TABLE 11.1-1

REACTOR COOLANT AND MAIN STEAM
RADIONUCLIDE CONCENTRATIONS

Isotope	Reactor Coolant Design (Ci/g)	Reactor Coolant Expected (Ci/g)	Main Steam Design (Ci/g)	Main Steam Expected (Ci/g)
Noble Gases[1]				
Kr-83m			5.5-3[2]	9.1-4
Kr-85m			9.7-3	1.6-3
Kr-85			3.0-5	5.0-6
Kr-87			3.3-2	5.5-3
Kr-88			3.3-2	5.5-3
Kr-89			2.1-1	3.4-2
Kr-90			4.6-1	7.5-2
Kr-91			5.5-1	9.1-2
Kr-92			5.5-1	9.1-2
Kr-93			1.5-1	2.4-2
Kr-94			3.6-2	5.9-3
Kr-95			3.3-3	5.5-4
Kr-97			2.2-5	3.6-6
Xe-131m			2.4-5	3.9-6
Xe-133m			4.6-4	7.5-5
Xe-133			1.3-2	2.1-3
Xe-135m			4.3-2	7.0-3
Xe-135			3.6-2	6.0-3
Xe-137			2.4-1	3.9-2
Xe-138			1.4-1	2.3-2
Xe-139			4.6-1	7.5-2
Xe-140			4.9-1	8.0-2
Xe-141			4.0-1	6.5-2
Xe-142			1.2-1	1.9-2
Xe-143			1.9-2	3.2-3
Xe-144			9.1-4	1.5-4
Halogens				
•→14				
Br-83	3.5-2	5.8-3	1.4-3	2.3-4
Br-84	3.5-2	5.8-3	1.4-3	2.2-4
Br-85	2.2-2	2.3-3	8.8-4	1.0-4
I-131	2.1-2	3.4-3	9.1-4	1.5-4
I-132	3.1-1	5.1-2	1.3-2	2.1-3
I-133	2.8-1	4.6-2	1.2-2	1.9-3
I-134	4.9-1	8.1-2	2.6-2	4.3-3
I-135	2.7-1	4.5-2	1.1-2	1.9-3
14←•				

TABLE 11.1-1 (Cont)

	Reactor Coolant		Main Steam	
Isotope	Design (Ci/g)	Expected (Ci/g)	Design (Ci/g)	Expected (Ci/g)
Cesium and Rubidium				
Rb-89	2.3-2	3.8-3	2.3-5	3.8-6
Cs-134	1.7-4	2.7-5	1.7-7	2.7-8
Cs-136	1.1-4	1.8-5	1.1-7	1.8-8
Cs-137	4.4-4	7.3-5	4.4-7	7.3-8
Cs-138	2.5-1	7.8-3	2.5-4	7.8-6
Water Activation Products				
●→14				
N-13	7.1-2	5.0-2	4.2-2	4.2-2
N-16	6.0+1	6.0+1	3.0+2	3.0+2
N-17	1.3-2	9.0-3	2.1-1	1.2-1
O-19	1.2+0	7.0-1	5.9-1	1.0-1
F-18	4.8-2	4.0-3	4.0-3	4.0-3
14←●				
Tritium				
H-3	1.0-2	1.0-2	1.0-2	1.0-2
Other Nuclides				
Na-24	9.0-3	9.0-3	9.0-6	9.0-6
P-32	1.9-4	1.9-4	1.9-7	1.9-7
Cr-51	5.6-3	5.6-3	5.6-6	5.6-6
Mn-54	6.5-5	6.5-5	6.5-8	6.5-8
Mn-56	5.0-2	4.2-2	5.0-5	4.2-5
Fe-55	9.3-4	9.3-4	9.3-7	9.3-7
Fe-59	8.0-5	2.8-5	8.0-8	2.8-8
Co-58	5.0-3	1.9-4	5.0-6	1.9-7
Co-60	5.0-4	3.7-4	5.0-7	3.7-7
Ni-63	9.3-7	9.3-7	9.3-10	9.3-10
Ni-65	3.0-4	2.5-4	3.0-7	2.5-7
Cu-64	2.7-2	2.7-2	2.7-5	2.7-5
Zn-65	1.9-4	1.9-4	1.9-7	1.9-7
Zn-69m	1.8-3	1.8-3	1.8-6	1.8-6
Sr-89	3.3-3	9.3-5	3.3-6	9.3-8
Sr-90	2.5-4	6.5-6	4.5-7	6.5-9
Sr-91	8.1-2	3.6-3	8.1-5	3.6-6
Sr-92	1.4-1	8.4-3	1.4-4	8.4-6
Y-91	2.2-4	3.7-5	2.2-7	3.7-8
Y-92	3.1-2	5.1-3	3.1-5	5.1-6
Y-93	2.2-2	3.6-3	2.2-5	3.6-6
Zr-95	4.5-5	7.4-6	4.5-8	7.4-9

TABLE 11.1-1 (Cont)

Isotope	Reactor Coolant Design (Ci/g)	Reactor Coolant Expected (Ci/g)	Main Steam Design (Ci/g)	Main Steam Expected (Ci/g)
Zr-97	3.6-5	5.4-6	3.6-8	5.4-9
Nb-95	4.5-5	7.4-6	4.5-8	7.4-9
Nb-98	1.9-2	3.2-3	1.9-5	3.2-6
Mo-99	2.5-2	1.8-3	2.5-5	1.8-6
Tc-99m	1.1-1	1.8-2	1.1-4	1.8-5
Tc-101	4.3-1	7.0-2	4.3-4	7.0-5
Tc-104	3.8-1	6.2-2	3.8-4	6.2-5
Ru-103	1.2-4	1.9-5	1.2-7	1.9-8
Ru-105	1.0-2	1.7-3	1.0-5	1.7-6
Ru-106	1.7-5	2.8-6	1.7-8	2.8-9
Ag-110m	6.0-5	9.3-7	6.0-8	9.3-10
Te-129m	3.7-4	3.7-5	3.7-7	3.7-8
Te-131m	5.5-4	9.1-5	5.5-7	9.1-8
Te-132	1.5-2	9.2-6	1.5-5	9.2-9
Ba-139	2.0-1	8.2-3	2.0-4	8.2-6
Ba-140	9.5-3	3.7-4	9.5-6	3.7-7
Ba-141	2.4-1	7.8-3	2.4-4	7.8-6
Ba-142	2.3-1	4.6-3	2.3-4	4.6-6
La-142	2.5-2	4.1-3	2.5-5	4.1-6
Ce-141	1.7-4	2.8-5	1.7-7	2.8-8
Ce-143	1.6-4	2.7-5	1.6-7	2.7-8
Ce-144	3.8-5	2.8-6	3.8-8	2.8-9
Pr-143	2.2-4	3.7-5	2.2-7	3.7-8
Nd-147	1.7-5	2.8-6	1.7-8	2.8-9
W-187	3.0-3	2.7-4	3.0-6	2.7-7
Np-239	2.6-1	7.4-3	2.6-4	7.4-6

[1] The design and expected concentration for noble gases in reactor coolant are negligible

[2] 5.5-3 = 5.5×10^{-3}

TABLE 11.1-2

PARAMETERS USED TO DETERMINE REACTOR COOLANT AND MAIN STEAM RADIONUCLIDE CONCENTRATIONS*

Variable	Unit
Maximum core thermal power	3,039 MWt
•→14 Total steam flow rate	1.32×10^7 lb/hr
Weight of reactor coolant in the reactor vessel, including recirculation lines	4.49×10^5 lb
Reactor coolant cleanup system flow rate	1.24×10^5 lb/hr
Condensate demineralizer flow rate	9.65×10^6 lb/hr

14←•

* Parameters unchanged for TPO (Appendix K) uprate as other conservatisms in the analyses produce results that bound TPO uprate conditions.

TABLE 11.1-3

GENERAL ELECTRIC DATA
NOBLE RADIOGAS SOURCE TERMS

Isotope	Half-Life	Source Term @t=0 (μCi/sec)	Source Term @t=30 min (μCi/sec)
Kr-83m	1.86 hr	3.4×10^{3}	2.9×10^{3}
Kr-85m	4.4 hr	6.1×10^{3}	5.6×10^{3}
Kr-85	10.74 yr	10 to 20*	10 to 20*
Kr-87	76 min	2.0×10^{4}	1.5×10^{4}
Kr-88	2.79 hr	2.0×10^{4}	1.8×10^{4}
Kr-89	3.18 min	1.3×10^{5}	1.8×10^{2}
Kr-90	32.3 sec	2.8×10^{5}	---
Kr-91	8.6 sec	3.3×10^{5}	---
Kr-92	1.84 sec	3.3×10^{5}	---
Kr-93	1.29 sec	9.9×10^{4}	---
Kr-94	1.0 sec	2.3×10^{4}	---
Kr-95	0.5 sec	2.1×10^{3}	---
Kr-97	1 sec	1.4×10^{1}	---
Xe-131m	11.96 day	1.5×10^{1}	1.5×10^{1}
Xe-133m	2.26 day	2.9×10^{2}	2.8×10^{2}
Xe-133	5.27 day	8.2×10^{3}	8.2×10^{3}
Xe-135m	15.7 min	2.6×10^{4}	6.9×10^{3}
Xe-135	9.16 hr	2.2×10^{4}	2.2×10^{4}
Xe-137	3.82 min	1.5×10^{5}	6.7×10^{2}
Xe-138	14.2 min	8.9×10^{4}	2.1×10^{4}
Xe-139	40 sec	2.8×10^{5}	---
Xe-140	13.6 sec	3.0×10^{5}	---
Xe-141	1.72 sec	2.4×10^{5}	---
Xe-142	1.22 sec	7.3×10^{4}	---
Xe-143	0.96 sec	1.2×10^{4}	---
Xe-144	9 sec	5.6×10^{2}	---
TOTALS		2.5×10^{6}	1.0×10^{5}

