RELATED CORRESPONDENCE

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

In the Matter of	)	
	)	Docket Nos. 50-338 SP
VIRGINIA ELECTRIC AND POWER COMPANY	)	50-339 SP
	)	
(North Anna Power Station, Units 1 and 2)	)	(Proposed Amendment to Operating License NPF-4)

RESPONSE TO VEPCO'S INTERROGATORIES

Pursuant to 10 CFR 2.740(b), Citizens Energy Forum (CEF) hereby responds to"Vepco's Interrogatories to CEF," dated May 17, 1979.

1. Thermal Effects

a. In its "Thermal Effects" contention, CEF points out that all possible environmental impacts "have not been adequately addressed by the NRC Staff and the Applicant." CEF would like to see a more complete elucidation of the issue than simply statements such as, "This would not have noticeable incremental effects on aquatic biota or the environment," as found--without any references to studies or other confirmatory support--in the NRC Environmental Impact Appraisal of April 2, 1979. Especially in the case of discharge directly to the WHTF, CEF believes that the following general effects are worthy of consideration upon addition of any large amount of waste heat discharge, even if the addition is a small proportion of total waste heat discharge:

(1) Weakening of the aquatic biota, through increased vulnerability to the effects of toxic wastes and/or parasites, in the entire lake system because of the additional heat load.

(2)Damage to aquatic organisms due to internal disturbances as a result of increased temperatures in the surrounding water.

(3) Interference with the normal development and growth of aquatic animal species as a result of increased temperatures.

(4)Oxygen depletion in the lake as a result of higher water temperatures.

We do not propose that these conditions will affect any particular species, but rather believe them to be plausible for affecting the entire lake population. Additionally, we do not believe that the fact that the added heat is a small portion of total heat discharge necessarily indicates no change in thermal effects on aquatic biota.

b. CEF does not believe that the effects of the added 6 MBTU/hr., as removed through the evaporation of an additional 12 gpm of water from the service water reservoir, will have credibly noticeable effects offsite. However, we do believe that fogging and icing will be increased in the area of the WHTF (cooling lagoons) through increased evaporation due to the increased heat in the event that the service water system is discharged to the WHTF. These phenomena are already being seen by residents living area of the cooling lagoons (see testimony of Mrs. Phyllis Vaughan, pages 37-42, Transcript of special prehearing conference in this proceeding held Sept. 8, 1978). Increased heat to be removed by these lagoons will of necessity increase the amount of water in the atmosphere surrounding them.

c. Although it is impossible to hypothesize each and every possible circumstance that would result in an accident such as a leak in the spent fuel pool, CEF believes that the following scenarios represent very possible events that would cause a leak in the spent fuel pool:

(1) A dropped spent fuel cask on the new rack configurations at near-full capacity, as has not been contemplated by the Design Basis Accident. Such a drop would subject the spent fuel pool to an unprecedented sudden weight load which would cause the racks to pull away from the pool attachments and crack the pool liner at the floor and/or walls. CEF contends that the chance of this accident occuring is increased by the two embedments which we assume were added after the original construction of the spent fuel pool had been completed.

(2) An earthquake exceeding the force which the spent fuel pool has been designed to withstand.

(3) An action of sabotage, such as the use of dynamite or other explosives, or the introduction of chemical compounds into the spent fuel pool itself, which would cause the spent fuel pool to crack open.

(4) A loss of coolant in the reactor core itself, or other serious accident which would require the reactor building to be evacuated for extensive periods of time. Without personnel in the immediate area during this period of time, the cooling water to the spent fuel pool could be disrupted and the means to correct the situation would be unavailable since personnel would not be around even to observe the malfunction. As a result, the pool could overheat substantially--perhaps causing Zircaloy

oxidation and a corresponding release of hydrogen--causing an explosion that would crack the pool, breach the reactor building itself and release high amounts of radioactivity into the environment.

