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Georgia Power
the southern electric system

D. O. Foster
Vice President and Project
General Manager
Vogtle Project

January 4, 1985

Director of Nuclear Reactor Regulation
Attention: Ms. Elinor G. Adensam, Chief
Licensing Branch #4
Division of Licensing
U. S. Nuclear Regulatory Commission
Washington, D.C. 20555

File: X8BE03
Log: GN-506

NRC DOCKET NUMBERS 50-424 AND 50-425
CONSTRUCTION PERMIT NUMBERS CPPR-108 AND CPPR-109
VOGTLE ELECTRIC GENERATING PLANT - UNITS 1 AND 2
COMMENTS ON DRAFT ENVIRONMENTAL IMPACT STATEMENT

Dear Mr. Denton:

Attached are the comments of Georgia Power Company on the Draft Environmental Impact Statement related to the operation of Vogtle Electric Generating Plant, Units 1 and 2. These comments are submitted in response to the Federal Register notice of November 16, 1984. The attached comments are in two parts. The General Comments address monitoring programs proposed in the DEIS or ongoing programs. The Specific Comments address different portions of the DEIS which we feel are in error or need clarification based on the Operating License Stage Environmental Report and other material submitted to the staff.

If you have any questions concerning the attached comments please contact us.

Yours very truly,

D. O. Foster

DOF/WLB/sro
Attachments
cc: M. A. Miller
R. A. Thomas
J. A. Bailey
L. T. Gucwa
G. F. Trowbridge, Esquire
G. Bockhold, Jr.
J. E. Joiner
L. Fowler
C. A. Stangler

C002
1/1

Comments on Draft Environmental Impact Statement related to the operation of Vogtle Electric Generating Plant, Units 1 & 2

The following are Georgia Power Company's comments on the Draft Environmental Impact Statement (DEIS). The comments are presented in two sections. The first section addresses general comments concerning the staff's findings. The second section addressess specific passages in the DEIS by chapter and section which we feel need correction or clarification for consistency with the Operating License Stage Environmental Report (ER-OL) and other documents submitted to the staff.

General Comments

Georgia Power Company agrees with the staff's overall evaluation of impacts attributable to the operation of the VEGP and its associated transmission lines. We do not agree that certain monitoring programs recommended by the staff in the DEIS are necessary. Specifically, we feel that the monitoring and mitigation proposal for transmission line noise is unjustified. We also feel that the proposed program for monitoring of damage attributable to cooling tower drift is unnecessary since our estimates of the range of deposition rates fall below rates listed in Regulatory Guide 4.11 as a threshold below which monitoring should not be required. In addition, monitoring programs for endangered species along transmission lines have been completed.

Transmission Line Noise.

The staff has concluded that noise impacts at one homesite along the transmission line corridor would produce annoyance levels which would be unacceptable based on Composite Noise Rating (CNR) criteria. This conclusion was based on calculations made by the staff assuming a background noise level of 24 dBA. Based on these calculations, the DEIS indicates that the staff will require that the applicant conduct a monitoring program and determine what mitigation actions, if any, are necessary to reduce impacts to acceptable levels. We do not believe that the inclusion of a monitoring and mitigation program is justified based on the following:

1. A monitoring program is unnecessary since sound levels of 55-58 dBA have been measured under 500 kV transmission lines during rain. This information was provided to the staff in response to the NRC question E 290.14. Further monitoring would only serve to confirm the result of these measurements which have already beer confirmed by studies conducted by others.

2. The staff's conclusions are based on an assumed background noise level of 24 dBA taken at location 4 on May 14, 1974. Figures 5.22 and 5.24 of the DEIS show that location 3 is closer to the home of concern. In addition, as noted in section 5.12.1 the staff used the lowest measured ambient noise level for each location as the basis for Table 5.18. It would be more appropriate to use an average noise level at the home which should be about 30 dBA in making calculations.

3. During heavy rains, the sound of rain itself raises the ambient sound level and masks the transmission line noise. EPRI has reported that AC corona noise is not unlike rain noise itself and may be difficult to distinguish from rain noise. Because of the masking effect of the rain noise, and because people are normally inside during rainy weather, and since the home of concern has a tin (metal) roof, line noise will not be an annoyance during rain.

4. The EPRI Transmission Line Reference Book suggests that transmission line noise levels would remain higher than ambient for 1 to 2 hours after rain stops as opposed to the "several" hours indicated in the staff assessment. In addition, the duration of higher noise levels will depend on, among other things, the loading on the line. A higher loading will result in a shorter duration since the moisture will be evaporated from the line more rapidly.

5. Fog, a foul weather condition which may lead to transmission line noise, occurs infrequently in the site vicinity. Section 2.3.2.1.5 of the FSAR indicates that fog with visibility less than 1/2 mile occurs only 1.21% of the time. Analysis of the 5 years of data from the Augusta Airport indicates that visibility less than 1/4 mile occurs only 0.4% of the time. In addition, these conditions occur predominantly in the winter and fall months. Dense fog conditions which could be expected to lead to transmission line noise occur only 30-90 hours during the year with these conditions occurring primarily in the winter and fall months when people are likely to be indoors. Wet snow, which may also lead to transmission line noise, is even less likely to occur than fog because of climatological conditions.

6. Studies have shown that it requires several hours of fog to build up moisture on the lines which could produce an audible noise. Although several hours of fog may occur at any one time, the above data (5) indicate that the frequency of such episodes is quite low.

7. There are no regulations which specify noise level. The Environmental Protection Agency recommends that L_{dn} less than 55 dBA be achieved in residential areas and farms and other areas where people spend widely varying amounts of times and where quiet is a basis for use. The adverse weather condition sound level predicted by the staff is not significantly above the EPA recomendation. In addition, it has been proposed that L_{dn} should be computed on an annual basis taking into account those periods of fair weather in which the line does not make noise. With the ambient sound levels (24-34 dBA) measured around the plant Vogtle site and the low operational levels predicted by the NRC staff (29-40 dBA) it is concluded that annual L_{dn} would be much lower than 55 dBA.

8. The staff assessment of annoyance using the modified CNR criterion did not account for the fact that line noise will be a problem only a very small part of the total time in a year. The modified CNR procedure properly includes a correction for intermittency, the ratio of source "on" time to the reference time period. If the intermittency is accounted for, the modified CNR rating predicts "no reaction" or "sporadic complaints," rather than "vigorous community action" as cited by the staff.

9. The EPRI Transmission Line Reference Book also reports that transmission line noise decreases as the conductors age. Over a three year period, aging is likely to produce noise reduction of 4.5 dB to 11 dB, making line noise even less of a problem at the home site.

