UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

Atomic Safety & Licensing Appeal Board

In the Matter of	)	
Public Service Electric & Gas Company, et al	)	Docket No. 50-272 OLA (Spent Fuel Pool)
(Salem Nuclear Generating Station, Unit No. 1	)	January 13, 1981

BRIEF IN SUPPORT OF EXCEPTIONS

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By Intervenors

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CONTENTS

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ATOMIC SAFETY & LICENSING APPEAL BOARD

IN THE MATTER OF	:	Docket No. 50-272 OLA (Spent Fuel Pool)
PUBLIC SERVICE ELECTRIC & GAS COMPANY, et al	:	Certification of Mailing
(Salem Nuclear Generating Station, Unit No. 1)	:	

I hereby certify that the enclosed Brief in Support of Exceptions filed with the Atomic Safety & Licensing Appeal Board in the above captioned matter by Intervenors Alfred C. Coleman, Jr. and Eleanor G. Coleman was mailed this 13th day of January, 1981 by deposit in the United States Mail, Pennsville, New Jersey, Post Office to persons indicated on the attached mailing list.

Alfred C. Coleman Jr.
Alfred C. Coleman, Jr.

Eleanor G. Coleman
Eleanor G. Coleman

January 13, 1981

Introduction

Intervenors Alfred C. Coleman, Jr. and Eleanor G. Coleman (herein after referred to as The Colemans or Intervenors) took exception to the Atomic Safety & Licensing Board's (ASLB) Initial Decision of October 27, 1980 as filed on November 11, 1980.

It is not surprising that the ASLB made an initial decision in favor of the applicant for the proposed expansion of fuel storage, finding "...additional storage can be accomplished without endangering the health or safety of the public..." In our opinion, the ASLB felt compelled to take this position because if this amendment proposal were denied, they would have had to redefine acceptability of prior decisions. A denial would have overturned the Nuclear Regulatory Commission's (NRC) earlier findings and decisions regarding expansion of spent fuel pools at other reactors.

Our brief in support of exceptions is based on substantive evidence, facts overlooked by the Staff, and facts completely ignored by both the Staff and the ASLB in their conclusions and decision.

The Initial Decision issued by the ASLB infers, after full utilization of expanded on-site storage pool, a permanent spent fuel storage facility will be available when needed by nuclear utilities.

There is no assurance that the spent fuel will leave this site at any time, given the nonexistence of off-site storage, disposal or reprocessing facilities, or economic incentives in the form of government subsidies.

The analysis done for the Final Environmental Impact Statement related to the operation of Salem Nuclear Generating Station Units 1 and 2 (April, 1973), Environmental Impact Assessment for Salem Nuclear Unit No. 1 and the Final Generic Environmental Impact Statement on Handling and Storage of Spent Light Water Power Reactor Fuel (NUREG 0505, Vol. 1 Executive Summary, August 1, 1979) did not consider this expansion (compact storage) on site as a long-term on-site storage facility, possibly extending beyond the licensing period of the power reactors.

None of the analysis considered the normal contents of spent fuel pools for light water reactor (LWR) nuclear plants and specifically Salem Unit No. 1.

Environmental considerations associated with the issuance of operating license for the Salem Nuclear Generating Stations Unit No. 1 and testing permit for Unit No. 2 (Docket Nos. 50-272 and 50-311) were prepared by the U.S. Atomic Energy Commission (AEC), Directorate of Licensing (staff) in accordance with the Commission's regulations, 10 CFR, Part 50, Appendix D, implementing the requirements of the National Environmental Policy Act of 1969 (NEPA).

Introduction

NEPA states, among other things, that it is the continuing responsibility of the Federal Government to use all practicable means, consistent with other essential considerations of national policy, to improve and coordinate Federal plans, functions, programs and resources to the end that the nation may:

- fulfill the responsibilities of each generation as trustee of the environment for succeeding generations.
- assure for all Americans safe, healthful, productive and aesthetically and culturally pleasing surroundings.
- attain the widest range of beneficial uses of the environment without degradation, risk to health or safety or other undesirable and unintended consequences.

Further, major Federal actions significantly affecting the quality of the human environment, Section 102(2) (c) of NEPA calls for preparation of a detailed statement on:

- the environmental impacts of the proposed action,
- any adverse environmental effects which cannot be avoided should the proposal be implemented,
- the relationship between local short-term users of man's environment and the maintenance and enhancement of long-term productivity, and
- any irreversible and irretrievable commitments of resources which would be involved in the proposed action should it be implemented.

Findings of Fact

I. The Salem Nuclear Generating Station Units 1 and 2 were presented to the public and licensed as power reactors with only a minimal incidental spent fuel storage capacity (interim storage of spent fuel).

The Atomic Energy Commission viewed interim storage on-site by original design for Salem Units 1 and 2 as needed for 264 spent fuel assemblies, and as such, justified it by stating a myth, a permanent spent fuel storage facility will be available when needed by nuclear utilities.

II. The Staff, Licensee and ASLB carefully limited contentions (issues), discovery, and continue to ignore material facts.

Our original petition for leave to intervene, dated March 11, 1978, contained twenty (20) contentions, amended and reduced to thirteen (13) by the Department of the Public Advocate of the State of New Jersey on May 11, 1978.

During the proceedings, the ASLB limited our interest to Contentions 2 and 6 as amended.

