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LBP-85-34

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

ATOMIC SAFETY AND LICENSING BOARD

Before Administrative Judges:
Sheldon J. Wolfe, Chairman
Dr. Jerry R. Kline
Dr. George A. Ferguson

In the Matter of	NRC Docket Nos. 50-338 OLA-1 50-339 OLA-1
VIRGINIA ELECTRIC AND POWER COMPANY	(ASLBP Docket No. 83-481-01 LA)
(North Anna Power Station, Units 1 & 2)	September 3, 1985

INITIAL DECISION
(Operating License Amendment)

Appearances

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for the Licensee

Henry J. McGurren, Esq.,
for the
United States Nuclear Regulatory Commission

James B. Dougherty, Esq.,
for the Intervenor,
Concerned Citizens of Louisa County

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OPINION

I. INTRODUCTION

A. Background

On July 13, 1982, Virginia Electric and Power Company (Licensee) applied for an amendment revising the operating licenses of North Anna Power Station, Units 1 and 2, to permit the receipt and storage of 500 spent fuel assemblies from the Surry Power Station, Units 1 and 2. 47 Fed. Reg. 41892 (Sept. 22, 1982).[1] The North Anna facility is located in Louisa County, Virginia, 40 miles northwest of Richmond. The Surry facility is located in Surry County, Virginia, 17 miles northwest of Newport News. The travel distance between the two facilities ranges between 159 and 177 miles depending on the selected route.

On July 3, 1984, the NRC Staff issued its Finding Of No Significant Impact, the Environmental Assessment (EA) and the Safety Evaluation Report (SER). On July 30, 1984, Concerned Citizens of Louisa County (CCLC) submitted five contentions, two of which were ultimately withdrawn. During the course of a supplemental special prehearing conference held on September 7, 1984, CCLC orally argued in general with

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[1] In a companion case, OLA-2, wherein the Licensee had applied for an amendment of the North Anna operating licenses to permit the expansion of the spent fuel pool storage capacity, this Board rejected the proposed contentions of Concerned Citizens of Louisa County, denied its petition for leave to intervene, dismissed the case and authorized the issuance of the amendment. LBP-84-40A, 20 NRC 1195, appeal dismissed, ALAB-790, 20 NRC 1450 (1984).

respect to its contentions that Table S-4 relied upon by the Staff in the EA was inapplicable in an operating license amendment case and that the Staff instead should have issued a final environmental impact statement. Consequently, the Board requested that counsel submit briefs on the question of whether there had been any administrative (NRC) and federal court rulings on the question of whether Table S-4 in 10 CFR § 51.52 applies only in construction permit proceedings or whether that Table is applicable also in operating license amendment cases. In a Memorandum and Order issued on October 15, 1984, noting that counsel had submitted briefs on the applicability of Table S-4 but that the Board would not decide the merits of contentions at this stage, we rewrote and consolidated three of the contentions, admitted Consolidated Contention 1 as an issue in controversy,[2] and admitted CCLC as a party-intervenor. LBP-84-40A, 20 NRC 1195 (1984).

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[2]As rewritten by the Board, Consolidated Contention 1 read as follows:

> The Staff's Environmental Assessment is inadequate and an Environmental Impact Statement should be prepared. The bases for this contention are two-fold. First, the Environmental Assessment, in relying upon the inapplicable values in Table S-4, did not evaluate the probability and consequences of accidents occurring during the transportation of spent fuel casks from the Surry Station to the North Anna Station or which might be occasioned by acts of sabotage or by error of Applicant's employees in preparing the casks for shipment. Second, contrary to the National Environmental Policy Act, 42 U.S.C. 4332(2)(E), consideration was not given to the alternative method of constructing a dry cask storage facility at the Surry Station which is feasible, can be effected in a timely manner, is the least expensive and safest method for at least 50 years, and can be used on or offsite.

Responding to the Board's Order of November 5, 1984 (unpublished), in a letter dated November 16, 1984, the parties requested that the Board treat their previous submissions as being motions for partial summary disposition and that, pursuant to § 2.749 of the Commission's Rules of Practice, we should rule on the applicability of Table S-4 as posed in Consolidated Contention 1. Thereafter, in a Memorandum and Order of January 7, 1985 (unpublished), we concluded in substance, as a matter of law, that the Staff's EA properly relied upon the values in Table S-4 to evaluate the environmental impact of the proposed transportation of spent fuel from Surry to North Anna in this operating license amendment case. Accordingly, we granted the Licensee's and the Staff's motions for partial summary disposition and denied CCLC's motion. We deleted wording from Consolidated Contention 1, and revised Consolidated Contention 1 to read as follows:

> The Staff's Environmental Assessment is inadequate and an Environmental Impact Statement should be prepared. The bases for this contention are two-fold. First, the Environmental Assessment did not evaluate the probability and consequences of accidents occurring during the transportation of spent fuel casks from the Surry Station to the North Anna Station which might be occasioned by acts of sabotage or by error of Applicant's employees in preparing the casks for shipment. Second, contrary to the National Environmental Policy Act, 41 U.S.C. 4332(2)(E), consideration was not given to the alternative method of constructing a dry cask storage facility at the Surry Station which is feasible, can be effected in a timely manner, is the least expensive and safest method for at least 50 years, and can be used on or offsite.

The evidentiary hearing took place on May 21-22, 1985 in Charlottesville, Virginia. Limited appearance statements were also taken. On June 21, 1985, the Licensee filed its post-hearing brief,

proposed findings of fact and conclusion of law, and a proposed order. On July 8, 1985, CCLC filed a post-hearing brief, and its proposed findings of fact and conclusions of law. On July 12th, the Licensee filed a reply to CCLC's post-hearing brief. The Staff filed its brief, proposed findings and conclusions of law, and a proposed order on July 18, 1985.

B. Content of Opinion

The first part of this Initial Decision begins with the Licensing Board's Opinion, which encompasses an Introduction, an analysis of Consolidated Contention 1, and Conclusions. The second part consists of our Findings of Fact, Conclusions of Law, and Order.

All of the proposed findings of fact and conclusions of law submitted by the parties that are not incorporated directly or inferentially in this Initial Decision are rejected as unsupported in law or fact as unnecessary to the rendering of this Initial Decision.

II. CONSOLIDATED CONTENTION 1

1. Employee Error In Preparing Casks For Shipment

(Fdgs. 2-28)

(Preliminary Discussion: In their respective briefs, the Licensee and the Staff argue that the issue of employee error (which they also refer to as "human error") in preparing casks for shipment should not have been considered in the hearing because the Board had previously concluded in the Memorandum and Order issued January 7, 1985

(unpublished) that the Staff's Environmental Assessment properly relied upon the values in Table S-4 to evaluate the environmental impact of the proposed transportation of spent fuel from Surry to North Anna.[3] This argument presumes that this issue of employee error had been directly addressed by the Licensee and the Staff and specific citations had been furnished to the Board. However, in their briefs submitted prior to the issuance of the aforementioned Memorandum and Order, the Licensee and Staff merely discussed the applicability of Table S-4 at the operating license amendment stage, and cited WASH-1238[4] and the Commission's Statement of Consideration (40 Fed. Reg. 1005 (1975)) for the propositions that Table S-4 is a generic rule, and that WASH-1238 provides the primary data base for Table S-4 in analyzing the probabilities of occurrences of transportation accidents involving nuclear fuel, the expected consequences of such accidents, and the

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[3]The Staff's EA stated that the environmental impact of the proposed transshipment of spent fuel from Surry to North Anna is within the scope of Table S-4 and therefore need not be addressed on a site specific basis. After setting forth a table comparing the pertinent parameters for the proposed transshipment with the parameters used in WASH-1238 for calculating the environmental impacts contained in Table S-4, the EA concluded that the radiological impact on the environment would be less by a factor of at least 30 than that shown in Table S-4 and accordingly, the impact would be well within the scope of Table S-4. (Staff Ex. 1 at 27, 28, as admitted in the hearing). Table S-4, as well as the EA, did not refer to and discuss the environmental impacts occasioned by error of Licensee's employees in preparing the casks for shipment.

