In the Matter of System Energy Resources RAS 12719
Docket No. 52-009-ESP Official Exhibit No. Staff 1
OFFERED by: Applicant/Licensee Intervenor
NRC Staff Other
IDENTIFIED on 11/29/99 Witness/Panel
Action Taken: ADMITTED REJECTED WITHDRAWN
Reporter/Clerk

NRC STAFF EXHIBIT 1

TABLE 1.3-1 / TABLE 3.0-1

COMPOSITE PLANT PARAMETERS ENVELOPE (PPE) [6]

PPE Section / Parameter [3]	Composite (Bounding) Value [1]	Units	Definition	Value [2]	Usage [7]
1.1.2 Foundation Embedment	140	Feet	The depth from finished grade to the bottom of the basemat for the most deeply embedded power block structure.	US	FSER FEIS
2.3.2 Condenser / Heat Exchanger Duty	10.7 E9	BTU per hour	Design value for the waste heat rejected to the circulating water system across the normal heat sink condensers.	US	FSER FEIS
2.4.3 (2.5.3) Blowdown Constituents and Concentrations	See TABLE 3.0-2	Ppm	The maximum expected concentrations for anticipated constituents in the cooling water systems blowdown to the receiving water body.	US	FEIS
2.4.4 (2.5.4) Blowdown Flow Rate	12,800 expected (39,000 max)	Gallons per minute	The normal (and maximum) flow rate of the blowdown stream from the cooling water systems to the receiving water body for closed system designs.	TP	FEIS
2.4.5 (2.5.5) Blowdown Temperature	100	Degrees Farenheit	The maximum expected blowdown temperature at the point of discharge to the receiving water body.	US	FEIS
2.4.6 (2.5.6) Cycles of Concentration	4	Number of cycles	The ratio of total dissolved solids in the cooling water blowdown streams to the total dissolved solids in the makeup water streams.	US	FEIS
2.4.7 (2.5.7) Evaporation Rate	35,100 expected (39,000 max)	Gallons per minute	The expected (and maximum) rate at which water is lost by evaporation from the cooling water systems.	TP	FEIS
2.4.8 (2.5.8) Height	60 (475 / 550) See Note 5	Feet	The vertical height above finished grade of either natural draft or mechanical draft cooling towers associated with the cooling water systems.	US	FEIS

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TABLE 1.3-1 / TABLE 3.0-1

COMPOSITE PLANT PARAMETERS ENVELOPE (PPE) (Continued) [6]

PPE Section / Parameter [3]	Composite (Bounding) Value [1]	Units	Definition	Value [2]	Usage [7]
2.4.9 (2.5.9) Makeup Flow Rate	47,900 expected (78,000 max)	Gallons per minute	The expected (and maximum) rate of removal of water from a natural source to replace water losses from closed cooling water systems.	TP	FSER FEIS
2.4.10 (2.5.10) Noise	55	Decibels	The maximum expected sound level produced by operation of a cooling tower, measured at 1000 feet from the noise source.	US	FEIS
2.4.12 (2.5.12) Cooling Water Flow Rate	865,000	Gallons per minute	The total cooling water flow rate through the normal heat sink condensers/heat exchangers.	US	FEIS
3.3.4 Blowdown Flow Rate	288 expected (1700 max)	Gallons per minute	The normal (and maximum) flow rate of the blowdown stream from the UHS system to receiving water body for closed system designs.	TP	FEIS
3.3.5 Blowdown Temperature	95	Degrees Farenheit	The maximum expected UHS blowdown temperature at the point of discharge to the receiving water body.	US	FEIS
3.3.7 Evaporation Rate	822 expected (1700 max)	Gallons per minute	The expected (and maximum) rate at which water is lost by evaporation from the UHS system.	TP	FEIS
3.3.9 Makeup Flow Rate	1110 expected (3,400 max)	Gallons per minute	The expected (and maximum) rate of removal of water from a natural source to replace water losses from the UHS system.	TP	FEIS
3.3.12 Cooling Water Flow Rate	26,125 (normal) 52,250 (shutdown / accident)	Gallons per minute	The total cooling water flow rate through the UHS system.	US	FEIS
5.1.1 Flow Rate	120 expected (210 max)	Gallons per minute	The expected (and maximum) effluent flow rate from the potable and sanitary waste water systems to the receiving water body.	TP	FEIS

TABLE 1.3-1 / TABLE 3.0-1

COMPOSITE PLANT PARAMETERS ENVELOPE (PPE) (Continued) [6]

