TABLE 15.5-32 Sheet 1 of 3

ASSUMPTIONS USED TO CALCULATE
POST-ACCIDENT CONTROL ROOM RADIOLOGICAL EXPOSURES

	DBA Case
A. Power Level	3580 MWt
B. Activity Released to Containment Atmosphere	
1. Iodine, % of core iodine inventory	25
a. Elemental, % of core iodine inventory	22.75
b. Organic, % of core iodine inventory	1.00
c. Particulate, % of core iodine inventory	1.25
2. Noble gases, % of core inventory	100
3. Other fission product	None
C. Decay, Cleanup, and Leakage in Containment Atmosphere	
1. Radiological decay included	Yes
2. Iodine spray cleanup	
a. Elemental	$31\ hr^{-1}$ (a)
b. Organic	$0\ hr^{-1}$
c. Particulate	$0\ hr^{-1}$
3. Decontamination factor (DF) cut-off for spray, elemental	100
4. Time post-LOCA spray starts	80 seconds
5. Filter cleanup of containment atmosphere	None
a. Iodines	None
b. Noble gases	None

TABLE 15.5-32 Sheet 1 of 3

ASSUMPTIONS USED TO CALCULATE
POST-ACCIDENT CONTROL ROOM RADIOLOGICAL EXPOSURES

	DBA Case
6. Containment leakrate	
a. First 24 hours	0.1% per day
b. Remainder of accident period	0.05% per day
D. Recirculation Loop Leakage	
1. RHR leakage rate	50 gpm
2. Start of RHR leakage	24 hrs
3. Duration of RHR leakage	0.5 hr
4. Charcoal filter efficiency for release of RHR leakage	
a. Iodine filter efficiency	
(1) Elemental, %	90.0
(2) Organic, %	70.0
(3) Particulate, %	90.0
b. Noble gas filter efficiency	0.0
E. Meteorology (atmospheric dilution factors from the containment to the control room)	Table 15.5-6
F. Control Room Ventilation Flowrates	
1. Flowrate of contaminated air infiltrating into the control room	10 cfm
2. Flowrate of pressurization air into the control room	2100 cfm
3. Flowrate of recirculated control room air through cleanup filters	2100 cfm

TABLE 15.5-32 Sheet 1 of 3

ASSUMPTIONS USED TO CALCULATE
POST-ACCIDENT CONTROL ROOM RADIOLOGICAL EXPOSURES

	DBA Case
G. Decay and Cleanup in Control Room	
1. Radiological decay included	Yes
2. Filter cleanup of pressurization air	Yes
a. Iodines	
(1) Elemental	95%
(2) Organic	95%
(3) Particulate	95%
b. Noble gases	0%
H. Control Room Complex Volume (total for Units 1 and 2)	170,000 ft^3
I. Control Room Occupancy Factors	
1. 0-24 hours	1
2. 24-96 hours	0.6
3. 96-720 hours	0.4

(a) Although a subsequent safety evaluation showed that the Design Case coefficient of 31 hr^{-1} (for 2600 gpm spray header flow) should be reduced to approximately 29 hr^{-1} (for 2466 gpm spray header flow), the potential offsite dose increase due to this change is extremely small and can be considered insignificant (Reference 39).

TABLE 15.5-33

ESTIMATED POST-~~ACCIDENT~~ LOCA EXPOSURE TO CONTROL ROOM PERSONNEL DURING INGRESS / EGRESS (HISTORICAL)

Radiation Source	~~DB~~LOCA Gamma Exposure, rem	~~DB~~LOCA Beta Exposure, rem	~~DB~~LOCA Thyroid Exposure, rem
1. ~~Radiation from airborne fission products postulated to enter the control room~~Not Used	~~See Table 15.5-63~~	~~See Table 15.5-63~~	~~See Table 15.5-63~~
2. Not Used~~Direct radiation to the control room from fission products in the containment structure~~	~~0.032~~	~~0~~	~~0~~
3. Not Used~~Direct radiation to the control room from fission products in the containment leakage plume~~	~~0.022~~	~~0~~	~~0~~
4. Radiation from airborne fission products in the containment leakage plume to control room personnel during ~~room personnel during~~ egress ingress	0.0066	0.0243	4.72
5. Direct radiation from fission products in the containment structure to control room personnel during egress-ingress (53 5-minute trips)	0.022	0	0

TABLE 15.5-34

~~STEAM RELEASES FOLLOWING A MAJOR STEAM LINE BREAK~~

	~~Time Period~~	
	~~0-2 hr~~	~~2-8 hr~~
~~Steam release from ruptured pipe, lbm~~	~~171,100~~	~~-0-~~
~~Steam release from relief valves, lbm~~	~~384,000~~	~~893,000~~

~~Note: All steam releases listed above are for RSGs. OSG MSLB steam releases, which are used in the MSLB dose analysis of record, are listed in item 11 of Section 15.5.18.2.1.~~

SUMMARY OF OFFSITE AND CONTROL ROOM DOSES
MAIN STEAM LINE BREAK

	Dose (TEDE, rem)	Regulatory Limit (TEDE, rem)
Maximum 2-hour Exclusion Area Boundary Dose		
- Pre-incident iodine Spike	0.1	25
- Accident-Initiated Iodine Spike	0.7	2.5
30-day Integrated Low Population Zone Dose		
- Pre-incident iodine Spike	<0.1	25
- Accident-Initiated Iodine Spike	0.2	2.5
30-day Integrated Control Room Occupancy Dose		5
- Pre-incident iodine Spike	2.0	
- Accident-Initiated Iodine Spike	4.1	

Note:

1. The maximum 2-hour EAB dose occurs during the following time period :

   - Pre-incident iodine Spike 0 - 2 hours
   - Accident-Initiated Iodine Spike 7.6 – 9.6 hours

TABLE 15.5-34A
MAIN STEAM LINE BREAK
Analysis Assumptions & Key Parameter Values

Parameter	Value
Power Level	3580 MWt
Reactor Coolant Mass	446,486 lbm
Leak rate to Faulted Steam Generator	0.75 gpm (conservative assumption) ; leakage density 62.4 lbm/ft^3
Leak rate to Intact Steam Generators	0 gpm (all leakage assumed into faulted SG)
Failed/Melted Fuel Percentage	0%
RCS Tech Spec Iodine Conc.	Table 15.5-78 (1 µCi/gm DE I-131)
RCS Tech Spec Noble Gas Conc.	Table 15.5-78 (270 µCi/gm DE Xe-133)
RCS Equilibrium. Iodine Appearance Rates	Table 15.5-79 (1 µCi/gm DE I-131)
Pre-Accident Iodine Spike Concentrations	Table 15.5-79 (60 µCi/gm DE I-131)
Accident-Initiated Iodine Spike Appearance Rate	500 times equilibrium appearance rate
Duration of Accident- Initiated Iodine Spike	8 hours
Initial Secondary Coolant Iodine Concentrations	Table 15.5-78 (0.1 µCi/gm DE I-131)
Secondary System Release Parameters	
Iodine Species released to Environment	97% elemental; 3% organic
Fraction of Iodine Released form Faulted SG	1.0 (Released to Environ without holdup)
Fraction of Noble Gas Released from Faulted SG	1.0 (Released to Environ without holdup)

TABLE 15.5-34A
MAIN STEAM LINE BREAK
Analysis Assumptions & Key Parameter Values

Parameter	Value
Liquid mass in each SG	Faulted: 182,544 lbm (max.) Intact: 92,301 lbm (min. and initial)
Release Rate of SG liquid activity from Faulted SG	Dryout within10 seconds
Time period when tubes not totally submerged (intact SG)	Insignificant
Steam Releases from intact SGs	0-2 hrs: 384,000 lbm 2-8 hrs: 893,000 lbm 8-10.73 hrs: Same release rate as that for 2-8 hrs
Iodine Partition Coefficient in Intact SG	100 (SGs fully covered)
Termination of release (0.75 gpm leak): Faulted SG	30 hrs when RCS reaches 212 °F
Termination of release from Intact SG	10.73 hours
Release Point: Faulted SG	Outside containment, at the steam line break location
Release Point: Intact SG	MSSVs/10% ADVs
CR Emergency Ventilation : Initiation Signal/Timing	
Initiation (signal)	SIS
Unaffected Unit CRVS inlet damper fully closed	Within 12.6 seconds
Affected Unit CRVS inlet dampers fully closed	Within 38.8 seconds
Control Room Atmospheric Dispersion Factors	Table 15.5-34B

TABLE 15.5-34B
MAIN STEAM LINE BREAK
Control Room Limiting Atmospheric Dispersion Factors (sec/m^3)

Receptor - Release Point	0-2hr	2-8 hr	8-10.73 hr	10.73-30 hr
CR NOP Intake - Faulted SG (Break Location)	Note 1			
CR NOP Intake - Intact SG (MSSVs/10% ADVs) - Note 2	8.60E-04			
CR Inleakage - Faulted SG (Break Location)	1.24E-02	7.35E-03	3.01E-03	3.01E-03
CR Inleakage - Intact SG (MSSVs/10% ADVs)	2.78E-03	1.63E-03	1.63E-03	-----
CR Emergency Intake & Bypass - Faulted SG (Break Location)	7.65E-05	4.78E-05	1.86E-05	1.86E-05
CR Emergency Intake & Bypass - Intact SG (MSSVs/10% ADVs)	1.57E-05	9.60E-06	9.60E-06	-----

Notes:

1. ARCON96 based χ/Q s are not applicable for these cases given that the horizontal distance from the source to the receptor is 1.5 meters (which is much less than the 10 meters required by ARCON96 methodology).

2. Due to the proximity of the release from the MSSVs/10% ADVs, to the normal operation CR intake of the affected unit, and due to the high vertical velocity of the steam discharge from the MSSVs/10% ADVs, the resultant plume from the MSSVs/10% ADVs will not contaminate the normal operation CR intake of the affected unit. Thus the χ/Q s presented reflect those applicable to the CR intake of the unaffected unit.