*Estimated from experimental observations

THIS TABLE HAS BEEN DELETED

TABLE 11.1-4

GENERAL ELECTRIC DATA
POWER ISOLATION EVENT -
ANTICIPATED OCCURRENCE

TABLE 11.1-5

GENERAL ELECTRIC DATA
REACTOR WATER FISSION PRODUCT RADIOHALOGENS

Isotope	Half-Life	Concentration* (μCi/g)
Br-83	2.40 hr	1.7×10^{-2}
Br-84	31.8 min	3.5×10^{-2}
Br-85	3.0 min	2.2×10^{-2}
I-131	8.065 day	1.5×10^{-2}
I-132	2.284 hr	1.5×10^{-1}
I-133	20.8 hr	1.0×10^{-1}
I-134	52.3 min	3.0×10^{-1}
I-135	6.7 hr	1.5×10^{-1}

*Based on noble gas release rate of 100,000 μCi/sec after 30 min

TABLE 11.1-6

GENERAL ELECTRIC DATA
OTHER FISSION PRODUCT RADIOISOTOPES IN REACTOR WATER

Isotope	Half-Life		Concentration* (μCi/g)
Sr-89	50.8	day	3.3×10^{-3}
Sr-90	28.9	yr	2.5×10^{-4}
Sr-91	9.67	hr	8.1×10^{-2}
Sr-92	2.69	hr	1.4×10^{-1}
Zr-95	65.5	day	4.3×10^{-5}
Zr-97	16.8	hr	3.6×10^{-5}
Nb-95	35.1	day	4.5×10^{-5}
Mo-99	66.6	hr	2.5×10^{-2}
Tc-99m	6.007	hr	9.4×10^{-2}
Tc-101	14.2	min	2.0×10^{-1}
Ru-103	39.8	day	2.1×10^{-5}
Ru-106	368	day	2.8×10^{-6}
Te-129m	34.1	day	3.7×10^{-4}
Te-132	78	hr	1.5×10^{-2}
Cs-134	2.06	yr	1.7×10^{-4}
Cs-136	13	day	1.1×10^{-4}
Cs-137	30.2	yr	2.6×10^{-4}
Cs-138	32.3	min	2.5×10^{-1}
Ba-139	83.3	min	2.0×10^{-1}
Ba-140	12.8	day	9.5×10^{-3}
Ba-141	18.3	min	2.4×10^{-1}
Ba-142	10.7	min	2.3×10^{-1}
Ce-141	32.53	day	4.3×10^{-5}
Ce-143	33.0	hr	3.9×10^{-5}
Ce-144	284.4	day	3.8×10^{-5}
Pr-143	13.58	day	4.1×10^{-5}
Nd-147	11.06	day	1.5×10^{-5}
Np-239	2.35	day	2.6×10^{-1}

*Based on noble gas release rate of 100,000 μCi/sec after 30 min

TABLE 11.1-7

GENERAL ELECTRIC DATA
COOLANT ACTIVATION PRODUCTS IN REACTOR WATER AND STEAM

Isotope	Half-Life	Steam Concentration (μCi/g)	Reactor Water Concentration (μCi/g)
N-13	9.99 min	1.5×10^{-3}	7.1×10^{-2}
N-16	7.13 sec	5.0×10^{1}	3.5×10^{1}
N-17	4.14 sec	3.5×10^{-2}	1.3×10^{-2}
O-19	26.8 sec	5.9×10^{-1}	1.2×10^{0}
F-18	109.8 min	4.4×10^{-4}	4.8×10^{-2}

•→14
Note: These are the GE provided values for Normal Water Chemistry.
14←•

TABLE 11.1-8

GENERAL ELECTRIC DATA
NONCOOLANT ACTIVATION PRODUCTS IN REACTOR WATER

Isotope	Half-Life	Concentration (μCi/g)
Na-24	15 hr	2×10^{-3}
P-32	14.31 day	2×10^{-5}
Cr-51	27.8 day	5×10^{-4}
Mn-54	313 day	4×10^{-5}
Mn-56	2.582 hr	5×10^{-2}
Co-58	71.4 day	5×10^{-3}
Co-60	5.258 yr	5×10^{-4}
Fe-59	45 day	8×10^{-5}
Ni-65	2.55 hr	3×10^{-4}
Zn-65	243.7 day	2×10^{-6}
Zn-69m	13.7 hr	3×10^{-5}
Ag-110m	253 day	6×10^{-5}
W-187	23.9 hr	3×10^{-3}

TABLE 11.2-1

EQUIPMENT DESCRIPTION LIQUID - RADWASTE SYSTEM

A. TANKS

•→10

Item No. 1LWS-TK	Name	Capacity Each (gal)	Design Temp (°F)	Design Press (psig)	Material	Quantity
1A,B,C,D	Waste collector	22,633	150	(1)	Fiberglass	4
2A,B,C	Floor drain	22,633	150	(1)	Fiberglass	3
3A, B	Regenerant waste	22,633	150	(1)	Fiberglass	2
4A,B,C,D	Recovery sample	17,200	150	(1)	Fiberglass	4
10←•						
6A, B	Phase separator	5,600	150	(1)	Fiberglass	2
7	Backwash	10,700	150	(1)	Fiberglass	1
22	Polyelec-trolyte	200	120	(1)	Polyethylene	1

TABLE 11.2-1 (Cont)

B. PUMPS

Item No. 1LWS-P	Name	Capacity (gpm)	TDH (ft)	Design Press (psig)	Quantity
1A, 1B	Waste collector	110	500	250	2
2A, 2B	Floor drain collector	110	500	250	2
3A	Regenerant waste	110	235	150	1
4A,4B, 4C,4D	Recovery sample	165	335	250	4
6A, 6B	Phase separator	55	240	150	2
7A, 7B	Backwash tank pumps	55	185	150	2
8A, B	Media filter backwash	350	80	250	2
22 A, B,C	Polyelec-trolyte	11(2)	NA(3)	250	3

TABLE 11.2-1 (Cont)

•→10

C. DEMINERALIZER (TREATMENT) VESSELS

Item No. 1LWS-DEMN	Capacity (gpm)	Volume (ft^3)	Design Temp (°F)	Design Press (psig)	Type	Material	Quantity
1A, B	100	60	150	150	Regenerable cation	Rubber-lined C.S.	2
2A, B	100	75	150	150	Regenerable stratified anion	Rubber-lined C.S.	2
3A, B	100	50	150	150	Regenerable mixed bed	Rubber-lined C.S.	2

10←•

TABLE 11.2-1 (Cont)

D. FILTERS

Item No. 1LWS-FLT	Name	Design Temp (°F)	Design Press (psig)	Capacity (gpm)	Flow Flux (gpm/ft)	Material	Quantity
1A, B	Radwaste	150	350	100	1	C.S./ 304 S.S.	2

E. STRAINERS

Item No. 1LWS-STR	Capacity (gpm)	Design Temp (°F)	Design Press (psig)	Operating Temp (°F)	Operating Press (psig)	Material	Quantity
4A, B	100	150	250	120	230	316 S.S.	2
6A, B	100	250	150	120	130	316 S.S.	2

(1) Tank design pressure is liquid static head
(2) Capacity in gallons per hour
(3) Positive displacement pump

TABLE 11.2-2

APPLICABLE CODES AND STANDARDS FOR LIQUID SYSTEMS

Description	Safety Class	Code	Code Class	Earth-quake Cri-teria	Tornado Criteria	QA Cat. 1
Tanks (steel or alloy)	NNS	ASME VIII non-stamped	-	No	No	No
Tanks (poly-ester)	NNS	(1)	-	No	No	No
Filters	NNS	(3)	-	No	No	No
Demineral-izers	NNS	ASME VIII	-	No	No	No
Pumps	NNS	(2)	-	No	No	No

(1) Polyester atmospheric storage tanks are filament-wound, fiberglass-reinforced plastic plastic tanks designed to meet the National Bureau of Standards PS15-69 and the Society of Plastics Industries tentative standard for filament-wound tanks.
(2) For vertical turbine type pumps of Safety Class NNS and operating above 150 psi or 212°F, ASME Section VIII, Division I, is used as a guide in calculating the wall thickness for pressure-retaining parts. For all other pumps, manufacturer's standard for intended pump service may be used.
(3) Radwaste filter to ASME VIII.

