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In the Matter of Georgia Power Company, et al. (Vogtle Electric  
Generating Plant, Units 1 and 2) ; Docket Nos. 50-424 (OL), 50-425  
(OL)

Analysis of the Atomic Safety and Licensing Board's November 12, 1985  
Memorandum And Order (Ruling On Motion For Summary Disposition Of  
Contention 7 re: Groundwater Contamination)

The intervenors did not file a motion to strike because the Applicants' were arguing their case through the mails. Because of the complexity of this issue, and because both Applicants and the ASLB board have had difficulty understanding some of the issues raised by Intervenor, Intervenor want to argue their case in front of both the Applicants and the ASLB board where confusion can be more easily resolved rather than trying to do so through the mails. Intervenor feel that sufficient information had been supplied to the Atomic Safety And Licensing Board (ASLB) to make a determination on whether or not the groundwater contention entoto merited genuine issues of material fact to be heard in an open forum before the ASLB. Nonetheless, the ASLB granted part of the Applicants' request although the ASLB board agreed genuine issues do exist with the groundwater contention. This analysis will review seriatim the dispositions by the ASLB board of the Intervenor's allegations on the groundwater

contention.

Sr-90 contamination of groundwater at VEGP

The ASLB board and the Applicants misconstrued this allegation. This part of the allegation stated :

The 1971 groundwater chemical analysis should be updated. It has been found that Sr-90 contamination in the VEGP...area , likely due to SRP releases, is significant (cf FES). There is the possibility that other released chemicals may have changed the 1971 datum.

Both the ASLB board and Applicants were unable to find reference to Sr-90 contamination in the VEGP groundwater in the FES and therefore dismissed the contention out of hand. But, Intervenors did not state there was Sr-90 contamination of the groundwater in the VEGP area. Intervenors stated that Sr-90 contamination in the VEGP area was significant, and that this was discussed in the FES (cf. FES, Appendix A, pp.91-92; the NRC response in the FES ,pp. 9-27,28, did not address the WFL-19 comment concerning significant Sr-90 in milk in the VEGP area either).

Simply put, using Dupont SRP and EPA data, there exists a significant difference in concentrations of Sr-90 found in milk in the VEGP area compared to what both the EPA and the SRP claim should be in the VEGP area due to nuclear weapons fallout and thus do to chance. Numerous EPA and SRP sources attest to the confounding of SRP released Sr-90 by

fallout; these are referenced in the first FES citation above. But none of these sources, both EPA and SRP, analyzed the Sr-90 data using statistical inference. Thus for the most part, the EPA and SRP conclusions in these sources were speculative. Using statistical inference, a significant difference was found to exist ( $t(12)=2.48$ ,  $p$  less than .05).

With it being firmly established that Sr-90 contamination in the SRP area is significant, especially in the VEGP area where the highest readings were found, and since the SRP emits Sr-90, the source of the Sr-90 becomes important. The SRP predictions of Sr-90 maximum concentrations, due to airborne releases, at its plant boundary are orders of magnitude below the concentrations found in milk in the VEGP area (e.g., DPST-82-1054, p. 2-5 (1982); DOE/EIS-0108, p.5-52 (1984); EPA 520/5-84-012 (1984)). Considering that the SRP is a source of Sr-90 (e.g., ERDA-1537, p. A-26), that the SRP has had a consistent history of underestimating environmental parameters and impacts (e.g., ERDA-1537, p.111-20; vs. DOE/ER-0225, pp. D-38,41), it is possible to conclude that the Sr-90 milk contamination in the VEGP area is likely due to many years of SRP releases.

Why is this of concern? The SRP releases not only Sr-90 but many other radionuclides and nonradioactive effluents as well (e.g., DPST-82-1054). The Sr-90 may be considered a signature. At the SRP, groundwater contamination due to background tritium under the radioactive waste burial grounds, about 1 mile upwind from the airborne release stacks in the H-Area, has been attributed to H-Area release stacks releasing tritium. Airborne released tritium effluents

are deposited on the surface of the burial grounds, washed into the soil when it rains, then percolated downwards to the groundwater below, and then intercepted by background monitoring wells (cf. the SRP Annual Well Monitoring Reports by Fenimore, Radionuclides In 643G Groundwater- 1973-76 , November 23, 1977, p.2). A clear path of airborne releases, deposition, and subsequent groundwater accumulation has been established at the SRP. The same pattern and causal relationship should be found in the VEGP area as a result of SRP releases. Since the only chemical datum for the groundwater under VEGP was established in 1971, and since the SRP makes significant airborne releases each year, and since Sr-90 has been found to be significantly higher in concentrations within milk in the VEGP area, it would appear to be important to re-establish a new datum for the groundwater. Otherwise, subsequent monitoring data may be confounded.

