Appendix A. Tables

Table A-1. Design Parameters for the Oconee ISFSI

GENERAL DESIGN REQUIREMENTS	
Maximum weight on crane hook	100 tons
Capacity (Casks/Canister)	24 PWR Assys
Maximum assembly weight	1682 lbs
Reference Fuel Assembly parameters:	
1. Nominal burnup	40,000 MWD\MTU
2. Initial Enrichment (Maximum)	4.0%
3. Maximum initial Uranium Content	472 kg/assembly
4. Cooling Time	10 years nominal
5. Fuel Rod Array	15 x 15
Fuel Cell Envelope (Minimum)	8.75/8.85 in.
Effective multiplication factor	$K_{eff} < 0.95$
Internal DSC atmosphere	Inert Gas (Helium)
Ambient temperature	-30ºF to 116ºF
Solar heat load (Maximum)	127 BTU/hr-ft^2
Average doses at HSM surface during storage	20 mr/hr combined gamma and neutron
Maximum Axial Midplane Dose at Transfer Cask Surface during Transport[1]	200 mr/hr combined gamma and neutron
Maximum Loading Height (Fuel Pool)	15' 6" above pool floor
Storage orientation	Horizontal
Normal Operating Equilibrium Clad Temperature	340ºC
Assume Credit for Burnup for Criticality Computations[2]	Based on 1.45% Initial Enrichment equivalent.
Accessible with Fuel Mast	
Maximum Assembly Length (Includes Radiation Growth and Control Components)	173 in.
Active Fuel Length	144 in.

Notes:

1. Licensing basis design calculations assume a homogeneous source over the active fuel region (See Section 7.2.1). Elevated dose rates in excess of 200 mrem/hr over limited areas of the transfer cask surface may be observed. In particular, elevated gamma dose rates in excess of 200 mrem/hr, centered on fuel assembly end fittings, can be anticipated based on initial DSC loading dose rate survey data. Supplementary shielding calculations performed subsequent to ISFSI operation demonstrate dose rates as high as 565 mrem/hr centered on fuel or near assembly end fittings can be anticipated.
2. Primary licensing basis criticality control design feature is credit for 1810 ppm soluble boron in DSC cavity during wet loading operations. Fuel assembly initial enrichment/burnup qualification procedures provide additional criticality safety margin.

Table A-2. Summary of ISFSI Fuel Handling Operations

1. Clean the DSC, if necessary, and Load it into the Transfer Cask
2. Fill the DSC with borated water and Transfer Cask annulus with demineralized water
3. Install the Inflatable Annulus Seal to seal the Cask/DSC annulus
4. Lift the Transfer Cask Containing the DSC into the Spent Fuel Pool
5. Load the Fuel into the DSC
6. Place the Top Shield Plug on the DSC
7. Lift the Transfer Cask Containing the Filled DSC out of the Spent Fuel Pool and Place it in the Decon Pit.
8. Remove the annulus seal.
9. Lower the water level in the DSC/transfer cask annulus to approximately 5 to 10 inches below the top of the DSC shell.
10. Lower the water level in the DSC below the bottom surface of the top shield plug.
11. Install and seal weld the inner top cover plate onto the DSC Body and perform NDE.
12. Install Outer Top Cover Plate.
13. Install Inner Top Cover Plate Strongback device.
14. Evacuate and Dry the DSC
15. Backfill the DSC with Helium
16. Seal Weld Covers for the Drain and Vent Line of the DSC and perform NDE
17. Remove Inner Top Cover Plate Strongback.
18. Seal Weld the Outer Top Cover Plate and perform NDE
19. Install the Transfer Cask Lid and Bolt in Place
20. Decontaminate the Transfer Cask Surface
21. Drain the water from the Cask/DSC Annulus
22. Lift the Transfer Cask onto the Transfer Trailer and Lower it into the Horizontal Position
23. Tow the Transfer Trailer to the HSM
24. Remove the HSM Front Access Door
25. Align the Transfer Cask and the HSM
26. Remove the Transfer Cask Lid and Bottom Access Plate
27. Push the DSC into the HSM Using the Hydraulic Ram System
28. Retract Hydraulic Ram Arm and reposition transfer cask
29. Replace the HSM Front Access Door and Tack Weld in Place

Table A-3. Primary Design Parameters for the ISFSI Transport Systems

System	Parameters	Value
Transfer Cask	Nominal Cavity Diameter	68 in.
	Nominal Cavity Length	188 in.
	Payload Capacity (Maximum)	90,000 lbs
	Reference Heat Rating	15.8 kw (.66/assembly)
	Shielding (Surface Dose) at Axial Midplane	200 mr/hr average
Transfer Cask Movement	Liftable by Crane	200,000 lbs. maximum.
	Rotatable by Crane from Vertical to Horizontal	Has rotation trunnions
Transfer Cask Lid	Removable in Horizontal Position	5,400 lb
Trailer and Skid	Truck Transportable	-
	Transfer Cask Lid Must Protrude	15.25 cm (6 in.)
	Past End of Trailer and Skid	
	Capacity (Transfer Trailer	109,000kg (120 tons)
	(Transfer Trailer Skid)	100,000kg (110 tons)

Table A-4. Major Systems, Subsystems and Components of the Oconee ISFSI

Dry Storage Canister
1. DSC Basket
a. Guide Sleeve (24)
b. Spacer Disks(8)
c. Support Rods(4)
2. DSC Shell
3. Shielded End Plugs (Top and Bottom)
4. Cover Plates (Top and Bottom)
5. Drain and Fill Ports
6. Grapple Ring
Horizontal Storage Module
1. Reinforced Concrete Walls, Roof, and Basemat
2. DSC Structural Steel Support Assembly
3. DSC Seismic Retainer
4. Cask Docking Flange and Tie-Down Restraints
5. Heat Shield
6. Shielded Front Access Door
7. Ventilation Air Openings (One Inlet, Two Outlets)
8. Shielded Ventilation Air Inlet Plenum
9. Ventilation Air Outlet Shielding Blocks
Transfer Cask
1. Cask Structural Shell Assembly
2. Bolted Top Head Assembly
3. Cask Lifting Trunnions
4. Lead Gamma Shielding
5. Neutron Shield Assembly
6. Ram Access Penetration Cover Plate
Transfer Trailer
1. Heavy Industrial-Grade Trailer
2. Cask Support Skid
3. Skid Positioning and Alignment System
Hydraulic Ram System
1. Hydraulic Cylinder and Supports
2. Hydraulic System
3. Grapple Assembly

Table A-5. Population Growth in Oconee, Pickens, and Anderson Counties, South Carolina (1980-2005)

	Oconee County		Pickens County		Anderson County	
	Population	**Annual Growth %**	**Population**	**Annual Growth %**	**Population**	**Annual Growth %**
1980	48,611	1.8%	79,292	2.8%	133,235	2.4%
1990	57,494	1.7%	93,896	1.7%	145,177	0.9%
1998	64,059	1.4%	107,087	1.7%	160,791	1.3%
2000	66,215	1.5%	110,757	1.7%	165,740	1.4%
2005	69,577	0.9%	113,575	0.7%	175,514	1.1%
Average		1.5%		1.7%		1.4%

Sources: DP-1. Profile of General Demographic Characteristics, Census 2000 Summary File 1 (SF 1) 100-Percent Data, U.S. Bureau of the Census, County Population Estimates for July 1, 2005 and Population Change for July 1, 2004 to July 1, 2005, Population Estimates, Population Division, U.S. Bureau of the Census, County Population Estimates for July 1, 1998 and Population Change for July 1, 1997 to July 1, 1998, Population Estimates Program Division, March 12, 1999; 1998 Upstate Profile; Development of the SC Upstate, Part 1: Population, Income, and Housing; South Carolina Appalachian Council of Governments; Greenville, South Carolina; Knight, H.T. (Ed.) 1998.

