VOGTLE OLSER
INSERTION INSTRUCTIONS
AMENDMENT 2, APRIL 15, 1984

Page/Section	Instruction
t. 2.1-3	Replace
t. 2.1-17	Replace
3.0 Table of Contents, p. 3-v through p. 3-vi	Replace
p. 3.6-3 through 3.6-4	Replace
p. 3.6-7 through 3.6-9	Replace
p. 3.9-1	Replace
p. 3.9-2	Add
t. 3.9-1 through t. 3.9-3	Add
f. 3.9-1 through f. 3.9-2	Add
p. 4.2-1	Replace
t. 5.2-1 (Sheets 1 of 2, 2 of 2)	Replace
p. 5.5-1 through p. 5.5-2	Replace
p. 5.6-1 through p. 5.6-2	Replace
p. 5.7-1 through p. 5.7-2	Replace
t. 6.1-1 (Sheet 1 of 4)	Replace
t. 12.1-4	Replace
p. Q-i through Q-ii	Replace
t. E100.1-1 (Sheets 4 of 6, 5 of 6)	Replace
p. QE290.4-1 through QE290.4-2	Replace
p. QE290.4-3	Add
p. QE290.6-1	Replace
p. QE451.9-1	Replace
p. QE451.9-2 through p. Q' ›1.9-4	Add
p. QE451.10-1	Replace
t. E451.12-1 (Sheets 1 of 2, 2 of 2)	Rep ace
Acknowledgement Receipt to this package	Sign and return the the address indicated
Revision Insertion Instructions	Use and discard

TABLE 2.1-3

1980 POPULATION BY SECTORS

Sector	1- To 50-Mile Radius Totals	50- to 500-Mile Radius Totals
N	51,171	5,381,854
NNE	14,423	7,318,870
NE	10,773	5,323,684
ENE	12,638	1,201,216
E	4,087	375,454
ESE	10,310	120,590
SE	4,225	66,298
SSE	8,078	1,231,420
S	6,203	5,784,624
SSW	7,995	392,318
SW	5,140	910,827
WSW	13,316	3,001,790
W	6,975	3,394,724
WNW	47,379	4,949,989
NW	103,027	3,636,743
NNW	76,174	7,231,986
	381,914	50,322,387

2

1

TABLE 2.1-17 1

POPULATION BY SEGMENT FOR SOUTH-SOUTHEAST SECTOR
(50 TO 500 MILES)

Mile (Ring)	Year 1987	2007	2028
50	5,619	6,357	7,617
60	4,615	6,116	8,100
70	4,845	6,338	8,141
85	108,636	136,822	164,380
100	114,807	137,670	173,377
150	15,338	18,815	21,864
200	NA	NA	NA
350	26,960	33,785	379,612
500	1,154,710	1,490,623	1,888,704
Total	1,435,530	1,836,526	2,651,795

2

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LIST OF FIGURES

As discussed in subsections 3.3.1 and 3.4.1, makeup water is supplied to the main cooling towers from the Savannah River. During normal operation the makeup flow is varied to replenish circulating water system losses due to evaporation, drift, and blowdown. Blowdown flow is varied to maintain the circulating water cycles of concentration between two and six.

The circulating water chemical injection system provides acid and chlorine to maintain proper pH and control biological growth. Sulfuric acid, 66° Baume', is added to the circulating water system through metering pumps at a rate sufficient to reduce alkalinity and maintain the pH that will result in a Ryznar Index of between 7.0 to 7.5 to balance scaling and corrosion effects. Chlorine is added to the system to control biological growth in the tower-condenser system. Chlorine is injected as a gas dissolved in water.

The river water makeup system will be continuously chlorinated 2
as necessary during the Corbicula spawning season up to a level of 10 ppm providing a free available chlorine concentration of 1 ppm.

Chlorine is diffused into the suction of the river makeup water pumps at the river intake structure. Grab samples are taken at the discharge of the river makeup water pumps to monitor 1
chlorine concentrations.

Chlorine is injected directly at the circulating water system intake structure. Grab samples will be taken from the natural draft cooling tower blowdown line to monitor chlorine concentrations.

The amount of chlorine added depends upon the rate of biological growth in the circulating water. In general, intermittent chlorination to produce approximately 0.2 mg/l free available chlorine in the circulating water is expected. During the 1
summer, because of increased biological growth on warm days, chlorine is injected from usually 1 to 3 times/day. During the winter when chlorine demand is low, a single weekly injection period is required. During Corbicula spawning season (section 2.1), chlorination will be continuous up to a level of 10 mg/l providing a 1.0 mg/l free available chlorine. The maximum free available chlorine in the blowdown will be limited to an average of 0.2 mg/l with a maximum spike of 0.5 mg/l. Chlorination rates will vary depending on system conditions. Maximum system design chlorination rate is 10,000 lb/day. At present, the EPA does not have an effluent limitation on total residual chlorine 1
for cooling tower blowdown. Operating experience with other cooling towers within the region have shown a total residual chlorine concentration in the blowdown usually less than 0.1 mg/l. The total residual chlorine concentrations of the cooling tower blowdown at the VEGP should be in the same range as that

found at other cooling towers within the region. The system is 1
designed to ensure that the station effluent meets EPA chlorine effluent limitations (section 5.1.1).

Discharge from the two natural draft cooling towers is combined in a sump, with discharge from the nuclear service cooling water towers and other station liquid wastes discharged from the waste water retention basin. The sump liquid is combined with other station effluents as discussed in subsection 3.6.3 and discharged to the Savannah River.

Suspended solids deposition in the circulating water system is controlled through the use of dispersants, as required. The dispersant is selected and used according to specific needs. Mud and other solids are deposited in the bottom of the cooling tower basin. These wastes are discussed in paragraph 3.6.4.1.

3.6.1.2 Nuclear Service Cooling Water (NSCW) System

The VEGP utilizes one operating and one spare NSCW tower per unit as described in the Final Safety Analysis Report (FSAR) section 9.2.1. During normal operation, the blowdown flow is varied to maintain the cycles of concentration to between two and eight.

Acid and chlorine injection is provided to control pH and to inhibit biological growth. Sulfuric acid (66° Baume') is added as required to maintain a pH that will result in a Ryznar index of 7.0 to 7.5 to balance scaling and corrosion effects. Tower chlorination varies usually from three times per day on warm 1
summer days to one time per week during the winter. A dispersant is applied as needed to control the suspended solids contents.

Chlorine is injected in the NSCW pump discharge. Grab samples will be taken from the blowdown line to monitor chlorine concentrations. The maximum free available chlorine concentration will be limited to an average of 0.2 ppm with a maximum spike of 0.5 ppm in the blowdown. Chlorination rates will vary depending on system conditions. Maximum system design chlorination rate is 2000 lb/day. There is only a remote possibility of the NSCW system becoming 1
contaminated with <u>Corbicula</u>. That remote possibility occurs if river water makeup is provided for the NSCW system. If that occurs prolonged continuous chlorination will be employed to ensure that there is no infestation of the NSCW system by <u>Corbicula</u>. Total residual chlorine concentrations in the blowdown will be similar to that discussed for the main circulating water system.

concentration. This will be followed with a rinse of demineralized water.

2. Rust and mill scale will be removed from the system by circulating a heated organic acid solution for several hours.

3. Following the cleaning, the system will be flushed with rinses consisting of demineralized water and/or passivating chemicals.

Estimated total water volume used in a complete cleaning would be approximately 9,000,000 gal per unit. Wastes from this flushing process will be directed to the waste water retention basin, construction sediment retention basin, or the startup ponds for suspended solids removal before discharge to the Savannah River. The startup ponds consist of one unlined pond with a capacity of 5 x 10^6 gal for short term storage and one lined (0.100-in. high-density polyethylene) pond with a capacity of 3 x 10^6 gal for long term storage. The waste water retention basin is described in section 3.6.3. The majority of the water flushings from the fire protection system, potable water system, and utility water system will be directed to site storm drains. From the storm drains, the flushings will discharge to one of the two construction sediment retention basins for suspended solids removal. A small quantity of flush water will be collected in building drains which discharge to the waste water retention basin. Other station systems that are water flushed will discharge to either the waste water retention basin or the unlined startup pond for suspended solids removal. All chemical cleaning flushings will be discharged to the lined startup pond for treatment prior to discharge. The waste water from the startup ponds and waste water retention basin is discharged to the blowdown sump. Assuming that water flushing is sufficient, the startup waste is subject to EPA effluent limitations and standards for low volume wastes. 2

If chemical cleaning is required, treatment in the startup ponds will conform to EPA effluent limitations for metal cleaning wastes as discussed in subsection 5.1.1. The estimated quantities of chemicals used for chemical cleaning is shown in table 3.6-3.