~~TABLE 15.5-40 (HISTORICAL)~~
~~*LONG-TERM ACTIVITY RELEASE FRACTIONS FOR FUEL FAILURE ACCIDENTS*~~

~~*Isotopes*~~	~~*Release Fractions*~~
~~*I-131*~~	~~1.37×10^{-9}~~
~~*I-132*~~	~~2.51×10^{-10}~~
~~*I-133*~~	~~9.43×10^{-10}~~
~~*I-134*~~	~~1.02×10^{-10}~~
~~*I-135*~~	~~5.34×10^{-5}~~
~~*Kr-83M*~~	~~2.16×10^{-5}~~
~~*Kr-85*~~	~~*0.98*~~
~~*Kr-85M*~~	~~5.02×10^{-5}~~
~~*Kr-87*~~	~~1.51×10^{-5}~~
~~*Kr-88*~~	~~3.14×10^{-5}~~
~~*Xe-133*~~	~~1.68×10^{-3}~~
~~*Xe-133M*~~	~~5.52×10^{-4}~~
~~*Xe-135*~~	~~1.07×10^{-4}~~
~~*Xe-135M*~~	~~3.23×10^{-7}~~
~~*Xe-138*~~	~~2.89×10^{-6}~~

TABLE 15.5-41 Sheet 1 of 2

ACTIVITY RELEASES FOLLOWING A LOCKED ROTOR ACCIDENT (CURIES)

	Design Basis Case	
Nuclide	0-2 hr	2-8 hr
I-131	8.643E-1	4.1783E0
I-132	1.121E-1	2.505E-1
I-133	7.753E-1	3.4725E0
I-134	6.086E-2	4.067E-2
I-135	3.673E-1	1.4067E0
I-131ORG	0.0	0.0
I-132ORG	0.0	0.0
I-133ORG	0.0	0.0
I-134ORG	0.0	0.0
I-135ORG	0.0	0.0
I-131PAR	0.0	0.0
I-132PAR	0.0	0.0
I-133PAR	0.0	0.0
I-134PAR	0.0	0.0
I-135PAR	0.0	0.0
Kr-83M	9.975E-1	4.281E-1
Kr-85	1.2282E1	1.6610E1
Kr-85M	4.9366E0	4.1691E0
Kr-87	3.2949E0	8.647E-1
Kr-88	8.5004E0	5.4137E0
Xe-133	2.7392E2	3.6840E2
Xe-133M	3.8638E0	5.1188E0
Xe-135	2.0293E1	2.2393E1
Xe-135M	3.026E-1	0
Xe-138	9.120E-1	0

TABLE 15.5-41 Sheet 1 of 2

ACTIVITY RELEASES FOLLOWING A LOCKED ROTOR ACCIDENT (CURIES)

	Expected Case	
Nuclide	0-2 hr	2-8 hr
I-131	1.109E-2	5.670E-2
I-132	1.223E-3	2.386E-3
I-133	8.495E-3	3.875E-2
I-134	6.708E-4	4.001E-4
I-135	3.984E-3	1.425E-2
I-131ORG	0.0	0.0
I-132ORG	0.0	0.0
I-133ORG	0.0	0.0
I-134ORG	0.0	0.0
I-135ORG	0.0	0.0
I-131PAR	0.0	0.0
I-132PAR	0.0	0.0
I-133PAR	0.0	0.0
I-134PAR	0.0	0.0
I-135PAR	0.0	0.0
Kr-83M	1.556E-2	3.770E-3
Kr-85	2.087E-1	2.379E-1
Kr-85M	7.267E-2	4.341E-2
Kr-87	5.210E-2	5.482E-3
Kr-88	1.401E-1	5.716E-2
Xe-133	2.8246E-0	3.1281E-0
Xe-133M	4.360E-2	4.702E-2
Xe-135	2.825E-1	2.366E-1
Xe-135M	5.116E-3	0
Xe-138	1.564E-2	0

TABLE 15.5-42

SUMMARY OF OFFSITE ~~DOSES~~ AND CONTROL ROOM DOSES ~~FROM A~~ LOCKED ROTOR ACCIDENT

	~~Thyroid Exposures, rem~~	
	~~Site Boundary - 2 hours~~	~~LPZ - 30 days~~
~~10 CFR Part 100~~	~~300~~	~~300~~
~~Design basis case~~	~~0.30~~	~~0.076~~
~~Expected case~~	~~2.5×10^{-4}~~	~~6.6×10^{-5}~~
	~~Whole Body Exposures, rem~~	
	~~Site Boundary - 2 hours~~	~~LPZ - 30 days~~
~~10 CFR Part 100~~	~~25~~	~~25~~
~~Design basis case~~	~~1.3×10^{-2}~~	~~1.1×10^{-3}~~
~~Expected case~~	~~1.6×10^{-5}~~	~~1.3×10^{-6}~~
	~~Population Doses, man-rem~~	
~~Design basis case~~	~~0.32~~	
~~Expected case~~	~~2.8×10^{-4}~~	

	Dose (TEDE, rem)	Regulatory Limit (TEDE, rem)
Maximum 2-hour Exclusion Area Boundary Dose[1]	0.8	2.5
30-day Integrated Low Population Zone Dose	0.2	25
30-day Integrated Control Room Occupancy Dose	2.4	5

Note:

1. The maximum 2-hour EAB dose occurs between 8.73 – 10.73 hours.

TABLE 15.5-42A
LOCKED ROTOR ACCIDENT
Analysis Assumptions & Key Parameter Values

Parameter	Value
Power Level	3580 MWt
Reactor Coolant Mass	446,486 lbm
Primary to Secondary SG tube leakage	0.75 gpm (total for all 4 SGs); leakage density 62.4 lbm/ft^3)
Melted Fuel Percentage	0%
Failed Fuel Percentage	10%
Equilibrium Core Activity	Table 15.5-77
Radial Peaking Factor	1.65
Fraction of Core Inventory in Fuel Gap	I-131: 12%
	Kr-85: 30%
	Other Noble Gases: 10%
	Other Halogens: 10%
	Alkali Metals: 17%
Isotopic Inventory in Fuel Gap	Table 15.5-80
Iodine Chemical Form in Gap	4.85% elemental
	95% particulate
	0.15% organic
Secondary Side Parameters	
Initial and Minimum SG Liquid Mass	92,301 lbm/SG
Iodine Species Released to Environment	97% elemental; 3% organic
Time period when tubes not totally submerged	insignificant
Steam Releases	0-2 hrs: 651,000 lbm 2-8 hrs: 1,023,000 lbm 8-10.73 hrs: same release rate as that for

TABLE 15.5-42A
LOCKED ROTOR ACCIDENT
Analysis Assumptions & Key Parameter Values

Parameter	Value
	2-8 hrs
Iodine Partition Coefficient in SGs	100
Particulate Carry-Over Fraction in SGs	0.0005 by weight
Fraction of Noble Gas Released	1.0 (Released without holdup)
Termination of releases from SGs	10.73 hours
Environmental Release Point	MSSVs/10% ADVs
CR emergency Ventilation : Initiation Signal/Timing	
	Control Room is assumed to remain on normal ventilation (CRVS Mode 1) for duration of the accident.
Control Room Atmospheric Dispersion Factors	Table 15.5-42B

Note 1: Due to the proximity of the release from the MSSVs/10% ADVs, to the normal operation CR intake of the affected unit, and due to the high vertical velocity of the steam discharge from the MSSVs/10% ADVs, the resultant plume from the MSSVs/10% ADVs will not contaminate the normal operation CR intake of the affected unit. Thus the χ/Q s presented reflect those applicable to the CR intake of the unaffected unit.

TABLE 15.5-42B
LOCKED ROTOR ACCIDENT
Control Room Limiting Atmospheric Dispersion Factors (sec/m^3)

Release point and receptor	0-2hr	2-8 hr	8-10.73 hr
MSSVs/10% ADVs to CR NOP Intake (Note 1)	8.60E-04	5.58E-04	5.58E-04
MSSVs/10% ADVs to CR In-leakage (CR Centerline)	2.78E-03	1.63E-03	1.63E-03

Note 1: Due to the proximity of the release from the MSSVs/10% ADVs, to the normal operation CR intake of the affected unit, and due to the high vertical velocity of the steam discharge from the MSSVs/10% ADVs, the resultant plume from the MSSVs/10% ADVs will not contaminate the normal operation CR intake of the affected unit. Thus the χ/Q s presented reflect those applicable to the CR intake of the unaffected unit.

~~TABLE 15.5-44~~

~~COMPOSITE SOURCE TERM FOR FUEL HANDLING ACCIDENT IN THE FUEL HANDLING BUILDING~~

~~Isotope~~	~~Composite Source Term (Ci/assembly at shutdown)~~	~~Activity at 100 Hours After Shutdown (Ci at 100 hrs)~~	~~Pool Activity (Ci at 100 hrs)~~	~~FHB Activity Based on DF200 for Iodines (Ci at 100 hrs)~~
~~I-131~~	~~5.057E+05~~	~~3.625E+05~~	~~5.9813E+04~~	~~299.0625~~
~~I-132~~	~~7.283E+05~~	~~3.042E+05~~	~~5.0193E+04~~	~~250.965~~
~~I-133~~	~~1.032E+06~~	~~3.783E+04~~	~~6.2420E+03~~	~~31.21~~
~~I-134~~	~~1.165E+06~~	~~0~~	~~0~~	~~0~~
~~I-135~~	~~9.611E+05~~	~~2.689E+01~~	~~4.4369E+00~~	~~0.0222~~
~~Kr-83m~~	~~8.196E+04~~	~~9.554E-08~~	~~1.5764E-08~~	~~1.5764E-08~~
~~Kr-85m~~	~~1.901E+05~~	~~3.679E-02~~	~~0.0060704~~	~~0.0060704~~
~~Kr-85~~	~~6.353E+03~~	~~6.350E+03~~	~~3143.25~~	~~3143.25~~
~~Kr-87~~	~~3.828E+05~~	~~0~~	~~0~~	~~0~~
~~Kr-88~~	~~5.416E+05~~	~~1.350E-05~~	~~2.2275E-06~~	~~2.2275E-06~~
~~Kr-89~~	~~6.855E+05~~	~~0~~	~~0~~	~~0~~
~~Xe-131m~~	~~5.661E+03~~	~~5.469E+03~~	~~902.385~~	~~902.385~~
~~Xe-133m~~	~~3.187E+04~~	~~1.306E+04~~	~~2154.9~~	~~2154.9~~
~~Xe-133~~	~~9.993E+05~~	~~6.914E+05~~	~~114081~~	~~114081~~
~~Xe-135m~~	~~2.021E+05~~	~~4.264E+00~~	~~0.70356~~	~~0.70356~~
~~Xe-135~~	~~2.886E+05~~	~~1.327E+03~~	~~218.955~~	~~218.955~~
~~Xe-137~~	~~9.140E+05~~	~~0~~	~~0~~	~~0~~
~~Xe-138~~	~~9.477E+05~~	~~0~~	~~0~~	~~0~~

~~Where:~~

~~The activity/Assembly at 100 hours after shutdown = A_{100}.~~
~~Pool activity at 100 hours = $(A_{100})^{Pool}$ = A_{100} x 1.65 x release fraction~~
~~= A_{100} x 1.65 x 0.1 for iodine and noble gases except Kr-85~~
~~and~~
~~= A_{100} x 1.65 x 0.3 for Kr-85~~
~~FHB activity at 100 hours = $(A_{100})^{Pool}$ / 200 for iodine~~