This apparent mail-order catalog use of regulations (business as usual) has again limited the issues to be reviewed and sheltered the utility company from a full exacting analysis of undetermined and unknown potential danger to the public in the vacinity of a nuclear facility (mini-park, four reactors) related to the compaction of spent fuel.

An environment of approval was always present and apparent. This attitude and practice stems from "...its announcement, dated September 16, 1975, the Commission stated its position that, in the public interest, there should be no deferral of individual licensing actions on the expansion of at-reactor spent fuel storage capacity during the period required for the preparation of this assessment. In line with this policy as of January, 1979, applications for modifications to increase storage-pool capacity at 65 operating nuclear power reactors have been received by the NRC... The actions can be taken without significant effect on public health and safety, and to date, 39 of of these applications have been approved and actions are proceeding as planned. Each of these applications were evaluated on an individual basis with findings in each case that:

Findings of Fact

.at-reactor spent fuel storage can be increased,

.the actions can be taken with no sacrifice of public health and safety and

.the environmental impact of the proposed increased at-reactor spent fuel storage was negligible." [1]

The Final Generic Environmental Impact Statement on Handling and Storage of Spent Light Water Power Reactor Fuel is based on erroneous information assembled for Draft Geis NUREG-0404, Vol. 2 Appendices, dated March, 1978, Project No. M-4, regarding Salem Nuclear Generating Plant Unit No. 1 and 2. Appendix E, "...provides specific data used in analysis and the results for individual reactor for the next 10-year period."[2] Table E.1 reflects spent fuel storage available for each reactor. In the case of Salem No. 1 and 2, Table E.1 shows 350 assemblies each can be stored on-site. The original design was for 264 spent fuel assemblies to be stored on-site by each reactor. If the discharge schedule were used from E.2,[3] the Salem Unit No. 1 pool would be full in 1985 as evidenced in Table E.3.[4] If original design for 264 were used, assuming discharge schedule Table E.2, the pool would be full in 1989. This type of confusing information must have been given to our Congressman William J. Hughes in 1977, which led him to write the following on July 20, 1977:

"The Salem Nuclear Power Plant has adequate facilities, approved by the NRC, to keep spent fuel on-site until 1990. They took this added precaution to guard against any possibility of an extension of the Energy Research & Development Administration's (ERDA) requirement to find a site by the current deadline."[5]

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[1] Final Generic Environmental Impact Statement on Handling and Storage of Spent Light Water Power Reactor Fuel, August, 1979, Project M-4. NUREG-0575, Vol. 1 Executive Summary, page ES-5, 3.1 Permitting the Expansion of Spent Fuel Storage Capacity at Nuclear Power Plants (Compact Storage).

[2] Draft Generic Environmental Impact Statement on Handling and Storage of Spent Light Water Power Reactor Fuel, March, 1978, Project M-4. NUREG-0404, Vol. 1 Executive Summary Text, page E-1 0404, Vol. 2.

[3] Same as 2, Table E.2, page E-13, Vol. 2 (0404)

[4] Same as 2, Table E.3, page E-19, Vol. 2 (0404)

[5] Congressman William J. Hughes letter, July 20, 1977 to Mrs. Betty Horner, page 2, paragraph 3, line 12 through 16.

Findings of Fact

III. The Licensee assumed early approval for expanded storage, reflected in Robert M. Crockett's letter of January 19, 1978 (Exhibit 9 and 10), question 3, spent fuel pool capacity adequate through 1993 (Salem No. 1) and 1994 (Salem No. 2).

Even with the assumed expansion, it was not clear to the licensee what the rationale was for 5-year cooling fuel criteria (Exhibit 10, page 2, Question 4, Lines 1 and 2). "PSE&G urges that the Department of Energy (DOE) investigate further the spent fuel specification requirements with the thought of reducing this period. PSE&G certainly would prefer to see it reduced (Exhibit 10, page 2, Question 4, Lines 6 through 9)." The licensee recognized the likelihood of emergency situations, "It must be recognized that there is the likelihood of emergency situations such as leaking fuel or some other difficulty which will necessitate shorter notice and earlier transfer (Exhibit 10, page 2, Question 4, Lines 11 through 13.)"

Further evidence of licensee precaution, and recognition of possible problem, "...because of inherent inability to predict future fuel designs, isotopic burnup, fuel leakers, etc. (Exhibit 10, page 2, Lines 24 through 27)."

Additional evidence of concern and licensee's opinion, "Cooling of five years appears to be excessive and PSE&G would prefer to have a more reasonable period on the order of one year, or less, or the minimum (Exhibit 10, page 2, Question 5, Lines 30 through 32)."

The Licensee was successful in their shell game to keep Robert M. Crockett, Vice President of Fuel Supply, PSE&G or his designee from testifying. The ASLB apparently, did not recognize the relevance of the contents of Mr. Crockett's response to the DOE.

By sanctioning the exclusion of licensee witnesses, Mr. Crockett or designee employees (not hired expert witnesses), the ASLB precluded Intervenors from introducing and elaborating on full contents of licensee's concerns which would effect significantly the conclusions drawn by the Staff and ASLB. The State of New Jersey, as interested State, offered the correspondence into the record (Exhibits 9 and 10).

Findings of Fact

IV. The ASLB denied responses to a set of interrogatories entitled "Intervenors First Set of Interrogatories of the Licensee," docketed by USNRC on January 29, 1979 received by the Colemans on February 2, 1979. The Board denied the Colemans answers to Interrogatories 13, 17, 18, 18(a), 18b), 19, 19(a), 19(b), 19(c), 20, 21, 21(a), after the licensee moved for a protective order that discovery be disallowed.