There is another concern. Groundwater under VEGP has been accepted as a formal contention. Groundwater contamination is a complex subject, one not easy to understand or predict. However, it doesn't appear to be part of the scientific method to dismiss arguments because the comments are vague, or not understandable, especially when it is an easy matter to contact those making the arguments. The ASLB and Applicants tend to suggest that some of these scientific arguments can be legally acceptable or not. While that may be so, it must be clearly understood that the spread of contamination in the aquifers below VEGP cannot be prevented by decree, by legal resolution, or by formal environmental statements. The most prosperous course, it would seem, is to resolve issues that may appear to be vague, especially when possible and when to the advantage of all parties.



### Statistical Analysis of Hydrological Data

Intervenors' stated that the groundwater data had not been studied with scientific inference methods. Applicants and the ASLB board agreed that this data had not been statistically treated, but both stated that intervenors have not found flaws in the conclusions based on that data. Intervenors were not planning to look for statistical errors, but for errors in process. This the Intervenors have found. Statistical treatment on the groundwater data should include a sensitivity analysis and an estimate of the range of error that exists in the collected data. VEGP groundwater data should be compared to normalized groundwater data from national groundwater monitoring data from nuclear reactors. No data base is error free, but the amount of error should be quantified, a datum established and updated when found incorrect. For example, an uncertainty analysis on the groundwater travel time may have resolved some of the issues in this area. The ASLB board has agreed that uncertainty exists in some of the VEGP data. A statistical treatment would quantify this uncertainty. Intervenors were not looking for flaws in the groundwater data using statistical treatments, per se, but in the planning process. It appears both were found.

Groundwater contamination plumes are known not to travel as a discrete whole, but as a distribution modeled by distribution moments. There are other reasons to use statistical and probabilistic treatments of hydrologic data. From Viessman, Knapp, Lewis, and Harbaugh (Introduction to Hydrology (2nd ed.), 1977, pp.157,201) :

Many hydrologic processes are so complex that they can be interpreted and explained only in a probabilistic sense. Hydrologic events appear as uncertainties of nature and are the result, it must be assumed, of an underlying process with random or stochastic components. The information to investigate these processes is contained in records of hydrologic observations. Methods of statistical analysis provide ways to reduce and summarize observed data, to present information in precise and meaningful form, to determine the underlying characteristics of the observed phenomena, and to make predictions concerning future behavior...

probability and statistical ...applications (to)...complex hydrologic processes often require knowledge of the joint distribution of several random variables and consideration of the correlation between them. Dependence of sequential events in a time series is also an important concept in hydrology. Methods of analysis can be extended... over both space and time...With the development of electronic computers, these methods and techniques have become a valuable element in planning and design.

From Meyer ( Introductory Probability and Statistical Applications ,1970, p.3),

For ...probabilistic...or...stochastic models , these phenomena do)...not lend itself to a deterministic approach. A probabilistic model describes the situation more accurately.

In a letter report from Dupont in 1981 (Letter R. Maher, Dupont, to T.B.Hindman, DOE-SR, Issues Pertinent to the Long-Term Operation of the Burial Ground, June 30, 1981, p. 25, 26), a discription of contaminant flow in the groundwater at SRP is of a distribution:

Tritium will continue to move out of the burial ground at an average flow velocity of 30-50 feet/year. The leading edge of the activity is moving 3-10 times faster...

In summary, scientific inference would quantify the amount of error that exists in the VEGP hydrologic data. If anything, in conclusions by VEGP on groundwater travel time, in its conclusions on the marl, in its conclusions on the direction of groundwater flow, VEGP has demonstrated that an uncertainty in the data exists.

#### Effect of Settlement on the Marl

Applicants and the ASLB board have misunderstood this part of the contention by Intervenors. Both stated they did not understand "differential flow rates of the grouted wells underlying the (VEGP) facility." An explanation follows. The wells underneath VEGP have supposedly been grouted with an acceptable method (Intervenors have questioned this method before; e.g., cf. the Bechtel report Geotechnical Verification Work Report of Results, August 1985, Geologic Drill Log, Hole No. 904: The amount of cement injected into the hole to grout the well was 28 cu yd compared to a drilled-out volume of 46.8 cu yds, leaving a difference of 18.8 cu yds.) Assuming the grouted wells under the VEGP power block are one complete solid,

then as the power block settles, those grouted wells directly under the block will be punched downward at a one-to-one rate, a rate that may be different ("differential") for the marl. Applicants have concluded that the marl is impermeable, but have not shown whether the marl is incompressible, or whether the marl will deform downward at the same rate as the grouted wells. The grouted wells are likely less compressible in a vertical direction than the more elastic marl. As these grouted wells settle, driven by the weight of the power block atop them, they act like spikes. With plastic deformation of the marl, it is possible that the bottom of the grouted wells may separate and core out at the bottom of the marl. If so, the integrity of the marl would be diminished.