Based on the foregoing discussion, we feel that the monitoring and mitigation programs are unjustified. Monitoring programs have been conducted which demonstrate the level of sound beneath transmission lines and these studies indicate close agreement with the staff estimates. Additional monitoring will only serve to verify those numbers. The levels of background noise upon which the staff based its calculations and recommendations for a mitigation program are unrealistically low. Finally, mitigation is unnecessary because the weather conditions which could cause transmission line noise occur very infrequently and the noise levels decrease as the conductor ages.

The following references apply to the above discussion:

Transmission Line Reference Book-345 kV and Above(2nd Edition), EPRI, 1982.

D. N. Keast, "Assessing the Impact of Audible Noise from AC Transmission Lines: A Proposed Method." IEEE Transactions on Power Apparatus and Systems, Vol. PAS-99, No. 3, pp. 1021-1031, May/June 1980.

Drift Deposition

Section 5.14.1 of the DEIS indicates that "To monitor for possible impacts of drift on vegetation, the applicant will use stereo, false color, infrared aerial photographs of the site. The details of this program will be specified in the Environmental Protection Plan that will be included as Appendix B of the operating license." Georgia Power Company has made no such commitment and monitoring as described in section 5.14.1 is unnecessary.

The staff evaluation of the impact on terrestrial resources due to cooling tower operation (Section 5.5.1.1 of the DEIS) does not provide a basis for requiring such a monitoring program. The staff has indicated that applicant's estimates of peak deposition rates are reasonable based on its review of material submitted in the ER-OL and results of other cooling tower modeling studies. These estimates, as noted in material submitted to the staff by D. O. Foster's letter of September 25, 1984, provided a range of drift deposition rates which varied from 0.7 to 17 lb/acre per year onsite and 11.2 to 14.7 lb/acre per year offsite. As noted in the September 25, 1984 submission, the upper level of those ranges were reported in the ER-OL. It should be noted that the upper level of those ranges included all solids in the drift and thus the impact is far below the 90 lb/acre per year of sodium chloride deposition which may reduce agricultural productivity. In addition the upper levels are below the 18 lb/acre per year offsite deposition threshold of solids contained in NRC Regulatory Guide 4.11 for requiring monitoring.

The staff has estimated in section 5.5.1 that the solids deposition rate at a distance of 0.6 miles from the cooling towers is expected to be below 45 lb/acre per year. The staff also estimated that if all the drift were deposited within 0.6 miles of the cooling towers it would result in a deposition rate of 42 lb/acre per year. This estimate is a very conservative deposition rate and would in no way resemble what will happen in the real world considering the effects of dispersion and meterology. The staff provided no basis for the 45 lb/acre per year at a distance of 0.6 miles from the cooling towers. These estimates do not provide any basis for the monitoring requirement contained in section 5.14.1 of the DEIS.

Georgia Power Company agrees with the staff's conclusion in section 5.5.1.1 that "Salt deposition rates from both types of cooling towers at Vogtle is expected be far below the levels that can cause reduced productivity of plant species, and no significant adverse impacts on vegetation or wildlife are expected." (emphasis added) We also agree with the staff's conclusion that "Because the sodium chloride deposition rates expected at Vogtle are so much less than the critical value reported in the Environmental Standard Review Plan (NUREG-055), the staff concludes that the impact will be negligible."(emphasis added) Based on these conclusions drawn in section 5.5.1.1, the staff has not provided any basis for the requirements in section 5.14.1 to monitor for possible impacts of drift on vegetation.

We encourage the staff to reevaluate the material contained in section 5.5.1.1 relative to their expected drift deposition rates in light of the material which has already been submitted in the ER-OL, and D. O. Foster's letter of September 25, 1984. In addition, the staff should consider the recommendations of Regulatory Guide 4.11. These factors will demonstrate that monitoring is not required.

Endangered Species

Section 5.14.1 of the DEIS notes that "Surveys of power line routes with regard to endangered species is continuing in several locations." Section 4.3.5.1 of the DEIS indicates that "If the remaining ground surveys identify habitat potentially impacted by the transmission lines, then the applicant must comply with the conditions stated in section 6.1 (1) of this statement." These surveys were relative to the red-cockaded woodpecker. Section 4.3.5.1 also indicates that the VEGP to Thalmann power line would traverse the geographic range of the eastern indigo snake (a threatened species) and that no surveys had been conducted for this species along the power line route.

Georgia Power Company has completed its surveys for all of the transmission lines associated with the VEGP project for the red-cockaded woodpecker and other endangered species. As noted in D. O. Foster's letter of September 14, 1984, several areas around the Piedmont National Wildlife Refuge were to be investigated for possible red-cockaded woodpeckers. This activity has been completed and no suitable habitat or colonies were identified. In addition, Georgia Power Company biologists have walked the VEGP to Thalmann transmission line. During this survey, no evidence of indigo snakes were observed on the right-of-way.

Specific Comments

Summary and Conclusions, page viii, item (c)

The two endangered species referred to in section 4.3.5 are the red-cockaded woodpecker and the indigo snake. The above comments on endangered species addresses the occurence of the red-cockaded woodpecker. In addition, the indigo snake is threatened.

Summary and Conclusions, page ix, item (j)

"...Section 5.5.1.3..." should read "...Section 5.5.1.2...".

Summary and Conclusions, page ix, item (m),

The allowable limits for chlorine in the discharge are contained in the NPDES permit.

Chapter 4 and 5 change "Thalman" to "Thalmann".

Section 4.1, page 4-1, third paragraph .

Note that the circulating water system will be chlorinated continuously for a period of up to a week/month during Corbicula spawning season. At other times the chlorination will be intermittent.

Section 4.2, page 4-2, second sentence.

Should read "... and the addition of an equipment building from ..."

Subsection 4.2.3.1, page 4-3, third paragraph, last sentence.

Change "...5.05 x 10^3 L/min (1333 gpm)..." to "...3.18 x 10^3 L/min (840 gpm)..."
Note that, ER-OL Subsection 3.3.3 will be ammended to reflect this correction and thus will agree with the ER-OL figure 3.3-1, sheet 2 of 3.

Subsection 4.2.3.2, page 4-3, first paragraph, first sentence.

Should read-"Chlorine will be added to the circulating water system at the station intake structure makeup water pumps and the circulating water system intake structure as a gas..."

Second sentence.

Change- "... at the natural draft cooling tower blowdown lines." to "... at the blowdown sump following dechlorination." This sampling point is designated in the NPDES permit.

Third sentence.

Should read- "Intermittent chlorination at the circulating water system intake structure will be ..."

Fifth sentence.