It was the responsibility of the Board to inform Intervenors of their "rights," example in point, signing of "Proprietory Information Agreement" and our right to be included with our one-time counsel.

Intervenors were denied constitutional right of due process and excluded from Exxon conference during the proceeding with no right of review. This exclusion makes it extremely difficult to determine that mentioned interrogatories would not have had a very important influence on this case.

By limiting contentions and discovery, the Board justified its decision by referring to 10 CFR 2.740 (b) (1), "...discovery...shall relate only to those matters in controversy which have been identified..." regardless of whether the answers to the questions would protect the health and safety of the public and possibly have some effect on their (ASLB) planned conclusions.

V. Evidence of ASLB not wanting to address factual findings and questions relating to this proceeding, without response, is one limited appearance written statement, dated April 13, 1979 by Michael DiBernardo which addressed six (6) material issues related to the proposed increased storage of spent fuel rod assemblies to be stored at Salem Unit No. 1 and No. 2.

Questions unanswered are as follows:

.Normal routine releases to the environment, increased inventory, greater percentage of possibility of larger releases, result in undue risk to health and safety of the public.

.Boron concentration, many reportable occurrances of low concentration of boron and an event of higher concentration, reports from August, 1976 through March 22, 1979, what is probability of deterioration or effect on racks with such fluctuations.

Findings of Fact

.Final Safety Analysis Report (FSAR) - neither NRC evaluation, nor applicant have fully evaluated potential effect or consequences of change in fuel design, new utilization of uranium, burnup.

.Criticality - effect of spent fuel pump circulation system failure, reported occurrance, consideration not given with references; also higher burnup not considered.

.Fuel element transfer tubes, radiation streaming problem, not addressed, percentage experienced, proration in light of additional storage.

.Use of spent fuel pool water as one possible backup in case of ECCS failure, effect with added fuel inventories, potential problems not addressed.

Certainly the Staff is well aware of similar spent fuel pool design and construction between Turkey Point power plants and Salem Unit No. 1 and No. 2. They are also well aware "...that leakage in the stainless steel liner of one of the fuel pits was first detected in 1972, before any fuel was even stored in it. No repairs were made at the time; however, because both the company and regulatory officials considered it to be minor.

In subsequent years, an increased amount of water contaminated with low-level radioactivity by its contact with fuel elements inside the pits - was detected leaking, not only through the steel liners of both pits, but through the pits outer, five-foot-thick concrete wall. (Miami Herald, August 23, 1976, page 1).

Findings of Fact

VI. Emphasis was placed on the fact that none of the parties directly questioned the five factors "applied, weighed and balanced" considered by the Staff in its Environmental Impact Appraisal (Initial Decision, Docket 50-272 OLA - Spent Fuel Pool, October 27, 1980, page 43, paragraph marked 66, lines 3 through 18). The ASLB failed to list among its exhibits, the Final Generic Environmental Statement on Handling and Storage of Spent Light Water Power Reactor Fuel, NUREG-0575 - August, 1979 and a letter written by Brian K. Grimes, Assistant Director for Engineering and Projects, Division of Operating Reactors, dated April 14, 1978 directed to All Power Reactor Licensees with enclosure for information and possible use NRC guidance on spent fuel pool modifications, entitled "Review and Acceptance of Spent Fuel Storage and Handling Applications."

The latter document was not made available to all parties during proceedings. This document was found in the Local Public Document Room (Salem City Library) by the Intervenor and we feel is substantive evidence and should be looked at more closely in light of ignored facts regarding Salem Unit No. 1.

The alleged objective of the Staff's review to prepare the Safety Evaluation and Environmental Impact Appraisal for Salem Unit No. 1 involved nuclear, mechanical, material, structural and environmental.

"Nuclear and thermal-hydraulic aspects of the review include the potential for inadvertant criticality in a normal (with emphasis) storage and handling of spent fuel, and the consequences of credible accidents with respect to criticality and the ability of the heat removal system to maintain sufficient cooling (Grimes' letter, April 14, 1978, Enclosure No. 1 - II. Review Disciplines II-1).

In the review discipline, the licensee shall calculate the effective neutron multiplication factor, K_{eff}, in the fuel storage pool under the following assumed condition:

"1.1 Normal Storage

a. The racks shall be designed to contain the most reactive fuel authorized to be stored in a facility without any control rods or any non-contained burnable poison (is that which is not an integral part of the full assembly) and the fuel shall be assumed to be at the most reactive point in its life (Grimes' letter,

Findings of Fact

The fact is that the Staff, Licensee and ASLB did not make available to all parties, F. P. Librizzi's letter to Mr. A. Schwencer, Chief Operating Reactors Branch, Division of Operating Reactors, Dated December 10, 1979, entitled Underwater Installation Procedures Increased Capacity Spent Fuel Racks No. 1 Unit Salem Nuclear Generating Station Docket No. 50-272, VII, Procedure - Phase II.

[redacted] in placing the fuel [redacted] rods and [redacted]

This document was found in the Local Public Document Room by the Colemans and proves that the review was not realistic for pool environment, yet substantive for such a decision. Again, this document was kept from all parties.