Periodic nonradioactive operational equipment cleaning wastes will also be discharged to the waste water retention basin and/or startup ponds. The amount of cleaning waste involved will not be greater than that used during preoperational cleaning. 2

3.6.2.4 Water Treatment Plant

The water treatment plant is essentially the same as discussed in CPSER subsection 3.7.3. However, there is only one water treatment plant due to the decrease in the plant size from four to two units.

3.6.2.5 Liquid Radioactive Wastes

Systems for processing liquid radioactive wastes are described in subsection 3.5.2. Final discharge of effluents from the liquid radioactive waste processing system will meet 10 CFR 20 requirements for release into the Savannah River and EPA effluent limitations for low volume waste as discussed in subsection 5.1.1.

3.6.2.6 Turbine Building and Miscellaneous Building and Area Drains

The turbine building miscellaneous building and area drains are discussed in FSAR subsection 9.3.3. Oily wastes are treated by an oily waste separator and meet the EPA effluent limitations for low volume waste oil discharge as discussed in subsection 5.1.1.

3.6.3 LIQUID DISCHARGE SUMMARY

As shown in figure 3.3-1, the low volume waste streams are
collected in the waste water retention basin. The basin is a 1
corrosion-proof, epoxy-lined basin that provides aeration and 2
retention time for the wastes. The basin consists of two compartments, one side being used to handle normal waste streams and the other compartment providing holdup capacity for waste requiring treatment. Each compartment is sized for the waste generated for both units. Any treatment of the waste is done manually as needed based on the results of periodic samples. The solids removed from the waste water retention basin is discussed in subsection 3.6.4.

Liquid wastes from the waste water retention basins, the blowdowns from the nuclear service cooling water towers and natural draft towers, and any dilution flow necessary to meet 10 CFR 20 limits are combined in the blowdown sump. The liquid radwaste is injected into the discharge pipe downstream of the blowdown sump.

The characteristics of the waste streams and of the combined effluent discharge to the Savannah River are shown in table

3.6-2. The plant waste discharge conforms to the requirements discussed in subsection 5.1.1.

3.6.4 CHEMICAL AND BIOCIDE SOLID WASTES

The VEGP chemical and biocide solid wastes consist of settled solids from the waste water retention basins and the cooling tower basins and salt drift emissions from the cooling towers.

3.6.4.1 Settled Solids Removal

Each natural draft cooling tower has a solid deposition rate of approximately 2.5 lb/min into the basin. The basins have a desilting channel that leads to the 24-in. blowdown line which goes to the blowdown sump for discharge into the river. The towers are also equipped with access ramps so that silt and sludge buildup may be removed. This is expected to occur during normal plant outages. Cooling tower sludge will be disposed of in an approved upland disposal site.

Solids removed from the waste water retention basin will also be disposed of in an upland disposal site. Previous operating experience has revealed that these solids and cooling tower settled solids are not hazardous (see section 5.6.3) and can be disposed of in an approved upland disposal site. 1

3.6.4.2 Cooling Tower Salt Drift Emissions

Salt drift emissions from the natural draft cooling towers for a four-unit plant are discussed in CPSER subsection 5.3.2. The NRC staff concluded (FES paragraph 5.5.1.1) that the effects of deposition of cooling tower salt drift would be negligible. The decrease in plant size from four to two units further reduces these effects. Additional information on salt drift emissions is provided in response to questions E290.3 and E451.17. 1

3.9 TRANSMISSION FACILITIES

The environmental effects of the operation and maintenance of the transmission facilities are addressed in section 5.5. This section addresses changes in the transmission system since the Construction Permit Stage Environmental Report (CPSER) and the Construction Permit Stage Final Environmental Statement (FES).

Figure 3.9-1 illustrates the transmission system proposed in the CPSER and evaluated in the FES. This system included six corridors containing eight 500-kV lines and three 230-kV lines. This system would have impacted approximately 12,660 acres.

Figure 3.9-2 indicates the currently proposed transmission system. This system is based on current planning studies evaluating substation and interconnection needs for the Georgia intergrated transmission network. Changes from the CPSER are due to a reduction from a four-unit plant to a two-unit plant as well as changes to construction schedules of substations and lines. The system described in figure 3.9-2 supersedes past system descriptions in the CPSER and intervening changes such as those described in D. E. Dutton's letter to D. G. Eisenhut of February 1, 1982. 2

Two 230-kV lines will go from VEGP to Goshen. These lines will share a common right-of-way approximately 19 miles in length with the existing 230-kV line which goes from Plant Wilson to Goshen.

A short single 230-kV line will go from VEGP to South Carolina Electric and Gas (SCEG). The exact right-of-way for this line has not been established.

A 500-kV line will go from VEGP to Plant Scherer. This line will be approximately 152 miles long. This line is routed via the existing Wadley Substation but will not be initially interconnected at that point. This line is also routed via the Wallace Dam area, the site of a future substation.

A 500-kV line will go from VEGP to the Thalmann Substation. This line is routed by a proposed substation at Effingham (McIntosh) but will not interconnected at that point. The VEGP - Thalmann line will be approximately 159 miles in length.

It is projected that the entire network illustrated on figure 3.9-2 will affect approximately 6,200 acres. This is a

reduction in the environmental impact from that originally evaluated at the Construction Permit Stage of approximately 12,600 acres.

Table 3.9-1 provides details on the basic electrical design parameters including design voltage, line capacity, conductor type and configuration, spacing between phases, and minimum conductor clearances to ground. Table 3.9-2 indicates the lengths, widths, and area of rights-of-way. Table 3.9-3 indicates the land use categories impacted by the transmission lines. The categories correspond to those given in the CPSER and (FES).

The basic structural design parameters for the 500-kV and 230-kV structures are the same as those described in section 5.4.1 of the CPSER. In addition, the general methods of construction are also the same as those provided in the CPSER. 2

Insofar as feasible and practical, route selection has been guided by the Federal Power Commission publication, "Electric Power Transmission and the Environment" and the Department of Interior/Department of Agriculture publication entitled "Environmental Criteria for Electric Transmission Systems." Due consideration has been given to the avoidance of possible conflicts with any known natural or manmade areas where adverse effects of the environment could result. GPC coordinates with the appropriate agencies within the State of Georgia for determination of whether any structures or site of historical or archaeological significance will be disturbed and any required mitigating returns. These actions are consistent with the requirements of the VEGP Construction Permit condition 3E(1) and the commitments summarized in section 4.5 of the (FES).