PPE Section / Parameter [3]	Composite (Bounding) Value [1]	Units	Definition	Value [2]	Usage [7]
5.2.1 Maximum Use	240	Gallons per minute	The maximum short-term rate of withdrawal from the water source for the potable and sanitary waste water systems.	TP	FSER FEIS
5.2.2 Monthly Average Use	180	Gallons per minute	The average rate of withdrawal from the water source for the potable and sanitary waste water systems.	TP	FSER FEIS
6.1.1 Flow Rate	220 expected (290 max)	Gallons per minute	The expected (and maximum) effluent flow rate from the demineralized system to the receiving water body.	TP	FEIS
6.2.1 Maximum Use	1440	Gallons per minute	The maximum short-term rate of withdrawal from the water source for the demineralized water system.	TP	FSER FEIS
6.2.2 Monthly Average Use	1100	Gallons per minute	The average rate of withdrawal from the water source for the demineralized water system.	TP	FSER FEIS
7.1.1 Maximum Use	1890	Gallons per minute	The maximum short-term rate of withdrawal from the water source for the fire protection water system.	TP	FSER FEIS
7.1.2 Monthly Average Use	(30)	Gallons per minute	The average rate of withdrawal from the water source for the fire protection water system.	TP	FSER FEIS
8.1.1 Flow Rate	200 expected (300 max)	Gallons per minute	The expected (and maximum) effluent flow rate from miscellaneous drains to the receiving water body.	TP	FEIS
9.4.2 Elevation (Normal)	Ground level	Feet	The elevation above finished grade of the release point for routine operational releases.	US	FSER FEIS

TABLE 1.3-1 / TABLE 3.0-1

COMPOSITE PLANT PARAMETERS ENVELOPE (PPE) (Continued) [6]

PPE Section / Parameter [3]		Composite (Bounding) Value [1]	Units	Definition	Value [2]	Usage [7]
9.4.3	Elevation (Post Accident)	Ground level	Feet	The elevation above finished grade of the release point for accident sequence releases.	US	FSER FEIS
9.4.4	Minimum Distance to Site Boundary	0.52 (841) – exclusion area boundary distance	Mile (meter)	The minimum lateral distance from the release point to the site boundary (exclusion area boundary for this parameter).	US	FSER FEIS
9.5.1	Airborne Effluents (Normal)	32,699 See TABLE 1.3-2 / TABLE 3.0-7	Curies per year	The annual activity, by isotope, contained in routine plant airborne effluent streams.	US	FSER FEIS
9.5.2	Airborne Effluents (Post-Accident)	Based on limiting DBAs. See Note 4	Curies	The activity, by isotope, activity contained in post-accident airborne effluents.	US	FSER FEIS
9.5.3	Tritium Airborne Effluent Normal)	7060	Curies per year	The annual activity of tritium contained in routine plant airborne effluent streams.	TP	FSER FEIS
10.2.1	Flow Rate	35	Gallons per minute	The flow rate of liquid potentially radioactive effluent streams from plant systems to the receiving water body.	US	FEIS
10.3.1	Liquid	0.694 See TABLE 3.0-8	Curies per year	The annual activity, by isotope, contained in routine plant liquid effluent streams.	US	FSER FEIS
10.3.2	Tritium	6,200 See TABLE 3.0-8	Curies per year	The annual activity of tritium contained in routine plant airborne effluent streams.	US	FSER FEIS
11.2.1	Activity	5400	Curies per year	The annual activity, by isotope, contained in solid radioactive wastes generated during routine plant operations.	TP	FSER FEIS
11.2.2	Principal Radionuclides	See TABLE 3.0-3	Curies per year	The principal radionuclides contained in solid radioactive wastes generated during routine plant operations.	US	FSER FEIS

TABLE 1.3-1 / TABLE 3.0-1

COMPOSITE PLANT PARAMETERS ENVELOPE (PPE) (Continued) [6]

