporated	1
	Startup Test Program		
141	In SSAR section 14.2.12.2, General Discussion of Startup Tests, GE should add a sentence which states that "startup test procedures will be provided to the NRC 60 days before fuel loading" to be consistent with similar statements in Sections 14.2.3, Test Procedures, and Section 14.2.12.1, Preoperational Test Procedures.	Incorporated	3
	Startup Test 14.2.12.1.41		
142	The staff's review identified that startup test 14.2.12.2.41 indicates this test is deleted, however, review of prior amendments indicates that startup test 14.2.12.2.41 has never existed. This test should be removed or explanation provided for the test that is being deleted.	This startup test was deleted in Amendment 32	2

	SSAR Section 14.2.13 COL License Information		
143	In SSAR Section 14.2.13.1, first sentence, GE should delete the words "site specific" and replace them with the words "COL applicant supplied". The words site specific is heavily used in the definition of interfacing systems. This will avoid any confusion with the 4 systems listed in this section as being interfacing systems since all of the listed systems are not interfacing systems.	Incorporated	3
144	In SSAR Section 14.2.13.2, Test Procedures/Startup Administrative Manual, states that the COL applicant will provide the following to the NRC, Item (4) "the approved preoperational and startup test procedures approximately 60 days before their intended use (Subsection 14.2.3)." Item 4 should be revised to state that " the approved preoperational test procedures approximately 60 days before their intended use and the startup test procedures approximately 60 days before fuel loading."	Incorporated	3
	Table 14.2-1, Power Ascension Test Matrix		
145	Table 14.2-1 should be renamed the Startup Test Matrix instead of the Power Ascension Test Matrix.	Incorporated	3
146	The requirement of RG 1.68, Appendix A, Position 5.c.c, state "demonstrate that gaseous and liquid radwaste processing, storage and release systems operate in accordance with design." Based on the staff's review of SSAR Amendment 23, the staff requested GE to revise Test Abstract 14.2.12.2.38 and Table 14.2-1 to include the Gaseous Radwaste System as part of the Gaseous and Liquid Radwaste Systems Performance Test to meet the intent of RG 1.68. GE revised the test abstract and the table in SSAR Amendment 30.		

	After further review of Table 14.2-1, Test Abstracts 14.2.12.2.1, Chemical and Radiochemical Measurements, 14.2.12.2.35, Offgas System Test, and 14.2.12.2.3-8, Gaseous and Liquid Radwaste System Performance Test, and GE Proprietary Sections 11.2, Liquid Radwaste Management and 11.3, Gaseous Radwaste Management System, the staff concluded that the Gaseous Radwaste System is the Offgas System; therefore this system is adequately discussed in test abstract 14.2.12.2.1, Chemical and Radiochemical Measurements. The test abstract discusses measurement testing of the release effluents but not radwaste processing and storage testing per the requirements of RG 1.68; therefore, the Liquid Radwaste system portion of the test is not an optional test as currently described in Table 14.2-1. Based on the above, the staff requests GE to make the following changes to SSAR Section 14.2 in Amendment 33. Test Abstract 14.2.12.2.38 should be renamed the Liquid Radwaste Management System Performance and Test Abstract 14.2.12.2.35 should be renamed the Gaseous Radwaste Management/Offgas System Performance per the titles used in Section 11.2 and 11.3. The description and acceptance criteria sections of Test Abstract 14.2.12.2.38 should delete all references to the gaseous radioactive waste system and Section 11.3. Additionally, GE should delete the 3rd through the 6th sentence in the description section. In table 14.2-1, Page 198, GE should substitute the "Gaseous Radwaste Management/Offgas System Performance" test for the "Offgas System Performance" test and substitute Liquid Radwaste management Performance test for the "Gaseous and Liquid Radwaste Systems Performance" test. GE should also delete the word optional for the Liquid Radwaste System Performance test in the table.	Incorporated	3
147	GE needs to verify that the page numbers are correct for all pages in Amendment 32. Page numbers were not properly changed from Amendment 31 to Amendment 32 when Section 14.2.13.3 was deleted.	Page numbers verified.	1

148	In Table 1.9, Item No. 14.3, Tests Exempt From License Conditions, Subsection 14.2.13.3, Page 1.9-10, should be deleted since Subsection 14.2.13.3 no longer exists in Chapter 14.	Item No. 14.3 deleted.	1
	The following generic comments are provided on problems with GE's use of SI units.		
149	Page 154, Units for vessel pressure are expressed in kg/cm**2*d. Since these are SI units, pressure is expressed in pascals or force per unit area (N/m**2) or kg*m/s**2/m**2 or kg/m*s**2. The above expressed units don't seem to make sense. d id defined as differential pressure? Even with d defined in this manner, the units don't match. GE seems to be mixing up SI units with english units. English units would be expressed as 1bf/ft**2.	See Item 4.	1
150	Page 164, Same as above. Units for reactor pressure are expressed as kg/cm**2-*g.Where g is defined as gauge pressure. Reactor pressure is usually expressed in pascals or force per unit area which breaks down like above to kg/m*s**2. With g defined in this manner, the units don't match.	See Item 4.	1
151	Page 165, 2nd paragraph, Same problem. Incorrect units for reactor pressure given as 10.5kg/cm**2 g, where g is defined as gauge pressure. Pressure is force per unit area which is N/m**2.	See Item 4.	1
152	Page 180, 1st paragraph. Again same problem with units. Vessel dome pressure expressed as 1.76kg/cm**2 d, where d is defined as differential pressure. Correct units are N/m**2.	See Item 4.	1
153	Page 182, 1st paragraph, Same problem. Vessel dome pressure expressed as 1.76kg/cm**2 d, where d is defined as differential pressure. Correct units are N/m**2.	See Item 4.	1
	EQUIPMENT SURVIVABILITY QUESTIONS (SCSB)		
154	1. Table 7.5-2 Suppression pool water level only measures 1.5 m above normal water level. Bottom of reactor vessel is 6.1 m above normal level and COPS is even higher. How does this effect EOPs to terminate containment flooding?	Instrument ranges changed to permit the EOPs to terminate containment flooding.	4

