Appendix 11A. Tables

Table 11-1. Parameters Used in the Calculation of Reactor Coolant Fission Product Activities During Normal Operation

1. Ultimate core thermal power, MWt	3636
2. Clad defects, as a percent of rated core thermal power being generated by rods with clad defects	0.12
3. Reactor coolant liquid mass, lbm	4.62×10^{5}
4. Reactor coolant full power average temperature, °F	590
5. Purification flow rate (normal) gpm	75
6. Effective cation demineralizer flow, gpm	3.0
7. Volume control tank volumes	
a. Vapor, ft^3	240
b. Liquid, ft^3	160
8. Fission product escape rate coefficients: [1]	
a) Noble gas isotopes, sec^{-1}	6.5×10^{-8}
b) Br, Rb, 1 and Cs isotopes, sec^{-1}	1.3×10^{-8}
c) Te isotopes, sec^{-1}	1.0×10^{-9}
d) Mo isotopes, sec^{-1}	2.0×10^{-9}
e) Sr and Ba isotopes, sec^{-1}	1.0×10^{-11}
f) Y, La, Ce, Pr isotopes, sec^{-1}	1.6×10^{-12}
9. Volume Control Tank noble gas stripping factors [2]	
Isotope	Stripping Fraction
Kr-85	2.3×10^{-1}
Kr-85m	2.7×10^{-1}
Kr-87	6.0×10^{-1}
Kr-88	4.3×10^{-1}
Xe-131m	1.0×10^{-2}

Xe-133	1.6×10^{-2}
Xe-133m	3.7×10^{-2}
Xe-135	1.8×10^{-1}
Xe-135m	8.0×10^{-1}
Xe-138	1.0
10. Boron Concentration and Reduction Rates a. B_o (initial cycle)	805 ppm
B' (initial cycle)	2.1 ppm/day
b. B_o (equilibrium cycle)	1080 ppm
B' (equilibrium cycle)	3.9 ppm/day
11. Pressurizer Volumes a. Vapor	720 ft^3
b. Liquid	1080 ft^3
12. Spray Line Flow	1.0 gpm
13. Pressurizer Stripping Fractions a. Noble gases	1.0
b. All other elements	

Note:

1. Escape rate coefficients are based on Westinghouse Fuel defect tests performed at the Saxton reactor. Recent experience at two plants operating with fuel rod defects has verified the listed escape rate coefficients.
2. Volume control tank purge rate is 0.7 scfm.
Volume control tank stripping efficiency is 40 percent.

Table 11-2. Design Basis Tritium Production for One Unit

Tritium Source	Total Produced (curies/yr)	Expected Release to Reactor Coolant (curies/yr)
Ternary Fission	10500	1050
Burnable Poison Rods (Initial Cycle)	1520	152
Soluble Boron		
(Initial Cycle)	222	222
(Equilibrium Cycle)	309	309
Lithium and Deuterium Reactions	110	110
Total Initial Cycle	12352	1540
Total Equilibrium Cycle	10919	1470
Basis:		
Power Level		3565 MWt
Load Factor		0.8
Release Fraction from Fuel		10%
Release Fraction from Burnable Poison Rods		10%
Burnable Poison Rod B-10 Mass		6160 gpm
Reactor Coolant Boron Concentration (Initial Cycle)		860 ppm
Reactor Coolant Boron Concentration (Equilibrium Cycle)		1200 ppm

Table 11-3. Reactor Coolant Fission and Corrosion Product Activities During Normal Operation

Isotope	Activity (μCi/gm)	Istope	Activity (μCi/gm)
H-3	1.0	Cs-134	2.8×10^{-2}
Br-83	5.9×10^{-3}	I-135	2.3×10^{-1}
Br-84	3.3×10^{-3}	Cs-136	1.5×10^{-2}
Br-85	3.8×10^{-4}	Cs-137	2.0×10^{-2}
Rb-86	9.5×10^{-5}	Ba-137m	2.0×10^{-2}
Rb-88	2.5×10^{-1}	Ba-140	2.4×10^{-4}
Sr-89	3.7×10^{-4}	La-140	1.7×10^{-4}
Sr-90	1.1×10^{-5}	Ce-141	7.4×10^{-5}
Y-90	1.3×10^{-6}	Ce-143	4.4×10^{-5}
Sr-91	7.6×10^{-4}	Pr-143	5.3×10^{-5}
Y-91m	4.5×10^{-4}	Ce-144	3.5×10^{-5}
Y-91	6.8×10^{-5}	Pr-144	4.2×10^{-5}
Y-93	4.0×10^{-5}	Cr-51	2.0×10^{-3}
Zr-95	6.4×10^{-5}	Mn-54	3.3×10^{-4}
Nb-95	5.3×10^{-5}	Fe-55	1.7×10^{-3}
Mo-99	9.1×10^{-2}	Fe-59	1.1×10^{-3}
Tc-99m	5.7×10^{-2}	Co-58	1.7×10^{-2}
Ru-103	4.8×10^{-5}	Co-60	2.1×10^{-3}
Rh-103m	5.6×10^{-5}	Kr-83m	2.2×10^{-2}
Ru-106	1.1×10^{-5}	Kr-85m	9.3×10^{-2}
Rh-106	1.3×10^{-5}	Kr-85	2.2×10^{-3}
Te-125m	3.1×10^{-5}	Kr-87	6.7×10^{-2}
Te-127m	3.0×10^{-4}	Kr-88	1.9×10^{-1}
Te-127	9.9×10^{-4}	Kr-89	6.3×10^{-3}
Te-129	2.0×10^{-3}	Xe-131m	5.6×10^{-3}
I-130	2.4×10^{-3}	Xe-133m	4.1×10^{-2}
Te-131m	2.8×10^{-2}	Xe-133	1.7
Te-131	1.4×10^{-3}	Xe-135m	1.6×10^{-2}
I-131	2.9×10^{-1}	Xe-135	2.2×10^{-1}
Te-132	2.9×10^{-2}	Xe-137	1.1×10^{-2}

Isotope	Activity (μCi/gm)	Istope	Activity (μCi/gm)
I-132	1.2×10^{-1}	Xe-138	5.4×10^{-2}
I-133	4.3×10^{-1}		
I-134	5.9×10^{-2}		

Table 11-4. Maximum Anticipated Reactor Coolant Fission and Corrosion Product Activities During Operation

Isotope	Activity (μCi/gm)	Istope	Activity (μCi/gm)
H-3	3.5	Cs-136	0.15
Br-84	4.3×10^{-2}	Cs-137	1.5
Rb-88	3.7	Cs-138	0.98
Rb-89	1.1×10^{-1}	Ba-140	4.3×10^{-3}
Sr-89	3.3×10^{-3}	La-140	1.5×10^{-3}
Sr-90	1.7×10^{-4}	Ce-144	3.4×10^{-4}
Sr-91	1.9×10^{-3}	Pr-144	3.4×10^{-4}
Sr-92	7.4×10^{-4}	Kr-85	8.8
Y-90	2.0×10^{-4}	Kr-85m	2.1
Y-91	6.1×10^{-3}	Kr-87	1.2
Y-92	7.2×10^{-4}	Kr-88	3.7
Zr-95	7.0×10^{-4}	Xe-131m	1.9
Nb-95	6.9×10^{-4}	Xe-133	2.81×10^{2}
Mo-99	5.3	Xe-133m	3.1
I-131	2.5	Xe-135	6.3
I-132	0.9	Xe-135m	0.7
I-133	4.0	Xe-138	0.7
I-134	0.6	Cr-51	2.0×10^{-3}
I-135	2.2	Mn-54	7.9×10^{-4}
Te-132	0.26	Mn-56	3.0×10^{-2}
Te-134	2.9×10^{-2}	Co-58	2.6×10^{-2}
Cs-134	0.3	Co-60	2.1×10^{-3}

Note:

1. Based on operation with defects in cladding of rods generating 1 percent of the core rated power and with the Waste Gas System removed from service.

Table 11-5. Parameters Used in Calculating Main Steam Iodine Concentrations

Fuel Defect Fraction	0.12%
Primary to Secondary Leak Rate	100 lbs/day
Steam Generator Water Mass	88,000 lbs/generator
Steam Generator Blowdown Rate	45,000 lbs/hr.
Steam Generator Internal Partition Factor for Iodine	0.01
Secondary System Demineralizer Iodine Decontamination Factor (DF)	10

Table 11-6. Main Steam Iodine Concentrations Resulting From Steam Generator Tube Leak

Isotope	Concentration (Microcuries/gram)
I-131	9.7×10^{-8}
I-132	2.9×10^{-8}
I-133	1.3×10^{-7}
I-134	5.8×10^{-9}
I-135	5.8×10^{-8}

Table 11-7. Design Basis Source Strengths for Radioactive Waste Systems Input Streams

The following list is an explanation of source strengths for various effluent streams.