~~TABLE 15.5-45~~ ~~Sheet 1 of 2~~

~~ASSUMPTIONS FOR FUEL HANDLING ACCIDENT IN THE FUEL HANDLING AREA~~

~~A.~~	~~Pre-accident Operation~~	
	~~1. Core Power~~	~~3580 MWt~~
~~B.~~	~~Highest Power Fuel Assembly Characteristics~~	
	~~1. Radial peaking factor~~	~~1.65~~
~~C.~~	~~Fuel Assembly Damage~~	
	~~1. Number of fuel rods per assembly~~	~~264~~
	~~2. Number of fuel rods ruptured per assembly~~	~~264~~
	~~3. Number of fuel assemblies damaged~~	~~1~~
~~D.~~	~~Gap Activity Fractions~~	
	~~1. Iodine~~	~~0.10~~
	~~a. Elemental~~	~~0.09975~~
	~~b. Organic~~	~~0.00025~~
	~~c. Particulate~~	~~0.0~~
	~~2. Noble gases~~	
	~~a. Other than Kr-85~~	~~0.10~~
	~~b. Kr-85~~	~~0.30~~
	~~3. Other fission products~~	~~None~~
~~E.~~	~~Gap Activity Release Fractions~~	
	~~1. Iodine~~	~~1~~
	~~2. Noble gases~~	~~1~~
	~~3. Other fission products~~	~~None~~
~~F.~~	~~Fission Product Release Depth~~	~~23 feet~~
~~G.~~	~~Spent Fuel Pool Decontamination Factors~~	
	~~1. Iodine~~	~~200~~
	~~a. Elemental~~	~~500~~
	~~b. Organic~~	~~1~~
	~~c. Particulate~~	~~None~~
	~~2. Noble gases~~	~~1~~
	~~3. Other fission products~~	~~None~~

TABLE 15.5-45 Sheet 1 of 2

ASSUMPTIONS FOR FUEL HANDLING ACCIDENT IN THE FUEL HANDLING AREA

H.	Decay and Cleanup in Fuel Handling Building		
	1. Radiological decay credit	None	
	2. Radiological cleanup credit	None	
I.	Fuel Handling Building Volume	435,000 ft^3	
J.	Fuel Handling Building Filter Efficiencies	Not credited	
K.	Fuel Handling Building Exhaust Rate	40,000 cfm	
L.	Atmospheric Dispersion		
	1. Radiological decay credit	None	
	2. χ/Qs	EAB (800m) 0 to 2 hr	9.9E-4 sec/m^3
		LPZ (10 km) 0 to 8 hr	2.6E-5 sec/m^3
		8 to 24 hr	4.5E-6 sec/m^3
		24 to 96 hr	1.6E-6 sec/m^3
		96 to 720 hr	3.3E-7 sec/m^3
M.	Offsite Breathing Rates	Table 15.5-7	
N.	Offsite Power	(a)	

(a) Assumes the FHB ventilation operates continuously to maximize the FHB exhaust to the early stages of this event with or without offsite power.

TABLE 15.5-47

SUMMARY OF OFFSITE AND CONTROL ROOM DOSES~~DOSES FROM FUEL HANDLING ACCIDENT~~
~~IN THE~~ FUEL HANDLING ~~AAREA~~ACCIDENT IN THE FUEL HANDLING BUILDING OR CONTAINMENT

	Dose (TEDE, rem)	Regulatory Limit (TEDE, rem)
Maximum 2-hour Exclusion Area Boundary Dose[1]		6.3
- FHA in Fuel Handling Building	1.5	
- FHA in Containment	1.5	
30-day Integrated Low Population Zone Dose		6.3
- FHA in Fuel Handling Building	0.2	
- FHA in Containment	0.2	
30-day Integrated Control Room Occupancy Dose		5
- FHA in Fuel Handling Building	1.1	
- FHA in Containment	4.7	

Note:

1. The maximum 2-hour EAB dose occurs between 0 – 2 hours.

TABLE 15.5-47A
FUEL HANDLING ACCIDENT IN THE FUEL HANDLING BUILDING OR CONTAINMENT
Analysis Assumptions & Key Parameter Values

Parameter	Value
Power Level	3580 MWt
Number of Damaged Fuel Assemblies	1
Total Number of Fuel Assemblies	264
Decay Time Prior to Fuel Movement	72 hours
Radial Peaking Factor	1.65
Fraction of Core Inventory in gap	I-131 (12%) Kr-85 (30%) Other Noble Gases (10%) Other Halides (10%) Alkali Metals (17%)
Isotopic Inventory in Fuel Gap (Decayed 72 hours)	Table 15.5-47C
Iodine form of gap release before scrubbing	99.85% elemental
	0.15% Organic
Iodine form of gap release after scrubbing	57% elemental
	43% Organic
Scrubbing Decontamination Factors	Iodine (200, effective)
	Noble Gas (1)
	Particulates (∞)
Rate of Release from Fuel	Puff
Environmental Release Rate	All airborne activity released within a 2 hour period (or less if the ventilation system promotes a faster release rate)

TABLE 15.5-47A
FUEL HANDLING ACCIDENT IN THE FUEL HANDLING BUILDING OR CONTAINMENT
Analysis Assumptions & Key Parameter Values

Parameter	Value
Environmental Release Points and Rates	
Accident in SFP in the FHB – Release flow rates	-Plant Vent – 46,000 cfm FHB Outleakage -Ingress/Egress locations – 30 cfm -Miscellaneous gaps/openings – 470 cfm
Minimum free volume in FHB above SFP	317,000 ft^3
Accident in Containment - Release flow rates	-Open Equipment Hatch – All airborne activity released in 2 hrs
Minimum Free Volume in Containment above Operating Floor	2,013,000 ft^3
CR Emergency Ventilation: Initiation Signal/Timing	
Signal(s) available to switch the Control Room Ventilation System (CRVS) from normal operation (NOP) Ventilation (Mode 1) to Pressurized Filtered Ventilation (Mode 4) following a FHA	Radiation signals from gamma sensitive intake monitors that initiate closure of the CR normal intake dampers and switch the Control Room Ventilation System from normal operation Ventilation Mode 1 to Pressurized Filtered Ventilation Mode 4.
Radiation Monitor Analytical Safety Limit	1 mR/hr
Delay time for CRVS Mode 4 operation, including monitor response, signal processing, and damper closure time	22 seconds (see below)
Radiation Monitor Response Time	10 seconds (conservative assumption) - (Refer to Section 15.5.22.2.4)
Radiation monitor signal processing time	2 seconds
NOP Ventilation Damper Closure Time	10 seconds
Bounding Control Room Atmospheric Dispersion Factors for FHA	Table 15.5-47B

	TEDE Exposures, rem	
	Site Boundary 2 - Hours	LPZ - 30 Days
Regulatory Limit	6.3	6.3
Design basis case	4.265	0.112
	Control Room	
Regulatory Limit	5	
Design basis case	0.689	

TABLE 15.5-47B
FUEL HANDLING ACCIDENT IN THE FUEL HANDLING BUILDING OR CONTAINMENT
Control Room Limiting Atmospheric Dispersion Factors (sec/m^3)

Release Location / Receptor	0-22 s	22 sec - 2 hr	2-8 hr	8-24 hr	1-4 d	4-30 d
Control Room Normal Intakes						
Containment Hatch Release						
- Affected Unit Intake	2.61E-02	-----	-----	-----	-----	-----
- Non-Affected Unit Intake	2.88E-03	-----	-----	-----	-----	-----
Plant Vent Release						
- Affected Unit Intake	1.67E-03	-----	-----	-----	-----	-----
- Non-Affected Unit Intake	9.10E-04	-----	-----	-----	-----	-----
FHB Out-leakage points						
- Affected Unit Intake	6.98E-03	-----	-----	-----	-----	-----
- Non-Affected Unit Intake	2.93E-03	-----	-----	-----	-----	-----
Control Room Infiltration						
Containment Hatch Release	5.51E-03	5.51E-03	-----	-----	-----	-----
Plant Vent	1.26E-03	1.26E-03	-----	-----	-----	-----
FHB Out-leakage points	3.78E-03	3.78E-03	-----	-----	-----	-----
Control Room Pressurization Intake						
Containment Hatch Release	-----	6.60E-05	-----	-----	-----	-----
Plant Vent	-----	5.65E-05	-----	-----	-----	-----
FHB Out-leakage points	-----	6.40E-05	-----	-----	-----	-----

Note 1: Release from the Containment Hatch: applicable to FHA in Containment

Note 2: Release from Plant Vent / FHB Out-leakage: applicable to FHA in FHB

TABLE 15.5-47C
ISOTOPIC GAP ACTIVITY – FUEL HANDLING ACCIDENT
Single Fuel Assembly (Decayed 72 hours)

Nuclide	Activity Per Assembly (Ci)	Gap Fraction	Gap Activity per Assembly (w/o Peaking Factor)
I-129	2.07E-02	0.10	2.07E-03
I-130	3.29E+02	0.10	3.29E+01
I-131	4.09E+05	0.12	4.91E+04
I-132	3.99E+05	0.10	3.99E+04
I-133	9.73E+04	0.10	9.73E+03
I-135	5.01E+02	0.10	5.01E+01
KR-83M	2.51E-04	0.10	2.51E-05
KR-85	5.75E+03	0.30	1.73E+03
KR-85M	1.77E+00	0.10	1.77E-01
KR-88	7.73E-03	0.10	7.73E-04
XE-127	9.64E-02	0.10	9.64E-03
XE-129M	5.28E+01	0.10	5.28E+00
XE-131M	6.96E+03	0.10	6.96E+02
XE-133	8.31E+05	0.10	8.31E+04
XE-133M	1.88E+04	0.10	1.88E+03
XE-135	1.07E+04	0.10	1.07E+03
XE-135M	8.18E+01	0.10	8.18E+00
CS-132	2.16E+01	0.17	3.67E+00
CS-134	1.25E+05	0.17	2.13E+04
CS-134M	1.04E-03	0.17	1.77E-04
CS-135	3.01E-01	0.17	5.12E-02
CS-136	3.10E+04	0.17	5.27E+03
CS-137	7.10E+04	0.17	1.21E+04
RB-86	1.16E+03	0.17	1.97E+02
RB-87	1.37E-05	0.17	2.33E-06
RB-88	8.63E-03	0.17	1.47E-03

TABLE 15.5-48 Sheet 1 of 2

DESIGN INPUTS AND ASSUMPTIONS FOR FUEL HANDLING ACCIDENTS INSIDE CONTAINMENT

Parameter	Value
Containment:	
- Containment Free Volume (ft^3)	2.55E+06
- Containment Volume above Fuel Pool (ft^3)	33600
- Purge Line Flowrate to Environment (CFM)	13750
- Depth of Water Above Damaged Fuel (ft)	≥23
Iodine Decontamination Factors:	
- Organic	1
- Inorganic (Elemental)	500
- Overall Effective	200
Exfiltration Rate (cfs)	2.55E+06
Duration of Release (sec)	<2.0
Time of Accident after Shutdown (hr)	100
Number of Failed Rods	264
Gap Activity Released from Damaged Rods (%):	
- Kr-85	30
- Noble Gases other than Kr-85	10
- Iodines	10
Iodine Gap Inventory (%):	
- Inorganic	99.75
- Organic	0.25
Values Assumed for Generation of Inventories:	
- Reactor Power (%RTP)	105
- Reactor Power (MWt)	3580
- Radial Peaking Factor	1.65
Dose Conversion Factors for Iodine Species (REM/Ci):	
- I-131	1.08E+06
- I-132	6.44E+03
- I-133	1.80E+05
- I-134	1.07E+03
- I-135	3.13E+04