There are other concerns with this issue. Will the power block settlement resume with water withdrawal over the years? The Savannah River Plant credits the contamination of the Tuscaloosa aquifer under the SRP to deterioration of production well casings. What is the possibility of grouting deterioration under the VEGP? Applicants have not given sufficient assurance that this will not become a pathway for contamination. Settlement under the VEGP powerblock has been described as plastic deformation, but Applicant did not describe the marl deformation boundary at the points of furthest deformation on the surface of the marl and downwards through the marl.

#### Leakage of Radioactive water from Auxiliary Building

Intervenors do not disagree with Applicants and the ASLB board that water would seep into the building from outside through a fracture.



The highest levels of contamination recorded under the SRP and in the Tuscaloosa aquifer occurred under a spent solvent holdup tank (e.g., Steele, Technical Summary of the A/M Area Groundwater Remedial Action Program, ca. 1984, SRP report, pp. 7, 10; DPST-83-829, pp. 6-12, 13, 79). The tank was not shown by SRP to have failed, only leaked for many years. In addition, even if water only inflows from a fracture in the building, a concentration gradient will occur, and it is possible that contamination will escape. Intervenors believe this to be a viable issue.

#### Hazardous Chemical Wastes

Intervenors argue that the potential for groundwater contamination of the aquifers at VEGP to be as viable an issue as the possibility of radioactive contamination. The groundwater contamination at the SRP has been by both radioactive and hazardous chemicals. The VEGP groundwater monitoring program should include monitoring for all chemical effluents.

#### Contamination of Crataceous Aquifer at SRP

ASLB alleges that Intervenors stated that groundwater contamination at SRP resulted from leaks out of a holding tank. That is so, but not the only source of contamination. The areal extent of the groundwater contamination in 1983 was in the hundreds of acres. Contamination under the tank is the highest recorded at SRP (e.g., DPST-83-829, p.6-12,13,79), but it occurred under the M-Area basin, and since the basin overflowed, and since the sewer lines leaked, percolation

downward occurred over a large areal extent also.

A source on the storage tank for spent solvents is noted above. On other matters, there is some confusion on the HLW tank releases with releases from other areas on the SRP. The HLW tanks are located in the 200 area at SRP, and the known Tuscaloosa aquifer contamination has occurred in M-Area, a significant distance away, but still on the SRP site.

#### Groundwater Travel Time

The outcrop at the SRP did not occur early solely because of the shortened flowpath due to erosion. It occurred primarily because of erroneous conclusions based on average groundwater flowrates. The original flowpath was about 1700 to 2600 ft and the erosion was about 900 ft (ERDA-1537, p. II-116; DP-1638, p.10). Assuming that erosion was the only factor, eroding 900 of 1700 should reduce the old estimated travel time for the groundwater first outcrop of tritium to 35 years from 70 years (ERDA-1537, p. II-116). However tritium effluent at the outcrop was first discovered in 1978, one year after ERDA-1537 was published wherein it was stated that no significant outcrop would occur until the 70th year; it could have occurred sooner than 1978, but that was the year it was discovered ( Lawless, Savannah River Plant (SRP) Burial Ground Building 643-G Management Appraisal Report (BGAR) Appraised June 2-13, 1980 , November 1, 1982, pp.12-13).

Further, and conclusively, even with the 900 ft erosion repaired, SRP predicted the re-emergence of the tritium in a subsequent outcrop within one year ( Lawless, BGAR , 1982, p. 11). This does not support

Applicants contentions on groundwater travel time.

The groundwater estimate used by SRP was in error. Applicants have used a similar method at the VEGP, a method subject to error. That is the main point of DP-1638. By using a three-dimensional model for groundwater flow, a calculation of 17 years for an outcrop was found, in close agreement to what has been observed. Flow rates varied in relation to changing gradients. This may account in part for the calculated differences from observed rates.

UNITED STATES OF AMERICA  
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

In the Matter of

GEORGIA POWER CO., et al.

(Vogtle Electric Generating Plant,  
Units 1 and 2)

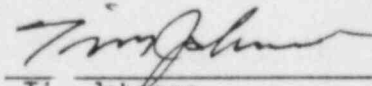
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Docket Nos. 50-424 and 50-425

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CERTIFICATE OF SERVICE

This is to certify that copies of the foregoing Intervenor's response to the ASLB's Ruling on Motion for Summary Disposition of Contention 7 and the related cover letter were served by hand or by deposit with the U. S. Postal Service in the City of Atlanta with first class postage attached to be delivered to the following service list this 20th day of December, 1985.

  
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