[HISTORICAL INFORMATION NOT REQUIRED TO BE REVISED]

X	*X: Maximum anticipated nuclide concentration*	*(Table 11-3)*
Y	*Y: Normal operational nuclide concentration*	*(Table 11-4)*

Flag Letter	***Source Strength***
A	*Reactor coolant containing fission and corrosion products*
B	*Reactor coolant downstream of mixed-bed demineralizer*
C	*Reactor coolant downstream of mixed-bed and cation-bed demineralizers*
D	*Reactor coolant, demineralized, gas-stripped (see Volume Control Tank Activities - Table 11-8)*
E	*Reactor coolant, fully degassed*
F	*Reactor coolant, fully degassed, diluted with other leakage (drain header, dilution factor = 1/50)*
G	*Reactor coolant, diluted with other leakage (flush header, factor = 1/50)*
H	*Reactor coolant, degassed, evaporated (DF = 1000)*
I	*Reactor coolant, degassed demineralized, diluted 1/4.8 (Refueling water storage tank)*
J	*Reactor coolant, degassed, demineralized, diluted 1/4.8 (Refueling mode)*
K	*Reactor coolant, design basis LOCA sump*
L	*Reactor coolant, degassed, demineralized, diluted 1/8 (Fuel pool water)*
M	*Fuel Pool water, demineralized (Fuel Pool demineralizers effluent)*
N	*Evaporator concentrates, nonrecyclable (see Table 11-29 and Table 11-31, see Section 11.5.2 for inputs)*
O	*Demineralizer resins (1 part combined resins plus 2 parts sluice water (spent resin conc. from Table 11-29 divided by factor of 3, see Section 11.5.2 for inputs)*
P	*Demineralizer resin sluice water return (equal to Flag A)*
Q	*Waste Gas Tank (normal) (See Table 11-18 and divide by tank volume of 600 $Ft.^3$ for concentration)*
R	*Secondary side activity caused by steam generator tube leak (See Table 11-9)*
S	*Mixing and settling tank sludge (equal to Flag F)*
T	*Liquid waste systems tanks vent header (vapor)*
U	*Containment ventilation unit condensate drains*
V	*Spent resins (combined and decayed for 6 months assuming demineralizer resins replaced once per year - See Table 11-31 and Section 11.5.4)*

W	*Maximum activity allowed by Environmental Technical Specifications divided by tank volume of 600 $ft.^3$ for concentration*

Table 11-8. Maximum Volume Control Tank Activities. (Based on parameters given in Table 11-1)

		Vapor Activity (Curies)	
Isotope	**[1]Stripping Fractions with WGS Operating**	**Assuming Operations of WGS**	**Plant Without WGS**
Kr-85	0.35	6.8×10^{-1}	1.4
Kr-85m	0.50	6.6	6.6
Kr-87	0.69	2.2	2.3
Kr-88	0.57	1.0×10^{1}	1.1×10^{1}
Xe-131m	0.39	1.4	9.8
Xe-133	0.40	4.1×10^{2}	1.4×10^{3}
Xe-133m	0.41	8.3	1.5×10^{1}
Xe-135	0.48	2.6×10^{1}	2.6×10^{1}
Xe-138	1.00	4.5×10^{-1}	4.7×10^{-1}

Note:

1. Volume control tank purge rate is 0.7 scfm.
2. Stripping efficiency is 100 percent.

Table 11-9. Steam Generator Blowdown Concentrations

Isotope	Activity (μCi/gm)	Isotope	Activity (μCi/gm)
H-3	1.0×10^{-3}	I-134	5.9×10^{-7}
Br-83	1.1×10^{-7}	Cs-134	2.4×10^{-6}
Br-84	2.3×10^{-8}	I-135	5.8×10^{-6}
Br-85	3.0×10^{-10}	Cs-136	1.3×10^{-6}
Rb-86	8.3×10^{-9}	Cs-137	1.8×10^{-6}
Rb-88	1.1×10^{-6}	Ba-137m	1.4×10^{-6}
Sr-89	3.4×10^{-8}	Ba-140	1.7×10^{-8}
Sr-90	6.8×10^{-10}	La-140	1.2×10^{-8}
Y-90	1.4×10^{-10}	Ce-141	6.8×10^{-9}
Sr-91	3.4×10^{-8}	Ce-143	3.4×10^{-9}
Y-91m	1.6×10^{-8}	Pr-143	3.4×10^{-9}
Y-91	5.1×10^{-9}	Ce-144	3.4×10^{-9}
Y-93	1.7×10^{-9}	Pr-144	1.5×10^{-10}
Zr-95	6.8×10^{-9}	Cr-51	1.5×10^{-7}
Nb-95	6.8×10^{-9}	Mn-54	3.4×10^{-8}
Mo-99	6.8×10^{-6}	Fe-55	1.4×10^{-7}
Tc-99m	5.0×10^{-6}	Fe-59	1.0×10^{-7}
Ru-103	3.4×10^{-9}	Co-58	1.4×10^{-6}
Rh-103m	3.1×10^{-9}	Co-60	1.5×10^{-7}
Ru-106	6.8×10^{-10}	Kr-83m	5.6×10^{-9}
Rh-106	6.0×10^{-10}	Kr-85m	2.4×10^{-8}
Te-125m	1.7×10^{-9}	Kr-85	5.6×10^{-10}
Te-127m	1.7×10^{-8}	Kr-87	1.6×10^{-8}
Te-127	5.1×10^{-8}	Kr-88	4.9×10^{-8}
Te-129m	1.0×10^{-7}	Kr-89	1.6×10^{-9}
Te-129	9.5×10^{-8}	Xe-131m	1.5×10^{-9}
I-130	6.9×10^{-8}	Xe-133m	1.1×10^{-8}
Te-131m	1.7×10^{-7}	Xe-133	4.4×10^{-7}
Te-131	3.1×10^{-8}	Xe-135m	4.1×10^{-9}
I-131	9.7×10^{-6}	Xe-135	5.6×10^{-8}

Isotope	**Activity (μCi/gm)**	**Isotope**	**Activity (μCi/gm)**
Te-132	1.7×10^{-6}	Xe-137	2.9×10^{-10}
I-132	2.9×10^{-6}	Xe-138	1.4×10^{-8}
I-133	1.3×10^{-5}		

Table 11-10. Liquid Waste System Component Design Parameters

1 REACTOR COOLANT DRAIN TANK SUBSYSTEM PARAMETERS	
1.1 REACTOR COOLANT DRAIN TANK HEAT EXCHANGER	
Number	1 (per unit)
Type	Horizontal Shell & U-Tube
Heat transfer rate at normal conditions, Btu/hr	2.23×10^6
Estimated UA, Btu/hr - °F	7.0×10^4
Shell Side Data:	
Design pressure, psig	150
Design temperature, °F	250
Pressure loss at operating conditions, psid	15
Nozzle size, inches	3"
Material of construction	Carbon Steel
Fluid circulated	Component cooling water
Tube Side Data:	
Design pressure, psig	150
Design temperature, °F	250
Pressure loss at operating conditions, psid	10
Nozzle size, inches	3"
Material of construction	Stainless Steel
Fluid circulated	Borated reactor coolant
Design Parameters:	Shell
Flow, lbm/hr	1.12×10^5
Inlet temperature, °F	95
Outlet temperature, °F	115
1.2 REACTOR COOLANT DRAIN TANK	
Number	1 (per unit)
Internal volume, gal	350
Design pressure, internal, psig	100
Design pressure, external, psig	15
Design temperature, °F	250
Operating pressure range, psig	2-5
Cover gas	Hydrogen

Normal operating temperature, °F	170 or less
Material of construction	Stainless Steel
1.3 REACTOR COOLANT DRAIN TANK PUMPS	
Number	2 (per unit)
Type	Canned centrifugal
Design pressure, psig	150
Design temperature, °F	200
Material of construction	Stainless Steel
Design flow, gpm	100
Developed head @ design flow, ft	300
1.4 INCORE INSTRUMENTATION ROOM SUMP PUMPS	
Number	1 (per unit)
Type	Vertical sump pump
Design pressure, psig	150
Design temperature, °F	180
Material of construction	Stainless Steel
Design flow, gpm	50
Head at design flow, ft	75
1.5 CONTAINMENT FLOOR AND EQUIPMENT SUMP PUMPS	
Number	4 (per unit)
Type	Vertical sump pump
Design pressure, psig	150
Design temperature, °F	180
Material of construction	Stainless Steel
Design flow, gpm	50 gpm
Head at design flow, ft	25
2 WASTE DRAIN TANK SUBSYSTEM PARAMETERS	
2.1 WASTE DRAIN TANK	
Number	1 (for both units)
Internal volume, gal	5000
Design pressure; internal	Atmospheric
Design temperature, °F	200
Material of construction	Stainless Steel

