Appendix 15A. Tables

Table 15-1. Reg. Guide 1.183 Fuel Handling Accident Source Term

Isotope	Gap Fraction (See Note 1)	72 Hour Gap Inventory (Ci/Fuel Assembly)
Kr-83m	0.05	2.34E-05
Kr-85m	0.10	3.72E-01
Kr-85	0.10	8.53E+02
Kr-87	0.05	2.39E-13
Kr-88	0.05	8.26E-04
Xe-131m	0.05	4.81E+02
Xe-133m	0.05	1.21E+03
Xe-133	0.05	5.26E+04
Xe-135m	0.05	5.38E+00
Xe-135	0.05	7.21E+02
Deleted Row(s) per 2009 Update		
I-131	0.08	4.35E+04
I-132	0.05	2.59E+04
I-133	0.05	6.44E+03
Deleted Row(s) per 2009 Update		
I-135	0.05	3.29E+01

Note:

1. For fuel pins which exceed the rod power/burnup criteria of Footnote 11 in RG 1.183, the gap fractions from RG 1.183 are increased by a factor of 3 for Kr-85, Xe-133, Cs-134 and Cs-137, and increased by a factor of 2 for I-131, and other noble gases, halogens and alkali metals.

Table 15-2. Rod Ejection Accident Analysis Results

Deleted Per 2013 Update

Mk-B-HTP with UO_2-Gad fuel rods						
Parameter	**Value**					
Cycle Exposure	**BOC**	**BOC**	**BOC**	**EOC**	**EOC**	**EOC**
Initial core power (% of 2568 MWt)	102	77	0	102	77	0
Number of RCP running	4	3	3	4	3	3
Initial rod position (% wd)	58	31	0	58	31	0
Ejected rod worth ($)	0.164	0.362	1.207	0.202	0.394	1.149
MTC (pcm/°F)	0.0	0.56	7.0	-28.0	-28.0	-12.0
DTC (pcm/°F)	-1.10	-1.16	-1.42	-1.19	-1.22	-1.53
Maximum neutron power (% of 2568 MWt)	118	108	426	122	114	160
Peak UO_2 fuel pellet average enthalpy (cal/gm)	115	95	72	103	107	45
Peak UO_2 -Gd fuel pellet average enthalpy (cal/gm)	129`	113	91	134	130	45
Percent pins exceeding DNBR (%)	<45%					
Maximum RCS pressure (psig)	2301	2273	See Note 1			

[1]RCS pressurization is not analyzed for these conditions since they are <u>not</u> limiting.

Table 15-3. Deleted Per 2008 Update

Table 15-4. Deleted Per 2004 Update

Table 15-5. Steam Line Break Accident - With Offsite Power Case Sequence of Events

Event	Time (sec)
Break opens	0.0
Third CBP starts	0.5
Reactor trip on variable low pressure-temperature	3.0
Control rod insertion begins	3.1
Turbine stop valves closed Control rods fully inserted	3.1
Deleted row(s) per 2003 update	
HPI actuates	35.5
Deleted row(s) per 2003 update	
CFT injection begins	97.4
Boron from CFT B starts	110.1
Boron from CFT A starts	115.1
Boron injection from HPI begins	115.8
Deleted row(s) per 2003 update	
Unaffected SG becomes water-solid	310.0
End of simulation	600.0

Table 15-6. Summary of LOCA Break Spectrum Break Size and Type

Parameter	CLPD DE	CLPD DE	CLPD DE	CLPD Split	CLPS DE
Break C_D	1.0	0.8	0.6	1.0	1.0
Unruptured node	12	12	13	13	12
PCT, °F	1915.1	1895.9	1851.9	1811.5	1829.9
Time, sec	33.549	41.515	37.100	34.086	32.151
Local oxidation, %	1.7364	1.5650	1.0324	0.9773	1.0277
Ruptured node	11	13	12	12	13
PCT, °F	1957.1	1889.6	1820.9	1745.0	1796.3
Time, sec	28.604	29.845	31.511	31.055	32.284
Local oxidation, %	2.0190	1.8633	1.6000	1.4752	1.5446
Clad rupture time, sec	19.02	20.655	23.21	21.02	19.19
CFTs begin injection, sec	11.80	12.80	14.60	12.20	13.00
End of bypass, sec	18.14	19.29	21.56	18.90	17.70
End of blowdown, sec	20.16	21.46	24.20	21.01	22.94
End of adiabatic heatup, sec	26.562	27.721	29.988	27.475	25.542
Water mass in reactor vessel lower plenum at end of blowdown, lbm	16701.6	17695.6	20418.6	16811.3	36238.7

Table 15-7. Deleted Per 1997 Update

Table 15-8. Deleted Per 1995 Update

Table 15-9. Deleted Per 1995 Update

Table 15-10. Deleted Per 1995 Update

Table 15-11. Deleted Per 1995 Update

Table 15-12. Deleted Per 1995 Update

Table 15-13. Deleted Per 1995 Update

Table 15-14. Deleted Per 2004 Update

Table 15-15. Total Core Activity for Maximum Hypothetical Accident

Isotope	Total Ci in Core[1]
AM241	2.02E+04
AM242M	1.35E+03
AM242	7.66E+06
AM243	3.22E+03
BA139	1.31E+08
BA140	1.27E+08
BA141	1.18E+08
BR83	8.95E+06
BR85	1.93E+07
BR87	3.04E+07
CE141	1.20E+08
CE143	1.12E+08
CE144	9.64E+07
CM242	4.61E+06
CM244	5.84E+05
CS134	1.52E+07
CS136	4.33E+06
CS137	1.07E+07
CS138	1.37E+08
CS139	1.28E+08
EU154	7.08E+05
EU155	2.92E+05
EU156	1.87E+07
I130	1.50E+06
I131	7.20E+07
I132	1.05E+08
I133	1.47E+08
I134	1.65E+08
I135	1.40E+08
KR83M	9.01E+06
KR85M	1.94E+07

Isotope	Total Ci in Core[1]
KR85	1.01E+06
KR87	3.85E+07
KR88	5.17E+07
KR89	6.46E+07
LA140	1.33E+08
LA141	1.19E+08
LA142	1.15E+08
LA143	1.11E+08
MO99	1.33E+08
NB95M	1.41E+06
NB95	1.24E+08
NB97	1.24E+08
ND147	4.74E+07
NP238	3.08E+07
NP239	1.54E+09
PD109	2.68E+07
PM147	1.55E+07
PM148M	3.69E+06
PM148	1.27E+07
PM149	4.16E+07
PM151	1.43E+07
PR143	1.09E+08
PR144M	1.35E+06
PR144	9.69E+07
PU236	3.92E+01
PU238	3.61E+05
PU239	3.42E+04
PU240	4.94E+04
PU241	1.30E+07
PU243	3.30E+07
RB86	1.41E+05
RB88	5.25E+07