155	2. Table 7.5-2 Drywell atmosphere temperature only measures up to 110 C as opposed to Reg. Guide 1.97 of 227 C. DBA temperature reaches over 120 C see figures 6.2-7,8,15.	Correct. Modified Section 7.5 to reflect required ranges of R.G. 1.97	4
156	3. Table 7.5-2 Hydrogen concentration measures 0% as opposed to Reg. Guide 1.97 which indicates 30%.	Same as Item 55.	2
157	4. Table 7.5-2 Oxygen concentration cross-reference does not exist.	Reference incorrect. Changed to Subsection 7.5.2.1(2)(k).	4
158	5. Table 7.5-2 and test Suppression pool water temperature indicates 4 divisions with deviations and this is similar to drywell atmosphere temperature with 2 divisions (Reference supp. pool temp. for acceptability).	Subsection 7.5.2.1(2)(l) revised accordingly.	4
159	6. Fig. 6.2-13 Graph indicates temp. of 1767.7C.	Typographical error. Changed to 176.7°C.	1
160	7. Figs. 6.2-17 and 18 are identical.	No. Look at curves past 70 seconds. Figure 6.2-17 shows difference between drywell and reactor building. Figure 6.2-18 shows difference between wetwell and reactor building.	2
161	8. 7.5.2.1(2)(b) Rupture disks actuate at pressure of 70 psig.	They actuate at 90 psig (6.3 Kg/cm^2g). The instrument range provides a margin of greater than 10%.	3
162	9. Table 7.5-3 indicates Type A variable for Drywell water level. No discussion is provided on ranges, purpose etc. No mention in Table 7.5-2.	Deleted Drywell water level from Table 7.5-3 (not a type A variable). Added discussion on drywell water level in Table 7.5-2 and Subsection 7.5.2.1(2)(o).	4
163	10. 18A.5 (PC-1) Entry condition for hydrogen is not specified, only blank entry of Hi Alarm Level. EPGs say 2%.	Hydrogen level COL applicant dependent. 2% is not specified.	2
	11. Deleted		
164	12. Table 7.5-2 Suppression pool water temperature range up to 110 C but HCTL curve have suppression pool temperature up to 150 C.	Changed upper range to 140°C to accommodate all possible suppression pool temperatures.	3
165	13. Table 7.5-2 Drywell atmosphere temperature range up to 110 C but DWSIL curves go up to 319.5 C.	110°C changed to 226.7°C. 319.5°C defines the slope of the curve, it is not the maximum value.	3

	CHAPTER 19 (SPSB)		
166	1. A November 3, 1993 letter from GE (J. Fox) regarding "Primary Containment Pressure Control EPG-Low Pressure Venting" indicating that there is a potentially significant suppression pool bypass path that was not assessed in SSAR Section 19E.2.3.3, the containment event trees, or GE's MAAP analyses. This path involves a common nitrogen makeup line with separate branches to the drywell and wetwell. These lines (originating at penetrations X-80 and X-240) are said to provide a interconnecting path between the wetwell and drywell which equalizes the pressure between the two primary containment volumes. Furthermore, the valves in each of the branches (F040 and F041) are said to be open during normal operation. No instrumentation to detect flow through this path during an accident is apparent. The bypass analysis should be updated to reflect these lines as potential bypass paths. The validity of the CETs and supporting MAAP analyses should also be justified given this bypass path.	The interconnecting path between the wetwell and the drywell has been added to the bypass study. The results of the study indicate that the bypass risk is below the threshold which would require further consideration of this in the CETs or the MAAP analysis. Therefore, no further consideration of this path is necessary. The SSAR has been modified to reflect this additional pathway in the bypass study.	3
	CHAPTER 19		
167	Table 19.2-1 Table incorrectly identifies concrete used in containment as limestone rather than basaltic.	The statement in the SSAR is correct. As discussed further in Subsection 19E.2.1.2.1(3), the containment is assumed to be made of limestone-sand concrete. Only sacrificial concrete in the lower drywell is specified to be made of basaltic concrete. However, as this assumption will have little, if any, bearing on the performance of the containment, this item is deleted from the Key Assumptions, Table 19.2-1. Additionally, in reviewing the table, other features were identified which have been incorporated in the standard design. Thus, they are no longer "assumptions" and have been deleted from the table.	2

168	Table 19.3-2 The success criteria for "all Transients" should have an "OR" before "ADS8". Note (9) in the table under states the requirements for RWCU to be usable as a high pressure system to remove decay heat.	A "OR" has been added to the table as indicated by the staff. Note (9) is consistent with the COL Action Item in Subsection 19.9.2. No modification to Note (9) is required.	4
169	Table 19.3-5 ATWS Frequency was 1.7 E-10.	The new value of 2.7E-10 is correct. No change is required.	2
170	Table 19.3-4 Accident Class II frequency should be E-10 not E-12. Table does not address LOCA s Outside of Containment.	As indicated below in the response to Item 175, the impact of the October 15th submittal on the overall results of the PRA are not significant. Therefore, the results of study for Class II events have not been propagated in the SSAR. No change is necessary. The contribution of LOCAs outside containment to the core damage frequency was found to be negligible, as was the risk associated with these events. The core damage frequency associated with all LOCAs outside containment was found to be approximately 10% of the total core damage. This estimate was very conservative in its treatment of operator recovery actions, therefore, it is not appropriate to propagate the very small numbers which results from the study into the baseline PRA and the SSAR. No change is necessary.	2
171	ATWS and transient frequencies have changed from earlier values.	ATWS and transient frequencies have changed from earlier values. The values in the table are correct.	2
172	Table 19.3-6 Release frequencies via rupture disc for 16 to 24 hours has changed from 1.1E-10.	Release frequencies via rupture disc for 16 to 24 hours has changed from 1.1E-10.	2
173	Section 19.4.3.1.1 Discussion of Section 3.2 implies that ACIWA is Seismic Category I when GE has indicated that it is not..	Sections 3.2 and 19.4 3 1 have been revised removing the implication that all systems that must remain functional in the event of a safe shutdown earthquake are seismic category I.	4
174	Section 19.5.3 CCFP-PI is identified as 0.004 is SSAR by was identified as 0.005 in ACRS view graphs. The 0.004 value fails to include late releases from drywell (.24 hours). With drywell releases included CCFP= 0.0066.	CCFP-PI is identified as 0.004 in SSAR but was identified as 0.005 in ACRS view graphs. The 0.004 value fails to include late releases from drywell (>24 hours). With drywell releases included CCFP=0.0066.	4

175	Section 19.6.5 October 15th GE submittal on Class II indicates that frequency of containment structural failure from loss of heat removal for internal events is 1.1E-8 per year with 1% resulting in core damage, not 1.1E-9 with 0.1%.	The October 15th submittal did not contain sufficient detail to calculate the frequency of containment structural failure. As requested by the staff, the branch associated with the operation of the rupture disk was deleted in that submittal. This branch has been reinstated in the figure to allow calculation of the structural failure frequency. The figures and text have been added to the SSAR as Subsection 19E.5.14. Subsection 19.6.5 has also been updated to include the results of the alternative analysis. Note that there is a negligible effect of Class II sequences on the overall core damage frequency and risk. Only those reporting parameters relating directly to Class II are affected by these changes.	3
176	The system operation (frequent starting and aligning of standby pumps) assumed for the RCW and service water system is not documented in Appendix 19K for inclusion to RAP nor do there appear to be any COL action items calling for this type of system operation. It is unclear why this assumption would be carried out by a COL applicant.	The RCW and Service Water System are not included in Appendix 19K for inclusion in RAP because no component of these systems appears in the 20 SSCs of greatest importance for level 1 failure of the systems do not affect level 2 primarily due to COPS. Section 19.9.20 has been added to the COL License Information requiring the standby pump and heat exchangers to be started and the previously running service and sea water equipment be placed in a standby mode at least once each month.	3
177	Section 19.6.8 The CCFP was previously 0.005.	The current value of 0.002 is correct. The text has been modified slightly to indicate that the value of interest is below the lowest ordinate in the figure.	2
178	Section 19.7.3 ACIWA and CTG do not virtually eliminate station blackout as a contributor to core damage frequency. SBO is the largest contributor to core damage frequency in the ABWR PRA.	The statement was intended to indicate that the core damage frequency due to station blackout is now very low. The text has been modified.	3
179	Lower drywell flooder - fusible plug temperature converts to 500F or 533K.	The incorrect value has been corrected.	4
180	Seismic capacity of added features - Most of ACIWA is not Seismic Category I. The ac-driven pump is not part of ACIWA.	Reference to the ACIWA as seismic I and includes the AC driven pump has been removed from Section 19.7.3.	4