TABLE 3.9-1

PHYSICAL CHARACTERISTICS OF VEGP TRANSMISSION LINES

		VEGP-Goshen (White) 230-kV Line	VEGP-Goshen (Black) 230-kV Line	VEGP-Thalmann 500-kV Line	VEGP-Plant Scherer 500-kV Line
1.	Structure type	Guyed H-frame	Guyed H-frame	Four-legged rigid base	Four-legged rigid base
2.	Structure material	Galvanized steel	Galvanized steel	Galvanized steel	Galvanized steel
3.	Nominal height	80 ft - 100 ft	80 ft - 100 ft	80 ft - 100 ft	80 ft - 100 ft
4.	Line length (miles)	18.8	18.8	159	152
5.	Number of lines	1 at 230 kV	1 at 230 kV	1 at 500 kV	1 at 500 kV
6.	Nominal span	1300 ft	1300 ft	1300 ft	1300 ft
7.	Number of structures/miles	4 - 4.5	4 - 4.5	4 - 4.5	4 - 4.5
8.	Conductor type/size	Two bundles 795 kcmil ACSR	Two bundles 795 kcmil ACSR	Three bundled 1113 kcmil ACSR	Three bundled 1113 kcmil ACSR
9.	Phase/phase clearance	23 ft	23 ft	28 ft	28 ft
10.	Conductor ground clearance at maximum operating condition	27 ft	27 ft	33 ft	33 ft

2

TABLE 3.9-2

PHYSICAL CHARACTERISTICS OF VEGP TRANSMISSION LINES

Name of Line/Section	Lengths of Different Widths of R/W (Miles) 275 ft	150 ft	137.5 ft	125 ft	100 ft	Total Length of Parallel lines (Miles)
Plant Vogtle-Wadley-Wallace Dam-Plant Scherer 500-kV transmission line						
• Plant Vogtle-Wadley section	--	24.6	17.8	--	--	17.8
• Wadley-Wallace Dam section	--	42.4	13.9	--	--	13.9
• Wallace Dam-Plant Scherer section	--	49.2	3.5	--	0.9	4.4
• Total	--	116.2	35.2	--	0.9	36.1
Plant Vogtle-Effingham-Thalmann 500-kV transmission line						
• Plant Vogtle-Effingham section	--	68.8	--	--	--	0.3
• Effingham-Thalmann section	--	83.6	--	6.2	--	45.[illegible]
• Total	--	152.4	--	6.2	--	45.4
Plant Vogtle-Goshen No.1 , No. 2, and No. 3 230-kV transmission line	18.80	--	--	--	--	18.8
Plant Vogtle-South Carolina Electric & Gas (SCEG)[a]	--	--	--	--	--	--

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a. Right-of-way to be established by SCEG.

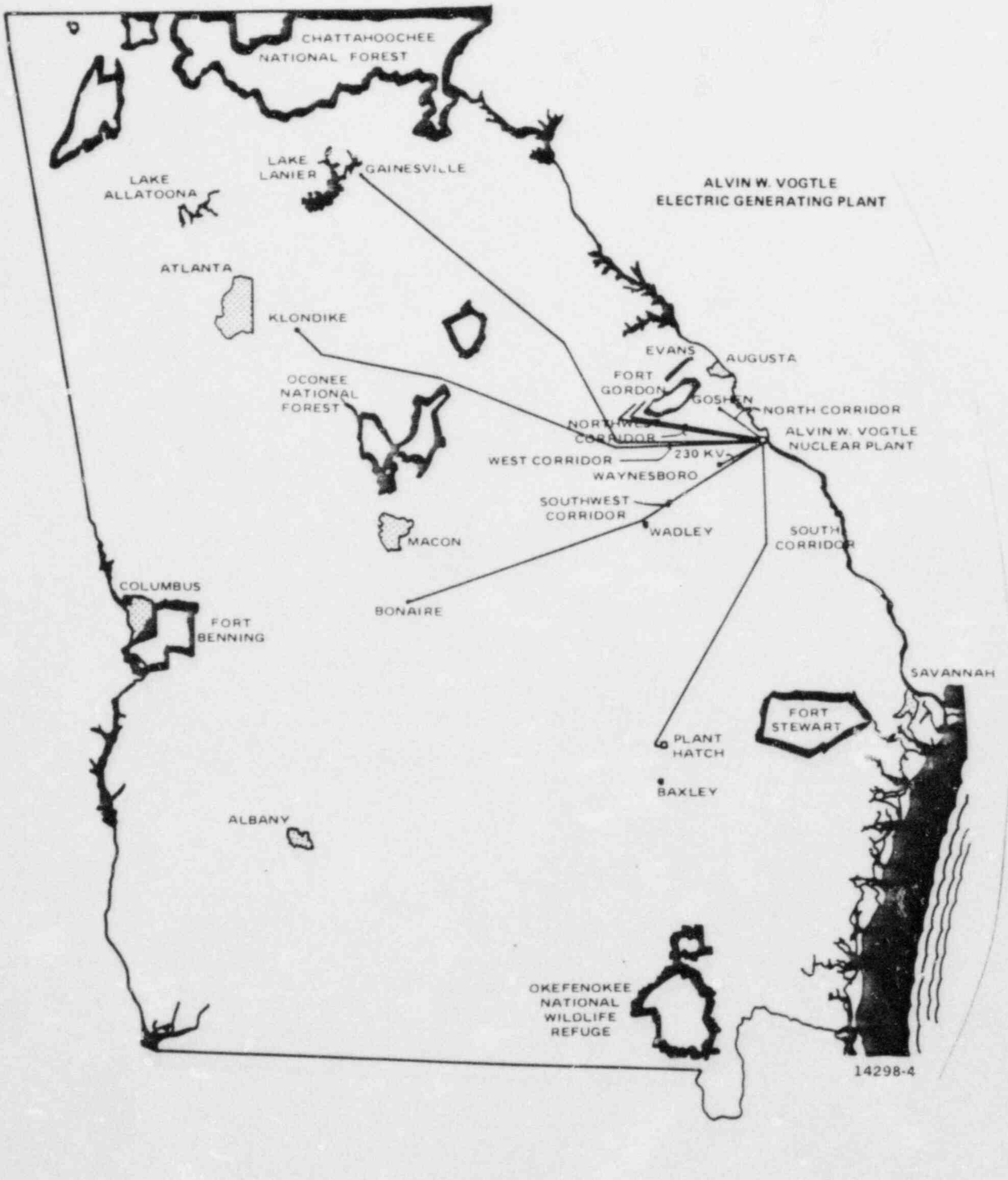
TABLE 3.9-3

LAND USE CATEGORIES OCCUPIED BY TRANSMISSION CORRIDORS

Name of Line/Section	Classification of R/W (Acres)				
	Wooded		Fields and Cultivated	Wetlands	Urban
	Pines	Hardwoods			
Plant Vogtle-Wadley-Wallace Dam-Plant Scherer 500-kV transmission line					
• Plant Vogtle-Wadley section	280	232	224	7	--
• Wadley-Wallace Dam section	419	310	257	13	4
• Wallace Dam-Plant Scherer section	534	313	96	16	5
• Total	1233	855	577	36	9
Plant Vogtle-Effingham-Thalmann 500-kV transmission line[a]					
• Plant Vogtle-Effingham section	408	455	385	42	--
• Effingham-Thalmann section	866	730	8	9	2
• Total	1274	1185	393	51	--
Plant Vogtle-Goshen No. 1, No. 2, and No. 3 230-kV transmission line	275	220	123	8	2

a. Some netland acreages were also classified and counted as woodlands.