Table A-6. Population Projections for Oconee, Pickens, and Anderson Counties, South Carolina (2010-2050)*

	Oconee County	Pickens County	Anderson County
	Population	Population	Population
2010	74,954	123,563	188,149
2020	86,987	146,250	216,213
2030	100,952	173,104	248,462
2040	117,159	204,888	285,522
2050	135,968	242,508	328,110

*Based on the average annual growth percent from Table A-5 for the respective county.

Table A-7. Joint Frequencies of Wind Direction and Speed by Stability Class

OCONEE METEOROLOGICAL SURVEY TOWER DATA					FOR PERIOD OF MAR. 15, 1970 THRU MAR. 14, 1972							
SUMMARY OF PASQUILL A				WIND OCCURRENCES BY SECTOR & SPEED CLASS (NO. OCCUR, PERCENT)								
											DATE OF REPORT 5-16-72	
			WIND SPEED CLASS									
Wind Sector	Item	Sector Total	1.0-3.2 .45-1.49	3.3-5.5 1.5-2.49-	5.6-7.8 2.5-3.49	7.9-10.0 3.5-4.49	10.1-12.3 4.5-5.49	12.4-14.5 5.5-6.49	14.6-16.7 6.5-7.49	16.8-19.0 7.5-8.49	19.1-21.2 8.5-9.49	>21.2 MPH >=9.5 M/S
360.0	NO	132	15	68	35	8	4	0	2	0	0	0
-N-	PCT	0.92	0.10	0.47	0.24	0.05	0.03	0.00	0.01	0.00	0.00	0.00
22.5	NO	99	5	48	26	10	5	3	2	0	0	0
-NNE-	PCT	0.69	0.03	0.33	0.18	0.07	0.03	0.02	0.01	0.00	0.00	0.00
45.0	NO	172	10	56	30	16	23	18	10	9	0	0
-NE-	PCT	1.20	0.07	0.39	0.21	0.11	0.16	0.13	0.07	0.06	0.00	0.00
67.5	NO	161	8	29	31	20	32	25	13	2	1	0
-ENE-	PCT	1.12	0.05	0.20	0.22	0.14	0.22	0.17	0.09	0.01	0.01	0.00
90.0	NO	165	8	47	52	32	18	6	2	0	0	0
-E-	PCT	1.15	0.05	0.33	0.36	0.22	0.13	0.04	0.01	0.00	0.00	0.00
112.5	NO	137	18	59	35	12	11	2	0	0	0	0
-ESF-	PCT	0.96	0.13	0.41	0.24	0.08	0.08	0.01	0.00	0.00	0.00	0.00
135.0	NO	255	15	76	81	50	22	8	2	1	0	0
-SE-	PCT	1.78	0.10	0.53	0.56	0.35	0.15	0.05	0.01	0.01	0.00	0.00
157.5	NO	200	5	31	63	52	31	12	4	2	0	0
-SSE-	PCT	1.39	0.03	0.22	0.44	0.36	0.22	0.08	0.03	0.01	0.00	0.00
180.0	NO	270	11	49	64	56	45	27	14	2	2	0
-S-	PCT	1.88	0.08	0.34	0.45	0.39	0.31	0.19	0.10	0.01	0.01	0.00
202.5	NO	374	4	53	105	86	67	32	18	8	0	1
-SSW-	PCT	2.61	0.03	0.37	0.73	0.60	0.47	0.22	0.13	0.05	0.00	0.01
225.0	NO	388	5	81	113	60	44	27	33	17	5	3
-SW-	PCT	2.71	0.03	0.56	0.79	0.42	0.31	0.19	0.23	0.12	0.03	0.02
247.5	NO	204	4	50	47	17	19	16	17	14	5	15
-WSW-	PCT	1.42	0.03	0.35	0.33	0.12	0.13	0.11	0.12	0.10	0.03	0.10
270.0	NO	184	8	53	35	8	22	19	16	9	9	5
-W-	PCT	1.28	0.05	0.37	0.24	0.05	0.15	0.13	0.11	0.06	0.06	0.03
292.5	NO	113	7	31	15	10	6	8	8	8	6	14
-WNW-	PCT	0.79	0.05	0.22	0.10	0.07	0.04	0.05	0.05	0.05	0.04	0.10
315.0	NO	123	14	41	15	12	3	6	9	4	5	14
-NW-	PCT	0.86	0.10	0.29	0.10	0.08	0.02	0.04	0.06	0.03	0.03	0.10
337.5	NO	84	12	38	21	4	4	2	2	0	1	0
-NNW-	PCT	0.59	0.08	0.26	0.15	0.03	0.03	0.01	0.01	0.00	0.01	0.00
CALM	NO	0										
	PCT	0.00										
TOTAL	NO	3061	149	810	758	453	356	211	152	76	34	52
	PCT	21.36	1.04	5.65	5.36	3.16	2.48	1.47	1.06	0.53	0.24	0.36
TOTAL VALID OBSERVATIONS			14333							TOTAL OBSERVATIONS 17545		

OCONEE METEOROLOGICAL SURVEY TOWER DATA						FOR PERIOD OF MAR. 15, 1970 THRU MAR. 14, 1972					
SUMMARY OF PASQUILL B + C						WIND OCCURRENCES BY SECTOR + SPEED CLASS (NO. OCCURR, PERCENT)					
											DATE OF REPORT 5-16-72
			WIND SPEED CLASS								
Wind Sector	Item	Sector Total	1.0-3.2 .45-1.49	3.3-5.5 1.5-2.49-	5.6-7.8 2.5-3.49	7.9-10.0 3.5-4.49	10.1-12.3 4.5-5.49	12.4-14.5 5.5-6.49	14.6-16.7 6.5-7.49	16.8-19.0 7.5-8.49	19.1-21.2 8.5-9.49	>21.2 MPH >=9.5 M/S
360.0	NO	20	3	8	3	4	0	0.	2	0.	0.	0
-N-	PCT	0.14	0.02	0.05	0.02	0.03	0.00	0.00	0.01	0.00	0.00	0.00
22.5	NO	34	6	8	8	2	2	5	2	1	0	0
-NNE-	PCT	0.24	0.04	0.05	0.05	0.01	0.01	0.03	0.01	0.01	0.00	0.00
45.0	NO	57	3	8	9	11	7	9	6	3	1	0
-NE-	PCT	0.40	0.02	0.05	0.06	0.08	0.05	0.06	0.04	0.02	0.01	0.00
67.5	NO	52	0	10	2	12	9	7	7	3	1	1
-ENE-	PCT	0.36	0.00	0.07	0.01	0.08	0.06	0.05	0.05	0.02	0.01	0.01
90.0	NO	37	4	11	10	5	7	0	0	0	0	0
-E-	PCT	0.26	0.03	0.08	0.07	0.03	0.05	0.00	0.00	0.00	0.00	0.00
112.5	NO	32	5	9	12	4	2	0	0	0	0	0
-ESE-	PCT	0.22	0.03	0.06	0.08	0.03	0.01	0.00	0.00	0.00	0.00	0.00
135.0	NO	51	11	16	11	9	4	0	0	0	0	0
-SE-	PCT	0.36	0.08	0.11	0.08	0.06	0.03	0.00	0.00	0.00	0.00	0.00
157.5	NO	40	1	11	12	7	6	2	1	0	0	0
-SSE-	PCT	0.28	0.01	0.08	0.08	0.05	0.04	0.01	0.01	0.00	0.00	0.00
180.0	NO	48	5	9	6	8	10	4	3	2	0	1
-S-	PCT	0.33	0.03	0.06	0.04	0.05	0.07	0.03	0.02	0.01	0.00	0.01
202.5	NO	74	2	13	12	14	11	5	10	5	2	0
-SSW-	PCT	0.52	0.01	0.09	0.08	0.10	0.08	0.03	0.07	0.03	0.01	0.00
225.0	NO	75	7	9	8	18	7	11	10	2	3	0
-SW-	PCT	0.52	0.05	0.06	0.05	0.13	0.05	0.08	0.07	0.01	0.02	0.00
247.5	NO	37	3	6	4	3	2	7	2	4	0	6
-WSW-	PCT	0.26	0.02	0.04	0.03	0.02	0.01	0.05	0.01	0.03	0.00	0.04
270.0	NO	24	3	4	3	0	4	2	2	1	0	5
-W-	PCT	0.17	0.02	0.03	0.02	0.00	0.03	0.01	0.01	0.01	0.00	0.03
292.5	NO	21	2	9	0	0	0	0	3	3	1	3
-WNW-	PCT	0.15	0.01	0.06	0.00	0.00	0.00	0.00	0.02	0.02	0.01	0.02
315.0	NO	28	4	8	2	1	3	2	0	2	1	5
-NW-	PCT	0.20	0.03	0.05	0.01	0.01	0.02	0.01	0.00	0.01	0.01	0.03
337.5	NO	26	4	8	8	3	1	0	0	0	0	2
-NNW-	PCT	0.18	0.03	0.05	0.05	0.02	0.01	0.00	0.00	0.00	0.00	0.01
CALM	NO	0										
	PCT	0.00										
TOTAL	NO	656	63	147	110	101	75	54	48	26	9	23
	PCT	4.58	0.44	1.03	0.77	0.70	0.52	0.38	0.33	0.18	0.06	0.16
TOTAL VALID OBSERVATIONS			14333						TOTAL OBSERVATIONS 17545			