PPE Section / Parameter [3]		Composite (Bounding) Value [1]	Units	Definition	Value [2]	Usage [7]
11.2.3	Volume	18,646	Cubic feet per year	The expected volume of solid radioactive wastes generated during routine plant operations.	TP	FSER FEIS
13.2	Flue Gas Effluents	See TABLE 3.0-4	Pounds per year	The expected combustion products and anticipated quantities released to the environment due to operation of the auxiliary boilers.	US	FEIS
16.1.3	Diesel Flue Gas Effluents	See TABLE 3.0-5	Pounds per year	The expected combustion products and anticipated quantities released to the environment due to operation of the emergency standby diesel generators.	US	FEIS
16.2.3	Gas-Turbine Flue Gas Effluents	See TABLE 3.0-6	Pounds per year Or PPMVD	The expected combustion products and anticipated quantities released to the environment due to operation of the emergency standby gas-turbine generators.	US	FEIS
17.3	Megawatts Thermal	4300	Megawatts	The maximum thermal power generated by a single unit or group of units/modules of a specific reactor plant type.	US	FSER FEIS
17.4	Plant Design Life	60	years	The life for which the plant is designed to operate.	US	FEIS
17.5.1	Operation	1160	Persons	The number of people required to operate and maintain the plant.	TP	FEIS
18.3.1	Noise	76-101	Decibels	The maximum expected sound level due to construction activities, measured at 50 feet from the noise source.	US	FEIS
18.4.1	Construction	3150 max	Persons	The number of people required to construct the plant.	US	FEIS

TABLE 1.3-1 / TABLE 3.0-1

COMPOSITE PLANT PARAMETERS ENVELOPE (PPE) (Continued) [6]

NOTES:

1. The "Composite Value" provides an envelope (bounding values) for design parameters for the various plant designs considered for the site. See Site Safety Analysis Report Section 1.3 for a discussion of the basis for parameter values.
2. "Value" pertains to the "Composite Value" for each parameter listed. In this table, a value designated "US" represents a "unit specific" value, meaning that it is applied per unit, or group of units or modules. A designation of "TP" is given to a value that represents total facility requirements. See Site Safety Analysis Report Section 1.3 for a discussion of the basis for parameter values.
3. Several main condenser cooling system alternatives were considered (i.e., mechanical and natural draft cooling towers, cooling ponds, and once-through cooling). The most restrictive value for each cooling system PPE section has been used in this table (e.g., 550 ft cooling tower height selected since both mechanical and natural draft towers were considered).
   - The once through cooling option was eliminated due to significant environmental impact.
   - The cooling pond option was eliminated due to insufficient GGNS site acreage to accommodate pond.
4. In general, source terms for any given accident are those used by the Vendors in their safety analyses. The methodologies used by the Vendors for establishing source terms include those established in TID-14844 and Regulatory Guide 1.183. See SSAR Sections 3.3.2 and 3.3.3 for additional detail on accident selection and source term methods.
5. For the purposes of environmental (aesthetic) impact, a natural draft cooling tower with a height of 550 ft is considered. The cooling tower plume model discussed in Section 5.3.3.1 of the ER was done assuming a natural draft cooling tower height of 475 ft., and a mechanical draft cooling tower height of 60 ft.
6. This composite table was prepared by combining information from ESP Application SSAR Table 1.3-1 and ER Table 3.0-1 to make up the list of PPE parameters. Definitions of parameters and their units are taken from SSAR Table 1.3-3 and ER Table 3.0-9, therefore these definition tables are not included in the composite. ER Tables 3.0-2 through 3.0-8 and SSAR Table 1.3-2 are included as supplementals to the composite, and are referenced in the composite as to their association with the PPE parameters via comments in the Composite Value fields. SSAR Table 1.3-2 and ER Table 3.0-7 are identical in content. Section headings from Tables 1.3-1 and 1.3-3 have been omitted from this composite table; e.g., headings 1., Structures, and 1.1, Building Characteristics, are not in this composite table.
7. Usage is defined for the purposes of this table to indicate, for the FSER, which parameters are directly or indirectly identified in the text or tables of the FSER and its appendices. For the FEIS usage, all parameters are included in Appendix I, and therefore are considered "used" for the purposes of this table.

TABLE 3.0-2

BLOWDOWN CONSTITUENTS AND CONCENTRATIONS[1]

Constituent	Concentration (ppm)[2, 3]		
	River Source	Well / Treated Water	Envelope
Chlorine demand	10.1	--	10.1
Free available chlorine	0.5	--	0.5
Chromium	--	--	--
Copper	--	6	6
Iron	0.9	3.5	3.5
Zinc	--	0.6	0.6
Phosphate	--	7.2	7.2
Sulfate	600	3,500	3,500
Oil and grease	--	--	--
Total dissolved solids	--	17,000	17,000
Total suspended solids	50	150	150
BOD, 5-day	--	--	--

NOTES:

1. See Composite PPE Table Sections 2.4.3 and 2.5.3.
2. Assumed cycles of concentration equals 4.
3. Concentrations are per unit/group of units, as applicable.