TABLE 15.5-48 Sheet 1 of 2

DESIGN INPUTS AND ASSUMPTIONS FOR FUEL HANDLING ACCIDENTS INSIDE CONTAINMENT

Parameter	Value
Control Room (CR) Input Data:	
Control Room Volume (U1 +U2) (cubic feet)	170000
Flowrates (CFM)	
Flowrate of contaminated air into CR	2110
Flowrate of recirc CR air thru filters	0
CR pressurization air filter:	
Filter Depth	2 inches
Iodine Filter Efficiency:	
Elemental	95%
Organic	95%
Particulate	95%
CR Occupancy Factors:	
0 - 24 hours	1
24 -96 hours	0.6
96 - 720 hours	0.4
Atmospheric Dispersion Factors (sec/m^3):	
Control Room Pressurization:	
0 - 8 hours	7.05E-05
8 - 24 hours	5.38E-05
24 - 96 hours	3.91E-05
96 - 720 hours	2.27E-05
Control Room Infiltration :	
0 - 8 hours	1.96E-04
8 - 24 hours	1.49E-04
24 - 96 hours	1.08E-04
96 - 720 hours	6.29E-05
Exclusion Area Boundary (EAB), 800 meters:	
0 - 2 hours	5.29E-04
Low Population Zone (LPZ), 10,000 meters:	
0 - 8 hours	2.20E-05
8 -24 hours	4.75E-06
1 - 4 days	1.54E-06
4 - 30 days	3.40E-07
Control Room Breathing Rate (m^3/sec):	3.47E-04
Offsite Breathing Rates (m^3/sec):	
0 - 8 hours	3.47E-04
8 -24 hours	1.75E-04
1 - 30 days	2.32E-04

~~TABLE 15.5-49~~

~~ACTIVITY RELEASES FROM FUEL HANDLING ACCIDENT INSIDE CONTAINMENT (CURIES)~~

~~Design Basis Case~~

~~Nuclide~~	~~0-2 hr~~
~~I-131~~	~~299.0625~~
~~I-132~~	~~250.965~~
~~I-133~~	~~31.21~~
~~I-134~~	~~0~~
~~I-135~~	~~0.0222~~
~~Kr-83m~~	~~1.5764E-08~~
~~Kr-85m~~	~~0.0060704~~
~~Kr-85~~	~~3143.25~~
~~Kr-87~~	~~0~~
~~Kr-88~~	~~2.2275E-06~~
~~Kr-89~~	~~0~~
~~Xe-131m~~	~~902.385~~
~~Xe-133m~~	~~2154.9~~
~~Xe-133~~	~~114081~~
~~Xe-135m~~	~~0.70356~~
~~Xe-135~~	~~218.955~~
~~Xe-137~~	~~0~~
~~Xe-138~~	~~0~~

~~TABLE 15.5-50~~

~~SUMMARY OF OFFSITE DOSES FROM FUEL HANDLING ACCIDENT INSIDE CONTAINMENT~~

~~Thyroid Exposures, rem~~

	~~Control Room – 30 Days~~	~~Site Boundary - 2 Hours~~	~~LPZ - 30 Days~~
~~10 CFR Part 100~~	~~30 (GDC 19)~~	~~300~~	~~300~~
~~Design basis case~~	~~22.31~~	~~60.62~~	~~2.52~~

~~Whole Body Immersion Exposures, rem~~

	~~Control Room – 30 Days~~	~~Site Boundary - 2 Hours~~	~~LPZ - 30 Days~~
~~10 CFR Part 100~~	~~5 (GDC 19)~~	~~25~~	~~25~~
~~Design basis case~~	~~7.57×10^{-3}~~	~~0.43~~	~~0.018~~

~~Population Doses, man-rem~~

~~Design basis case~~	~~8.53~~
~~Expected case~~	~~3×10^{-3}~~

TABLE 15.5-51 Sheet 1 of 2

ACTIVITY RELEASES FOLLOWING A ROD EJECTION ACCIDENT (CURIES)

	Design Basis Case				
Nuclide	0-2 hr	2-8 hr	8-24 hr	24-96 hr	4-30 Days
I-131	0.9765E-02	0.0	0.0	0.0	0.0
I-132	0.1578E-02	0.0	0.0	0.0	0.0
I-133	0.7394E-02	0.0	0.0	0.0	0.0
I-134	0.1729E-02	0.0	0.0	0.0	0.0
I-135	0.3867E-02	0.0	0.0	0.0	0.0
I-131ORG	0.0	0.0	0.0	0.0	0.0
I-132ORG	0.0	0.0	0.0	0.0	0.0
I-133ORG	0.0	0.0	0.0	0.0	0.0
I-134ORG	0.0	0.0	0.0	0.0	0.0
I-135ORG	0.0	0.0	0.0	0.0	0.0
I-131PAR	0.0	0.0	0.0	0.0	0.0
I-132PAR	0.0	0.0	0.0	0.0	0.0
I-133PAR	0.0	0.0	0.0	0.0	0.0
I-134PAR	0.0	0.0	0.0	0.0	0.0
I-135PAR	0.0	0.0	0.0	0.0	0.0
Kr-83M	0.7646E-01	0.61693-01	0.7366E-02	0.9508E-05	0.2124E-16
Kr-85	0.1066E-01	0.3193E-01	0.8511E-01	0.1912E-02	0.1641E-03
Kr-85M	0.3500E-00	0.5778E-00	0.3377E-00	0.1477E-01	0.1753E-06
Kr-87	0.2570E-00	0.1245E-00	0.4858E-02	0.3842E-06	0.3026E-23
Kr-88	0.7005E-00	0.8383E-00	0.2360E-00	0.2193E-02	0.3293E-10
Xe-133	0.1123E-02	0.3297E-02	0.8275E-02	0.1471E-03	0.2929E-03
Xe-133M	0.1857E-00	0.5299E-00	0.1232E-01	0.1646E-01	0.1117E-01
Xe-135	0.1332E-01	0.2979E-01	0.3650E-01	0.7768E-00	0.3437E-02
Xe-135M	0.2577E-01	0.1253E-03	0.1421E-10	0.2140E-29	0.0
Xe-138	0.7913E-01	0.2070E-03	0.3679E-11	0.3956E-32	0.0

TABLE 15.5-51 Sheet 1 of 2

ACTIVITY RELEASES FOLLOWING A ROD EJECTION ACCIDENT (CURIES)

Expected Case

Nuclide	0-2 hr	2-8 hr	8-24 hr	24-96 hr	4-30 Days
I-131	0.1645E-02	0.0	0.0	0.0	0.0
I-132	0.2675E-03	0.0	0.0	0.0	0.0
I-133	0.1247E-02	0.0	0.0	0.0	0.0
I-134	0.2963E-03	0.0	0.0	0.0	0.0
I-135	0.6529E-03	0.0	0.0	0.0	0.0
I-131ORG	0.0	0.0	0.0	0.0	0.0
I-132ORG	0.0	0.0	0.0	0.0	0.0
I-133ORG	0.0	0.0	0.0	0.0	0.0
I-134ORG	0.0	0.0	0.0	0.0	0.0
I-135ORG	0.0	0.0	0.0	0.0	0.0
I-131PAR	0.0	0.0	0.0	0.0	0.0
I-132PAR	0.0	0.0	0.0	0.0	0.0
I-133PAR	0.0	0.0	0.0	0.0	0.0
I-134PAR	0.0	0.0	0.0	0.0	0.0
I-135PAR	0.0	0.0	0.0	0.0	0.0
Kr-83M	0.3823E-01	0.3085E-01	0.3684E-02	0.4757E-05	0.1063E-16
Kr-85	0.5339E-00	0.1599E-01	0.4260E-01	0.9570E-01	0.8242E-02
Kr-85M	0.1750E-00	0.2889E-00	0.1689E-00	0.7387E-02	0.8775E-07
Kr-87	0.1285E-00	0.6227E-01	0.2430E-02	0.1922E-06	0.1515E-23
Kr-88	0.3503E-00	0.4192E-00	0.1180E-00	0.1097E-02	0.1648E-10
Xe-133	0.5617E-01	0.1648E-02	0.4139E-02	0.7359E-02	0.1469E-03
Xe-133M	0.9285E-01	0.2650E-00	0.6162E-00	0.8236E-00	0.5596E-00
Xe-135	0.6662E-00	0.1490E-01	0.1826E-01	0.3887E-00	0.1721E-02
Xe-135M	0.1289E-01	0.6268E-04	0.7107E-11	0.1070E-29	0.0
Xe-138	0.3957E-01	0.1035E-03	0.1840E-11	0.1979E-32	0.0

TABLE 15.5-52

SUMMARY OF OFFSITE DOSES AND CONTROL ROOM DOSES ~~FROM A CONTROL~~ ROD EJECTION ACCIDENT

	Dose (TEDE, rem)	Regulatory Limit (TEDE, rem)
Maximum 2-hour Exclusion Area Boundary Dose[1]		6.3
- Containment Release	0.7	
- Secondary Side Release	0.7	
30-day Integrated Low Population Zone Dose		6.3
- Containment Release	0.3	
- Secondary Side Release	0.2	
30-day Integrated Control Room Occupancy Dose		5
- Containment Release	3.4	
- Secondary Side Release	0.5	

~~Thyroid Exposures, rem~~

	~~Site Boundary 2 - Hours~~	~~LPZ - 30 Days~~
~~10 CFR Part 100~~	~~300~~	~~300~~
~~Design basis case~~	~~3.3×10^{-3}~~	~~1.4×10^{-4}~~
~~Expected case~~	~~3.7×10^{-5}~~	~~1.6×10^{-6}~~

~~Whole Body Exposures, rem~~

	~~Site Boundary - 2 Hours~~	~~LPZ - 30 Days~~
~~10 CFR Part 100~~	~~25~~	~~25~~
~~Design basis case~~	~~7.3×10^{-4}~~	~~1.3×10^{-4}~~

~~Expected case~~	~~3.6×10^{-5}~~	~~6.4×10^{-6}~~

~~Population Doses, man-rem~~

~~Design basis case~~	~~0.54~~
~~Expected case~~	~~0.027~~

Note:

1. The maximum 2-hour EAB dose occurs between 0 – 2 hours.

TABLE 15.5-52A
CONTROL ROD EJECTION ACCIDENT
Analysis Assumptions & Key Parameter Values