VII. An umbrella source term concept was used to limit the number of accidents requiring detailed impact analysis. Substantive and material information was held back by Staff and Licensee, namely Spent Fuel Heatup Following Loss of Water During Storage, March, 1979. Sand 77-1371, NUREG/CR-0649 Sandia Laboratories developed by (among others) Allen S. Benjamin. "The likelihood of a severe spent fuel drainage accident is judged to be extremely low. Additionally, "A complete drainage of a spent fuel pool, therefore has to be considered as an extremely unlikely occurrence."

The Staff never once discussed, nor even acknowledged the event of an incomplete drainage of the spent fuel pool. "A detailed [redacted] event of an incomplete [redacted] (NUREG/CR-0649, [redacted] Effect of Incomplete [redacted]

"...if the heat removal rate is smaller than the rate of production, overheating resulting in clad rupture or melting will occur (NUREG/CR-0649, page 74, Lines 4 through 6).

"If, however, the drainage were to uncover the whole length of the rods but still to constrict the flow, either by blocking the baseplate holes or by not allowing enough space for unrestricted flow in the base region, then the heat production would exceed the heat removal capacity and the clad would overheat. The same situation would eventually occur if, rather than

immediately draining to this position, the water were to drain part way down the rods and then boil off down to the baseplates over a period of time (NUREG/CR-0649, page 74, Lines 24 through 32)."

"The amount of data available for oxidation of Zircaloy in air is not as substantial as that available for oxidation in steam (NUREG/CR-0649, page 32, Lines 13 through 15)."

"The clad oxidation effect has not been calculated for the case of incomplete drainage..." Additionally, "It is clear, however, that an incomplete drainage can potentially cause a more severe heatup problem than a complete drainage, ...(NUREG/CR-0649, page 76, Lines 9 through 14 and Lines 26 through 29)."

"The current requirement that K_{eff} must be, .095 or less for spent fuel rack designs, is given in NUREG-75/087, "Standard Review Plan for the Review of Safety Analysis Reports for Nuclear Power Plants - LWR," Section 9.1.2. Past design practice used spacings which allowed calculated K_{eff} values of 0.90 or less, using less sophisticated computational techniques and hence a greater error allowance. For example, with current computational design dependent techniques, it has been shown in the case of PWR plants that spacing can be reduced from about 20 inches to about 12 to 14 inches without exceeding the specified K_{eff} limit (NUREG-0404, Vol. 1 Executive Summary, pages 3-8, Lines 3 through 10)."

The proposed design modification for Salem Unit No. 1 and Unit No. 2 is "...center-to-center spacing of 10.5 inches (KIA Introduction 1.0)." The record will show licensee witness testified Salem Unit No. 1 racks (new) are unique and not used anywhere else.

VIII. "Both fission and radioactive decay must be considered in spent fuel storage basin design. The spacing of spent fuel assemblies within fixed racks must be engineered to make sure that array of fuel assemblies does not represent a configuration that could initiate self-sustaining nuclear fission (become critical). This is achieved by insuring that the criticality factor, K_{eff}, is less than 0.95, assuming the most reactive composition of the fuel (NUREG-0404, Vol. 1 Executive Summary 2.1.2, Pages 2-3, Lines 5 through 10)."

-10-

...of Fuel

"Reactivity is ... as a PWR assembly than a BWR assembly. Because ... this, PWR fuel requires greater spacing (assembly) in the fuel storage pool than is required ... fuel for the same criticality limits (NUREG-0... Appendices, Appendix B-3, Lines 16 through ...

"Decay heat pro... spent fuel elements varies strongly with ti... removal from the core as well as the operating ... tions and burnup experienced in the core.... the ... are of great importance (NUREG/CR-0649, Sand 77-... March, 1979)."

Consequently, a ... of operating practice should have been made and new ... power computations should have been undertaken ... unt for realistic operating conditions for Salem ... t No. 1 in the Environmental Impact Appraisal.

IX. Salem No. 1 is a ... of Westinghouse' "Optimized Fuel Assembly Demonstration Program" and "Westinghouse Reload Safety Evaluation ... dulogy" program. These programs include, but are not ... limited to, the following tests:

1. Control rod drive tests and drop time
2. Critical boron concentration measurements
3. Control rod bank worth measurements
4. Moderator temperature coefficient measurement
5. Power coefficient measurement, and
6. Startup power distribution measurements using the Incore flux mapping system.

The licensee has changed original Safety Technical Specifications, pertaining to the following areas:

1. Axial Flux Difference
2. Heat Flux Hot Channel Factor
3. Nuclear Enthalpy Hot Channel Factor, and Reactor Core

Findings of Fact

Again, the Staff ignored and did not require copies of Frank P. Librizzi's letter, March 2, 1979 to Albert Schwencer entitled "Cycle 2 Reload Analysis Facility Operating License DPR-70, Unit No. 1, Salem Generating Station Docket No. 50-272 - proposed changes and Appendix A) be made available to all parties during these proceedings. This document was found by the Colemans in the Local Public Document Room.

In this document, the Licensee states, "Salem No. 1 is one of the first Westinghouse units with an F_{xy} limit to reload and a revision in this limit is required to avoid exceeding F_{xy} limit to reload and a revision in this limit is required to avoid exceeding F_{xy} limits during the second and subsequent cycles (Cycle 2, March 2, 1979)." under Proposed Changes Heat Flux Hot Channel Factor, Reasons for Changes No. 2, Lines 4 through 7.