[4]Environmental Survey Of Transportation Of Radioactive Materials To And From Nuclear Plants, December 1972.

potential radiation exposures to transportation workers and the general public under normal conditions of transport.[5] Only at page 6 of its reply brief of October 1, 1984, did the Licensee refer in passing to "human error."

Thus, prior to the issuance of our Memorandum and Order and indeed prior to the hearing, the argument had not been presented to us, supported by specific citations, that Table S-4 includes consideration of accidents attributable to human error in preparing spent fuel casks for shipment. We were not told that WASH-1238, in Appendix A at 72, provided estimates which indicate that the possible frequency of casks being improperly closed prior to shipment is very low. Also, we were not told that WASH-1238 at 16 concludes that the likelihood of an error, such as a package being used in a manner not in accordance with the design, is small in light of the regulatory requirements for quality assurance and for various observations and tests before each shipment.[6] We neither understand nor appreciate Licensee's and Staff's counsel failure to move for reconsideration of our Memorandum and Order of January 7, 1985 or their failure to pursue the recourse provided in

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[5] See Licensee's brief of September 20, 1984 at 6, 8 and 9, and its reply brief of October 1, 1984 at 4. See Staff's brief of September 21, 1984 at 5, 6 and its reply brief of October 1, 1984 at 4.

[6] Moreover, prior to the issuance of the Memorandum and Order and prior to the hearing, the Licensee and the Staff had neither cited Supplement 1, NUREG-75/038, April 1975 nor NUREG-0170 (Final Environmental Statement On The Transportation Of Radioactive Material By Air And Other Modes) at 4-31.

paragraph 2 of our Order of November 5, 1984 (unpublished) which stated that "Within thirty (30) days after service of the Board's Order ruling upon the issue of the applicability of Table S-4, any further motions for summary disposition shall be filed with respect to the issues posed by Consolidated Contention 1."

Had we been presented in a timely manner with the argument and appropriate citations, we would have dismissed that portion of Consolidated Contention 1 which contended that the EA had not evaluated the probability and consequences of accidents occurring during transportation of spent fuel casks which might be occasioned by employee error in preparing the casks for shipment.)

Since, as a matter of law, it is clear that the Staff's Environmental Assessment, in relying upon Table S-4 and WASH-1238, did evaluate the probability and consequences of accidents occurring during the transportation of spent fuel casks from Surry to North Anna which might be occasioned by error of the Licensee's employees in preparing the casks for shipment, we would not have to set forth Findings of Fact, infra, and analyze these facts in this Initial Decision. However, not having been properly briefed upon this issue prior to the hearing,[7] we have decided to issue factual findings and to discuss them.

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[7] During the course of the supplemental special prehearing conference held on September 7, 1984 (Tr. 92) and again in its brief of July 8, 1985, at 1 and 2, CCLC's position is that the risks of sabotage and human error, standing alone, do not create such significant

(Footnote Continued)

Our factual findings, infra, confirm the conclusions in WASH-1238 which, being included in the values of generic Table S-4, were relied upon in the Staff's Environmental Assessment. In other words, the chances of employee (human) error in preparing the casks for shipment are small because of the Licensee's cask handling training program, and because the handling procedures are thorough and require checking and double checking by the operators' supervisor. In addition, whenever a step is taken that requires that its performance be verified by readings of pressure, torque or visual examination, these values or attributes are confirmed by a quality control representative. Moreover, some of the safety-related design features of the model TN-8L cask to be used for the Surry-to-North Anna shipments make errors less likely and/or would minimize the effect of an error if committed. Thus, we conclude that an environmental impact statement need not be prepared because the Staff's EA, both as a matter of law and as supplemented by

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(Footnote Continued)
environmental effects as to require that an environmental impact statement be issued pursuant to the National Environmental Policy Act. In light of this position, CCLC neither proposed findings of fact upon these two issues nor discussed them in its brief. During the course of the supplemental special prehearing conference, however, CCLC stated that it had retained an expert witness and led us to believe that it intended to put on a full case demonstrating that the risks are significant and, therefore, that an environmental impact statement is required. Tr. 93. However, CCLC did not present any witnesses.

Finally, we note that CCLC requests at page 2 of its brief that we reconsider our ruling in the Memorandum and Order of January 7, 1985 upon the applicability of Table S-4. Such a request is denied as untimely.

our findings, adequately evaluated the probability and consequences of shipping accidents, including those which might be caused by error of Licensee's employees in preparing the casks for shipment.

2. Sabotage (Fdgs. 29-49)

The subject of sabotage was not discussed in the Staff's Environmental Assessment issued on July 3, 1984. However, the Staff's Safety Evaluation Report (SER), issued on the same date, after observing that hijacking or sabotage of a spent fuel shipment has never been attempted, set forth four considerations and concluded that, on the basis of these considerations, the probability of a sabotage incident is remote and the risk to the public is very small.

With regard to this subject, the thrust of Consolidated Contention 1 is that an Environmental Impact Statement should be prepared because the EA did not evaluate the probability and consequences of accidents occurring during the Surry-to-North Anna transportation of spent fuel casks which might be caused by acts of sabotage. However, CCLC has never challenged the SER's analysis of sabotage and did not object to the admission of the SER into evidence. Moreover, it presented no evidence and did not cross-examine the Licensee's and the Staff's witnesses on the subject of sabotage, and, indeed, as reflected in footnote 7, supra, neither proposed findings of fact nor discussed sabotage in its brief. Moreover, the Commission's Statement of Consideration, in noting that sabotage is not covered in WASH-1238 and is not accounted for in Table S-4, stated that the environmental effects of sabotage are subject to appropriate separate

consideration in individual reactor licensing proceedings. 40 Fed. Reg. 1005 (1975). We believe we have given "appropriate" consideration to the issue of sabotage in this case.

The record made before this Board amplifies and supports the SER's discussion and conclusions. First, the probability of an act of sabotage being directed at a shipment of spent fuel is very remote - there is no history of such sabotage attacks despite the fact that there have been over 5,000 shipments in this country since 1964. Second, even if a saboteur made the effort, there would be a high probability of failure because the cask design, the physical protection system required by 10 CFR § 73.37, and time pressures would impede a successful attack. Finally, even assuming a sabotage attack was successful, extrapolations from two studies,[8] evaluating releases of respirable material in a highly populated area such as New York City, show that the maximum possible harm to the public in Richmond, Virginia, the most populous area along the proposed route, would be one-half a latent cancer.