Parameters	Value
Containment Leakage Pathway	
Power Level	3580 MWt
Free Volume	2.550E+06 ft^3
Containment leak rate (0 -24 hr)	0.1% vol. fraction per day
Containment leak rate(1-30 day)	0.05% vol. fraction per day
Failed Fuel Percentage	10%
Percentage of Core Inventory in Fuel Gap	10% (noble gases & halogens)
Melted Fuel Percentage	0%
Chemical Form of Iodine in Failed fuel	4.85% elemental 95% particulate 0.15% organic
Radial Peaking Factor	1.65
Core Activity Release Timing	Puff
Form of Failed Iodine in the Containment Atmosphere	97% elemental 3% organic
Equilibrium Core Activity	Table 15.5-77
Termination of Containment Release	30 days
Environmental Release Point	Same as LOCA Containment Leakage pathway
Secondary Side Pathway	
Reactor Coolant Mass	446,486 lbm

TABLE 15.5-52A
CONTROL ROD EJECTION ACCIDENT
Analysis Assumptions & Key Parameter Values

Parameters	Value
Primary-to-Secondary Leak rate	0.75 gpm (total for all 4 SGs); leakage density 62.4 lbm/ft^3
Failed Fuel Percentage	Same as containment leakage pathway
Percentage of Core Inventory in Fuel Gap	Same as containment leakage pathway
Minimum Post-Accident SG Liquid Mass	92,301 lbm / SG
Iodine Species released to Environment	97% elemental 3% organic
Time period when tubes not totally submerged	Insignificant
Steam Releases	0-2 hrs: 651,000 lbm 2-8 hrs: 1,023,000 lbm 8-10.73 hrs: same release rate as that for 2-8 hrs.
Iodine Partition Coefficient in SGs	100
Fraction of Noble Gas Released	1.0 (Released without holdup)
Termination of Release from SGs	10.73 hours
Environmental Release Point	MSSVs/10% ADVs
CR emergency Ventilation: Initiation Signal/Timing	
Initiation time (signal)	300 sec (SIS Generated) 312 sec (Non-Affected Unit NOP Intake fully Closed) 338.2 sec (Affected Unit NOP Intake fully Closed with full Mode 4 Emergency Ventilation Operation).
Control Room Atmospheric Dispersion Factors	Table 15.5-52B

TABLE 15.5-52B
CONTROL ROD EJECTION ACCIDENT
Control Room Limiting Atmospheric Dispersion Factors (sec/m^3)

Release Location / Receptor	0-2hr	2-8hr	8-10.73hr	10.73-24hr	24-96hr	96-720hr
CR Normal Intakes						
Containment leakage						
- Affected Unit Intake	6.84E-03	-----		-----	-----	-----
- Non-Affected Unit Intake	2.24E-03	-----		-----	-----	-----
MSSVs/10% ADVs						
- Affected Unit Intake	Note 3	-----	-----	-----	-----	-----
- Non-Affected Unit Intake	8.60E-04	-----	-----	-----	-----	-----
CR Infiltration						
Containment leakage	3.22E-03	1.85E-03	7.29E-04	7.29E-04	7.15E-04	6.64E-04
MSSVs/10% ADVs	2.78E-03	1.63E-03	1.63E-03	-----	-----	-----
CR Pressurization Intake						
Containment leakage	6.45E-05	4.05E-05	1.65E-05	1.65E-05	1.38E-05	1.12E-05
MSSVs/10% ADVs	1.57E-05	9.60E-06	9.60E-06	-----	-----	-----

Note 1: Containment leakage: Used for Containment release scenario; based on Containment penetration area release point.

Note 2: MSSV /10% ADVs: Used for Secondary System Release Scenario;

Note 3: Due to the proximity of the release from the MSSVs/10% ADVs, to the normal operation CR intake of the affected unit, and due to the high vertical velocity of the steam discharge from the MSSVs/10% ADVs, the resultant plume from the MSSVs/10% ADVs will not contaminate the normal operation CR intake of the affected unit.

TABLE 15.5-63

POST-LOCA DOSES WITH MARGIN RECIRCULATION LOOP LEAKAGE

CONTROL ROOM OPERATOR DOSES (REM)

Pathway	Thyroid	Gamma Whole Body	Beta Skin	Notes
Containment leakage	5.96	0.0394	0.480	
RHR pump seal leakage	0.022	0.0	0.0	1
Expected recirculation loop leakage	0.85	0.00002	0.0014	
Recirculation loop leakage:				
1.85 gpm, with charcoal filtration, or				
0.186 gpm, with no filtration	18.45	0.0006	0.0083	2
Plume radiation (egress-ingress)	4.72	0.0066	0.0243	3
Other direct radiation pathways	0.00	0.0760	0.00	3
TOTAL CONTROL ROOM OPERATOR DOSES	30.00		-	
10 CFR PART 50 APPENDIX A, GDC 19 LIMITS	30	5	30	

OFFSITE DOSES (REM)

SITE BOUNDARY Pathway	Thyroid	Gamma Whole Body	Notes
Containment leakage	107.06	3.24	
RHR pump seal leakage	0.0	0.0	
Expected recirculation loop leakage	8.22	0.03	
Recirculation loop leakage:			
1.88 gpm, with charcoal filtration, or			
0.189 gpm, with no filtration	184.72	0.52	2
TOTAL SITE BOUNDARY DOSES	300.00	-	-

LPZ Pathway	Thyroid	Gamma Whole Body	Notes
Containment leakage	19.01	0.293	
RHR pump seal leakage	0.09	0.0	
Expected recirculation loop leakage	2.12	0.003	
Recirculation loop leakage:			
11.07 gpm, with charcoal filtration, or			
1.11 gpm, with no filtration	278.78	0.44	2
TOTAL LPZ DOSES	300.00	-	-
10 CFR PART 100 DOSE LIMITS	300	25	

Notes:

1. RHR pump seal leakage of 50 gpm for 30 minutes, starting 24 hours after the start of the LOCA, see Tables 15.5-24 and 15.5-33.
2. Additional recirculation loop leakage, existing at the start of the LOCA and continuing for 30 days.
3. Taken from Table 15.5-33.

~~TABLE 15.5-64~~

~~Sheet 1 of 2~~

~~PARAMETERS USED IN EVALUATING~~
~~RADIOLOGICAL CONSEQUENCES FOR SGTR ANALYSIS~~

~~I. Source Data~~	
~~A. Core power level, MWt~~	~~3580~~
~~B. Total steam generator tube leakage, prior to accident, gpm~~	~~1.0~~
~~C. Reactor coolant activity:~~	
~~1. Accident initiated spike~~	~~The initial RC iodine activities based on 1 μCi/gram of D.E. I-131 are presented in Table 15.5-65. The iodine appearance rates based on an iodine spiking factor of 335 assumed for the accident initiated spike are presented in Table 15.5-66~~
~~2. Pre-accident spike~~	~~Primary coolant iodine activities based on 60 μCi/gram of D.E. I-131 are presented in Table 15.5-65~~
~~3. Noble gas activity~~	~~The initial RC noble gas activities based on 1% fuel defects are presented in Table 15.5-67~~
~~D. Secondary system initial activity~~	~~Dose equivalent of 0.1 μCi/gm of I-131, presented in Table 15.5-65~~
~~E. Reactor coolant mass, grams~~	~~2.27×10^8~~
~~F. Initial steam generator mass (each), grams~~	~~4.07×10^7~~
~~G. Offsite power~~	~~Lost at time of reactor trip~~
~~H. Primary-to-secondary leakage duration for intact SG, hrs~~	~~8~~
~~I. Species of iodine~~	~~100 percent elemental~~

~~TABLE 15.5-64~~ ~~Sheet 2 of 2~~

~~PARAMETERS USED IN EVALUATING~~
~~RADIOLOGICAL CONSEQUENCES FOR SGTR ANALYSIS~~

~~II. Activity Release Data~~	
~~A. Ruptured steam generator~~	
~~1. Rupture flow~~	~~See Figure 15.4.3-6b and Table 15.4-14~~
~~2. Flashed rupture flow~~	~~See Figure 15.4.3-11 and Table 15.4-14~~
~~3. Iodine scrubbing efficiency~~	~~Not Modeled~~
~~4. Total steam release, lbs~~	~~See Figure 15.4.3-9 and Table 15.4-14~~
~~5. Iodine partition coefficient~~	
~~- non-flashed~~	~~100~~
~~- flashed~~	~~1.0~~
~~B. Intact steam generators~~	
~~1. Total primary-to-secondary leakage, gpm~~	~~1.0~~
~~2. Total steam release, lbs~~	~~See Figure 15.4.3-10 and Table 15.4-14~~
~~3. Iodine partition coefficient~~	~~100~~
~~C. Condenser~~	
~~1. Iodine partition coefficient~~	~~100~~
~~D. Atmospheric dispersion factors~~	~~See Table 15.5-68~~

TABLE 15.5-64

SUMMARY OF OFFSITE AND CONTROL ROOM DOSES
STEAM GENERATOR TUBE RUPTURE

	Dose (TEDE, rem)	Regulatory Limit (TEDE, rem)

~~TABLE 15.5-64~~

~~PARAMETERS USED IN EVALUATING RADIOLOGICAL CONSEQUENCES FOR SGTR ANALYSIS~~

Maximum 2-hour Exclusion Area Boundary Dose[1]		
- Pre-incident iodine Spike	1.3	25
- Accident-Initiated Iodine Spike	0.7	2.5
30-day Integrated Low Population Zone Dose		
- Pre-incident iodine Spike	0.1	25
- Accident-Initiated Iodine Spike	<0.1	2.5
30-day Integrated Control Room Occupancy Dose		5
- Pre-incident iodine Spike	0.6	
- Accident-Initiated Iodine Spike	0.3	

Note:

1. The maximum 2-hour EAB dose occurs during the 0-2hr time period :

~~TABLE 15.5-64~~ ~~Sheet 2 of 2~~

~~PARAMETERS USED IN EVALUATING RADIOLOGICAL CONSEQUENCES FOR SGTR ANALYSIS~~

TABLE 15.5-64A
STEAM GENERATOR TUBE RUPTURE
Analysis Assumptions & Key Parameter Values

Parameter	Value
Power Level	3580 MWt
Reactor Coolant Mass	446,486 lbm
Time of Reactor Trip	179.0 sec
Time of isolation of stuck-open 10% ADV on the Ruptured SG	2653 sec
Termination of Break Flow from Ruptured SG that flashes	3402 sec
Termination of Break Flow from Ruptured SG	5872 sec
Time of manual depressurization of the Ruptured SG	2 hours
Break Flow to Ruptured Steam Generator that flashes	Table 15.5-64C, Column "A"
Break Flow to Ruptured Steam Generator that does not flash	Table 15.5-64C, Column "B"
Tube Leakage rate to Intact Steam Generators	0.75 gpm (total for all 4 SGs; conservatively assumed for 3 intact SGs); leakage density 62.4 lbm/ft^3
Failed/Melted Fuel Percentage	0%
RCS Tech Spec Iodine Concentration	1 µCi/gm DE I-131 (Table 15.5-78)
RCS Tech Spec Noble Gas Concentration	270 µCi/gm DE Xe-133 (Table 15.5-78)