Reactor Core changes, technical specifications, each fuel rod shall contain a "nominal total weight of 1743 grams of uranium, "changed to "maximum total weight of 1766 grams of uranium" during Cycle 2. During Cycle 2, two (2) optimized fuel assemblies had a nominal total weight of uranium of about eight per cent less than the standard Westinghouse 17x17 fuel assembly."

The initial core loading had a maximum enrichment of 3.35 weight per cent U-235.

Also available in the Local Public Document Room is a letter from Frank P. Librizzi to Steven Varga, dated September 24, 1980, entitled "Cycle 3 Reload Analysis Facility Operating License DPR-70, Unit No. 1 Salem Generating Station, Docket No. 50-272."

"The Cycle 3 reload core will consist of 64 new Westinghouse 17x17 fuel assemblies. Fifty two (52) assemblies will have an enrichment of 2.80 w/o and the remaining twelve (12) assemblies will have an enrichment of 3.40 w/o.

Findings of Fact

Cycle 1 - Technical Specification
Axial Flux Difference (AFD)
3.2.1 The indicated Axial Flux Difference shall be maintained within a ± 5% target band (flux difference units) about the target flux difference.

Cycle 2 - Technical Specification proposal "...axial flux difference will be restricted to less than ± 7.5% at rated thermal power.

Cycle 3 - Axial Flux Difference (AFD) as a result of Cycle 2 analysis
3.2.1 "...within +6, -9% target band.

Changing of Heat Flux Hot Channel Factor, modify limit on F_{xy} at fractional thermal power by changing the multiplier from 0.2 to 0.3 (Cycle 3) to allow optimization of core loading patterns at hot full power conditions without incurring a restrictive F_{xy} limit at low power. This could lead..."

Each Cycle letter explains different fuel burnup, number of fuel assemblies to be replaced and different enrichment of certain new assemblies. Cycle 3 correspondence states replacement of 64 assemblies, contrary to Mr. Wetterhahn's letter of July 5, 1979, planned 52 assemblies.

Licensee is not sure of fuel burnup, life cycle of assemblies, or possible rod integrity during usage.

K. The Staff in its review of mechanical, material and structural aspects of the Salem Unit No. 1 spent fuel pool completely ignored the fact that the spent fuel pool was leaking during the proceeding (Report Number 80-09/03L, Report date February 14, 1980, Occurrance date January 17, 1980 reported "Leak in Spent Fuel Pit."). This report was found by the Colemans in the LPDR.

The record will show correspondence dated January 28, 1980 from Keith A. Onsdorff, Counsel for the Colemans to Gary L. Milhollin, Chairman ASLB in which we respectfully requested Board's consideration of 12 questions regarding the pool leak. A followup letter dated February 20, 1980 by Mr. Onsdorff was directed to Mr. Milhollin, also ignored.

Findings of Fact

XI. The record will show the following:

Brooks and Perkins, Inc., manufacture poison materials and, in this case, has supplied the Boral material.[7] The Lackenby manufacturing firm is under contract to Exxon Nuclear Company (hereinafter "Exxon") to assemble the finished racks.[8] Exxon, in turn, will supply the racks to the Licensee, and was responsible for their design, engineering analyses and quality control during fabrication.[9] Exxon also did the testing and criticality calculations in support of the integrity of the racking system.[10] The Licensee has done no independent studies.[11]

Exxon's criticality analysis, submitted with the Licensee's application, concluded that K_{eff}[12] is lower than the .95 criteria accepted by the Nuclear Regulatory Commission (NRC) for spent fuel storage in high density racks. Those calculations, however, and the NRC Staff's accord with their conclusions, were predicted upon the integrity of the Boral in the proposed racks. According to the Staff, the K_{eff} of .95 in relation to the reracking of the Salem SFP is a function of how much boron is in the racks.[13] In short, as a Staff witness pointed out, " t here has to be a minimum amount of boron in those racks to maintain the effective below .95."[14] Given the increased density of the new storage array, that minimally required areal density of boron between fuel assemblies is the 2.41×10^{21} boron-10 atoms per square centimeter created by the two Boral sheets.[15]

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[7] Exhibit 6B, at 2-13; Tr 545
[8] Tr 547
[9] Tr 602
[10] See Exhibit 5; Exhibit 6B, at 2-1
[11] Tr 581
[12] K_{eff} or K effective is the measure of the approach toward criticality. For criticality to occur, K_{eff} must equal 1.0. (Exhibit 6B, fn at 2-1)
[13] Exhibit 6B, at 2-1, 2-2
[14] Tr 658
[15] Id.; Exhibit 6B, at 2-1, 2-2

Thus, irrespective of any boron in the pool water,[16] from a criticality standpoint it is imperative that there be no impeachment of the Boral material during the intended useful life of the modified SFP.

Boral, like all poison materials is subject to degradation depending upon its environment.[17] The relevant environment in this case is the borated SFP water.[18] Corrosion occurs when Boral is exposed to a boric acid SFP environment. This problem, not "fully expected" in the words of Exxon,[19] came to light recently at the Monticello Nuclear Generating Plant SFP. In summary, leaks developed in a number of the storage cells at Monticello, and when the Boral was exposed to the borated pool water aluminum oxidation and corrosion resulted.[20]

According to Exxon, the welding procedures used during fabrication of the racks proposed for the Salem SFP make them 'leak-tight,' and overcome the Monticello problem. Upon closer examination, Exxon's precise, and less extravagant, claim is that there is a 95% leaktightness with a 95% confidence level.[21] When pressed further by the Board, Exxon interpreted this to mean, leaks in up to 30 cells could be anticipated.[22] And, even this claim is questionable where it is based upon only one helium check of the completed cells,[23] and obviously not on experience. In short, if the proposed reracking proceeds, corrosion will occur in up to 30, and perhaps more, of the storage cells.

