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UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

In the Matter of	)	
	)	
GEORGIA POWER COMPANY	)	Docket Nos. 50-424
et al.	)	50-425
	)	(OL)
(Vogtle Electric Generating Plant,	)	
Units 1 and 2)	)	

NRC STAFF'S PROPOSED
FINDINGS OF FACT AND CONCLUSIONS OF LAW

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May 5, 1986

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INTRODUCTION

Pursuant to 10 C.F.R. §2.754 and as directed by the Atomic Safety and Licensing Board (Tr. 874), the NRC staff (Staff) submits its proposed Findings of Fact and Conclusions of Law with respect to the three contentions litigated on March 11-14, 1986, in Waynesboro, Georgia. The Contentions at issue are: 1) Contention 7 (Ground-water), 2) Contention 10.1 (Dose-Rate Effects), and 3) Contention 10.5 (ASCO Solenoid Valves). As more fully set forth in the proposed findings below, the staff submits that the Board should find that Intervenor's contentions lack merit.

I. FINDINGS OF FACT

A. Jurisdiction and Parties

A.1. [Staff has reviewed that portion of Applicants' "Proposed Findings of Fact" headed "I. Jurisdiction and Parties" (at page 2-8) and in order to avoid unnecessary repetition agrees with and adopts that

portion of Applicants' Findings as setting out the procedural history of this proceeding to date.] 1/

B. Contention 7: Groundwater

1. INTRODUCTION

B.2. As admitted by the Board's Memorandum and Order dated September 5, 1984, Contention 7 reads as follows:

> Applicant has not adequately addressed the value of the groundwater below the plant site and fails to provide adequate assurance that the groundwater will not be contaminated as required by 10 CFR 51.20(a), (b) and (c), 10 CFR 50.34(a)(1), and 10 CFR 100.10(c)(3).

B.3. On July 15, 1985 Applicants filed a Motion for Summary Disposition 2/ which was granted in part and denied in part in the Board's "Memorandum and Order (Ruling on Motion for Summary Disposition of Contention 7 re: Groundwater Contamination)", dated November 12, 1985. The Board noted the gravamen of the contention is that Intervenors are concerned that an accidental spill of radioactive water on the site could result in radioactive contamination of the water table, and possibly the deeper aquifers under VEGP, all of which are used as public water supplies. As a result of the Board's rulings on Summary

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1/ Neither the Applicants' procedural history of this proceeding or the following proposed Findings of Fact and Conclusions of Law address the admitted contentions which challenge offsite emergency response planning for Vogtle. If necessary, those contentions will be the subject of a Supplemental Initial Decision.

2/ Applicants' Motion for Summary Disposition of Joint Intervenors' Contention 7 (Groundwater), July 15, 1985.

Disposition, five issues of material fact remained to be litigated at the hearing. These issues are:

(1) The adequacy of Geological/Hydrological Exploration of the Vogtle site;

(2) Uncertainty in Data on Marl Thickness and Permeability;

(3) Data on Marl Continuity;

(4) The Direction of Groundwater Flow; and

(5) Groundwater Travel Time.

We shall address each of these issues seriatum.

a. Background

B.4. Testimony on this Contention was filed by the Applicants (Testimony of Thomas W. Crosby, Clifford R. Farrell, and Lewis R. West on Contention 7, hereinafter Crosby, et al., ff. Tr. 253 and Testimony of Dr. Stavros S. Papadopulos on Contention 7, hereinafter Papadopulos, ff. Tr. 253), the Joint Intervenors (Intervenors' Testimony Before the Atomic Safety and Licensing Board March 11, 1986: Contention 7, Groundwater Contamination, hereinafter Lawless, ff. Tr. 720, and an attachment to the Lawless testimony entitled "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)", dated December 15, 1985, hereinafter Lawless Attachment, ff. Tr. 720), and by the NRC Staff (Testimony of Lyman W. Heller and Raymond Gonzales on Contention 7, hereinafter Heller, et al., ff. Tr. 764).

B.5. In order to put the context of Contention 7 in proper perspective, a brief description of the VEGP site geology and hydrology is set forth below.

b. Vogtle Site Geology and Hydrology

B.6. Plant Vogtle is located approximately 26 miles south-southeast of Augusta, Georgia on the Coastal Plain of Georgia. Crosby, et al., ff. Tr. 555, at 2. The Coastal Plain is underlain by a sequence of sedimentary formations consisting of alternating beds of sand, clay, marl and limestone sediments atop a basement complex of older sedimentary, crystaline and metamorphic rocks. Id. The Tuscaloosa Formation overlies the basement complex and consists of sands and gravels with scattered beds of silt and clay deposited in late Cretaceous time (about 90 million years ago). Id., at 3. The Huber and Ellenton Formations overlie the Tuscaloosa Formation and consist of dark gray sandy clays and silts and multicolored clays deposited during the Paleocene Epoch (Tertiary Period). Id. The Lisbon Formation was deposited atop the Huber and Ellenton Formations during the Eocene Epoch (Tertiary Period). This formation is comprised of a lower calcareous sand unit (called the unnamed sands) and an upper calcareous clay (named the Blue Bluff marl). Id. Finally, the Barnwell Group of sediments were deposited over the Lisbon Formation during the Late Eocene Epoch and consist of sand with minor amounts of clay and limestones. Overlying sediments of the Barnwell Group are composed primarily of sands and silts and are exposed at the surface in the area of the Vogtle site. Id.

B.7. There are two major aquifers in the coastal plain region, both of which are present under the Vogtle plant. The lower of these is called the Cretaceous aquifer and consists primarily of the sands and gravels of the Tuscaloosa Formation, and is also referred to as the Tuscaloosa aquifer. Id., at 4. The upper aquifer is called the Tertiary aquifer and consists primarily of permeable sands and limestones of several Tertiary-age geological formations. This aquifer is the principal artesian aquifer and is represented by the unnamed sands of the Lisbon Formation. Both of these aquifers are confined under the Vogtle plant, with the uppermost confining layer being the Blue Bluff marl of the Lisbon Formation. Id. In addition to these aquifers, groundwater also exists under water-table (unconfined) conditions as shallow and discontinuous bodies in the Barnwell Group and are referred to as the water-table aquifer. Id., at 4-5.

2. ISSUES OF MATERIAL FACT

a. Adequacy of Vogtle site Geological/Hydrological Exploration

B.8. The Board in denying Applicants' Motion for Summary Disposition pointed to three inadequacies in Applicants' program for exploring the geology and hydrology of the Vogtle site that had been identified in the Staff's SER, and indicated that further exploration of these matters was necessary. The Board stated:

> (1) Further monitoring of the unconfined aquifer and backfill is necessary to establish the design-basis groundwater level. The level has not been conclusively established because the water level was measured in the unconfined aquifer over a relatively short time and had

interrupted segments as discussed in Section 2.4.12.6 of this SER (pp. 2-32);

(2) The staff requires additional wells in the marl aquiclude because of the limited monitoring over the full depth of the marl as discussed in Section 2.4.12.2.2 of this SER. The required permeability testing will confirm the range of the applicants' previous permeability test results and provide the permeability of the interbedded limestone lenses (pp. 2-32);

(3) This aquifer [Tuscaloosa] should be monitored to determine the long-term effect of withdrawing water from the Tuscaloosa aquifer. Well No. 1W-1 [sic, TW-1] and any other production wells not being pumped should be read on a monthly frequency to monitor the effects of pumping from the Tuscaloosa aquifer (pp. 2-33).