Type	Vertical with diaphragm
2.2 WASTE DRAIN TANK PUMPS	
Number	2 (for both units)
Type	Canned centrifugal & mechanical seal centrifugal
Design pressure, psig	150
Design temperature, °F	200
Material of construction	Stainless Steel
Design flow, gpm	Condition 1: 35
	Condition 2: 100
Developed head, ft	Condition 1: 250
	Condition 2: 200
3 WASTE EVAPORATOR FEED TANK SUBSYSTEM PARAMETERS	
3.1 WASTE EVAPORATOR FEED TANK	
Number	1 (for both units)
Internal volume, gal	5000
Design pressure, internal	Atmospheric
Design temperature, °F	200
Material of construction	Stainless Steel
Type	Horizontal
3.2 WASTE EVAPORATOR FEED PUMPS	
Number	2 (for both units)
Type	Mechanical seal centrifugal
Design pressure, psig	150
Design temperature, °F	200
Material of construction	Stainless Steel
Design flow, gpm	Condition 1: 35
	Condition 2: 100
Developed head, ft	Condition 1: 250
	Condition 2: 200
3.3 WASTE EVAPORATOR FEED FILTERS	
Number	2 (for both units)
Type	Disposable
Design pressure, psig	150

Design temperature, °F	200
Design flow, gpm	35
Pressure loss at design flow, psig	Fouled - 20
	Unfouled - 5
Deleted per 2018 Update	
Material of construction	Stainless Steel
3.4 WASTE EVAPORATOR PACKAGE	
Number	1 (for both units)
Capacity	15 gpm
Feed concentration	10-2000 ppm B (as dilute boric acid)
Bottoms concentration	7000-7,700 ppm B
3.5 WASTE EVAPORATOR CONDENSATE DEMINERALIZER	
Number	1 (for both units)
Type	Flushable
Resin type	ROHM & HASS amberlite 1RM-150 or equivalent (H^+ OH^-- form)
Design pressure, internal, psig	150
Design temperature, °F	200
Resin volume, ft^3	30
Design flow - through, gpm	35
Material of construction	Stainless Steel
3.6 WASTE EVAPORATOR REAGENT TANK	
Number	1 (for both units)
Internal volume, gal	20
Design pressure, internal, psig	150
Design pressure, external	Atmospheric
Design temperature, °F	200
Material of construction	Stainless Steel
Type	Vertical
3.7 WASTE EVAPORATOR CONDENSATE FILTER	
Number	1 (for both units)
Type	Disposable
Design pressure, psig	150

Design temperature, °F	200
Design flow, gpm	35
Pressure loss at design flow, psid	Fouled - 20
Deleted Per 2018 Update	
Material of construction	Stainless Steel
3.8 RECYCLE MONITOR TANKS	
Number	2 (for both units)
Internal volume, gal	5000
Design pressure, internal	Atmospheric
Design temperature, °F	200
Material of construction	Stainless Steel
Type	Vertical with diaphragm
3.9 RECYCLE MONITOR TANK PUMPS	
Number	2 (for both units)
Type	A-canned rotor, B-Mechanical seal centrifugal
Design pressure, psig	150
Design temperature, °F	200
Material of construction	Stainless Steel
Design flow, gpm	Condition 1: 35
	Condition 2: 100
Developed head, ft	Condition 1: 250
	Condition 2: 200
3.10 WASTE EVAPORATOR CONDENSATE RETURN UNIT	
Number for both units	1
Receiver volume, gal	100
Design pressure, psig	200
Design temperature, °F	350
No. of pumps	2
Design flow, gpm	25
Design head, ft	65
3.11 WASTE EVAPORATOR FEED TANK SUMP PUMP	
Number	1 (for both units)
Type	Vertical sump pump

Design pressure, psig	150
Design temperature, °F	180
Material of construction	Stainless Steel
Design flow, gpm	50
Head at design flow, ft	31
3.12 RHR AND CS ROOM SUMP PUMPS	
Number	4 (for both units)
Type	Vertical sump pump
Design pressure, psig	150
Design temperature, °F	180
Material of construction	Stainless Steel
Design flow, gpm	100
Head at design flow, ft	65
3.13 EVAPORATOR CONCENTRATE LINES FLUSH TANK	
Number	1 (for both units)
Design pressure, psig	150
Design flow rate, gpm	15
Capacity, gal	50
Set temperature, °F	100-180
Min Inlet Temperature, °F	70
Time to heat total capacity, hrs	2.5
3.14 WASTE EVAPORATOR CONCENTRATES PUMP	
Number	1 (for both units)
Type	Double mechanical seal centrifugal
Design pressure, psig	150
Design temperature, °F	250
Material of construction	Stainless Steel
Design flow, gpm	35
Head at design flow, ft.	125
Seal cooling water requirements flow, gpm	0.5 min.
Temperature, °F	110 max.
Supply head, ft.	90 min.
3.15 MECHANICAL SEAL COOLING WATER PUMP	

Number	1 (for both units)
Type	Gear
Design pressure, psig	100
Design temperature, °F	140
Material of construction	Bronze
Design flow, gpm	2
Head at design flow, ft.	140
3.16 MECHANICAL SEAL COOLING WATER HEAT EXCHANGER	
Number	1 (for both units)
Type	Coil
Heat transfer rate at normal conditions, Btu/hr	3.0×10^4
Shell Side Data:	
Design pressure, psig	150
Design temperature, °F	140
Normal inlet temperature	95
Normal outlet temperature	101
Design flow rate, gpm	10
Pressure loss at normal operating conditions, psid	4
Material of construction	Carbon Steel
Tube Side Data:	
Design pressure, psig	150
Design temperature, °F	140
Normal inlet temperature	140
Normal outlet temperature	110
Design flow rate, gpm	2
Pressure loss at normal operating conditions, psid	2
Material of construction	Stainless Steel
MECHANICAL SEAL COOLING WATER TANK	
Number	1 (for both units)
Internal volume, gal.	8.9
Design pressure, internal, psig	Atmospheric
Design pressure, external, psig	Atmospheric

Material of construction	Stainless Steel
MECHANICAL SEAL COOLING WATER TANK	
Number	1 (for both units)
Internal volume, gal.	8.9
Design pressure, internal, psig	Atmospheric
Design pressure, external, psig	Atmospheric
Material of construction	Stainless Steel
MECHANICAL SEAL COOLING WATER FILTER	
Number	1 (for both units)
Type	Disposable
Design pressure, psig	100
Design temperature, °F	140
Design flow, gpm	2
Pressure drop, psid	Negligible
Deleted Per 2018 Update	
Material of construction	Stainless Steel
4 LAUNDRY AND HOT SHOWER TANK SUBSYSTEM PARAMETERS	
4.1 LAUNDRY AND HOT SHOWER TANK	
Number	1 (for both units)
Internal volume, gal.	10,000
Design pressure, internal	Atmospheric
Design temperature, °F	200
Material of construction	Stainless Steel
Type	Horizontal
4.2 LAUNDRY AND HOT SHOWER TANK STRAINER	
Number	1 (for both units)
Type	Basket
Design pressure, psig	150
Design temperature, °F	200
Design flow, gpm	35
Pressure loss at design flow	Negligible
Strainer mesh number	40 (1/16 inch)
Material of construction	Stainless Steel

4.3 LAUNDRY AND SHOWER TANK PUMP	
Number	1 (for both units)
Type	Centrifugal
Design pressure, psig	150
Design temperature, °F	200
Material of construction	Stainless Steel
Design flow, gpm	Condition 1: 35
	Condition 2: 100
Developed head, ft.	Condition 1: 250
	Condition 2: 200
4.4 LAUNDRY AND HOT SHOWER TANK PRIMARY FILTER	
Number	2 (for both units)
Type	Disposable
Design pressure, psig	150
Design temperature, °F	200
Design flow, gpm	35
Pressure loss at design flow, psid	Fouled - 75
	Unfouled - 5
Deleted Per 2018 Update	
Material of construction	Stainless Steel
4.5 LAUNDRY AND SHOWER TANK SECONDARY FILTER	
Number	1 (for both units)
Type	Disposable
Design pressure, psig	150
Design temperature, °F	200
Design flow, gpm	35
Pressure loss at design flow, psid	Fouled - 20
	Unfouled - 5
Deleted Per 2018 Update	
Material of construction	Stainless Steel
4.6 LAUNDRY AND HOT SHOWER TANK DEMINERALIZER (WM 1° IX)	
Number	1 (for both units)
Type	Flushable
Design pressure, internal, psig	150