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[16] The Salem SFP water is borated with borid acid to a concentration of approximately 2000 ppm in order to be compatible with, and not dilute the reactor cooling water which it contacts during refueling (Tr 445). At the hearings, Exxon suggested that because of the boron in the SFP water, all Boral might be lost without criticality occurring. (Tr 557) However, no calculations, or other verifications appear in the record in support of this anomolous position, which does not logically flow from the NRC Staff analysis cited above. Indeed, Exxon admitted that it did not account for affect on criticality resulting from the presence of boron in the SFP water in the calculations submitted by the Licensee for NRC review. (Tr 550) Moreover, and in stark contradiction, the same Exxon witness admitted at one point that if all or part of the Boral is lost, this "certainly would have a serious impact on criticality." (Tr 556)

[17] Tr 624

[18] Tr 448; see fn 14, supra.

[19] Tr 628; In fact, the problems were "new." (Tr 626-627)

[20] Exhibit 6B, at 2-13

[21] Tr 458, 493, 599; also see Exhibit 6B, at 2-13

[22] Tr 770

[23] Tr 493

Moreover, the corrosion will most likely extend to all four Boral plates in the walls of each affected cell.[24]

It is significant to realize that the use of stainless steel clad Boral in the boric acid SFP environment for an extended period of time, and in conjunction with a still relatively novel high-density storage array,[25] is essentially experimental. This is obvious from the record. None of the longer term uses of Boral mentioned by the Licensee, Exxon or the NRC Staff involved borated SFP water.[26] Furthermore, past experience with Boral in an unborated environment has not even come close to the 40-year time frame being addressed in this case.[27]

Many reportable occurrences have occurred at Salem 1 since August, 1976, ignored by Staff and the Board are as follows:

Report No.	Occurrence Date
79-79/03L	12-30-79
80-23/03L	7-31-80
80-43/03L	8- 1-80
80-28/03L	8-20-80
80-53/03L	10- 2-80

Clearly, the impacts of an "experiment" with Boral use over an extended period and in the face of real corrosion problems, as proposed in this case, are highly speculative and shrouded with doubt. The full, longer term results of the Monticello incident are not yet in. And, the Licensee's conclusion that the occurrence of corrosion will have little or no affect on the Boral's neutron-absorbing capacity for the next 40 years is based solely upon Exxon's brief one-year corrosion study, and extrapolation of its necessarily limited findings to a 40-year period.[28] The magnitude of the difference between the study period and the time frame in which the

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[24] Tr 617, 618
[25] Tr 1062, 1064
[26] Exhibit 6B, at 2-2, Tr 592, 603, 680
[27] Complete Tr 680 with Tr 417, 418, 866 through 873
[28] Exhibit 5, Tr 582, 680

study findings are predicted to apply, alone destroys confidence in the conclusion by extrapolation. Indeed, in response to questioning by the Board on a related matter, an Exxon witness admitted (during an obviously evasive dialogue with the Board) that it would not be "judicious" to rely upon Exxon's corrosion report and the mere one-year study it reflected, to conclude that there would be no problem in the long run if the Boral sheets in the storage cells were indiscriminately exposed to the Boric acid pool environment.[29] At one point he went so far as to state:

> I'm saying based on our one-year test program I cannot conclusively say that every single possible effect due to Boral performance in a boric acid environment has been identified.[30]

At other points he noted that corrosion problems had not been completely out to rest by the one-year study and that unknown questions remained as to the 30 or 40-year performance of Boral exposed to borated pool water.[31]

Dr. Benjamin, an NRC Staff witness, pointed out, there are uncertainties as to the effect of the proposed SFP configuration on propogation of a "zirconium fire."[32] After summarizing bases for such doubts,[33] he indicated that a calculation to resolve them, one way or another, could be done by one person in a few months.[34]

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[29] Tr 619 through 630
[30] Tr 630
[31] Id.
[32] For brevity, the term "zirconium fire" is used herein, as in Mr. Pasedag's prepared testimony, to refer to a class of situations, not all of which would be fires in a technical physio-chemical sense. Tr 1481 through 1491
[33] Tr 1485
[34] Tr 1482-1483

Dr. Benjamin eloquently responded to the Board that the missing calculation is indeed warranted. His testimony in this regard was the following:

> I believe that the possibility of this phenomenological occurrence happening is significant enough to warrant its inclusion in a consideration of what the consequences might be.
>
> Let me restate what I just said. I think that the possibility of this occurrence of clad oxidation propogation is significant enough to warrant its consideration in determining whether there is a difference between one special (sic) spatial geometry and another. Scientifically we were to (sic) would approach it this way. I would not say whether the probability of this occurring is greater than or less than 50 per cent because it is not a (stochastic process - it is a process which has an answer and we need to find the answer before we can say what it is but I would say that it would be scientifically correct to include as a conservative possibility in evaluating the difference between fuel pools the possibility that this would occur.[35]

Although another Staff witness, Mr. Pasedag, felt that further study is unnecessary, his testimony was based only upon a few days of reviewing literature,[36] whereas Dr. Benjamin is an expert working in the field. In any event, the fact that they were in disagreement over the existing data can lead to only one responsible conclusion viz., more specific data is needed.