Isotope	Total Ci in Core[1]
RB89	6.90E+07
RB90	6.26E+07
RH103M	1.19E+08
RH105	7.97E+07
RU103	1.19E+08
RU105	8.59E+07
RU106	4.69E+07
SB127	6.90E+06
SB129	2.12E+07
SM153	3.44E+07
SR89	7.18E+07
SR90	8.05E+06
SR91	9.02E+07
SR92	9.61E+07
SR93	1.06E+08
TC99M	1.18E+08
TC101	1.24E+08
TE127M	1.15E+06
TE127	6.79E+06
TE129M	3.82E+06
TE129	1.99E+07
TE131	6.09E+07
TE132	1.02E+08
TE133M	6.95E+07
TE133	7.87E+07
TE134	1.33E+08
XE131M	9.62E+05
XE133M	4.57E+06
XE133	1.43E+08
XE135M	3.11E+07
XE135	5.33E+07
XE137	1.32E+08

Isotope	Total Ci in Core[1]
XE138	1.26E+08
Y90	8.26E+06
Y91M	5.23E+07
Y91	9.32E+07
Y92	9.72E+07
Y93	1.09E+08
Y94	1.14E+08
Y95	1.18E+08
ZR95	1.23E+08
Z R97	1.23E+08
U237	6.61E+07

Note:

1. Core activity values bound both 18-month and 24-month cycle scenarios.

Table 15-16. Summary of Transient and Accident Doses Including the Effects of High Burnup Reload Cores with Replacement Steam Generators

		Doses (rem)	
Fuel Handling Accident for Single Fuel Assembly Event			
	TEDE at EAB	1.33	
	TEDE at LPZ	0.14	
	TEDE in Control Room	2.45	
Deleted row(s) per 2016 update			
Steam Generator Tube Rupture		Case 1	Case 2
	Thyroid at EAB	4.24E+1	2.80E+2
	Whole body at EAB	1.46E-1	1.82E-1
	Thyroid at LPZ	1.00E+1	6.93E+1
	Whole body at LPZ	3.04E-2	4.00E-2
Waste Gas Tank Failure			
	TEDE at EAB	4.4E-1	
Rod Ejection		Containment Release	Secondary Side Release
	TEDE at EAB	5.23	2.66
	TEDE at LPZ	2.00	1.35
	TEDE in Control Room	4.46	4.92
Deleted row(s) per 2009 update			
Large Main Steam Line Break		Preaccident Iodine Spike	Concurrent Iodine Spike
	TEDE at EAB	0.18	0.70
Deleted row(s) per 2012 Update			
	TEDE at LPZ	0.05	0.22
	TEDE in Control Room	0.76	1.30

		Doses (rem)	
Small Main Steam Line Break		Preaccident Iodine Spike	Concurrent Iodine Spike
	TEDE at EAB	0.29	0.68
Deleted row(s) per 2012 Update			
	TEDE at LPZ	0.06	0.24
	TEDE in Control Room	1.29	1.69
Deleted row(s) per 2004 update			
Maximum Hypothetical Accident			
	TEDE at EAB	10.86	
	TEDE at LPZ	2.74	
	TEDE in Control Room	4.39	
	Deleted row(s) per 2008 update		
Fuel Cask Handling Accident for Multiple Fuel Assembly Event			
	TEDE at EAB	2.05	
	TEDE at LPZ	0.22	
	TEDE in Control Room	4.05	
Deleted row(s) per 2008 update			
Deleted row(s) per 2004 update			
Deleted row(s) per 2008 update			

Table 15-17. Deleted Per 2000 Update

Table 15-18. Deleted Per 2000 Update

Table 15-19. Deleted Per 1995 Update

Table 15-20. Deleted Per 1995 Update

Table 15-21. Deleted Per 1995 Update

Table 15-22. Deleted Per 1995 Update

Table 15-23. Deleted Per 1995 Update

Table 15-24. Deleted Per 1997 Update

Table 15-25. Deleted Per 2001 Update

Table 15-26. Deleted Per 1995 Update

Table 15-27. Deleted Per 2003 Update

Table 15-28. HPI Flow Assumed in Core Flood Line Small Break LOCA Analyses

102% Full Power SBLOCA	
Flow rates prior to credit for operator realignment of HPI at 10 minutes	
RCS Pressure (psig)	**HPI Flow (gpm)**
0	428
600	428
1200	333
1500	294
1600	280
1800	250
2400	127
Flow rates after credit for operator realignment of HPI at 10 minutes	
RCS Pressure (psig)	**HPI Flow (gpm)**
0	817
600	817
1200	653
1500	573
1600	544
1800	482
2400	230
52% Full Power SBLOCA	
RCS Pressure (psig)	**HPI FLow (gpm)**
0	389
600	389
1200	303
1500	262
1600	248
1800	216
2400	84

Table 15-29. HPI Flow Assumed in RCP Discharge Small Break LOCA Analyses

102% Full Power SBLOCA		
Flow rates prior to credit for operator realignment of HPI at 10 minutes		
RCS Pressure (psig)	**Broken Leg Flow (gpm)**	**Intact Leg Flow (gpm)**
0	243	185
600	243	185
1200	189	144
1500	167	127
1600	159	121
1800	142	108
2400	69	53
Flow rates after credit for operator realignment of HPI at 10 minutes		
RCS Pressure (psig)	**Broken Leg Flow (gpm)**	**Intact Leg Flow (gpm)**
0	243	574
600	243	574
1200	189	464
1500	167	406
1600	159	385
1800	142	340
2400	72	158
52% Full Power SBLOCA		
RCS Pressure (psig)	**Broken Leg FLow (gpm)**	**Intact Leg Flow (gpm)**
0	223	167
600	223	167
1200	174	130
1500	151	113
1600	142	106
1800	124	93
2400	48	36

Table 15-30. HPI Flow Assumed in HPI Line Small Break LOCA Analyses

102% Full Power SBLOCA		
Flow rates prior to credit for operator realignment of HPI at 10 minutes		
RCS Pressure (psig)	**Broken Leg/Spill Flow (gpm)**	**Intact Leg Flow (gpm)**
0	259	181
600	320	124
1200	382	47
1500	408	0
Flow rates after credit for operator realignment of HPI at 10 minutes		
RCS Pressure (psig)	**Broken Leg/Spill Flow (gpm)**	**Intact Leg Flow (gpm)**
0	259	570
600	320	513
1200	383	366
1500	407	279
52% Full Power SBLOCA		
RCS Pressure (psig)	**Broken Leg Flow (gpm)**	**Intact Leg Flow (gpm)**
0	236	165
300	269	134
600	303	101
1200	377	15
1500	385	0
1600	385	0
1800	385	0
2400	385	0

Table 15-31. Deleted Per 2008 Update

Table 15-32. Summary of Transient and Accident Cases Analyzed

UFSAR Section	Description of Transient	Summary of Cases Analyzed
15.2	Startup Accident	Peak RCS pressure
15.3	Rod Withdrawal at Power	1. Core cooling capability 2. Peak RCS pressure
15.4	Moderator Dilution Accidents	1. Power operation 2. Refueling
15.5	Cold Water Accident	Core cooling capability
15.6	Loss of Coolant Flow	Core cooling capability: 1. Four RCP trip from four-RCPs 2. Two RCP trip from four-RCPs 3. One RCP trip from three-RCPs 4. Locked rotor from four-RCPs 5. Locked rotor from three-RCPs
15.7	Control Rod Misalignment Accidents	Core cooling capability 1. Dropped rod from four-pumps 2. Dropped rod from three-pumps 3. Statically misaligned rod
15.8	Turbine Trip	Peak RCS pressure
15.9	Steam Generator Tube Rupture	Offsite dose
15.10	Waste Gas Tank Rupture	Offsite dose
15.11	Fuel Handling Accidents	Offsite dose 1. Fuel handling accident in Spent Fuel Pool 2. Fuel handling accident in containment 3. Fuel shipping cask drop 4. Dry storage canister cask drop