Design temperature, °F	200
Resin ft^3	20
Design flow-through, gpm	20
Material of construction	Stainless Steel
4.7 WASTE MONITOR TANK DEMINERALIZER (WM 2° IX)	
Number	1 (for both units)
Type	Flushable
Resin type	Duolite
	S-37
	Absorbent resin
Design pressure, internal, psig	150
Design temperature, °F	200
Resin volume, ft^3	30
Design flow-through, gpm	35
Material of construction	Stainless Steel
4.8 WASTE MONITOR TANK FILTER	
Number	1 (for both units)
Type	Disposable
Design pressure, psig	150
Design temperature, °F	200
Design flow, gpm	35
Pressure loss at design flow, psid	Fouled - 20
	Unfouled - 5
Deleted Per 2018 Update	
Material of construction	Stainless Steel
4.9 WASTE MONITOR TANKS	
Number	2 (for both units)
Internal volume, gal	6399
Design pressure, internal	Atmospheric
Design temperature, °F	200
Material of construction	Stainless Steel
Type	Horizontal
4.10 WASTE MONITOR TANK PUMPS	

Number	2 (for both units)
Type	Mechanical seal
Design pressure, psig	150
Design temperature, °F	200
Material of construction	Stainless Steel
Design flow, gpm	Condition 1: 35
	Condition 2: 100
Developed head, ft	Condition 1: 250
	Condition 2: 200
4.11 MIXING AND SETTLING TANK	
Number	1 (for both units)
Type	Vertical cylindrical with steam panel coils and mixer
Capacity, gal	800
Design pressure	Atmospheric
Design temperature, °F	180
Normal operating temperature, °F	65
Material of construction, tank	Austenitic SS
Material of construction panel coils	Carbon Steel
Heat Transfer Requirements:	
Heat duty during heatup, Btu/hr	443,000
Steam temperature, °F	250
Initial fluid temperature, °F	32
Final fluid temperature, °F (design)	165 (65 normal)
Heatup time, hr	2
4.12 MIXING AND SETTLING TANK PUMP	
Number	1 (for both units)
Type	Canned centrifugal with external flushing
Design pressure, psig	150
Design temperature, °F	200
Material of construction	Stainless Steel
Design flow, gpm	Condition 1: 35
	Condition 2: 100
Developed head, ft	Condition 1: 250

	Condition 2: 200
4.13 MIXING AND SETTLING TANK SLUDGE PUMP	
Number	1 (for both units)
Type	Canned centrifugal with external flushing
Design pressure, psig	150
Design temperature, °F	200
Material of construction	Stainless Steel
Design flow, gpm	Condition 1: 35
	Condition 2: 100
Developed head, ft	Condition 1: 250
	Condition 2: 200
4.14 MIXING AND SETTLING TANK REAGENT TANK	
Number	1 (for both units)
Internal volume, gal	20
Design pressure, internal, psig	150
Design pressure, external	Atmospheric
Design temperature, °F	200
Material of construction	Stainless Steel
4.15 MIXING AND SETTLING TANK METERING PUMP	
Number	1 (for both units)
Type	Positive displacement with metered capacity
Design pressure, psig	150
Design temperature, °F	200
Material of construction	Stainless Steel
Design flow, gpm	1 to 5
4.16 MIXING AND SETTLING TANK CONDENSATE STRAINER	
Number	1 (for both units)
Type	Basket
Design pressure, psig	150
Design temperature, °F	200
Design flow, gpm	10 gpm
Pressure loss at design flow	Negligible

Strainer mesh number	40
Material of construction	Stainless Steel
4.17 LAUNDRY AND HOT SHOWER TANK PRE-STRAINER	
Number	1 (for both units)
Type	Basket
Design pressure, psig	50
Design temperature, °F	200
Max Flow, gpm	30
Pressure loss at max flow	Negligible
Strainer mesh number	20
5 FLOOR DRAIN TANK SUBSYSTEM PARAMETERS	
5.1 FLOOR DRAIN TANK	
Number	1 (for both units)
Internal volume, gal	10,000
Design pressure, internal	Atmospheric
Design temperature, °F	200
Material of construction	Stainless Steel
Type	Horizontal
5.2 FLOOR DRAIN TANK STRAINER	
Number	1 (for both units)
Type	Basket
Design pressure, psig	150
Design temperature, °F	200
Design flow, gpm	35
Pressure loss at design flow	Negligible
Strainer mesh number	40 (1/16 inch)
Material of construction	Stainless Steel
5.3 FLOOR DRAIN TANK PUMP	
Number	1 (for both units)
Type	Centrifugal
Design pressure, psig	150
Design temperature, °F	200
Material of construction	Stainless Steel

Design flow, gpm	Condition 1: 35
	Condition 2: 100
Developed head, ft	Condition 1: 250
	Condition 2: 200
5.4 FLOOR DRAIN TANK FILTER	
Number	2 (for both units)
Type	Disposable
Design pressure, psig	150
Design temperature, °F	200
Design flow, gpm	35
Pressure loss at design flow	Fouled - 75
Deleted Per 2018 Update	
Material of construction	Stainless Steel
5.5 FLOOR DRAIN TANK SUMP PUMPS	
Number	8 (for both units)
Type	Vertical sump pump
Design pressure, psig	150
Design pressure, °F	180
Material of construction	Stainless Steel
Design flow, gpm	50
Head at design flow, ft	50
5.6 FLOOR DRAIN TANK PRE-STRAINER	
Number	3 (for both units)
Type	Y
Design pressure, psig	50
Design temperature, °F	200
Max flow, gpm	200
Pressure loss at max flow, psid	.2
Strainer mesh number	20
5.7 VENTILATION UNIT CONDENSATE DRAIN TANK	
Number	1 (for each unit)
Internal volume, gal	4000
Design pressure, internal	Atmospheric

Design temperature, °F	150
Material of construction	Stainless Steel
5.8 VENTILATION UNIT CONDENSATE DRAIN TANK PUMPS	
Number	2 (for each unit)
Type	Centrifugal
Design pressure, psig	50
Design temperature, °F	150
Material of construction	Stainless Steel
Design flow, gpm	Condition 1: 100
	Condition 2: 50
Developed head, ft	Condition 1: 31
	Condition 2: 65
6 RADWASTE FACILITY SUBSYSTEM COMPONENTS	
6.1 AUXILIARY FLOOR DRAIN TANK	
Number	1 (for both units)
Internal Volume, gal.	50,000
Design pressure, psig	Atmospheric
Design temperature, °F	200
Material of construction	Seismic concrete with stainless steel liner
6.2 AUXILIARY WASTE EVAPORATOR FEED TANK	
Number	1 (for both units)
Internal volume, gal.	50,000
Design pressure, internal	Atmospheric
Design temperature, °F	200
Material of construction	Seismic concrete with stainless steel liner
6.3 AUXILIARY FLOOR DRAIN TANK PUMP	
Number	1 (for both units)
Type	Mechanical seal centrifugal
Design pressure, psig	150
Design temperature, °F	200
Material of construction	Stainless Steel
Design flow, gpm	100
Head at design flow, ft.	200

6.4 AUXILIARY WASTE EVAPORATOR FEED TANK PUMP	
Number	1 (for both units)
Type	Mechanical seal centrifugal
Design pressure, psig	150
Design temperature, °F	200
Material of construction	Stainless Steel
Design flow, gpm	100
Head at design flow, ft.	200
6.5 RADWASTE FACILITY SUMP PUMP	
Number	1 (for both units)
Type	Vertical sump pump
Design pressure, psig	150
Design temperature, °F	200
Material of construction	Stainless Steel
Design flow, gpm	50
Head at design flow, ft.	50
6.6 RADWASTE FACILITY PIPE TRENCH SUMP PUMPS	
Number	2 (for both units)
Type	Vertical sump pump
Design pressure, psig	150
Design temperature, °F	200
Material of construction	Stainless Steel
Design flow, gpm	35
Head at design flow, ft.	30
7.2 DECON EQUIPMENT SUMP PUMPS	
Number	2 (for both units)
Type	Vertical sump pump
Design pressure, psig	150
Design temperature, °F	200
Material of construction	Stainless Steel
Design flow, gpm	35
Head at design flow, ft.	30

Table 11-11. Estimates of Annual Liquid Waste Quantities from Two Units

	Volume (gal/yr) Processed and Discharged
Reactor Coolant Leakage and Letdown	1,400,000
Laundry and Hot Shower	600,000
Miscellaneous Wastes (Decontaminations, Lab Rinses, etc.)	100,000
Turbine Building Drain[1]	8,400,000
Totals	9,516,000

Note:

1. Turbine Building drains are not normally processed.

Table 11-12. Deleted Per 1992 Update

Table 11-13. Deleted Per 1992 Update

Table 11-14. Deleted Per 1992 Update

Table 11-15. Deleted Per 1992 Update

Table 11-16. Estimates of Radioactivity Concentration in Hydro Station Discharges Downstream of McGuire

The concentrations in the lakes indicated below can be expressed as a fraction of the channel concentration in Lake Norman as follows:

Hydro Station	Average Stream Flow (CFS)
Cowans Ford	2670
Mountain Island	2700
Wylie	4400
Fishing Creek	4860
Great Falls	5150