d. CEF has not specified an "unacceptable" rate of temperature rise. CEF's orginal stipulated contention entitled "Leakage" states: "Intervenor contends that Vepco fails...to identify the effects of an accidental leakage of spent fuel pool water due to a crack in the pool liner. Specifically, the rate of temperature rise in the pool... [is] not enumerated." (Stipulation of Contentions, dated March 29, 1979, from attachment A). CEF does not postulate a defined unacceptable rate, but rather question the actual rate of temperature rise in the event of leakage at various rates from the pool. We believe the rate of temperature rise to be an important issue, as the cooling system is designed to remove heat from a water-filled pool to specific levels, at a specific rate. Lowered water levels which render the cooling system ineffective could, logically, result in increased temperatures in the pool; a fast rate of temperature rise could then logically precipitate events such as exothermic oxidation of the fuel assembly zirconium cladding (Sandia Labs, "Spent Fuel Heatup Following Loss of Water during Storage,"SAND-77-1371). CEF believes that the rate of temperature rise will directly affect the ability of Vepco to detect and/or correct a leakage situation in time to prevent such an event.

e. CEF needs to know the following information to adequately assess the consequences of the additional heat:

(1) A more extensive analysis of the flow of water in the pool.

Section 6.6 of the Summary of Proposed Modifications says that "analyses have been performed" but gives no details. We want to know:

i. Areas of higher and lower temperatures throughout the spent fuel pool at reloading and when assemblies reach stable temperatures.

ii. Amount of water kept in the spent fuel pool, both in level and volume.

iii. Rate and force of cooling water flowing into the spent fuel pool.

iv. Composition of the cooling water.

v. Temperature of cooling water upon entrance to the pool, in the pool and at exit.

(2) i. Amount of heat generated per fuel assembly at time of initial storage in the pool

ii. Total heat generated at the time of refueling.

iii. Length of time needed for spent fuel assemblies, after immersion in the spent fuel pool, to reach a relatively stable temperature (that is, for temperature to cease declining) and at what temperature stability is reached.

(3) Distance of modified racks from pool floor and walls.

(4) Details of spent fuel cooling system, particularly :

i. Its relation to the component cooling system.

ii. Its relation to the service water cooling system.

iii. Its relation to the pumphouse.

(5) Effect of the spent fuel pool building ventilation system on the cooling of the pool under normal conditions and in emergencies.

(6) Detailed explanation of the makeup cooling water systems listed on page 54 of the Summary of Proposed Modifications, including a description of their relationship to each other and their uses during normal situations.

f. CEF believes that hot spots and boiling would occur as a result of the proposed modification simply because there will be more heat to deal with and no corresponding modifications to the spent fuel pool cooling system. In addition, since the assemblies would be more tightly cramped together, there would be greater resistance to the flow of water circulating throughout the pool. CEF does believe that the Summary is deficient in Section 6.6 because it does not tell how much the racks are elevated from the pool floor or their distance from the pool walls. Further, Section 6.6 states at one point that the hot spot temperature is lower with 17 x 17 racks than that with the 15 x 15 racks, but then in fact offers a hot spot temperature of 198° for the 17 x 17 racks and a hot spot temperature of 197° for the 15 x 15 racks. As mentioned earlier, CEF would like to know the distance of the racks from the pool floor and the walls, the points of highest and lowest temperature throughout the pool at the time of initial loading and when the assemblies reach a stable temperature, the rate and force of cooling water entering the pool, the chemical composition of the cooling water, the amount of water maintained in the pool under normal circumstances, and other information mentioned in response to le and requested in CEF's Interrogatories to Vepco.

2. Radioactive Emissions

a. The loss of spent fuel pool cooling capability in Sec. 9.1 of Vepco's Summary of Proposed Modifications: Vepco has failed to provide any discussion of the makeup water sources that are"readily available" in the event of a loss of cooling capacity and their relationship to each other. CEF is particulary concerned about how these makeup systems would be put into operation (beyond Vepco's assertion that they "could be utilized by either changing valve lineups or implementing certain temporary measures such as the use of temporary pumps or hoses." If these are put into operation manually, can they be put to use if there is a large amount of radioactivity present in the spent fuel pool area? Further, how would they be put to use if the reactor site had to be evacuated? What are the "temporary pumps or hoses"? Are they in fact "readily available"? Are they inspected regularly to ensure that they will be able to function at the crucial time if needed? Are they used for other constant or intermittent functions during normal operations? If so, what are they used for? If they are diverted to the spent fuel pool, how will their regular functions be affected and carried out?