UFSAR Section	Description of Transient	Summary of Cases Analyzed
15.12	Rod Ejection	Peak fuel enthalpy 1/4. Four-pump BOC and EOC 2/5.Three-pump BOC and EOC 3/6.Three-pump BOC and EOC, HZP Core cooling capability 1/4.Four-pump BOC and EOC 2/5.Three-pump BOC and EOC 3/6.Three-pump BOC and EOC, HZP Peak RCS pressure 7. Three-pump BOC 8. Four-pump BOC
15.13	Steam Line Break	Core cooling capability 1. With offsite power 2. Without offsite power
15.14	Loss of Coolant Accidents	10CFR50.46 and offsite dose 1. Large-break LOCA spectrum Full-core Mk-B-HTP LOCA limits 2. Small-break LOCA spectrum (full power) Full-core Mk-B-HTP LOCA limits 3. Small-break LOCA spectrum (reduced power) Full-core Mk-B-HTP LOCA limits
15.15	Maximum Hypothetical Accident	Large Break LOCA - offsite dose
15.16	Post-Accident Hydrogen Control	Large Break LOCA - flammability limit
15.17	Small Steam Line Break	Core cooling capability

Table 15-33. Methodology Topical Reports and Computer Codes Used in Analyses

	UFSAR Section	Topical Reports	Computer Codes
15.2	Startup Accident	DPC-NE-3005-PA	RETRAN-3D SIMULATE-3
15.3	Rod Withdrawal at Power Accident	DPC-NE-3005-PA	RETRAN-3D VIPRE-01 SIMULATE-3
15.4	Moderator Dilution Accidents	DPC-NE-3005-PA	N/A
15.5	Cold Water Accident	DPC-NE-3005-PA	RETRAN-3D
15.6	Loss of Coolant Flow Accidents	DPC-NE-3005-PA	RETRAN-3D VIPRE-01 SIMULATE-3
15.7	Control Rod Misalignment Accidents	DPC-NE-3005-PA	RETRAN-3D VIPRE-01 SIMULATE-3
15.8	Turbine Trip Accident	DPC-NE-3005-PA	RETRAN-3D
15.9	Steam Generator Tube Rupture Accident	DPC-NE-3005-PA	RETRAN-3D
15.12	Rod Ejection Accident	DPC-NE-3005-PA	SIMULATE-3K SIMULATE-3 RETRAN-3D VIPRE-01
15.13	Steam Line Break Accident	DPC-NE-3005-PA	RETRAN-3D VIPRE-01 SIMULATE-3
15.14	Loss of Coolant Accident		
	Large Breaks	BAW-10192-PA	RELAP5/MOD2-B&W CONTEMPT REFLOD3 BEACH
	Small Breaks	BAW-10192-PA	RELAP5/MOD2-B&W CONTEMPT
15.17	Small Steam Line Break Accident	DPC-NE-3005-PA	RETRAN-3D VIPRE-01 SIMULATE-3

Table 15-34. Summary of Input Parameters for Accident Analyses Using Computer Codes

UFSAR Section	Case Identifier	Power Level (%FP)	RCS T-ave (°F) (Note 16)	RCS Pressure (psig)	RCS FLOW (gpm)	Pressurizer Level (inches)	MTC (Δk/k./°F)	DTC (Δk/k./°F)	β-effective	SG Tube Plugging (%)
15.2	N/A	1.0E-7	532	2155	272,624	285	+7.0E-5	Note 15	0.0065	0
15.3	1	102	579	2125	378,400	195	0.0	Note 2	0.0065	0
	2	102	581	2155	371,360	285	0.0	Note 2	0.0065	5
15.5	N/A	80	579	2125	282,665	195	-35.0E-5	Note 3	0.0049	0
15.6	1	102	579	2125	378,400	195	0.0	Note 2	0.0065	0
	2	102	579	2125	378,400	195	0.0	Note 2	0.0065	0
	3	80	579	2125	282,665	195	0.0	Note 2	0.0065	0
	4	102	579	2125	378,400	195	0.0	Note 2	0.0065	0
	5	75	579	2125	282,665	195	+0.56E-5	Note 2	0.0065	0
15.7	1	102	579	2125	381.920	195	0.0	Note11	.0058	0
	2	75	579	2125	282,665	195	+0.56E-5	Note 11	.0058	0
15.8	N/A	102	581	2185	374,493	285	0.0	Note 2	0.0065	5
15.9	N/A	102	577	2185	371,360	285	-35.0E-5	Note 4	0.0049	5
15.12 (Note 7)	1	102	581	2095	374,880	N/A	0.0	-1.10E-5	0.0058	N/A
	2	77	581	2095	275,614	N/A	+0.56E-5	-1.16E-5	0.0058	N/A
	3	0	540	2095	275,614	N/A	+7.0E-5	-1.42E-5	0.0058	N/A
	4	102	581	2095	374,880	N/A	-28.0E-5	-1.19E-5	0.0047	N/A
	5	77	581	2095	275,614	N/A	-28.0E-5	-1.22E-5	0.0047	N/A
	6	0	540	2095	275,614	N/A	-12.0E-5	-1.53E-5	0.0047	N/A

UFSAR Section	Case Identifier	Power Level (%FP)	RCS T-ave (°F) (Note 16)	RCS Pressure (psig)	RCS FLOW (gpm)	Pressurizer Level (inches)	MTC (Δk/k./°F)	DTC (Δk/k./°F)	β-effective	SG Tube Plugging (%)
	7	77	581	2095	275,614	285	+0.56E-5	-1.16E-5	0.0058	5
	8	102	581	2095	374,880	285	0.0	-1.10E-5	0.0058	5
15.13	1	102	577	2095	371,360	195	Note 8	Note 5	0.0	0
	2	102	579	2125	378,400	285	0.0	Note 6	0.0065	0
15.14	1	102	579	2155	374,880(10)	220	0.0	Note 4	0.007	7
	2	102	579	2155	374,880(10)	220	0.0	Note 4	0.007	7
	3	52	579	2155	374,880(10)	220	+5.0	Note 4	0.007	7
15.17	N/A	102	579	2125	381,902(17)	195	-7.0	Note 14		0

Note:

1. This flow rate corresponds to 105.5% of Design Flow.
2. Doppler Reactivity assumption as function of average fuel temperature:
   Accident Analyses: 15.3, 15.6 (Cases 1-5), 15.8

Average Fuel Temperature (°F)	Doppler Coefficient Δk/k-°F (x10^{-5})
230.0	-1.89
450.0	-1.58
750.0	-1.27
1450.0	-1.02

Note:

3. Doppler reactivity assumption as function of average fuel temperature:
   Accident Analyses: 15.5

UFSAR Section	Case Identifier	Power Level (%FP)	RCS T-ave (°F) (Note 16)	RCS Pressure (psig)	RCS FLOW (gpm)	Pressurizer Level (inches)	MTC (Δk/k./°F)	DTC (Δk/k./°F)	β-effective	SG Tube Plugging (%)