Mountain Island	= Lake Norman
Wylie	$= \frac{(2670)}{(2700)}$ x Lake Norman
Fishing Creek	$= \frac{(2670)}{(4400)}$ x Lake Norman
Great Falls	$= \frac{(2670)}{(4860)}$ x Lake Norman
Below Great Falls	$= \frac{(2670)}{(5150)}$ x Lake Norman

Assumptions:

For a conservative estimate of the dilution of the concentration of radio-isotopes in the water discharged from Lake Norman, the following assumptions can be made:

1. Ignore decay (short transit time).
2. Assume that all additional dilution occurs just upstream of each hydro station.

Table 11-17. Estimated Doses from Liquid Releases

[HISTORICAL INFORMATION NOT REQUIRED TO BE REVISED]

Maximum Whole Body Dose (Adult - all pathways)	*0.86 mrem*
Maximum Organ Dose - Liver (Adult - all pathways)	*1.1 mrem*

Assumptions:

1. *Reactor coolant fission product concentrations associated with .12 percent fuel defects.*
2. *Activated corrosion product concentrations from Table 11-3.*

Table 11-18. Waste Gas Tank Normal Inventories

Isotope	Activity (Curies)
KR 85M	2.6×10^{1}
KR 85	4.1×10^{3}
KR 87	3.1×10^{0}
Kr 88	2.8×10^{1}
XE 131M	4.9×10^{2}
XE 133M	4.8×10^{2}
XE 133	6.0×10^{4}
XE 135M	1.2×10^{-1}
XE 135	2.1×10^{2}

Assumptions:

1. Volume control tank stripping fractions are based upon a stripping efficiency of 40% (See Table 11-1).
2. percent fuel defects.
3. Decay during buildup is the only loss term.
4. The above inventories correspond to an equilibrium accumulation from station operation plus the noble gas contents from two degassed reactor coolant system volumes.
5. A continuous letdown of 75 gpm.

Table 11-19. Waste Gas System Component Data

WASTE GAS COMPRESSORS	
Quantity (per plant)	2
Design temperature, °F	180
Design pressure, psig	150
Operating suction pressure, psig	0.5
Design flow (N_2 at 140 °F and 110 psi (discharge), scfm	40
Material	Stainless Steel or Bronze
Operating temperature, °F	70-140
Operating pressure, psig	25-100
CATALYTIC HYDROGEN RECOMBINER	
Quantity (per plant)	2
Design temperature, °F	Note 1
Design pressure, psig	150
Design flow, scfm	50
Catalyst bed design life, yrs	40
Material	SS
Operating Conditions, Inlet	
Temperature, °F	70-140
Pressure, psig	25-100
Operating Conditions, Outlet	
Temperature, °F	70-140
Pressure, psig	20
WASTE GAS DECAY TANKS	
(Normal Power Service Tanks)	
Quantity	6
Type	Vertical cylindrical
Design temperature, °F	180
Design pressure, psig	150
Volume, ft^3	600
Material	CS
SHUTDOWN/STARTUP TANKS	

Quantity	2
Type	Vertical cylindrical
Design temperature, °F	180
Design pressure, psig	150
Volume, ft^3	600
Material	CS

Note :

1. Varies by component, but exceeds component operating temperature by 100°F.

Table 11-20. Waste Gas System Instrumentation - Design Parameters

Channel Number	Location of Primary Sensor	Design Press. (psig)	Design Temp. (°F)	Range	Alarm Setpoint	Control Setpoint	Location of Readout
			FLOW INSTRUMENTATION				
OWGFT 5190	Gas Decay Tank Water Flush	150	180	0-6000 gal.		Adjust in field	Local
			PRESSURE INSTRUMENTATION				
OWGPS 5040	Moisture Separator	150	180	0-100 psig			Local
OWGPS 5050	Moisture Separator	150	180	0-100 psig			Local
OWGPS 5100	Gas Decay Tank A	150	140	0-150 psig	140 psig		WG panel
OWGPS 5110	Gas Decay Tank B	150	140	0-150 psig	140 psig		WG panel
OWGPS 5120	Gas Decay Tank C	150	140	. 0-150 psig	140 psig		WG panel
OWGPS 5130	Gas Decay Tank D	150	150	0-150 psig	140 psig		WG panel
OWGPS 5140	Gas Decay Tank E	150	140	0-150 psig	140 psig		WG panel
OWGPS 5150	Gas Decay Tank F	150	140	0-150 psig	140 psig		WG panel
OWGPS 5080	Shutdown Tank A	150	140	0-150 psig	90 psig		WG panel
OWGPS 5090	Shutdown Tank B	150	140	0-150 psig	140 psig		WG panel

Channel Number	Location of Primary Sensor	Design Press. (psig)	Design Temp. (°F)	Range	Alarm Setpoint	Control Setpoint	Location of Readout
OGSPS 5020	Hydrogen Supply Header	150	120	. 0-160 psig			WG panel
OGNPG 5020	Nitrogen Supply Header	150	120	0-150 psig			WG panel
OWGPT 5170	Compressor Suction Header	100	180	2 psi vac. 2 psig	0.5 psi vac.	0.5 psi	WPS panel
OWGPG 5900	Gas Decay Tank Makeup Water	150	140	0-150 psig	2 psi		Local
OWGPG 5000 and OWGPG 5010	Volume Control Tank Discharge Pressure	150	200	0-20 psig			Local
OWGPG 5160	Gas Decay Tank Inlet Nitrogen Pressure	150	100	0-150 psig			Local
			LEVEL INSTRUMENTATION				
OWGLT 5040	Compressor Moisture Separator	150	180	0-30" H_2O	12" H_2O 8" H2O	15",-12", 8", 1" H_2O	WPS panel
OWGLT 5050	Compressor Moisture Separator	150	180	0-30" H_2O	12" H_2O 8" H_2O	15",-12" 8", 1" H_2O	WPS panel

INSTRUMENTATION SYMBOLS

C - CONTROL ROOM INSTRUMENT

R - REMOTE RACK OR PANEL INSTRUMENT

LOCALLY MOUNTED INSTRUMENT

V - UNIT DESIGNATION

Channel Number	Location of Primary Sensor	Design Press. (psig)	Design Temp. (°F)	Range	Alarm Setpoint	Control Setpoint	Location of Readout

W - SYSTEM DESIGNATION

X - INSTRUMENT DESIGNATION

Y - INSTRUMENT LOOP NUMBER

Z - IDENTIFIES MULTIPLE INSTRUMENTS OF THE SAME TYPE IN THE SAME LOOP.

SINGLE LETTER L.D.

P - RECEIVER

EQUIP. TWO LETTER I.D.

RD - RTD ELEMENT

CR - RECORDER

LL - LIMIT SWITCH

SV - SOLENOID VALVE

VP - VALVE POSITION TRANSMITTER CS - CONTROL SWITCH

EP - E/P CONVERTER

PE - P/E CONVERTER

PA - POWER ACTUATOR

SS - SELECTOR STATION

ML - MANUAL LOADER

FIRST LETTER OF TWO LETTER I.D.

T - TEMPERATURE

P - PRESSURE

F - FLOW

L - LEVEL

R - RADIATION

SECOND LETTER OF TWO LETTER I.D.

T TRANSMITTER

X TEST POINT

A ALARM

I INDICATOR

S SWITCH

Channel Number	Location of Primary Sensor	Design Press. (psig)	Design Temp. (°F)	Range	Alarm Setpoint	Control Setpoint	Location of Readout
C	- CONDUCTIVITY			E	WITH "T" TO INDICATE THERMOCOUIPLE WELL		
S	- SPEED			E	WITH "F" TO INDICATE FLOW ELEMENT		
V	- VIBRATION			E	WITH "C" TO INDICATE CONDUCTIVITY ELEMENT		
M	- MISCELLANEOUS			G	WITH "P" TO INDICATE PRESSURE GAGE		
				H	WITH "T" TO INDICATE THERMOMETER		

Table 11-21. Reduction in Reactor Coolant System Radioactive Fission Product Gaseous Activity. Resulting from Normal Operation of the Waste Gas System At 3580 MWt Core Thermal Power with 1 Percent Fuel Defects

	Reactor Coolant Gaseous Fission Product Activities - uCi/cc (580°F)	
Isotope	**WG Operating**	**WG Not Operating**
Kr-85	0.15	8.8
Kr-85m	2.1	2.1
Kr-87	1.2	1.2
Kr-88	3.7	3.7
Xe-131m	0.3	1.9
Xe-133	83	280
Xe-133m	1.6	3.1
Xe-135	5.9	6.3
Xe-135m	0.7	0.7
Xe-138	0.7	0.7

Note:

1. Purification letdown rate = 75 gpm
2. Purge rate - 0.7 scfm

Table 11-22. Parameters Used to Estimate Annual Average Airborne Radioactivity Releases from Two Units