Should read-"During the Corbicula (Asiatic clam) spawning season, chlorination at the river intake structure makeup pumps may be continuous...

After the sixth sentence.

Add-"In the winter when chlorine demand is low, a single weekly injection period is required.

Last sentence.

Should read-"The circulating water system intake structure is equipped with three 10,000 lb/day capacity chlorine evaporators in series, with one being used as a backup. (ADD) The river intake structure is equipped with one 12,000 lb/day chlorine evaporator."
(NOTE): The ER-OL Section 3.6.1.1 will be amended accordingly.

Subsection 4.2.3.2, page 4-3, second paragraph.

Change "... 1435 lb/day ..." to "... 1425 lb/day ..."

Subsection 4.2.4.4, page 4-5, last sentence.

Change "... 2.4 m (7.9 feet) ..." to "... 1.4 m (5 feet) ..."

Subsection 4.2.6, page 4-6, first paragraph, second sentence.

The low volume waste streams and sewage plant effluent are treated and combined in the waste water retention basins then discharged to the blowdown sump where they are combined with the cooling tower blowdown.

Subsection 4.2.6, page 4-7, first paragraph, last sentence.

Flush water, which does not involve the addition of chemicals, will be discharged based on oil and grease and turbidity limits as opposed to the NPDES limits for low volume waste.

Subsection 4.2.6, page 4-7, third paragraph, last sentence.

Should read- "Previous operating experience has shown (ER-OL Section 3.6.4.1) that these solid wastes ..."

Subsection 4.2.7, page 4-8, first paragraph.

The route for the South Carolina line has been selected and preliminary engineering studies are being conducted. The route will involve approximately 2.5 miles of line on the Georgia side of the Savannah River and approximately 18.3 miles on the Savannah River Plant. The right-of-way for this line will be 100 feet wide. The line will occupy approximately 25 acres of wetlands primarily in 1000 to 2000 foot stretches associated with Four Mile, Branch and Steel Creeks. Most of these wetland areas can be spanned by the transmission lines by placing towers outside these areas. South Carolina Electric and Gas

(SCE&G) will be responsible for constructing the line. SCE&G will be required to obtain an Environmental Compatability and Public Convenience and Necessity Permit from the state of South Carolina. The application for this permit will include biological evaluations as well as cultural resource evaluations. This process has been initiated by SCE&G. A copy of the application will be provided to the staff for your information when it is submitted to the state of South Carolina.

Subsection 4.3.1, page 4-8, second paragraph, second sentence.

Change-"... 18.5 feet ..." to "... 219.5 feet ..."

Subsection 4.3.1.1, page 4-8, third paragraph, third sentence.

Change-"... 5000 feet ..." to "... 5500 feet ..."

Subsection 4.3.1.1, page 4-11, paragraphs three and four.

These paragraphs appear to be out of order and should be moved to Subsection 4.3.1.2.

Subsection 4.3.1.1, page 4-11, third paragraph.

Should read- "None of the ground water users are located downgradient of the onsite aquifer system flowpath of a release from the powerblock area as shown on figure 4.11, and thus will not be affected by any potential radioactive liquid release at the Vogtle site.

Subsection 4.3.1.2, page 4-11, first paragraph, third sentence.

Should read-"The Blue Bluff marl is a clayey marl and is the load bearing horizon, ..."

Sixth sentence

Change-"...lower Lisbon..." to "...Lisbon...".

Second paragraph, page 4-12, third and fourth sentences.

Should read-"Although the Savannah River is in hydraulic contact with the deep aquifers, it is not a potential pathway to these deep aquifers. The deep aquifers discharge ..."

Third paragraph, last sentence.

Delete-"... is shown in FSAR Figure 2.4.12-7 and ..." Add to the end of the sentence "... and the contours of the water table aquifer are shown in FSAR Figure 2.4.12-7."
Note: The OL-ER Figure 2.1-10 from which DES Figure 4.11 was reproduced has been updated and is included as Attachment 1 to these comments. Attachment 2 is a figrue showing the flowpath of the water table aquifer at the Vogtle site. These figures will be added to the next ER-OL amendment.

Subsection 4.3.1.3, page 4-13, third paragraph, second sentence.

Change-"... demineralizer ..." to "... demineralized ..."

Subsection 4.3.2, page 4-14, second paragraph, third sentence.

Should read "... over the period of 1979 through 1983 ..." Note that levels of manganese referenced here are not listed in Table 4.8. Also, references identified here are not included in the reference list at the end of this section.

Subsection 4.3.3 page 4-14, second paragraph, first sentence.

Change-"...107°F..." to "...106°F..."

Second sentence.

Change 56 days to 54 days.

Third paragraph, last sentence.

Change "...1979..." to "...1972..."

Table 4.8, page 4-45, last footnote.

Should read "... Question E291.1."

See Attachments 3 through 6 for corrections to Figure 4.3 and Tables 4.1, 4.2, and 4.5.

Subsection 4.3.4.1, page 4-15, fourth paragraph, third sentence.

Change-"...Table 4.9..." to"... Table 4.10..."

Subsection 4.3.4.1, page 4-16, third paragraph, first sentence.

Should read-"After becoming aware that the Ebenezer Creek Swamp was a National Natural Landmark, the applicant ..."

Page 4.16, footnote.

Note that Dr. Bozeman now works for the Georgia Department of Natural Resources.

Subsection 4.3.5.1, page 4-20, fourth paragraph.

Surveys for red-cockaded woodpecker are complete and no sites were found as noted in the General Comments.

Subsection 4.3.5.1, page 4-21, first paragraph

The area in southeastern Georgia along the Vogtle to Thalmann transmission line was walked by Georgia Power Company biologists and no sign of the indigo snake, a threatened species, was found along the right-of-way.

Subsection 5.2.2, page 5-3, first paragraph.

There will be two towers inside the Landmark boundary. The 195 foot towers located at station 124.00 and station 135.00 are inside the Landmark. The 195 foot tower on the south bluff and the 175 foot tower on the north edge are outside the Landmark. See item A, page 2 of D.O. Foster's letter of October 10, 1984.

Subsection 5.4.2, page 5-10, third sentence.

Change "...Section 3.7.2..." to "...Section 3.7.3 that the state of..."

Subsection 5.3.1.1, page 5-5, second paragraph, fourth sentence.

Should read-"... 3 m/s (10 fps) ... " to "... 1.5 m/s (5 fps) ..."

Subsection 5.3.1.2, page 5-5, first paragraph.

Should read-"...that draw water from the Cretaceous aquifer system ..."

Subsection 5.3.3, page 5-9, third paragraph, first sentence.

Change "powerhouse" to "powerblock"

Subsection 5.5.1.1, page 5-11, last paragraph.