OCONEE METEOROLOGICAL SURVEY TOWER DATA			FOR PERIOD OF MAR. 15, 1970 THRU MAR. 14, 1972									
SUMMARY OF PASQUILL D			WIND OCCURRENCES BY SECTOR + SPEED CLASS (NO. OCCURR, PERCENT)									
												DATE OF REPORT 5-16-72
			WIND SPEED CLASS									
Wind Sector	Item	Sector Total	1.0-3.2 .45-1.49	3.3-5.5 1.5-2.49-	5.6-7.8 2.5-3.49	7.9-10.0 3.5-4.49	10.1-12.3 4.5-5.49	12.4-14.5 5.5-6.49	14.6-16.7 6.5-7.49	16.8-19.0 7.5-8.49	19.1-21.2 8.5-9.49	>21.2 MPH >=9.5 M/S
360.0	NO	30	10	10	3	4	1	1	0	1	0	0
-N-	PCT	0.21	0.07	0.07	0.02	0.03	0.01	0.01	0.00	0.01	0.00	0.00
22.5	NO	43	2	8	12	11	4	6	0	0	0	0
-NNE-	PCT	0.30	0.01	0.05	0.08	0.08	0.03	0.04	0.00	0.00	0.00	0.00
45.0	NO	95	7	10	18	9	18	19	11	2	1	0
-NE-	PCT	0.66	0.05	0.07	0.13	0.06	0.13	0.13	0.08	0.01	0.01	0.00
67.5	NO	55	4	7	10	12	13	6	0	3	0	0
-ENE-	PCT	0.38	0.03	0.05	0.07	0.08	0.09	0.04	0.00	0.02	0.00	0.00
90.0	NO	63	6	20	14	8	9	4	1	1	0	0
-E-	PCT	0.44	0.4	0.14	0.10	0.05	0.06	0.03	0.01	0.01	0.00	0.00
112.5	NO	26	4	12	7	3	0	0	0	0	0	0
-ESE-	PCT	0.18	0.03	0.08	0.05	0.02	0.00	0.00	0.00	0.00	0.00	0.00
135.0	NO	35	7	12	7	7	2	0	0	0	0	0
-SE-	PCT	0.24	0.05	0.08	0.05	0.05	0.01	0.00	0.00	0.00	0.00	0.00
157.5	NO	43	6	14	10	8	3	1	1	0	0	0
-SSE-	PCT	0.30	0.04	0.10	0.07	0.05	0.02	0.01	0.01	0.00	0.00	0.00
180.0	NO	44	4	7	7	4	7	9	3	3	0	0
-S-	PCT	0.31	0.03	0.05	0.05	0.03	0.05	0.06	0.02	0.02	0.00	0.00
202.5	NO	65	3	9	16	8	14	9	4	1	1	0
-SSW-	PCT	0.45	0.02	0.06	0.11	0.05	0.10	0.06	0.03	0.01	0.01	0.00
225.0	NO	98	2	23	25	13	9	14	11	1	0	0
-SW-	PCT	0.68	0.01	0.16	0.17	0.09	0.06	0.10	0.08	0.01	0.00	0.00
247.5	NO	38	5	10	2	2	5	8	2	1	0	3
-WSW-	PCT	0.26	0.03	0.07	0.01	0.01	0.03	0.05	0.01	0.01	0.00	0.02
270.0	NO	51	8	10	3	5	4	6	5	3	0	7
-W-	PCT	0.36	0.05	0.07	0.02	0.03	0.03	0.04	0.03	0.02	0.00	0.05
292.5	NO	24	2	6	2	1	1	2	0	3	1	6
-WNW-	PCT	0.17	0.01	0.04	0.01	0.01	0.01	0.01	0.00	0.02	0.01	0.04
315.0	NO	36	14	9	1	1	1	1	1	3	1	4
-NW-	PCT	0.25	0.10	0.06	0.01	0.01	0.01	0.01	0.01	0.02	0.01	0.03
337.5	NO	26	6	9	6	3	0	0	0	1	0	1
-NNW-	PCT	0.18	0.04	0.06	0.04	0.02	0.00	0.00	0.00	0.01	0.00	0.01
CALM	NO	0										
	PCT	0.00										
TOTAL	NO	772	90	176	143	99	91	86	39	23	4	21
	PCT	5.38	0.63	1.23	1.00	0.64	0.63	0.60	0.27	0.16	0.03	0.15
TOTAL VALID OBSERVATIONS			14333							TOTAL OBSERVATIONS 17545		