TABLE 11.2-3

MATERIAL AND ACTIVITY BALANCE -
LIQUID RADWASTE SYSTEM

•→14

Input	Average 1-Unit Flow (GPD)	Discharge Fraction	Fraction of Primary Coolant Activity
•→10 Floor drains	5,700	0.1	0.001
Equipment drains			
Drywell	3,400	0.01	1.00
Containment, auxiliary building, and fuel pool	3,700	0.01	0.10
Radwaste bldg	1,100	0.01	0.10
Turbine bldg	3,000	0.01	0.001
Ultrasonic resin cleaner backwash	15,000	0.01	0.05
Resin rinse	2,500	0.01	0.002
Phase separator decant	320	0.01	0.002
Chemical wastes (decon and lab drains)	600	0.1	0.02
Solid waste dewater	4,802	0.1	0.002

10←• 14←•

TABLE 11.2-4

EXPECTED ANNUAL LIQUID RELEASES

Isotope	Activity (uCi/g)	Released (Ci)
Na-24	1.2-09*	5.0-03
P-32	3.5-11	1.5-04
Cr-51	1.0-09	4.5-03
Mn-54	1.2-11	5.0-05
Mn-56	1.2-09	5.5-03
Fe-55	1.7-10	7.5-04
Fe-59	5.1-12	2.3-05
Co-58	3.5-11	1.6-04
Co-60	6.8-11	3.0-04
Ni-63	1.7-13	7.5-07
Ni-65	7.2-12	3.2-05
Cu-64	3.3-09	1.5-02
Zn-65	3.5-11	1.6-04
Zn-69m	4.1-12	1.8-05
Sr-89	1.7-11	7.5-05
Sr-90	1.2-12	6.0-06
Sr-91	3.8-10	1.7-03
Sr-92	2.7-10	1.2-03
Y-91	7.5-12	3.3-05
Y-92	6.3-10	2.8-03
Y-93	4.0-10	1.8-03
Zr-95	1.4-12	6.0-06
Zr-97	7.2-13	3.2-06
Nb-95	1.4-12	6.0-06
Nb-98	5.6-12	2.5-05
Mo-99	3.1-10	1.4-03
Tc-99m	1.4-09	6.0-03
Tc-101	3.0-14	1.3-07
Tc-104	2.6-13	1.2-06
Ru-103	3.5-12	1.6-05
Ru-105	1.0-10	4.5-04
Ru-106	5.2-13	2.3-06
Ag-110m	1.7-13	7.5-07
Te-129m	6.8-12	3.0-05
Te-131m	1.4-11	6.0-05
Te-132	1.6-12	7.0-06
Ba-139	6.6-11	2.9-04
Ba-140	6.7-11	3.0-04
Ba-141	3.8-14	1.7-07
Ba-142	6.1-17	2.7-10
La-142	4.9-11	2.2-04

TABLE 11.2-4 (Cont)

Isotope	Activity (uCi/g)	Released (Ci)
Ce-141	5.1-12	2.3-05
Ce-143	4.2-12	1.9-05
Ce-144	5.2-13	2.3-06
Pr-143	6.8-12	3.0-05
Nd-147	5.1-13	2.2-06
W-187	4.0-11	1.8-04
Np-239	1.2-09	5.5-03
Br-83	1.5-10	6.5-04
Br-84	1.2-12	5.0-06
I-131	6.1-10	2.7-03
I-132	1.2-09	5.5-03
I-133	6.6-09	2.9-02
I-134	1.6-10	7.0-04
I-135	3.8-09	1.7-02
Rb-89	3.5-14	1.5-07
Cs-134	5.9-11	2.6-04
Cs-136	3.8-11	1.7-04
Cs-137	1.6-10	7.0-04
Cs-138	1.8-11	8.0-05
H-3	1.0-05	4.6+01
Grams released	4.4+12	

NOTES:

1 1.2-09 = 1.2×10^{-9}

2 Isotope releases of less than 1.0-10 curies/yr are set to 0.0. Anticipated operational occurrences 1.00-01 curies/yr added to release. Dilution (blowdown) release rate is 4.38×10^{12} ml/yr. Total release (excluding tritium) is 1.1-01 curies/yr or 2.5-08 uCi/g.

TABLE 11.2-5

DESIGN ANNUAL LIQUID RELEASES

•→10

Isotope	Design Activity Released (uCi/ml)	Design Activity Released (Ci/yr)	ECL[3] (uCi/ml)	Fraction of ECL[4]
Na-24	1.2-9[5]	5.0-3	5.0-5	2.4-7
P-32	3.5-11	1.5-4	9.0-6	3.9-6
Cr-51	1.0-9	4.5-3	5.0-4	2.0-6
Mn-54	1.2-11	5.0-5	3.0-5	4.0-7
Mn-56	1.4-9	7.0-3	7.0-5	2.0-5
Fe-55	1.7-10	8.0-4	1.0-4	1.7-6
Fe-59	1.5-11	7.0-5	1.0-5	1.5-6
Co-58	9.2-10	4.1-3	2.0-5	4.6-5
Co-60	9.2-11	4.1-4	3.0-6	3.1-5
Ni-63	1.7-13	1.8-6	1.0-4	1.7-9
Ni-65	8.6-12	3.8-5	1.0-4	8.6-8
Cu-64	3.3-9	1.5-2	2.0-4	1.6-5
Zn-65	3.5-11	1.6-4	5.0-6	7.0-6
Zn-69m	4.1-12	1.8-5	6.0-5	6.8-8
Sr-89	6.0-10	2.7-3	8.0-6	7.5-5
Sr-90	4.6-11	2.1-2	5.0-7	9.2-5
Sr-91	8.6-9	3.9-2	2.0-5	4.3-4
Sr-92	4.5-9	1.9-2	4.0-5	1.1-4
Y-91	4.5-11	2.0-4	8.0-6	5.6-6
Y-92	3.8-9	1.7-2	4.0-5	9.5-5
Y-93	2.4-9	1.1-2	2.0-5	1.2-4
Zr-95	8.5-12	3.7-5	2.0-5	4.2-7
Zr-97	4.8-12	2.1-5	9.0-6	5.3-7
Nb-95	8.5-12	3.7-5	3.0-5	2.8-7
Mo-99	4.3-9	1.9-2	2.0-5	2.2-4
Tc-99m	8.6-9	3.7-2	1.0-3	8.6-6
Ru-103	2.2-11	1.0-4	3.0-5	7.3-7
Ru-105	5.9-10	2.6-3	7.0-5	8.4-6
Ru-106	3.2-12	1.4-3	3.0-6	1.1-6
Ag-110m	1.1-11	4.9-5	6.0-6	1.8-6
Te-129m	6.8-11	3.0-4	7.0-6	9.7-6
Te-131m	8.5-11	3.7-4	8.0-6	1.1-5
Te-132	2.6-9	1.2-2	9.0-6	2.9-4
Ba-140	1.7-9	7.5-3	8.0-6	2.1-4
Ce-141	3.1-11	1.4-4	3.0-5	1.0-6
Ce-143	2.5-11	1.1-4	2.0-5	1.2-6
Ce-144	7.1-12	3.1-5	3.0-6	2.4-6
Pr-143	4.0-11	1.8-4	2.0-5	2.0-6

10←•

TABLE 11.2-5 (Cont)

•→10 Isotope	Design Activity Released (uCi/ml)	(Ci/yr)	ECL[3] (uCi/ml)	Fraction of ECL[4]
Nd-147	3.1-12	1.4-5	2.0-5	1.6-7
W-187	4.4-10	2.0-3	3.0-5	1.5-5
Np-239	4.2-8	2.0-1	2.0-5	2.1-3
Br-83	9.1-10	3.9-3	9.0-4	1.0-6
I-131	3.8-9	1.7-2	1.0-6	3.8-3
I-132	7.3-9	3.4-2	1.0-4	7.3-5
I-133	4.0-8	1.8-1	7.0-6	5.7-3
I-134	9.7-10	4.3-3	4.0-4	2.4-6
I-135	2.3-8	1.0-1	3.0-5	7.7-4
Cs-134	3.7-10	1.6-3	9.0-7	4.1-4
Cs-136	2.3-10	1.1-3	6.0-6	3.8-5
Cs-137	9.6-10	4.2-3	1.0-6	9.6-4
H-3[1]	1.0-5	4.6+1	1.0-3	1.0-2
Total[2]	1.7-7	7.5-1	9.2-3	1.6-2

Dilution release rate (blowdown) = 4.38 x 10^{12} ml/yr.

(1) Tritium release is in accordance with NUREG-0016, Rev 1, 1/79, page 1-8, Section 1.5.1.10.
(2) All totals are excluding tritium.
(3) ECL values are from 10CFR20, App B, table II, Col. 2.
(4) Fraction of ECL = $\frac{\text{design activity released (uCi/ml)}}{\text{ECL (uCi/ml)}}$
(5) 1.2-9 = 1.2 x 10^{-9}

TABLE 11.3-1

EXPECTED RADIOACTIVE GASEOUS EFFLUENT
FROM ALL SOURCES (CI/YR/UNIT)

Isotope	Contain-ment[(1)]	Aux Bldg	Turb Bldg[(2)]	Radwaste Bldg	Mechan-ical Vacuum Pump	Off Gas System
Kr-83m	<1	<1	<1	<1	neg	4.7(-2)
Kr-85m	1	3	5	<1	neg	210
Kr-85	<1	<1	<1	<1	neg	210
Kr-87	<1	2	12.2	<1	neg	3.8(-4)
Kr-88	1	3	18.2	<1	neg	25
Kr-89	<1	2	116	29	neg	neg
Xe-131m	<1	<1	<1	<1	neg	21
Xe-133m	<1	<1	<1	<1	neg	6.6(-2)
Xe-133	27	83	30	220	1300	900
Xe-135m	15	45	80	530	neg	neg
Xe-135	33	94	66	280	500	neg
Xe-137	45	135	200	83	neg	neg
Xe-138	2	6	200	2	neg	neg
Cr-51	2.0(-6)	9.0(-4)	1.8(-4)	7.0(-6)	neg	neg
Mn-54	4.0(-6)	1.0(-3)	1.2(-4)	4.0(-5)	neg	neg
Fe-59	9.0(-7)	3.0(-4)	2.0(-5)	3.0(-6)	neg	neg
Co-58	1.0(-6)	2.0(-4)	2.0(-4)	2.0(-6)	neg	neg
Co-60	1.0(-5)	4.0(-3)	2.0(-4)	7.0(-5)	neg	neg
Zn-65	1.0(-5)	4.0(-3)	1.2(-3)	3.0(-6)	neg	neg
Sr-89	3.0(-7)	2.0(-5)	1.2(-3)	neg	neg	neg

