

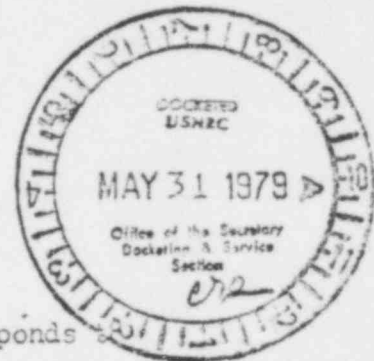
UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

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

NRC PUBLIC DOCUMENT ROOM

RESPONSE TO NRC STAFF INTERROGATORIES
AND REQUEST FOR DOCUMENTS



In response to 10 CFR 2.740b, Citizens Energy Forum (CEF) hereby responds to "NRC Staff Interrogatories to, and Request for the Production of Documents From, Intervenor Citizens Energy Forum," dated May 8, 1979.

The answer to each of the questions is followed by the name, in parentheses, of the person(s) who prepared or substantially contributed to the preparation of the response.

In researching its contentions, CEF relied heavily on materials maintained in the NRC Public Document Room. Books, papers and other documents cited in this response are, with few exceptions, available in the NRC Public Document Room and are not in the immediate possession of CEF.

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Contention 1: Thermal Effects

- 1-1 a. CEF intends to call no witnesses in support of contention 1.
b. Not applicable. (Irwin Kroot)
- 1-2 Not applicable. (Irwin Kroot)
- 1-3 (1) "Summary of Proposed Modifications to the Spent Fuel Storage Pool Associated With Increasing Storage Capacity for North Anna Power Station Unit Nos. 1 and 2," Virginia Electric and Power Co., 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. et.al., Benjamin/ Reactor Safety Studies Division; Sandia Labs, Albuquerque (#SAND-77-1371); Draft printed September 1978.
(5) "Nuclear Energy's Dilemma: Disposing of Hazardous Radioactive Waste Safely," Report to Congress by the Comptroller General of the United States; Government Accounting Office Report # EMD-77-41, Sept. 9, 1977.
(6) Letter by Professor Earl A. Gulbransen, Department of Metallurgical and Materials Engineering, University of Pittsburgh; in the Bulletin of Atomic Scientists, June 1975, page 5.

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(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, Moticello Nuclear Plant, dated Sept. 11, 1978.

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

(Irwin Kroot, Debbie Bouton, Renee Parsons, Tim Engebretson)

1-4 Same as 1-3.

1-5 CEF believes Vepco's Summary of Proposed Modifications to be deficient in its analysis of those conditions specified in the Thermal Effects contention. First, no representation is made concerning the changed flow of water in the pool, due to the new rack and fuel configurations, if the proposed modification is made. Second, the effects of a loss of water from the pool on the assemblies in the pool and ^{on} the remaining water, if any, are not enumerated. Third, the effects of the additional 6 MBTU/hr of waste heat to be discharged to the environment in light of the proposed modification are not given or, seemingly, even examined by Vepco.

CEF also regards the NRC Safety Evaluation of Jan. 29, 1979 as deficient in that it fails to present an analysis of water flow in the modified pool as proposed. Additionally, no analysis of ^{the effects of} a loss of water on the fuel pool cooling system are presented.

CEF further regards the NRC Environmental Impact Appraisal of April 2, 1979 as deficient through its superficial treatment of the environmental effects of the additional water to be drawn from Lake Anna, and of the additional heat to be discharged to the environment. We do not believe that the statements: "any atmospheric effects of its operation such as fogging and icing are unlikely to occur offsite" (sec. 4.3) or "This would not have noticeable incremental effects on aquatic

biota or the environment" (sec. 4.3) constitute sufficient analysis of environmental impacts without in-depth evidence of biological and meteorological testing presented to support such claims. (Irwin Kroot)