~~TABLE 15.5-64~~ ~~Sheet 2 of 2~~

~~PARAMETERS USED IN EVALUATING RADIOLOGICAL CONSEQUENCES FOR SGTR ANALYSIS~~

TABLE 15.5-64A
STEAM GENERATOR TUBE RUPTURE
Analysis Assumptions & Key Parameter Values

Parameter	Value
RCS Equilibrium Iodine Appearance Rates	Table 15.5-79 (1 µCi/gm DE I-131)
Pre-Accident Iodine Spike Concentration	60 µCi/gm DE I-131 (Table 15.5-79)
Accident-Initiated Iodine Spike Appearance Rate	335 times TS equilibrium appearance rate
Duration of Accident-Initiated Iodine Spike	8 hours
Initial Secondary Coolant Iodine Concentrations	0.1 µCi/gm DE I-131 (Table 15.5-78)
Secondary System Release Parameters	
Initial SG liquid mass	89,707 lbm / SG
Iodine Species released to Environment	97% elemental; 3% organic
Steam flow rate to condenser from Ruptured SG before trip	63,000 lbm/min
Steam flow rate to condenser from intact SGs before trip	189,000 lbm/min
Partition Factor in Main Condenser	0.01 (elemental iodine)
	1 (organic iodine and noble gases)
Steam Releases from Ruptured SG	Table 15.5-64C, Column "C"
Steam Releases from intact SG	Table 15.5-64C, Column "D"
Post-accident minimum SG liquid mass for Ruptured SG	89,707 lbm

~~TABLE 15.5-64~~ ~~Sheet 2 of 2~~

~~PARAMETERS USED IN EVALUATING RADIOLOGICAL CONSEQUENCES FOR SGTR ANALYSIS~~

TABLE 15.5-64A
STEAM GENERATOR TUBE RUPTURE
Analysis Assumptions & Key Parameter Values

Parameter	Value
Post-accident minimum SG liquid mass for intact SGs	89,707 lbm per SG
Time period when tubes not totally submerged (intact SG)	insignificant
Fraction of Iodine Released (flashed portion)	1.0 (Released without holdup)
Fraction of Noble Gas Released from all SGs	1.0 (Released without holdup)
Iodine Partition Coefficient	100
Termination of Release from intact SG	10.73 hrs
Environmental Release Points	Plant Vent : 0 – 179 sec MSSVs/10% ADVs:179 sec – 10.73 hr
CR emergency Ventilation : Initiation Signal/Timing	
Initiation time (signal)	SIS: 219 sec Unaffected Unit inlet damper closed: 231 sec Affected Unit inlet damper closed: 257.2 sec
Control Room Atmospheric Dispersion Factors	Table 15.5-64B

TABLE 15.5-64B
STEAM GENERATOR TUBE RUPTURE
Control Room Limiting Atmospheric Dispersion Factors (sec/m^3)

Release Location / Receptor	0-179 s	179-257.2 s	257.2 s- 2 h	2-8 hr	8-10.73 hr
CR Normal Intakes					
- Plant Vent	1.29E-03	-----	-----	-----	-----
- MSSVs/10% ADVs (Note 1)	-----	8.60E-04	-----	-----	-----
CR Infiltration					
- Plant Vent	1.26E-03	-----	-----	-----	-----
- MSSVs/10% ADVs	-----	2.78E-03	2.78E-03	1.49E-03	1.49E-03
CR Pressurization Intake					
- MSSVs/10% ADVs	-----	-----	1.57E-05	7.65E-06	7.65E-06

~~TABLE 15.5-65~~

~~IODINE SPECIFIC ACTIVITIES~~
~~IN THE PRIMARY AND SECONDARY COOLANT[a] – SGTR ANALYSIS~~

		~~Specific Activity (μCi/gm)~~	
		~~Primary Coolant~~	~~Secondary Coolant~~
~~Nuclide~~	~~1 μCi/gm~~	~~60 μCi/gm~~	~~0.1 μCi/gm~~
~~I-131~~	~~0.794~~	~~47.64~~	~~0.0794~~
~~I-132~~	~~0.204~~	~~12.24~~	~~0.0204~~
~~I-133~~	~~1.113~~	~~66.78~~	~~0.1113~~
~~I-134~~	~~0.139~~	~~8.34~~	~~0.0139~~
~~I-135~~	~~0.589~~	~~35.34~~	~~0.0589~~

~~(a) Based on 1, 60 and 0.1 μCi/gm of Dose Equivalent I-131 consistent with the DCPP Technical Specifications (Reference 22).~~

~~TABLE 15.5-66~~

~~IODINE SPIKE APPEARANCE RATES[a] – SGTR ANALYSIS (CURIES/SECOND)~~

~~I-131~~	~~I-132~~	~~I-133~~	~~I-134~~	~~I-135~~
~~2.46~~	~~1.92~~	~~4.14~~	~~2.75~~	~~3.10~~

~~[a] The accident initiated spike appearance rate is 335 times the equilibrium appearance rate. The equilibrium appearance rate is calculated based on a total letdown flow of 143 gpm. This total is comprised of 120 gpm with perfect cleanup, a letdown flow uncertainty of 12 gpm, 10 gpm identified reactor coolant system leakage, and 1 gpm unidentified leakage from the reactor coolant system.~~

~~TABLE 15.5-67~~

~~NOBLE GAS SPECIFIC ACTIVITIES IN THE REACTOR COOLANT[a] BASED ON 1% FUEL DEFECTS - SGTR ANALYSIS~~

~~Nuclide~~	~~Specific Activity (μCi/gm)~~
~~Xe-131m~~	~~2.523~~
~~Xe-133m~~	~~3.911~~
~~Xe-133~~	~~256.3~~
~~Xe-135m~~	~~0.449~~
~~Xe-135~~	~~8.663~~
~~Xe-138~~	~~0.568~~
~~Kr-85m~~	~~2.141~~
~~Kr-85~~	~~6.209~~
~~Kr-87~~	~~1.232~~
~~Kr-88~~	~~3.907~~

~~[a] Based on a 2 year fuel cycle at a core power of 3580 MWt, a 75 gpm reactor coolant system letdown flow rate, and a 90% demineralizer iodine removal efficiency.~~

~~TABLE 15.5-68~~

~~ATMOSPHERIC DISPERSION FACTORS AND BREATHING RATES - SGTR ANALYSIS~~

~~OFFSITE EXPOSURE~~

~~Time (hours)~~	~~Exclusion Area Boundary χ/Q (Sec/m^3)~~	~~Low Population Zone χ/Q (Sec/m^3)~~	~~Breathing Rate[a] (m^3/Sec)~~
~~0-2~~	~~5.29×10^{-4}~~	~~2.2×10^{-5}~~	~~3.47×10^{-4}~~
~~2-8~~	~~—~~	~~2.2×10^{-5}~~	~~3.47×10^{-4}~~

~~CONTROL ROOM EXPOSURE~~

~~Time (hours)~~	~~Control Room Filtered Pressurization χ/Q (Sec/m^3)~~	~~Control Room Unfiltered Pressurization Zone χ/Q (Sec/m^3)~~	~~Control Room Breathing Rate[a] (m^3/Sec)~~
~~0-8~~	~~7.05×10^{-5}~~	~~1.96×10^{-4}~~	~~3.47×10^{-4}~~
~~8-24~~	~~5.38×10^{-5}~~	~~1.49×10^{-4}~~	~~3.47×10^{-4}~~
~~24-96~~	~~3.91×10^{-5}~~	~~1.08×10^{-4}~~	~~3.47×10^{-4}~~
~~>96~~	~~2.27×10^{-5}~~	~~6.29×10^{-5}~~	~~3.47×10^{-4}~~

Note 1:

Due to the proximity of the release from the MSSVs/10% ADVs, to the normal operation CR intake of the affected unit, and due to the high vertical velocity of the steam discharge from the MSSVs/10% ADVs, the resultant plume from the MSSVs/10% ADVs will not contaminate the normal operation CR intake of the affected unit. Thus the χ/Q s presented reflect those applicable to the CR intake of the unaffected unit.

TABLE 15.5-64C
STEAM GENERATOR TUBE RUPTURE
Break Flows and Steam Releases

	Break Flow and Steam Release within each Time Interval			
	A	B	C	D
Time from Break (sec)	Flashed Break Flow (lbm)	Un-flashed Break Flow (lbm)	Ruptured SG Steam Releases (lbm)	Intact SGs Steam Releases (lbm)
0	1678	8422	187822	563100
179	2217	30003	10527	42565
853	12121	90754	113657	118
2653	1355	15906	0	146
2953	779	23177	0	85467
3402	0	45026	0	97164
4324	0	16870	0	9237
4739	0	23892	0	29103
5872	0	0	0	103300
7200	0	0	270000	1,342,400
38628	0	0	0	0

Note: Data in row for T=0 is applicable to time interval between T=0 sec to T=179 sec (typ)

~~(a) Regulatory Guide 1.4, Revision 2, June 1974 (Note: Although revision 2 was referenced in the analysis, the breathing rates are the same as those in revision 1 which is the DCPP licensing basis)~~

~~TABLE 15.5-69~~

~~THYROID DOSE CONVERSION FACTORS[a] – SGTR ANALYSIS~~

~~Nuclide~~	
~~I-131~~	~~1.07×10^6 (Rem/Curie)~~
~~I-132~~	~~6.29×10^3 (Rem/Curie)~~
~~I-133~~	~~1.81×10^5 (Rem/Curie)~~
~~I-134~~	~~1.07×10^3 (Rem/Curie)~~
~~I-135~~	~~3.14×10^4 (Rem/Curie)~~

~~[a] International Commission on Radiological Protection Publication 30, 1979.~~

~~TABLE 15.5-70~~

~~AVERAGE GAMMA AND BETA ENERGY FOR NOBLE GASES[a] – SGTR ANALYSIS (MeV/dis)~~

~~Nuclide~~	~~$\bar{E}_\gamma$~~	~~$\bar{E}_\beta$~~
~~I-131~~	~~0.38~~	~~0.19~~
~~I-132~~	~~2.2~~	~~0.52~~
~~I-133~~	~~0.6~~	~~0.42~~
~~I-134~~	~~2.6~~	~~0.69~~
~~I-135~~	~~1.4~~	~~0.43~~
~~Xe-131m~~	~~0.0029~~	~~0.16~~
~~Xe-133m~~	~~0.02~~	~~0.21~~
~~Xe-133~~	~~0.03~~	~~0.15~~
~~Xe-135m~~	~~0.43~~	~~0.099~~
~~Xe-135~~	~~0.25~~	~~0.32~~
~~Xe-138~~	~~1.2~~	~~0.66~~
~~Kr-85m~~	~~0.16~~	~~0.25~~
~~Kr-85~~	~~0.0023~~	~~0.25~~
~~Kr-87~~	~~0.79~~	~~1.3~~
~~Kr-88~~	~~2.2~~	~~0.25~~

~~(a) ENDF-223, October 1975 (Reference 36)~~

TABLE 15.5-71

OFFSITE RADIATION DOSES FROM SGTR ACCIDENT

	Dose (Rem)	
	Calculated Value	Allowable Guideline Value (Reference 37)
1. Accident Initiated Iodine Spike		
Exclusion Area Boundary (0-2 hr.) Thyroid CDE	27	30.5[a]
Low Population Zone (0-8 hr.) Thyroid CDE	1.5	30
2. Pre-Accident Iodine Spike		
Exclusion Area Boundary (0-2 hr.) Thyroid CDE	67	300
Low Population Zone (0-8 hr.) Thyroid CDE	3.2	300
3. Accident Initiated Iodine Spike Whole-Body Gamma Dose		
Exclusion Area Boundary (0-2 hr.) Whole Body Gamma DDE	0.2	2.5
Low Population Zone (0-8 hr.) Whole-Body Gamma DDE	0.02	2.5
4. Pre-Accident Initiated Iodine Spike Whole-Body Gamma Dose		
Exclusion Area Boundary (0-2 hr.) Whole Body Gamma DDE	0.3	25
Low Population Zone (0-8 hr.) Whole-Body Gamma DDE	0.02	25

[a] Note: A dose limit of 30.5 rem has been approved by the NRC based on OSGs. Refer to Section 15.5.20.2.1(5) for further discussion.