TABLE 11.3-1

EXPECTED RADIOACTIVE GASEOUS EFFLUENT
FROM ALL SOURCES (CI/YR/UNIT)

Isotope	Containment[1]	Aux Bldg	Turb Bldg[2]	Radwaste Bldg	Mechanical Vacuum Pump	Off Gas System
Sr-90	3.0(-8)	7.0(-6)	4.0(-6)	neg	neg	neg
Zr-95	3.0(-6)	7.0(-4)	8.0(-6)	8.0(-6)	neg	neg
Nb-95	1.0(-5)	9.0(-3)	1.2(-6)	4.0(-8)	neg	neg
Mo-99	6.0(-5)	6.0(-2)	4.0(-4)	3.0(-8)	neg	neg
Ru-103	2.0(-6)	4.0(-3)	1.0(-5)	1.0(-8)	neg	neg
Ag-110m	4.0(-9)	2.0(-6)	neg	neg	neg	neg
Sb-124	2.0(-7)	3.0(-5)	2.0(-5)	7.0(-7)	neg	neg
Cs-134	7.0(-6)	4.0(-3)	4.0(-5)	2.4(-5)	neg	neg
Cs-136	1.0(-6)	4.0(-4)	2.0(-5)	neg	neg	neg
Cs-137	1.0(-5)	5.0(-3)	2.0(-4)	4.0(-5)	neg	neg
Ba-140	2.0(-5)	2.0(-2)	2.0(-3)	4.0(-8)	neg	neg
Ce-141	2.0(-6)	7.0(-4)	2.0(-3)	7.0(-8)	neg	neg
•→14						
I-131	2.0(-3)	3.9(-2)	1.1(-1)	2.0(-3)	8.1(-3)	neg
I-133	2.7(-2)	5.3(-1)	1.5	2.8(-2)	1.1(-1)	neg
H-3	22.8	neg	22.8	neg	neg	neg
Ar-41	15	neg	neg	neg	neg	121.0
C-14	<1	neg	neg	neg	neg	9.5
14←•						

(1) Fuel building releases are included in the containment releases.
(2) A reduction factor of five is incorporated into the turbine building releases to account for special design features to control system leakage.

TABLE 11.3-2

DATA USED IN CALCULATING ANNUAL RELEASES OF RADIOACTIVE GASEOUS EFFLUENTS*

Parameter	Data
Maximum core thermal power	3,039 (Mwt)
•→14	
Total steam flow rate	1.32×10^7 (lb/hr)
Off gas system holdup time	~10 min
Off gas charcoal bed holdup times (Kr)	46 hr
(Xe)	42 days
Plant capacity factor	80%
Expected releases source term failed fuel basis	50,000 µCi/sec (after 30 min)
Design releases source term failed fuel basis	304,000 µCi/sec (after 30 min)
Iodine partition factor (carryover)	
Normal Water Chemistry	0.015
Hydrogen Water Chemistry	0.04
14←•	
Off gas system charcoal mass/train	24,640 lb
Dynamic adsorption coefficients (Kr)	105 (cm^3/gm)
(Xe)	2,410 (cm^3/gm)
Charcoal delay system normal operating temperature	0°F
Charcoal delay system dew point temperature	<-40°F
Ventilation systems	See Section 9.4
Decontamination factors	90% (4" Deep Charcoal Element) 99% (HEPA Filter)

* Data unchanged for TPO (Appendix K) uprate as other conservatisms in the analyses produce results that bound TPO uprate conditions.

TABLE 11.3-3

OFF GAS SYSTEM MAJOR EQUIPMENT ITEMS

Off Gas Preheater		
Quantity		2
Material		Stainless steel tubes, carbon steel shell
Shell:	Design pressure, psig	350
	Design temperature, °F	40/450
Tube:	Design pressure, psig	1,000
	Design temperature, °F	40/575
Catalytic Recombiner		
Quantity		2
Material		Carbon steel cartridge, carbon steel shell. Catalyst cartridge containing a precious metal catalyst on metal base of porous nondusting ceramic. Catalyst cartridge to be replaceable without removing vessel.
Design pressure, psig		350
Design temperature, °F		900
Off Gas Condenser		
Quantity		1
Material		Low alloy steel shell, stainless steel tubes
Shell:	Design pressure, psig	350
	Design temperature, °F	900
Tube:	Design pressure, psig	600
	Design temperature, °F	150
Water Separator		
Quantity		1
Material		Carbon steel shell, stainless steel wire mesh
Design pressure, psig		350
Design temperature, °F		250

TABLE 11.3-3 (Cont)

Cooler-Condenser			
Quantity			2
Material			Carbon or stainless steel shell, stainless steel tubes
	Shell:	Design pressure, psig	350
		Design temperature, °F	32/170[2]
	Tube:	Design pressure, psig	100
		Design temperature, °F	150
Moisture Separator (downstream of cooler-condenser)			
Quantity			2
Material			Carbon steel shell, stainless steel wire mesh
Design pressure, psig			350
Design temperature, °F			32/150
Desiccant Dryer			
Quantity			4
Material			Carbon steel shell packed with Linde Mol Sieve or equivalent
Design pressure, psig			350
Design temperature, °F			32/500
Desiccant, Regeneration Skid			
Quantity			2
Dryer Chiller			
Quantity			2
Material			Carbon steel shell, stainless steel tubes
Design pressure, psig			50
Design temperature, °F			32/500
Regenerator Blower[1]			
Quantity			2
Material			Cast iron housing
Design pressure, psig			50
Design temperature, °F			32/150

[1] Material meets seller's standard.
[2] The cooler condenser shell side has been evaluated for operation up to 180°F (Ref. ER 03-0570)

TABLE 11.3-3 (Cont)

Dryer Heater	
Quantity	2
Material	Carbon steel vessel
Design pressure, psig	50
Design temperature, °F	32/500
Gas Cooler	
Quantity	2
Material	Carbon or stainless steel
Tube: Design pressure, psig	1,050
Design temperature, °F	-50/150
Glycol Cooler Skid	
Quantity	1
Glycol Storage Tank	
Quantity	1
Material	Carbon steel 3,000 gal
Design pressure	Water-filled hydrostatic
Design temperature, °F	32
API-650	
Glycol Solution Refrigerator and Motor Drive[(1)]	
Quantity	3
Material	Conventional refrigeration unit
Glycol solution exit temperature, °F	35
Glycol Pump and Motor Drive[(1)]	
Quantity	3
Material	Cast iron, 3-in connections
Design temperature, °F	0
Prefilter and After Filter	
Quantity	2 each
Material	Carbon steel shell, high-efficiency, moisture-resistant filter element, flanged shell
Design pressure, psig	350
Design temperature, °F	-50/250

TABLE 11.3-3 (Cont)

Charcoal Adsorber

Quantity	8 beds
Material	Carbon steel, approximately 4-ft o.d. x 21-ft vessels each containing approximately 3 tons of activated carbon
Design pressure, psig	350
Design temperature, °F	-50/250

THIS TABLE HAS BEEN DELETED

TABLE 11.3-4 (SHEET 1 OF 2)

PROCESS DATA FOR THE OFF GAS (RECHAR.) SYSTEM

THIS TABLE HAS BEEN DELETED

TABLE 11.3-4 (SHEET 2 OF 2)

PROCESS DATA FOR THE OFF GAS (RECHAR.) SYSTEM

TABLE 11.3-5

OFF GAS SYSTEM ALARMED PROCESS PARAMETERS

Parameters	Main Control Room Indicated	Main Control Room Recorded
Air ejector discharge pressure - high	X	
Preheater discharge temperature - low	X	
Recombiner catalyst temperature - high/low	X	X
Off gas condenser water level (dual) - high/low	X	
Off gas condenser gas discharge temperature - high (LOCAL)	X	
H_2 analysis (off gas condenser discharge) - dual - high	X	X
Off gas condenser discharge radiation - high	X	X
Gas flow - high/low	X	X
Cooler - condenser discharge temperature - high/low	X	X
Glycol solution temperature - high/low	X	X
Glycol solution level - low	(Alarmed Only)	
Gas drier discharge humidity - high (LOCAL)	X	
Prefilter dP - high	X	
Charcoal adsorber temperature - high	X	X
Carbon vault temperature - high/low		X
Carbon vault temperature - high/low	X	X

TABLE 11.3-5 (Cont)

Parameters	Main Control Room Indicated	Main Control Room Recorded
Carbon train flow - high/low	X	X
After filter dP - high	X	
Off gas (carbon bed discharge) radiation - high	X	X
Dilution steam flow - low	X	

TABLE 11.3-6

EQUIPMENT MALFUNCTION ANALYSIS

Equipment Item	Malfunction	Consequences	Design Precautions
Steam jet air	Low flow of motive high pressure steam	When the hydrogen and oxygen concentration exceed 4 and 5 vol %, respectively, the process gas becomes flammable	Alarm provided on steam for low steam flow. Recombiner temperature alarm.
		Inadequate steam flow causes overheating and deterioration of the catalyst.	Steam flow to be held at constant maximum flow regardless to plant level. Recombiner temperature alarm.
	Wear of supply steam nozzle of ejector	Increased steam flow to recombiner. This would reduce degree of recombination at low power levels.	Low temperature alarms on preheater exit (recombiner inlet). Recombiner H_2 analyzers.
Preheaters	Steam leak	Would further dilute process off gas. Steam consumption would increase.	Spare preheater.
	Low pressure steam supply	Recombiner performance would fall off at low power level, and hydrogen content of recombiner gas discharge may increase, eventually to a combustible mixture.	Low-temperature alarms on preheater exit (recombiner inlet). Recombiner outlet H analyzers.
Recombiners	Catalyst gradually deactivates	Temperature profile changes through catalyst. Eventually excess H_2 would be detected by H_2 analyzer or by gas flowmeter. Eventually the stripped gas could become combustible.	Temperature probes in recombiner H analyzer provided spare recombiner.