Memorandum and Order, pp. 12-13.

B.9. At the time the motion for Summary Disposition was filed, the Applicants were still conducting laboratory permeability tests on cores taken from the marl in June 1985 and data from well series 42 was still being supplemented and confirmed by data from additional wells. At hearing the staff witnesses testified that the geologic exploration of the VEGP is now adequate based on review of Applicants' report entitled "Geotechnical Verification Work - Report of Results" enclosed with a letter from J.A. Bailey, Georgia Power Company, to Ms. E.G. Adensam, U.S. Nuclear Regulatory Commission, dated August 23, 1985, which describes the exploratory work carried out by performing six core borings into the marl formation and the results of pressure tests conducted in the cored holes. Heller, et al., ff. Tr. 764, at 4.

B.10. This exploration work meets all applicable NRC Regulatory Guides and Standard Review Plan recommendations, and the procedures and practices used are adequate to reveal the pertinent features and composition of the marl and to assure that pressure test results and water

level monitoring in the new wells are reliable. Id., at 5. In addition, ten core samples from the marl were tested in the laboratory to determine their permeability, resulting in an indication that the marl permeability is about 10^{-7} centimeters per second (cm/sec), a value that is consistent with the description and classification of the marl formation. Id.

B.11. The Staff's SER concern regarding additional monitoring in the unconfined aquifer and backfill was related to the Applicants' design-basis groundwater elevation of 165 feet mean sea level (msl). Id., at 7. The design-basis groundwater level defines the maximum groundwater level which is used to compute groundwater induced loads on sub-surface portions of safety-related structures and, hence, is a structural rather than groundwater contamination concern. Id. As the groundwater levels in the backfill and unconfined aquifer had only been monitored for a relatively short time, it could not be determined conclusively that this elevation could not be exceeded over the life of the plant. Id.

B.12. To address this concern, the Applicants installed four new monitoring wells in the plant backfill and two new wells in the Barnwell sediments, two of which have continuous water level recorders. Id. The remaining wells are being monitored on a weekly basis to confirm the adequacy of Applicants' design-basis groundwater level. Id., See also, Crosby, et al., ff. Tr. 253, at 33-35. There will be a license condition for the Vogtle plant to require this monitoring throughout the life of the plant, although the frequency of monitoring is subject to change. Heller, et al., ff. Tr. 764, at 8.

B.13. In response to the second noted SER concern involving the permeability of the marl, the Applicants drilled new wells, installed

groundwater level monitoring instruments, and performed additional field and laboratory permeability tests throughout the entire thickness of the marl. Id., at 6. Six continuous and controlled core borings into the marl formation were performed by the Applicants. Id,. at 8. These two well clusters were installed at opposite corners of the power block to provide additional detail on the pore pressure distribution within the marl. Data from these wells provide sufficient evidence to conclude that the marl is continuous with respect to its ability to impede the movement of groundwater from the upper aquifer to the lower aquifer. Id., at 16.

E.13. The monitoring of the Tuscaloosa aquifer provision in the SER is required to ensure that the withdrawal of water from this aquifer will not adversely impact on other groundwater users and, hence, is an environmental, rather than a construction safety concern. Heller, et al., ff. Tr. 764, at 8. This monitoring will be required throughout the life of the plant, and the Applicants are currently monitoring two wells on a monthly basis. Id.; see also Crosby, et al., ff. Tr. 253, at 35-36.

E.14. At the time of the hearing, the Applicants had completed laboratory permeability tests on 10 samples obtained during core drilling of the marl which together with the in situ field tests confirm that the marl is nearly impermeable. Heller, et al., ff. Tr. 764, at 9. As a result of the additional monitoring and testing data supplied by the Applicants, the Staff is fully satisfied that the required confirmation of marl permeability factors identified in the SER has been resolved. Id., at 13.

B.15. Hence, the Board finds that the VEGP geological and hydrological exploration is adequate to resolve the Board's concerns in this regard.

b. Uncertainty in Data on Marl Thickness and Permeability

B.16. The marl is a densely consolidated, fine grained calcareous clay with subordinate lenses of dense well indurated, well cemented limestone. Crosby, et al., ff. Tr. 253, at 12. Reported values of the permeability of unweathered marine clays, of which the marl is a type, range from 10^{-7} to 10^{-10} cm/sec. Materials with such low permeability are qualitatively considered to be impermeable. Id.

B.17. The thickness and permeability of the marl was tested during site exploration in 1971-73 in situ; 80 packer tests and permeameter tests were conducted in 22 drill holes. Crosby, et al., ff. Tr. 254, at 9, 13; Crosby, Tr. 281. An additional 15 packer tests were performed in six new holes in the summer of 1985, with laboratory permeability measurements taken on ten samples from these holes. Id.

B.18 The marl thickness is well known because of the unusually large number of holes (33) drilled through the marl in this area by the Applicant as compared to industry practice and NRC regulatory guides. Heller et al., ff. Tr. 764 at 11. The marl formation is about 65 feet thick and extends from about elevation 135 feet mean sea level (msl) to 70 feet msl. To accommodate the foundation for the auxiliary building, the marl was excavated to elevation 108.5 feet msl, so the resulting marl thickness is about 38 feet in this area. Id. Crosby, Tr. 379.

B.19. The in situ tests in the marl spanned intervals of 5 to 10 feet. Papadopulos, Tr. 450. Water was injected into holes that spanned those intervals under pressure and no water intake was recorded. Id., at 451. This would indicate a permeability of less than 10^{-7} cm/sec, that is, it would allow 1.5 to 2 inches of water to go through the marl. Id. Compared to the total recharge available into the aquifer, about 15 inches this is a reasonable estimate of the permeability of the marl. Id. Were the permeability an order higher, 10^{-6} cm/sec., it would indicate that there was about 20 inches of flow through the marl. Id. This is not possible since only 15 inches of recharge exist. Id.

B.20. Laboratory tests of ten typical marl core samples confirmed this value, and were calculated using the harmonic mean. Farrell, Tr. 387-88. Intervenors in their proposed findings now maintain that an arithmetic, rather than harmonic mean should be used to calculate permeability. (I.F. 23, 30, 31). 3/ However, the issue was fully

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3/ Although the Intervenors' Findings on Contention 7: Groundwater, do cite some of the testimony in the record for statements of facts, quite often key premises for conclusions appear in the documents or texts listed in the "Bibliography", none of which were introduced into evidence at hearing. These documents are not part of the record and thus cannot be the basis for findings of fact. See Administrative Procedure Act, 5 U.S.C. § 556(e); 10 C.F.R. §§ 2.754(c), 2.760(a); Public Service Electric and Gas Co. (Salem Nuclear Generating Station, Unit 1), ALAB-650, 14 NRC 43, 49 (1981); Pacific Gas & Electric Co. (Diablo Canyon Nuclear Plant, No. 3), ALAB-254, 8 AEC 1184, 1187-88 (1975); see also Virginia Electric & Power Co. ALAB-555, 10 NRC 23, 26 (1979).