181		EPG Improvements - The manual operation of valves to cool the core and provide inventory makeup in the event of a large seismic event should be added to the COL action items in Section 19.9.	The COL applicant is required to develop procedures for the manual operation of MOVs in Subsection 19.9.15. These procedures will be applicable to a seismic event. No SSAR change is required.	2
182	Section 19.8.4	ACIWA System - GE has indicated that if the ACIWA pump and water supply cannot be designed and built to a HCLPF of 0.5g in a cost-effective manner, then the COL applicant will provide a fire truck capable of withstanding such an earthquake and if necessary will provide a building capable of withstanding such an earthquake to house the fire truck. GE needs to provide documentation of this commitment.	The footnote to Table 19I-1 has been revised to reflect this commitment. See item 209.	3
183		Three Divisions of ESF - High pressure lines are NOT to penetrate walls or floors separating different safety divisions.	The divisional separation of high pressure lines was identified as important to the flooding analysis. This feature is included in the text of Subsection 19.8.5 and as the last item of Table 19.8.5. No SSAR modification is needed.	2
184		Four Divisions of SSLC - Administrative actions to prevent CCF need to be applied to more than EMUX calibration. GE should provide an expanded explanation of what is expected to prevent CCF from occurring in the ABWR.	An extensive discussion of causes and defenses of CCFs for EMUXs is provided in Appendix N. No revision to the SSAR is required.	2
185	Section 19.8.2.3	Shortest path to core damage - It is the NRC's understanding that the limiting components for dc power (seismic) are the batteries and the dc cable trays, not the racks or the chargers.	Section 19.8.2.3 has been modified deleting reference to the battery racks and chargers as limiting components and adding the cable trays.	4
186		Most sensitive components - Batteries or dc cable trays are single components whose failure could cause the HCLPF of the plant to drop below 0.6g.	The sentence stating that no single component could cause HCLPF of the plant to drop below 0.6g has been deleted.	4

187		ACIWA - The building housing the ACIWA system (an external shed) must not fail seismically in such a manner that it would prevent the ACIWA from performing its function. The ACIWA is not Seismic Category I. The ACIWA discussion should include the fire truck.	The footnote on Table 19I-1 has been revised consistent with the comment. See Item 209.	3
188	Section 19.8.4.1	The CDF reported in 19E.2.3.3.4 is 1.3E-8, with most (1.3E-8) non-bypass and 1.7E-10 bypass.	The values reported in Amendment 32 are correct. The table in 19E.2.3.3.4(3) has been clarified to indicate that the table references to Ex-containment LOCAs only.	3
189	Section 19.8.5.1	The fact that tunnels will connect some building is not reflected in these statements, nor are the assumptions regarding the adequacy of the flooding protection provided by the seals at the ends of these tunnels. The adequacy of these seals should be included as an Inter face Item.	A statement was added to Section 19.8.5 to describe the reasons why flooding in the radwaste tunnels was not treated in the event trees. Basically, the probability was determined to be significantly lower than the flooding scenarios resulting from the pipe breaks in the buildings (i.e., a pipe break had to occur plus failure of multiple seal failures to cause interbuilding flooding). The COL applicant must ensure the adequacy of the radwaste tunnel seal designs.	3
190	Section 19.8.5.3	Need to add (1) NEMA Type 4 enclosures for MCCs and motors that are drip-proof, (2) UHS cannot gravity drain to control building, and (3) max of 4000 m of pipe between isolation valves at the UHS and the RCW/RSW rooms.	As requested, requirements for drip proof motors, NEMA 4 enclosures for MCCs, no gravity draining of the UHS to the control building, and a maximum of 4000 meters of RSW piping between the control building and the RSW valves in the pump house were added to 19.8.5.3.	3
191	Section 19.8.7	Lower drywell design. The interconnection between the lower drywell and the wetwell is at an elevation 8.6 m above the floor of the suppression pool.	The SSAR has been modified to reflect this number. this change has no effect on the analysis.	3
192		Need to add capability of HPCF pumps to pump 340°F water from suppression pool.	Reference to HPCF capability to pump 340°F has been added to Section 19.8.1.	3
193	Table 19.8-2	ACIWA is not Seismic Category I.	The reference to the ACIWA System as Seismic Category I has been deleted.	4
194	Section 19.9.1	On May 17, 1993, in a fax from Cal Tang to Chet Poslusny and George Thomas, GE committed to revise Section 19.9.1 in its entirety. It has yet to be modified.	Section 19.9.1 has been revised as requested.	3

195	Section 19.9 On October 22, 1992, in a fax from Glenn Kelly to Jack Duncan, the NRC asked GE to provide guidance to a COL Applicant on how to assure that the assumptions in the ABWR PRA regarding the UHS and the Reactor Service Water System come true in the as-built plant. GE needs to provide this guidance.	Item (9) was added to Section 19.9.10 describing a COL Action Item to ensure that the RSW pumphouse is designed to prevent interdivisional flooding and draining of water to the control building.	3
196	Section 19.9.17 Ultimate pressure capability will be shown to be at least 134 psig.	The SSAR section has been modified.	4
197	Section 19.9 Add a procedure to depressurize with ADS during a station blackout after loss of RCIC. Add a procedure to backup DC power to ADS valves to keep open for up to 16 hours following loss of RCIC when its battery fails.	Depressurization with ADS during a station blackout after loss of RCIC is currently in the EPGs. A procedure to backup DC power to ADS has been added to Section 19.9.9.	3
198	Section 19D.4 The event trees for each initiation event contribution to Class II (TT,TIS,TEO) should be replaced or supplemented by the modified trees described in the October 15, 1993 Class II submittal.	The October 15 submittal was included as a sensitivity study in new section 19D.5.14. As indicated in Section 19D.5.14, the results of the study do not warrant propagation into the balance of the SSAR. No modification is needed.	2
199	Section 19D.5 Update Sections 19D.5.11.4, 19D.5.12.4 and Figure 19d.5-10 to reflect the October 15,1993 submittal.	The October 15 submittal was included as sensitivity study in new section 19D.5.14. A reference to this section was added to 19D.5.14. As indicated in Section 19D.5.14, the results of the study do not warrant propagation into the balance of the SSAR. Nonetheless, minor modifications to Subsections 19D.5.12.2 and 19D.5.12.4 were made to prevent confusion.	3
200	Section 19D.7.2 "OP fails to depressurize RCS" said to be considered in level 1 analysis and is referred to in Section 19D.7.2. Modify SSAR (including table) to better addr[illegible] Depressurization actions including [illegible]essurization.	A modified discussion has been provided in Section 19D.7.2 to provide a description of "bounding analysis". As discussed in the modified text, the value of the human error portion of the OP node is approximately 0.002, However, the table has not been modified since one would not be able to track this value to a specific node in the CETs. The table does have a footnote directing the reader to the text for this node.	3