TABLE 11.3-6

EQUIPMENT MALFUNCTION ANALYSIS

Equipment Item	Malfunction	Consequences	Design Precautions
	Catalyst gets wet at start	H_2 conversion falls off and H_2 is detected by downstream analyzers. Eventually the gas could become combustible.	Condensate drains, temperature probes in recombiner. Air bleed system at startup. Recombiner thermal blanket, spare recombiner and heater, hydrogen analyzer.
Off gas condenser	Cooling water leak	The coolant (reactor condensate) would leak to the process gas (shell) side. This would be detected if drain well liquid level increases. Moderate leakage would be of no concern from a process standpoint (the process condensate drains to the hotwell).	None.
	Liquid level instruments fail	If both drain valves fail to open, water builds up in the condenser and the pressure drop increases. The high delta P, if not detected by instrumentation, could cause pressure buildup in the main condenser and eventually initiate a reactor scram. If a drain valve fails to close, gas recycles to the main condenser, increases the load on the SJAE, and increases the operating pressure of the main condenser.	Two independent drain systems, each provided with high- and low-level alarms.
Water separator	Corrosion of wire mesh element	Higher quantity of water collected in holdup line and routed to radwaste.	Stainless steel mesh specified.

TABLE 11.3-6

EQUIPMENT MALFUNCTION ANALYSIS

Equipment Item	Malfunction	Consequences	Design Precautions
Holdup line	Corrosion of line	Leakage to soil of gaseous and fission products.	Outside of pipe dipped and wrapped 1/4-in corrosion allowance.
Cooler-condeners	Corrosion of tubes	Glycol-water solution would leak into process (shell) side and be discharged to clean radwaste. If not detected at radwaste, the glycol solution would discharge to reactor condensate system.	Stainless steel tubes specified. Low level alarm glycol tank level. Spare cooler condenser provided.
	Icing up of tubes	Shell side of cooler could plug up with ice, gradually building up pressure drop. If this happens, the spare unit could be activated. Complete blockage of both units would increase delta P and lead to a reactor scram.	Design glycol-H_2 solution temperature well above freezing point. Spare unit provided. Temperature indication and low alarms on glycol temperature and process gas temperature.
Glycol refrigeration machines	Mechanical	If both spare units fail to operate, the glycol solution temperature rises and the dehumidification system performance deteriorates. This requires rapid regeneration cycles for the desiccant beds and may raise the gas dewpoint as it is discharged from the drier.	Two spare refrigerators during normal operation are provided. Glycol solution temperature alarms provided. Gas moisture detectors provided downstream of gas driers.

TABLE 11.3-6

EQUIPMENT MALFUNCTION ANALYSIS

Equipment Item	Malfunction	Consequences	Design Precautions
Moisture separators	Corrosion wire mesh element	Increased moisture would be retained in process gas routed to gas driers. Over a long period, the desiccant drier cycle period would deteriorate as result of moisture pickup. Pressure drop across prefilter may increase if filter media is wetted.	Stainless steel mesh specified. Spare unit provided. High delta P alarm on prefilter.
Prefilters	Loss of integrity of filter	More radioactivity would deposit the drier desiccant. This would increase radiation level in the drier vault and make maintenance more difficult, but would not affect releases to the environment.	Spare unit provided in separate vault. Delta P instrumentation provided.
Desiccant drier	Moisture breakthrough	Moisture would freezout in gas cooler would result in increased system pressure drop. Gas with a high dewpoint temperature would reach charcoal bed.	Drier cycles on time. Redundant gas humidity analyzers and alarms supplied. Redundant drier system supplied. Gas drier and first charcoal bed can be bypassed through alternate drier to second charcoal bed.
Desiccant regeneration equipment	Mechanical failure	Inability to regenerate desiccant.	Redundant, shielded desiccant beds and drier equipment supplied.

TABLE 11.3-6

EQUIPMENT MALFUNCTION ANALYSIS

Equipment Item	Malfunction	Consequences	Design Precautions
Charcoal adsorbers	Charcoal accumulates moisture	Charcoal performance deteriorates gradually as moisture deposits, holdup times for krypton and xenon would decrease, and plant emissions would increase. Provisions made for drying charcoal as required during annual outage.	Highly instrumented, mechanically simple gas dehumidification system with redundant equipment.
Vault refrigeration units	Mechanical failure	If temperature exceeds approximately 0°F, increased emission could occur.	Spare refrigeration unit provided. Vault and charcoal adsorber temperature alarms provided.
After filter	Loss of integrity of filter media	Probably of no real consequence, the charcoal media itself should be a good filter at the low air velocity.	Delta P instrumentation provided. Spare unit provided.
System	Internal detonation	Release of radioactivity if pressure boundary fails.	Main process equipment and piping are designed to contain a detonation.
System	Earthquake damage	Release of radioactivity.	Dose consequences are within 10CFR20 limits. Analysis is included in Reference 6.

TABLE 11.3-7

RADWASTE EQUIPMENT DESIGN CODES

Equipment	Design and Fabrication	Materials	Welder Qualification and Procedure	Inspection and Testing
Pressure vessels	ASME Section VIII Div 1	ASME Section II	ASME Section IX	ASME Section VIII Div 1
Atmos-pheric or 0-15 psig tanks	ASME[(2)] Section III Class 3, API 620;650,AWWA D-100	ASME Section II	ASME Section IX	ASME[(2)] Section III Class 3, API 620;650,AWWA D-100
Heat exchang-ers	ASME Section VIII Div 1; and TEMA	ASME Section II	ASME Section IX	ASME Section VIII Div 1
Piping and valves	ANSI B 31.1	ASTM or ASME Section II	ASME Section IX	ANSI B 31.1
Pumps	Manufacturer's Standards[(1)]	ASME Section II or Manufac-turer's Standard	ASME Section IX (as required)	ASME[(1)] Section III Class 3; and Hydraulic Institute

[(1)] Manufacturer’s standard for the intended service. Hydrotesting should be 1.5 times the design pressure.
[(2)] ASME Code Stamp and material traceability not required.

TABLE 11.3-8

●→14

DESIGN ANNUAL RADIOACTIVE GASEOUS RELEASES VS ECL

Release (MVP)	Continuous Release				Radwaste Building		Intermittent	
Isotope	Activity at Restricted Area Boundary (μCi/cc)	Fraction of ECL	Activity at Restricted Area Boundary (μCi/cc)	Fraction of ECL	Activity at Restricted Area Boundary (μCi/cc)	Fraction of ECL	Total Fraction of ECL	ECL Values Used (μCi/cc)
Kr-83m	1.9-12	3.9-08					3.9-08	5.0-05
Kr-85m	1.4-10	1.4-03					1.4-03	1.0-07
Kr-85	1.4-10	1.9-04					1.9-04	7.0-07
Kr-87	9.7-12	4.8-04					4.8-04	2.0-08
Kr-88	3.0-11	3.3-03					3.3-03	9.0-09
Kr-89	7.6-11	7.6-02	3.7-10	3.7-01			7.6-02	1.0-09
Xe-131m	1.5-11	7.6-06					7.6-06	2.0-06
Xe-133m	2.0-12	3.2-06					3.2-06	6.0-07
Xe-133	8.2-10	1.6-03	2.8-09	5.6-03	8.4-09	1.7-02	2.4-02	5.0-07
Xe-135m	8.9-11	2.2-03	6.7-09	1.7-01			1.7-01	4.0-08
Xe-135	1.9-10	2.7-03	3.5-09	5.1-02	3.4-09	4.8-02	1.0-01	7.0-08
Xe-137	2.4-10	2.4-01	1.1-09	1.1+00			2.4-01	1.0-09
Xe-138	1.3-10	6.6-03	2.5-11	1.3-03			7.9-03	2.0-08
Cr-51	1.2-16	3.8-07	1.5-17	4.8-10			3.8-07	3.0-08
Mn-54	1.2-16	1.2-07	8.3-17	8.3-08			2.0-07	1.0-09
Fe-59	9.6-17	1.9-07	1.8-17	3.6-08			2.3-07	5.0-10
Co-58	1.1-15	1.1-07	1.1-16	1.1-07			2.2-07	1.0-09
Co-60	5.9-16	1.2-05	2.0-16	3.9-06			1.6-05	5.0-11
Zn-65	5.4-16	1.4-06	8.2-18	2.0-08			1.4-06	4.0-10
Sr-89	4.5-15	2.2-05					2.2-05	2.0-10
Sr-90	4.4-17	7.4-06					7.4-06	6.0-12
Zr-95	4.5-16	1.1-06	1.0-16	2.5-07			1.4-06	4.0-10
Nb-95	5.7-15	2.9-06	5.1-19	2.5-10			2.9-06	2.0-09
Mo-99	8.7-14	4.4-05	8.7-19	4.3-10			4.4-05	2.0-09
Ru-103	2.5-15	2.8-06	1.3-19	1.4-10			2.8-06	9.0-10
Ag-110m	1.3-18	1.3-08					1.3-08	1.0-10
Sb-124	3.2-17	1.1-07	8.8-18	2.9-08			1.4-07	3.0-10
Cs-134	2.6-15	1.3-05	3.1-16	1.6-06			1.5-05	2.0-10
Cs-136	2.7-16	3.0-07					3.0-07	9.0-10
Cs-137	3.3-15	1.7-05	5.1-16	2.5-06			1.9-05	2.0-10
Ba-140	5.9-14	3.0-05	2.1-15	1.1-06			3.1-05	2.0-09
Ce-141	1.7-15	2.1-06	8.8-19	1.1-09			2.1-06	8.0-10
I-131	1.5-13	7.5-04	2.5-14	1.3-04	2.1-14	1.1-04	9.8-04	2.0-10
I-133	2.0-12	2.0-03	3.5-13	3.5-04	2.9-13	2.9-04	2.7-03	1.0-09
H-3	4.8-12	4.8-05					4.8-05	1.0-07
Ar-41	1.5-11	1.5-03					1.5-03	1.0-08
C-14	1.2-12	3.8-04					3.8-04	3.0-09
TOTALS:		3.3-01		2.3-01		6.5-02	6.3-01	