Percent Fuel Defects	0.12%
Containment Building	
Primary Coolant Leakage Rate to Containment Atmosphere	0.001%/day
Iodine (Percentage of Primary Coolant Inventory) Nobles Gases (Percentage of Primary Coolant Inventory)	 1.0%/day
Frequency of Containment Purge Containment Auxiliary Carbon Filter Iodine DF	8 purges/year/plant
(Lower compartment)	10
Auxiliary Building	
Primary Coolant Leakage Rate Iodine Partition Factor	320 lb/day/plant 0.0075
Primary to Secondary Leakage Rate	110 lb/day/unit
Steam Generator Blowdown Rate	45000 lb/hr.
Secondary System Demineralizer Iodine DF	10
Secondary System Iodine Partition Factors	
Steam Generator Internal Partition Air Ejectors Steam Packing Exhauster	0.01 0.15 0.01
Turbine Building	
Main Steam Leakage Rate Iodine Partition Factor (Steam) Liquid Leakage Rate to Turbine Bldg. Sump Iodine Partition Factor (Liquid)	3400 lb/hr/plant 1.0 20 gal/min plant 0.0075

Table 11-23. Estimates of Annual Radioactivity Releases in Gaseous Waste from Two Units (Curies)

Isotope	Waste Gas Decay Tanks	Reactor Building Purge	Auxiliary Building Ventilation	Turbine Building Steam Leaks	Air Ejector	Total
Kr-85m	Note 1	5.5	2.0	Note 1	1.3	8.7
Kr-85	2.6×10^{2}	1.3	Note 1	Note 1	Note 1	2.6×10^{2}
Kr-87	Note 1	1.2	1.4	Note 1	Note 1	2.6
Kr-88	Note 1	7.5	4.1	Note 1	2.5	1.4×10^{1}
Xe-131m	3.4	3.0	Note 1	Note 1	Note 1	6.4
Xe-133m	Note 1	1.4×10^{1}	Note 1	Note 1	Note 1	1.4×10^{1}
Xe-133	1.5	7.8×10^{2}	3.6×10^{1}	Note 1	2.2×10^{1}	8.4×10^{2}
Xe-135	Note 1	2.4×10^{1}	4.6	Note 1	2.9	3.2×10^{1}
Xe-138	Note 1	Note 1	1.2	Note 1	Note 1	1.2
I-131	Note 1	1.4×10^{-2}	4.6×10^{-3}	5.3×10^{-4}	2.9×10^{-2}	4.8×10^{-2}
I-133	Note 1	8.4×10^{-3}	6.8×10^{-3}	7.3×10^{-4}	4.2×10^{-2}	5.8×10^{-2}

Note:

1. indicates that release is <1.0 Ci/yr for noble gases and <0.001 Ci/yr for iodine.

Table 11-24. Gaseous Discharges for 1971 From Westinghouse PWR Plants

Plant	Total Released (Equiv. Xe-133) Curies	Avg. Annual Site Boundary Dose mr/yr	Fraction 10CFR20
I	12.4	0.033	6.6×10^{-5}
II	3990.0	7.1	1.4×10^{-2}
III	7666.0	2.3	4.6×10^{-3}
IV	31,855.0	4.5	9.0×10^{-3}
V	838.0	0.067	1.4×10^{-3}

Table 11-25. Release Points Data

	Unit 1 Vent	Unit 2 Vent
Vent Shape	Cylindrical	Cylindrical
Inside Diameter	7' - 0"	7' - 0"
Maximum Effluent Velocity	3900 Fpm	3100 Fpm
1Maximum Effluent Velocity	3100 Fpm	2200 Fpm
Maximum Heat Input to Atmosphere	5X106 BTU/h	4X106 BTU/h
1Maximum Heat Input to Atmosphere	4X106 BTU/h	3X106 BTU/h

Note:

1. Occurs whenever the Containment Purge and Ventilation System is inactive.

Table 11-26. Estimated Doses From Gaseous Releases

[HISTORICAL INFORMATION NOT REQUIRED TO BE REVISED]

Maximum Whole Body Dose (*Exclusion Area Boundary*)	*0.45 mrem/yr*
Maximum Thyroid Dose (*Infant-Goat Milk Pathway*)	*1.7 mrem/yr*
Maximum Beta Air Dose (*Exclusion Area Boundary*)	*0.96 mrad/yr*
Maximum Gamma Air Dose (*Exclusion Area Boundary*)	*0.37 mrad/yr*
Maximum Skin Dose (*Exclusion Area Boundary*)	*0.75 mrem/yr*

Table 11-27. Liquid Process Radiation Monitoring Equipment

Detector Number	Identification	Location	Function	Detect or Type	Typical Sensitivity	Range Counts/Minute	Design Service
1-EMF-31	Conventional Waste/Water Treatment Monitor	Turbine Bldg. EL 741 1-C-24-25	Monitor effluent to Conventional Waste/Water Treatment System. Stop turbine room pumps and terminate discharge on high alarm when turbine room pump align to Conventional Waste/Water Treatment System.	NaI Scint.	$3x10^8$ cpm per µCi/ml Cs-137	$10^1 - 10^7$	Normal Operation Gross Gamma
1-EMF-34	Steam Generator sample	EL 716 FF-55,56	Detect Steam Generator tube leak and terminate sampling	NaI Scint.	$3x10^8$ cpm per µCi/ml Cs-137	$10^1 - 10^7$ (1)$10^1 - 10^6$	Normal Operation Gross Gamma
1-EMF-44	Containment Ventilation Unit Condensate Monitor	EL 716 BB-50	Monitor effluent and terminate discharge on high alarm	NaI Scint. GM	$3x10^8$ cpm perµCi/ml Cs-137	$10^1 - 10^7$ (1)$10^1 - 10^6$	Normal Operation Gross Gamma
1-EMF-45A 1-EMF-45B	Nuclear Service Water Monitor	EL 733 JJ-55	Detect Containment Spray Heat exchanger tube failure	NaI Scint.	$3x10^8$ cpm per µCi/ml Cs-137	$10^1 - 10^7$ (1)$10^1 - 10^6$	Post LOCA Gross Gamma
1-EMF-46A 1-EMF-46B	Component Cooling Water Monitor	EL 750 GG-56	Detect Heat exchanger leaks	NaI Scint.	$3x10^8$ cpm per µCi/ml Cs-137	$10^1 - 10^7$	Normal Operation Gross Gamma
0EMF-47	Boron Recycle Evaporator Condensate Monitor	EL 733 MM-56	Monitor and divert evaporator condensate	NaI Scint.	$3x10^8$ cpm per µCi/ml Cs-137	$10^1 - 10^7$	Normal Operation Gross Gamma
1-EMF-48	Reactor Coolant Monitor	EL 716 EE, FF-54	Detect Fuel Clad Failure	NaI Scint.	$8x10^3$ cpm per µCi/ml F.P.	$10^1 - 10^7$	Normal Operation Gross Gamma
0EMF-49	Waste Liquid Monitor	EL 716 KK, LL-56,57	Monitor effluent and terminate discharge on high alarm	NaI Scint. GM	$3x10^8$ cpm per µCi/ml Cs-137	$10^1 - 10^7$ (1)$10^1 - 10^6$	Normal Operation Gross Gamma

Detector Number	Identification	Location	Function	Detect or Type	Typical Sensitivity	Range Counts/Minute	Design Service
2-EMF-31	Condensate Wastewater Monitor	Turbine Bldg. EL 741 U-28	Monitor effluent to conventional wastewater treatment system. Stop turbine room pumps on high level alarm	NaI Scint. GM	$3x10^8$ cpm per µCi/ml Cs-137	10^1 - 10^7	Normal Operation Gross Gamma
2-EMF-34	Steam Generator Sample monitor	EL 716 EE, FF-57,58	Detect Steam Generator tube leak and terminate sampling	NaI Scint. GM	$3x10^8$ cpm per µCi/ml Cs-137	10^1 - 10^7 (1) 10^1 - 10^6	Normal Operation Gross Gamma
2-EMF-44	Containment Ventilation Unit Condensate Monitor	EL 716 BB-62	Monitor effluent and terminate discharge on high alarm	NaI Scint. GM	$3x10^8$ cpm per µCi/ml Cs-137	10^1 - 10^7 (1) 10^1 - 10^6	Normal Operation Gross Gamma
2-EMF-45A 2-EMF-45B	Nuclear Service Water Monitor	EL 733 JJ-57	Detect Containment Spray heat exchanger tube failure	NaI Scint. GM	$3x10^8$ cpm per µCi/ml Cs-137	10^1 - 10^7	Post LOCA Gross Gamma
2-EMF-46A 2-EMF-46B	Component Cooling Water Monitor	EL 750 GG-56	Detect heat exchanger leaks	NaI Scint.	$3x10^8$ cpm per µCi/ml Cs-137	10^1 - 10^7	Normal Operation Gross Gamma
2-EMF-48	Reactor Coolant Monitor	EL 716 EE, FF-57,58	Detect Fuel Clad Failure	NaI Scint.	$8x10^3$ cpm per µCi/ml F.P.	10^1 - 10^7	Normal Operation Gross Gamma