Average Fuel Temperature (°F)	Doppler Coefficient Δk/k-°F (x10[-5])
472.18	-1.7290
632.60	-1.5926
889.68	-1.3738
1358.65	-1.2662

Note:

4. Doppler reactivity assumption as function of average fuel temperature:
   Accident Analyses: 15.9, 15.14 Case 1

Average Fuel Temperature (°F)	Doppler Coefficient Δk/k-°F (x10[-5])
452.38	-2.1782
754.3	-1.8795
1149.79	-1.6651
1350	-1.5566

Note:

5. Doppler reactivity assumption as function of average fuel temperature:
   Accident Analysis: 15.13 Case 1

Average Fuel Temperature (°F)	Doppler Reactivity %Δk/k
953.8	0
940.55	0.0221

UFSAR Section	Case Identifier	Power Level (%FP)	RCS T-ave (°F) (Note 16)	RCS Pressure (psig)	RCS FLOW (gpm)	Pressurizer Level (inches)	MTC (Δk/k./°F)	DTC (Δk/k./°F)	β-effective	SG Tube Plugging (%)
950.0			0.0							
938.59			0.0169							
918.39			0.0477							
532			0.8804							
512			0.9194							
500			0.9419							
450			1.0398							
400			1.1398							
Average Fuel Temperature			Doppler Reactivity							
350			1.2423							
300			1.3480							
250			1.4571							
200			1.570							

Note:

6. Doppler reactivity assumption as function of average fuel temperature:
   Accident Analysis 15.13 Case 2

Average Fuel Temperature	Doppler Reactivity
(°F)	%Δk/k/°F
1450	-1.02E-5
750	-1.27E-5
450	-1.58E-5

UFSAR Section	Case Identifier	Power Level (%FP)	RCS T-ave (°F) (Note 16)	RCS Pressure (psig)	RCS FLOW (gpm)	Pressurizer Level (inches)	MTC (Δk/k./°F)	DTC (Δk/k./°F)	β-effective	SG Tube Plugging (%)
230			-1.89E-5							
Deleted Row(s) Per 2008 Update										

Note:

7. Actual physics parameter values determined from code cross section library for 15.12 Cases 1-7, target values listed for moderator and doppler reactivities and β-effective

8. Moderator reactivity assumption as a function of moderator density.
   Accident Analysis: 15.13 Case 1

Moderator Density	Moderator Reactivity
(lbm/ft^3)	%Δk/k
44.6590	0
45.2758	0.2253
Moderator Density	Moderator Reactivity
46.0125	0.4866
47.6731	0.6991
47.6658	1.0369
47.8133	1.0824
49.1185	1.6595
49.5917	1.8547
51.5476	2.6327
52.0171	2.8095
53.7633	3.4392
54.1503	3.5729

UFSAR Section	Case Identifier	Power Level (%FP)	RCS T-ave (°F) (Note 16)	RCS Pressure (psig)	RCS FLOW (gpm)	Pressurizer Level (inches)	MTC (Δk/k./°F)	DTC (Δk/k./°F)	β-effective	SG Tube Plugging (%)
55.7105			4.0921							
56.0313			4.1950							

Deleted Row(s) Per 2008 Update

9. Deleted Row(s) Per 2008Update

Note:

10. This flow rate corresponds to 106.5% of Design Flow.

11. Doppler reactivity assumption as a function of average fuel temperature:
    Accident Analyses: 15.7

Average Fuel Temperature	Doppler Coefficient
(°F)	Δk/k-°F (x10^{-5})
230.0	-1.89
450.0	-1.58
Average Fuel Temperature	Doppler Coefficient
750.0	-1.27
1450.0	-1.02

12. Deleted Row(s) per 2008 Update

Note:

13. Doppler reactivity assumption as a function of average fuel temperature:
    Accident Analysis: 15.17

Average Fuel Temperature	Doppler Coefficient
(°F)	Δk/k-°F (x10^{-5})

UFSAR Section	Case Identifier	Power Level (%FP)	RCS T-ave (°F) (Note 16)	RCS Pressure (psig)	RCS FLOW (gpm)	Pressurizer Level (inches)	MTC (Δk/k./°F)	DTC (Δk/k./°F)	β-effective	SG Tube Plugging (%)
230.0			-1.89							
450.0			-1.58							
750.0			-1.27							
1450.0			-1.02							

Note:

14. Doppler reactivity assumption interpolated between the following:

BOC		EOC	
Average Fuel Temperature	Doppler Coefficient	Average Fuel Temperature	Dopler Coefficient
(°F)	Δk/k-°F (x10^{-5})	(°F)	Δk/k-°F (x10^{-5})
230.0	-1.89	472.18	-1.7290
450.0	-1.58	632.60	-1.5926
750.0	-1.27	889.68	-1.3738
1450.0	-1.02	1358.65	-1.2662
Average Fuel Temperature	Doppler Coefficient	Average Fuel Temperature	Dopler Coefficient

βeff interpolated between the following

BOC	EOC
.0065	.0054

Note:

15. Doppler reactivity assumption as a function of temperature:
Accident Analysis: 15.2

Average Fuel Temperature	Doppler Coefficient

UFSAR Section	Case Identifier	Power Level (%FP)	RCS T-ave (°F) (Note 16)	RCS Pressure (psig)	RCS FLOW (gpm)	Pressurizer Level (inches)	MTC (Δk/k./°F)	DTC (Δk/k./°F)	β-effective	SG Tube Plugging (%)
(°F)			Δk/k-°F ($x10^{-5}$)							
231.4			-2.0174							
452.47			-1.6873							
743.78			-1.3838							
1434.14			-1.1136							

Note:

16. All accident analyses have been evaluated for an end-of-cycle T-ave reduction of up to 10°F lower than the T-ave values shown in this table.

17. This flow rate corresponds to 108.5% of Design Flow.

Table 15-35. Trip Setpoints and Time Delays Assumed in Accident Analyses

Trip Functions	Nominal Setpoint	Limiting Trip Setpoint Assumed in Analyses	Time Delay (seconds)
RPS:			
High Flux [8]	107.5% FP	108.5% 112.0% [10]	0.4
High Flux[11]	80.5% FP	81.5%	0.4
High Pressure	2355 psig	2362 psig	0.5
Low Pressure	1800 psig	1793 psig[2]	0.5
Variable Low Pressure-Temperature	Trip if: [1] $P<11.14 * T_{hot}-4706$	Trip if: [1] $P<11.14 * T_{hot}-4716$	0.7
High Temperature	618°F	618.85°F	0.7
Flux/Flow [8]	Trip if: [3] $\Phi > 109.4\%FP/flow * Fm$	Trip if: [3] $\Phi > 109.4\%FP/flow * Fm +2.2\%FP$	1.2
Pump Monitor		NA	0.9

ESPS:	HPI Trip Setpoint	HPI Time Delay (seconds)	LPI Time Delay (Seconds)	CFT Setpoint
Nominal Setpoint	1590 psig			2 psid
Transient				
LBLOCA	N/A	N/A	38 + 36 sec. ramp	(Note 7)
SBLOCA	1500 psig	48 (LOOP)	N/A	(Note 7)
Large Steam Line Break	1400 psig	15 (no LOOP) 38 (LOOP)	N/A	+6.5 psid (CFT A) –2.5 psid (CFT B)
Small Steam Line Break	1450 psig	15 (no LOOP) 38 (LOOP)	N/A	N/A
Rod Ejection	(Note 5)	(Note 5)	N/A	N/A
SGTR	(Note 6)	(Note 6)	N/A	N/A

Notes:

1. “P” is gauge pressure.
2. SBLOCA assumes 1765 psig.
3. "Fm" is measured flow.
4. Deleted per 2003 update.
5. Rod ejection assumes HPI actuation 5 seconds after the event begins.
6. SGTR assumes HPI actuation coincident with the tube rupture.
7. LOCA analyses assume a CFT nitrogen pressure of 550 psig. The CFT line break case considers a pressure of 547 psig to account for check valve leakage.
8. %FP is % of 2568 mwth.
9. Deleted per 2010 update.
10. Rod Ejection at 102% FP.
11. 3 RCP Small Steam Line Break.