The Staff should provide references for the other cooling tower modeling studies reviewed.

Subsection 5.5.1.2, page 5-13, second paragraph, last sentence.

This sentence should be deleted because NESC guidelines do not specifically address the level of field strength within a particular right-of-way.

Third paragraph, next to the last sentence.

Change "... Section 5.6.3 ..." to "... Section 5.5.1 ..."

Subsection 5.9.1, page 5-21, third paragraph.

Change "...Table 5.16 ..." to "... Table 5.17..."

Subsection 5.9.3.1 (1), page 5-25, fourth paragraph, second sentence

Change "... 160 ..." to "... 77.3 ..." (See FSAR Table 12.4.3-1).

Subsection 5.9.3.1 (2), page 5-27, second paragraph, last sentence.

It is not clear at what location the dose rates are expecated to be less than 5 mrems per year. ER-OL Section 5.2.4.3 states the dose rate at the site boundary will be 1 millirem per year.

Subsection 5.9.4.4 (3), page 5-41, next to the last sentence,

should read..."for two emergency planning zones (EPZs)..."

Subsection 5.9.4.5 (2), page 5.51, third paragraph, last sentence, should read

"... plant (see FSAR Figure 2.4.12-7)."

Page 5-53, first equation.

Change "... 693 ..." to "... 0.693 ..."

Page 5-54, Items 2 and 3,.

Change "... Pathways ..." to "... Pathway ..."

Subsection 5.9.4.5 (6), page 5-58, first paragraph, first sentence.

Change "... 16P ..." to "... P/16 ..."

Page 5-60, fourth paragraph, fourth sentence.

The minimal expected losses ranging from $0 to $44 per reactor year are not found in Table 5.16. The FES should provide an appropriate reference.

Page 5-68, first paragraph, next to the last sentence.

Should read " ...in the ER-OL (Table 2.7-1) ..."

Subsection 5.14.3, page 5-72, first paragraph, fifth sentence.

Note that this paragraph should be written in past tense. Also, note that according to FSAR Table 2.3.2-2, the system accuracies for analog recording are within the Regulatory Guide 1.23 specification.

Page 5-72, second paragraph, first sentence should read

"Four years of meteorological data (December 4, 1972 to December 4, 1973, April 4, 1977 to April 4, 1979 and April 1, 1980 to March 31, 1981 were provided ..."

Third paragraph, first and second sentences.

Should read "The applicant has upgraded ... The upgrade included ... and includes measurements ..."

Third paragraph, second sentence.

Change "133" to "33"

Table 5.3, page 5-106.

The maximum deposition on land for Beaver Valley Unit 2 should be 2.4 kg/ha/year (2.1 lb/acre/year). This is based on the 9.9 lb/acre/year maximum value reported for Units 1 and 2 in ER-OL Table E290.8-1 and assuming that the salt deposition attributed to each unit is proportional to its emission rate. An annotated copy of Table 5.3 provides additional corrections in Attachment 7.

Subsection 6.4.1, page 6-2, first paragraph.

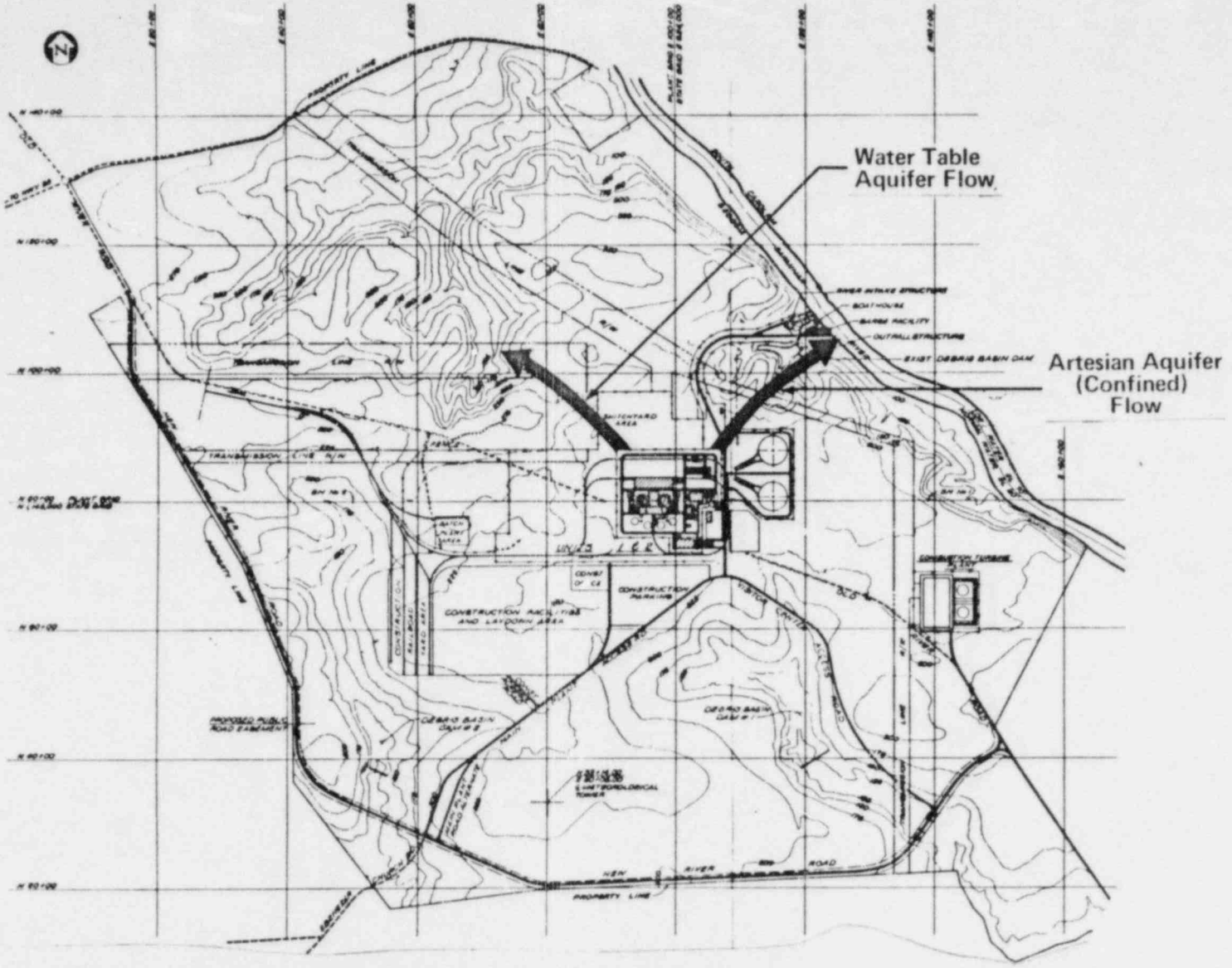
Note that the total annual avoided cost would exceed $500 million (constant 1987 dollars). This projection is based on a capacity factor of 63%-66%. The response to NRC Question E320.1 justifies the use of this capacity factor. Current studies indicate this capacity will rise to 69% (based on an effective forced outage rate of 18.4% and a maintenance of 8 weeks per year), and is supported by a demonstrated availability of nuclear units on the Southern electric system for 1983 of 69.9%.