14←●

TABLE 11.3-9

FREQUENCY AND QUANTITY OF STEAM DISCHARGED TO SUPPRESSION POOL

Event		Frequency Category	Quantity of Steam Lb/Event
1.	RCIC test[1]	Moderate	25,200
2.	Inadvertent RCIC injection[1]	Moderate	4,200
3.	SRV test (each valve)[2]	Moderate	3,900
4.	SRV flow capacity test (each valve)[3]	Infrequent	15,300
5.	Total SRV leakage (16 valves)[4]	Continuous	320/hr
6.	Trip of both recirculation pump motors[5]	Moderate	30,000
7.	Turbine trip[5]	Moderate	30,000
8.	Generator load rejection[5]	Moderate	30,000
9.	Pressure regulator failure, open[5]	Moderate	834,300[7]
10.	Recirculation controller failure[5]	Moderate	30,000
11.	Loss of all feedwater flow[5]	Moderate	30,000
12.	Inadvertent MSIV closure[5]	Moderate	834,300[7]
13.	Loss of condenser vacuum[5]	Moderate	834,300[7]
14.	Feedwater control failure, maximum demand[5]	Moderate	30,000
15.	Loss of auxiliary transformer[5]	Moderate	777,000
16.	Loss of all grid connections[5]	Moderate	777,000
17.	Turbine trip w/o bypass[5]	Infrequent	834,300[7]
18.	Generator load rejection w/o bypass[5]	Infrequent	834,300[7]
19.	Stuck open SRV[6]	Moderate	592,000

(1) Events 1 and 2 based on steam flow rate during test mode according to RCIC System Process Diagram, 762E421A, for 60 and 10 min, respectively.

(2) Event 3 assumes tested SRV opened 30 sec maximum at 300-500 psig vessel pressure.

(3) Event 4 assumes tested SRV opened 30-60 sec at 1,000 psig vessel pressure.

(4) Event 5 based on maximum average SRV leakage rate of 20-lb/hr valve.

(5) Event 6 thru 18 based on event description from Chapter 15.

(6) Event 19 based on vessel depressurized to 100 psia with additional SRV's opened 10 min following scram.

(7) Isolation event. Except for events 15 and 16, it is assumed that SRV actuation is terminated 30 min into the event whereupon the reactor is depressurized at 100°F/hr via RHR shutdown cooling mode. For events 15 and 16, it is assumed that loss of plant air prevents normal SRV opening, vessel depressurized via ADS SRVs.

TABLE 11.4-1

ANNUAL QUANTITIES OF SOLIDIFIED AND
RADIOACTIVE WASTE MATERIAL

(1-Unit Normal)

Solid Waste Stream	Volume(2) (ft^3/yr) Expected	Design	Specific Activity (μ Ci / cc) Expected	Design	Curie Content (Ci / yr) Expected	Design
Radwaste filter sludge	414(1)	828(1)	6.94-01	8.65-01	8.1	20.3
•→10 Fuel pool/RWCU/ SPC sludge	486(1)	972(1)	53.9	175	743.6	4801.7
Radwaste, SPC & fuel pool demin spent resin	1,300(1)	2,600(1)	6.18	50.6	221	3,718
10←• Condensate demin spent resin	6,800(1)	13,600(1)	6.77	41.2	1305.6	15,912
Compactible dry solid waste	14,632	19,306	4.8-02	4.7-02	9.76	12.8
Noncompactible dry solid waste	6,942	9,062	7.58	7.62	745	978

•→3
(1) Processed waste volume
3x"
(2) Based on 365 days operation per year
(3) 4.7-02 = 4.7 x 10^{-2}

TABLE 11.4-2

EXPECTED ISOTOPIC COMPOSITION OF SOLIDIFIED
AND DRY RADIOACTIVE WASTE MATERIAL

(1-Unit Normal)

•→10

Isotopes	Radwaste Filter Sludge (Ci/cc)	Radwaste, SPC and Fuel Pool Demin Spent Resin[2] (Ci/cc)	Condensate Demin Spent Resin (Ci/cc)	Fuel Pool Filter/RWCU SPC Sludge[2] (Ci/cc)	Compactible Dry Waste (Ci/yr)	Noncompactible Dry Waste (Ci/yr)
10←•						
BR83	-	-	3.84-02	-	-	-
I131	-	3.21-01	2.06	5.04-01	-	-
I132	-	2.80-01	3.64-01	2.28-03	-	-
I133	-	1.90	2.22	-	-	-
I134	-	1.65-02	2.49-01	-	-	-
I135	-	4.50-01	8.96-01	-	-	-
SR89	-	9.76-03	1.15-02	6.47-01	-	-
SR90	-	-	-	1.13-01	-	-
SR91	-	6.45-02	6.56-03	-	-	-
SR92	-	1.62-02	-	-	-	-
Y90	-	-	-	1.13-01	-	-
Y91M	-	2.80-02	-	-	-	-
Y91	-	-	1.68-02	1.03	-	-
Y92	-	1.16-01	-	-	-	-
Y93	-	-	-	-	-	-
ZR95	-	-	-	6.26-02	-	-
NB95	-	-	-	9.51-02	-	-
MO99	-	1.44-01	2.29-02	-	-	-
TC99M	-	4.34-01	6.59-02	-	-	-
RU103	-	-	-	1.04-01	-	-
RU105	-	-	-	-	-	-
RU106	-	-	-	4.31-02	-	-
RH103M	-	-	-	9.40-02	-	-
RH105M	-	-	-	-	-	-
RH106	-	-	-	4.31-02	-	-
TE129M	-	-	-	1.68-01	-	-
TE129	-	-	-	1.09-01	-	-
TE131M	-	-	-	-	-	-
TE131	-	-	-	-	-	-
TE132	-	7.50-04	1.33-04	8.00-06	-	-
CS134	-	-	-	4.42-01	6.44-01	4.92+01
CS136	-	-	-	1.39-02	-	-
CS137	-	-	-	1.27	1.18	9.01+01
BA137M	-	-	-	1.21	-	-
BA139	-	4.21-03	-	-	-	-
BA140	-	3.71-02	2.07-02	2.54-01	-	-
LA140	-	-	-	2.92-01	-	-

TABLE 11.4-2

EXPECTED ISOTOPIC COMPOSITION OF SOLIDIFIED
AND DRY RADIOACTIVE WASTE MATERIAL

(1-Unit Normal)

•→10

Isotopes	Radwaste Filter Sludge (Ci/cc)	Radwaste, SPC and Fuel Pool Demin Spent Resin[(2)] (Ci/cc)	Condensate Demin Spent Resin (Ci/cc)	Fuel Pool Filter/RWCU SPC Sludge[(2)] (Ci/cc)	Compactible Dry Waste (Ci/yr)	Noncompactible Dry Waste (Ci/yr)
LA141	-	-	-	-	-	-
CE141	-	-	-	1.88-01	-	-
CE143	-	-	-	-	-	-
CE144	-	-	-	4.15-02	-	-
PR143	-	-	-	3.23-02	-	-
PR144	-	-	-	4.15-02	-	-
ND147	-	-	-	-	-	-
NA24	1.13-01	2.80-01	-	-	-	-
P32	4.30-03	-	-	1.75-01	-	-
CR51	1.25-01	5.76-01	5.37-01	1.93+01	3.03-01	2.31+01
MN54	-	-	-	9.82-01	1.85-01	1.42+01
MN56	7.33-02	7.47-02	-	-	-	-
FE55	2.13-02	9.94-02	1.62-01	1.56+01	-	-
FE59	6.38-04	-	-	1.75-01	-	-
CO58	4.34-03	2.02-02	2.61-02	1.71	1.02-01	7.82
CO60	8.45-03	-	-	6.32	1.63	1.24+02
CU64	3.15-01	7.26-01	-	-	-	-
ZN65	4.34-03	-	-	2.73	7.76-01	5.92+01
ZN69M	2.06-02	-	-	-	-	-
AG110M	-	-	-	1.39-02	-	-
AG110	-	-	-	1.81-04	-	-
W187	-	1.28-02	-	-	-	-
NP239	-	5.42-01	5.15-02	3.47-04	-	-
F18	3.94-03	-	-	-	-	-
Other[1]	-	-	-	-	6.30-02	4.84

10←•

Notes 5.42-01 = 5.42 x 10^{-1}

(1) For compactible and noncompactible dry solid waste, “other” means a combination of FE59, ZB95, and NB95.