- 1-6 CEF believes that fogging and icing due to evaporative cooling of the water necessary to remove the increased heat will have measurable effects on the environment, depending on climatic conditions. Also, in an unusual event requiring the discharge of the service water to the WHTF, we maintain that the added heat to be discharged would likely affect the human environment, due to the additional evaporation of water from the cooling lagoons, as well as the aquatic environment. The additional 5.6 million BTU/hr, to be released, while a minor portion of the total heat discharged from the plant, is very likely to affect the oxygen concentration of discharge and cooling water, as well as cause possible heat damage or developmental effects to sensitive aquatic species in the vicinity of the increased heat discharge. (Irwin Kroot)
- 1-7 Same as 1-5.
- 1-8 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 contends that the following scenarios represent very possible sequences of 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 unforeseen 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 occurring is increased by the two embedments which we assume were added after the original

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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 a chemical compound into the spent fuel pool itself, would cause the spent fuel pool to crack or break open in several places.

(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 spent fuel pool 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 to even observe the malfunction. As a result, the pool could overheat (--perhaps causing zircalloy oxidation and a corresponding release of hydrogen--) substantially, causing an explosion that would crack the pool, breach the reactor building itself and release high amounts of radioactivity into the environment. (Debbie Bouton)

1-9 Although no specific documents were employed in the supposition that leakage from the spent fuel pool would result in a measurable rise in the pool temperature, it is a generally accepted premise based on common sense. Since water is used to cool the spent fuel pool, any loss of water would necessarily precipitate an increase in temperature. (Debbie Bouton)

1-10 CEF contends that the spent fuel pool cooling system would be inadequate to prevent "hot spots" and possible boiling as a result of the proposed modification because the NRC would allow the modified racks to be installed with no corresponding changes in the pool cooling system. The more spent fuel assemblies in the pool at any one time, the greater the burden on the cooling system to maintain an acceptable temperature. Vepco and the NRC claim that the cooling system was sufficiently

overdesigned (or "conservatively designed") to compensate for the additional heat load without any modifications. But conservative design aside, the original spent fuel cooling system was designed to accommodate a specific number of fuel assemblies, with a specific amount of "extra" cooling capacity to account for any unforeseen circumstances. With more spent fuel assemblies in the pool, placed at closer proximity, the cooling system will not be able to maintain the same margin of safety in regard to the "extra" cooling capacity. As a result, there will be a greater chance for hot spots and boiling to develop, as there will be a smaller chance for error. (Nathan Sauberman, Debbie Bouton)

- 1-11 "Hot spots" are areas in the spent fuel pool where the fuel elements are so closely packed that the cooling water is unable to circulate freely and therefore cannot carry away decay heat in sufficient quantities to keep "pockets" of heat from developing. As a result of this heat build-up in certain areas, small explosions of radioactive steam would release radioactive elements in the spent fuel area and, subsequently, into the environment. (Nathan Sauberman, Debbie Bouton)

Contention 2: Radioactive Emissions

- 2-1 a. CEF intends to call no witnesses in support of contention 2.
b. Not applicable. (Irwin Kroot)
- 2-2 Not applicable. (Irwin Kroot)
- 2-3 Same as 1-3.
- 2-4 Same as 1-3.
- 2-5 See 2-7.

2-6 Liquid and gaseous emissions from nuclear power plants, and from spent fuel pools, under normal operating conditions are routine. As more spent fuel assemblies are loaded into the pool, gaseous emissions will increase accordingly. And as the spent fuel pool cooling water is filtered through the pool purification system, liquid radioactive emissions will increase in correlation with the increased assemblies stored in the pool. In the event of an accident, of course, these liquid and gaseous emissions would be increased even more. (Debbie Bouton)

2-7 We believe Vepco's analyses of radiation released in its Summary of Proposed Modifications of April 1978 to be incomplete because we see no indication that such analyses have in fact been performed in considering the posulated accidents. Specifically, in considering leakage control and shielding (Summary of Proposed Modifications, Sec. 9.2), 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.