Table 15-36. Startup Accident Sequence of Events

Event	Time(sec)
Rod withdrawal begins	0.0
Pressurizer control heaters de-energize	49.3
High power reactor trip	50.6
Control rod insertion begins	51.0
Pressurizer safety valves open	53.3
Peak RCS pressure occurs	53.7
Pressurizer safety valves reseat	55.5
End of simulation	100.0

Table 15-37. Rod Withdrawal at Power Accident - Peak RCS Pressure Analysis Sequence of Events

Event	Time (sec)
Rod withdrawal begins	0.0
High RCS pressure reactor trip setpoint reached	36.7
Control rod insertion begins	37.2
Turbine trip on reactor trip	37.2
Main steam safety valves lift	39.8 - 41.2
Peak RCS pressure occurs	41.0
Main steam safety valves begin to reseat	47.3
End of simulation	47.3

Table 15-38. Rod Withdrawal at Power Accident - Core Cooling Capability Analysis Sequence of Events

Event	Time (sec)
Rod withdrawal begins	0.0
Pressurizer spray actuates	92.7
High temperature reactor trip setpoint reached	204.4
Control rod insertion begins	205.1
Turbine trip on reactor trip	206.1
Main steam safety valves lift	208.4 – 210.4
Pressurizer spray terminates	211.2
End of simulation	215.2

Table 15-39. Cold Water Accident Sequence of Events

Event	Time (sec)
Fourth RCP starts	0.1
RCP reaches full speed	5.1
Maximum heat flux occurs (97.5%)	6.9
End of simulation	15.0

Table 15-40. Loss of Flow Accidents Four RCP Coastdown from Four RCP Initial Conditions Sequence of Events

Event	Time (sec)
All RCPs trip	0.0
Pump monitor reactor trip	0.0
Rod motion begins	0.9
Turbine trip on reactor trip	1.1
Pressurizer spray initiates	2.7
MSSVs lift	3.9 - 4.7
Pressurizer spray terminates	11.4
End of simulation	20.0

Table 15-41. Loss of Flow Accidents Two RCP Coastdown from Four RCP Initial Conditions Sequence of Events

Event	Time (sec)
Two RCPs trip	0.0
Flux/flow reactor trip setpoint reached	3.0
Rod motion begins	4.2
Turbine trip on reactor trip	4.4
Pressurizer spray initiates	5.4
MSSVs lift	6.5 – 11.2
End of simulation	20.0

Table 15-42. Loss of Flow Accidents One RCP Coastdown from Three RCP Initial Conditions Sequence of Events

Event	Time (sec)
One RCPs trip	0.0
Flux/flow reactor trip setpoint reached	3.8
Rod motion begins	5.0
Turbine trip on reactor trip	5.2
MSSVs lift	7.4 – 9.8
End of simulation	20.0

Table 15-43. Loss of Flow Accidents Locked Rotor from Four RCP Initial Conditions Sequence of Events

Event	Time (sec)
Locked rotor occurs	0.0
Flux/flow reactor trip setpoint reached	0.5
Rod motion begins	1.7
Turbine trip on reactor trip	1.8
Pressurizer spray initiates	2.8
MSSVs lift	3.9 - 7.8
End of simulation	10.0

Table 15-44. Loss of Flow Accidents Locked Rotor from Three RCP Initial Conditions Sequence of Events

Event	Time (sec)
Locked rotor occurs	0.0
Flux/flow reactor trip setpoint reached	0.4
Rod motion begins	1.6
Turbine trip on reactor trip	1.8
Pressurizer spray initiates	3.5
MSSVs lift	4.8 - 8.8
End of simulation	10.0

Table 15-45. Control Rod Misalignment Accidents - Dropped Rod Accident Sequence of Events

Event	Time (sec)
Control rod drops	0.01
ICS initiates control rod withdrawal	0.6
Control rod withdrawal terminates	12.9
Pressurizer spray initiates	21.6
Terminate Pressurizer Spray	68.2
End of Simulation	90.0

Table 15-46. Turbine Trip Accident Sequence of Events

Event	Time (sec)
Turbine trip	0.01
MFW isolation	0.01
Main steam safety valves start to lift	2.5
High RCS pressure reactor trip	3.6
Control rod insertion begins	4.1
Peak RCS pressure occurs	6.0
Main steam safety valves start to reseat	11.3
End of simulation	40.0

Table 15-47. Steam Generator Tube Rupture Accident Sequence of Events

Event	Seconds
SGTR occurs	0.1
HPIS injection flow starts	0.1
Reactor trip	1,200
Turbine trip on reactor trip	1,200
MFW pumps trip	1,200
MSSVs lift and begin cycling	1,202
EFW flow to ruptured SG begins	1,380
Operator identifies EFW control valve is failed closed	1,980
EFW to both SG is restored	2,580
Operator identifies ruptured SG	3,180
Operator begins minimizing subcooled margin	3,900
Operator begins cooldown to 532°F with ADVs	6,300
All MSSVs have reseated	6,300
RCS cooled down to 532°F	7,040
Operator completes isolation of the ruptured SG	8,240
Operator trips one RCP in loop without pressurizer	8,240
Shift changeover begins	8,240
Steaming of ruptured SG due to high SG level begins	10,621
Shift changeover completed	11,840
Operator begins RCS cooldown to 450°F.	12,140
RCS temperature reaches 450°F. - RCS Boron Concentration is determined and boration to cold shutdown initiated.	15,191
Operator begins cooldown to LPIS conditions	22,691
Operator trips one RCP in loop with the pressurizer	24,605
LPIS conditions reached	31,455
Start cooldown with LPIS	36,855
Plant cooled down to 212°F	40,725

Table 15-48. Steam Line Break Accident - Without Offsite Power Case Sequence of Events

Event	Time (sec)
Break initiates, offsite power lost, reactor trips	0.0
RCPs begin to coast down	
Deleted row(s) per 2003 update	
Control rod insertion begins	0.14
Turbine stop valves closed	1.72
Control rods fully inserted	2.54
End of simulation	5

Table 15-49. Small Steam Line Break Accident Sequence of Events

Event	Time (sec)
Break occurs	10
Pressurizer heater backup banks energize, makeup flow starts	10.6
Third Condensate Booster Pump actuates	18.7
Pressurizer heater control and backup banks de-energize on low pressurizer level	174.5
MDNBR occurs	195
Pressurizer heater control and backup banks energize	248.6
Peak neutron power	610.0
Problem termination	610