Fuel pool leakage Control and Shielding in Sec. 9.2 of Vepco's Summary: Vepco addresses only accidents involving the inlet and outtake pipes to the pool. No consideration is given to leaks which occur lower than the 285'9" level of pipe entry, due to cracks in the liner or other causes, and the effects of the resulting lowered water level on the increased amount of fuel in the pool. We are especially concerned, in this case, with gaseous radioactive emissions from the pool due to such leaks.

Earthquake and Tornado Protection in Sec. 9.3 of Vepco's Summary: Vepco says only that the "..racks and pool structures have been analyzed to ensure that the racks can be accommodated during a seismic event." Who conducted the analyses? Were defective racks considered a possibility in the analyses? If so, in what way? If not, why? What does Vepco mean by "accommodate"?

Fuel Handling Accidents in Sec. 9.4 of Summary: No consideration has been given to the dropping of an assembly perpendicular to the top of the spent fuel storage rack in the modified pool, putting that assembly into close proximity with more than one stored assembly. Also, if an assembly were to be stuck between racks, or between a rack and the wall of the pool, the radiological emissions caused by attempts to remove that assembly are not considered by Vepco.

Design Basis Accident: Vepco assumes that only the dropped fuel assembly will be damaged. CEF believes that an adequate Design Basis Accident needs to be analyzed in which the dropped assembly hits others stored in the racks (rather than the spent fuel pool floor alone) and in which an assembly becomes wedged between rack spacings at full spent fuel pool capacity.

b. See answer to 2a, above.

c. CEF believes the following information is needed to adequately discuss liquid and gaseous emissions:

(1) Levels of radiation present in the spent fuel pool at capacity--and all radioactive elements involved.

(2) An analysis of how much all radioactive nuclides increase with each refueling (i.e., loading into the spent fuel pool.

(3) A description of all filtering systems for the spent fuel pool and their percentage of efficiency for each radioactive element present in the pool.

(4) A list of all points of discharge of liquid and gaseous emissions after and during purification of the pool water, and replacement of the filters and demineralizer resins.

d. CEF makes no judgment as to the possible levels of radiation releases in the event of such accidents. Our principal concern in stating the contention is not in maintaining releases at "allowable" levels under NRC regulations, but rather in ensuring that possible releases are kept to as low a level as possible, both in frequency and dosage.

e. Since Vepco failed to address the issue of emissions other than those related directly to occupational exposure, CEF has no way of knowing what radioactive materials will be released--Vepco notes in Sec. 5.5.3 of its Summary only the "principle" (sic) isotopes--much less what harm will be done. After CEF receives Vepco's response to CEF's interrogatories, we will be prepared to respond to this question.

f. (1) Through the bottom of the spent fuel pool in the event of a leak. (2) Through the component water cooling system. (3) Through used purification filters. (4) Through the changing of demineralizer resins.

g. CEF contends that the Applicant has not shown that the increased gaseous and liquid radioactive emissions resulting from the proposed modification will not exceed the limitations imposed by 10 CFR

§§ 105, 106 (see also 20 CFR pt. 20 Appendix B), nor that such emissions will not result in significant environmental effects. The nuclides to which this contention refers include Cesium 134 and 137, (Cobalt) 58 and 60, Iodine 131, and Krypton 85. Although the Applicant has neither admitted nor denied that the proposed modification will increase the concentrations of these elements in the spent fuel pool water, such an increase is inevitable. Leaks and inefficiencies in purification systems will permit these increased levels to be discharged to the environment in increasing amounts.

h. "Water is found in the residual weathered soils, and this supply appears to be interconnected with other sources in fractures of the bedrock...all the groundwater moves slowly toward lower levels, where it eventually discharges as springs or seeps directly into the streams (The rate of movement of water through the soil and fractured rock is estimated by the Applicant to be only about 0.015 feet/day.)" (Final Environmental Statement Related to the Continuation of Construction and the Operation of Units 1 and 2 and the Construction of Units 3 and 4, North Anna Power Station, By the Atomic Energy Commission, April 1973, pages 2-15) If there were a crack in the pool liner, contaminated water could seep out through the layer of overburden between the reactor spent fuel pool and the bedrock. The radioactive nuclides present in the spent fuel pool water would be transmitted to the soil and groundwater, working their way up through the food chain, as well as to the atmosphere. Since Vepco has not yet identified all the radioactive materials that would be involved, CEF cannot yet fully respond to this question.

i. CEF is concerned not only with water leaking into the channels behind the welds (which will then activate the fuel building floor drain sumps and be transferred to the liquid radwaste system), but with leaks at non-welded areas in the spent fuel pool as well. Our concern in the first case is with the possible overloading of the floor drain sumps, and in the second case with a possible total bypassing of the sumps. (See also response to 2h above.)