TABLE 3.0-3

PRINCIPAL RADIONUCLIDES IN SOLID RADWASTE [1]

Radionuclide [3]	Quantity (Ci/yr)
Fe-55	1761.37
Fe-59	1.35
Co-60	395.92
Mn-54	347.22
Cr-51	97.138
C0-58	93.6
Nl-63	279
H-3	1.5
C-14	0.3
Nb-95	162
Ag-110m	9
Zr-95	76.45
Ba-140	0.528
Pu-241	0.09
La-140	0.607
Other	72.858
Cs-134	605
Cs-137	507
Sr-90	1.24
I-131	81.91
Ba-137m	507
Na-24	0.44
Ru-103	2.18
Ru-106	1.37
Sb-124	11.29
I-133	4.55
Ce-141	0.14
Ce-144	0.11
Gd-153	3.09
CS-136	0.0287
Zn-65	25.7
Sr-89	0.886
Y-90	1.24
Y-91	4.43 E-4
Rh-103m	1.22 E-3
Rh-106	0.0592
Te-129m	2.31 E-5
Te-129	1.51 E-5
Total (rounded to nearest hundred) [2]	5400

NOTES:

1. See Composite PPE Table Section 11.2.2.
2. This is the bounding total for twice the single unit or group of units, not the total of the bounding quantities above.
3. Individual radionuclide quantities must be doubled since they represent data for a single unit or group of units.

TABLE 3.0-4

YEARLY EMISSIONS AUXILIARY BOILERS[1]

Pollutant Discharged[2, 3]	Quantity (lbs)
Particulates	17,250
Sulfur oxides	51,750
Carbon monoxide	1749
Hydrocarbons	50,100
Nitrogen oxides	19,022

NOTES:

1. See Composite PPE Table Section 13.2.
2. Emissions are based on 30 days/yr operation.
3. Individual quantities must be doubled since they represent data for a single unit or group of units.

TABLE 3.0-5

YEARLY EMISSIONS FROM STANDBY DIESEL GENERATORS [1]

Pollutant Discharged [2]	Quantity (lbs)
	Total All DGs [3]
Particulates	1230
Sulfur oxides	4,608
Carbon monoxide	4,600
Hydro-carbons	3,070
Nitrogen oxides	28,968

NOTES:

1. See Composite PPE Table Section 16.1.3.
2. Emissions are based on 4 hrs/month operation for each of the diesel generators.
3. Individual quantities must be doubled since they represent data for a single unit or group of units.

TABLE 3.0-6

YEARLY STANDBY POWER SYSTEM GAS TURBINE FLUE GAS EFFLUENTS[1]

Gas Turbine Capacity (MWe)	20 MWe
Distillate 20°F Ambient BTU/KWH (LHV)[3]	9,890
BTU/KWH (HHV)	10,480
Fuel Consumption Rate (lbs/hr)[3]	121,200
Effluent[4]	Quantity[2, 3] (lbs or PPMVD)
NOX (PPMVD @ 15% O2	42
NOX as NO2 (lbs)	2016
CO (PPMVD)	31
CO (lbs)	912
UHC (PPMVD)	3
UHC (lbs)	48
VOC (PPMVD)	N/A
VOC (lbs)	10
SO2 (PPMVD)	N/A
SO2 (lbs)	1882
SO3 (PPMVD)	N/A
SO3 (lbs)	30
SULFUR MIST (lbs)	50
PARTICULATES (lbs)	22
Exhaust Analysis (% Vol)	(% Vol)
ARGON	0.87
NITROGEN	72.56
OXYGEN	12.52
CARBON DIOXIDE	5.19
WATER	9.87

NOTES:

1. See Composite PPE Table Section 16.2.3.
2. Emissions are based on 4 hrs/month operation for each of the gas turbines.
3. Individual quantities must be doubled since they represent data for a single unit or group of units.
4. PPMVD - parts per million volume, measured on a dry basis.

TABLE 1.3-2 / TABLE 3.0-7

NORMAL OPERATIONS GASEOUS RELEASE SOURCE TERM[1]