OCONEE METEOROLOGICAL SURVEY TOWER DATA						FOR PERIOD OF MAR. 15, 1970 THRU MAR. 14, 1972						
SUMMARY OF PASQUILL E						WIND OCCURRENCES BY SECTOR + SPEED CLASS (NO. OCCURR, PERCENT)						
												DATE OF REPORT 5-16-72
			WIND SPEED CLASS									
Wind Sector	Item	Sector Total	1.0-3.2 .45-1.49	3.3-5.5 1.5-2.49-	5.6-7.8 2.5-3.49	7.9-10.0 3.5-4.49	10.1-12.3 4.5-5.49	12.4-14.5 5.5-6.49	14.6-16.7 6.5-7.49	16.8-19.0 7.5-8.49	19.1-21.2 8.5-9.49	>21.2 MPH >=9.5 M/S
360.0	NO	391	50	135	129	49	19	4	3	0	0	2
-N-	PCT	2.73	0.35	0.94	0.90	0.34	0.13	0.03	0.02	0.00	0.00	0.01
22.5	NO	392	35	92	126	64	44	21	4	6	0	0
-NNE-	PCT	2.73	0.24	0.64	0.88	0.45	0.31	0.15	0.03	0.04	0.00	0.00
45.0	NO	611	42	87	120	129	108	90	25	8	2	0
-NE-	PCT	4.26	0.29	0.61	0.84	0.90	0.75	0.63	0.17	0.05	0.01	0.00
67.5	NO	390	30	84	93	92	39	27	15	9	1	0
-ENE-	PCT	2.72	0.21	0.59	0.65	0.64	0.27	0.19	0.10	0.06	0.01	0.00
90.0	NO	313	33	92	106	46	24	8	2	0	2	0
-E-	PCT	2.18	0.23	0.64	0.74	0.32	0.17	0.05	0.01	0.00	0.01	0.00
112.5	NO	165	34	56	47	11	13	2	2	0	0	0
-ESE-	PCT	1.15	0.24	0.39	0.33	0.08	0.09	0.01	0.01	0.00	0.00	0.00
135.0	NO	182	39	57	42	21	17	3	2	0	1	0
-SE-	PCT	1.27	0.27	0.40	0.29	0.15	0.12	0.02	0.01	0.00	0.01	0.00
157.5	NO	166	21	43	44	35	20	2	1	0	0	0
-SSE-	PCT	1.16	0.15	0.30	0.31	0.24	0.14	0.01	0.01	0.00	0.00	0.00
180.0	NO	217	31	36	58	38	25	19	7	2	1	0
-S-	PCT	1.51	0.22	0.25	0.40	0.26	0.17	0.13	0.05	0.01	0.01	0.00
202.5	NO	401	18	64	75	82	73	49	28	12	0	0
-SSW-	PCT	2.80	0.13	0.45	0.52	0.57	0.51	0.34	0.20	0.08	0.00	0.00
225.0	NO	570	35	94	100	84	87	93	60	15	2	0
-SW-	PCT	3.98	0.24	0.65	0.70	0.59	0.61	0.65	0.42	0.10	0.01	0.00
247.5	NO	363	20	54	62	51	69	57	24	11	3	12
-WSW-	PCT	2.53	0.14	0.38	0.43	0.36	0.48	0.40	0.17	0.08	0.02	0.08
270.0	NO	364	39	79	37	26	33	52	32	28	16	22
-W-	PCT	2.54	0.27	0.55	0.26	0.18	0.23	0.36	0.22	0.20	0.11	0.15
292.5	NO	206	22	36	18	16	15	15	25	15	16	28
-WNW-	PCT	1.44	0.15	0.25	0.13	0.11	0.10	0.10	0.17	0.10	0.11	0.20
315.0	NO	275	36	82	50	24	15	15	8	21	5	19
-NW-	PCT	1.92	0.25	0.57	0.35	0.17	0.10	0.10	0.05	0.15	0.03	0.13
337.5	NO	233	38	89	55	19	14	8	4	0	0	6
-NNW-	PCT	1.63	0.26	0.62	0.38	0.13	0.10	0.05	0.03	0.00	0.00	0.04
CALM	NO	17										
	PCT	0.12										
TOTAL	NO	5239	523	1180	1162	787	615	465	242	127	49	89
	PCT	36.55	3.65	8.23	8.11	5.49	4.29	3.24	1.69	0.89	0.34	0.62
TOTAL VALID OBSERVATIONS			14333							TOTAL OBSERVATIONS 17545		

OCONEE METEOROLOGICAL SURVEY TOWER DATA					FOR PERIOD OF MAR. 15, 1970 THRU MAR. 14, 1972							
SUMMARY OF PASQUILL F					WIND OCCURRENCES BY SECTOR + SPEED CLASS (NO. OCCURR, PERCENT)							
											DATE OF REPORT 5-16-72	
			WIND SPEED CLASS									
Wind Sector	Item	Sector Total	1.0-3.2 .45-1.49	3.3-5.5 1.5-2.49-	5.6-7.8 2.5-3.49	7.9-10.0 3.5-4.49	10.1-12.3 4.5-5.49	12.4-14.5 5.5-6.49	14.6-16.7 6.5-7.49	16.8-19.0 7.5-8.49	19.1-21.2 8.5-9.49	>21.2 MPH >=9.5 M/S
360.0	NO	384	38	160	150	30	6	0	0	0	0	0
-N-	PCT	2.68	0.26	1.12	1.05	0.21	0.04	0.00	0.00	0.00	0.00	0.00
22.5	NO	213	24	93	76	16	1	2	1	0	0	0
-NNE-	PCT	1.48	0.17	0.65	0.53	0.11	0.01	0.01	0.01	0.00	0.00	0.00
45.0	NO	170	23	83	45	12	4	2	1	0	0	0
-NE-	PCT	1.19	0.16	0.58	0.31	0.08	0.03	0.01	0.01	0.00	0.00	0.00
67.5	NO	106	12	50	31	5	5	0	1	0	1	1
-ENE-	PCT	0.74	0.08	0.35	0.22	0.03	0.03	0.00	0.01	0.00	0.01	0.01
90.0	NO	88	19	30	31	5	3	0	0	0	0	0
-E-	PCT	0.61	0.13	0.21	0.22	0.03	0.02	0.00	0.00	0.00	0.00	0.00
112.5	NO	53	11	25	12	4	1	0	0	0	0	0
-ESE-	PCT	0.37	0.08	0.17	0.08	0.03	0.01	0.00	0.00	0.00	0.00	0.00
135.0	NO	84	9	33	26	13	3	0	0	0	0	0
-SE-	PCT	0.59	0.06	0.23	0.18	0.09	0.02	0.00	0.00	0.00	0.00	0.00
157.5	NO	84	10	26	26	17	5	0	0	0	0	0
-SSE-	PCT	0.59	0.07	0.18	0.18	0.12	0.03	0.00	0.00	0.00	0.00	0.00
180.0	NO	108	14	27	26	14	21	6	0	0	0	0
-S-	PCT	0.75	0.10	0.19	0.18	0.10	0.15	0.04	0.00	0.00	0.00	0.00
202.5	NO	124	8	31	35	24	12	9	3	1	1	0
-SSW-	PCT	0.86	0.05	0.22	0.24	0.17	0.08	0.06	0.02	0.01	0.01	0.00
225.0	NO	173	16	49	32	35	24	15	1	0	0	1
-SW-	PCT	1.21	0.11	0.34	0.22	0.24	0.17	0.10	0.01	0.00	0.00	0.01
247.5	NO	142	13	40	29	30	14	6	8	2	0	0
-WSW-	PCT	0.99	0.09	0.28	0.20	0.21	0.10	0.04	0.05	0.01	0.00	0.00
270.0	NO	185	34	58	29	20	15	10	11	6	2	0
-W-	PCT	1.29	0.24	0.40	0.20	0.14	0.10	0.07	0.08	0.04	0.01	0.00
292.5	NO	159	23	67	29	16	10	6	5	1	2	0
-WNW-	PCT	1.11	0.16	0.47	0.20	0.11	0.07	0.04	0.03	0.01	0.01	0.00
315.0	NO	246	39	123	50	19	6	4	1	2	1	1
-NW-	PCT	1.72	0.27	0.86	0.35	0.13	0.04	0.03	0.01	0.01	0.01	0.01
337.5	NO	337	38	155	104	30	5	4	1	0	0	0
-NNW-	PCT	2.35	0.26	1.08	0.72	0.21	0.03	0.03	0.01	0.00	0.00	0.00
CALM	NO	3										
	PCT	0.02										
TOTAL	NO	2656	331	1050	731	290	135	64	33	12	7	3
	PCT	18.53	2.31	7.33	5.10	2.02	0.94	0.45	0.23	0.08	0.05	0.02
TOTAL VALID OBSERVATIONS			14333							TOTAL OBSERVATIONS 17545		