Subsection 6.4.2, page 2, first paragraph.

Same comment as above regarding the capacity used.

Table D1, page 4 and 5, Table D6, page 10.

Annotated copies of these tables are provided as Attachments 8 through 10.



Georgia Power

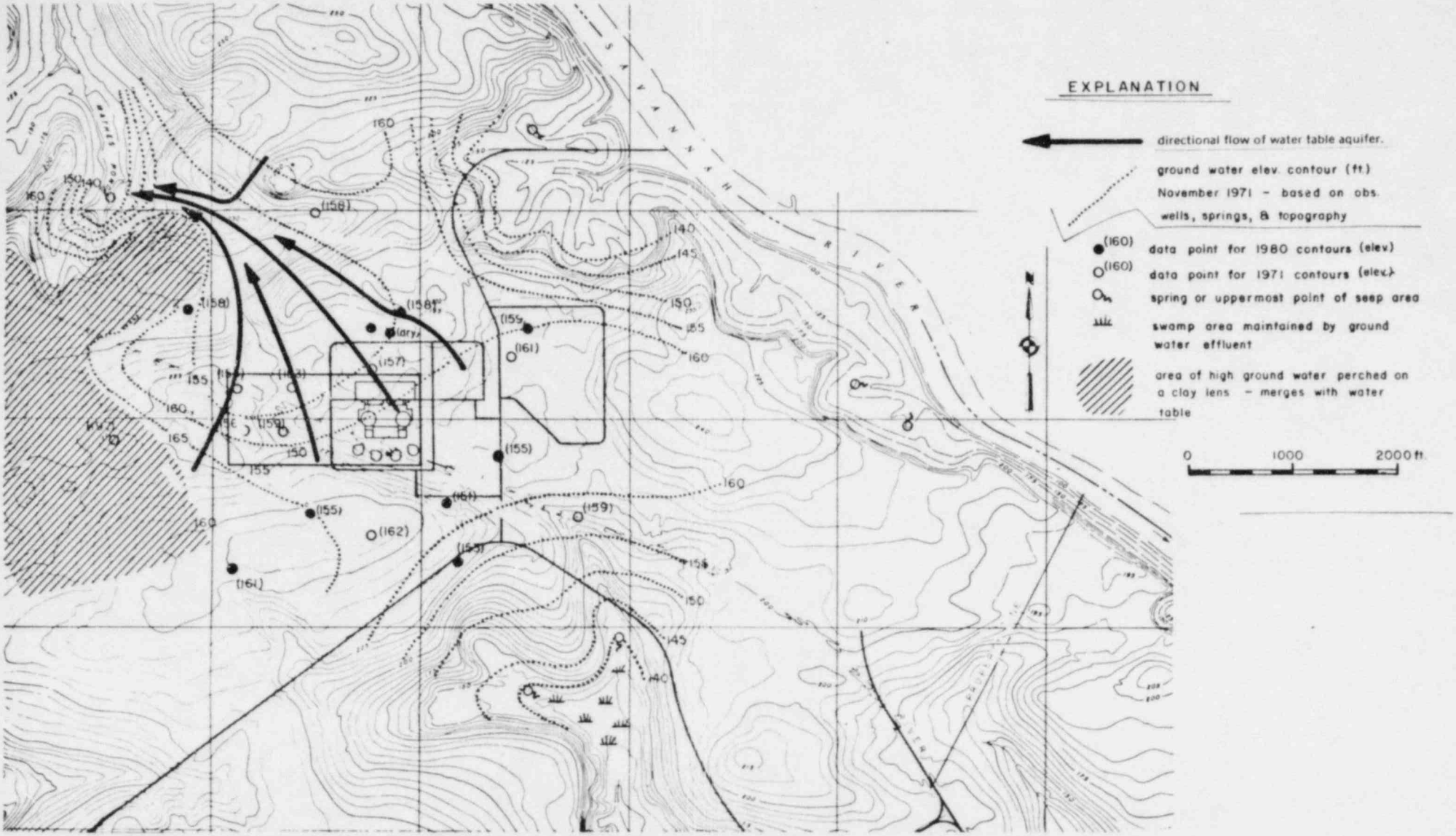
VOGTLE
ELECTRIC GENERATING PLANT
UNIT 1 AND UNIT 2

FLOW DIRECTIONS IN ONSITE
AQUIFER SYSTEMS

FIGURE 2.1-10

433-9

Attachment (1)