Further, Intervenors cite a reference work to show that an arithmetic mean should be used to calculate permeability of the marl. [I.F. 23, 30, 31.] However, experts in testimony gave a contrary interpretation of the reference work. Papadopulos, Tr. 396, 587-93.

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explored on the record, and it was established that in layered systems the harmonic mean is used to determine effective permeability, while in heterogeneous systems the geometric mean is used. Papadopulos, Tr. 396, 587-92. When considering horizontal (rather than vertical) flow rate within a layer in a layered system the arithmetic mean is used. Id. Moreover, the permeability value applied to marl was not based on a calculation of the harmonic mean as a result of laboratory tests, but was based on the upper bound of in situ testing of the marl which confirmed a permeability value of 10^{-7} cm/sec or less and shows that the marl is effectively impermeable. Farrell, Tr. 586, 590, 593-94.

B.21. An actual field test measurement is much more reliable than one that is computed or calculated. Gonzales, Tr. 784. This is due to the fact that lab tests use small, disturbed samples. Gonzales, Tr. 769; Papadopulos, Tr. 451-53. The Staff testified that the Applicants' exploration program is adequate and acceptable, and its review concurs with Applicants' final conclusions that the marl is thick and has the ability to impede the flow of water. Gonzales, Tr. 769; Heller, Tr. 786.

B.22. Thus, the Board finds its concerns regarding the uncertainty in data on the marl thickness and permeability fully resolved.

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Thus the work cannot be used to support Intervenor's theories. See Federal Rules of Evidence, Rule 803(18) and the advisory committee note thereon, cautioning against considering statements in a treatise as evidence without sworn testimony of an expert explaining and applying the treatise.

c. Data on Marl Continuity

B.23. The continuity of the marl, that is, the lack of voids, open joints or fractures, has been demonstrated at VEGP by drilling, coring, standard penetration testing and undisturbed sampling. None of the borings encountered significantly fractured zones, nor was there evidence of leaching. Crosby, et al., ff. Tr. 253, at 15. Very few joints or fractures were observed and those identified were consistently found to be tight, and without void space. Id. The finding that the marl is consistently a tight, calcareous clay formation was determined from over 200 holes extending up to 18 miles south of the plant. Farrell, Tr. 663-664.

B.24. Further the August 1985 report referenced in Finding 8 supra, presented geologic drill logs for new holes recently drilled into the marl formation, and provides evidence that the marl is continuous and there are no detectable paths for water to leak into the lower aquifer beneath the marl. Heller, et al., Tr. 764, at 15. An additional report "Vogtle Energy Generating Plant-Groundwater Monitoring Program July-December, 1985" attached to a letter from J. Bailey to B.J. Youngblood, NRC, dated February 6, 1986, provides evidence that the marl formation is an effective and continuous aquiclude. Id.

B.25. The large and consistent hydraulic head differential between the water-table aquifer and the confined aquifers immediately below the marl confirms that the marl is a barrier to significant groundwater movement. Crosby et al., ff. Tr. 253, at 16. The hydraulic head or energy potential of groundwater in an aquifer is commonly expressed as

feet above sea level and is determined from measuring the elevation of water in an observation well. Id.

B.26. Observation wells constructed in 1971, including two open to the marl itself and one each open to the confined and water-table aquifers showed that in the vicinity of the VEGP, the hydraulic head in the water-table aquifer is 45 to 55 feet greater than the hydraulic head in the aquifer immediately below the marl. Id. These wells were monitored for four years until construction of the plant required their closure. Id., at 17.

B.27. In addition, two clusters of piezometers, installed in the marl in June and July of 1985, at opposite corners of the power block, provided a direct measurement of hydraulic head over the full depth of the marl. Id. at 18. Data from these piezometers provided quantitative information sufficient to conclude that the marl is continuous with respect to its ability to impede the movement of groundwater from the upper aquifer to the lower aquifer. Heller, et al., ff. Tr. 764, at 16.

B.28. The Board finds there is now sufficient data regarding the continuity of the marl to resolve our concerns in this regard.

d. The Direction of Groundwater Flow

B.29. Since the marl prevents significant vertical movement of contaminants through it, migration of contaminants from an accidental spill at VEGP would be predominantly lateral in the direction of the decreasing head in the water-table aquifer. Crosby, et al,. ff. Tr. 253, at 21. The Board was concerned regarding the direction of flow of any contaminants because three groundwater maps for the Vogtle area, dated November 1971, March 1980 and December 1984 showed differences in the

flow fields sufficient to suggest the possibility that flow fields in the water table aquifer under VEGP may shift and change. Memorandum and Order, November 12, 1985, at 23-24.

B.30. The November 1971 map shows groundwater conditions prior to construction of the plant, with the highest groundwater level south of the plant at 16[illegible] feet, and another high groundwater level at elevation 161 feet northeast of the plant. Heller, et al., ff. Tr. 764, at 17. Both of these elevations are higher than the groundwater level directly underneath the plant, which is at elevation 160 feet. Id. These two groundwater levels indicate that there is a ridge in the groundwater surface that extends from northeast of the plant to south of the plant. Id. If the plant were located such that it straddled this ridge, then a spill from the plant to the groundwater table could be considered to flow in more than one direction. However, since the plant is actually located northwest of this ridge, and since groundwater can only flow down-gradient, it is not possible for groundwater to move from an elevation of 160 feet beneath the plant to a higher elevation along the ridge which is located south of the plant. Id.

B.31. This map also shows that groundwater levels west of the plant are even higher at elevation 165 feet, so there could not be any flow in a westerly direction. Flow in a northerly direction is also impossible, because groundwater would have to move from an elevation of 160 feet beneath the plant to elevation 155 feet and then back up to an elevation of 160 feet. Id., at 18. Consequently, the only other direction in which groundwater can flow is in a northwesterly direction. Id.

E.32. The March 1980 map, however, does suggest that the flow fields around the the plant are directed back toward the plant, but this map represents the effects of a temporary construction-related activity. Id. Construction of the power block structures required an excavation that extended well below the groundwater table, and bottomed out at elevation 130 feet, or about 30 feet below the groundwater level. Id. In order to prevent sloughing of the excavation side slopes and to ensure dry firm working conditions, the construction area had to be dewatered and the 1980 map reflects the effects of this dewatering program. Id. This was terminated once construction was completed. Id.

E.33. Dewatering was a temporary condition and groundwater levels should rise to approximately the November 1971 levels when dewatering was terminated. The post-construction December 1984 map is, in fact, similar to the pre-construction November 1971 map and indicates a ridge extending from south of the plant to northeast of the plant. Id., at 19; Crosby et al., ff. Tr. 253, at 22. Because of this ridge, there can be no groundwater flow in a southerly direction. Id., at 23; Heller, et al., ff. Tr. 764, at 19; See also Farrell, Papadopulos Tr. 673-77, Gonzales, Tr. 774.

E.34. Groundwater levels north and west of the plant are also lower than at the plant, but the gradient in those directions is flatter than it is toward the northwest. Id. Since groundwater flow follows the path of least resistance, flow will be toward the northwest. Id. Groundwater moving northward from beneath the power block area will eventually reach Mathes Pond, and concentrations of any radionuclides from a spill at the plant would be further reduced by dilution as the contaminated

groundwater slowly discharged into Mathes Pond (which is completely onsite) and subsequently to the stream. Crosby, et al., ff Tr. 253, at 23; Crosby, Tr. 401; Papadopulos, Tr. 486.