Table 15-50. Failed Fuel Source Term for the Rod Ejection Accident (Curies)

Nuclide	Single DNB Assembly Activity	Release Fraction	Failed Fuel Gap Release Source Term[1]
I--130	2.14E+04	10%	1.70E+05
I--131	6.20E+05	10%	4.94E+06
I--132	9.14E+05	10%	7.28E+06
I--133	1.33E+06	10%	1.06E+07
I--134	1.55E+06	10%	1.23E+07
I--135	1.26E+06	10%	1.00E+07
BR--83	1.04E+05	5%	4.16E+05
BR--85	2.41E+05	5%	9.59E+05
BR--87	3.96E+05	5%	1.58E+06
KR--83M	1.04E+05	10%	8.32E+05
KR--85M	2.42E+05	10%	1.92E+06
KR--85	8.30E+03	10%	6.61E+04
KR--87	4.93E+05	10%	3.93E+06
KR--88	6.72E+05	10%	5.35E+06
KR--89	8.58E+05	10%	6.84E+06
XE131M	8.02E+03	10%	6.39E+04
XE133M	4.01E+04	10%	3.19E+05
XE-133	1.27E+06	10%	1.01E+07
XE135M	2.64E+05	10%	2.10E+06
XE-135	4.20E+05	10%	3.34E+06
XE-137	1.21E+06	10%	9.65E+06
XE-138	1.23E+06	10%	9.83E+06
RB--86	1.68E+03	12%	1.60E+04
RB--88	6.77E+05	12%	6.47E+06
RB--89	8.98E+05	12%	8.58E+06
RB--90	8.46E+05	12%	8.09E+06
CS-134	1.94E+05	12%	1.85E+06
CS-136	4.67E+04	12%	4.46E+05
CS-137	9.61E+04	12%	9.19E+05
CS-138	1.32E+06	12%	1.26E+07

Nuclide	Single DNB Assembly Activity	Release Fraction	Failed Fuel Gap Release Source Term[1]
CS-139	1.24E+06	12%	1.19E+07

Note:

1. Assumes 45% failed fuel.

Table 15-51. Reactor Coolant System Fission Product Source Activities - 500 EPFD Equilibrium Cycle[1]

Nuclide	Maximum Specific Activity [2] (µCi/gm)	Maximum Total Coolant [3] Activity (Curies)
I-131	5.80E+0	1.39E+3
I-132	8.36E+0	1.68E+3
I-133	7.03E+0	1.42E+3
I-134	7.76E-1	1.55E+2
I-135	3.32E+0	6.63E+2
Xe-131m	6.04E+0	1.21E+3
Xe-133m	6.42E+0	1.28E+3
Xe-133	4.67E+2	9.32E+4
Xe-135m	7.06E-1	1.41E+2
Xe-135	1.34E+1	2.67E+3
Xe-138	7.40E-1	1.48E+2
Kr-83m	5.34E-1	1.06E+2
Kr-85m	2.23E+0	4.44E+2
Kr-85	1.72E+2	3.43E+4
Kr-87	1.21E+0	2.42E+2
Kr-88	3.81E+0	7.60E+2

Note:

1. Reactor coolant activities at equilibrium assuming 1 percent failed fuel randomly distributed throughout the core.
2. Based on steady-state operation with no RCS leakage and no continuous pressurizer spray flow. Used for calculating doses arising from reactor coolant leaks to the secondary systems.
3. Based on steady-state operation with no RCS leakage and 1 gpm continuous pressurizer spray flow.

Table 15-52. Deleted Per 2003 Update

Table 15-53. Deleted Per 2003 Update

Table 15-54. Deleted Per 2003 Update

Table 15-55. Deleted Per 2003 Update

Table 15-56. Deleted Per 2014 Update

Table 15-57. Deleted per 2014 Update

Table 15-57. Deleted Per 2014 Update

Table 15-58. Parameters Used To Determine Hydrogen Generation

Reactor Thermal Power (102%)		2,568 MWt
Reactor Operating Time (average cycle length)		980 Days
Containment Free Volume		1.79E+06 ft^3
Weight Of Zirconium Surrounding The Fuel		41,000 lbm
Hydrogen Generated From 5.0% Zr-Water Reaction		17,435 scf
Hydrogen Dissolved In Primary Coolant And Pressurizer Gas Space		450 scf
Corrodable Metals		Aluminum, Zinc
Hydrogen Generated From Radiolysis		
Sources	Core Radiolysis	Sump Radiolysis
Percent of total halogens retained in solution	50	50
Percent of total noble gases retained in solution	0	0
Percent of other fission products retained in solution	99	1
Energy Distribution		
Percent of total decay energy - Gamma	50	50
Percent of total decay energy - Beta	50	50
Energy Absorption by the Solution		
Percent of gamma energy absorbed	10	100
Percent of beta energy absorbed	0	100
Molecules of H2 Produced per 100 ev Energy Absorbed	0.45	0.3

Table 15-59. Deleted Per 2001 Update

Table 15-60. Deleted per 2014 Update

Table 15-61. Control Room Atmospheric Dispersion Factors (χ/Qs)

Release Type	Bounding χ/Q (sec/m^3)
Units Vent Releases	
0 to 2 hr	9.43E-04
2 to 8 hr	6.00E-04
8 to 24 hr	2.41E-04
1 to 4 days	1.87E-04
4 to 30 days	1.54E-04
Main Steam Penetration Releases	
0 to 2 hr	5.76E-04
2 to 8 hr	4.09E-04
8 to 24 hr	1.72E-04
1 to 4 days	1.34E-04
4 to 30 days	1.08E-04
Equipment Hatch Releases	
0 to 2 hr	6.59E-04
2 to 8 hr	4.86E-04
8 to 24 hr	2.13E-04
1 to 4 days	1.65E-04
4 to 30 days	1.28E-04
ADV Releases	
0 to 2 hr	1.79E-03
2 to 8 hr	1.25E-03
8 to 24 hr	5.45E-04
1 to 4 days	4.17E-04
4 to 30 days	3.34E-04
MSSV Releases	
0 to 2 hr	1.91E-03
2 to 8 hr	1.33E-03
8 to 24 hr	5.86E-04
1 to 4 days	4.52E-04
4 to 30 days	3.54E-04

Release Type	Bounding χ/Q (sec/m^3)
MSLB Releases	
0 to 2 hr	1.21E-03
2 to 8 hr	8.39E-04
8 to 24 hr	3.70E-04
1 to 4 days	2.81E-04
4 to 30 days	2.23E-04
Fuel Handling Building Roll-up Door Releases	
0 to 2 hr	3.19E-04
2 to 8 hr	2.50E-04
8 to 24 hr	1.04E-04
1 to 4 days	7.89E-05
4 to 30 days	6.10E-05
BWST Releases	
0 to 2 hr	4.76E-04
2 to 8 hr	3.27E-04
8 to 24 hr	1.35E-04
1 to 4 days	1.05E-04
4 to 30 days	8.99E-05

Table 15-62. Results of LBLOCA Analyses for Mark-B-HTP Full Core Sequence of Events