Georgia Power

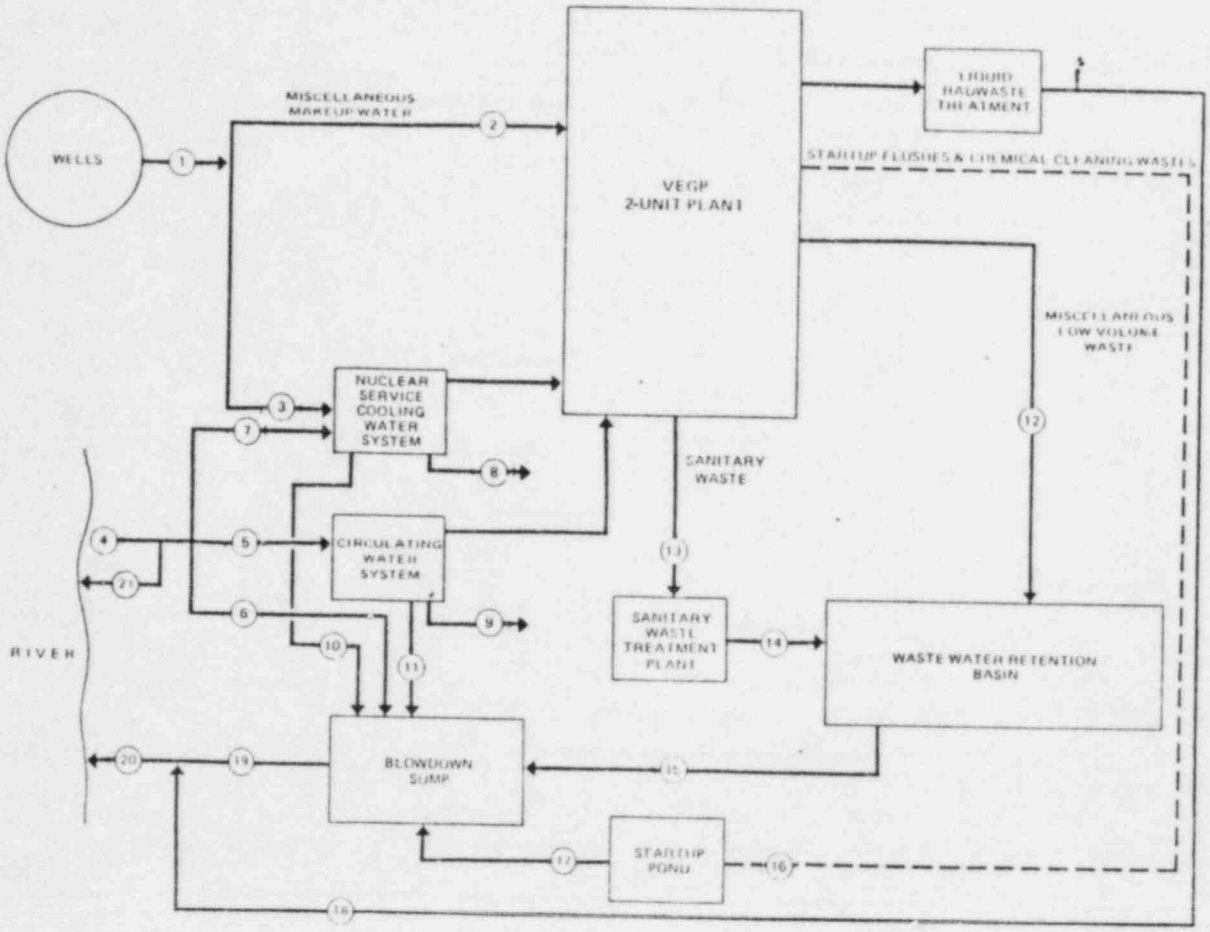
VOGTLE
ELECTRIC GENERATING PLANT
UNIT 1 AND UNIT 2

FLOW PATH AND CONTOURS OF WATER TA
AQUIFER, NOVEMBER 1971

FIGURE 2.1-11

R Attachment (2)

Attachment (3)



Description	Max Flow[a] (gpm)	Avg Flow (gpm)
1 2 MAKEUP WELLS (1 WELL AT A TIME IN USE)	2300	640
2 MISCELLANEOUS MAKEUP WATER FOR VEGP	2000	300
3 MAKEUP WATER TO NUCLEAR SERVICE COOLING TOWERS (2 PER UNIT WITH ONLY 1 PER UNIT OPERATED UNDER NORMAL CONDITIONS)	410 (PER TOWER)	270 (PER TOWER)
4 RIVER WATER MAKEUP SYSTEM TO CIRCULATING WATER SYSTEM AND DILUTION (UNITS 1 AND 2)	61,000[b] (AT 4 CYCLES)	40,000 (AT 4 CYCLES)
5 MAKEUP WATER TO CIRCULATING WATER SYSTEM (2 PERBOLIC COOLING TOWERS)[c]	60,000 (AT 2 CYCLES)	40,000 (AT 4 CYCLES)
6 DILUTION WATER FOR LIQUID RADWASTE DISCHARGE (UNITS 1 AND 2)	31,000	0
7 EMERGENCY WATER MAKEUP FOR NUCLEAR SERVICE COOLING WATER SYSTEM	1000	0
8 EVAPORATION AND DRIFT LOSSES FROM NUCLEAR SERVICE COOLING WATER SYSTEM PER TOWER	200	200
9 EVAPORATION AND DRIFT LOSSES FROM CIRCULATING COOLING WATER SYSTEM PER TOWER[c]	15,000 (ASSUMED CONSTANT)	15,000 (ASSUMED CONSTANT)
10 NUCLEAR SERVICE COOLING TOWER BLOWDOWN PER TOWER	210	70

Description	Max Flow[a] (gpm)	Avg Flow (gpm)
11 CIRCULATING COOLING TOWER BLOWDOWN PER TOWER[c]	15,000 (AT 2 CYCLES)	5000 (AT 4 CYCLES)
12 MISCELLANEOUS LOW VOLUME WASTES (OILY WASTE SEPARATOR, STEAM GENERATOR BLOWDOWN, TURBINE BUILDING DRAIN SYSTEM, CONDENSATE AND FEEDWATER FLUSH, DEMINERALIZED WATER MAKEUP SYSTEM)	11,000[d]	280
13 SANITARY WASTE	30	10
14 SANITARY WASTE TREATMENT PLANT DISCHARGE TO WASTE WATER RETENTION BASIN	180	10
15 WASTE WATER RETENTION BASIN DISCHARGE PER UNIT[e]	1600	140
16 STARTUP FLUSHES AND CHEMICAL CLEANING WASTES TO STARTUP POND	10,600	0[f]
17 STARTUP POND DISCHARGE	140	0[f]
18 LIQUID RADWASTE TREATMENT SYSTEM DISCHARGE	70	5[g]
19 BLOWDOWN SUMP DISCHARGE	55,000	10,280
20 PLANT DISCHARGE TO THE RIVER	55,000	10,285
21 RIVER WATER DIVERTED THROUGH TRASH SCREENS	140	0

a. THESE FLOWS ARE NOT NECESSARILY CONCURRENT.

b. THIS FLOW IS BASED ON AN EXPECTED PREOPERATIONAL FLUSH DISCHARGE.

f. STARTUP FLUSHES AND CHEMICAL CLEANING DOES NOT REGULARLY OCCUR DURING NORMAL OPERATION.

d. INTERMITTENT FLOW EXPRESSED AS A CONTINUOUS AVERAGE.

e. UNDER NORMAL CONDITIONS.

b. 10,000 gal/min dilution supplied by cooling tower blowdown.

Figure 4.3 Plant water use
Source: ER-OL Figure 3.3-1

c. Flows associated with normal operating conditions are determined by weather conditions, water chemistry, river conditions & operator discretion.