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[35] Tr 1488-1489 (emphasis added)
[36] Tr 1588-1589

Exceptions

Exceptions 1, 2, 3, 8, 9 and 12

The Staff failed to investigate, analyze or review the facts known by both the Staff and Licensee, as outlined in Findings of Fact III, IV, V, VI, VII, VIII, IX and X, in the review process in preparation of the Environmental Impact Analysis and analysis by the Staff expert during these proceedings.

Exception 4

The Staff failed to investigate, analyze or review the facts sighted by Mr. Michael DiBernardo in his "limited Participation" statement, dated April 13, 1979 (Findings of Fact V).

Exception 5

We need say no more than Public Service Electric & Gas own interest in nuclear facilities as follows:

Salem No. 1	42½%
Salem No. 2	42½%
Hope Creek No. 1	95%
Hope Creek No. 2	95%
Peach Bottom No. 2	42½%
Peach Bottom No. 3	42½%

Exception 6

Neither the Staff nor the ASLB can state with 100% assurance without ever considering facts (III through XI) and their potential effect on conclusions drawn by Staff witnesses and outlined in the EIA.

Exception 7

Intervenors do not agree that the record was cured (Tr 1324-1339).

Witness Donohew testified that he was "very close to removing charges and tables because I think of the confusion that it caused (Tr 132, Lines 14 through 17)." Mr. Donohew further pointed out, "There are other tables associated with them. Like Table 1 really has three pages. It was not intended to associate the tables... to Xerox all the tables and include them with the figures (with emphasis) because of the fact of the difficulty in reading the grid locations (Tr 1328, Lines 8 through 13." Further, Donohew, "The thing is the problems were in associating the grid location with

the figure. As I say, I had not intended to include these tables, because of the fact of that difficulty (Tr 1329, Lines 2 through 5)." The record in our opinion reflects more clearly why these charts and tables should have been stricken from the record, not that the figures have been explained. This is confirmed by the record (Tr 1330, Lines 2 through 12 that certain portions should be thrown away.

Mr. Donohew, "My feeling was it was not necessary to an exhaustive study, search to collect all the data that would be available in terms of dose rates (Tr 1336, Lines 15 through 17)."

Mr. Smith said, "One of the problems that we had with putting it (package) in as an exhibit, to be honest with you, it would be difficult to verify (with emphasis) (Tr 1339, Lines 19 through 21)."

Exception 10

To allow an increase in spent fuel storage in excess of 400%, it is a major decision when weighed with the same increase at Salem Unit No. 2 and the fuel storage at Hope Creek Unit No. 1 and 2.

Intervenors contend that the Staff ignored the full intent of NEPA and failed to resolve possible problems and consider storage beyond the licensing periods of the four (4) reactors, specifically Salem Unit No. 1 and Unit No. 2 (Findings of Fact in I through XI).

Exception 11

The fact that the publications:

1. "Intent to Prepare Generic Environmental Impact Statement on Handling and Storage of Spent Light Water Power Reactor Fuel" 40 Fed. Reg. 42801 (September, 1975)
2. NUREG-0575
3. NUREG-0404 and
4. Grimes' letter of April 14, 1978

Were not made available to all parties and phrase "...not directly made matters in controversy before us, and no evidence other than the Staff's Appraisal was introduced with respect to them (Initial Decision, page 43, Lines 9 through 13)," is abused. Even if the Board ignores the fact that none of the above was made available to all parties, they can not deny the fact that the Staff ignored material facts (Findings of Fact I through XI).

Conclusions of Law

The Board should reconsider its decision and conclusions:

(a) The issuance of this License Amendment is a major commission action, significantly affecting the quality of the human environment and requires the preparation of an Environmental Impact Statement under the National Environmental Policy Act of 1969, 42 USC 4321, et ., and Part 51, taking into consideration, among other things, facts set forth in III through XI.

(b) The Generic Environmental Impact Statement on Handling and Storage of Spent Light Water Power Reactor Fuel, does not adequately assess (under NEPA) the adverse environmental impacts of allowing spent fuel compaction and does not adequately review actual spent fuel pool inventories and their potential effect (Facts III through XI.

(c) Although we oppose such amendment, if the Board should affirm this decision, the Board should require the Licensee to conduct analysis, including actual inventories, true environment, partial and complete loss of water, adequately address Facts III through XI and review with all parties prior to actual installation of new racks, as required for adequate assurance of no additional effects on the human environment.

(d) Testimony excluded by the Board by not permitting Mr. Crockett or designee to be submitted and explore more fully contents of his correspondence, denying answers to Intervenors interrogatories (Findings of Fact IV), the Staff ignoring Facts III through XI in review process on a period of 3 years, the Board relying on 2 to 3-day review by witnesses Pasadag and Benjamin, did not fulfill the requirements and intent of NEPA.

It is apparent that the NRC's position that "safety is first last, and a permanent consideration (Power Reactor Development Co., 1AEC 128, 136-1959 See Appendix on Citation Form)," clearly has not been carried out in this case in that the Staff and this Board have ignored material facts which could effect significantly the ultimate conclusions and decision, thus not complying fully with NEPA. This type of irresponsible use of regulations and lack of accountable

Conclusions of Law

decision making will eventually lead to contributory negligence and litigation, far too late to protect the health and safety of those of us who live near nuclear facilities. Even the relatively short time required for additional testing and long-term testing of true pool environments was denied in our opinion, without substantial justification.