•→10

(2) SPC sludge and demin resin isotopic activity comparable to these values. Refer to calculation G13.18.9.0-005 for detailed isotopic mixtures and concentrations.

10←•

TABLE 11.4-3

SOLID RADWASTE COMPONENT DESCRIPTION

Component	Quantity	Capacity (ft^3)	Design Pressure	Design Temp (°F)	Materials
Waste sludge tank	1	838	Atmos.	150	Fiberglass
		Type	Discharge Pressure (psig)	Capacity (gpm)	
Waste sludge pump	1	Progressing cavity	0-75	0-50	Carpenter 20 stainless steel
Contractor equipmenty(1)	-	-	-	-	-

●→3
(1)Refer to applicable CNS topical report for a description of these components.
3←●

TABLE 11.4-4

APPLICABLE CODES AND STANDARDS FOR
SOLID RADWASTE SYSTEMS

Description	Safety Class	Code	Code Class	Earthquake Criteria	Tornado Criteria	Quality Assurance Category I
Tanks (polyester)	NNS	(1)	-	No	No	No
Pumps	NNS	(2)	-	No	No	No
Contractor-furnished equipment	(3)	(3)	(3)	(3)	(3)	(3)

(1) Polyester atmospheric storage tanks are filament-wound fiberglass-reinforced plastic tanks designed to meet National Bureau of Standards Voluntary Product Standard PS 15-69 and American Society for Testing and Materials Specification No. ASTM D3299-74 for filament-wound tanks.

(2) For vertical turbine-type pumps of Safety Class NNS and operating above 150 psi or 212°F, ASME Section VIII, Division I, is used as a guide in calculating the wall thickness for pressure-retaining parts. For all other pumps, the manufacturer's standard for intended pump service may be used.

•→

(3) For details concerning contractor equipment, refer to applicable CNS topical report.

3←•

TABLE 11.4-5

Low Level Radwaste Storage Design

Waste Type	Container Type	Container Volume	Maximum No. of Containers	Total Volume
Resin[1]	HIC	205 cu ft	90	18,450 cu ft
DAW[2]	Drum-55 gl	7.5 cu ft	989	7,395 cu ft
DAW[3]	Box-E48	45 cu ft	123	5,535 cu ft
Other[4]	Box-B25	96 cu ft	52	4,992 cu ft

[1]Dewatered resin with 1-25 R/hr radiation field
[2]Dry active waste compacted and uncompacted with 1-5 mR/hr radiation field
[3]Dry active waste incinerated and compacted with 10-200 mR/hr radiation field
[4]Condenser tube bundle (compacted), tube sheets, tube support plates and tube reinforcing steel with 10-25 mR/hr radiation field.

TABLE 11.4-6

Estimated Activity of Radioactive Waste in the LLRWSF Per Year

Container Type	**Estimated # of Containers**	**Design # of Containers**	**Activity / Container (mci/cont)**	**Estimated Activity in Storage (mci)**	**Design Activity (mci)**
Drums	80.00	200.00	1.00	80.00	200.00
Boxes	40.00	150.00	3.00	120.00	450.00
Sealands	40.00	80.00	8.00	320.00	640.00
Liners (HICs)	0.00	32.00	1000.00	0.00	32000.00
Misc.	15.00	50.00	1.00	15.00	50.00
Total				535.00	33340.00

TABLE 11.5-1
PROCESS AND EFFLUENT RADIATION MONITORING SYSTEMS

•→16

Equipment Number	Monitor Location	Monitor Type	Channel Type	Detector Type	Nominal Range (uCi/cc)	Isotope	Function
A. Systems Required for Safety							
*RE5A	Fuel building ventilation exhaust	Gas - extended range	Gas (L) Gas (M) Gas (H)	Beta scintillator (4) CdTe CdTe	10^{-7}-10^{-1} 10^{-4}-10^{2} 10^{-1}-10^{5}	Xe133, Kr85 Xe133, Kr85 Xe133, Kr85	Monitors effluent releases. Activates Cat. I filters. PAM(1).
*RE5B	Fuel building ventilation exhaust	Gas and particulate	Gas Particulate	Beta scintillator Beta scintillator	10^{-7}-10^{-1} 10^{-11}-10^{-5}	Xe133, Kr85 I131	Monitors effluent releases and airborne radiation. Activates Cat. I filters.
*RE13A, 13B *RE14A, 14B	Main control room air intakes (two per intake)	Gas	Gas	Beta scintillator	10^{-7}-10^{-1}	Xe133, Kr85	Monitors incoming control room air. Activates Cat. I filters (13A, 13B).
•→9							
*RE21A, 21B	Containment purge isolation (two)	Area	Area	Ion chamber	10^{1}-10^{7} mR/hr	NA	Activates containment purge isolation.
9←•							
•→8							
*REN003A, C	Main steam line (two)(2)	Online steam	Area	Ion chamber	10^{0}-10^{6} mr/hr	NA	Monitors main steam lines for fuel damage and carryover to turbine building.
8←•							
B. Systems Required for Plant Operation							
*RE125	Main plant exhaust duct	Gas - extended range	Gas (L) Gas (M) Gas (H)	Beta scintillator(4) CdTe CdTe	10^{-7}-10^{-1} 10^{-4}-10^{2} 10^{-1}-10^{5}	Xe133, Kr85 Xe133, Kr85 Xe133, Kr85	Monitors effluent releases. PAM(1)
*RE111	Containment atmosphere	Gas and particulate	Gas Particulate	Beta scintillator Beta scintillator	10^{-7}-10^{-1} 10^{-11}-10^{-5}	Xe133,Kr85 I131	Monitors containment for airborne radiation.

16←•

TABLE 11.5-1 (Cont)

•→16

Equipment Number	Monitor Location	Monitor Type	Channel Type	Detector Type	Nominal Range (uCi/cc)	Isotope	Function
*RE112	Drywell atmosphere	Gas and particulate	Gas	Beta scintillator	10^{-7}-10^{-1}	Xe133, Kr85	Monitors drywell for airborne radiation. RCPB leak detection[3].
			Particulate	Beta scintillator	10^{-11}-10^{-5}	I131	
-RE6A	Radwaste building ventilation exhaust	Gas - extended range	Gas (L)	Beta scintillator[4]	10^{-7}-10^{-1}	Xe133, Kr85	Monitors effluent releases. PAM[1]
			Gas (M)	CdTe	10^{-4}-10^{2}	Xe133, Kr85	
			Gas (H)	CdTe	10^{-1}-10^{5}	Xe133, Kr85	
-RE6B	Radwaste building ventilation exhaust	Gas and particulate	Gas	Beta scintillator	10^{-7}-10^{-1}	Xe133, Kr85	Monitors effluent releases and airborne radiation.
			Particulate	Beta scintillator	10^{-11}-10^{-5}	I131	
-RE126	Main plant exhaust duct	Gas and particulate	Gas	Beta scintillator	10^{-7}-10^{-1}	Xe133, Kr85	Monitors effluent releases.
			Particulate	Beta scintillator	10^{-11}-10^{-5}	I131	
*RE11A, 11B	Reactor building annulus ventilation (two)	Gas	Gas	Beta scintillator	10^{-7}-10^{-1}	Xe133, Kr85	Monitors airborne levels in the annulus. Activates SGTS.
*RE15A, 15B	RHR heat exchanger service water (two)	Liquid	Liquid	Gamma scintillator	10^{-7}-10^{-2}	Cs137	Monitors effluent from heat exchangers for contamination.
•→12 -RE19A, 19B	Fuel pool cooling pumps discharge (two)	Liquid	Liquid	Gamma scintillator	10^{-7}-10^{-2}	Cs137	Removed From Service. Controlled In Accordance With ADM-0045.[5]
12←• -RE102	Turbine plant component cooling water	Liquid	Liquid	Gamma scintillator	10^{-7}-10^{-2}	Cs137	Removed from Service, Controlled in Accordance With ADM-0045[5]

16←•

•→16

Equipment Number	Monitor Location	Monitor Type	Channel Type	Detector Type	Nominal Range (uCi/cc)	Isotope	Function
-RE103	Standby gas treatment system effluent	Gas	Gas	Beta scintillator	10^{-7}-10^{-1}	Xe133, Kr85	Monitors radiation level in SGTS effluent.
-RE107	Liquid radwaste effluent	Liquid	Liquid	Gamma scintillator	10^{-7}-10^{-2}	Cs137	Monitors radwaste effluent discharge to environment. Isolates system at trip level.
•→12 -RE108	Cooling tower blowdown line	Liquid	Liquid	Gamma scintillator	10^{-7}-10^{-2}	Cs137	Monitors cooling tower blowdown.
12←• -RE110	Auxiliary building ventilation	Gas and particulate	Gas Particulate	Beta scintillator Beta scintillator	10^{-7}-10^{-1} 10^{-11}-10^{-5}	Xe133, Kr85 I131	Monitors airborne radiation levels in auxiliary building exhaust.
-RE116	Containment purge gaseous exhaust	Gas	Gas	Beta scintillator	10^{-7}-10^{-1}	Xe133, Kr85	Monitors function of containment purge filter. Isolates purge.
-RE117	Mechanical vacuum pump gaseous discharge	Gas	Gas	Beta scintillator	10^{-7}-10^{-1}	Xe133, Kr85	Removed from Service, Controlled in Accordance With ADM-0045 (5)
-RE118	Turbine building ventilation (including condensate demineralizer area)	Gas and particulate	Gas Particulate	Beta scintillator Beta scintillator	10^{-7}-10^{-1} 10^{-11}-10^{-5}	Xe133, Kr85 I131	Monitors airborne radiation levels in turbine building exhaust.