201	Section 19D.7.3 Write up has been pruned of all discussion specific to associated critical tasks (g) and (h), and COL system operating procedure (j). e.g., - valve numbers (including F005, -17 and -18) - "must have access under accident conditions" GE needs to significantly improve its write up in this area.	The references to Section 19D.7.3 in items (g) and (h) in the critical tasks list and item (j) in the COL system operating procedures list in Section 19D.7.6. were in error. These references have been corrected to refer to Section 19D.7.2.	4
202	Table 19D.7.12 Control room capability incorrectly indicated for several critical tasks. Table incompletely discusses unambiguous indication and control room capability for same COL system operating procedures.	Section 19D.7.11, Table 19D.7-11, and Table 19D.7-12 have been deleted. Section 19D.7.6 has been revised to provide more complete information as requested.	3
203	Section 19D.10.6.1 The list of top 10 contributors to uncertainly in CDF needs to be modified to reflect the updating of the importance measures for the CTG and the EDGs.	Section 19D.10.2 has been revised to address the issue.	3
204	Section 19E.2.1.2.2.1 GE needs to clarify wording in SSAR on statement regarding core cooling function being lost if AC is unavailable after eight hours to indicate that this is true only for the internal events analysis and not for seismic events where ACIWA is credited in the level 1 trees.	This subsection considers only the long term station blackout scenario. There is no discussion of the use or non-use of the ACIWA during the first few hours of an accident. A statement was added to indicate that the ACIWA could be used to prevent core damage during the long-term station blackout scenario.	3
205	Section 19E.2.1.2.2.2 The discussion on RCIC room temperature state that the ABWR will be designed to prevent the temperature in the room from rising to 15°F. This number is probably incorrect, particularly since the normal room temperature is 104°F.	A character was inadvertently dropped from the document. The correct temperature is 151°F. The SSAR has been corrected.	1
206	Section 19E.2.1.5 GE states that the "propagation of uncertainty distributions was carried out as done in NUREG-1150". This is incorrect and significantly overstates the analysis performed by GE.	The word "not" was inadvertently deleted from the text. The SSAR has been amended.	1

207	Section 19E.2.3.3.4 The reported core damage frequency for the bypass events is approximately one order of magnitude less than in the previous submittal. GE needs to provide an explanation for the reduction in CDF.	The core damage frequency for ex-containment LOCAs with bypass decreased due to 1) the removal of the sampling lines from consideration since these lines do not constitute a LOCA event, and 2) credit for the isolation of RCIC and CUW lines which has been conservatively omitted in the initial analysis. The analysis is appropriately described in the SSAR. No discussion of these modifications to the analysis is required in the SSAR.	2
208	Table 19H-1 The table needs to be expanded to address dc power cable trays.	The values given in Table 19H-1 include DC cable trays. No changes to Table 19H-1 are needed.	2
209	Table 19I-1 The table needs to be updated to reflect the changes to the assumptions regarding the ACIWA system HCLPFs including the fire truck and any building that is required to house it.	The footnote to Table 19I-1 has been revised to reflect this commitment.	3
210	Tables 19I-2 and -4 The tables need to be updated to reflect the changes in the ACIWA assumptions.	Tables 19I-2 and 19I-4 have been updated to reflect changes in ACIWA assumptions.	4
211	Figure 19I-1 It is the NRC's understanding that the fire water (ACIWA) system's HCLPF is 0.5g, not 0.62g.	Figure 19I-1 has been revised to reflect the 0.5g HCPLF for ACIWA.	3
212	Figures 19I-16 and-19 The titles of these figures do not match the contents of the diagrams.	The titles to Figures 19I-6 to 19I-19 have been corrected to match the contents of the diagrams.	1
213	Section 19K.5 The statement, "The primary containment and the reactor building are the structures with the lowest values of HCLPF, ..." is incorrect because it does not identify that this is only true for structures with safety related equipment that are in the certified design. The Service Water Pump House has a lower capacity. Further down this paragraph "battery cable trays" and "fire truck" need to be added to the list of SSCs identified as being important.	A reference to "Category I" was added to the description of the primary containment and the reactor building. A reference to "Cable trays" was added to the list of DC power system equipment important to the seismic analysis "Fire truck" was not added to the seismic analysis list of important systems. No credit was taken in the seismic analysis for the fire truck. This is consistent with the agreed list of important features in Section 19.8.2.	4
214	Section 19K.11.1 The discussion in this section needs to be updated to reflect the importance of the CTG and the EDGs.	This section was updated to reflect the importance of the CTG and the EDGs.	3

215	Section 19K.11.7 This section needs to be expanded to address dc power cable trays.	DC power cable trays were added to this section, as were the service water system pumps, pump house, and air conditioner. These items were also added to Table 19K-4.	3
216	Table 19K-1 This table needs to be updated to reflect the importance of the CTG and the EDGs.	Table 19K-1 was revised to reflect the importance of the CTG and the EDGs.	3
217	Table 19K-4 "COPS AOVs inadvertently left open closed following maintenance." Delete "open".	The SSAR has been modified as noted. The word "open" was deleted as requested.	1
218	Section 19K.11.5 The write up needs to address the opening valves F-005, F-017, and F-18 for ACIWA operation (core injection or drywell spray).	Section 19.9.7 has been revised to include the operation of valves F005, F017, and F018 for ACIWA operation. Reference to Section 19.9.7 has been provided in Section 19K.11.5. The testing requirements of RHR system valves F005, F017, and F018 for RAP has been provided in Section 19K.4.	3
219	Section 19Q.4.3 This section on shutdown risk too strongly downplays the potential effect of loss of containment integrity during an event in shutdown. At a meeting with GE in San Jose on this issue, the NRC was told that the consequences would be very harsh if there were a core melt during modes 3,4, or 5 with loss of containment integrity such that the pool would be bypassed. GE should more accurately portray the effect of loss of containment integrity in order to not mislead a COL applicant as to the potential seriousness of such an event.	A paragraph has been added to 19Q.4.3 describing the potential for high offsite doses if a core melt were to occur when the primary containment was open.	3
	Other Sections		
220	Figure 6.2-39, sht 2/3 The atmospheric control system P&ID does not show an annunciation on the vacuum breakers on position indicated.	An enunciation has been added to the drawing. The SSAR has been modified.	4