OCONEE METEOROLOGICAL SURVEY TOWER DATA					FOR PERIOD OF MAR. 15, 1970 THRU MAR. 14, 1972							
SUMMARY OF PASQUILL G					WIND OCCURRENCES BY SECTOR + SPEED CLASS (NO. OCCURR, PERCENT)							
												DATE OF REPORT 5-16-72
					WIND SPEED CLASS							
Wind Sector	Item	Sector Total	1.0-3.2 .45-1.49	3.3-5.5 1.5-2.49-	5.6-7.8 2.5-3.49	7.9-10.0 3.5-4.49	10.1-12.3 4.5-5.49	12.4-14.5 5.5-6.49	14.6-16.7 6.5-7.49	16.8-19.0 7.5-8.49	19.1-21.2 8.5-9.49	>21.2 MPH >=9.5 M/S
360.0	NO	370	35	144	139	46	6	0	0	0	0	0
-N-	PCT	2.58	0.24	1.00	0.97	0.32	0.04	0.00	0.00	0.00	0.00	0.00
22.5	NO	143	28	69	38	8	0	0	0	0	0	0
-NNE-	PCT	1.00	0.20	0.48	0.26	0.05	0.00	0.00	0.00	0.00	0.00	0.00
45.0	NO	97	18	41	27	8	2	1	0	0	0	0
-NE-	PCT	0.68	0.13	0.29	0.19	0.05	0.01	0.01	0.00	0.00	0.00	0.00
67.5	NO	72	10	31	18	11	2	0	0	0	0	0
-ENE-	PCT	0.50	0.07	0.22	0.13	0.08	0.01	0.00	0.00	0.00	0.00	0.00
90.0	NO	55	7	27	13	5	1	2	0	0	0	0
-E-	PCT	0.38	0.05	0.19	0.09	0.03	0.01	0.01	0.00	0.00	0.00	0.00
112.5	NO	31	6	14	7	1	2	1	0	0	0	0
-ESE-	PCT	0.22	0.04	0.10	0.05	0.01	0.01	0.01	0.00	0.00	0.00	0.00
135.0	NO	102	11	36	39	14	2	0	0	0	0	0
-SE-	PCT	0.71	0.08	0.25	0.27	0.10	0.01	0.00	0.00	0.00	0.00	0.00
157.5	NO	65	11	22	23	8	1	0	0	0	0	0
-SSE-	PCT	0.45	0.08	0.15	0.16	0.05	0.01	0.00	0.00	0.00	0.00	0.00
180.0	NO	55	8	18	17	10	1	1	0	0	0	0
-S-	PCT	0.38	0.05	0.13	0.12	0.07	0.01	0.01	0.00	0.00	0.00	0.00
202.5	NO	64	11	23	18	10	2	0	0	0	0	0
-SSW-	PCT	0.45	0.08	0.16	0.13	0.07	0.01	0.00	0.00	0.00	0.00	0.00
225.0	NO	142	19	42	46	25	8	1	0	1	0	0
-SW-	PCT	0.99	0.13	0.29	0.32	0.17	0.05	0.01	0.00	0.01	0.00	0.00
247.5	NO	111	23	40	29	10	5	3	0	0	0	1
-WSW-	PCT	0.77	0.16	0.28	0.20	0.07	0.03	0.02	0.00	0.00	0.00	0.01
270.0	NO	99	18	37	24	10	5	2	2	1	0	0
-W-	PCT	0.69	0.13	0.26	0.17	0.07	0.03	0.01	0.01	0.01	0.00	0.00
292.5	NO	110	26	52	19	4	4	3	2	0	0	0
-WNW-	PCT	0.77	0.18	0.36	0.13	0.03	0.03	0.02	0.01	0.00	0.00	0.00
315.0	NO	168	35	80	37	8	4	3	0	1	0	0
-NW-	PCT	1.17	0.24	0.56	0.26	0.05	0.03	0.02	0.00	0.01	0.00	0.00
337.5	NO	242	33	100	77	26	4	1	0	0	0	1
-NNW-	PCT	1.69	0.23	0.70	0.54	0.18	0.03	0.01	0.00	0.00	0.00	0.01
CALM	NO	3										
	PCT	0.02										
TOTAL	NO	1926	299	776	571	204	49	18	4	3	0	2
	PCT	13.44	2.09	5.41	3.98	1.42	0.34	0.13	0.03	0.02	0.00	0.01
TOTAL VALID OBSERVATIONS			14333							TOTAL OBSERVATIONS 17545		

Table A-8. Soil Permeability Test Results

Well No.	h (ft)	r (ft)	$\frac{h}{r}$	T_u (ft)	Q (ft^3./min)	T (°C)	WT Condition	K (ft./min)
NA-4W2	3.83	2.50	1.53(1)	27.0	0.175	23.5	Low	3.9×10^{-5}
NA-11AW2	14.0	0.833	16.8	31.0	0.133	20.5	High	3.3×10^{-4}
NA-13W1	6.17	0.833	7.42(2)	27.0	0.275	20.0	Low	2.0×10^{-4}
NA-15W1	14.0	0.833	16.8	30.3	0.240	20.5	High	6.1×10^{-4} (3)
NA-15W2	12.25	0.833	14.7	30.5	0.190	21.0	High	5.1×10^{-4}

Notes:

1. $\frac{h}{r} << 10$, not acceptable
2. $\frac{h}{r} < 10$, possibly acceptable
3. For manual incremental test, $k = 7.4 \times 10^{-4}$ ft/min

Table A-9. Significant Earthquakes in the Southeast United States (Intensity V or Greater)

Year	Date	Intensity (Modified Mercalli)	Locality	Epicentral Location		Perceptible Area (Square Miles)
				N.Lat	W.Long.	
1843	January 4	VIII	Western Tennessee	35.2	90.0	400,000
1857	December 19	Not Listed	Charleston, S.C.	32.8	79.8	Not Listed
1872	June 17	V	Milledgeville, Ga.	33.1	83.3	Not Listed
1874	February 10 April 17	V	McDowell County, N.C.	35.7	82.1	Local
1875	November 1	VI	Northern Georgia	33.8	82.5	25,000
1875	December 22	VII	Arvonia, Virginia	37.6	78.5	50,000
1877	November 16	V	Western N.C. and Eastern Tennessee	35.5	84.0	5,000
1879	December 12	V	Charlotte, N.C.	35.2	80.0	Not Listed
1884	January 18	V	Wilmington, N.C.	34.3	78.0	Local
1885	August 6	IV-V	North Carolina	36.2	81.6	Local
1886	February 4	V	Alabama	32.8	88.0	1,600
1886	August 31	IX-X	Charleston, S.C	32.9	80.0	2,000,000
1886	October 22 October 22	VI VII	Charleston, S.C. Charleston, S.C.	32.9 32.9	80.0 80.0	30,000 30,000
1886	November 5	VI	Charleston, S.C.	32.9	80.0	30,000
1889	July 19	VI	Memphis, Tenn.	35.2	90.0	Local
1897	April 30	IV-V	Tennessee and Ill.	Not Listed	Not Listed	Not Listed
1897	December 18	V	Ashland, Virginia	37.7	77.5	7,500
1900	October 31	V	Jacksonville, Fla.	30.4	81.7	Local