Attachment (4)

Table 4.1 Cooling water system design comparison[1]

Parameter	CP stage[2]	OL Stage[3]
Circulating water system	units - gpm	units - gpm
Heat rejection rates, Btu/h	8.2×10^9	7.95×10^9
Circulating water flowrate	474,800	484,600
System makeup	19,000	20,000[4]
Evaporation	14,860	15,000
Drift	70	
Blowdown (dilution)	4,000	5,000[5]
Radwaste ~~deletion~~	15,000	0[6]
Concentration factor	4 to 8; 5 average	2 to 6
Nuclear service water system		
System flowrate	20,700	20,700
System makeup	268	270
Evaporation and drift	203	200
Blowdown	65	70

[1]All values in gallons per minute per unit unless otherwise specified. To convert to liters per minute multiply values shown by 3.785; to convert Btu/h to J/h, multiply the values shown by 1055.

[2]As presented in the FES-CP.

[3]As presented in the ER-OL.

[4]For 4 cycles of concentration; at 2 cycles, makeup would be 60,000 gpm.

[5]For 4 cycles of concentration; at 2 cycles, blowdown would be 15,000 gpm.

[6]The capability exists for providing a 31,000-gpm flow for dilution, if necessary.

Attachment (5)

Table 4.2 Summary of biocide and chemical use at Vogtle

Common name	Trade name or scientific formula	Use (system function)	Use per year per unit
Alkaline phosphate solution	Na_3PO_4 + Na_2HPO_4	Startup chemical cleaning*	66,000 lb**
Organic acid	Hydroxyacetic acid ($HOCH_2COOH$)	Startup chemical cleaning*	33,000 lb
	Formic acid (HCO_2H)		15,000 lb
Acid inhibitor	Dow A-145 (or equivalent)	Startup chemical cleaning*	4000 lb
Citric acid	$HOC(CH_2CO_2H)_2$, (O_2H)	Startup chemical cleaning*	31,000 lb
Hydrazine	N_2H_4, 35% solution	Condensate and steam generator	10,000 gal
		Auxiliary boiler	2000 gal
Sulfuric acid	H_2SO_4, 66° Baume	Circulating water	92,900 gal***
		Nuclear service cooling water	8000 gal
		Waste neutralization	72,000 gal
		Demineralizer regeneration	8500 gal
Sodium hydroxide	NaOH, 50% commercial solution	Waste neutralization	9000 gal
		Demineralizer regeneration	54,000 gal
		Fire protection corrosion protection	2,500 gal
Ammonia	NH_3, 29% commercial solution	Condensate and steam generator	13,300 gal
		Auxiliary boiler	4600 gal
Chlorine	Cl_2	River intake	90,000 lb
		Circulating water	300,000 lb
		Nuclear service cooling water	9000 lb
		Potable water	147 lb
Disperant	Nalco 7319 or equivalent	Main circulating water	27,800 lb
		Nuclear service cooling water	4300 lb

*Chemicals may be used for subsequent maintenance cleaning.
**1 lb = 0.45 kg.
***At 70.7% plant availability, 105,120 gal/yr at 80% plant availability (approximate); 1 gal/yr = 3.785 L/yr or 0.003785 m^3/yr.
Source: ER-OL Table 3.6-1

Attachment (6)

Table 4.5 Liquid effluent water quality summary

Characteristic*	Main cooling water system blowdown		NSCW tower blowdown		Low volume waste		Combined effluent
	Avg at 4 cycles	Max at 6 cycles	Avg at 4 cycles	Max at 8 cycles	Avg	Max	Avg
Flow (gpm)	5000	2070	65	30	140	1600	10,280
TDS (mg/L)	240	360	435	870	640	2100	250
TSS (mg/L)	50	100	<50	<100	30	100	30
Calcium (mg/L)	30	40	<60	<120	17	18	30
Sodium (mg/L)	30	44	50	100	40	890	30
Magnesium (mg/L)	14	21	32	64	4	8	14
Iron (mg/L)	1	2	1	2	1	2	1.0
Potassium (mg/L)	8	11	11	22	13	16	8
Copper (mg/L)	<0.1	<0.1	<0.1	<0.1	<1.0	<1.0	<1.0
Lead (mg/L)	<0.1	<0.1	<0.1	<0.1	<1.0	<1.0	<1.0
Zinc (mg/L)	0.1	0.2	<0.3	<0.6	<1.0	<1.0	<1.0
Mercury (mg/L)	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Chloride (mg/L)	20	30	10	20	33	50	20
Fluoride (mg/L)	0.3	0.5	<0.1	<0.2	<1.0	<1.0	<1.0
Total phosphorus (mg/L)	1.0	3.0	2	3	<1.0	<1.0	1.0
Chromium (mg/L)	<0.1	<0.2	<0.1	<0.1	<0.1	<0.2	<0.1
Oil and grease	Nil	Nil	Nil	Nil	<15	<20	<15
5-day BOD (mg/L)	NA	NA	NA	NA	<30	<45	<30
Nitrate (mg/L)	1.0	2.0	6.0	13.0	10	110	1.0
pH	7.0-8.0	7.0-8.0	7.0-8.0	7.0-8.0	6.0 9.5	6.0 9.5	6.0-9.0
Alkalinity	95	140	140	290	100	250	100

*Describes the characteristics of the combined liquid wastes after treatment; i.e., the plant effluent discharged to the Savannah River.

Note: Maximum flow is not necessarily concurrent with maximum water quality concentration.

Source: ER-OL Table 3.6-2

Attachment (I)

Table 5.3 Natural draft cooling tower data for Vogtle compared with four other nuclear plants, per cooling tower

Parameter	Vogtle	Susquehanna	Beaver Valley Unit 2	Shearon Harris	Grand Gulf
Location	Burke County, GA	Berwick, PA	Shippingport, PA	Bonsal, NC	Port Gibson, MS
Drift rate, %					
Guaranteed	0.03	0.02	0.013	0.05	0.008
Expected	0.008	0.002	NA*	0.002	~~0.008~~ NA*
Circulating water flow rate, L/s (gpm)	30,569 (484,600)	30,152 (478,000)	32,007 (507,400)	30,404 (482,000)	36,082 (572,000)
Dissolved solids					
In makeup, mg/L	60	~~431~~ 432	203	70	376
In blowdown, mg/L	240	1640	365	539	1880
Concentration factor	4	3.8	1.8	7.7	5.0
TDS emission rate,** kg/yr	14,800	24,900	-	8,300	136,900
Frequency of dominant wind, %	12	15	11	11	9
Maximum solids deposition on land**	<9.5 kg/ ha/yr (<8.5 lb/ acre/yr)	1.7 kg/ ha/yr (1.5 lb/ acre/yr)	2.4 1.7 kg/ha/yr (1.5 lb/ acre/yr) 2.1	4.5 kg/ha/yr (4 lb/ acre/yr)	2.8 kg/ha/yr (2.5/lb/ acre/yr)

*NA = not available.