221	Section 5.4.7.1.1.10.1	A GE mark up (Taft fax 8/26/93) is not incorporated in the SSAR. Certain valves in the ACIWA needed for drywell spray (and possibly for core injection) are inaccessible after core damage if water subsequently is circulated through specific ECCS lines. This fact should be discussed.	A discussion of potential dose rates in the areas where the valves necessary to operate the ACIWA System are located has been provided in Section 5.4.1.1.10.	3
222	Section 5.4	The NRC is waiting for a complete description of operation of ACIWA including operation of valves in the yard and how the diesel-driven pump is operated.	A description of the operation of the ACIWA including operation of the valves in the yard and how the diesel-driven is operated has been provided in Section 19.9.7. A reference to Section 19.9.7 has been provided in Section 5.4.1.1.10.	3
223	Section 6.2	The NRC is waiting for a complete description of drywell/wetwell spray operation. This description should a discussion of the orifices, alignment of equipment, capabilities of local/manual valve actuation, and accessibility/shielding.	Sections 5.4.1.1.10 and 19.9.7 have been revised to include the requested information about ACIWA System operation. No change to Section 6.2 is necessary.	2

	Heat Capacity Temperature Limit		
224	GE's review of certain station blackout (SBO) sequences showed that suppression pool temperature has the potential to exceed the EPG HCTL. During a SBO, the only injection system available to the RPV is the turbine driven reactor core isolation cooling (RCIC) system. Once the HCTL is exceeds the operator is directed to depressurize the RPV. When RPV depressurization occurs RCIC, a high pressure injection system, would become unavailable for injection and may lead to heat up of the core. GE then submitted for staff review a revised HCTL with a low-pressure endpoint temperature of 137.7°C instead of 103.9°C. This upward shifting of the HCTL curve postpones RPV depressurization and would increase the availability of the RCIC. Unfortunately, this upward shift also allows temperatures exceeding saturation to exist within the suppression pool. There are disadvantages associated with operating the suppression pool at or near saturation. An extended plume of high quality steam was observed during sub-scale experiments performed by Chun and Sonin when the pool reached saturation temperature. The staff is concerned about the existence of large stem bubbles may drift into a relatively cooler area within the containment integrity. With the lost of the RHR pumps during a SBO there is a concern of a stratified pool is a possibility. Another consequence of these extended plumes of steam is the reduction of the scrubbing capability of the suppression pool. This would result in a direct path from the quencher to the wetwell airspace thus effectively bypassing the suppression pool.	This issue is being addressed as follows: A paper will be written by GE and reviewed by Prof. Sonin of MIT to justify that depressurization of the reactor with the suppression pool at high temperature will result in stable condensation, and will also address the scrubbing issue. This approach has been communicated to the NRC staff.	3

	The staff acknowledges the value of increasing the availability of the only high pressure injection system, RCIC, during a SBO. The staff does not believe that this increased availability is significant enough to justify operating the disadvantages mentioned above. The staff also believes that the fire water addition system should be available for low pressure injection once RPV depressurization takes place. Therefore, SCSB recommends that the ABWR adopt a HCTL curve that does not exceed saturation temperature for atmospheric conditions such as the one in Amendment 31 of the ABWR EPGs.		
225	GE did not include analyses on I&C diversity issue that was docketed on June 18, 1993. GE plans to include a synopsis of this analyses in Appendix 7C Amendment 33.	Included in revised Appendix 7C	3
	The following action items the staff needs to respond to the ACRS subcommitee or full committee on safeguard information in the future:		
226	1. What is the latest safeguards submittal for the ABWR design? The staff may have to revisit the FSER and to make sure that their safety findings are still valid or not affected?	Safeguards submittal as part of Amendment 33.	3
227	2. Should vital area classification of CAS and SAS be interface requirement rather than COL action item?	NRC action.	2
228	3. Where CAS and SAS will be located in the ABWR design?	NRC action.	2
229	4. Will CAS and SDAS be seismically qualified?	NRC action.	2
230	5. Should be an ITAAC/DAC for security?	NRC action.	2
231	6. How GE perform the sabotage vulnerability analyses when they do not a detailed security design? What are the NRC sabotage vulnerability requirements that the staff uses for the ABWR review?	NRC action.	2

	This is a summary of the discrepancies found as a result of the SPLB review of ABWR SSAR Amendment 32. Not included are discrepancies found in SSAR Section 6.4,6.5, 9.4 and 11, which have been provided to GE previously.		
	<u>**CHAPTER 3**</u>		
232	1. Modify the 10th paragraph of the SSAR Subsection 3.4.1.1.2 to "Analyses of the worst flooding due to pipe and tank failures and their consequences are performed in this subsection for the Reactor Building, Control Building, Radwaste Building, <u>Turbine Building,</u> and Service Building."	Incorporated	1
233	2. Modify the third paragraph of SSAR Subsection 3.4.1.1.2.1.2 to correct "SWCU" to "SPCU".	Incorporated	1
	3. Make the following modifications to SSAR Table 3.4-1 and related layout drawings,		
234	The first column of Table 3.4-1 and Fig 1.2-6 say that the tunnel between the Reactor Building (RB) and Service Building (SB) is at 4800mm but Fig. 1.2-6 does not clearly identify the access way and column 2 of the table, along with Figs. 1.2-14 and 1.2-15, show the access way at 3500mm. Also, Fig. 1.2-18 shows the access way at 3500mm (in addition, the access way is not clearly labeled on this figure).	R/B Figure 1.2-6 (4800mm) shows the clean access path at coordinates RA/R1-7. This path leads to the S/B ramp down to 3500mm (Figure 1.2-18). The ramp and the clean access path are identified by clarification's to the figure.	3
235	Columns 2 and 3 of Table 3.4-1 state that there is an access way between the control and service buildings at 3500 mm but Fig. 1.2-18 does not clearly label the access way.	C/B and S/B Figure 1.2-15 (Section B-B) does not show the 3500mm access between these building because the access location is not in the view of Section B-B. The access between the C/B and S/B is shown on Figure 1.2-18.	3
236	Column 2 of Table 3.4-1 states that there is an access way between the service and turbine buildings at 3500 mm but Fig. 1.2-18 does not clearly label this access way.	See the clarification's to Figure 1.2-18 in Item 243.	3