3. Corrosion

a. CEF believes that the additional storage capacity will worsen corrosion because: (1) Page 56 of Vepco's Summary states, "storing additional spent fuel in the pool will increase the amount of corrosion and fission product nuclides introduced into the pool water."

(2) The Draft Environmental Impact Statement (NUREG 0404) states in Vol. 2, page H-23 that "Corrosion effects that might occur after longer storage periods need to be examined in much greater detail so that effects such as accelerated corrosion, microstructural changes, or alterations in mechanical properties can be determined." One effect of the proposed modification, if granted, would be to allow for longer-term storage of spent fuel at North Anna without having to secure an AFR storage facility to allow for the continued operation of the North Anna units. CEF is greatly concerned that these unknown effects of long-term storage may prove to include deleterious effects.

(3) When full, the proposed racks would hold far more assemblies than the current racks. There would logically be, then, a larger amount of material subject to corrosion, and therefore a larger amount of corrosion.

b. CEF does not directly contend that the fuel pool purification system will be inadequate to handle the added impurities from the storage of spent fuel in the spent fuel pool, but rather that "there has been an inadequate examination of the problems that may arise due to a potential incremental increase in the amount of corrosion," including "the ability of the spent fuel pool purification system to remove any potential incremental impurities." We believe this examination to have been inadequate because Vepco's analysis is "based on the experience of Surry Power Station." While extrapolation of conditions is a reasonable course, Surry has nowhere near the number of spent fuel assemblies contemplated for North Anna. We are extremely concerned that such a crucial analysis (at North Anna) is based only on partial data from the Surry Power Plant, and we believe that a more thorough examination of the effects of the additional assemblies on the purification is necessary.

c. With more spent fuel assemblies in the pool, corrosion will increase, particularly with those that have remained in the pool the longest time. As a result, their eventual removal from the pool could be more difficult. At the Monticello nuclear facility, for instance, corrosion in the spent fuel pool has caused the racks to swell so that the assemblies cannot be removed as anticipated.

d. Problems that CEF believes may arise due to the incrementally increased corrosion on the spent fuel assemblies and racks include: (1) A decreased lifetime for the stainless steel racks (and decreased integrity of these racks) over their lifetime. (2) Restriction of cooling water flow, due to a build-up of corrosion

from the assemblies and racks, and on other pool structures (including the walls of the pool), resulting in possible "hot spots" in the pool. (3) An increase in worker exposure to radioactive nuclides due to emissions released in handling more defective assemblies at the time of eventual removal of the assemblies from the pool. These postulated problems are unverifiable in the absence of adequate studies on an already-existing fuel pool, such as the one at the Surry Power Station. The intent of the contention is not to propose problems on which CEF has collected data, but rather to state that increased corrosion is likely to cause problems over the duration of the storage of spent fuel assemblies and to point out that further evaluation of the effects of corrosion is not only warranted, but imperative.

4. (1)"Summary of Proposed Modifications to the Spent Fuel Pool Storage Associated With Increasing Storage Capacity for North Anna Power Station Units 1 and 2," Vepco, April 1978.

(2) "Safety Evaluation by the Office of Nuclear Reactor Regulation Relating to Modification of the Spent Fuel Storage Racks Facility. Operating License No. NPF-4, Virginia Electric and Power Company, North Anna Power Station, Units 1 and 2, Docket Nos. 50-338 and 50-339," January 29, 1979.

(3) "Environmental Impact Appraisal by the Office of Nuclear Reactor Regulation Relative to a Proposed Increase in Storage Capacity of the Spent Fuel Pool, North Anna Power Station, Units 1 and 2, Virginia Electric and Power Company, Docket Nos. 50-338 and 50-339 Facility Operating License No. NPF-4," April 2, 1979.