~~TABLE 15.5-72~~

~~CONTROL ROOM PARAMETERS USED IN EVALUATING RADIOLOGICAL CONSEQUENCES FOR SGTR ANALYSIS~~

~~Control Room Isolation Signal Generated~~	~~Time of Safety Injection Signal~~
~~Delay in Control Room Isolation After Isolation Signal is Generated~~	~~35 seconds~~
~~Control Room Volume~~	~~170,000 ft^3~~
~~Control Room Unfiltered In-Leakage~~	~~10 cfm~~
~~Control Room Unfiltered Inflow~~	
~~Normal Mode~~	~~4200 cfm~~
~~Emergency Mode~~	~~0 cfm~~
~~Control Room Filtered Inflow~~	
~~Normal Mode~~	~~0 cfm~~
~~Emergency Mode~~	~~2100 cfm~~
~~Control Room Filtered Recirculation~~	
~~Normal Mode~~	~~0 cfm~~
~~Emergency Mode~~	~~2100 cfm~~
~~Control Room Filter Efficiency~~	~~95%~~

~~TABLE 15.5-74~~

~~CONTROL ROOM RADIATION DOSES FROM AIRBORNE ACTIVITY IN SGTR ACCIDENT~~

	~~Accident Initiated Iodine Spike, rem~~	~~Pre-Accident Iodine Spike, rem~~	~~GDC 19 Guideline, rem~~
~~Thyroid CDE (0-30 days)~~	~~0.2~~	~~0.8~~	~~30~~
~~Whole Body DDE (0-30 days)~~	~~.002~~	~~.002~~	~~5~~
~~Beta Skin SDE (0-30 days)~~	~~0.09~~	~~0.09~~	~~30~~

~~TABLE 15.5-75~~

~~SUMMARY OF POST-LOCA DOSES FROM VARIOUS PATHWAYS (DF OF 100)~~

~~THYROID DOSES, rem~~

	~~EAB - 2 hours~~	~~LPZ - 30 days~~
~~10 CFR Part 100~~	~~300~~	~~300~~
~~Containment Leakage~~	~~107.06~~	~~19.01~~
~~RHR Pump Seal (50 gpm)~~	~~0~~	~~0.09~~
~~Pre-existing leak (1910 cc/hr)~~	~~8.22~~	~~2.12~~
~~Total~~	~~115.28~~	~~21.22~~

~~WHOLE BODY DOSES, rem~~

	~~EAB - 2 hours~~	~~LPZ - 30 days~~
~~10 CFR Part 100~~	~~25~~	~~25~~
~~Containment Leakage~~	~~3.24~~	~~0.293~~
~~RHR Pump Seal (50 gpm)~~	~~0.0~~	~~0.0~~
~~Pre-existing leak (1910 cc/hr)~~	~~0.03~~	~~0.003~~
~~Total~~	~~3.27~~	~~0.296~~

~~TABLE 15.5-76~~

~~WHOLE BODY DOSE CONVERSION FACTORS[(a)(b)]~~
~~DOSE EQUIVALENT XE-133~~

~~Nuclide~~	
~~Kr-85m~~	~~7.48E-15 (Sv-m^3/Bq-s)~~
~~Kr-87~~	~~4.12E-14 (Sv-m^3/Bq-s)~~
~~Kr-88~~	~~1.02E-13 (Sv-m^3/Bq-s)~~
~~Xe-133m~~	~~1.37E-15 (Sv-m^3/Bq-s)~~
~~Xe-133~~	~~1.56E-15 (Sv-m^3/Bq-s)~~
~~Xe-135m~~	~~2.04E-14 (Sv-m^3/Bq-s)~~
~~Xe-135~~	~~1.19E-14 (Sv-m^3/Bq-s)~~
~~Xe-138~~	~~5.77E-14 (Sv-m^3/Bq-s)~~

~~(a) Table III.1 of Federal Guidance Report 12, EPA-402-R-93-081, 1993.~~
~~(b) Note the AOR used conservative values with respect to the above.~~

TABLE 15.5-77

DCPP EQUILIRIUM CORE INVENTORY (Power Level: 3580 MWth)
Dose Significant Isotopes including the Parent, Grandparent and 2nd Parent Isotopes

ISOTOPE*	ACTIVITY (CURIES)	ISOTOPE*	ACTIVITY (CURIES)	ISOTOPE*	ACTIVITY (CURIES)
AG-110	2.67E+07	IN-125	8.46E+05	**SB-125**	9.63E+05
AG-110M	6.92E+05	IN-127	1.86E+06	**SB-127**	9.14E+06
AG-111	7.09E+06	IN-129	3.55E+06	**SB-129**	3.25E+07
AG-111M	7.09E+06	IN-131	1.09E+06	**SB-130**	1.08E+07
AG-112	3.16E+06	IN-132	2.85E+05	**SB-130M**	4.38E+07
AG-115	6.21E+05	**KR-83M**	1.14E+07	**SB-131**	7.67E+07
AG-115M	2.60E+05	**KR-85**	1.11E+06	**SB-132**	4.70E+07
AM-239	4.90E-01	**KR-85M**	2.33E+07	**SB-132M**	4.37E+07
AM-241	1.32E+04	**KR-87**	4.65E+07	**SB-133**	6.32E+07
AM-242	9.40E+06	**KR-88**	6.43E+07	SB-134	1.14E+07
AM-242M	8.54E+02	**KR-89**	7.94E+07	SB-135	5.46E+06
AM-243	5.28E+03	**KR-90**	8.48E+07	SB-136	8.63E+05
AM-244	3.79E+07	KR-91	5.83E+07	**SE-83**	5.38E+06
AM-245	1.12E-03	KR-92	3.12E+07	SE-83M	5.65E+06
AS-76	3.05E+03	KR-93	1.07E+07	SE-84	2.04E+07
AS-83	7.02E+06	KR-94	5.00E+06	SE-85	9.54E+06
BA-137M	1.30E+07	**LA-140**	1.85E+08	SE-87	1.32E+07
BA-139	1.76E+08	**LA-141**	1.61E+08	SE-88	7.15E+06
BA-140	1.78E+08	**LA-142**	1.57E+08	SE-89	2.49E+06
BA-141	1.59E+08	**LA-143**	1.48E+08	**SM-153**	6.04E+07
BA-142	1.51E+08	LA-144	1.31E+08	SM-155	4.30E+06
BA-143	1.29E+08	**MO-99**	1.84E+08	SM-156	2.66E+06
BA-144	9.93E+07	**MO-101**	1.69E+08	SM-157	1.70E+06
BR-82	4.44E+05	MO-103	1.62E+08	**SN-121**	8.43E+05
BR-82M	3.88E+05	MO-104	1.33E+08	**SN-123**	6.43E+04
BR-83	1.13E+07	MO-105	9.97E+07	**SN-125**	5.25E+05
BR-84	2.10E+07	MO-106	5.86E+07	SN-125M	1.58E+06
BR-85	2.31E+07	NB-101	1.59E+08	**SN-127**	3.69E+06
BR-87	3.67E+07	NB-104	5.10E+07	SN-127M	4.95E+06
BR-88	3.52E+07	**NB-95**	1.66E+08	SN-129	1.28E+07
BR-89	2.45E+07	**NB-95M**	1.89E+06	SN-129M	1.17E+07
BR-90	1.35E+07	**NB-97**	1.59E+08	SN-130	3.28E+07
CD-115	9.17E+05	**NB-97M**	1.50E+08	SN-131	2.83E+07

TABLE 15.5-77

DCPP EQUILIRIUM CORE INVENTORY (Power Level: 3580 MWth)
Dose Significant Isotopes including the Parent, Grandparent and 2nd Parent Isotopes

ISOTOPE*	ACTIVITY (CURIES)	ISOTOPE*	ACTIVITY (CURIES)	ISOTOPE*	ACTIVITY (CURIES)
CD-115M	4.43E+04	NB-99	1.07E+08	SN-132	2.28E+07
CD-121	7.67E+05	NB-99M	7.35E+07	SN-133	6.21E+06
CE-141	1.63E+08	**ND-147**	6.59E+07	SN-134	1.07E+06
CE-143	1.50E+08	ND-149	3.90E+07	**SR-89**	9.05E+07
CE-144	1.26E+08	ND-151	2.08E+07	**SR-90**	9.67E+06
CE-147	6.18E+07	NP-238	6.20E+07	**SR-91**	1.13E+08
CF-249	2.46E-02	**NP-239**	2.16E+09	**SR-92**	1.22E+08
CM-241	3.54E+00	NP-240	6.23E+06	**SR-93**	1.39E+08
CM-242	5.88E+06	**PD-109**	4.73E+07	**SR-94**	1.39E+08
CM-244	1.31E+06	PD-109M	3.12E+05	SR-95	1.25E+08
CM-245	1.26E+02	PD-111	7.09E+06	SR-97	4.68E+07
CO-58**	0.00E+00	PD-112	3.14E+06	**TB-160**	1.87E+05
CO-60**	0.00E+00	PD-115	7.84E+05	**TC-99M**	1.63E+08
CS-132	5.75E+03	**PM-147**	1.68E+07	**TC-101**	1.69E+08
CS-134	2.41E+07	**PM-148**	1.88E+07	TC-103	1.65E+08
CS-134M	5.63E+06	**PM-148M**	2.83E+06	**TC-104**	1.40E+08
CS-136	7.01E+06	**PM-149**	6.43E+07	**TC-105**	1.18E+08
CS-137	1.37E+07	**PM-151**	2.10E+07	TC-106	8.80E+07
CS-138	1.85E+08	PM-153	9.77E+06	**TE-127**	9.03E+06
CS-139	1.72E+08	**PR-142**	9.47E+06	**TE-127M**	1.52E+06
CS-140	1.54E+08	**PR-143**	1.47E+08	**TE-129**	3.10E+07
CS-141	1.17E+08	**PR-144**	1.27E+08	**TE-129M**	6.30E+06
CS-142	6.80E+07	PR-144M	1.76E+06	**TE-131**	8.28E+07
CS-143	3.41E+07	PR-147	6.52E+07	**TE-131M**	2.04E+07
DY-166	4.91E+02	PR-149	3.57E+07	**TE-132**	1.41E+08
EU-154	9.00E+05	PR-151	1.23E+07	**TE-133**	1.09E+08
EU-155	3.83E+05	**PU-238**	5.22E+05	**TE-133M**	8.93E+07
EU-156	3.90E+07	**PU-239**	3.06E+04	**TE-134**	1.75E+08
EU-157	4.12E+06	**PU-240**	4.87E+04	TE-135	9.68E+07
EU-158	1.01E+06	**PU-241**	1.36E+07	TE-136	4.29E+07
EU-159	5.15E+05	**PU-242**	3.34E+02	TE-137	1.45E+07
GA-72	1.71E+03	PU-243	7.36E+07	TE-138	3.65E+06
GA-77	1.66E+05	RA-224	5.16E-01	**TH-228**	5.14E-01
GD-159	8.91E+05	**RB-86**	2.50E+05	U-239	2.17E+09
GE-77	6.48E+04	RB-86M	2.07E+04	**XE-131M**	1.42E+06