237	SSAR Fig. indicates that the radwaste tunnel slopes downward to the -8200 mm elevation at the RB and Control building (CB) ends of the tunnel. This is in direct contradiction to GE's discussion with the staff that the highest section of the tunnel would be at the RB and CB ends to ensure that any flooding in the tunnel would flow away from safety-related areas.	The R/B sumps are at -8200mm and the flow must be pumped upward to the radwaste building (Figure 1.2-23a). The T/B sumps are at 8800mm and the flow is downward to the radwaste building. The radwaste tunnels are sealed at each building wall.	4
238	4. Modify SSAR Subsection 3.5.1.1.3 to refer to Fig. 3.5-2, not 3.5-1	Incorporated	4
239	5. Modify the SSAR Subsection 3.5.4.5 to refer to SSAR Subsection 3.5.1.1.1.3, not 3.5.1.1.3	Incorporated	4
240	6. Add a statement in 3.6.1 that all walls, doors, floors and penetrations which serve as divisional boundaries will be designed to withstand the worst case pressurizations associated with the postulated pipe failures	Incorporated as item (12) of subsection 3.6.1.1.3 with a clarification of postulated pipe failures outside primary containment and within secondary containment.	3
241	7. GE has agreed to change the reference in SSAR Section 3.11 from Chapter 12 to Chapters 11 and 12.	Incorporated	3
	<u>CHAPTER 6</u>		
242	1. Section 6.2.1.1.1 (page 6.2-1), Item (4): typographic error, "flow form" should be read as "flow from".	Incorporated	1
243	2. Section 6.2.1.1.1 (page 6.2-1) Item(%): typographic error, "form the reactor core" should be read as "from the reactor".	Incorporated	1
244	3. Section 6.2.1.1.1 (page 6.2-2), Item(6), (7), and (8): similar typographic errors "form" should be read as "from".	Incorporated	1
245	4. Similar typographic errors on "form" vs. "from" spreading throughout the rest of Section 6.2.1 and maybe beyond. This is a generic typographic error. GE should identify all the specific errors and correct them.	Incorporated	1

246	5. Section 6.2.1.1.3.3.1.2 (page 6.2-10): Assumption No. 7 in the previous Amendments regarding feedwater enthalpy is missing in Amendment 32. Put it back.	Incorporated See Item 7 of Subsection 6.2.1.1.3.3.1.2.	4
247	6. Section 6.2.1.1.3.3.2.1. (page 6.2-12): Assumption No. 1 regarding critical flow model in the previous Amendments was taken away in Amendment 32. Put it back.	Incorporated See Item 1 of Subsection 6.2.1.1.3.3.2.1.	4
248	7. Section 6.2.1.1.3.5.1 (page 6.2-13 and -14): typographic errors on "Table" and "temperature".	Incorporated	1
249	8. Section 6.2.1.1.5.6.1 (page 6.2-26): typographic error on "the".	Incorporated	1
250	9. Section 6.2.1.2.2 (page 6.2-36): The break sizes of "150A" and "50A" should be "150mm" and "50mm".	The "A" carries the dimension of mm. The definition is provided in Figure 1.7-1. It is not necessary to duplicate.	2
251	10. Include Tables 6.2-37 a-e in Chapter 6 of the SSAR	Tables 6.2-37a - e do not exist.	2
	CHAPTER 9		
252	1. Add information to the SSAR regarding the COL applicant to provide a criticality analysis showing that the design of the new storage racks will be such that Keff will not exceed 0.98 with a fuel load of the highest reactivity, assuming optimum moderator conditions (foam, small droplets, spray, or fogging), as described in SRP Section 9.1.1.	Already required by Subsection 9.1.6.1 which references Subsection 9.1.1.1.1 which in turn requires the COL applicant to respond to Question 430.180 (all information requested).	2
253	2. Add information to the SSAR discussing the storage of defective fuel assemblies and provide design requirements in Table 3.2-1 of the SSAR.	Incorporated in Amendment 31. See Subsection 9.1.4.2.8 and Table 3.2-1.	2
254	3. Provide design requirements for the spent fuel pool liner in Table 3.2-1.	Incorporated	3
255	4. Incorporate information regarding protection of the filter-demineralizer resins in 9.1.3.	Incorporated	3

256	5. Modify SSAR Subsection 9.1.4.2.8 to clarify that defective fuel assemblies are placed in special storage containers and stored in the spent fuel storage rack, not the equipment storage rack, and correct SSAR Subsection 9.1.4.3 to state that the COL license information requirements are in SSAR Subsection 9.1.6.4, not 9.1.4.3.	Defective fuel storage is stored in the equipment storage rack. See Subsection 9.1.4.2.8 . COL license information requirements are incorporated in Subsection 9.1.6.4.	4
257	6. Correction SSAR Subsection 9.1.5.8 to refer to SSAR Subsection 9.1.6.6, not 9.1.6.7.	Incorporated	4
258	7. Modify the second paragraph of ITAAC 2.11.23 to include the Control Building in the list of buildings in which the PSW system is part of the Certified Design.	See ITAAC submittal	3
259	8. Modify SSAR Fig. 9.2-9 to include the discharge from the nonradioactive drain system. This connection is downstream of the hypocontact tank in the figure.	Included in Amendment 32.	2
260	9. Modify SSAR Subsection 9.2.5.1 (11) to include capability for full operational inspection and testing	Incorporated	3
261	10. Modify SSAR Subsection 9.2.5.10 to include inspections and tests during normal operation	Incorporated	3
262	12. Modification SSAR Subsection 9.2.9.1 (5) to refer to Table 9.2-1, not Table 9.2-2.	Reference should be to Table 9.2-3. Incorporated.	3
263	13. Remove references to Fig. 9.2-1a from SSAR Subsection 9.2.11.2	Incorporated	1
264	14. Modify Tables 9.2-4a-c to refer to safety-related and nonsafety-related instead if essential and nonessential	Decision was made between GE and NRC to not make this change.	2
265	15. Clarify the heat capacity. SSAR Subsection 9.2.11.2 states that the <u>total</u> reactor decay heat 4 hours after shutdown is 31.8 E6 kcal/hr but Tables 9.2-4 a-c indicate that <u>each</u> division will need to accommodate approximately 30 E6 kcal/hr	Decay heat does not appear in Tables 9.2-4 a-c. Each division of RCW has cooling loads from the RWR system in addition to other cooling loads.	2