Thus, we conclude that an environmental impact statement need not be prepared because the intervenor has never challenged the SER's analysis of sabotage, and because the record, in amplifying and supporting the SER's analysis, establishes that the probability is

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[8] The Final Report on Shipping Cask Sabotage Source Term Investigation, Battelle Columbus Laboratories, NUREG/CR-2472, October 1982; An Assessment of the Safety of Spent Fuel Transportation in Urban Environs, Sandia National Laboratories, SAND 82-2365, June 1983.

remote of either a sabotage attack being undertaken or being successful, and that, even if such an attack was successful, the impact upon the public health and safety and upon the environment would be very small.

3. The Dry Cask Alternative (Fdgs. 50-71)

In Part II.1., supra, we concluded that the Staff's EA of July 3, 1984 adequately evaluated the probability and consequences of shipping accidents, inclusive of those which might be caused by error of Licensee's employees in preparing the casks for shipment. In Part II.2., supra, we found that even if a sabotage attack was successful, the impact upon the environment and upon the public health and safety would be very small. In light of these conclusions, we agree with the EA's evaluation that the proposed receipt, storage and transshipment of the Surry spent fuel involved "no significant change in types or significant increase in the amounts of any effluents that may be released off-site, that there is no significant increase in individual or cumulative occupational radiation exposure," and that thus an environmental impact statement need not be prepared.

The Licensee's and the Staff's initial position is that, because the EA concluded that the proposed receipt, storage and transshipment of Surry spent fuel would not significantly affect the quality of human environment and because it determined that an environmental impact statement need not be prepared pursuant to Section

102(2)(C)[9] of the National Environmental Policy Act, there was no reason for the Staff to analyze the dry cask storage alternative pursuant to Section 102(2)(E) of NEPA.[10] In support of this position, they cite Duke Power Company (Amendment to Materials License SNM-1773 - Transportation of Spent Fuel from Oconee Nuclear Station for Storage at McGuire Nuclear Station), ALAB-651, 14 NRC 307 (1981), Virginia Electric and Power Company (Proposed Amendment to Permit Storage Pool Modification) ALAB-584, 11 NRC 451 (1980), and Portland General Electric Company (Trojan Nuclear Plant), ALAB-531, 9 NRC 263 (1979). We disagree with the Licensee's and Staff's position and conclude that pursuant to Section 102(2)(E), the Staff was required to analyze the dry cask storage alternative in the EA. We read the Trojan, Duke Power and VEPCO decisions to mean only that, after reviewing the record made during summary disposition proceedings or at a hearing, if a licensing board were to conclude that the Staff had correctly determined that an environmental impact statement was unnecessary because the proposed action would not significantly affect the quality of human environment,

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[9]Section 102(2)(C) of the National Environmental Policy Act, 42 U.S.C. 4332(2)(C) requires that a federal agency include in a report on major federal acts "significantly affecting the quality of human environment," a detailed statement on alternatives to the proposed action.

[10]Section 102(2)(E) directs federal agencies to "study, develop, and describe appropriate alternatives to recommended courses of action in any proposal which involves unresolved conflicts concerning alternative uses of available resources."

the licensing board would not have to consider the impacts of any alternative which necessarily would have to be equal or greater. These decisions, however, did not relieve the Staff of its obligation to comply with § 102(2)(E). Apparently, believing that the case made in the EA for the proposed transshipment was so strong, it opted not to discuss the dry cask storage alternative. Congress did not grant such an option.[11] Further, the Appeal Board stated in Consumers Power Company (Big Rock Point Nuclear Plant), ALAB-636, 13 NRC 312, 332 (1981), ". . . some factual basis (usually in the form of the Staff's environmental analysis) is necessary to determine whether a proposal 'involves unresolved conflicts concerning alternative uses of available resources' - the statutory standard of Section 102(2)(E)." As discussed, infra, the Staff's failure to discuss this alternative is not fatal.

As reflected in footnote 7, supra, CCLC does not urge that a detailed final environmental impact statement should be prepared. Its

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[11]The Staff points out in its brief that, at pages 2-3 of its July 3, 1984 EA, it referenced the Final Generic Environmental Statement on Handling and Storage of Spent Light Water Power Reactor Fuel, NUREG-0575 (August 1979), and noted that the finding of the FGEIS is that the environmental impact costs of interim storage are essentially negligible, regardless of where such spent fuel is stored. Apparently, in the alternative, the Staff is suggesting that in fact it did discuss the alternative of dry cask storage and that no further analysis was necessary. See Staff's brief at 16. The suggestion is without merit. Indeed, the Surry dry cask EA of April 12, 1985 accurately observed that the environmental impacts of the dry cask storage option had not been specifically addressed in the FGEIS. Staff Ex. 3 at 4.

position is that Section 102(2)(E) requires that the EA be redone to include a discussion of or at least acknowledge the dry cask storage alternative. Apparently it argues that whenever a proposed action - here the proposed transshipment of Surry spent fuel - has "some" impact on the environment, the application of § 102(2)(E) is triggered and there must be an agency consideration of alternatives regardless of whether or not a § 102(2)(E) "unresolved conflict" exists. This argument is disingenuous. None of the cases cited by CCLC remotely suggest that the words "unresolved conflicts" are or should be excised from Section 102(2)(E). Moreover, two of the cases cited by CCLC at page 4 of its proposed findings do not evidence that this issue "has badly split" the Appeal Board.[12] In the Trojan decision, the Appeal Board stated that ". . . there is no obligation to search out possible alternatives to a course which itself will not either harm the environment or bring into serious question the manner in which this country's resources are being expended." Footnote 41 in the Big Rock Point decision is not in conflict in stating that ". . . Section 102(2)(E) of NEPA is not limited to major federal actions with significant effects on the environment and may require consideration of alternatives even when an EIS is not otherwise required" inasmuch as on the same page, as noted supra, the Appeal Board reaffirms that "some

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[12] Portland General Electric Company (Trojan Nuclear Plant), ALAB-531, 9 NRC 263, 266 (1979); Consumers Power Company (Big Rock Point Nuclear Plant), ALAB-636, 13 NRC 312, 332 n.41 (1981).

factual basis (usually in the form of the Staff's environmental analysis) is necessary to determine whether a proposal 'involves unresolved conflicts concerning uses of available resources' - the statutory standard of Section 102(2)(E)."