B.35. The Mathes Pond drainage has cut down to the marl, as have other streams bordering the interfluvial ridge on which the plant is located, interrupting continuity between water-table aquifers. Crosby, et al., ff. Tr. 253, at 23. Groundwater in the water-table aquifers on both sides of the bordering pond and streams discharges into the pond and streams and not across them. Id. Because the water-table aquifer beneath the VLGP is hydraulically isolated, an accidental spill flowing in any direction could not impair domestic or other wells beyond the streams around the interfluvial ridge. Id.

B.36. The determination that the flow is northwest is based on 13 years of records from 1971 to 1984 and there is no indication the divide will not exist for the entire life of the plant. Gonzales, Tr. 774.

B.37. The Board finds our concerns regarding the direction of groundwater flow have been fully resolved.

e. Groundwater Travel Time

B.38. The rate of flow is determined by the hydraulic gradient across the marl, and by the permeability and porosity of the materials. The relationship between these parameters in determining groundwater seepage velocity is expressed as Darcy's Law, $V=Ki/n_e$, where V=seepage velocity (L/T), K=coefficient of hydraulic conductivity (permeability) (L/T), i=hydraulic gradient or the difference in the hydraulic head over the travel path expressed as a ratio, n_e=effective porosity (ratio).

Crosby, et al., ff. Tr. 253, at 18-19. The permeability at VEGP was established at 10^{-7} cm/sec. or less by in situ tests, actually measured water levels determined the gradient, and a large number of porosity measurements were taken. Papadopulos, Tr. 484.

B.39. Considering a flow path in the groundwater northward to Mathes Pond from the auxiliary building area, the flow would travel initially through the backfill material. The time required for groundwater to migrate through the backfill is determined by the permeability and porosity of the materials and the hydraulic gradient. Crosby, et al., ff. Tr. 253, at 25. Applying Darcy's Law to the parameter values for the backfill material, the groundwater velocity in the backfill is 36.6 ft/yr, with a flow path length of 550 feet, this yields a groundwater travel time in the backfill of about 15 years. Heller, et al., Tr. 764, at 26-27; Ser at 2-35.

B.40. The Board was concerned in this regard because the grade of the water table at VEGP undergoes marked changes, and becomes very steep as Mathes Pond and the Savannah River are approached. Memorandum and Order Ruling on Summary Disposition, at 28. The Board was also concerned that because the observed values of velocity at the Savannah River Plant (SRP) had maxima of 69 and 72 ft/year, while the calculated velocity using Darcy's Law was only 32 ft/year, the one dimensional Darcy model may underestimate ground-water velocity. The Board wanted to know whether a three dimensional model would prove superior to the one-dimensional Darcy model since the three dimensional model would be capable of calculating estimates which take into account flow velocity changes as the water table gradient changes. Id.

B.41. The Staff model considered only the flow through a relatively short distance in the plant backfill because radionuclide concentrations from an accidental tank spill would be reduced to less than 10 C.F.R. Part 20 limits for off-site releases within the backfill. Heller, et al., ff. Tr. 764, at 20-24. This backfill material consists of selected sandy material, graded and compacted to meet certain specifications. This makes the backfill essentially isotropic and homogeneous, such that the groundwater gradient within this material is essentially uniform having no abrupt changes. Id. Groundwater flows in such materials is predominately laminar, so its velocity can be adequately determined using Darcy's Law. Id

B.42. Processes that control migration of radioactive contaminants include convection, dispersion and absorption by subsurface materials. Papadopulos, Tr. 306. Tritium is the only possible contaminant with which we are concerned as it is not absorbed into subsurface materials, but would move at the same velocity as the groundwater and travel with it through the marl. Crosby, et al., ff. Tr. 253, at 26-27; Farrell, Tr. 306. However, the Tritium would be decayed to acceptably low concentrations before it actually passed through the on-site marl. Farrell, Tr. 306. 4/ This is due to the fact that groundwater velocity

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4/ Intervenors' proposed findings question whether the retardation factors influencing the movement of groundwater obviate the need to consider the migration of strontium. I.F. 33, 38, 42. The issue of the migration rate for strontium does not seem to be in the issues delineated for litigation by this Board. Further, Intervenors states that Applicants used a batch method to determine the retardation coefficients for SR-90 (I.F. 38), when actually the considerably more conservative values of Isherwood in NUREG/CR-0912 (January 1981), were used by Applicants in determining that only the migration of

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in the marl is calculated to be .31 ft/year and the time required to traverse 38 feet of the marl (under the auxiliary building where it is least thick) would be 123 years, which is sufficient time to reduce the concentration below the maximum permissible concentration levels in 10 C.F.R. Part 20. Farrell, Tr. 384.

B.43. The Staff analysis assumed a maximum seepage velocity by using the maximum value for permeability and minimum value for porosity, not an average of those factors to determine groundwater velocity. Gonzales, Tr. 782.

B.44. Although the velocity computed using Darcy's law (32 ft/year) differed from the 69 and 72 ft/year velocities for the SRP, this difference is due to the different methods used. The 32 ft/year is an average velocity, while the 69 and 72 ft/yr are point velocities. Heller, et al., ff. Tr. 764, at 22-23. Using the point dilution method, the maximum velocity at SRP is 69 ft/yr, with a minimum of 2.3 ft/yr. The average of the two is about 36 ft/yr which is approximately equal to the Darcy velocity. Id. Also, the SRP velocities were determined by tracer tests and not using Darcy's law. Papadopulos, Tr. 658; Lawless, Tr. 735. Tracer tests were not used by the Applicant. Papadopulos, Tr. 659; Lawless, Tr. 737. Under Darcy's Law, which is set out above, velocities

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tritium need be considered. Crosby, et al., ff. Tr. 253, at 28. Although Intervenor points in the proposed findings to reports in various publications to show that the coefficients for the retardation of strontium may be in error, no evidence was introduced to show this was so. Again findings cannot be premised on extra-record material which were not subject to test in hearing. See fn. 3 supra.

are inversely proportional to the length of the pathway so that a longer curvilinear pathway would have a smaller velocity than a shorter linear pathway. Therefore any error caused by the application of Darcy's Law to a linear in contrast to an actual curvilinear pathway would be conservative and lead to underestimating travel time. Cf. Papadolus, Tr. 650-651. 5/

B.45. Average groundwater velocities cannot be compared with point values. Heller, et al., ff. Tr. 764, at 23. For example, the groundwater contours near Mathes Pond are much steeper than they are closer to the plant and the gradient between two of the closely spaced contour lines near Mathes Pond is about 0.10, while the gradient over the entire distance from the edge of the plant backfill to Mathes Pond is about 0.006. Id., at 24. Thus, the velocity close to Mathes Pond, which can be considered a point velocity because of the short distance over which the gradient was calculated, is 17 times greater than the average velocity calculated over the entire distance from the plant backfill to Mathes Pond. Hence, the two velocities are not comparable. Id.

B.46. However, flow velocity changes would not be a factor at VEGP since only the groundwater gradient within the plant backfill needs to be considered as the radionuclide concentration from an accidental tank spill would be reduced to less than 10 C.F.R. Part 20 limits for off-site

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5/ Although Intervenors in their proposed findings maintain that differences in the head can effect velocity, they fail to explain how this could make travel time over a longer curvilinear path shorter than over a direct linear path.

releases within the backfill. Id. The water table gradient does not change within the backfill. Id.