TABLE 15.5-77

DCPP EQUILIRIUM CORE INVENTORY (Power Level: 3580 MWth)
Dose Significant Isotopes including the Parent, Grandparent and 2nd Parent Isotopes

ISOTOPE*	ACTIVITY (CURIES)	ISOTOPE*	ACTIVITY (CURIES)	ISOTOPE*	ACTIVITY (CURIES)
GE-77M	1.70E+05	**RB-88**	6.60E+07	**XE-133**	2.01E+08
GE-83	1.24E+06	**RB-89**	8.57E+07	**XE-133M**	6.42E+06
H-3	6.10E+04	**RB-90**	7.86E+07	**XE-135**	4.92E+07
HO-166	2.58E+04	**RB-90M**	2.53E+07	**XE-135M**	4.30E+07
I-129	4.00E+00	RB-91	1.05E+08	**XE-137**	1.84E+08
I-130	3.58E+06	RB-92	9.35E+07	**XE-138**	1.70E+08
I-130M	1.92E+06	RB-93	7.89E+07	XE-139	1.25E+08
I-131	9.90E+07	RB-94	4.13E+07	XE-140	8.66E+07
I-132	1.44E+08	RB-95	2.01E+07	XE-142	1.33E+07
I-133	2.01E+08	**RH-103M**	1.66E+08	**Y-90**	1.02E+07
I-134	2.22E+08	**RH-105**	1.08E+08	Y-90M	7.71E+02
I-134M	2.07E+07	**RH-105M**	3.43E+07	**Y-91**	1.19E+08
I-135	1.92E+08	**RH-106**	7.53E+07	**Y-91M**	6.57E+07
I-136	8.73E+07	RH-109	3.65E+07	**Y-92**	1.23E+08
I-137	9.40E+07	RN-220	5.16E-01	**Y-93**	9.41E+07
I-138	4.80E+07	**RU-103**	1.66E+08	**Y-94**	1.50E+08
I-139	2.22E+07	**RU-105**	1.21E+08	**Y-95**	1.57E+08
I-140	6.06E+06	**RU-106**	6.68E+07	Y-97	1.26E+08
IN-115M	9.17E+05	RU-109	3.16E+07	ZN-72	1.71E+03
IN-121	7.55E+04	**SB-122**	1.57E+05	ZR-101	9.55E+07
IN-121M	7.82E+05	SB-122M	1.57E+04	**ZR-95**	1.65E+08
IN-123	6.87E+05	**SB-124**	1.21E+05	**ZR-97**	1.58E+08
		SB-124M	2.34E+03	ZR-99	1.66E+08

Note:

* Isotopes in **Bold** Font are dose-significant for inhalation, submersion and direct shine. The parent, grandparent and second parent of the isotopes in **Bold** Font are also required to address daughter product in-growth.

The group of isotopes needed to determine the "submersion and inhalation" dose in the Control Room and at the Site Boundary is typically a subset of the isotopes listed above in **bold** font, and represent a small group of reasonably long half-life isotopes with significant inhalation dose conversion factors which dominate the TEDE dose.

To determine the total effective dose equivalent (TEDE) resulting from inhalation and submersion following a LOCA, the DCPP LOCA dose consequence analysis uses the default group of 60 isotopes provided with computer code RADTRAD 3.03 plus 13 additional nuclides that were deemed to be dose significant (i.e., Br-82, Br-84, Rb-88, Rb-89, Te-133, Te-133m, Te-134, I-130, Xe-131m, Xe-133m, Xe-138, Cs-138 and Np-238).

** Co-58 / Co-60 are activation products that are developed external to the core and typically do not appear in the equilibrium core inventory

TABLE 15.5-78

PRIMARY AND SECONDARY COOLANT
Technical Specification Activity Concentrations

Nuclide	Primary Coolant (µCi/gm)	Secondary Coolant (µCi/gm)
Kr-83M	1.87E-01	-----
Kr-85M	6.60E-01	-----
Kr-85	5.60E+00	-----
Kr-87	4.41E-01	-----
Kr-88	1.22E+00	-----
Xe-131M	1.88E+00	-----
Xe-133M	1.92E+00	-----
Xe-133	1.29E+02	-----
Xe-135M	4.07E-01	-----
Xe-135	3.76E+00	-----
I-131	7.87E-01	8.06E-02
I-132	2.99E-01	1.94E-02
I-133	1.16E+00	1.08E-01
I-134	1.67E-01	4.78E-03
I-135	6.68E-01	5.09E-02

TABLE15.5-79

PRIMARY COOLANT
Pre-Accident Iodine Spike Concentrations & Equilibrium Iodine Appearance Rates

Nuclide	Pre-Accident Spike RCS Concentrations (60 µCi/gm DE I-131) (µCi/gm)	Equilibrium Iodine Activity Appearance Rates into RCS (µCi/sec)
I-131	47.2	7.18E+03
I-132	17.9	7.78E+03
I-133	69.5	1.25E+04
I-134	10.0	8.91E+03
I135	40.1	9.91E+03

TABLE 15.5-80
ISOTOPIC GAP ACTIVITY
LOCKED ROTOR ACCIDENT / CONTROL ROD EJECTION ACCIDENT

Nuclide	Core Activity (Ci)	Fraction of Core Activity in Gap LRA	Core Gap Activity w/o Peaking Factor (Ci) LRA	Fraction of Core Activity in Gap CREA	Core Gap Activity w/o Peaking Factor (Ci) CREA
KR-85	1.11E+06	0.30	3.33E+05	0.10	1.11E+05
KR-85M	2.33E+07	0.10	2.33E+06	0.10	2.33E+06
KR-87	4.65E+07	0.10	4.65E+06	0.10	4.65E+06
KR-88	6.43E+07	0.10	6.43E+06	0.10	6.43E+06
Xe-131M	1.42E+06	0.10	1.42E+05	0.10	1.42E+05
Xe-133M	6.42E+06	0.10	6.42E+05	0.10	6.42E+05
XE-133	2.01E+08	0.10	2.01E+07	0.10	2.01E+07
XE-135	4.92E+07	0.10	4.92E+06	0.10	4.92E+06
Xe-138	1.70E+08	0.10	1.70E+07	0.10	1.70E+07
I-130	3.58E+06	0.10	3.58E+05	0.10	3.58E+05
I-131	9.90E+07	0.12	1.19E+07	0.10	9.90E+06
I-132	1.44E+08	0.10	1.44E+07	0.10	1.44E+07
I-133	2.01E+08	0.10	2.01E+07	0.10	2.01E+07
I-134	2.22E+08	0.10	2.22E+07	0.10	2.22E+07
I-135	1.92E+08	0.10	1.92E+07	0.10	1.92E+07
BR-82	4.44E+05	0.10	4.44E+04	0.10	4.44E+04
BR-84	2.10E+07	0.10	2.10E+06	0.10	2.10E+06
CS-134	2.41E+07	0.17	4.10E+06	-	-
CS-136	7.01E+06	0.17	1.19E+06	-	-
CS-137	1.37E+07	0.17	2.33E+06	-	-
CS-138	1.85E+08	0.17	3.15E+07	-	-
RB-86	2.50E+05	0.17	4.25E+04	-	-
Rb-88	6.60E+07	0.17	1.12E+07	-	-
Rb-89	8.57E+07	0.17	1.46E+07	-	-

Note: Values reported reflect the core isotopic gap activity assumed for the LRA and CREA. These values have to be adjusted for a) the failed fuel percentage (10%) and b) peaking factor (1.65), prior to assessing the associated dose consequences.

For the isotopic gap activity associated with the FHA refer to Table 15.5-47C.

TABLE 15.5-81

CONTROL ROOM
Analysis Assumptions & Key Parameter Values

Parameter	Value
Free Volume	170,000 ft^3
Unfiltered Normal Operation Intake	Total 4200 cfm ± 10% Unit 1: 2100 cfm ± 10% Unit 2: 2100 cfm ± 10%
Emergency Pressurization Flow Rate	650 – 900 cfm
Maximum Unfiltered Backdraft Damper Leakage during CR Pressurization Operation	100 cfm
Carbon / HEPA Filter Flow during CR Pressurization Operation	1800 – 2200 cfm
Emergency Filtered Recirculation Rate	1250 cfm (minimum)
Pressurization Intake and Recirculation Carbon/HEPA Filter Efficiency (includes filter bypass)	93% (iodine) 98% (particulates)
Unfiltered Inleakage (Normal and Pressurization Mode)	70 cfm (maximum) Includes 10 cfm ingress / egress
Occupancy Factors	0-24 hr (1.0)
	1 - 4 d (0.6)
	4-30 d (0.4)
Operator Breathing Rate	0-30 d (3.50E-04 m^3/sec)

TABLE 15.5-82

TECHNICAL SUPPORT CENTER
Analysis Assumptions & Key Parameter Values

Parameter	Value
Free Volume	51,250 ft^3
Filtered Rate (HEPA only) Normal Operation Intake Flow	500 cfm
Normal Intake HEPA Filter Efficiency(includes filter bypass)	98% (particulates)
Filtered (Carbon / HEPA) Pressurization Flow Rate	500 cfm
Flow through Carbon / HEPA Filter during Pressurization mode	1000 cfm
Filtered Recirculation flow rate during Pressurization mode	500 cfm (minimum)
Pressurization Intake and Recirculation Carbon / HEPA Filter Efficiency (includes filter bypass)	93% (iodine) 98% (particulates)
Unfiltered Inleakage	60 cfm (maximum) Includes 10 cfm ingress/egress
Occupancy Factors	0-24 hr (1.0)
	1 - 4 d (0.6)
	4-30 d (0.4)
Operator Breathing Rate	0-30 d (3.50E-04 m^3/sec)