266	16. Modify SSAR Subsection 9.2.14.2.2 to remove the next to the last sentence of the subsection (there is no safety-related equipment in the Turbine Building)	Statement is correct. For example, selected sensors for the RPS are located in the Turbine Building.	3
267	17. Modify SSAR Subsection 9.2.15.1.4 to clarify that on a LOCA signal, all standby pumps start and all standby valves open.	Incorporated	3
268	18. Modify SSAR Subsection 6.7.2 and ITAAC 2.11.13 to clarify that the supply valve to the bottled nitrogen supply also opens on a low pressure signal in the nondivisional portion of the system.	As indicated in the second paragraph of Subsection 6.7.2, the values between the non-divisional and divisional systems close on low pressure. Subsystem 6.7.2 and ITAAC 2.11.3 are consistent.	2
269	19. Delete references to Fig. 9.3-9 in SSAR Subsection 9.3.8.1.1 (5) (b)	Incorporated	3
270	20. Correct the reference to a COL Action Item made in SSAR Subsection 9.3.8.1.1 (5) (c). 9.3.12.1. does not refer to the DTS. It refers to the NRD. Make a separate COL Action Item for the DTS.	Incorporated in Subsection 9.3.12.4 .	3
271	21. The staff indicated that GE's design capabilities for fire protection and mitigation in primary containment internal areas during shutdown conditions, supported by operational controls and procedures appear to adequately address the concerns. Further evaluation of this information will be completed and follow-up discussions will be conducted to provide feedback to GE and to identify any required SSAR changes if necessary. GE agreed to provide write-up in Section 9.5.1.3.12.	Incorporated in Subsection 9.5.1.3.12 .	3
272	22. The staff had requested a change in the SSAR to indicate that the smoke control capability would take into account the fact that the fire doors would be maintained open between a fire area and a non fire area. GE provided a revised markup which will be included in SSAR amendment and was found to be acceptable except that the words "maintain open" need to be included.	Incorporated in Subsection 9.5.1.1.6 .	3

273	23. The staff identified a statement in the SSAR that cables in trays with bottoms were not considered in the total combustible loading. This was not in compliance with Generic Letter 86-10 which states that all cables in trays need to be part of the total loading. GE agreed to delete the statements in the SSAR which indicate the exclusion. The staff found this to be acceptable. GE will provide additional changes if other exclusions are found in the SSAR.	Incorporated in Subsections 9.5.1.1.4, 9.5.1.1.5, 9A.2.4 and 9B.2.3.3	3
274	24. The staff identified that in the SSAR GE had referenced the ICBO 1495 Code for design of the type 1 walls. The staff stated that ASTM E-119 code needed to be referenced. GE committed to revising the SSAR and providing markups of the SSAR.	Incorporated in Subsection 9.A.3.6.	3
	25. GE provided a discussion of deviations from the BTP. GE provided a handout GE which justifies each deviation. The following is a summary of the discussions for each item.		
275	Additionally, GE is to provide a markup regarding DG room fire and manual FF.	The DG room has an automatic foam system as a fire suppression with closed head water sprinklers with fusible links. GE/NRC agree that current detection/suppression systems will prevent inadvertent actuation of the sprinkler system. The DG room has sufficient space to hold the suppressant and it will not cause any overflow should the door be opened for manual fire fighting.	2
276	a. High Impedance Faults - A deviation from the specification of the commitment to perform a high impedance fault analysis to ensure that such faults could not affect the operation of safety related equipment. GE provided an acceptable markup.	Incorporated, see Subsection 9.5.13.12.	3
277	b. BTP Reference Error - The staff identified a typographical error in the SSAR BTP reference. GE provided an acceptable markup which corrected the error.	Appropriate reference to BTP CMEB 9.5-1 provided.	1

278	c. Diesel Fuel Storage Area - GE has located in the reactor building, outside secondary containment, 3 diesel fuel tanks which are greater than 1100 gallons in capacity. The staff requested that GE show that the sunken floor below each tank will accommodate fire suppression water and foam for 30 minutes without forcing spilled fuel to migrate to other areas of the plant. GE agreed to consider the staff's concern.	Justification provided under Subsection 9.5.1, new item (1).	3
279	d. Control Room Complex - GE committed to changing the design to add fire detection capability to the sub-floor area which was acceptable to the staff.	Incorporated in Subsection 9.5.1, Item(2)	3
280	e. Plant Computer Room - GE indicated that this was not a deviation from the SRP and would not need to be further discussed.	No change.	2
281	f. Outdoor Transformers - For this item GE indicated that a commitment to NFPA 15 will be added to the SSAR and to indicate that the barrier walls to be used will be equivalent to a one-hour fire barrier.	Repeat of item 72	2
282	26. Clarify that the diesel engine is capable of operating for minutes without secondary cooling to ensure that the engine can operate at full load in excess of the time required to restore cooling water (RCW and RSW), which are sequenced onto the emergency power supply within 1 minute following a Loss of Preferred Power (LOPP)	Clarified	3
283	27. Modify SSAR Subsection 9.5.5.2 to state that the COL License Information is in SSAR Subsection 9.5.13.6, not 9.5.13.5	Incorporated	1
284	28. Modify SSAR Subsection 9.5.5.2 to state that the system is filled with high quality treated water from the Makeup Water (Purified) system, not the Demineralized Water System.	Incorporated.	3
285	29. Reinstate note 4 on Fig. 9.5-8 clarifying that the air dryer includes both pre- and after-filters	Incorporated.	3

286	30. Correction Fig. 9.5-9 to change the flow sensor shown on the lube oil sump tank to a level sensor, as had been agreed to and modified in an earlier version of the figure.	Incorporated.	3
287	31. Modify Fig. 9.5-6 to show the pressure sensors used to detect high pressure conditions in the crankcase (as discussed in SSAR Subsection 9.5.8.2) and to show the differential pressure gauge used to monitor plugging on inlet filters (as discussed in SSAR Subsection 9.5.8.3)	Incorporated.	3
	<u>CHAPTER 10</u>		
288	1. The Design Description of ITAAC 2.10.7 should add "IVs" on page 2.10.7-2 for the "Actions for Protective Action."	Incorporated, see ITAAC 2.10.7 .	3
289	2. Revise SSAR Chapter 15 for the turbine CV trip closure time to "0.08 seconds or greater."	Incorporated	3
290	3. Define "NBR" in SSAR Section 10.2.1.3.3	Incorporated	1
291	4. Revise SSAR Section 10.4.10 to refer to 10.4.3.5.1.2, not 10.4.3.5.1.3.	Subsection 10.4.3.5.1.3 is correct.	2
292	5. Revise SSAR page 10.0-iii/iv, Tables 10.4-4 through 10.4-6, Figure 10.4-4b, and the text of Section 10.4.6 to reflect system's designation as "Condensate Purification System (CPS)."	Incorporated	4
293	6. Revise the last paragraph of SSAR Subsection 10.4.7.2 to state "The system extends...outlet to (but not including) the seismic interface restraint outside containment." and the last paragraph of SSAR Subsection 10.4.7.3 to state "The portion which connects to the seismic interface restraint outside the containment...Reactor Building."	Incorporated	3
294	7. SSAR Figure 10.4-7 should reflect instrumentation and its corresponding locations as shown in ITAAC Figure 2.10.2a.	Figure 10.4-7 and ITAAC Figure 2.10.2a are not the same system.	2