16←•

TABLE 11.5-1 (Cont)

●→16

Equipment Number	Monitor Location	Monitor Type	Channel Type	Detector Type	Nominal Range (uCi/cc)	Isotope	Function
●→12 -RE120	Fuel pool cooling demineralizer outlet	Liquid	Liquid	Gamma scintillator	10^{-7}-10^{-2}	Cs137	Removed From Service. Controlled In Accordance With ADM-0045 (5)
-RE121	Reactor plant component cooling water	Liquid	Liquid	Gamma scintillator	10^{-7}-10^{-2}	Cs137	Monitors RPCCW discharge for detection of radiation inleakage.
-RE122	Radwaste reboiler clean steam outlet	Online steam	Steam	Gamma scintillator	10^{-6}-10^{-1}	N16	Removed From Service. Controlled In Accordance With ADM-0045 (5)
-RE123	Seal steam evaporator clean steam outlet	Online steam	Steam	Gamma scintillator	10^{-6}-10^{-1}	N16	Removed From Service. Controlled In Accordance With ADM-0045 (5)
-RE124	Offgas building ventilation	Gas and particulate	Gas Particulate	Beta scintillator Beta scintillator	10^{-7}-10^{-1} 10^{-11}-10^{-5}	Xe133, Kr85 I131	Monitors airborne radiation levels in offgas building exhaust.
12←● ●→15 (2)	Offgas pretreatment	Gas	Gas	GM tube	10^{0}-10^{6} mr/hr	NA	Monitors process before treatment.
(2)	Offgas post-treatment	Gas	Gas	GM tube	10^{0}-10^{6} cpm	NA	Monitors process after treatment. Isolates discharge.

15←● 16←●

TABLE 11.5-1 (Cont)

---

(1) PAM - Post-accident monitor.

(2) Monitors are not part of digital radiation monitoring system. They are supplied separately as part of the process system.

(3) Reactor coolant pressure boundary leak detection, in accordance with Regulatory Guide 1.45.

(4) The gaseous effluent monitors used on River Bend are manufactured by the General Atomic Company. The detector model nos. used are RD-52 (beta scintillator) and RD-72 (CdTe). The energy dependence of these monitors is in accordance with the design requirements of Regulatory Guide 1.97 overall system accuracy within a factor of two under accident conditions. Purge capability is provided on all monitors to allow background determination and correction. Also, post-accident shielding is provided on applicable monitors to prevent saturation of the detectors from background radiation. Post-accident particulate and iodine sampling to 10 uCi/cc is provided with these monitors. Shielding of these filters is provided to satisfy Regulatory Guide 1.97 criteria for maintaining doses ALARA. Sampling systems are designed in accordance with ANSI 13.1. Each effluent monitor is equipped with a dedicated display panel and recorder in the main control room. Modifications to the system data base and functional control capabilities are available via the control room panels. L, M, and H refer to low-, medium-, and high-range gas channels.

•→12

(5) Procedure ADM-0045, “System Management and Utilization of the DRMS”

12←•

TABLE 11.5-2

GRAB SAMPLES FOR RADIOLOGICAL ANALYSIS

Sample Point Location	Grab Sample at the Sample Station	Local Grab Sample	Grab Sample at the Radiation Monitor
Reactor Steam Supply System			
Reactor Water Recirculation System Pump Discharge	X	-	-
Main Steam Line	X	-	-
Reactor Water Cleanup System			
Filter/Demineralizer Influent	X	-	-
Filter/Demineralizer Effluent	X	-	-
Fuel Pool Cooling and Cleanup System			
•→12			
Purification Pump Discharge	X	-	-
Filter Effluent	X	-	-
Demineralizer Effluent	X	-	-
12←•			
Reactor Plant Component Cooling Water			
Cooling Water Sample (Outlet of Each Major Heat Exchanger)	X	-	X
Turbine Plant Component Cooling Water			
•→16			
Cooling Water Sample (Outlet of Each Major Heat Exchanger)	X	-	-
16←•			
Residual Heat Removal System			
Heat Exchanger Outlet (Service Water)	X	-	X
Control Rod Drive System			
CRD Supply Inlet Line	X	-	-

TABLE 11.5-2 (Cont)

GRAB SAMPLES FOR RADIOLOGICAL ANALYSIS

Sample Point Location	Grab Sample at the Sample Station	Local Grab Sample	Grab Sample at the Radiation Monitor
Radwaste System			
Waste Collector Tank Effluent	X	-	-
Demineralizer Effluent	X	-	-
Filtrate Pump Effluent	X	-	-
Demineralizer Effluent	X	-	-
Demineralizer (Acid Influent)	-	X	-
Demineralizer (Caustic Influent)	-	X	-
Recovery Sample Tank Effluent	X	-	-
Floor Drain Collector Tank Effluent	X	-	-
Final Discharge	X	-	X
Radwaste Filter Effluent	X	-	-
Regenerant Waste Tank Effluent	X	-	-
Regenerant Evaporator Bottoms Effluent	X	-	-
Phase Separator Tank Pump Discharge	-	X	-
Waste Evaporator Bottoms Effluent	X	-	-
Waste Evaporator Distillate Cooler Effluent	-	X	-
Regenerant Evaporator Distillate Cooler Effluent	-	X	-
Radwaste Demineralizer Waste Header Effluent	X	-	-

TABLE 11.5-2 (Cont)

GRAB SAMPLES FOR RADIOLOGICAL ANALYSIS

Sample Point Location	Grab Sample at the Sample Station	Local Grab Sample	Grab Sample at the Radiation Monitor
Water Treating System			
Cation Exchanger Unit Influent	X	-	-
Cation Exchanger Unit Effluent	X	-	-
Anion Exchanger Unit Influent	X	-	-
Anion Exchanger Unit Effluent	X	-	-
Mixed-Bed Exchanger Unit Influent	X	-	-
Mixed-Bed Exchanger Unit Effluent	X	-	-
Dilute Acid Effluent	-	X	-
Dilute Caustic Effluent	-	X	-
Wastewater Effluent	-	X	-
Condensate Demineralizer System			
Demineralizer (Train) Influent	X	-	-
Demineralizer (Train) Effluent	X	-	-
Resin Hold Tank Effluent	X	-	-
Demineralizers Effluent	X	-	-
Ultrasonic Resin Cleaner Effluent	-	X	-
Resin Mix Tank Effluent	X	-	-
Cation Regeneration Tank Effluent	X	-	-
Anion Regeneration Tankffluent	X	-	-
Recovered Acid Tank Effluent	-	X	-

TABLE 11.5-2 (Cont)

GRAB SAMPLES FOR RADIOLOGICAL ANALYSIS

Sample Point Location	Grab Sample at the Sample Station	Local Grab Sample	Grab Sample at the Radiation Monitor
Dilute Acid Effluent	-	X	-
Recovered Caustic Tank Effluent	-	X	-
Dilute Caustic Effluent	-	X	-
Recovered Water Sump Effluent	-	X	-
Condensate Makeup and Drawoff System			
Condensate Transfer Line	X	-	-
Makeup Water System			
Demineralizer Water Transfer Line	X	-	-
Wastewater Treatment System			
Waste Neutralizing Tank Effluent	-	X	-
Condensate System			
Condensate Pump Discharge	X	-	-
Condenser Hotwell	-	-	-
Heater Drains (Third Point)	X	-	-
Reactor Feedwater System			
Feedwater (After Last Heater)	X	-	-
Circulating Water System			
Effluent (Blowdown Line)	-	X	X
Auxiliary Steam System			
Auxiliary Boiler (Steam Outlet)	X	-	-
Feedwater (Pump Discharge)	X	-	-

TABLE 11.5-2 (Cont)

GRAB SAMPLES FOR RADIOLOGICAL ANALYSIS

Sample Point Location	Grab Sample at the Sample Station	Local Grab Sample	Grab Sample at the Radiation Monitor
Auxiliary Boiler (Blowdown)	-	X	-
Sealing Steam System			
Sealing Steam Evaporator	X	-	-
Radwaste Steam Supply			
Radwaste Steam Reboiler (Radwaste Auxiliary Steam)	X	-	-
Reactor Plant Ventilation System			
Reactor Bldg. Annulus Ventilation Exhaust	-	-	X
Main Plant Exhaust Duct	-	-	X
Containment Atmosphere	-	-	X
Containment Purge Exhaust	-	-	X
Drywell Ventilation System			
Drywell Atmosphere	-	-	X
Standby Gas Treatment System			
Standby Gas Treatment System Effluent	-	-	X
Auxiliary Building Ventilation System			
Auxiliary Bldg. Ventilation Exhaust	-	-	X
Fuel Building Ventilation System			
Fuel Bldg. Ventilation Exhaust	-	-	X

TABLE 11.5-2 (Cont)

GRAB SAMPLES FOR RADIOLOGICAL ANALYSIS

Sample Point Location	Grab Sample at the Sample Station	Local Grab Sample	Grab Sample at the Radiation Monitor
Control Building Ventilation System			
Main Control Room Intakes	-	-	X
Radwaste Building Ventilation System			
Radwaste Bldg Ventilation Exhaust	-	-	X
Turbine Building Ventilation System			
Turbine Bldg. Ventilation Exhaust	-	-	X
•→16			
Mechanical Vacuum Pump Discharge	-	-	-
16←•			
Condensate Demineralizer and Off Gas Building Ventilation Exhaust	-	-	X
Off Gas Pre-treatment	-	-	X
Off Gas Post-treatment	-	-	X
•→12			
Turbine Gland Seal Discharge	-	-	-
12←•			