2



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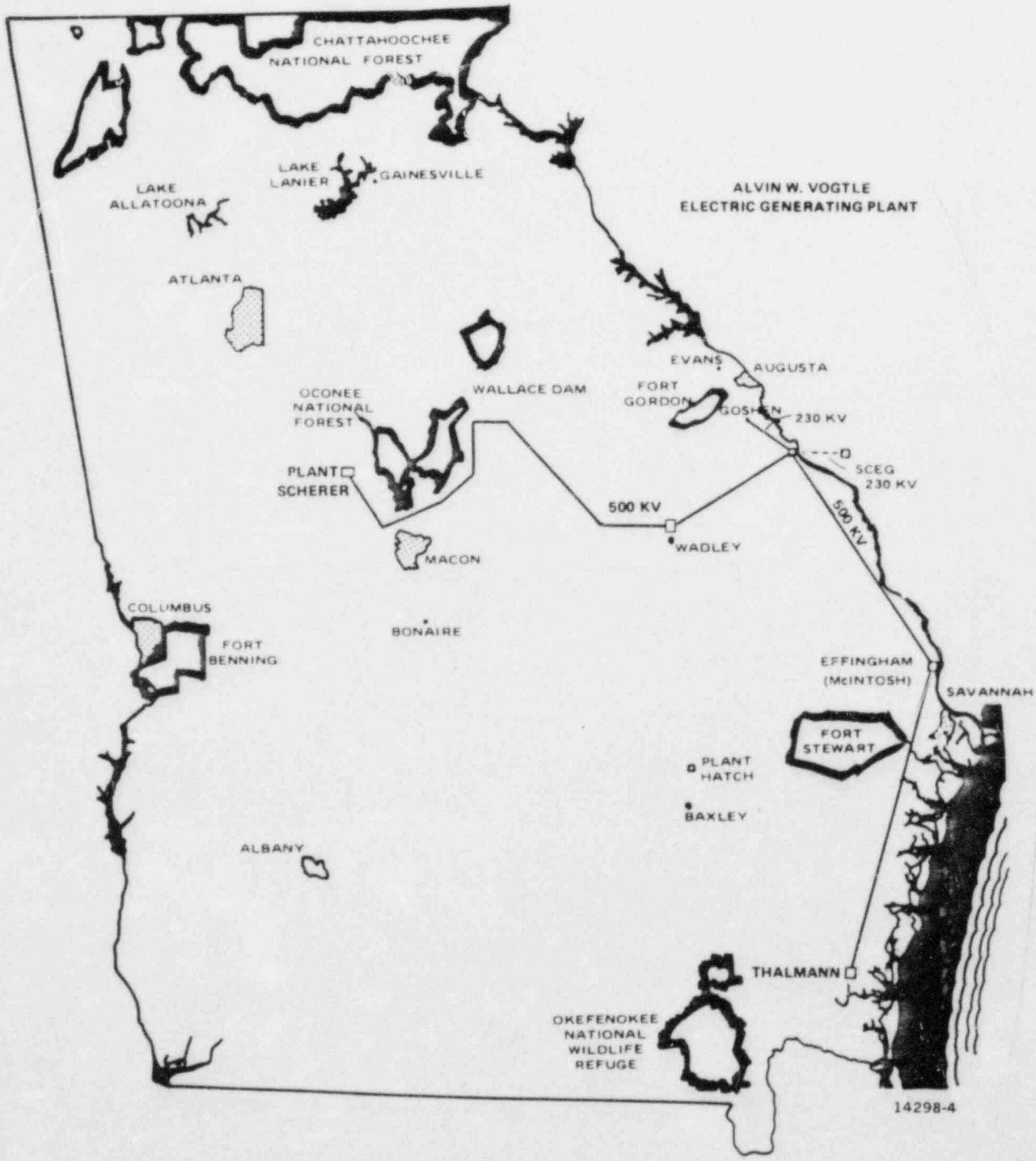
Georgia Power

ALVIN W. VOGTLE
ELECTRIC GENERATING PLANT
UNIT 1 AND UNIT 2

TRANSMISSION LINE ROUTING

FIGURE 3.9-1



Georgia Power	ALVIN W. VOGTLE ELECTRIC GENERATING PLANT UNIT 1 AND UNIT 2	TRANSMISSION LINE ROUTING FIGURE 3.9-2

433-9

2

4.2 TRANSMISSION FACILITIES CONSTRUCTION

The environmental effects of transmission facilities construction were addressed in section 5.4 of the Construction Permit Stage Environmental Report (CPSER). Changes in the transmission line rights of way since that report are provided in section 3.9. These changes illustrated that the projected impacts were less than those given in the CPSER. Actions taken by Georgia Power Company to comply with the conditions of the Construction Permit relative to transmission line construction are addressed in chapter 13 of the VEGP-OLSER. 2

TABLE 5.2-1 (SHEET 1 OF 2)

DIFFUSION AND DEPOSITION ESTIMATES FOR ALL RECEPTOR LOCATIONS

Release Point: Plant Vent/Wake-Split Season: Annual Computer Run ID: VX-3

Direction	Distance to Nearest Milk Cow (m)[a]	X/Q (s/m³)	Depleted X/Q (s/m³)	D/Q (m⁻²)	Distance to Nearest Meat Animal (m)[a]	X/Q (s/m³)	Depleted X/Q (s/m³)	D/Q (m⁻²)	Distance to Nearest Milk Goat (m)[a]	Depleted X/Q (s/m³)	X/Q (s/m³)	D/Q (m⁻²)
N	-	2.5E-08	2.2E-08	8.2E-11	-	2.5E-08	2.2E-08	8.2E-11	-	2.5E-08	2.2E-08	8.2E-11
NNE	-	2.6E-08	2.3E-08	9.0E-11	-	2.6E-00	2.3E-08	9.0E-11	-	2.6E-08	2.3E-08	9.0E-11
NE	-	3.5E-08	3.2E-08	1.1E-10	-	3.5E-08	3.2E-08	1.1E-10	-	3.5E-08	3.2E-08	1.1E-10
ENE	-	2.9E-08	2.6E-08	1.3E-10	-	2.9E-08	2.6E-08	1.3E-10	-	2.9E-08	2.6E-08	1.3E-10
E	-	2.2E-08	2.0E-08	1.6E-10	-	2.2E-08	2.0E-08	1.6E-10	-	2.2E-08	2.0E-08	1.6E-10
ESE	-	2.2E-08	1.9E-08	1.4E-10	-	2.2E-08	1.9E-08	1.4E-10	-	2.2E-08	1.9E-08	1.4E-10
SE	-	2.3E-08	2.0E-08	1.1E-10	6920	2.6E-08	2.3E-08	1.4E-10	-	2.3E-08	2.0E-08	1.1E-10
SSE	-	1.3E-08	1.2E-08	6.4E-11	-	1.3E-08	1.2E-08	6.4E-11	-	1.3E-08	1.2E-08	6.4E-11
S	-	2.0E-08	1.8E-08	8.1E-11	7242	2.0E-08	1.8E-08	9.4E-11	-	2.0E-08	1.8E-08	8.1E-11
SSW	-	1.8E-08	1.6E-08	9.1E-11	7805	1.8E-08	1.6E-08	9.4E-11	-	1.8E-08	1.6E-08	9.1E-11
SW	-	3.6E-08	3.2E-08	1.4E-10	4828	5.9E-08	5.3E-08	3.2E-10	-	3.6E-08	3.2E-08	1.4E-10
WSW	-	2.8E-08	2.5E-08	1.2E-10	3862	6.2E-08	5.6E-08	3.9E-10	-	2.8E-08	2.5E-08	1.2E-10
W	-	2.5E-08	2.3E-08	1.1E-10	5713	3.6E-08	3.2E-08	1.9E-10	-	2.5E-08	2.3E-08	1.1E-10
WNW	-	2.4E-08	2.2E-08	8.7E-11	4184	4.7E-08	4.3E-08	2.5E-10	-	2.4E-08	2.2E-08	8.7E-11
NW	-	2.8E-08	2.6E-08	8.1E-11	6437	3.5E-08	3.2E-08	1.2E-10	-	2.8E-08	2.6E-08	8.1E-11
NNW	-	2.6E-08	2.4E-08	7.6E-11	-	2.6E-08	2.4E-08	7.6E-11	-	2.6E-08	2.4E-08	7.6E-11

a. Receptor distance greater than 8000 m is indicated by (-); diffusion values given are for 8000 m; data collected in spring of 1983.