We are no longer willing to accept such meaningless phrases as "reasonable assurance," "high level of confidence," minimum safety standards (many of which are far from precise), safety systems designed to minimize probability and effect, alleged changes in various technical specifications (other methods of meeting the intent of regulations - untested in many cases) and other numerous modifications which, if violations are detected and adverse effects result, are difficult to enforce.

It is apparent that the Licensee has failed to provide the Staff with adequate information (Facts III through X) to do an acceptable EIA.

The Appeal Board must consider whether the decision was based on a consideration of the relevant factors and whether there has been a clear error in judgment which may require some explanation in order to determine if the ASLB's action is justifiable. "The agency must articulate a rational connection between the facts found and the choice made (Bowman Trans., Inc. v. Arkansas-Best Freight, 419 U.S. 281, 285)."

The major decision fails to adequately justify the expansion of the spent fuel pools at Salem Units 1 and 2 without proper review and analysis and therefore is arbitrary, capricious, an abuse of discretion and not based on substantial evidence. The decision is inadequate to sustain the ultimate conclusions.

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References

1. Final Generic Environmental Impact Statement on Handling and Storage of Spent Light Water Power Reactor Fuel, NUREG-0575, Vol. 1, Executive Summary, August, 1979, Project No. M-4, USNRC Office of Nuclear Material Safety and Safeguards.

2. Draft Generic Environmental Impact Statement on Handling and Storage of Spent Light Water Power Reactor Fuel, NUREG-0404, Vol. 2 Appendices, March, 1978, Project No. M-4, USNRC, Office of Nuclear Safety and Safeguards.

3. Letter by Congressman William J. Hughes to Mrs. Betty Horner, July 20, 1977.

4. Letter of December 20, 1977 from Cunningham to Smith, Exhibit 9.

5. Robert M. Crockett's letter of January 19, 1978,(Exhibit10) to Beckjord.

6. Gary L. Milhollin's correspondence to all parties, docketed January 29, 1979 (dated January 29, 1979) entitled "Order Concerning Licensee's Objections to Interrogatories."

7. Michael DiBernardo, limited appearance, letter dated April 13, 1979.

8. Brian K. Grimes Letter to All Power Reactor Licensees with enclosure, dated April 14, 1978, entitled "Review and Acceptance of Spent Fuel Storage and Handling Applications."

9. Final Environmental Statement, Salem Nuclear Generating Station Units 1 & 2, Docket Nos. 50-272 & 50-311, April, 1973.

10. Safety Evaluation by the Office of Nuclear Reactor Regulation Relating to the Modification of the Spent Fuel Storage Pool Facility Operating License No. DPR-70, PSE&G Salem Nuclear Generating Station Unit No. 1, Docket No. 50-272.

11. Environmental Impact Appraisal by the Office of Nuclear Reactor Regulation Relating to the Modification of the Spent Fuel Pools, Facility Operating License No. DPR-70, Construction Permit No. CPPR-53, PSE&G, Salem Nuclear Generating Stations Unit 1, Docket No. 50-272.

12. Mark J. Wetterhahn's letter to Menasha J. Tousner, Esq. council for Intervenors, Asst. Deputy Public Advocate, dated May 16, 1980 (contents of Salem Unit 1 spent fuel pool).

13. F. P. Librizzi's letter and procedures, dated December 10, 1979, directed to Mr. A. Schwencer, Chief Operating Reactors Branch, Division of Operating Reactors, Entitled "Underwater

References

Installation Procedures Increased Capacity Spent Fuel Racks No. 1 Unit, Salem Nuclear Generating Station, Docket No. 50-272.

14. Spent Fuel Meatup Following Loss of Water During Storage, March, 1979 (Sand 77-1371, NUREG/CR-0649 Sandia Laboratories).

15. Mark J. Wetterhahn's letter, July 5, 1979 to Board covering "...schedule for discharge of fuel from the Salem reactors."

16. Letter, Librizzi to Schwencer, March 2, 1979 and proposed changes, entitled "Cycle 2 Reload Analysis Facility Operating License DPR-70, Unit No. 1, Salem Generating Station, Docket No. 50-272.

17. Letter, Librizzi to Stenen Varga, September 24, 1980 and proposed changes, entitled "Cycle 3 Reload Analysis Facility Operating License DPR-70, Unit No. 1 Salem Generating Station, Docket No. 50-272.

18. Letter, Librizzi to Varga, October 20, 1980 and proposed changes, entitled "Request for Amendment Facility Operating License DPR-70, Unit No. 1, Salem Generating Station, Docket No. 50-272.

19. Letter, Librizzi to Grier, February 14, 1980, Reportable Occurrence 80-09/03L (Leak in Spent Fuel Pit).

20. Letter, Onsdorff to Milhollin, January 28, 1980 (12 questions on leak in spent fuel pit).

21. Letter, Onsdorff to Milhollin, February 20, 1980 (follow-up to January 28, 1980 letter in No. 20 above).

22. New Article - Miami Herald, August 23, 1976, page 1.

23. Letters, Librizzi to Grier - Reportable Occurrence

79-79/03L	12-30-79
80-23/03L	7-31-80
80-23/03L	8- 1-80
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24. Letter, Sandra T. Ayers, Council for Intervenors to All Parties, June 26, 1980, Intervenors Proposed Findings of Fact and Conclusions of Law on Contentions 2 and 6.

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