BOL Conditions	**Core Elevation, ft**				
	2.506	4.264	6.021	7.779	9.536
Allowable peak linear heat rate, kW/ft	17.8	17.8	17.8	17.8	17.3
End of blowdown, sec	22.3	22.3	22.2	22.2	22.1
LPI begins injecting, sec	42.1	42.1	42.1	42.1	42.1
CFTs empty, sec	48.9	48.9	48.9	48.8	48.8
Unruptured node:					
Peak cladding temperature, °F	1849.5	1867.4	1887.0	1905.7	1864.5
Time, sec	35.1	37.7	36.9	39.1	74.7
Local oxidation, %	1.10	1.43	1.58	1.83	1.87
Rupture node:					
Peak cladding temperature, °F	1913.2	1897.2	1907.0	1857.6	1841.7
Time, sec	29.8	29.8	31.2	29.7	36.2
Local oxidation, %	1.89	1.99	2.39	2.08	2.01
Rupture time, sec	22.3	23.1	22.8	23.7	25.5
Hot pin initial pressure, psia	683	681	679	678	670
Whole core hydrogen generation, %	<0.14	<0.14	<0.15	<0.16	<0.15

MOL Conditions	**Core Elevation, ft**				
	2.506	4.264	6.021	7.779	9.536
Allowable peak linear heat rate, kW/ft [Note 1]	17.8	17.8	17.8	17.8	17.3
End of blowdown, sec	22.4	22.3	22.2	22.2	22.1
LPI begins injecting, sec	42.1	42.1	42.1	42.1	42.1
CFTs empty, sec	48.9	48.8	48.9	48.8	48.7
Unruptured node:					
Peak cladding temperature, °F	1879.0	1858.3	1863.9	1863.3	1805.2
Time, sec	31.9	37.0	36.8	36.3	72.1
Local oxidation, %	1.85	2.03	2.11	2.33	2.27
Rupture node:					
Peak cladding temperature, °F	1864.3	1776.3	1873.6	1766.7	1707.7
Time, sec	31.7	31.7	31.6	36.1	38.4
Local oxidation, %	2.11	1.88	2.31	1.93	1.74
Rupture time, sec	19.7	21.3	20.8	22.2	24.4
Hot pin initial pressure, psia	1898	1853	1817	1818	1792
Whole core hydrogen generation, %	<0.07	<0.07	<0.08	<0.09	<0.08

Note 1: The allowable peak linear heat rates shown above at MOL were used in the Analysis of Record. To account for fuel pellet thermal conductivity degradation, the MOL values for all core elevations are penalized (reduced) by 2 kW/ft. See Sections 15.14.4.1.6 and 15.14.4.4.

EOL Conditions	Core Elevation, ft				
	2.506	4.264	6.021	7.779	9.536
Allowable peak linear heat rate, kW/ft	12.3	N/A	N/A	N/A	N/A
End of blowdown, sec	22.3	N/A	N/A	N/A	N/A
LPI begins injecting, sec	42.1	N/A	N/A	N/A	N/A
CFTs empty, sec	48.9	N/A	N/A	N/A	N/A
Unruptured node:					
Peak cladding temperature, °F	1577.0	N/A	N/A	N/A	N/A
Time, sec	31.8	N/A	N/A	N/A	N/A
Local oxidation, %	1.81	N/A	N/A	N/A	N/A
Rupture node:					
Peak cladding temperature, °F	1618.3	N/A	N/A	N/A	N/A
Time, sec	31.6	N/A	N/A	N/A	N/A
Local oxidation, %	1.92	N/A	N/A	N/A	N/A
Rupture time, sec	24.8	N/A	N/A	N/A	N/A
Hot pin initial pressure, psia	2971	N/A	N/A	N/A	N/A
Whole core hydrogen generation, %	<0.03	N/A	N/A	N/A	N/A

Table 15-63. Results of LBLOCA Analyses for Full Core Mark-B-HTP; Gadolinia Fuel Pins

2 w/o Gadolinia Concentration	**BOL**	**MOL**	**EOL**
Burnup, GWd/mtU	0	34	62
Allowable peak linear heat rate, kW/ft [Note 1]	16.9	16.9	11.6
Axial Peak Elevation, ft	2.506	2.506	2.506
End of blowdown, sec	22.3	22.4	22.3
LPI begins injecting, sec	42.1	42.1	42.1
CFTs empty, sec	48.9	48.9	48.9
Unruptured node:			
Peak cladding temperature, °F	1814.4	1833.4	1556.4
Time, sec	35.1	31.9	31.8
Local oxidation, %	0.97	1.72	2.10
Rupture node:			
Peak cladding temperature, °F	1858.6	1793.8	1581.8
Time, sec	29.8	31.7	31.5
Local oxidation, %	1.57	1.84	2.18
Rupture time, sec	23.2	20.5	25.0
Pin initial pressure, psia	676	1745	2694
4 w/o Gadolinia Concentration	**BOL**	**MOL**	**EOL**
Burnup, GWd/mtU	0	34	62
Allowable peak linear heat rate, kW/ft [Note 1]	16.1	16.1	11.1
Axial Peak Elevation, ft	2.506	2.506	2.506
End of blowdown, sec	22.3	22.4	22.3
LPI begins injecting, sec	42.1	42.1	42.1
CFTs empty, sec	48.9	48.9	48.9
Unruptured node:			
Peak cladding temperature, °F	1812.2	1856.2	1566.7
Time, sec	35.1	31.9	31.8
Local oxidation, %	0.95	1.76	2.34
Rupture node:			
Peak cladding temperature, °F	1862.7	1826.0	1581.3
Time, sec	29.8	31.7	31.5
Local oxidation, %	1.58	1.95	2.41
Rupture time, sec	23.2	20.3	25.0
Pin initial pressure, psia	675	1823	2706

6 w/o Gadolinia Concentration	**BOL**	**MOL**	**EOL**
Burnup, GWd/mtU	0	34	62
Allowable peak linear heat rate, kW/ft [Note 1]	15.6	15.6	10.8
Axial Peak Elevation, ft	2.506	2.506	2.506
End of blowdown, sec	22.3	22.4	22.3
LPI begins injecting, sec	42.1	42.1	42.1
CFTs empty, sec	48.9	48.9	48.9
Unruptured node:			
Peak cladding temperature, °F	1813.8	1848.8	1578.7
Time, sec	35.1	31.9	31.8
Local oxidation, %	0.95	1.73	2.34
Rupture node:			
Peak cladding temperature, °F	1874.3	1821.9	1598.0
Time, sec	29.8	31.7	31.5
Local oxidation, %	1.63	1.93	2.42
Rupture time, sec	23.1	20.4	24.8
Pin initial pressure, psia	675	1770	2797
8 w/o Gadolinia Concentration	**BOL**	**MOL**	**EOL**
Burnup, GWd/mtU	0	34	62
Allowable peak linear heat rate, kW/ft [Note 1]	15.1	15.1	10.4
Axial Peak Elevation, ft	2.506	2.506	2.506
End of blowdown, sec	22.3	22.4	22.3
LPI begins injecting, sec	42.1	42.1	42.1
CFTs empty, sec	48.9	48.9	48.9
Unruptured node:			
Peak cladding temperature, °F	1814.2	1806.0	1575.8
Time, sec	35.1	31.9	31.8
Local oxidation, %	0.94	1.62	2.22
Rupture node:			
Peak cladding temperature, °F	1881.1	1771.9	1594.5
Time, sec	29.8	31.7	31.5
Local oxidation, %	1.66	1.75	2.30
Rupture time, sec	23.1	21.1	24.9
Pin initial pressure, psia	675	1697	2749

Note 1: The allowable peak linear heat rates shown above at MOL were used in the Analysis of Record. To account for fuel pellet thermal conductivity degradation, the MOL values for all core elevations are penalized (reduced) by 2 kW/ft. See Sections 15.14.4.1.6 and 15.14.4.4.