1

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TABLE 5.2-1 (SHEET 2 OF 2)

Direction	Distance to Nearest Residence (m)[a]	X/Q (s/m^3)	Depleted X/Q (s/m^3)	D/Q (m^{-2})	Distance to Nearest Veg. Garden (m)[a]	X/Q (s/m^3)	Depleted X/Q (s/m^3)	D/Q (m^{-2})	Nearest Site Boundary (m)[a]	Depleted X/Q (s/m^3)	X/Q (s/m^3)	D/Q (m^{-2})
N	-	2.5E-08	2.2E-08	8.2E-11	-	2.5E-08	2.2E-08	8.2E-11	1344	1.4E-07	1.2E-07	1.3E-09
NNE	-	2.6E-08	2.3E-08	9.0E-11	-	2.6E-08	2.3E-08	9.0E-11	1097	1.9E-07	1.7E-07	1.8E-09
NE	-	3.5E-08	3.2E-08	1.1E-10	-	3.5E-08	3.2E-08	1.1E-10	1097	2.0E-07	1.8E-07	2.3E-09
ENE	-	2.9E-08	2.6E-08	1.3E-10	-	2.9E-08	2.6E-08	1.3E-10	1097	1.8E-07	1.7E-07	2.8E-09
E	-	2.2E-08	2.0E-08	1.6E-10	-	2.2E-08	2.0E-08	1.6E-10	1369	1.2E-07	1.1E-07	2.7E-09
ESE	-	2.2E-08	1.9E-08	1.4E-10	-	2.2E-08	1.9E-08	1.4E-10	1817	9.4E-08	8.4E-08	1.6E-09
SE	5150	3.5E-08	3.1E-08	2.3E-10	6920	2.6E-07	2.3E-07	1.4E-10	1866	8.3E-08	7.4E-08	1.2E-09
SSE	-	1.3E-08	1.2E-08	6.4E-11	-	1.3E-08	1.2E-08	6.4E-11	1773	4.8E-08	4.4E-08	7.0E-10
S	7242	1.9E-08	1.7E-08	9.4E-11	7242	2.0E-08	1.8E-08	9.4E-11	1692	6.8E-08	6.1E-08	9.2E-10
SSW	7483	1.9E-08	1.7E-08	1.0E-10	7805	1.8E-08	1.6E-08	9.4E-11	1680	7.7E-08	7.0E-08	1.1E-09
SW	4828	5.9E-08	5.3E-08	3.2E-10	7725	3.7E-08	3.4E-08	1.4E-10	1462	1.7E-07	1.6E-07	1.2E-09
WSW	1931	1.2E-07	1.1E-07	1.1E-09	1931	1.2E-07	1.1E-07	1.1E-09	1462	1.5E-07	1.4E-07	1.8E-09
W	5713	3.6E-08	3.2E-08	1.9E-10	7081	2.8E-08	2.6E-08	1.3E-10	1462	1.2E-07	1.1E-07	1.5E-09
WNW	3701	5.3E-08	4.9E-08	3.1E-10	3701	5.3E-08	4.9E-08	3.1E-10	1649	1.0E-07	9.4E-08	1.0E-09
NW	3701	6.0E-08	5.6E-08	2.9E-10	3701	6.0E-08	5.6E-08	2.9E-10	2240	8.5E-08	7.8E-08	6.3E-10
NNW	-	2.6E-08	2.4E-08	7.6E-11	-	2.6E-08	2.4E-08	7.6E-11	1840	9.4E-08	8.5E-08	7.7E-10

1

a. Receptor distance greater than 8000 m is indicated by (-); diffusion values given are for 8000 m; data collected in spring of 1983. 2

5.5 EFFECTS OF OPERATION AND MAINTENANCE OF THE TRANSMISSION SYSTEMS

The environmental effects of transmission lines were addressed in the Construction Permit Stage Environmental Report (CPSER) subsection 5.4.1. This section provides an update of the information presented in the CPSER. Transmission lines are sited in accordance with several construction permit conditions (see Final Environmental Statement (FES) section 4.5) and thus, any operational impacts should be minimal.

5.5.1 ENVIRONMENTAL EFFECTS OF OPERATION OF THE TRANSMISSION SYSTEMS

Transmission line environmental effects other than appearance can be classified into two categories, electrostatic or electromagnetic fields and corona-induced effects. These effects are sometimes referred to as nonionizing and ionizing radiation, respectively.

Environmental effects of high voltage lines have been under study by the electric power industry for many years. These effects include radio and television interference and audible noises and biological effects.

One biological effect results from the induced voltages that electrical fields can produce. The possibility of electrical shock exists if a grounded person touches a conducting object that is insulated from the ground. For large objects (e.g., metal fences), the induced voltage could cause a painful discharge shock. Accordingly, fences and other large metal objects near transmission lines are routinely grounded according to the National Electric Safety Code.

Another possible effect of transmission lines which has been investigated relates to potential disruption of pacemaker performance. However, no serious effects to pacemaker patients from transmission lines has been reported. The most probable effect would be for a demand-type pacemaker to revert to the asynchronous mode of operation, which pulses the heart at a regular rate and represents a safety mode that is not necessarily harmful.

5.5.1.1 ELECTROSTATIC-ELECTROMAGNETIC FIELD EFFECTS

Any conductor energized at a voltage to ground and carrying current produces electrical fields in the air or resulting space surrounding the conductor. The voltage produces a vertical electrostatic field, and the current produces a horizontal

electromagnetic field between the conductor and ground. When a partially insulated object is introduced in that space, a current can be induced in the body by either or both fields. This is a basic cause for concern from a biological standpoint.

The magnitude of the electrostatic field is a function of the applied voltage and the distance to ground. It can be calculated for given line designs and is usually expressed in kV/m measured at a height above ground equal to an average person's height. The maximum field strength under high voltage lines in the United States varies from 1 to 12 kV/m, with the highest stresses at 765 kV. These values are maximum at only one point in the span, under the highest load current and the maximum ambient temperature which reduces clearance to ground to a minimum. Based on measurements taken on Georgia Power Company (GPC) 500-kV lines, field strengths are a maximum of 5.2 kV/m 38 ft from center, and 2.8 kV/m 75 ft from center at the edge of right of way. These measurements were taken 1 m above ground level. The electromagnetic field under a 500-kV transmission line at ground level will not exceed 0.55 G maximum. By comparison, the earth's natural magnetic field is 0.59 G. 2

5.5.1.2 Corona Effects

If the voltage on a given conductor is raised high enough, the conductor will go into corona, which is the breakdown (i.e., ionization) of the surrounding insulation media, in this case, air. Also, at normal voltage, if there is a sharp point or discontinuity on the line, such as a water droplet on the conductor or insulator breakage, the air in that local area could be stressed beyond the corona start level and breakdown will occur.

The corona arc produces radiated signals with both high and low frequency components, which can affect radio and television reception in low signal to noise reception areas. Utilities have addressed both these annoying effects either through proper initial design requirements or local maintenance.

During rain or fog, condensation or collection can cause many water droplets on the conductor, which can put the whole line in corona at normal voltage. This produces a low level audible noise which can be annoying to residents of nearby houses, particularly in rural areas. The larger the individual conductor diameter, the lower the audible noise level; however, the problem tends to be exaggerated as transmission voltage is increased. Whether this low level noise (maximum 50 to 55 dB) is more annoying than other aversive noises remains to be proven.

5.6 OTHER EFFECTS

This section discusses other effects of station operation that have not been covered in other sections of this report or covered in the Construction Permit Stage Environmental Report (CPSER) section 5.4.

5.6.1 NOISE

The VEGP will make noise during normal operation. However, community complaints about plant noise are not anticipated because the area is sparsely populated.

5.6.1.1 Predicted Plant Property Line Noise Levels

Noise levels were predicted for seven locations along the property line during full plant operating conditions. Predictions were made using Edison Electric Institute's Electric Power Plant Environmental Noise Guide.(1) The significant sound-producing plant components were identified, and the effects of directional sources, distance, and other attenuation factors were considered. The predicted levels for each location are listed in table 5.6-1. Ambient noise levels at the seven locations were measured during a sound level survey prior to plant startup (see section 2.7); these are also included in table 5.6-1.

5.6.1.2 Community Reaction to Plant Noise

The noise guide concludes that the most complete procedure available for evaluating the impact of plant noise on surrounding communities is the Modified Composite Noise Rating System (MCNR). Applying this procedure resulted in a "no reaction" prediction for each of the seven locations as shown in table 5.6-1. 2

5.6.2 AUXILIARY BOILER, DIESEL GENERATOR, AND FLUID BED DRY WASTE PROCESSOR EMISSIONS

Air emissions resulting from operation of the auxiliary boiler, diesel generator, fluid bed dry waste processor, and conformance to applicable air quality regulations are addressed in section 3.7.

5.6.3 OTHER WASTES

Any waste which has been designated as a hazardous waste by the Environmental Protection Agency or any appropriate state agency shall be managed in compliance with all applicable regulations.