B.47. Hence, the Board finds sufficient evidence in the record to determine that Applicants' estimate of travel time for radionuclide contaminants at the VEGP has been adequately established.

f. Settlement of the VEGP

B.48. Although not raised as an issue of material fact to be resolved at hearing, the Board permitted inquiry of a collateral issue regarding the impact settlement of the VEGP would have upon the 35 grouted wells under the power block and whether this could cause slippage with respect to the marl and consequently open a pathway for travel of contaminants. See Tr. 713; Lawless Testimony, ff. Tr. 720, at 6,

B.49. The 35 grouted core holes under the power block are distributed as follows: three are beneath the auxiliary building, eleven are beneath the unit 1 containment, three beneath the unit 2 containment, seven under the turbine building, and forty-two are in the backfill area generally. The Auxiliary building itself rests on top of the marl. West, Tr. 789-91.

B.50. Intervenors testified that the grouted wells are likely to be less compressible in a vertical direction than the more elastic marl and that plant settlement would punch these grouted wells downward at a rate that might be different from the marl. Lawless Attachment, ff. Tr. 720, at 8. Applicants testified that the marl is actually more rigid than the grout columns. Crosby, Tr. 792. We need not resolve this difference in opinion as slippage is doubtful because the large surface area around the

outside of the columns in contrast to the small surface area at the base of the hole creates more than a sufficient amount of frictional area to prevent any movement. Crosby, Tr. 792-93. Further, the underlying unnamed sands are dense and would resist punching of the grout columns into the lower sands Crosby, Tr. 793. Papadopulos, Tr. 805. In addition, the plastic property of the marl is such that it would tend to deform and close any opening that occured. Papadopulos, Tr. 804-05; Crosby, Tr. 798.

B.51. Net settlement throughout the whole backfilling and excavation process is about one inch. Crosby, Tr. 794. Net settlement is the difference between heave which occurred before placement of the backfill and gross settlement after placement of the backfill. In the case of the VEGP, the heave was about three inches and the weight of the plant and backfill added caused a total settlement of about four inches. Crosby, Tr. 815-16; Heller, Tr. 776-77.

B.52. No evidence was presented by Intervenors to contradict the testimony of the Applicants regarding settlement at the VEGP and the Board does not find any merit in the issue regarding the settlement of VEGP raised by Intervenors.

3. CONCLUSION

B.53. Based on the evidence of record, the Board finds that Applicants have adequately explored the geology and hydrology of the VEGP, and that the marl thickness, permeability and continuity has been established. The Board further finds that the direction of groundwater flow has been appropriately determined and that groundwater travel time has been computed correctly. Thus, the Board finds the concerns regarding contamination of the water table and protection of the

underlying aquifer for normal plant operation or a design basis accident are resolved. Contention 7 is without merit.

C. Environmental Qualification - Contentions 10.1 and 10.5

1. Background

C.54. The purpose of environmental qualification at a nuclear power plant is to demonstrate that equipment used to perform a necessary safety function is capable of maintaining functional operability under all service conditions postulated to occur during the installed life for the time the equipment is required to operate. The qualification program must demonstrate that the equipment in question is capable of the specific length of operating time required following an accident. Masciantonio, ff. Tr. 550, at 5-6.

C.55. Environmental qualification can best be achieved by subjecting a representative piece of equipment to a test program which simulates the expected environmental and service conditions the equipment will see during its installed life, followed by exposure to the expected design basis accident during which the equipment is required to operate. (Id. at 6-7).

C.56. An EQ program typically consists of the following sequence of tests:

- Baseline functional tests
- Accelerated aging to place the equipment in a physically aged state equivalent to the condition in which it would be at its end of life. Accelerated aging includes thermal aging, radiation exposure, operational cycling and other stresses such as

vibration, pressure, etc., which the equipment would likely encounter during its installed service life.

- Design Basis Accident test to demonstrate that the piece of equipment, at the end of its installed life, is capable of performing its required function for the period of time required during and after the most severe design basis event it will see.

Other methods such as operating experience and analysis in combination with partial testing can also be used to demonstrate qualification. These other methods are reviewed on a case by case basis. (Id. at 7).

C.57. This qualification process, endorsed by both industry and the NRC, is what provides the reasonable assurance that equipment of a specific type can perform as needed during its installed life. Id.

2. Contention 10.1 (Dose Rate Effects)

C.58. Contention 10.1 challenges the appropriateness of the rate of application of radiation during environmental qualification tests for four specific materials used at Vogtle; Ethylene Propylene Rubber (EPR), Cross-linked Polyolefin (XLPO), chlorosolfonated polyethylene (Hypalon), and chloroprene (Neoprene).

C.59. Applicants presented testimony by George Bockhold, Jr. and Harold J. Quasny (Bockhold and Quasny ff. Tr. 561) and Joel Kitchens, Mark L. Mayer, Patrick R. Nau, and Harold J. Quasny (Kitchens, et al., ff. Tr. 561). Staff presented testimony by Armando Masciantonio. (Masciantonio ff. Tr. 576). Intervenors did not present any testimony

nor did they cross examine any of the Applicants' or Staff witnesses. 6/ The Board, however, questioned these witnesses. (Tr. 562-573 and 577-580). We find those witnesses to be fully qualified to set forth the opinions found in the record and discussed below.

C.60. Testimony by Staff witness Masciantonio who was responsible for the technical reviews, analyses and evaluations of the adequacy of the environmental qualification of electric equipment important to safety and safety-related mechanical equipment whose failure under postulated environmental conditions could adversely affect the performance of safety systems in nuclear power plants, explained why and how materials are exposed to radiation during qualification tests. Masciantonio ff. tr. 576 at 3. Staff testimony was substantially in agreement in these regards with testimony filed by Applicants (Kitchens, et al., ff. Tr. 561), and is summarized below.

C.61. Because of the prohibitively long time it would take to expose equipment to real time radiation dose rates, 10 C.F.R. § 50.49 allows accelerated aging of equipment during an equipment qualification program. A higher dose rate may be applied during qualification tests than would be received by the equipment during its installed life. Radiation dose rates of approximately 1 megarad per hour are used during tests. Masciantonio at 3. Research tests have shown that most materials exhibit a "dose rate effect" to some degree. This means that the amount

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6/ Intervenor, although directed by the Board at Tr. 824, did not file any proposed findings of fact on Contention 10.1. Therefore, pursuant to 10 C.F.R. § 2.754(a)(3)(b), the Board could deem Intervenors to be in default concerning this contention.

of degradation experienced by the material depends not only on the total dose received but also on the rate at which the radiation is applied. Id. Industry qualification standards and the NRC recognize that aging effects which cannot be adequately accelerated must be accounted for. This includes any effects of dose rate differences between actual and test conditions. Id. at 4.

C.62. Based on the results of Sandia National Laboratories tests as reported in NUREG/CR-2157, "Occurrence and Implications of Radiation Dose-Rate Effects for Material Aging Studies", XLPO is the only specific material identified in Contention 10.1 which would exhibit any significant degree of "dose rate effect" at the expected total doses of Vogtle. Id.