The Licensee has submitted extensive proposed findings of fact, as modified by the Staff, in support of their secondary position that the record establishes that there are no Section 102(2)(E) unresolved conflicts concerning alternative uses of available resources. We now turn to the record to make this determination.[13] First, CCLC concedes that "From an economic point of view, dry cask storage appears to be no less attractive an alternative than transshipment." CCLC proposed finding 12. Thus, the costs are comparable. In any event, consideration of an alternative based on economic superiority (and not environmental superiority) is not the responsibility of this agency. Virginia Electric Power Company (North Anna Power Station, Units 1 and 2), ALAB-584, 11 NRC 451, 456 (1980). Second, the Staff's witness, Mr. Donald P. Cleary, testified that the proposed action will not involve

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[13] In passing, we note that, in its proposed finding 15, CCLC urges that even if the Surry spent fuel pool lost its full core reserve and the nuclear plant had to shut down, this would be preferable to needless exposure to the public occasioned by the proposed shipment of spent fuel to North Anna. The record is not cited in support of this barren allegation. Also, we note that, in proposed finding 17, CCLC asserts that Licensee's plan to construct a dry cask storage facility at Surry is sufficiently advanced that it can be implemented in time to prevent the loss of full core reserve and thus avoid the need for transshipment. As our finding 66 reflects, the dry cask storage license might not be granted or might be revoked at some future date.

any noteworthy conflict in the use of resources such as lead, steel, copper, resin, cement, labor, vehicles, casks and roadways. CCLC did not cross-examine Mr. Cleary. Thus, it cannot be heard to barrenly allege that the proposed action will require extensive commitments of those resources. See CCLC's brief at 5. Finally, contrary to CCLC's allegation at page 5 of its brief, the Licensee's witness, Mr. Marvin L. Smith, at page 259 of the transcript did not acknowledge that the transshipment proposal would tie up the resource represented by the available storage capacity at North Anna. He merely indicated that storage space is a resource and that generally he was involved in the planning stages of activities that might impinge on the storage of spent fuel.

On the basis of this record, we conclude that the proposed transshipment of Surry spent fuel to North Anna would not significantly affect the quality of the human environment, that the transshipment inherent in the proposal does not involve unresolved conflicts concerning alternative uses of available resources, and that there is no basis for concluding that the dry cask storage alternative is environmentally preferable to the instant transshipment proposal. Such an ultimate NEPA judgment may properly be made on the basis of the entire record before adjudicatory tribunals. Philadelphia Electric

Company (Limerick Generating Station, Units 1 and 2), ALAB-262, 1 NRC 163, 197 n.54 (1975).[14]

III. CONCLUSIONS

The Board concludes that an environmental impact statement need not be prepared because the Staff's Environmental Assessment, both as a matter of law and as supplemented by the Board's findings, adequately evaluated the probability and consequences of shipping accidents, including those which might be caused by error of Licensee's employees in preparing the spent fuel casks for shipment. We also conclude that an evironmental impact statement need not be prepared because the intervenor has never challenged the Safety Evaluation Report's analysis of sabotage, and because the record establishes that the probability is remote of either a sabotage attack being undertaken or being successful, and that, even if such an attack was successful, the impact upon the public health and safety and upon the environment would be very small. Finally, the record establishes and we conclude that the transshipment proposal does not involve unresolved conflicts

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[14]Despite the Limerick decision, CCLC urges that NEPA requires that a discussion of alternatives to a given proposal be included within the environmental assessment of that proposal. It asserts that the North Anna transshipment EA should be remanded to the Staff for supplementation, lest the Staff's officials who will pass on the transshipment proposal will not be aware of the dry cask proposal and its environmental assessment. We reject this argument, which if adopted by the Board, would produce nothing other than delay in the resolution of this controversy. There is nothing in the record to establish that the NRC Staff is so compartmentalized that responsible officials would be unaware of the dry cask storage proposal and the environmental assessment.

concerning alternative uses of available resources and that there is no basis for concluding that the dry cask storage alternative is environmentally preferable to the transshipment proposal.

FINDINGS OF FACT[15]

1. Consolidated Contention 1 reads as follows:

> The Staff's Environmental Assessment is inadequate and an Environmental Impact Statement should be prepared. The bases for this contention are two-fold. First, the Environmental Assessment did not evaluate the probability and consequences of accidents occurring during the transportation of spent fuel casks from the Surry Station to the North Anna Station which might be occasioned by acts of sabotage or by error of Applicant's employees in preparing the casks for shipment. Second, contrary to the National Environmental Policy Act, 41 U.S.C. 4332(2)(E), consideration was not given to the alternative method of constructing a dry cask storage facility at the Surry Station which is feasible, can be effected in a timely manner, is the least expensive and safest method for at least 50 years, and can be used on or offsite.

A. Employee Error In Preparing Casks For Shipment.

Cask Description

2. The cask to be used for the Surry-to-North Anna shipments is the model TN-8L cask manufactured by Transnuclear, Inc. The TN-8L cask is designed to carry three pressurized water reactor fuel assemblies, one in each of three compartments. The cask cavity consists

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[15]The factual background is set forth in the introduction to our Opinion, supra.

of three stainless steel square pressure vessels welded to an end plate and circular stepped top flange, separated by a T-shaped copper plate, and surrounded with boron carbide and copper plates. The main shielding consists of 135 mm of lead, 26 mm of steel and 150 mm of resin. A wet cement layer is located between the lead and the outer steel shell to reduce heat flow in the event of fire. Radial cooper fins are welded to the outer shell and cover the surface of the cask between the end drums. Each end of the cask is surrounded by stainless steel drums reinforced by radial gusset plates and filled with balsa wood. A disk-shaped shock absorbing cover, constructed of carbon steel and balsa wood, is fastened to each drum with four, 1¼ inch bolts. The cask has six trunnions, which are the structures by which the cask is handled. Impact limiters are attached to the trunnions to reduce impact loads in the event of a side drop onto a trunnion. Certain vent and drain lines that penetrate the inner cavity are equipped with positive closures. All access ports are protected by the shock absorbing covers. McCreery, ff. Tr. 220, at 3-4.

3. NRC has issued a Certificate of Compliance certifying that the cask meets the safety standards in the 10 CFR Part 71. Id. at 4 and App. 2.

4. The main cask penetration is the opening on the top of the cask through which spent fuel is loaded and unloaded. This opening is covered by a lid that is a welded stainless steel circular flanged shell containing lead and resin shields. The lid is secured by sixteen 1¼ inch diameter bolts and is provided with a double seal consisting of

two concentric Viton "O-rings" located within recessed grooves on the top flange. McCreery, ff. Tr. 220, at 4.

5. Three other penetrations lead to the fuel cavity -- the "A," "B" and "C" penetrations. The "A" and "B" penetrations are located in the lid. The "C" penetration is located on the side of the cask near its bottom. The "A" penetration passes through the lid and is 1½ inches in diameter. The "A" penetration is used for cask evacuation and drying in the vacuum drying test, and for venting when the cask is being filled with water. The "B" penetration is a penetration from the bottom of the lid that passes upward through a Hansen valved quick-disconnect fitting. It is used to provide access for instrumentation to obtain pressure readings within the cask during cask handling operations, and for backfilling the cask with nitrogen. When the cask first arrives, it is used to compare the pressures inside and outside the cask. The "C" penetration is a penetration formed by the drain lines at the bottom of the cask that converge into a single Hansen valved quick-disconnect fitting. It is used to drain water out of the cask and to fill the cask with water. Id. at 4-5.

6. The "A" penetration is sealed by the "A" plug, a lead-filled flanged cylinder that has one "O-ring" seal on the underside of the flanged portion and is secured to the lid by three bolts. The "B" penetration is sealed by a circular flange with a single "O-ring" and is held in place by three bolts. The Hansen valved connector acts as a second seal. The "C" penetration is sealed by a flange cover, with

one "O-ring" and three bolts. Again, the Hansen valved connector acts as a second seal. Id. at 4-5.