Table 15-64. Results of 102% FP SBLOCA Analyses for Full Core Mark-B-HTP

Break Size and Description	PCT (°F)	Time of PCT (sec)	Local Oxidation (%)	Whole Core H_2 Generation (%)
0.01 ft^2 CLPD with LOOP	711.9 (1)	0.005	0.08	<0.01
0.04 ft^2 CLPD with LOOP	711.9 (1)	0.005	0.08	<0.01
0.07 ft^2 CLPD with LOOP	711.9 (1)	0.005	0.08	<0.01
0.1 ft^2 CLPD with LOOP	1288.2	959.8	0.16	<0.01
0.125 ft^2 CLPD with LOOP	1515.4	739.0	0.48	<0.02
0.15 ft^2 CLPD with LOOP	1597.5	641.6	0.88	<0.04
0.175 ft^2 CLPD with LOOP	1565.9	557.7	0.70	<0.03
0.2 ft^2 CLPD with LOOP	1474.1	498.9	0.34	<0.02
0.3 ft^2 CLPD with LOOP	1310.3	330.2	0.13	<0.01
0.4 ft^2 CLPD with LOOP	1126.3	214.4	0.08	<0.01
0.5 ft^2 CLPD with LOOP	1103.5	126.9	0.08	<0.01
0.3 ft^2 CLPD with 2 Min RCP Trip	711.9 (1)	0.005	0.08	<0.01
0.4 ft^2 CLPD with 2 Min RCP Trip	1175.9	233.1	0.09	<0.01
0.5 ft^2 CLPD with 2 Min RCP Trip	1255.5	210.0	0.10	<0.01
0.02464 ft^2 HPI with LOOP	711.9 (1)	0.005	0.08	<0.01
0.44 ft^2 CFT with LOOP	711.9 (1)	0.005	0.08	<0.01
0.44 ft^2 CFT with 2 Min RCP Trip	1072.8	215.9	0.08	<0.01

Notes:

1. Indicates initial steady-state cladding temperature.

Table 15-65. Dose Equivalent Iodine (DEI) Calculation

Isotope	Concentration (µCi/gm)	FGR No. 11, Table 2.1 DCFs (Sv/Bq)	DEI (µCi/gm)
I-131	9.55E-01	8.89E-09	9.55E-01
I-132	1.42E-01	1.03E-10	1.64E-03
I-133	2.48E-01	1.58E-09	4.40E-02
I-134	1.32E-02	3.55E-11	5.27E-05
I-135	7.38E-02	3.32E-10	2.76E-03
		DEI	1.00E+00

Table 15-66. Dose Equivalent Xenon (DEX) Calculation

Isotope	Concentration (µCi/gm)	FGR No. 12, Table III.1 DCFs (Sv-s/Bq-m3)	DEX (µCi/gm)
KR-85M	2.15E+00	7.48E-15	1.03E+01
KR-85	1.82E+01	1.19E-16	1.39E+00
KR-87	1.18E+00	4.12E-14	3.11E+01
KR-88	3.69E+00	1.02E-13	2.41E+02
XE-131M	4.39E+00	3.89E-16	1.09E+00
XE-133M	5.76E+00	1.37E-15	5.06E+00
XE-133	3.93E+02	1.56E-15	3.93E+02
XE-135M	4.47E-01	2.04E-14	5.84E+00
XE-135	1.14E+01	1.19E-14	8.67E+01
XE-138	7.19E-01	5.77E-14	2.66E+01
		DEX	8.02E+02

Table 15-67. Peak Cladding Temperature Results of LBLOCA Reanalyses for Mark-B-HTP Full Core to Address Error Corrections, UO_2 Fuel Pins

Time in Life (GWd/mtU)		**BOL** (0)	**MOL** (34)	**EOL** (62)
Peaking Elevation (ft)	Node	Peaking Cladding Temperature (°F)		
0.0	Both	*<1836.9*	*<1851.9*	*<1688.3*
2.506	Ruptured	1834.6	1750.9	*1618.3*
2.506	Unruptured	1836.9	1851.9	*1618.3*
4.264	Ruptured	*1821*	*1700*	*1618*
4.264	Unruptured	*1844*	*1835*	*1618*
6.021	Ruptured	*1833*	*1799*	*1618*
6.021	Unruptured	*1847*	*1824*	*1618*
7.779	Ruptured	1785.5	*1695*	*1618*
7.779	Unruptured	1848.0	*1806*	*1618*
9.536	Ruptured	*1772*	*1638*	*1618*
9.536	Unruptured	*1789*	*1730*	*1618*
12.0	Both	*<1789*	*<1730*	*<1738*

Notes: PCT estimates are shown in italics. EOL values are conservatively set to the base analysis values per Table 15-62, and are not split between and unruptured nodes.

Table 15-68. Peak Cladding Temperature Results of LBLOCA Reanalyses for Mark-B-HTP Full Core to Address Error Corrections, Gadolinia Fuel Pins

Time in Life		**BOL**	**MOL**	**EOL**
(GWd/mtU)		(0)	(34)	(62)
Peaking Elevation (ft)	Gadolinia w/o	Peaking Cladding Temperature (°F)		
0.0	2	*<1801.0*	*<1783.4*	*<1688.3*
0.0	4	*<1802.6*	*<1806.1*	*<1688.3*
0.0	6	*<1813.6*	*<1790.8*	*<1688.3*
0.0	8	*<1820.5*	*<1736.8*	*<1688.3*
2.506	2	1801.0	1783.4	*1618.3*
2.506	4	1802.6	1806.1	*1618.3*
2.506	6	1813.6	1790.8	*1618.3*
2.506	8	1820.5	1736.8	*1618.3*
4.264	2	*1808*	*1767*	*1618*
4.264	4	*1810*	*1789*	*1618*
4.264	6	*1821*	*1774*	*1618*
4.264	8	*1828*	*1720*	*1618*
6.021	2	*1811*	*1756*	*1618*
6.021	4	*1813*	*1778*	*1618*
6.021	6	*1824*	*1763*	*1618*
6.021	8	*1831*	*1709*	*1618*
7.779	2	*1812*	*1738*	*1618*
7.779	4	*1814*	*1760*	*1618*
7.779	6	*1825*	*1745*	*1618*
7.779	8	*1832*	*1691*	*1618*
9.536	2	*1753*	*1662*	*1618*
9.536	4	*1755*	*1684*	*1618*
9.536	6	*1766*	*1669*	*1618*
9.536	8	*1773*	*1615*	*1618*
12.0	2	*<1753*	*<1662*	*<1738*
12.0	4	*<1755*	*<1684*	*<1738*
12.0	6	*<1766*	*<1669*	*<1738*
12.0	8	*<1773*	*<1615*	*<1738*

Notes: PCT estimates are shown in italics. EOL values are conservatively set to the base analysis values for UO_2 pins, as none of the EOL cases for gadolinia pins were explicitly reanalyzed.