Radionuclide	Composite Normal Release[2] (Ci/yr)	Radionuclide	Composite Normal Release[2] (Ci/yr)
Kr-83m	1.68E-03	Rb-89	8.65E-05
Kr-85m	7.20E+01	Sr-89	1.14E-02
Kr-85	8.20E+03	Sr-90	3.60E-03
Kr-87	5.03E+01	Y-90	9.19E-05
Kr-88	9.20E+01	Sr-91	2.00E-03
Kr-89	4.81E+02	Sr-92	1.57E-03
Kr-90	6.49E-04	Y-91	4.81E-04
Xe-131m	3.60E+03	Y-92	1.24E-03
Xe-133m	1.74E+02	Y-93	2.22E-03
Xe-133	9.20E+03	Zr-95	3.19E-03
Xe-135m	8.11E+02	Nb-95	1.68E-02
Xe-135	9.19E+02	Mo-99	1.19E-01
Xe-137	1.03E+03	Tc-99m	5.95E-04
Xe-138	8.65E+02	Ru-103	7.03E-03
Xe-139	8.11E-04	Rh-103m	2.22E-04
I-131	5.19E-01	Ru-106	2.34E-04
I-132	4.38E+00	Rh-106	3.78E-05
I-133	3.41E+00	Ag-110m	4.00E-06
I-134	7.57E+00	Sb-124	3.62E-04
I-135	4.81E+00	Sb-125	1.83E-04
C-14	2.19E+01	Te-129m	4.38E-04
Na-24	8.11E-03	Te-131m	1.51E-04
P-32	1.84E-03	Te-132	3.78E-05
Ar-41	1.02E+02	Cs-134	1.24E-02
Cr-51	7.03E-02	Cs-136	1.19E-03
Mn-54	1.08E-02	Cs-137	1.89E-02
Mn-56	7.03E-03	Cs-138	3.41E-04
Fe-55	1.30E-02	Ba-140	5.41E-02
Co-57	2.46E-05	La-140	3.62E-03
Co-58	6.90E-02	Ce-141	1.84E-02
Fe-59	1.62E-03	Ce-144	3.78E-05
Co-60	2.61E-02	Pr-144	3.78E-05
Ni-63	1.30E-05	W-187	3.78E-04
Cu-64	2.00E-02	Np-239	2.38E-02
Zn-65	2.22E-02		
		Total without Tritium	25,639
		Tritium (H-3)	7.06E+03
		Total with Tritium	32,699

NOTES:

1. See Composite PPE Table, Section 9.5.1 and 9.5.3.
2. Composite source term based on highest Radionuclide release for all plant types considered.

TABLE 3.0-8

NORMAL OPERATIONS LIQUID RELEASE SOURCE TERM [1]

Radionuclide	Composite Normal Release [2] (Ci/yr)	Radionuclide	Composite Normal Release [2] (Ci/yr)
I-131	2.826E-02	Zr-95	2.080E-03
I-132	5.200E-03	Nb-95	3.820E-03
I-133	2.000E-02	Mo-99	1.659E-03
I-134	3.400E-03	Tc-99m	1.600E-03
I-135	1.503E-02	Ru-103	9.860E-03
H-3	6.200E+03	Rh-103m	9.860E-03
C-14	8.800E-04	Ru-106	1.470E-01
Na-24	5.622E-03	Rh-106	1.470E-01
P-32	3.600E-04	Ag-110	2.800E-04
Cr-51	1.541E-02	Ag-110m	2.100E-03
Mn-54	5.200E-03		
Mn-56	7.622E-03	Sb-124	1.358E-03
Co-57	1.438E-04	Te-129	3.000E-04
Co-58	6.720E-03	Te-129m	2.400E-04
Co-60	1.822E-02	Te-131	6.000E-05
Fe-55	1.162E-02	Te-131m	1.800E-04
Fe-59	4.000E-04	Te-132	4.800E-04
Ni-63	2.800E-04	Cs-134	1.986E-02
Cu-64	1.503E-02	Cs-136	1.260E-03
Zn-65	8.200E-04	Cs-137	2.664E-02
Br-84	4.000E-05	Ba-137m	2.490E-02
Rb-88	5.400E-04	Cs-138	3.800E-04
Rb-89	8.811E-05	Ba-140	1.104E-02
Sr-89	2.200E-04	La-140	1.486E-02
Sr-90	7.027E-05	Ce-141	2.400E-04
Y-90	6.216E-06	Ce-143	3.800E-04
Sr-91	1.800E-03	Ce-144	6.320E-03
Y-91	2.200E-04	Pr-143	2.600E-04
Y-91m	2.000E-05	Pr-144	6.320E-03
Sr-92	1.600E-03	W-187	2.600E-04
Y-92	1.200E-03	Np-239	6.216E-03
Y-93	1.800E-03	All Others	4.000E-05
		Total All w/o Tritium	6.941E-01
		Total Tritium	6.200E+03

NOTES:

1. See Composite PPE Table, Section 10.3.1 and 10.3.2.
2. Composite source term based on highest Radionuclide release for all plant types considered.