7. The "D" opening is an opening into the lid that does not lead into the fuel cavity. It is an access port to the annulus between the two lid "O-rings." It allows access from the top of the lid to the space between the two "O-rings" so that the integrity of the main lid "O-rings" can be checked. It is sealed by a threaded plug with an "O-ring" on the underside of the head of the plug. Id. at 6.

8. The three bolts in the "A," "B" and "C" penetrations, the threaded plug in the "D" opening, and the 16 bolts in the lid are torqued to levels specified in the operating procedure, in a specified sequence. The specified torque is applied to the bolts to compress the "O-rings" and to form a tight seal against the metal on both sides. The Hansen valved connectors in the "B" and "C" penetrations act as a second seal. Id. at 6.

Safety-related Design Features

9. Both Staff and Licensee witnesses testified that certain design features of the model TN-8L cask minimize the potential for damage-producing human error in cask handling. Lahs et al., ff. Tr. 346, at 19; McCreery, ff. Tr. 220, at 7.

10. As reflected in findings 11-17, infra, some of the design features of the model TN-8L cask make errors less likely, and others would minimize the effect of an error if one were committed. McCreery, ff. Tr. 220, at 7.

11. First, the cask is shipped "dry," i.e., with no water in the fuel cavities. That precludes the development of steam pressures inside the cask, since there is no residual water that can turn to steam. The absence of steam pressure reduces the possibility of a release of radioactive gas in the event an employee erred and, for example, failed to properly tighten the lid bolts, or failed to detect a defective seal. If no positive pressure exists inside the cask, there is no driving force to force radioactive gases outside the cask. Also, the less pressure, the less chance for a seal to fail. Id.

12. Second, the casks were designed to carry fuel that has been discharged from the reactor only six months and is thus "hot" (thermally) with a decay heat of approximately eight kW per assembly. The design parameters of the cask enable it to contain pressures of 105 psig, with a safety factor of three. The Surry fuel that will be shipped to North Anna has been out of the reactors for over five years, with a heat output per assembly of less than two kW, and so is producing heat at only a fraction of the design capacity of the cask. This is another important safety factor over and above the original design safety factor of three. The fact that the fuel to be shipped is being selected from reactor discharges that indicated a low relative activity, and thus no major failures, also makes it less likely that a significant driving force would be created inside the cask. Id. at 8.

13. Third, the cask is designed to carry the maximum payload that can be transported by highway. One unloading/loading cycle removes as much fuel as three loads in the only other available highway cask

model. The likelihood of handling errors is thus decreased during any given shipping campaign, since the Licensee will need one-third as many shipments with the model TN-8L cask. Id.

14. Fourth, while only one seal for each penetration will satisfy NRC requirements, the cask features double seals for the lid opening and two of the other three penetrations into the cask cavity. Id. at 8-9; McCreery, Tr. 224; Lahs, et al., ff. Tr. 346, at 19. The NRC Staff testified that based on the cask closure design of the TN-8L cask, as well as on the cask handling procedures, a release of radioactive material due to employee error is unlikely. Lahs et al., ff. Tr. 346, at 17-18.

15. Fifth, the cask uses seals made of a rubber-like material (Viton) rather than metallic seals. A seal containing this rubber-like material is less susceptible to damage than a metallic seal, in that if it is deformed during handling operations it will regain its original shape. This minimizes the possibility of additional handling, which would be required if a seal had to be changed, and thus decreases the likelihood of error. McCreery, ff. Tr. 220, at 9.

16. Sixth, the cask is relatively simple in design, resulting in easy-to-follow operating procedures. The less complicated the operation of the cask, the less likely it is for an error to occur. And, if an error occurred, it would be easily detected and corrected. Id.

17. Finally, the cask is designed pursuant to 10 CFR § 71.73 to withstand severe accidents without significant damage. The

regulations require that it withstand a 30-foot drop onto an essentially unyielding surface, a side drop of 40 inches into a 6-inch diameter steel bar, exposure for not less than 30 minutes to a fire of not less than 1475°F. and immersion under at least three feet of water for not less than eight hours. Id. at 9-10; McCreery, Tr. 226.

Cask Handling Procedures

18. From the time the empty cask is removed from the truck until it is placed back on the truck filled with spent fuel, the following procedures are prescribed:

(1) Cask protective devices are removed.

(2) Cask is taken to decontamination area.

(3) Skirt (cover) is placed on it, so that radioactive contamination will not accumulate on fins while the cask is in the spent fuel pool.

(4) Sixteen bolts that engage the cask lid are removed.

(5) Cask is filled with water and then moved to the loading station in the pool.

(6) Cask lid is removed while cask is under water.

(7) Cask lid is lifted above the water with a crane.

(8) Seals are inspected for defects.

(9) Seals that have defects are replaced.

(10) Three assemblies are loaded into the cask.

(11) Cask lid is replaced while cask is under water.

(12) Cask is lifted partially out of water, and four bolts are replaced, hand-tight, in lid.

(13) Cask is moved to decontamination area, and the remaining 12 bolts are installed.

(14) Numbered template prescribing the order for bolt tightening is placed on the cask.

(15) All 16 bolts are tightened to 290 ft. lbs. with calibrated torque wrenches.

(16) Water in cask is drained (gravity draining) through penetration "C."

(17) Leak tightness of the lid seal is checked through the "D" opening. (18) Air is evacuated from the cask.

(19) Any remaining moisture is evaporated by the vacuum drying system.

(20) When pressure inside cask is less than 20 millibars, cask is tested for 10 minutes. If pressure increases no more than three millibars during this time, the seals are working and the cask is dry (vacuum drying test).

(21) Evacuated cask is back-filled with nitrogen to prevent oxidation of the fuel.

(22) Cask is back-filled with nitrogen to one atmosphere, in order to equalize the pressures inside and outside the cask.

(23) Remaining penetrations into the cask are checked under vacuum for leak-tightness.

(24) Skirt is removed, and the cask is ready to be moved to truck.

(25) Cask is secured to its specially designed trailer by a system designed to restrain the cask in all three motion modes.

(26) Cask protective devices are attached to ends and trunnions. Security seals are attached at each end.

McCreery, ff. Tr. 220, at 14-16; Licensee Exs. 1 and 2.

19. These procedures are repeated when the shipment reaches its end destination and the cask is unloaded, except for the seal leak tests and except that four bolts remain in the lid until the loaded cask begins its descent into the fuel pool. Id.

20. A supervisor watches as the operator performs each step of the operating procedure. The supervisor's responsibility is to ensure that the operators perform each step in the proper sequence and as prescribed by the operating procedure. The procedure contains a "check-off" space beside each step delineated to verify that each step has been properly performed. McCreery, ff. Tr. 220, at 16-17.

21. In addition, whenever a step is taken that requires that its performance be verified by readings of pressure, torque or visual examination, these values or attributes are confirmed by a quality control representative. Required quality control checkpoints provide an additional layer of assurance during the performance of the more important steps. Id. at 17.