Year	Date	Intensity (Modified Mercalli)	Locality	Epicentral Location		Perceptible Area (Square Miles)
				N.Lat	W.Long.	
1902	October 18	V	Southeastern Tenn. and Northwestern Ga	35.0	85.3	1,500
1903	January 23	VI	Georgia and S.C.	32.1	81.1	10,000
1904	March 4	V	Eastern Tenn.	35.7	83.5	5,000
1905	January 27-8	VII	Alabama	34	86	250,000
1907	April 19	V	South Carolina	32.9	80.0	10,000
1911	April 20	V	North Carolina - South Carolina Border	35.2	82.7	600
1912	June 12	VII	Summerville, S.C.	32.9	80.0	35,000
1912	June 20	V	Savannah, Georgia	32	81	Not Listed
1913	January 1	VII-VIII	Union County, S.C.	34.7	81.7	43,000
1913	March 28	VII	Eastern Tennessee	36.2	83.7	2,700
1913	April 17	V	Eastern Tennessee	35.3	84.2	3,500
1914	January 23	V	Eastern Tennessee	35.6	84.5	Local
1914	March 5	VI	Georgia	33.5	83.5	50,000
1914	September 22	V	South Carolina	33.0	80.3	30,000
1915	October 29	V	North Carolina	35.8	82.7	1,200
1916	February 21	VI	Western N.C.	35.5	82.5	200,000
1916	August 26	V	Western N.C.	36	81	3,800
1916	October 18	VII	Alabama	33.5	86.2	100,000
1917	June 29	V	Alabama	32.7	87.5	Local
1918	June 21	V	Tennessee	36.1	84.1	3,000

Year	Date	Intensity (Modified Mercalli)	Locality	Epicentral Location		Perceptible Area (Square Miles)
				N.Lat	W.Long.	
1918	October 15	V	Western Tennessee	35.2	89.2	20,000
1920	December 24	V	Eastern Tennessee	36	85	Local
1924	October 20	V	Pickens County, S.C.	35.0	82.6	56,000
1926	July 8	VI	Southern Mitchell County, N.C.	35.9	82.1	Local
1927	June 16	V	Alabama	34.7	86.0	2,500
1928	November 2	VI	Western N.C.	36.0	82.6	40,000
1931	May 5	V-VI	Northern Alabama	33.7	86.6	6,500
1933	December 19	IV-V	Summerville, S.C.	33.0	80.2	Local
1935	January 1	V	North Carolina - Georgia Border	35.1	83.6	7,000
1939	May 4	V	Anniston, Ala.	33.7	85.8	Not Listed
1941	November 16	V-VI	Covington, Tenn.	35.5	89.7	Local
1945	June 13	V	Cleveland, Tenn.	35	84.5	Not Listed
1945	July 26	VI	Murray Lake, S.C.	34.3	81.4	25,000
1952	November 19	V	Charleston, S.C.	32.8	80.0	Not Listed
1952	July 16	VI	Dyersburg, Tenn	36.2	89.6	Not Listed
1954	January 22	V	Athens and Etowah, Tennessee	35.3	84.4	Not Listed
1954	April 26	V	Memphis, Tenn.	35.2	90.1	Not Listed
1955	January 25	VI	Tenn-Arkansas-Missouri Border	35.6	90.3	30,000
1955	March 29	VI	Finley, Tenn	36.0	89.5	Not Listed

Year	Date	Intensity (Modified Mercalli)	Locality	Epicentral Location		Perceptible Area (Square Miles)
				N.Lat	W.Long.	
1955	September 5	V	Finley, Tenn.	36.0	89.5	Not Listed
1955	September 28	V	Virginia-N.C. Border	Not Listed	Not Listed	1,700
1955	December 13	V	Dyer County, Tenn.	36	89.5	Not Listed
1956	September 7	VI	Eastern Tennessee	35.5	84.0	8,300
1956	January 28	VI	Tennessee-Arkansas Border	35.6	89.6	Not Listed
1957	April 23	VI	Northern Alabama	34.5	86.7	11,500
1957	May 13	VI	Western N.C.	35.7	82	8,100
1957	June 23	V	Eastern Central Tennessee	36.5	84.5	Not Listed
1957	July 2	VI	Western N.C.	35.5	83.5	Not Listed
1957	November 24	VI	North Carolina-Tennessee Border	35	83.5	4,100
1958	March 5	V	Wilmington, N.C.	34.2	77.7	Not Listed
1958	April 8	V	Obion County, Tenn.	36.2	89.1	400
1958	October 20	V	Anderson, S.C.	34.5	82.7	Local
1959	August 3	VI	South Carolina	33	79.5	25,000
1959	August 12	VI	Alabama-Tennessee Border	35	87	2,800
1959	October 26	VI	Northeastern S.C.	34.5	80.2	4,800
1959	December 21	V	Finley, Tenn	36	89.5	400
1960	January 28	V	Dyer County, Tenn.	36	89.5	Local
1960	February 262	V	Near Coast, S.C.	33	79	3,500
1960	April 15	V	Eastern Tenn.	35.7	84	1,300

Year	Date	Intensity (Modified Mercalli)	Locality	Epicentral Location		Perceptible Area (Square Miles)
				N.Lat	W.Long.	
1960	April 21	V	Lake County, Tenn.	36.3	89.5	Local
1960	July 23	V	Charleston, S.C.	33	80	Local
1971	July 13	IV-VI	Seneca, S.C.	34-35	82-83	Local
1979	August 25	VI	Lake Jocassee, S.C.	35	83	5,800

Table A-10. Physical Characteristics of PWR Fuel Assemblies Based on Nominal Design

Array	15 x 15
Maximum Assembly Length (including radiation growth and control component) (in.)	173
Weight (lb.)	1,682
Number of Fuel Rods	208
Number of Guide Tubes	16
Number of Instrument Tubes	1
Fuel Rod Length (in.)	153.69
Active Fuel Length (in.)	141.8-144.0
Maximum Distance between Grid Straps (in.)	21 7/32(1)

Notes:

Grid straps are placed on intervals of 21 3/32 ± 1/16 inch. Thus the maximum interval is 21 7/32 inch. These tolerances do not accumulate. The spacers in the DSC are two inches wide and the fuel grid straps are 1 ½ inch wide (higher for later zircaloy grid fuel). Therefore, fuel assembly support will be provided at the grid straps by the DSC spacer discs through the entire tolerance range of 20.97 inches (20 31/32) – 21.22 inches (21 7/32). The nominal value of 21.12 used in Revision 1 of the NUHOMS® -24P Topical Report (Table 3.1-2) falls within this range.