5.7 RESOURCES COMMITTED

The operation of the VEGP will involve the commitment and use of various natural resources and will result in certain irretrievable and irreversible commitments of natural resources. Because of the reduction from four units to two units at VEGP, the committed resources will be substantially reduced from those summarized in the Final Environmental Statement and chapter 10 of the Construction Permit Stage Environmental Report (CPSER). Air, water, and land commitments are retrievable upon cessation of plant operation. At the end of the useful life of this plant, the buildings could be removed and the grounds returned to essentially their original condition; however, it is most likely that the concrete structures would remain (subsection 5.8).

The irretrievable resources committed at the VEGP would be the uranium used in the form of nuclear fuel and the materials used for construction of the plant. Of these resources committed, only the nuclear fuel is unique, because the commitment and use of air, water, land, and construction materials would be similar for a fossil plant.

A number of the following acreage figures have changed since publication of the CPSER. These changes are due to various reasons, such as reduction in the number of units and design changes. The following resources are committed for the operation of the VEGP:

A. Land

1. Site - The VEGP site consists of 3169 acres of land. A list of plant facilities and acreages is found in subsection 2.1.3. The plant facilities will occupy approximately 717 acres of the site, thus changing their use from agricultural and timber production to electrical generation. The remaining 2452 acres will either be managed in accordance with acceptable land management 1
techniques or be landscaped, fertilized, and reseeded after construction is completed. At the end of the useful life of the plant, the land can be returned to agricultural or other uses with the necessary expenditures of money and human effort.

2. Transmission lines - The offsite transmission line rights of way will consist of approximately 6200 2
acres which will be removed from the growing of timber and agricultural products; however, this land can be returned to its former state if desired.

3. Access railroad - The offsite access railroad spur will consist of approximately 386 acres which will be removed from the growing of timber and agricultural products; however, this land can be returned to its former state if desired.

4. The total area of the plant site, the transmission line rights of way, and the access railroad spur is approximately 6500 acres, which is about 0.12 percent of the land within a 50-mile radius of the site. The acreage used is very similar to the land within the 50-mile radius. No unique or unusual areas will be consumed by the land use.

B. Water

Savannah River water converted to water vapor by operation of the VEGP cooling towers represents a minor loss to the Savannah River (at maximum consumptive use: approximately 1.2 percent of 5800 ft^3/s at low flow and 0.6 percent of 10,300 ft^3/s at average flow). This water vapor will be returned in the form of precipitation due to natural phenomena. Groundwater used for makeup, drinking, etc., will be obtained from wells at a maximum rate of approximately 2300 gal/min and average rate of approximately 1333 gal/min. The VEGP water consumptive use is discussed in subsection 3.3.3.

C. Uranium

The reactors are fueled with uranium dioxide pellets enriched in the fissionable isotope U-235. The initial fuel load for each core consists of 193 fuel assemblies divided into regions with average enrichments of 2.1, 2.6, and 3.1 weight percent U-235. Each enrichment region represents approximately one-third of the initial core. Fuel requirements for operation of the reactors depend upon fuel management practices. However, a typical annual cycle would require replacement of approximately one-third of each core annually. Assuming 75 percent capacity, the plant would require an annual commitment per reactor of approximately 440,000 lb of U_3O_8 (natural uranium), assuming no reprocessing of spent fuel. Over the plant's 40-year life, this represents a commitment of approximately 17,600 tons of U_3O_8 or approximately 0.5 percent of the total estimated uranium resources in the United States in the forward-cost category of $100 per lb of U_3O_8 or less.

TABLE 6.1-1 (SHEET 1 OF 4)

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM

Sample Medium and Location	Frequency	Analysis
Airborne particulates and radioiodine	Continual sampler operation with sample collection weekly	Radioiodine cannister: I-131
Indicator stations		Particulate sampler: gross beta activity following filter change;[a] composite (by location) for gamma isotopic quarterly
7 - Simulator building (1.5 miles SE)		
10 - Meteorogogical tower (1.1 miles SSW)		
16 - Hancock Landing Road (1.4 miles NNW)		
Nearest community[b]		
35 - Girard (7.5 miles SSE)		
Control station		
36 - Waynesboro (15 miles WSW)		
Direct radiation	Quarterly	Gamma dose
Thermoluminescent dosimeters (see table 6.1-2 for locations)		

2

TABLE 12.1-4

TRANSMISSION SYSTEM
ENVIRONMENTAL APPROVALS AND CONSULTATIONS

Authorization Required	Issuing Agency	Status	Comments
Permit for aerial crossing over navigable waters	Corps of Engineers		Permits for VEGP-Thalmann line were issued on 10/29/82 and 11/5/82. 2
Utility encroachment permit for aerial crossing over federal interstate highways	Georgia Department of Transportation (DOT)	Pending	
Utility encroachment permit for aerial crossing over state highways	Georgia DOT		Permits for the VEGP-Wadley line were issued on 4/12/83. Other permits pending.
Utility encroachment permit for aerial crossing over county or local highways	County Highway Departments		Permits for the VEGP-Wadley line were issued on 4/18/83. Other permits pending.
Permit for aerial crossing over railroad lines	Railroad superintendent		Permits for the Louisville and Wadley railroad were issued on 12/9/77. Other permits pending.
Notification of aerial crossing over pipelines	General manager of individual pipelines	Pending	

NUCLEAR REGULATORY COMMISSION
QUESTIONS AND RESPONSES INDEX
VOGTLE ELECTRIC GENERATING PLANT - UNITS 1 AND 2
OPERATING LICENSE STAGE ENVIRONMENTAL REPORT
NRC DOCKET NUMBERS 50-424 AND 50-425

NRC Question	OLSER Section/Subsection	Keywords
E100.1	-	Summary of significant changes since Construction Permit review
E290.1	2.2.1	Requests for site terrestrial ecology studies
E290.2	F2.2-1	Site vegetation map
E290.3	3.6.4.2	Salt drift emissions
E290.4	3.9	Transmission line right-of-way
E290.5	5.5.2	Herbicide use
E290.6	T12.1-4	Location of aerial crossings over navigable waters
E290.7	-	Requests for aerial photographs of site
E291.1	2.4	Surface water quality data
E291.2	2.4	USGS water quality data
E291.3	2.4	Pollutant types and sources that influence water quality near the site
E291.4	3.3	Clarification of water flowrates
E291.5	F3.3-1	Clarification of "normal design conditions"
E291.6	3.3	Potential for short circuiting of makeup water to the blowdown line
E291.7	3.3, 3.4	Clarification of river water makeup system flowrates

NRC Question	OLSER Section/Subsection	Keywords
E291.8	3.6	Chlorine injection and control/monitoring points
E291.9	3.6	Proposed chlorination program and expected concentrations
E291.10	3.6	Corbicula control
E291.11	5.3.1	Plant chemical and biocide discharge
E291.12	12.1	Copy of discharge pipe water quality certification
E291.13	2.2.2.3	GPC's response to IE Bulletin 81-83 on Corbicula abundance
E291.14	2.2.2.5.2	Other zooplankton studies conducted on the Savannah River
E291.15	3.6.1.1	Corbicula spawning season
E291.16	5.1.3.1	Status of CWA Section 316(b) demonstration
E291.17	6.1	Requests for site ecological studies
E291.18	6.1.1.2	Requests for site ecological studies
E291.19	6.1.4.2.1.5	Reference: Georgia Coastal Fisheries Investigation 2
E311.1	2.1.1	Exclusion area boundary reference point
E311.2	2.1.2	1980 census data used for population projections
E311.3	2.1.3	Distance and direction of towns, villages, etc., within 10 miles of the site
E320.1	8.1	Justification of capacity factors used

TABLE E100.1-1 (SHEET 4 OF 6)

OLSER	CPSER	Description of Change
3.7	3.7, 3.8	No significant change in the design of the sanitary treatment facility. Fluid bed dry waste processor emissions to air.
3.8	3.6.5, 5.4.2	Transportation of new fuel and spent fuel is set forth in 10 CFR 51.20, table S-4.
3.9	3.2	Number of transmission line rights-of-way reduced from six corridors containing eight 500-kV lines and three 230-kV lines occupying 12,600 acres to four corridors containing two 500-kV lines and four 230-kV lines occupying approximately 6200 acres. 2
4.0	4.0	No discussion required concerning construction impacts.
4.4	-	Radiological impact on Unit 2 construction workers from the operation of Unit 1.
5.1.1	5.1	Revised U.S. EPA effluent limitation guidelines for steam electric generating plants. Operational (NPDES) permit application submitted.
5.1.2	5.1.1, 5.1.3	Change in design of discharge system from a submerged multiport diffuser to a single-point discharge pipe. The thermal effects of the VEGP effluent is updated.
5.1.3	5.1.3	Intake and discharge structure design change. Studies submitted to NRC evaluating impacts of each design on aquatic of the Savannah River.
5.1.4	5.1.5, 3.1.1	Environmental effects of operating the heat dissipation system effectively halved.
5.2	5 2, 5.5	Radiation doses calculated according to Regulatory Guide 1.109. Doses remain lower than design objectives of NRC.