22. The cask handling procedures are thorough rather than complex, and, as reflected above, require checks and double checks. Id. Not only is a seal visually inspected, and then subjected to a leak test (id at 10), but it is also replaced annually, whether or not it has deteriorated, despite a five year shelf-life (id. at 12). It is then subjected to a still more demanding leak test. Id. A drying test is also a verification of proper installation of the lid seals. Id. at 11.

23. The procedures also include "self-checking" operation, i.e., procedures that would make manifest any earlier mistake. For example, the "dryness" test under vacuum will not pass if the lid or penetration bolts are not in place, or if the cask is not drained of water, or if the seals are defective. Id. at 17-18.

24. There is a great deal of redundancy in leakage barriers and in the tests performed on them, and so any error would likely be found by test or negated by a redundant leakage barrier. Lahs et al., ff. Tr. 346, at 20.

25. These cask handling procedures are based on over 500 cask-years' operating experience. Similar casks have been used in Europe since the 1970's. There have been at least 50 loadings and unloadings of TN-8L casks in the United States. These cask handling procedures to be used in the shipment from Surry to North Anna evolved from this operating experience and from knowledge gained through technical investigations. McCreery, ff. Tr. 220, at 17.

26. The Licensee's witness, the manager of Transnuclear Inc.'s Aiken Operations, testified that he is familiar with approximately one-half of this historical experience in shipping spent fuel in casks and that there is a fairly free exchange of information between companies in this industry. While an incident had occurred at a New Jersey reactor site, he stated that it posed no significant threat to the public health and safety or to workmen and that such an incident would be unlikely to occur at the Licensee's reactor sites since a different type of mechanical joint is used which remains connected throughout shipment. McCreery, Tr. 218-19, 232-33, 235-36, 241.

27. A generic operating procedure has been approved by NRC along with the cask's Safety Analysis Report. The site-specific procedures have been reviewed and verified by Transnuclear, Inc. to conform to the generic requirements. McCreery, ff. Tr. 220, at 17.

28. The employees that will be involved in shipping the Surry fuel have had seven hours of classroom instruction in cask handling and have become certified operators after completing an 80-hour course in crane operation and rigging by the Crane/MIT Operator School. These employees also obtained hands-on experience with the cask at the Allied Gulf Nuclear Services facility in Barnwell, South Carolina in August, 1983. Additionally, these employees have gone through a "dry-run" (without fuel) that took place at Surry in November 1983. A refresher course will be given, informing employees of any minor changes in cask handling procedures before any spent fuel is shipped. Pickworth, ff. Tr. 222, at 2-3.

B. Sabotage

29. The subject of sabotage was not discussed in the Environmental Assessment issued on July 3, 1984. Staff Ex. 1. However, the Staff's Safety Evaluation Report, issued on the same date, stated that, so far as known, the hijacking or sabotage of a spent fuel shipment has never been attempted. The SER also stated that the following considerations indicate that the probability of such an event is remote and that the risk to the public is very small: (1) Extensive safeguards precautions minimize the probability of success. (2) Attempted sabotage, even if successful, would not produce serious radiological consequences. (3) Attempted theft and separation of plutonium or fission products, even if successful, would require complex equipment and time-consuming reprocessing. (4) The size and weight of

the cask and the intense radioactivity of its contents would strongly militate against the successful theft of the spent fuel. Staff Ex. 2 at 4-3, 4-4.

Threat of Sabotage

30. More than 5,000 shipments of spent fuel have been made in the United States since 1964. Except for pellets from a shotgun discharged during a labor dispute in the early 1970's which penetrated the siding of the tractor-trailer carrying a cask containing research reactor fuel elements, attacks upon this kind of transportation system have been virtually nonexistent. The cask in that incident was undamaged. Jefferson, ff. Tr. 326, at 9. The Staff regularly consults with law enforcement and intelligence gathering agencies to obtain their views with respect to the possible existence of adversary groups interested in sabotage of nuclear activities. None of the information collected by the Staff confirms the presence of an identifiable threat to domestic spent fuel shipments. Lahs et al., ff. Tr. 346, at 8.

31. Saboteurs might consider attacking a spent fuel shipment for three different reasons:

(a) to acquire nuclear material for weapons. However, materials for weapons use could be extracted from spent reactor fuel only by reprocessing. Since it is highly unlikely that a saboteur could manage successfully to reprocess stolen spent fuel and since there are other more promising targets, it is unlikely that he would attempt to

purloin the material for that purpose. Jefferson, ff. Tr. 326, at 14.

(b) to make a "political statement" in order to embarrass the government or the nuclear industry. However, historically, such attacks have been carried out at times and locations so as to minimize injury to the public whose support the terrorists seek. Moreover, given the dangers and obstacles, discussed below, a spent fuel shipment would not be an inviting target. Id. at 14-15.

(c) to cause direct harm to the public. However, if a saboteur attempted directly to breach the cask in transit or to divert the shipment for use at a time and location of his choosing, he would face a significant threat from law enforcement agencies and/or from radiation. There are other more attractive targets that would provide far greater risk of harm to the public with far less risk of failure and possible injury or death to the saboteur. Id. at 15-16; Jefferson, Tr. 330.

Probability of Success

32. As discussed above in findings 2 and 17, the TN-8L cask is designed to maintain radiation shielding in the face of severe accident conditions, which include conditions produced by certain accident-like events staged by saboteurs. A multiplicity of steel shells and thick, dense radiation shields enable the cask to withstand accident-like events caused by sabotage and attack by small arms or

conventional explosives. Studies have indicated that it will require skillful use of explosives by persons with knowledge of both explosives and shipping cask design parameters to potentially achieve a release of radioactive material. Lahs, et al., ff. Tr. 346, at 6-7.

33. The regulations contained in 10 CFR Part 71 specify that the cask must be designed to survive a set of engineering criteria specified in the regulations as "hypothetical accident conditions." These design criteria encompass impact, puncture, fire and immersion and, by inference, such other phenomena as crushing and tumbling. Jefferson, ff. Tr. 326, at 6.

34. While the TN-8L cask has never been subjected to actual test conditions, calculations contained in the Safety Analysis Report for Packaging (SARP) indicate that the cask can satisfy, without loss of containment and with minor loss of shielding, the regulatory requirements contained in the 10 CFR Part 71 hypothetical accident conditions. While it might suffer some cosmetic damage in an accident (such as the bending of fins) the cask is capable of surviving the prescribed accident conditions with no structural damage. Id. at 8.

35. NRC has promulgated the physical protection regulations in 10 CFR § 73.37 in direct response to the possibility of sabotage against a spent fuel shipment. Lahs et al., ff. Tr. 346, at 8. These regulations require, for example, advance notification to NRC of each shipment, procedures for coping with threatening events, prior arrangements with local law enforcement authorities, and a continuously manned communications center. For shipments by road, such as those

planned by Licensee, the shipping vehicle will be equipped with an immobilization device. Jefferson, ff. Tr. 326, at 10-11. Armed escorts or local law enforcement agents are required to accompany the shipping vehicle, and these escorts, the shipping vehicle, local law enforcement agencies and the shipper's communications center will be capable of contacting each other through communications equipment required by 10 CFR § 73.37. Id.