Table A-11. Transfer Cask Stress Analysis for Tornado Effects

Load Case	Load Description	Stress Category	Calculated Stresses (ksi)			Allowable[1] Stress (ksi)
			Cask Shell	Top Cover Plate	Bottom Cover Plate	
1	Wind Pressure Loads	Primary Membrane	0.9	0.0	0.0	49.0
		Membrane + Bending	2.9	0.4	0.3	70.0
2	Massive Missile	Primary Membrane	6.4	0.0	0.0	49.0
		Membrane + Bending	20.5	19.7	17.5	70.0
3	Penetration Resistance Missile	Primary Membrane	4.9	0.0	0.0	49.0
		Membrane + Bending	30.3	13.2	22.2	70.0
4	Protective Barrier Missile	Primary Membrane	Bounded by Case (3) Above			49.0
		Membrane + Bending				70.0

Note:

1. Service Level D Allowables are used.

Table A-12. Oconee ISFSI Major Components and Functions

Transfer	Cask Onsite IFA Transport, Shielding
Dry Storage Canister (DSC) Guide Sleeves Spacer Disks Support Rods End Shield Plugs DSC Body End Cover Plates	Criticality Control, IFA Support, Cover Gas Containment, Radioactive Material Confinement, Shielding
Horizontal Storage Module (HSM) Concrete Shielding DSC Support Assembly	Shielding, DSC Support, DSC Tornado Missile Protection DSC Cooling
Foundation	HSM Foundation Support
Transfer Components Transfer Trailer Hydraulic Ram Trailer Optical Alignment System	Transfer Cask Movement, DSC Transfers

Table A-13. Oconee ISFSI Radioactive Material Confinement Barriers

Radioactivity Source	Confinement Barriers
Contaminated Spent Fuel Storage Pool Water	1. Demineralized Water in DSC/Transfer Cask Annulus 2. Inflatable Annulus seal between DSC and Transfer Cask
Irradiated Fuel and Fission Gases	1. Fuel Cladding 2. DSC Body 3. Seal Welded Primary Closure (Inner Top Cover Plate) 4. Seal Welded Secondary Closure (Outer Top Cover Plate)

Table A-14. Oconee ISFSI Major Components and Design Requirements

Item	Design Code	Design Criteria
Transfer Cask	ASME Section III Class 2, 1983 Ed. with winter 1985 Addenda	Presented in Ref. 3.1, Section 3.2.5.3
DSC	ASME Section III Class 1, 1983 Ed. with winter 1985 Addenda	Presented in Ref. 3.1, Section 3.2.5.2
HSM Including Foundation and DSC Support Structure	ACI 349-85 ACI 318-83 AISC, 8th Ed.	Presented in Ref. 3.1, Section 3.2.5.1
Transfer Trailer and Skid	Industry Standards[1]	Ref. 3.1, Section 1.3.1.4 and 1.3.1.5
Hydraulic Ram	Industry Standards[2]	Ref. 3.1, Section 1.3.1.6
Cask Lifting Devices	ASME Section III, Subsection NF, 1983 Ed. with winter 1985 Addenda.	None required at HSM site. Fuel bldg. lifts controlled by 10CFR Part 50 criteria.
HSM Site Electrical Power	NEC, NEMA, NEPA (built to the code requirements at the time of construction)	Required for DSC transfer operations only.

Notes:

1. See Section 1.3 and 3.1.2.2 of this UFSAR.
2. See Section 5.1 of this UFSAR.

Table A-15. ONS ISFSI Project Transfer Trailer Design Parameters

Ambient Storage Temperature	-30°F to 116°F
Ambient Operating Temperature	0°F to 110°F
Ambient Humidity	10% to 100%
Ambient Radiation	Negligible
Pressure Altitude	0' to 5000' el.
Payload (Cask + Skid)	120 tons
Minimum Deck Height	34”
Maximum Deck Height	52”
Maximum Deck + Steering Unit Length	25'-0”
Maximum Deck Length	21'-1”
Maximum Width	12'-0”
Inside Turn Radius	9' or less
Outside Turn Radius	27' or less
Maximum Pulling Speed (Laden)	5 mph
Maximum Grade	6.5%
Road Surface:	
(Fully Laden)	Asphalt
(Empty Cask)	Packed Gravel or Asphalt

Table A-16. Oconee ISFSI Major Components and Classification

Transfer Cask	Safety Related(1)
Dry Storage Canister (DSC)	Safety Related(2)
Basket	
Spacer Disks	
Support Rods	
End Shield Plug/Support (top and bottom)	
DSC Body	
End Closure Plates	
Horizontal Storage Module (HSM)	Seismic Interaction Related(3)
Concrete Shielding	
DSC Support Assembly	
Foundation	Seismic Interaction Related(3)
Transfer Components	Industrial Grade
Transfer Trailer	
Ram Assembly	
Instrumentation	Industrial Grade

Notes:

1. To ensure containment and criticality control under all applicable transport accident conditions, transfer cask components are designed, constructed, and tested in accordance with Nuclear Safety Related requirements as defined by 10CFR 50, Appendix B and the DPC QA-1 Quality Assurance Program.
2. To ensure safe and secure, long-term containment and criticality control during transfer and storage of IFAs, DSC components are designed, constructed, and tested in accordance with Nuclear Safety Related requirements as defined by 10CFR 50, Appendix B and the DPC QA-1 Quality Assurance Program.
3. Components which are not required to perform a safety function or mitigate the consequences of an accidental radiological release comparable to 10CFR 100 site dose criteria guide values are designed, constructed, and tested in accordance with the DPC QA-2 Quality Assurance Program. Additionally, the concrete HSMs and foundation are designed to withstand Safe Shutdown Earthquake seismic forces and tornado missiles so as to preclude any interaction with the DSC pressure boundary or loss of shielding Therefore, construction and inspection shall be in accordance with the DPC QA-4 Quality Assurance Program.

Table A-17. Gamma Energy Spectrum

Cask Energy Group No.	E_{upper} (MeV)	E_{mean} (MeV)		Gamma Source Strength (Photons/sec/ MTIHM)
23	10.0			0
24	8.0			0
25	6.5	5.50		3.84+6
		4.75		
26	5.0	4.25		1.16+7
		3.75		
27	4.0	3.25		1.53+9
28	3.0	2.80		8.93+9
		2.40		
29	2.5	2.00		3.96+11
30	2.0			0
31	1.66	1.57		1.88+13
32	1.33	1.13		2.66+14
33	1.0			0
34	0.8	0.65		4.34+15
35	0.6			0
36	0.4	0.30		1.92+14
37	0.3			0
		0.17		
38	0.2	0.12		4.91+14
		0.085		
39	0.1	0.055		1.11+15
		0.030		
40	0.05	0.010	$\sum$ All Group	$\frac{3.38+15}{9.80+15}$

Table A-18. Shielding Analysis Results

Location	Neutron Dose Rate (mr/hr)		Gamma Dose Rate (mr/hr) Primary and Secondary[1]		Total Dose Rate (mr/hr)
	Direct	Reflected	Direct	Reflected	
DSC In HSM					
1. HSM Wall or Roof	0.1	Note 2	7	Note 2	7
2. HSM Phase I Air Outlet Shielding Cap	0	0.2	<1	50	50
3. HSM Phase II Air Outlet Shield Cap	0	.2	<1	12	12
4. HSM Phase I Air Outlet (No Shielding Cap)	0.7	15	265	3270	3551
5. HSM Phase II Air Outlet (No Shield Cap)	0.7	15	288	3539	3827
6. Center of Door	37	Note 2	8	Note 2	45
7. Center of Opening	430	Note 2	330	Note 2	760
8. Center of Air Inlets	0.1	2	<7	86	96.4
9. 4.5 Ft. From HSM Door	20	Note 2	4	Note 2	24
DSC In CASK (Lead Shield Plug)					
1. Centerline Top of DSC Plug (with water in annulus and with 2 inches temporary neutron shielding)	5.3	Note 2	10	Note 2	15
2. Top of DSC Cover Plate (with water in annulus and with 2 inches of temporary neutron shielding)					
a. Centerline	40	Note 2	30	Note 2	70
b. Gap (Peak)[3]	32	Note 2	24	100	156
3. Transfer Cask Surface					
a. Radial	54	Note 2	146	Note 2	200

Location	Neutron Dose Rate (mr/hr)		Gamma Dose Rate (mr/hr) Primary and Secondary[1]		Total Dose Rate (mr/hr)
	Direct	**Reflected**	**Direct**	**Reflected**	
(Centerline)					
b. Radial (Peak)[4]	54	Note 2	511	Note 2	565
c. Top axial	15	Note 2	1	Note 2	16
d. Bottom axial	32	Note 2	16	Note 2	48

Notes:

1. The DSC/Cask annulus is filled with water and additional neutron shielding material is utilized as required. In addition, all but top six inches of the DSC inner cavity is assumed to be filled with water for this operation.
2. The reflected dose at these locations is negligible
3. The same gap dose rate applies for case where only top lead plug is on DSC. The dose rates reported are with water in the DSC/cask annulus (however, no water was assumed to be in the DSC).
4. Estimated maximum radial surface dose rate localized near IFA end fitting and fuel pin plenum axial elevations.