C.63. The record shows that the only application of XLPO at Vogtle is in cable insulation. Id. at 5. When "dose rate effects" are known to exist, material aging data generated at high dose rates are treated cautiously by the Staff if a low dose rate application is intended. In order to account for dose rate effects, the staff requires applicants for an operating license to develop and implement surveillance/maintenance procedures which will detect age-related degradation and take corrective action before a safety problem develops. Id. 6-9. As noted in the NRC Staff's Response to Applicants' Motion for Summary Disposition of Contention 10.1 dated August 26, 1985, the Staff requires that this maintenance/surveillance program be developed and implemented to identify and prevent significant age-related degradation of electrical and

mechanical equipment. 7/ As further discussed below, Applicants have committed to follow the recommendations in Regulatory Guide 1.33, Rev. 2, "Quality Assurance Program Requirements (Operation)," which endorses the more detailed guidance contained in American Nuclear Society/American National Standards Institute Standard ANS-3.2/ANSI N18.7-1976, "Administrative Controls and Quality Assurance for the Operational Phase of Nuclear Power Plants." This standard defines the scope and content of a maintenance/surveillance program for safety-related equipment which is acceptable to the Staff. The program should assure that provisions for preventing or detecting age-related degradation in safety-grade equipment are specified and include (1) utilizing experience with similar equipment, (2) revising and updating the program as experience is gained with equipment during the life of the plant, (3) reviewing and evaluating malfunctioning equipment and obtaining adequate replacement components, and (4) establishing surveillance tests and inspections based on reliability analyses, frequency and type of service or age of the items, as appropriate. Id. at 5-6. Applicants have committed to implementing a maintenance/surveillance program prior to fuel loading at Unit 1. Bockhold and Quasny ff. Tr. 561 at 2-3. This program was described in detail in Applicants' testimony. Id. [The program is also set forth at length at §§ 101-108 of Applicants' Proposed Findings of Fact.] Staff witness Masciantonio indicated Staff's approval of Applicants' maintenance/surveillance program. Tr. 578-79.

7/ Cf. Applicants' proposed finding 99 which incorrectly stated that Reg. Guide 1.33, Rev. 2 requires the maintenance and surveillance program.

C.64. The Staff witness also testified that the Staff has assessed the Applicants' Quality Assurance (QA) program for the operations phase of Vogtle to determine if it complies with the requirements of 10 C.F.R. 50, Appendix B, "Quality Assurance Criteria for Nuclear Power Plants and Fuel Reprocessing Plants", including Regulatory Guide 1.33, Revision 2. Testimony of Masciantonio at 6.

C.65. We also note that in Section 17.4 of the Vogtle Safety Evaluation Report, NUREG-1137, the Staff concludes that the Applicants' description of the QA program, if properly implemented, is in compliance with applicable NRC regulations and is acceptable for the operations phase of VEGP. Id. The record shows that the Applicants have provided a program that incorporates the above guidelines. The Applicants have also provided a description of the specific program that will be used to detect unanticipated, age-related degradation of electrical cables inside containment. Bockhold and Quasny ff. Tr. 561. The Staff witness stated that the program is acceptable as described. Tr. 577, 579. The Staff will verify that the program is implemented at VEGP. Masciantonio at 7. Formal approval of the program will be given when the Safety Evaluation Report on the environmental qualification program is written prior to licensing. Tr. 579.

C.66. Based on the possible "dose rate effect" for XLPO as identified in NUREG/CR-2157 and the requirement, which has been met for Vogtle, to implement a surveillance/maintenance program to detect and correct any unanticipated degradation of electrical cables at Vogtle, the Board finds that there is adequate assurance that any increased deterioration of cable insulation due to the expected low radiation dose

rate will be discovered, if any exists, through the maintenance and surveillance described in the record of this proceeding and will not cause an unsafe condition to occur at Vogtle. Accordingly, based on the uncontroverted evidence presented by Applicants and staff, we find that Contention 10.1 is without merit.

3. Contention 10.5 (ASCO Solenoid Valves)

C.67. Contention 10.5 challenges the environmental qualification of the Automatic Switch Company (ASCO) solenoid valves used to perform safety functions at Vogtle. The contention is based on the results of tests performed by the Automatic Switch Company and Franklin Research Center (FRC) and on the subsequent issuance of NRC notifications.

C.68. Applicants presented testimony by George J. Baenteli, George Bockhold, Jr., Stephen J. Cereghino, William V. Cesarski, and Harold J. Quasny (Baenteli et al., ff. Tr. 517). Staff presented testimony by Armando Masciantonio (Masciantonio, ff. Tr. 550). Intervenor, GANE, presented testimony by Howard M. Deutsch (Deutsch, ff. Tr. 371). Intervenor had a limited amount of cross-examination of Applicants' witnesses but did not question Staff's witness. Applicants briefly questioned Intervenor's witness, as did Staff. Intervenor's witness stated that he did not disagree with the Staff's testimony. Tr. 374. The Board also questioned the witnesses presented by the parties.

C.69. Subsequent to conducting a voir dire examination of Intervenor's witness, Tr. 357-362, Applicant objected to the admissibility of Dr. Deutsch's proffered testimony on the basis that he did not qualify as an expert on the subject matter involved in Contention 10.5. Tr. 362-364. Staff supported this objection. Tr. 366. The Board after

carefully reviewing Applicants' objection generally concluded that Dr. Deutsch's scientific background is such that it would help us to understand the evidence presented by the other parties. Tr. 371. However, based on the fact that Intervenor conducted very limited cross-examination of Applicants' witnesses, and no examination of Staff's witness, and more significantly because Dr. Deutsch subsequently indicated total agreement with the Staff's testimony, Tr. 374, we have not relied on Dr. Deutsch's very limited prefiled direct testimony in reaching these findings. 8/ Nor have we relied on the less than half page of proposed findings on Contention 10.5 submitted by Dr. Deutsch on April 23, 1986. The less than half page of conclusory statements submitted does not in large part comply with the Commission's procedural requirements concerning proposed findings. See 10 C.F.R. §2.754(c). 9/ More importantly, the conclusions stated in the Intervenor's proposed

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8/ We also indicated at Tr. 371 that we would take into account the nature of Dr. Deutsch's training vis a vis Contention 10.5 in terms of the weight we would give to his testimony.

9/ 10 C.F.R. 2.754(c) provides in pertinent part that:

> Proposed findings of fact shall be clearly and concisely set forth in numbered paragraphs and shall be confined to the material issues of fact presented on the record, with exact citations to the transcript of record and exhibits in support of each proposed finding. Proposed conclusions of law shall be set forth in numbered paragraphs as to all material issues of law or discretion presented on the record.

Intervenor has set forth only one general citation to the transcript of record and has not otherwise complied with this provision.

findings have been fully addressed and properly disposed of in the findings submitted by Applicants and Staff.

C.70. We find, however, that the witnesses presented by Applicants and Staff on Contention 10.5 were fully qualified to set forth the opinions found in the record and discussed below.

C.71. Testimony by Staff witness Masciantonio who was responsible for the technical reviews, analyses and evaluations of the adequacy of the environmental qualification of electric equipment important to safety and safety-related mechanical equipment, whose failure under postulated environmental conditions could adversely affect the performance of safety systems in nuclear power plants, explained the results of the tests and Staff issuances which formed the basis of Intervenor's Contention 10.5. (Masciantonio, ff. Tr. 550).