36. The physical protection system is designed to increase the obstacles faced by a would-be saboteur and, in particular, to create substantial time pressures for the saboteur. Jefferson, ff. Tr. 326, at 11, 13. The saboteur would face armed resistance from the outset. The transport and escort vehicles could quickly alert local and state police. The transport vehicle could activate the vehicle's immobilization device at the first sign of a threat. Id. at 12-13. If the saboteur gained control of the vehicle, he could not swiftly drive it away; he would have to uncouple the heavy trailer from the immobilized tractor and recouple it with another tractor in full view of the public. Id. at 16-17. The time necessary to deal with this array of obstacles would greatly reduce the probability of success. Id. at 12-13.

37. A saboteur who overcomes the impediments described above might attempt any of the following three methods to breach the cask: (a) mechanical means, (b) use of projectiles, and (c) use of explosives. Lahs et al., ff. Tr. 346, at 10.

38. The first of these methods would be extremely difficult, dangerous and time-consuming. Id. at 11; Jefferson, ff. Tr. 326, at 19. As previously indicated in finding 33, the cask is designed to survive severe accident-like events. Thus, the saboteurs might attempt to disassemble the cask mechanically. Lahs et al., ff. Tr. 346, at 10-11. Performance of this task would be difficult for several reasons. In the first place, the 37-ton cask is designed for vertical unloading but rests horizontally on the truck. The saboteur must either have access to a 50-ton crane or its equivalent in order to erect the cask or face the problems of removing the cover from the horizontal cask. Jefferson, ff. Tr. 326, at 19.

39. To remove spent fuel from the horizontal cask, the saboteur would first have to remove the 900-pound shock absorbing cover. Then, he would have to remove the lid of the cask, which weighs almost a ton and is designed to fit tightly into the cask. It is likely that the heavy, closefitting lid would bind during the process. Furthermore, a vertical steel wall, welded across the front of the trailer, would make it difficult to use cables to pull the lid off. Id.

40. In the event that a saboteur could remove the lid, the cask would then project a radiation beam that would be lethal near the cask opening. The saboteur would have to deal with this beam if he should attempt to remove the spent fuel assemblies. Id. at 19-20.

41. To remove the fuel assemblies, the saboteur would have to grapple blindly for a place to hook the spent fuel assemblies, probably with a specially constructed tool. This would be difficult, because the

only grasping points lie flush against the chamber walls, making them difficult to hook. It would also be dangerous, as the saboteur might expose his arm to a high dose of radiation. Moreover, the vertical steel wall at the front of the trailer would block the complete extraction of the fuel assemblies from the cask. Id. at 20-21.

42. If the saboteur were to attempt to breach the cask in this manner, apart from the risks of irradiation and the difficulties of disassembly, he would have tremendous time constraints. If he wished to maximize his time to dismantle the cask fully before interdiction, he would not attack the cask near a heavily populated area where law enforcement agencies would be centered and the chance of detection would be greatest. Instead, he would attack the shipment in a remote area. If the attack were carried out in a remote area, however, the consequences to the public would be minimized. Id. at 22.

43. The second method might be an attempt to breach the cask by using projectiles. Id. However, the use of small firearms, high powered rifles and machine guns would not result in the penetration of the spent fuel cask. Lahs et al., ff. Tr. 346, at 11-12. Tests conducted by Sandia National Laboratories establish that neither light antitank weapons nor armor piercing projectiles would be effective means of penetrating the casks. Jefferson, ff. Tr. 326, at 23. Light antitank weapons prove ineffective for two reasons: (a) the extremely accurate aim required (a skill not expected in those who do not use the weapons continuously) (id.), and (b) the limited penetration capability of the charges used. Jefferson, Tr. at 334. Moreover, armor-piercing

projectiles would be ineffective against the TN-8L cask because the lead shielding is not an effective transmitter of impact shock waves. Jefferson, ff. Tr. 326, at 23.

44. The third method, the use of explosives, is the most effective means available to breach the casks. Conical-shaped charges, while requiring some skill, would be the most effective means available, and could cause a penetration of the cask. Lahs et al., ff. Tr. 346, at 12-13.

Consequences of Explosive Attack

45. Two research programs provide experimental data to support estimates of the magnitude and the chemical and physical form of radioactive material release from a presumed successful sabotage attack. The first study was performed for the NRC - the Final Report on Shipping Cask Sabotage Source Term Investigation, Battelle Columbus Laboratories, NUREG/CR-2472, October 1982. Lahs et al., ff. Tr. 346, at 14. The second study was performed for the Department of Energy - An Assessment of the Safety of Spent Fuel Transportation in Urban Environs, Sandia National Laboratories, SAND 82-2365, June 1983. Id; Licensee Ex. 3.

46. The Sandia Study measured the fuel material released from a full-scale cask containing a single unirradiated, depleted UO_2 fuel assembly when subjected to a full-scale conical shaped charge attack, Jefferson, ff. Tr. 326, at 26; Licensee Ex. 3 at 2-3; Lahs, Tr. 355. The Battelle study utilized a ½-scale cask containing irradiated fuel pins. Lahs, Tr. at 355.

47. Health consequences were calculated using the following scenario: a three-assembly truck cask is successfully sabotaged in Manhattan during mid-afternoon of a week day. Licensee Ex. 3 at 4; Lahs et al., ff. Tr. 346, at 15.

48. The Sandia Study indicated that less than 34 grams of respirable material would be likely released; the Battelle program indicated a likely release of less than 18 grams. NRC considers these release results to be higher than releases would be under uncontrolled circumstances. The Sandia Study established that, in a highly populated area such as New York City, the release of this material would result in no early fatalities and an average of four latent cancer fatalities. The Battelle program indicated that, in a highly populated area such as New York City, there would be no early fatalities and less than one latent cancer fatality. Id. at 15. Early fatalities are defined as those occurring within one year after exposure to the radioactive material. Licensee Ex. 3 at 93. Early latent cancer fatalities occur at any time after the initial exposure and are the result of that exposure. Id. These fatalities include early fatalities. Jefferson, ff. Tr. 326, at 28. When the maximum value is assigned to each factor in the calculation, the maximum effect would be three early fatalities and fourteen latent cancers. Jefferson, ff. Tr. 326, at 28.

49. These predicted radiological consequences would be significantly reduced where, as in the case of the Surry-North Anna shipments, the fuel transported is 730-day-cooled fuel and the maximum population along the proposed route is 3.5% of the test population. Id.

at 29. Under these circumstances, and applying maximum values, the maximum possibility drops to one-half a latent cancer for a successful sabotage in Richmond, Virginia, the most populous area along the proposed route. Id. Assuming that the attack were to occur in a remote area, the consequences would be reduced to zero.

C. The Dry Cask Storage Alternative

Need For Additional Spent Fuel Storage Space

50. The spent fuel storage capacity of the Surry Units 1 and 2 spent fuel storage pool is 1,044 spent fuel assemblies. Smith (I), ff. Tr. 247, at 3. At the end of 1985, 886 of the fuel storage spaces in the Surry pool will be occupied. Id. at 2 and App. 2. Thus, at the end of 1985 the Surry spent fuel pool storage racks will contain 158 vacant spaces. Id. at 3.