295	8. Delete Subsections 10.4.5.9 and 10.4.5.10 on page 10.4-19 of the SSAR. These are already printed on page 10.4-18 as Subsections 10.4.5.7 and 10.4.5.8.	Incorporated	4
	CHAPTER 11		
296	1. Reinstate the P&ID s for the [illegible] reviously found in SSAR Chapter 11		
297	Section 18.5 In forth paragraph replace "action item" with "license information requirement"	 Incorporated	 1
298	Section 18.8.1 In last sentence replace "action" with more suitable phrase	 Replaced "action items are" with "license information is".	 1
	Section 18.8.13		
299	Put period at end of second sentence	Incorporated	1
300	Insert "to" between the words actions and isolate in second sentence.	Incorporated	1
301	Insert ")" following "Table 18E-1" in last sentence.	Incorporated	1
302	What date for IEC964 on page 18E-20 and IEEE-1023 on Page 18E-21.	Dates are provided in Table 1.8-21.	2
303	What are dates for ANSI HSF-100 and IEC 964 on page 18E-24?	Dates are provided in Table 1.8-21.	2
	Section 13.5		
304	Where is the rest of sentence pertaining to "Loss of Feedwater System Failure? on page 13-5?	Sentence complete by replacing "." with")" at end of sentence.	1
305	What happened to autoblowdown in upper portion of page 13.5-8?	Autoblowdown applies only to PWRs.	2
306	What are dates for MIL-H-468558 and MIL-STD-1472D on page 13.5-8	Dates are provided in Table 1.8-21.	2

	Section 15.6		
307	Delete Subsection 15.6.7.2, analysis done using boundary Chi/Q.	Incorporated	3
	Section 11.2.5		
308	Add Sections 1001-2402 after 10CFR20 under item (2).	Incorporated	3
309	Insert "10 times" following the word within under item (5).	Incorporated	3
	Sections 8.2.4 and 8.2.		
310	Proposed staff interface requirements/conceptual design is provided in Attachment 1. GE to develop, in conjunction with the staff, final version suitable for inclusion with Amendment 33.	Final version in Amendment 33.	3
	COMMENTS RECEIVED 11/18 - 19/93		
	3.4.1-Flood protection Pending clarification in the SSAR of the following discrepancies:		
311	Modification of the 10th paragraph of SSAR Subsection 3.4.1.1.2 to "Analysis of the worst flooding due to pipe and tank failures and their consequences are performed in this subsection for the Reactor Building, Control Building, Radwaste Building, Turbine Building, and Service Building.	Same as Item 232	2
312	Modification of the third paragraph of SSAR Subsection 3.4.1.1.2.1.2 to correct "SWCU" to "SPCU".	Same as Item 233	2
	Make the following modifications to SSAR Table 3.4-1 and the related layout drawings,		
313	The first column of Table 3.4-1 and Fig. 1.2-6 say that the tunnel between the Reactor Building (RB) and Service Building (SB) is at 4800mm but Fig.1.2-6 does not clearly identify the access way and column 2 of the table, along with Figs. 1.2-14 and 1.2-15, show the access way at 3500mm. Also, Fig. 1.2-18 shows the access way at 3500mm (in addition, the access way is not clearly labeled on this figure.)	Same as Item 234	2
314	Columns 2 and 3 of Table 3.4-1 state that there is an access way between the control and service buildings at 3500mm. However, Fig. 1.2-15 does no t show this access way and Fig. 1.2-18 does not clearly label the access way.	Same as Item 235	2

315	Column 2 of Table 3.4-1 states that there is an access way between the service and turbine buildings at 3500mm but Fig. 1.2-18 does no t clearly label this access way.	Same as Item 236	2
316	SSAR Fig. indicates that the radwaste tunnel slopes downward to the -8200mm elevation at the RB and Control Building (CB) ends of the tunnel. This is in direct contradiction to GE's discussion with the staff that the highest section of the tunnel would be at the RB and CB ends to ensure that any flooding in the tunnel would flow away from safety-related areas	Same as Item 237	2
	3.5.1.1-**INTERNALLY-GENERATED MISSILES OUTSIDE CONTAINMENT**		
	Pending resolution of the following discrepancies:		
317	Modify SSAR Subsection 3.5.1.1.1.3 to refer to Fig. 3.5-2, not 3.5-1	Same as Item 238	2
318	Modify SSAR Subsection 3.5.4.5 to refer to SSAR Subsection 3.5.1.1.1.3, not 3.5.1.1.3	Same as Item 239	2
	3.6.1 - **PIPE FAILURES**		
	Pending correction of the following discrepancies:		
319	Addition of a statement in 3.6.1 that all walls, doors, floors, and penetrations which serve as divisional boundaries will be designed to withstand the worst case presurrizations associated with the postulated pipe failures	Same as Item 240	2
320	Inclusion of Tables 6.2-37 a-e in Chapter 6 of SSAR	Same as Item 251	2
	3.11 - EQUIPMENT QUALIFICATION		
321	SSAR Section 3.11.5.2 states that normal operational exposure is based on the radiation sources provided in chapter 12. The staff has determined that this reference is incorrect. GE indicated that this reference will change to state that the normal operational exposure is based on a source term provided in chapter 11, and inventory provided in chapter 12.	Same as Item 241	2
	CHAPTER 14		
322	Section 14.2.12.1.45.4(3)(j) of SSAR amendment 32 uses the phrase "...powered from wither preferred or standby sources..." Clarify the use of the word "wither" in this phrase.	The word is either. It has been corrected.	1

323	Section 14.2.12.1.45.4(3)(i) of SSAR amendment 32 references subsection 8.3.1.1.5.2. There is no subsection in the SSAR. Clarify where the design voltages are specified in the SSAR.	Subsection 8.3.1.5.2 changed to Subsection 8.3.1.1.5 in Subsection 14.2.12.1.45.4(3)(i). Design voltages are not specified in the SSAR. The use of design voltages in terms of ± 10% fluctuations are documented in GE letter "Response to NRC comments on SSAR Section 14.2" dated May 13, 1993. The phrase "as specified in" has been replaced with the phrase "in accordance with" for clarification of Subsection 14.2.12.1.45.4(3)(i)	4
324	Section 14.2.12.1.45.4(3)(j) of SSAR amendment 32 indicates that available bus voltage are specified in Subsection 8.3.1.1.8.3. Available bus voltages do not appear to be specified in this subsection. Provide clarification.	Available bus voltages are not specified in the SSAR The phrase "as specified in " has been replaced with the phrase "in accordance with" for clarification of Subsection 14.4.12.1.45.(3)(i).	3
325	Section 14.2.12.1.45.4(3)(h) of SSAR amendment 32 indicates that acceptable bus voltage frequency variations between no load and full load conditions are specified by subsection 8.2.3. Acceptable bus voltage and frequency variations between no load and full load conditions do not appear to be specified in this subsection. Provide clarification.	Bus voltage and frequency variations between no load conditions are not specified in the SSAR. The phrase "as specified in" has been replaced with the phrase "in accordance with" for clarification of Subsection 14.2.12.1.45.4.(3)(h).	3

Legend:

1 Editorial/Typos

2 No Change Necessary

3 New Information/Clarification

4 Discrepancy