Fuel-handling accidents (Summary of Proposed Modifications, sec. 9.4) have also been given inadequate treatment. No consideration, for instance, has been given to the dropping of an assembly perpendicular to the top of a 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. (Irwin Kroot)

2-8 The Applicant has failed to adequately analyze the liquid and gaseous radioactive emissions that will result from the proposed modification by failing to analyze such emissions. The Summary of Proposed Modifications states at §9.0 that "the proposed expansion of the spent fuel storage capacity could affect the offsite radiological consequences of an incident because of the additional increment of long-lived radioactive fission products stored in the pool. The effect of this amount of additional radioactive products on normal station operations is discussed in Section 9.5 of this report." Section 9.5 of that report, however, discusses only the ^dradiological impacts of the proposed modification on plant personnel. At no point does the Summary, at 9.5 or anywhere else, attempt to quantify the amounts of radioactive effluents that will be released offsite as a result of the proposed modification, or to state that there will be no such releases.

In § 10.0, the Summary states that the environmental impacts of the proposed modification will be to increase ^{decay} / heat in the spent fuel pool, increase the amount of radioactivity stored in the pool, and result in a small commitment of metal resources. That section of the summary makes no attempt to estimate the offsite releases of radioactive emissions resulting from the proposed modification.
(Jim Dougherty)

2-9 See page 56 of the Summary of Proposed Modifications: "Storing additional spent fuel in the pool will increase the amount of corrosion and fission product nuclides introduced into the pool water....During the storage of spent fuel under water, both volatile and non-volatile radioactive nuclides may be released to the water from the surface of the assemblies or from defects in the fuel cladding."
(Jim Dougherty)

Contention 5: Corrosion

5-1 a. CEF intends to call no witnesses in support of contention 5.

b. Not applicable.

5-2 Not applicable.

5-3 Same as 1-3; in addition: Brooks & Perkins, Inc. Spent Fuel Storage Module Corrosion Report No. 554 (Abstract), prepared by Leslie Mollon, director, Nuclear Product Development, June 1, 1977.

5-4 Same as 5-3.

5-5 CEF maintains that the following documents are deficient in regard to the Corrosion contention:

(1) Vepco's Summary of Proposed Modifications, Sec. 9.0: Vepco fails to address the topic of corrosion on either the racks or the spent fuel assemblies themselves. There is no analysis of the use of zirconium cladding and its relation to corrosion.

(2) Vepco's Summary of Proposed Modifications, Sec. 7.0: Vepco fails to re-evaluate the efficiency of the pool purification system as a result of additional corrosion and its by-products.

(3) NRC Environmental Impact Appraisal: The Office of Nuclear Reactor Regulation does not address the environmental effects of corrosion on the racks and spent fuel assemblies in light of the proposed modification.

(Renee Parsons)

5-6 CEF believes that there is a potential for increased corrosion on the spent fuel assemblies and racks over the life of storage in the spent fuel pool because:

(1) There will be more assemblies and a larger number of racks stored in the

pool. Of necessity then, there is a larger amount of material subject to corrosion.

(2) According to the Draft Generic Environmental Impact Statement (NUREG 0401), Volume 2, "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." Certainly, the proposed modification will allow for much longer storage periods than those originally intended for the pool; the unknown effects of corrosion after long-term storage, being as yet unstudied, may prove to include greatly accelerated corrosion rates.

(3) Page 56 of Vepco's Summary of Proposed Modifications states, "Storing additional spent fuel in the pool will increase the amount of corrosion...introduced into the pool water."

(Irwin Kroot, Debbie Bouton)

5-7 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 radio-nuclides due to emissions released in handling defective assemblies at the time of eventual removal of the assemblies from the pool. (Irwin Kroot, Debbie Bouton)

CERTIFICATE OF SERVICE

I Hereby certify that the foregoing "Response to the NRC Staff Interrogatories and Request for Documents" has been mailed this 29th day of May, 1979, by deposit in the U.S. Mail, First Class, to the following:

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