C.72. The ASCO valves involved here direct the operation of air-operated process valves and dampers in safety-related fluid and HVAC systems by controlling air flow to the air operators on these valves or dampers. By either venting or providing air to the air operator on the process valve or damper, an ASCO solenoid valve enables that valve or damper to close or open. Baenteli et al, ff. Tr. 517, at 7-8. Table 10.5-1 of the Applicants' testimony lists each of the safety-related air-operated valves or dampers at Vogtle controlled by an ASCO solenoid valve and describes the function performed by that valve or damper. Id. at 9-10.

C.73. The safety function of each of the subject ASCO solenoid valves is to vent the operator of the air-operated valve or damper with which it is associated so as to allow that valve or damper to move to its

safety-related position. All of the ASCO solenoid valves employed in safety-related capacities at Vogtle are of the normally closed design. This means that when de-energized, which is its safety-related position, the solenoid valve blocks the supply of instrument air and vents the air operator on the process valve or damper. The process valves and dampers that are controlled by ASCO solenoid valves are arranged so that the process valve or damper will assume its safety-related position when the air operator is vented. Id. at 7-9.

C.74. In response to a question posed in a Board Order regarding whether any type of failure of any of the valve models considered will result in achieving an unsafe configuration, the staff witness did not have any information as to the Vogtle - specific configurations. However, the witness testified that, in general, these solenoid valves are designed to operate in a fail safe mode; that is, loss of power to the solenoid will result in its achieving a safe condition. Masciantonio at 10. These valves are generally found throughout the plant, both inside and outside containment. Further, if a valve is determined to be qualified it is recognized that it will not experience common mode failure. Id.

C.75. Applicants have stated that the only ASCO solenoid valves used in the Vogtle plant which fall within the scope of 10 C.F.R. § 50.49 are model numbers NP 8316, NP8320, NP8321, and 206-381-6RF. Baenteli et al, ff Tr. 517, at 5. The Staff reviewed the following qualification reports pertaining to ASCO solenoid valves:

(a) Isomedix Test Report No. AQS 21678/TR-Rev A, "Qualification Tests of Solenoid Valves", March 1978, Revision A, July 1979.

(b) ASCO Test Report No. AQR-67368/Revision 1, "Report on Qualification of ASCO Catalog NP-1 Solenoid Valves for Safety-Related Applications in Nuclear Power Generating Stations," March 2, 1982.

(c) Westinghouse Topical Report WCAP-8587, Revision 6 (NP), "Methodology for Qualifying Westinghouse WRD Supplied NSSS Safety Related Electrical Equipment," WCAP-8587 EQDP-HE2/HE5, WCAP-8687 EQTR-HO2A/HO5A, and WCAP-8687 Supp. 2-HO2A/HO5A Addendum 1 Revision O.

(d) NUREG/CR-3424, "Equipment Qualification Research Test Program and Failure Analysis of Class 1E Solenoid Valves" prepared by Franklin Research Center, November 1983. (Id. at 10-11).

The qualification tests reported in (a) above were conducted by Isomedix, Inc. for ASCO and established the qualification of ASCO valves to current 1978 standards. Tests (b) and (c) above were conducted by ASCO/Westinghouse to qualify ASCO valves to a higher level. Tests (d) were performed by Franklin Research Center under contract to the NRC for the purpose of qualification methodology research. (Id. at 11). 10/

C.76. The Intervenor presented prefiled written testimony which basically pointed out some of the anomalies which occurred during the three series of tests on ASCO solenoid valves. Deutsch ff. Tr. 371. However, no explanation as to the significance of these anomalies is

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10/ A comparison of pertinent test parameters is shown on Attachment 2 to the Staff's prefiled testimony, ff. Tr. 550.

offered by the Intervenor's witness. Applicants and Staff agree that anomalies were reported in the tests of ASCO valves. However, in all cases these anomalies were properly resolved and do not call into question the validity of the qualification of ASCO valves. Masciantonio at 12-14, and 15-16 . As evidenced in the test reports reviewed by the Staff, we find that the qualification programs were properly conducted in accordance with accepted standards. Test results show that all anomalies were appropriately addressed and valve performance was demonstrated in agreement with Staff's position. 11/

C.77. With respect to the four ASCO solenoid valves at issue by virtue of Contention 10.5, the Board finds that ASCO valve model NP 8316 is considered qualified to the levels reported in Isomedix Test Report Number AQS 21678/TR, Revision A. The valve model was capable of performing its required safety function during and following a design basis event (DBE) simulation with a peak temperature of 346°F. The valve had been preaged to the equivalent of 4 years at 140°F and had received a radiation exposure of 200 megarads. Id. at 13.

C.78. The higher level of qualification claimed in ASCO Report No. AQR-67368 was not accepted by the Staff because of the failure of a naturally aged NP 8316 valve during the NRC-sponsored tests at Franklin

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11/ The Staff position on the qualification status of ASCO solenoid valves was made known in IE Information Notice 84-23, "Results of NRC-Sponsored Qualification Methodology Research Test on ASCO Solenoid Valves" and Information Notice 85-08, "Industry Experience on Certain Materials Used in Safety-Related Equipment." A copy of IN 84-23 is attached to the Staff's testimony as Attachment 1, ff. Tr. 550.

Research Center. 12/ The test conditions during the FRC test of this valve were similar to the conditions during the ASCO tests reported in Report AQR-67368. Id.

C.79. Based on the review of the FRC test results during which a naturally aged NP 8316 valve failed after 2.75 hours, the Staff was able to conclude that there are circumstances in which valve model NP 8316 might be considered acceptable for use in environmental conditions as severe as those listed in ASCO report AQR-67368/Rev. 1. Id. at 13-14. These include situations in which the valve is only required to operate early into an accident, as in the case of isolation valve applications, and in which subsequent failure does not degrade other safety functions nor mislead the operator. Id. 15. Under these circumstances, report AQR-67368/Rev. 1 is an acceptable qualification document for valve model

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12/ Applicants continue to urge at ¶ 147 of their proposed findings that they believe that the failure of the naturally aged model NP 8316 valve in the Franklin tests does not call into question the validity of the Westinghouse/ASCO test results. However, in light of the NRC Staff's evaluation of the Franklin test results, Westinghouse has modified the generic composite LOCA/MSLB temperature and pressure profile to which it considers the model NP 8316 valve to be qualified by reducing the peak temperature during each transient to 400°F. A thermal lag analysis performed by Westinghouse for the model NP 8316 valve, which analysis determines the temperature reached by the valve itself, has shown that upon exposure to the conditions shown in the modified Westinghouse LOCA/MSLB profile, the valve itself would reach a maximum temperature of 345°F. That temperature is below the maximum temperature of 346°F that was reached by the model NP 8316 valve in the qualification testing program performed by Isomedix. Baenteli et al., ff. Tr. 517, at 48-49. Applicants acknowledge that the NRC staff has reviewed the thermal lag analysis and concluded that the approach used to generate the derated Westinghouse generic LOCA/MSLB profile is reasonable and is acceptable as a means of establishing an environmental qualification level for the model NP 8316 valve. Masciantonio on 10.5, ff. Tr. 550, at 14-15.