Table A--19. Summary of Estimated On-Site Doses Resulting from ISFSI[1] Operations. (Per DSC Transfer to HSM)

Operation	Number of Personnel	Time[(2)] (Hours)	Ave. Dist. From Cask/ DSC/Cask Surface (Feet)	Dose Rate (mR/Hr)	Total Personnel Dose (P-mR)
Location: Fuel Pool					
Load Fuel into DSC	2	8	GA[(3)]	2	32
Place Sheilded End Plug on DSC	2	0.5	GA	2	2
Location: Cask Handling Area					
Decontaminate and Survey Surface of Cask	3	2	8 Side	35	210
Lower Water Level in DSC Cavity and DSC/Transfer Cask Annulus	2 2	0.25 2	1.5 F/D Port GA	48 2	24 8
Tack Weld Top End Shield Plug to DSC	1	0.25	1.5 Top Edge	48	12
Set up Automatic Welder and Seal Weld Top End Shield Plug to DSC	2 2	1.5 3	1.5 Top Edge GA	48 2	144 12
Perform Dye Penetrant Test on Welds	1	.0.5	1.5 Top Edge	48	24
Remove Remaining Water/Vacuum Dry DSC Cavity	2 2	0.25 3.75	1.5 F/D Port GA	55 2	27 15
Backfill DSC Cavity With Helium	2	0.5	GA	2	2
Helium Leak Test	1	0.5	1.5 Top Edge	61	31
Seal Weld Vent/Siphon Ports	2	1	1.5 F/D Port	61	122
Perform Dye Penetrant Test on Welds	1	0.25	1.5 Top Edge	61	15
Install Top Cover Plate	2	0.25	1.5 Top Edge	61	31
Weld Top Cover Plate to DSC	2 2	0.35 2.65	1.5 Top Edge GA	61 2	43 11
Perform Dye Penetrant Test on Weld	1	0.5	1.5 Top Edge	61	31
Remove Seal, Drain Cask/DSC Annulus and Swipe	2 2	0.75 3.25	1.5 Top Edge GA	151 2	227 13
Install Cask Head and Bolt Into Place	2	0.5	1.5 Top Edge	85	85
Lower Transport Cask to Skid and Trailer	2 4	1 2	4 Side 8 Side	120 67	240 536
Location: Trailer/HSM					
Attach Skid-Tiedown to Trailer	2	0.25	1.5 Side	210	105

Operation	Number of Personnel	Time[(2)] (Hours)	Ave. Dist. From Cask/ DSC/Cask Surface (Feet)	Dose Rate (mR/Hr)	Total Personnel Dose (P-mR)
Transport Cask to HSM	1	1	8 Side	67	67
	3	1	GA	2	6
Remove Cask Head, Bottom Cover Plate and Position Ram	2	0.5	1.5 Bot/Top	90	90
Align Cask with HSM and Install Cask Restraints	4	1.5	4 Side	120	720
Transfer DSC from Cask to HSM	4	0.5	4 Side	120	240
Install Seismic Restraint	2	0.08	1 DSC Top	760	122
Close and Tack Weld HSM Door	1	0.25	4.5 HSM	23	6
Radiation Protection Survey of HSM	1	1	3 HSM	5	5
Total for Transfer Operation (P-mrem)					3255

Notes:

1. Monitoring operation - Personnel will be monitoring the operation so that any problems which may arise can be swiftly corrected. The personnel may leave the area if necessary and the operation could be monitored from a remote location out of the radiation field.
2. Estimated times are conservative estimates for personnel working in the radiation field around the cask or HSM.
3. GA refers to General Area and is used to indicate workers in the room or area with the DSC/Transfer Cask to maintain visual control over operations in areas where the dose contribution from ISFSI operations is very low.

Table A-20. Dose Estimate for Construction of Additional Horizontal Storage Modules Based on Labor Estimates for 2 X 10 Array

Task	Number Workers	Hours in Radiation Area	Average Dose Rate (mRem/hr.)	Maximum Indiv. Dose (P-mRem)	Total Task Dose (P-mRem)
Survey	4	50	2	25	100
Excavation	4	192	2	96	383
Concrete Basemat	8	192	2	48	383
Forming Scaffolding Rebar	8	8496	2	2124	16992
Crane Operation	1	96	2	192	192
Steel Installation	8	1920	1	240	1920
Welding	1	30	1	30	30
Surveyors (steel)	4	167	1	42	167
Crane Operation (steel)	1	75	1	75	75
Paint	8	96	1	12	96
Clean up	2	42	1	21	42
TOTALS		11354			20379

Notes:

1. Estimated dose/module constructed = 1.02 Person Rem
2. Estimated maximum individual dose/module = 106 Person mRem

Table A-21. Neutron and Gamma Energy Spectra

	Cask Library Group No	Normalized Flux
Neutrons[1]		
	1	0.000005
	2	0.000030
	3	0.000138
	4	0.000982
	5	0.002567
	6	0.002456
	7	0.002970
	8	0.007440
	9	0.006820
	10	0.011135
	11	0.017633
	12	0.018344
	13	0.026756
	14	0.042225
	15	0.019154
	16	0.024170
	17	0.020290
	18	0.014654
	19	0.019803
	20	0.017683
	21	0.018689
	22	0.726046
Gammas[2]		
	23	0.000018
	24	0.000145
	25	0.000248
	26	0.000283
	27	0.000383
	28	0.000275
	29	0.001008
	30	0.009272
	31	0.007947
	32	0.057772
	33	0.051577
	34	0.074007
	35	0.123743
	36	0.093142
	37	0.137524
	38	0.316630
	39	0.125240
	40	0.000775

Notes:

1. Sum of Neutrons = 1.0
2. Sum of Gammas = 1.0

Table A-22. Comparison of Total Dose Rates for HSM With and Without Air Outlet Shielding Blocks

Distance (meters) from Nearest HSM Wall, 2x10 Array	Normal Case Dose Rate[1] (mrem/hr.) (with Shield Blocks)	Accident Case Dose Rate[1] (mrem/hr.) (Without Shield Blocks)
10	2.85	21.9
100	0.0587	0.533
500	8.97E-4	2.14E-3
2000	3.77E-8	9.62E-7

Note:

1. Air scattered plus direct radiation.

Table A-23. Cask Drop Target Parameters

1.	Slab reinforcement:
	a. Bottom mat - #5's @ 6″ c-c each way
	b. Top mat - #4's @ 6″ c-c each way
	c. Yield strength = 60 ksi per ASTM 615.
2.	Slab thickness = 1'-6″ of concrete
3.	Concrete strength (28 days) = 4000 psi (minimum)
4.	Soil ultimate strength - 12.0 ksf (Based on laboratory testing)
5.	Soil elastic modulus = 174 ksf (Based on laboratory testing)
6.	Poisson's ratio of soil = 0.3 (Based on soil test data and “Foundation Analysis and Design” 3rd Ed., Joseph E. Bowles.)