**Expected drift rate used in calculations.

Source: ER-OL Table E290.8-1

Attachment (8)

Table D-1 (continued)

Nuclide	Radwaste solidification building vent	Nuclide	Radwaste solidification building vent
H-3	2.3E+02	Te-127	8.1E-06
Cr-51	4.3E-05	Te-129	2.1E-05
Mn-54	7.5E-06	Te-129m	3.2E-05
Fe-59	3.9E-05	Te-131	3.3E-06
Fe-58	2.3E-05	Te-131m	1.8E-05
Co-58	3.8E-04	Te-132	3.8E-04
Co-60	4.9E-05	I-130	1.3E-03
Br-83	9.0E-07	I-131	2.6E-01
Rb-86	7.2E-06	I-132	2.0E-02
Sr-89	8.3E-06	I-133	9.7E-02
Sr-90	3.0E-07	I-134	1.5E-05
Y-90	1.0E-07	I-135	1.2E-02
Y-91	1.6E-06	Cs-134	2.4E-03
Y-91m	9.0E-07	Cs-136	1.0E-03
Zr-95	1.4E-06	Cs-137	1.8E-03
Nb-95	1.2E-06	Ba-137m	1.6E-03
Mo-99	1.1E-03	Ba-140	4.6E-06
Tc-99m	1.0E-03	La-140	4.4E-06
Ru-103	1.1E-06	Ce-141	1.6E-06
Ru-106	3.0E-07	Ce-143	3.0E-07
Rh-103m	1.1E-06	Ce-144	8.0E-07
Rh-106	3.0E-07	Pr-143	1.1E-06
Te-125	7.0E-07	Pr-144	8.0E-07
Te-127m	6.7E-06	Np-239	1.4E-05

Total Kr and Xe, 4200Ci

Total Iodine and particulates (excluding H-3 and C-14), 0.53 Ci

*All releases should be considered continuous.

**Plant vent.

***Exponential notation: 3.0E+00 = 3×10^{0}.

†For the C-14 dose releases, 7 Ci/yr/reactor is attributed to an annual release duration of 700 hours, and 1 Ci/yr/reactor is attributed to continuous releases.

Attachment (9)

Table D-1 Calculated releases of radioactive materials in gaseous effluents from Vogtle 1 and 2 (Ci/yr per reactor)*

Nuclide	Waste gas system**	Building ventilation			Air ejector exhaust	Total**
		Reactor**	Auxiliary**	Turbine		
Kr-83m	0	3.0E+00***	0	0	0	3.0E+00
Kr-85m	0 E+02	3.1E+01	2.0E+00	0	1.0E+00	3.3E+01
Kr-85	2.5E+~~0.2~~	5.0E+00	0	0	0	2.6E+02
Kr-87	0	7.0E+00	1.0E+00	0	0	8.0E+00
Kr-88	0	4.4E+01	4.0E+00	0	3.0E+00	4.8E+01
Kr-89	0	0	0	0	0	0
Xe-131m	3.0E+00	1.3E+01	0	0	0	1.6E+01
Xe-133m	0	6.4E+01	2.0E+00	0	1.0E+00	6.6E+01
Xe-133	1.0E+00	3.4E+03	1.1E+02	0	7.0E+01	3.5E+03
Xe-135m	0	0	0	0	0	0
Xe-135	0	1.3E+02	7.0E+00	0	4.0E+00	1.4E+02
Xe-137	0	0	0	0	0	0
Xe-138	0	1.0E+00	1.0E+00	0	0	2.0E+00
I-131	0	1.8E-02	4.5E-03	1.3E-03	2.8E-02	2.3E-02
I-133	0	2.1E-02	6.4E-03	1.4E-03	4.0E-02	2.7E-02
H-3						8.2E+02
C-14						8.0E+00
Ar-41						2.5E+01
Mn-54	4.5E-05	2.2E-04	1.8E-04			4.5E-04
Fe-59	1.5E-05	7.4E-05	6.0E-05			1.5E-04
Co-58	1.5E-04	7.4E-04	6.0E-04			1.5E-03
Co-60	7.0E-05	3.4E-04	2.7E-04			6.8E-04
Sr-89	3.3E-06	1.7E-05	1.3E-05			3.3E-05
Sr-90	6.0E-07	3.0E-06	2.4E-06			6.0E-06
Cs-134	4.5E-05	2.2E-04	1.8E-04			4.5E-04
Cs-137	7.5E-05	3.8E-04	3.0E-04			7.6E-04

*See footnotes at the end of the table.

Attachment (10)

Table D-6 Annual dose commitments to a maximally exposed individual near the Vogtle 1 and 2 nuclear station

Location	Pathway	Doses (mrems/yr per unit, except as noted)			
		Noble gases in gaseous effluents			
		Total body	Skin	Gamma air dose (mrad/yr/unit)	Beta air dose (mrad/yr/unit)
Nearest* site boundary(1.98 km E)	Direct radiation from plume	0.1	0.2	0.1	0.3
		Iodine and particulates in gaseous effluents**			
		Total body		Organ	
Nearest*** site boundary(1.98 km E)	Ground deposition	a		a	
	Inhalation	0.1		0.5 (C) (thyroid)	
Nearest residence (1.93 km WSW)	Ground deposition	a		a	
	Inhalation	a		0.5 (C) (thyroid)	
Nearest milk cow (7.4 km SE)	Ground deposition	a		a	
	Inhalation	a		a	
	Vegetable consumption	a		0.1 (C) (thyroid)	
	Cow milk consumption	a		0.8 (I) (thyroid)	
				0.3 (C) (thyroid)	
Nearest garden (2.25 km WSW)	Ground deposition	a		a	
	Inhalation	a		0.4 (C) (thyroid)	
	Vegetable consumption	a		0.8 (C) (thyroid)	
Nearest meat animal (5.0 km SW)	Meat consumption	a		a	
		Liquid effluents**			
		Total body		Organ	
Drinking water at plant discharge area	Water ingestion	0.1 (C)		0.9 (I) (thyroid)	
Nearest fish at plant discharge area	Fish consumption	0.5 (A)		0.6 (T) (liver)	
Nearest shore access near plant discharge area	Shoreline recreation	a		a	

a = Less than 0.1 mrem/year.

*"Nearest" refers to that site boundary location where the highest radiation doses as a result of gaseous effluents have been estimated to occur.

**Doses are for the age group and organ that results in the highest cumulative dose for the location: A=adult, T=teen, C=child, I=infant. Calculations were made for those age groups and these organs: gastrointestinal tract, bone, liver, kidney, thyroid, lung, and skin.

***"Nearest" refers to the location where the highest radiation dose to an individual from all applicable pathways has been estimated.