NP 8316. Id. Similarly, if the valve is required for long term operation, an analysis in accordance with NUREG-0588 can be used to show that even though the ambient temperature may be greater than 346°F for a short period of time, the temperature of the valve will not exceed 346°F. Id. at 14. This temperature corresponds to the valve qualification level determined by the Isomedix tests. If this can be shown, the valve can be considered qualified by Isomedix AQS 21678/TR-Rev. A for long term operation. Id.

C.80. Westinghouse has provided a method of addressing the long term environmental qualification of ASCO valve model NP 8316 in topical report WCAP-8687, Supplement 2 - HO2A/HO5A, Addendum 1, Revision O, dated January 1985. This report documents the analyses which demonstrate qualification to a derated Westinghouse generic LOCA/MSLB temperature profile which has a maximum peak temperature of 400°F for approximately three minutes. Id. at 14.

C.81. The derated Westinghouse generic profile is based on a heat transfer model developed by using the actual thermocouple data and test environmental parameters from the Franklin Research Center test. The model predicts the temperature response of an ASCO solenoid valve exposed to a LOCA/MSLB. Id.

C.82. Westinghouse concludes that the maximum temperature of ASCO NP 8316 solenoid valves installed in plants whose accident environments are enveloped by the derated Westinghouse LOCA/MSLB profile will be less than 345°F and therefore qualified by Isomedix Report No. AQS 21678/TR-Revision A. Id. at 15.

C.83. The Staff reviewed the information provided in WCAP-8687, Supplement 2 - HO2A/HO5A, Addendum 2, Revision O, dated January 1985 and found that the approach used to generate the derated Westinghouse generic LOCA/MSLB profile is reasonable and acceptable as a means of establishing an environmental qualification level for ASCO valve model NP 8316. Id. at 15. We agree. The derated Westinghouse generic LOCA/MSLB temperature profile envelops the Staff's accepted accident profile for the Vogtle power plant. Id.

C.84. ASCO valve model NP 8321 is considered qualified to the levels reported in Isomedix Test Report Number AQS 21678/TR-Rev. A. This test included a preaging equivalent to 4 years at 140°F, peak accident temperature of 346°F and radiation exposure of 200 megarads. The reported anomalies were adequately resolved. Based on these test results the Staff considers this valve model qualified to the levels reported in Isomedix AQS 21678/TR-Rev. A. Id. at 15-16. We agree. Based on information submitted by the applicant, these qualification levels exceed the stated service and accident requirements for this valve model at the Vogtle plant. Id. at 16.

C.85. ASCO valve models NP 8320 and 206-381-6F are considered qualified to the levels reported in ASCO Report No. AQR-67368. Id. at 16. This test included preaging to the equivalent of 8 years at 140°F, a peak accident temperature of 420°F and radiation exposure of 200 megarads. All test anomalies were adequately resolved. Based on the test results, the Staff considers these valve models to be qualified to the levels reported in AQR-67368. Id. We agree. The Staff accepted qualification levels exceed the stated requirements for the Vogtle power

plant. Id. 19. With respect to FRC tests, because of the unrealistic and severe cycling of the valves during the high thermal aging temperatures, the tests results of the valves which were artificially preconditioned cannot be considered conclusive and the previously demonstrated qualification levels are still considered valid. Id. at 17.

C.86. The two naturally aged valves (Models NP 8316 and NP 8344) were not subjected to the severe preconditioning received by the other valves. Therefore, the failure of these two valves must be considered as valid failures. Since the FRC tests were patterned after the same standards and environmental conditions as in the ASCO AQR-67368 tests, the Staff negated the previous acceptance of valve model NP 8316 to the qualification levels claimed in the AQR-67368 report and relied on the Isomedix tests for the qualification levels of valve model NP 8316. Id.

C.87. In addition, the results of the Franklin tests and subsequent NRC notifications (upon which contention 10.5 is based) only concern the qualification status of ASCO valve model NP 8316 and do not in any way question or cast doubt upon the previous qualification status of any other ASCO valve model. Masciantonio at 3-4 and 17.

C.88. As detailed above, adequate documentation is available which establishes environmental qualification of each of the ASCO solenoid valves used at the Vogtle power plant. The qualification levels established envelop the specific Vogtle requirements for each valve model. The Staff will conduct a site audit prior to licensing to verify that a record of qualification in accordance with 10 C.F.R. § 50.49(j) exists and is maintained for the Vogtle plant. Id.

C.89. Based on the record adduced, as summarized above, the Board finds that Contention 10.5 is without merit.

II. CONCLUSIONS OF LAW

C.90. Pursuant to 10 C.F.R. §2.760a, and based on the entire record, the Board makes the following conclusions of law:

C.91. With respect to matters placed in controversy concerning groundwater (Contention 7), the activities authorized by an operating license can be conducted without endangering the public health and safety.

C.92. With respect to matters placed in controversy concerning the environmental qualification (EQ) program at Vogtle (Contention 10.1 - Dose Rate Effects and Contention 10.5 - ASCO Solenoid Valves), Applicants' EQ program complies with 10 C.F.R. § 50.49.

C.93. This Board does not find it necessary to raise any safety issues pursuant to 10 C.F.R. § 2.760(a) of the Commission's regulations.

C.94. Pursuant to 10 C.F.R. §§ 2.760(a) and 50.57, the Director of Nuclear Reactor Regulation is hereby authorized to make the appropriate findings on all matters not in controversy in this proceeding.

III. ORDER

C.95. WHEREFORE, IT IS ORDERED, in accordance with 10 C.F.R. §§ 2.760, 2.762, 2.785, and 2.786, that this Initial Decision shall become effective and shall constitute, with respect to matters covered herein, the final action of the Commission, thirty (30) days after the date of issuance hereof, subject to any review pursuant to the above cited rules. A

Notice of Appeal as to this Initial Decision may be filed with the Atomic Safety and Licensing Appeal Board by any party within ten (10) days after service of this Initial Decision. Within thirty (30) days thereafter (forty (40) days in the case of the Staff) any party noting such an appeal shall file a brief in support thereof. Within thirty (30) days of the filing and service of the brief of the appellant (forty (40) days in the case of the Staff), any other party may file a brief in support of, or in opposition to, the exceptions.

IT IS ORDERED.

FOR THE ATOMIC SAFETY AND
LICENSING BOARD

_____
Morton B. Margulies, Chairman
Administrative Law Judge

_____
Gustave A. Linenberger, Jr.
Administrative Judge

_____
Dr. Oscar H. Paris
Administrative Judge

Dated at Bethesda, Maryland
This ____ day of _____ 1986

Respectfully submitted,

Bernard M Bordenick

Bernard M. Bordenick
Counsel for NRC Staff

Dated at Bethesda, Maryland
this 5th day of May, 1986

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

In the Matter of	)	
	)	
GEORGIA POWER COMPANY,	)	Docket Nos. 50-424
et al.	)	50-425
	)	(OL)
(Vogtle Electric Generating Plant,	)	
Units 1 and 2)	)	

CERTIFICATE OF SERVICE

I hereby certify that copies of "NRC STAFF'S PROPOSED FINDINGS OF FACT AND CONCLUSIONS OF LAW" in the above-captioned proceeding have been served on the following by deposit in the United States mail, first class or, as indicated by an asterisk, through deposit in the Nuclear Regulatory Commission's internal mail system, this 5th day of May, 1986.

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