(4) "Spent Fuel Heat-Up Following Loss of Water During Storage," by Allan S. Benjamin, et.al, Sandia Labs, Albuquerque, N.M. (SAND-

77-1371); Draft printed Sept. 1978.

(5)"Nuclear Energy's Dilemma: Disposing of Hazardous Radioactive Wastes Safely," Government Accounting Office Report #EMD-77-41, Sept. 9, 1977.

(6) Letter from Professor Earl A. Gulbransen, Department of Metturgical and Materials Engineering, University of Pittsburgh; in the Bulletin of Atomic Scientists, June 1975, Page 5.

(7)"Draft Generic Environmental Impact Statement on Handling and Storage of Spent Light Water Power Reactor Fuel," NUREG 0404, Vols. 1 and 2 Executive Summary, March 1978.

(8) Letter to T.A. Ippolito of the NRC from R.J. Clark, project manager, Monticello Nuclear Power Plant, dated Sept. 11, 1978.

(9)"Ad Hoc Subcommittee on Spent Fuel Pool Design Storage (PCR 2702), Advisory Committee on Reactor Safeguards Report, dated Feb. 23, 1979.

(10) "Final Environmental Statement Related to the Continuation of Construction and the Operation of Units 1 and 2 and the Construction of Units 3 and 4, North Anna Power Station," Atomic Energy Commission, April 1973.

5. Not applicable.

6. 1. a. Irwin Kroot; b. Irwin Kroot; c. Debbie Bouton; d. Irwin Kroot; e. Debbie Bouton; f. Irwin Kroot, Debbie Bouton.
   2. a. Irwin Kroot, Debbie Bouton; b. Debbie Bouton; c. Debbie Bouton; d. Irwin Kroot; e. Debbie Bouton; f. Debbie Bouton; g. Jim Dougherty; h. Irwin Kroot, Debbie Bouton; i. Irwin Kroot.
   3. a. Irwin Kroot, Debbie Bouton; b. Irwin Kroot; c. Debbie Bouton; d. Irwin Kroot, Debbie Bouton;
   4. Irwin Kroot, Debbie Bouton, Renee Parsons, Tim Engebretsen
   7. Tim Engebretson

7. With the exception of the following, CEF expects the information it needs for its contentions will be supplied through response to

its interrogatories already served to Vepco and the NRC.

1. Is the 140° fuel pool temperature (page 11, Summary) a mean or median value?

2. Where are fuel pool temperatures taken? Are they taken on a regular basis?

3. What is the heat decay curve for the following volume of spent fuel assemblies loaded into the proposed high-density racks?
   (a) One refueling or one-third core discharge
   (b) One assembly
   (c) Full-core discharge

4. Under abnormal conditions, it is stated that the pool water will be maintained at or below 170° F. What percent increase in the prevalence of hot spots, beyond that for the normal operating conditions of 140°F, would result at 170°F?

5. Provide an efficiency curve for the purification system. How will this change for various pool temperatures?

6. Provide an analysis of the cooling efficiency of the shell and tube heat exchangers in terms of percent of heat removed for various "normal" and "abnormal" pool temperatures (i.e., at 96°F, 140°F, 170°F, 200°F, 212°F, 241°F, and 250°F).

7. In the event of a loss of water to the spent fuel pool, to what extent would radioactive emissions be released to the air--and what nuclides would be involved?

8. Clarify the contradictory information concerning the presence or absence of boron in the cooling water. Sec. 7.4 of the Summary implies the presence of boron in the pool(as does #109 in Vepco's Statement of Material Facts As to Which There is No Genuine Issue to Be Heard), while verbal reports we have received from Vepco indicate that the water is "pure" and without boron.

8. See response to No. 4, above.

9. CEF has already served a copy of its response to the NRC Staff Interrogatories to Vepco.

CITIZENS ENERGY FORUM

by: Irwin B. Kroot, Jr.
Irwin B. Kroot

Dated: June 11, 1979

CERTIFICATE OF SERVICE

I hereby certify that I have served the foregoing "Response to Vepco's Interrogatories" to the following parties by deposit in the U.S. Mail, first class, this 11th day of June, 1979:

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Dated June 11, 1979