Note:
1. High Range (Shielded) – GM

Table 11-28. Airborne Activity Process Radiation Monitoring Equipment

Detector Number	Identification	Location (1)	Function	Detector Type	Typical Sensitivity	Counts/Minute	Design Service
1-EMF-24	Main Steam Line	Outboard Doghouse	Monitor Effluent Release for noble gas	G-M	Per Procedure	10^{-1}-10^{4} mR/hr	Normal Operation and tube rupture for gross gamma
1-EMF-25		Inboard Doghouse					
1-EMF-26		Inboard Doghouse					
1-EMF-27		Outboard Doghouse					
1-EMF-33	Condensate Air Ejector	Turb. Bldg	Detect noble gas indicative of SG tube leak	NaI Scint.	Per Procedure	10^{1} - 10^{7}	Normal Operation Gross Gamma
1-EMF-35	Unit Vent Air Part.	EL 767 JJ-50,51	Monitor buildup on filter from effluent sample	Plastic Scint.	$4x10^{12}$ cpm per µCi/ml Cs-137	10^{-2} - 10^{4}	Normal Operation Gross Beta
1-EMF-36 (HH)	Unit Vent Activity	U-1 Vent Stack	Monitor effluent activity for noble gas	Ionization	per procedure	10° - 10^{8} R/hr	LOCA
1-EMF-36	Unit Vent Gas	EL 767 JJ-50,51	Monitor effluent sample for noble gas	Plastic Scint. GM	$2x10^{7}$ cpm per µCi/ml Xe-133	10^{1} - 10^{7} (1)10^{1} - 10^{6}	Normal Op & LOCA for noble gas
1-EMF-37	Unit Vent Iodine	EL 767 JJ-50,51	Monitor buildup on filter from effluent sample	NaI Scint.	$2x10^{4}$ cpm per µCi/ml I-131(2)	10^{1} - 10^{7}	Normal Op & LOCA for Iodine
1-EMF-38	Containment Air Part.	EL 750 HH-53,54	Monitor buildup on filter from building sample	Plastic Scint.	$4x10^{12}$ cpm per µCi/ml Cs-137	10^{-2} - 10^{4}	Normal Operation Gross Beta

Detector Number	Identification	Location (1)	Function	Detector Type	Typical Sensitivity	Counts/Minute	Design Service
1-EMF-39	Containment Gas	EL 750 HH-53,54	Monitor building sample for noble gas	Plastic Scint. GM	$2x10^7$ cpm per µCi/ml Xe-133	10^1 - 10^7 (1)10^1 - 10^6	Normal Operation for noble gas
1-EMF-40	Containment Iodine	EL 750 HH-53,54	Monitor buildup on filter from building sample	NaI Scint.	$2x10^4$ cpm per µCi/ml I-131(2)	10^1 - 10^7	Normal Operation for Iodine
0EMF-41	Auxiliary Building Ventilation	EL 750 KK-56	Monitor Vent. for noble gas indicative of leak	Plastic Scint.	$2x10^7$ cpm per µCi/ml Xe-133	10^1 - 10^7	Normal Operation for noble gas
1-EMF-42	Spent Fuel Building Ventilation	EL 767 QQ-52	Monitor Vent. for noble gas	Plastic Scint.	$2x10^7$ cpm per µCi/ml Xe-133	10^1 - 10^7	Normal Operation for noble gas
0EMF-43	Control Room Ventilation	EL 750, CC-46 CC-66	Monitor Vent. for noble gas	Plastic Scint.	$2x10^7$ cpm per µCi/ml Xe-133	10^1 - 10^7	Normal Operation & Post LOCA for noble gas
0EMF-50	Waste Gas Discharge	EL 716MM-55,56	Monitor effluent & terminate discharge on high alarm	Plastic Scint. GM	$2x10^7$ cpm per µCi/ml Xe-133	10^1 - 10^7 (1)10^1 – 10^6	Normal Operation for Gross Beta
1-EMF-51A 1-EMF-51B	Reactor Bldg. Activity	L.C. 335°. 17R L.C. 200°, 17R	Monitor Reactor Building Activity	Ionization	Per Procedure	10^0 - 10^8R/hr	Normal Operation & LOCA for gross radioactivity
0EMF-52	Interim Radwaste Facility Ventilation Exhaust	2" Floor Int. Radwaste Bldg.	Monitor Vent. for noble Gas	Plastic Scint.	$4x10^7$ cpm per µCi/ml Xe-133	10^1 - 10^7	Normal Operation for noble gas
0EMF-53	Contaminated Parts Warehouse Ventilation Exhaust	EL 775 VV-61,62	Monitor Vent. for noble Gas	Plastic Scint.	$4x10^7$ cpm per µCi/ml Xe-133	10^1 - 10^7	Normal Operation for noble gas

Detector Number	Identification	Location (1)	Function	Detector Type	Typical Sensitivity	Counts/Minute	Design Service
0EMF-54	Technical Support Center Ventilation Intake	EL-790 1J-34 2J-34	Monitor Vent. for noble Gas	Plastic Scint.	2x10^7 cpm per µCi/ml Xe-133	10^1 - 10^7	LOCA
1-EMF-71 1-EMF-72 1-EMF-73 1-EMF-74	S/G A Leakage S/G B Leakage S/G C Leakage S/G D Leakage	Turb Bldg	Detect N-16 in Steam Line indicative of S/G tube leak	NaI Scint.	Per Procedure	10^1-10^7 10^0-10^5 GPD	Normal Operation above 40% Reactor Power
2-EMF-10	Main Steam Line	Outboard Doghouse	Monitor effluent release for noble gas	G-M	Per Procedure	10^{-1}-10^4 mR/hr	Normal operation and tube rupture for gross gamma
2-EMF-11		Inboard Doghouse					
2-EMF-12		Inboard Doghouse					
2-EMF-13		Outboard Doghouse					
2-EMF-33	Condenser Air Ejector	Turb. Bldg.	Detect noble gas indicative of SG tube leak	NaI Scint.	Per Procedure	10^1 - 10^7	Normal Operation Gross Gamma
2-EMF-35	Unit Vent Air Part.	EL 767 JJ-61,62	Monitor buildup on filter from effluent sample	Plastic Scint.	4x10^{12} cpm per µCi/ml Cs-137	10^{-2} - 10^4	Normal Operation Gross Beta
2-EMF-36 (HH)	Unit Vent Activity	U-2 Vent Stack	Monitor Effluent Activity for noble gas	Ionization	Per Procedure	10° - 10^8 R/hr	LOCA

Detector Number	Identification	Location (1)	Function	Detector Type	Typical Sensitivity	Counts/Minute	Design Service
2-EMF-36	Unit Vent Gas	EL 767 JJ-61,62	Monitor effluent sample for noble gas	Plastic Scint. GM	$2x10^7$ cpm per µCi/ml Xe-133	10^1 - 10^7 (3)10^1 - 10^6	Normal Op & LOCA for noble gas
2-EMF-37	Unit Vent Iodine	EL 767 JJ-61,62	Monitor buildup on filter from effluent sample	NaI Scint.	$2x10^4$ cpm per µCi/ml I-131(2)	10^1 - 10^7	Normal Op & LOCA for Iodine
2-EMF-38	Containment Air Part.	EL 750 HH-58,59	Monitor buildup on filter from building sample	Plastic Scint.	$4x10^{12}$ cpm per µCi/ml Cs-137	10^{-2} - 10^4	Normal Operation Gross Beta
2-EMF-39	Containment Gas	EL 750 HH-58,59	Monitor building sample for noble gas	Plastic Scint. GM	$2x10^7$ cpm per µCi/ml Xe-133	10^1 - 10^7 (1)10^1 - 10^6	Normal Operation for noble gas
2-EMF-40	Containment Iodine	EL 750 HH-58,59	Monitor buildup on filter from building sample	NaI Scint.	$2x10^4$ cpm per µCi/ml I-131(2)	10^1 - 10^7	Normal Operation for Iodine
2-EMF-42	Spent Fuel Building Ventilation	EL 767 QQ-60	Monitor vent. for noble gas	Plastic Scint.	$2x10^7$ cpm per µCi/ml Xe-133	10^1 - 10^7	Normal Operation for noble gas
2-EMF-51A	Reactor Bldg. Activity	L.C. 335°, 17'R	Monitor reactor building activity	Ionization	Per Procedure	10^0 - 10^8R/hr	Normal Operation & LOCA for gross radioactivity
2-EMF-51B		L.C. 200°, 17'R					
2-EMF-59	U-2 Staging Building	U-2 Staging Building	Monitor Vent for Noble Gas	Plastic Scint.	$4x10^7$ CPM per µCi/ml Xe-133	10^1 - 10^7	Normal operation for noble gas

Detector Number	Identification	Location (1)	Function	Detector Type	Typical Sensitivity	Counts/Minute	Design Service
2-EMF-71 2-EMF-72 2-EMF-73 2-EMF-74	S/G A Leakage S/G B Leakage S/G C Leakage S/G D Leakage	Turb Bldg	Detec N-16 in Steam Line indicative of S/G tube leak	NaI Scint.	Per Procedure	10^1-10^7 10^0-10^5 GPD	Normal Operation above 40% Reactor Power

Note:

1. Based on activity deposited on collection medium.
2. 1EMF37 sample flow pathway has been bypassed and it no longer provides indication of unit vent iodine activity.