TABLE E100.1-1 (SHEET 5 OF 6)

OLSER	CPSER	Description of Change
5.3	5.3	Impacts reduced in OLSER due to design changes, reduction of plant size, and revised U.S. EPA effluent limitation guidelines for steam electric generating plants. Discharge regulated by NPDES permit.
5.4	5.3	Sanitary treatment plant has no significant design changes. Sanitary waste effluent regulated under the NPDES permit. Release of sanitary waste will not adversely impact the Savannah River.
5.5	5.4.1	Additional information on the health effects, noise levels, electrical field strengths, and corona effects are presented in the OLSER. 2
5.6	-	Ambient noise level compared with predicted operational noise level. No adverse community impacts anticipated.
5.7	10.0	Reduction from four to two units will substantially reduce the resources committed summarized in the CPSER (water, land, uranium, and construction material).
5.8	9.0	New information presented on decommissioning.
6.1	5.5	Biological and radiological preoperational monitoring programs conducted to update those presented in the CPSER.
6.2	5.5	Operational radiological monitoring program established by the Radiological Effluent Technical Specifications. Aquatic monitoring program established by the NPDES permit.
6.3	-	New information presented. Environmental monitoring programs carried out by public agencies near the VEGP are cited.

Question E290.4 (OLSER 3.9)

This section states that changes to the transmission line rights-of-way since the Construction Permit (CP) were provided to the Nuclear Regulatory Commission (NRC) by letter dated February 1, 1982, from D. Dutton, Georgia Power Company (GPC), to D. Eisenhut, NRC. The maps included with this letter show a completely new 500-kV line going from the Vogtle plant to the Effingham plant.

Because this proposed line has never been evaluated by NRC we will need the following information if different from information already provided:

A. Basic electrical design parameters, including transmission design voltage or voltages, line capacity, conductor type and configuration, spacing between phases, minimum conductor clearances to ground, maximum predicted electric field strength(s) at 1 m above ground, the predicted electric field strength(s) at the edge of the right-of-way in kilovolts per meter (kV/m), and the design basis for these values.

B. Predicted noise levels resulting from transmission-system operation.

C. Basic structural design parameters, including illustrations and descriptions of towers, conductors, and other structures, with dimensions, materials, color, and finish.

D. Topographic maps (15-minute scale as a rule) or aerial photographs showing the proposed corridor or corridors and all existing major high-voltage corridors in the region.

E. Lengths, widths, and area of rights-of-way, including modifications and/or use of existing rights-of-way and other facilities for the proposed project.

F. General methods of construction, e.g., tower foundations, stringing, location of access roads, span length, and clearing of rights-of-way.

G. If available, tower and substation locations.

Attachment 2 of the February 1, 1982 letter labels the Vogtle to North Goshen line as 230 kV. Does this mean that the two 500-kV lines proposed at the CP stage (Final Environmental Statement-Construction Permit (FES-CP), page 3-40) between these two points

will not be built? Provide details of any modifications to this line from that proposed at the CP stage.

Attachment 2 also shows a line going from the Vogtle plant to Wadley with a short spur to Waynesboro. Provide details of any modifications of this line since the CP stage.

Response

Section 3.9 of the VEGP-OLSER has been amended to provide a description of the current planned transmisson system associated with VEGP Units 1 and 2. The following addresses responses to the specific items requested in question 290.4.

A. Table 3.9-1 has been added to the VEGP-OLSER to address basic electrical design parameters. Section 5.5 of the VEGP-OLSER has been amended to address electric field strengths. These field strengths were based on measurements taken 1 m above the ground by Georgia Power Company on existing 500-kV lines.

B. Predicted noise levels under 500-kV lines are addressed in section 5.5.1.2 of the VEGP-OLSER.

C. Basic structural design parameters for the VEGP transmission line structues (230 kV and 500 kV) are the same as those described in the Construction Permit Stage Environmental Report (CPSER), section 5.4.1.3.

D. Topographic maps illustrating proposed corridors and existing corridors in the region were provided for the staff's inspection during the March 21-22, 1984 site visit.

E. Section 3.9 of the VEGP-OLSER has been amended to include table 3.9-2 which illustrates the lengths and widths of proposed transmission corridors and table 3.9-3 showing the land-use categories affected.

F. General methods of construction were discussed with the staff during the March 21-22, 1984 site visit. It was noted that these methods are the same as described in section 5.4.1.2 of the CPSER.

G. Specific tower locations have not been identified for much of the proposed transmission system. Tower locations for the VEGP-Wadley portion of the transmission system were reviewed by the staff during

the March 21-22, 1984 site visit. Substation locations, existing and possible future additions, are illustrated on figure 3.9-2 of the VEGP-OLSER.

Question E290.6 (OLSER Table 12.1-4)

This table shows that authorization for a permit for aerial crossing over navigable waters is required from the U.S. Army Corps of Engineers. Indicate where this river crossing is to take place.

Response

Permits for aerial crossing over navigable waters for the VEGP/Thalmann line have been obtained for two locations: 2

1. The Altamaha River near Evert, Georgia, between McIntosh and Glynn Counties.
2. Ogeechee River near Richmond Hill, Georgia, between Bryan and Chatham Counties.

Table 12.1-4 has been amended to include these permits.

Question E451.9 (Regulatory Guide 4.2, section 6.1.3, and Safety Review Plan 2.3.3) (FSAR 2.3.2)

Table 2.3.2-2 of the FSAR presents the parameters measured on the Vogtle meteorological tower, the heights of measurement, and the instrument and/or sensor characteristics. Provide estimates of the overall system accuracy for each parameter, considering errors introduced by the sensor, cable, signal conditioner, and data reduction process, and compare these system accuracies with those presented in Regulatory Guide 1.23.

Response

The VEGP meteorological tower has both analog and digital recording. Both look at the same signal (parallel) for redundancy.

Wind Speed

Regulatory Guide 1.23 calls for an accuracy of time-averaged values to ± 0.5 mph and a starting speed of anemometer <1 mph. The values for wind speed recording on the meteorological tower are instantaneous values with a starting speed of anemometer (0.6 mph). Parameter accuracy estimate is as follows: 2

- Wind speed transmitter - ± 1 percent
- Translator - ± 0.1 percent
- Recorder (analog strip chart) - ± 0.5 percent

$$\text{Parameter Accuracy} = \sqrt{(\pm 0.01)^2 + (\pm 0.001)^2 + (\pm 0.005)^2}$$

$$= \pm 1.12 \text{ percent} = \pm 0.56 \text{ mph}$$

(Wind speed range of 0-50 mph)

Wind Direction

Regulatory Guide 1.23 calls for an accuracy of instantaneous recorded values $\pm5^\circ$. Parameter accuracy estimate for the meteorological tower is as follows:

- Wind direction transmitter - ±1 percent
- Translator - ±0.1 percent
- Recorder (analog strip chart) - ±0.5 percent

$$\text{Parameter Accuracy} = \sqrt{(\pm0.01)^2 + (\pm0.001)^2 + (\pm0.005)^2}$$
$$= \pm1.12 \text{ percent} = \pm6.0^\circ$$
(Wind direction range of 540°)

2

Differential Temperature

Regulatory Guide 1.23 calls for an accuracy of $\pm0.1^\circ C = 0.18^\circ F$. Parameter accuracy estimate for the meteorological tower is as follows:

- Thermistor - $\pm0.15^\circ C = 0.0090$
- Translator - ±0.1 percent
- Recorder (analog strip chart) - ±0.5 percent

$$\text{Parameter Accuracy} = \sqrt{(\pm0.009)^2 + (\pm0.001)^2 + (\pm0.005)^2}$$
$$= \pm1.03 \text{ percent} = 0.31^\circ F$$
(ΔT range of 30°F: -10°F to 20°F)

All the above accuracies were calculated considering: an analog recorder accuracy of ± 0.5 percent; data is also recorded in parallel via data coupler and magnetic tape; and the stated accuracy of the data coupler is ± 0.1 percent. Data is recorded every 60 s. Estimated meteorological tower accuracies recorded on magnetic tape are:

- Wind speed parameter $= \sqrt{(\pm 0.001)^2 + (\pm 0.001)^2 + (\pm 0.001)^2}$

  $= 1.009$ percent $= \pm 0.5045$ mph

- Wind direction parameter $= \sqrt{(\pm 0.001)^2 + (\pm 0.001)^2 + (\pm 0.001)^2}$

  $= 1.009$ percent $= \pm 5.45°$ 2

- Differential temperature parameter $= \sqrt{(\pm 0.009)^2 + (\pm 0.001)^2 + (\pm 0.001)^2}$

  $= 0.91$ percent $= \pm\ 0.273°F = 0.15°C$

- Ambient temperature parameter $= \sqrt{(\pm 0.00225)^2 + (\pm 0.001)^2 + (\pm 0.001)^2}$

  $= \pm 0.266$ percent $= \pm 0.319°F = \pm 0.177°C$

- Rain gauge parameter $= \sqrt{(\pm 0.005)^2 + (\pm 0.001)^2 + (\pm 0.001)^2}$

  $= 0.519$ percent $= 0.519$" H_2O

Ambient Temperature

Regulatory Guide 1.23 calls for an accuracy of $\pm 0.5°C$. Parameter accuracy estimation for the meteorological tower is as follows:

- Thermistor - $\pm 0.15°C = \pm 0.27°F = \frac{0.27}{120} = \pm 0.00225$
- Translator - ± 0.1 percent
- Recorder (analog strip chart) - ± 0.5 percent

$$\text{Parameter Accuracy} = \sqrt{(\pm 0.00225)^2 + (\pm 0.001)^2 + (\pm 0.005)^2}$$
$$= \pm 0.557 \text{ percent} = \pm 0.67°F = \pm 0.37°C$$

(Ambient temperature range of -10°F to 110°F) 2

Rain Gauge (No guidelines per Regulatory Guide 1.23)

Parameter accuracy estimate for the meteorological tower is as follows:

- Rain gauge transmitter - ± 0.5 percent
- Translator - ± 0.1 percent
- Recorder (analog strip chart) - ± 0.5 percent

$$\text{Parameter Accuracy} = \sqrt{(\pm 0.005)^2 + (\pm 0.001)^2 + (\pm 0.005)^2}$$
$$= 0.714 \text{ percent} = 0.0714'' \ H_2O$$

Question E451.10 (Safety Review Plan 2.3.3) (FSAR 2.3.2)

The technique for measuring vertical temperature gradient at the VEGP site is not clear from the information presented in table 2.3.2-2 of the Final Safety Analysis Report (FSAR). Vertical temperature gradient is most often measured directly (e.g., through a resistance bridge circuit) to obtain the measurement system accuracy for this parameter specified in Regulatory Guide 1.23.

Generally, the subtraction of two temperature measurements is considerably less accurate than a direct measure of temperature difference. At other sites reviewed by the Nuclear Regulatory Commission, an accuracy of vertical temperature gradient determined by the subtraction of two temperatures has often exceeded the specification in Regulatory Guide 1.23.

A. Provide an expanded discussion of the measurement of vertical temperature gradient and clarify the measurement technique.

B. If vertical temperature gradient is determined by subtraction of two temperatures, (1) indicate whether the sensors are matched at installation and replacement; (2) indicate the "drift" between sensors found at instrument calibration; (3) identify the average period considered for the determination of temperature difference; and (4) clarify the computational procedures for the determination of temperature difference (i.e., is temperature difference computed for each interrogation of the sensors or from an ensemble average of temperature measurements).

Response

Vertical temperature gradient (on the old tower at the VEGP) is measured directly, through a resistance bridge circuit. The differential temperature is determined using two linear thermistor temperature probes. These probes and a resistor network form two resistive voltage divider strings, one for each probe. A change in temperature causes a change in the probe resistance and therefore a change in the voltage in the resistor network. An FET switch chops the dc voltage levels producing a square wave ac signal whose peak-to-peak value is the difference of the sensor voltages. This ac signal is amplified and chopped, producing a dc level proportional to the difference of the temperature probes. 2

Amend. 1 2/84
Amend. 2 4/84

TABLE E451.12-1 (SHEET 1 OF 2)

EXTENDED OUTAGE PERIODS SINCE DECEMBER 1972
CAUSES OF THE OUTAGE AND CORRECTIVE ACTIONS TAKEN

First Year - December 4, 1972 through December 3, 1973

Parameter	Outage Period	Cause	Corrective Action
Wind speed 33 feet	6/14/73 - 7/12/73	Lightning	Replaced damaged equipment
Wind speed 33 feet	5/24/73 - 5/30/73	Replacement of instrument booms	NA
Wind speed 150 feet	6/14/73 - 7/12/73	Lightning	Replaced damaged equipment
Wind direction 33 feet	6/14/73 - 7/12/73	Lightning	Replaced damaged equipment
Wind direction 150 feet	5/24/73 - 5/30/73	Replacement of instrument boom	NA
Wind direction 150 feet	6/14/73 - 7/12/73	Lightning	Replaced damaged equipment
Delta-T (150 feet - 33 feet)	6/14/73 - 7/12/73	Lightning	Replaced damaged equipment
Temperature ambient	12/22/72 - 12/27/72	Records incomplete	-
Temperature ambient	6/14/73 - 7/12/73	Lightning	Replaced damaged equipment
Temperature dew point	12/22/72 - 12/26/72	Records incomplete	-
Temperature dew point	6/14/73 - 7/12/73	Lightning	Replaced damaged equipment
Precipitation	3/31/73 - 5/1/73	Bad potentiometer on rain gage	Replaced potentiometer
Precipitation	6/14/73 - 7/12/73	Lightning	Replaced damaged equipment

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Second Year - April 4, 1977 through April 3, 1978

Parameter	Outage Period	Cause	Corrective Action
Delta-T (150 feet - 33 feet)	5/14/77 - 5/22/77	Strip chart recorder failure	Replaced the following: amplifier, chart-drive motor, power supply, modulator

TABLE E451.12-1 (SHEET 2 OF 2)

Third Year - April 4, 1978 through April 3, 1979

Parameter	Outage Period	Cause	Corrective Action
Wind speed 33 feet	7/1/78 - 7/7/78	Lightning	Replaced damaged parts
Wind speed 150 feet	7/1/78 - 7/7/78	Lightning	Replaced damaged parts
Wind direction 33 feet	7/1/78 - 7/7/78	Lightning	Replaced damaged parts
Wind direction 150 feet	7/1/78 - 7/7/78	Lightning	Replaced damaged parts
Delta-T (150 feet - 33 feet)	7/1/78 - 7/7/78	Lightning	Replaced damaged parts
Temperature ambient	7/1/78 - 7/10/78	Lightning	Replaced damaged parts
Temperature dew point	7/1/78 - 7/7/78	Lightning	Replaced damaged parts
Temperature dew point	8/21/78 - 8/25/78	Lightning	Replaced damaged parts
Precipitation	7/1/78 - 7/7/78	Lightning	Replaced damaged parts
Precipitation	8/21/78 - 9/8/78	Lightning	Replaced damaged parts

Fourth Year - April 4, 1980 through April 3, 1981

Parameter	Outage Period	Cause	Corrective Action
Delta-T (150 feet - 33 feet)	10/13/80 - 10/20/80	Faulty aspirator motor	Replaced motor

a. Information for the fourth year was taken from check sheets only.