Table 11-29. Estimated Maximum Specific Activities Input to Nuclear Solid Waste Disposal System

	Spent Resins Arriving at Storage Tank (μCi/cc)
Br85	3.4×10^{-2}
Rb88	1.7×10^{0}
Rb89	3.8×10^{-2}
Sr89	7.1×10^{0}
Sr90	1.2×10^{0}
Sr91	2.9×10^{-2}
Sr92	3.2×10^{-3}
Y90	1.5×10^{-3}
Y91M	1.9×10^{-2}
Y91	1.3×10^{0}
Y92	3.9×10^{-4}
ZR95	1.6×10^{0}
Nb95	8.8×10^{-1}
Mo99	5.5×10^{1}
I131	7.6×10^{2}
I132	3.2×10^{0}
I133	1.2×10^{2}
I134	7.3×10^{-1}
I135	2.2×10^{1}
Te132	3.2×10^{1}
Te134	3.2×10^{-2}
Cs134	2.0×10^{2}
Cs136	6.8×10^{0}
Cs137	1.2×10^{-3}
Cs138	7.6×10^{-2}
Ba140	2.0×10^{0}
La140	8.8×10^{-2}
Ce144	2.0×10^{0}
Pr144	1.4×10^{-4}
Mn54	5.0×10^{1}
Mn56	1.2×10^{0}

	Spent Resins Arriving at Storage Tank (μCi/cc)
Co58	6.5×10^{2}
Co66	6.6×10^{1}
Fe59	1.7×10^{1}
Cr51	9.7×10^{0}
H3	---
Total	2.5×10^{3}

Table 11-30. Nuclear Solid Waste Disposal System Component Design Parameters (Two Units)

1. Spent Resin Storage Tanks	
a. Quantity	2
b. Total Volume, GAL.	5000
c. Resin Storage Volume, GAL.	3600
d. Design Pressure, PSIG	100
e. Design Temperature, °F	200
f. Material	Stainless Steel
2. Chemical Drain Tank	
a. Quantity	1
b. Total Volume, GAL.	600
c. Design Pressure, PSIG	0
d. Design Temperature, °F	200
e. Material	Stainless Steel
3. Evaporator Concentrates Storage Tank	
a. Quantity	1
b. Total Volume, GAL.	3000
c. Design Pressure, PSIG	0
d. Design Pressure, °F	200
e. Material	Stainless Steel
4. Resin Batching Tank	
a. Quantity	1
b. Total Volume, GAL.	800
c. Design Pressure, PSIG	0
d. Design Pressure, °F	150
e. Material	Stainless Steel
5. (Deleted)	
6. (Deleted)	
7. (Deleted)	
8. (Deleted)	
9. Spent Resin Sluice Pump	
a. Quantity	1
b. Design Flow, GPM	140

c. Total Head, FT	250
d. Design Pressure, PSIG	150
e. Design Temperature, °F	200
f. Material	Stainless Steel
g. Type	Canned Horizontal Centrifugal
10. Chemical Drain Tank Pump	
a. Quantity	1
b. Design Flow, GPM	35
c. Total Head, FT	250
d. Design Pressure, PSIG	150
e. Design Temperature, °F	200
f. Material	Stainless Steel
g. Type	Canned Horizontal Centrifugal
11. (Deleted)	
12. Aux Radwaste Transfer Pump	
a. Quantity	1
b. Design Flow, GPM	90
c. Total Head, FT	220
d. Material	Stainless Steel
e. Type	Positive Displacement Duel Diaphragm
13. (Deleted)	
14. Dewatering Pump	
a. Quantity	1
b. Design Flow, GPM	10
c. Total Head, PSIG	130
d. Material	Stainless Steel
e. Type	Single Stage Regenitive Turbine
15. Spent Resin Sluice Filter	
a. Quantity	1
b. Type	Disposable Cartridge
c. Design Pressure, PSIG	150
d. Design Temperature, °F	200
e. Design Flow, GPM	150

	f. Pressure Drop at Design Flow (Clean), PSI	5
	1) Retention for 25 Micron Particles, %	98
	g. Maximum Pressure Differential (Fouled), PSI	20
	h. Material	Stainless Steel
16.	Resin Batching Tank Mixer	
	a. Quantity	1
	b. Type	Top Entering, Vertically Mounted, Turbine
	c. Motor, HP	5
	d. Material	Stainless Steel
17.	(Deleted)	
18.	(Deleted)	
19.	Contaminated Oil Transfer Pump	
	a. Quantity	1
	b. Type	Screw Type
	c. Design pressure, psig	150
	d. Design temperature, °F	120
	e. Material of construction	Carbon Steel
	f. Design flow, gpm	14
	g. Pressure at design, flow	40
20.	Evaporator Concentrates Batch Tank	
	a. Quantity	1
	b. Total volume, gal	1450
	c. Design pressure, internal	Atmospheric
	d. Design temperature, °F	200
	e. Material of construction	Stainless Steel
21.	Contaminated Oil Storage Tank	
	a. Quantity	1
	b. Total volume, gal	6000
	c. Design pressure, internal	Atmospheric
	d. Design temperature, °F	120
	e. Material of construction	Carbon Steel (lined)

Table 11-31. Estimated Maximum Volumes Discharged from Nuclear Solid Waste Disposal System (Two Units)

	Volumes[1] (ft^3/year)	**Nature of Waste**
Spent Resins	2400	Chemical resins and fission and corrosion products - includes powdex
Filters	300	Filter cartridges with fission and corrosion products, resin fines, particulates, etc.
Miscellaneous Solids	32,000	Rags, paper, glass, clothing, etc. with fission and corrosion products prior to compaction

Note:

1. Does not include matrix or solidification materials.

Table 11-32. Estimated Maximum Isotopic Activity Discharged from Nuclear Solid Waste Disposal System (Two Units)

	Spent Resins (curies/year)
Sr89	2.4×10^{0}
Sr90	4.6×10^{0}
Sr91	---
Sr92	---
Y90	4.6×10^{0}
Y91M	---
Y91	5.9×10^{-1}
Zr95	8.9×10^{-1}
Nb95	1.7×10^{0}
Mo99	---
I131	4.4×10^{-4}
I132	---
I133	---
I135	---
Te132	---
Cs134	6.8×10^{2}
Cs136	1.6×10^{-3}
Cs137	4.6×10^{3}
Ba140	3.9×10^{-4}
La140	4.5×10^{-4}
Ce144	5.0×10^{0}
Pr144	5.0×10^{0}
Mn54	1.3×10^{2}
Mn56	---
Co58	4.2×10^{2}
Co60	2.4×10^{2}
Fe59	4.0×10^{0}
Cr51	4.0×10^{-1}
H3	---
TOTAL	5.4×10^{3}

Table 11-33. Estimated Doses Concerning Critical Pathways to Man for Radionuclides Releases to the Environment

	mrem/yr
Airborne Related Pathways	
1. Submersion (all ages-skin)	0.75
2. Inhalation (infant-thyroid)	0.58
3. Milk (infant-thyroid)	1.7
4. Vegetation (child-thyroid)	0.77
Water Related Pathways	
5. Lake and Shoreline Recreation (teenager-whole body)	0.005
6. Water (infant-thyroid)	0.53
7. Fish (adult-liver)	0.99

Table 11-34. Examples of Analytical Sensitivity Versus Permissible and Discharge Canal Concentrations

Radionuclides	Discharge Canal Concentration μCi/ml	Concentration Permitted[1] by NRC Regulations μCi/ml	Sensitivity of Analysis μCi/ml
1. Releases into Water			
Tritium	1.9×10^{-6}	1×10^{-3}	2×10^{-9}
Sr^{90}	3.3×10^{-14}	5×10^{-7}	1×10^{-9}
Cs^{137}	4.4×10^{-10}	1×10^{-6}	1×10^{-9}
Co^{60}	1.5×10^{-12}	3×10^{-6}	1×10^{-8}
I^{131}	4.1×10^{-10}	1×10^{-6}	1×10^{-8}
2. Releases into Air			
Radionuclide			
I^{131}	3.7×10^{-14}	2×10^{-10}	1×10^{-14}

Note:

1. 10CFR 20 Appendix B, Table 2 Limits