51. Each of the two Surry reactor cores contains 157 fuel assemblies. If the reactor core from either Surry Unit must be discharged, to permit either inspections or maintenance activities, 157 spaces must be available to store the spent fuel. Id. at 3. These 157 spaces will be referred to as "full core reserve." Id.

52. The Licensee has carried out several full core discharges in the past. Id. The Licensee presently plans a full core discharge at Surry during 1986 in order to carry out required inspections. Smith, Tr. 261.

53. If the Licensee were required in the future to remove a full fuel core from a Surry Unit in order to perform an inspection or

work essential to continued operation, and if there were inadequate space to store the 157 fuel assemblies comprising the core, an outage would result and would last until additional space could be made available. Smith, ff. Tr. 247, at 3. This outage would be long and expensive. The Licensee estimates that the cost of replacing the power from one Surry Unit would be $300,000 per day. Thus, prudent operation requires that the Licensee make every reasonable effort to maintain full core reserve. Id.

54. Pursuant to § 135(b)(2) of the Nuclear Waste Policy Act of 1982, 42 U.S.C. § 10155(b)(2) (1982) (NWPA), the Commission made a generic determination that, for purposes of a determination under 10 CFR Part 53, maintenance of full core reserve is necessary for continued, orderly operation of a nuclear power plant. See 50 Fed. Reg. 5548-67 (1985); 10 CFR Part 53.

55. The Licensee currently plans to refuel Surry Unit 1 beginning July 5, 1986. This date assumes that Surry Unit 1 will be operated beyond its normal end-of-cycle date in a "coastdown" mode. But if Surry Unit 1 were to operate at a higher than anticipated capacity factor prior to the 1986 outage or if an unplanned shutdown were to occur during the "coastdown," the refueling outage now scheduled for July 5, 1986, could start several weeks before that date. Smith (I) ff. Tr. 247, at 4.

56. The Licensee plans to discharge 56 fuel assemblies during the 1986 Surry Unit 1 outage. This would leave only 102 vacant fuel spaces in the Surry spent fuel pool, 55 fewer than necessary to maintain

full core reserve. Thus, at least 55 fuel assemblies must be removed from the Surry spent fuel pool and stored elsewhere prior to the end of the 1986 Surry Unit 1 refueling outage. In fact, for reasons set out in the following finding, these 55 assemblies ought to be removed before the Surry Unit 1 1986, outage begins. Id. at 5.

57. The Licensee prefers to avoid transshipping spent fuel between Surry and North Anna while a refueling outage is in progress at either station. This is because refueling outages are periods of intensive activity, and work that may increase the length of an outage should be avoided in order to minimize outage duration and replacement power costs. Shipment of spent fuel involves use of facilities in the spent fuel pool that are also needed during outages for core off-loading and on-loading. Also, some of the personnel required for spent fuel shipments would have conflicting responsibilities during a refueling outage. The Licensee presently has outages scheduled for North Anna Unit 1 during the period November 1 through December 19, 1985, and for North Anna Unit 2 during the period April 25 through June 12, 1986. Id. at 5 and App. 3.

58. In addition, the Licensee would prefer to avoid planning for spent fuel shipments during the period from mid-December through February because of the higher probability that bad weather would result in delays in the shipment of spent fuel. Id. at 5. Such delays would result in increased cask lease charges and personnel costs. Id. at 6.

59. The Licensee also has an outage scheduled for Surry Unit 2 during the period October 17 through December 14, 1986, id. at

App. 3, and it plans to discharge an additional 60 assemblies during that outage, id. at App. 2. Thus, prior to that outage, the Licensee must have provided storage space outside the pool for both the 55 Surry Unit 1 assemblies, discussed above, and these 60 Surry Unit 2 assemblies.

Dry Cask Storage

60. Dry cask storage involves the storage of spent nuclear fuel in large metal casks (dry casks) that, in the Licensee's case, would be stored on site at the Surry Power Station. Smith (I), ff. Tr. 247, at 6. Although the Licensee filed the application at issue in this proceeding, it has continued to pursue the dry cask storage alternative. Id. In fact, the Licensee has (a) applied to NRC for a license for a dry cask storage facility at its own Surry Power Station and (b) entered into a cooperative development program with the Department of Energy (DOE) designed to demonstrate the feasibility of dry cask storage. Id. at 7-11.

61. In October 1982, the Licensee submitted to NRC a license application under 10 CFR Part 72 for a dry cask storage facility at the Surry Power Station. The facility would consist of concrete pads and security facilities, which would be built by the Licensee, and dry storage casks, which the Licensee would purchase from one or more cask vendors. Id. at 7. The NRC Staff issued its Environmental Assessment for the proposed dry cask storage facility on April 12, 1985. Staff Ex. 3.

62. With respect to the public health and safety aspects of the application, by letter of March 15, 1984, the Licensee informed the NRC of its selection of the GNS Castor V type cask as the first to be considered for evaluation. Lahs et al., ff. Tr. 346, at 22. The application in corporates by reference the topical report for the Castor V cask. The licensee has answered all review questions except for those set forth in a March 7, 1985 request from the NRC. Smith (I) ff. Tr. 247, at 7. The Staff witness testified that the Licensee must still resubmit the dry cask safety analysis report incorporating the Castor V topical report. Roberts, Tr. 351. The Staff also testified that until it completes its review and Commission approval is obtained, it cannot be considered a viable alternative. Lahs et al., ff. Tr. 346, at 21, Roberts, Tr. 348. The Staff testified that completion of its safety review could take "roughly" a month. Roberts, Tr. 350-51. On April 10, 1985, the Licensee requested permission from NRC to begin construction of the dry cask facility at Surry. The Licensee estimates that approximately 10 months will be required to build the dry cask facility. Smith (I), ff. Tr. 247, at 7. The testimony revealed that if the Licensee were to receive an early construction authorization from NRC, construction could begin as early as June 1985.[16] In that event, the

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[16]The Licensee proposed as a finding that on June 10, 1985, after the record was closed in this proceeding, NRC advised the Licensee that it "does not intend to invoke legal bars" to the pre-license construction work proposed by the Licensee. The Licensee reported on

(Footnote Continued)

dry cask facility could be ready for operation as soon as April 1986. Id. at 8.

63. The Licensee has ordered the first dry storage cask for use in the facility. The cask, which will hold 21 assemblies, is scheduled for delivery in November 1985. Id. The Licensee expected to order four additional casks during May 1985 (Smith, Tr. 255) and plans to order still more casks for Surry as often as necessary to maintain full core reserve in the Surry fuel pool. Once the facility is completed, the first cask is delivered, and personnel training is finished, the 21 assemblies could be loaded into the first cask in about a week. Smith (I), ff. Tr. 247, at 8.

64. Pursuant to § 218(a) of NWPA, 42 U.S.C. § 10198(a) (1982), the Licensee and DOE signed a Cooperative Agreement on March 29, 1984, to conduct a dry cask storage demonstration program. Id. The program will consist of (a) a NRC-licensed demonstration at the Surry Power Station, using the facility described in finding 61 above, and (b) reserach and development activities to be conducted by DOE at a Federal site. Pursuant to the Cooperative Agreement, the Licensee had, at the time of the hearing, ordered two storage casks for delivery to the

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(Footnote Continued)
June 26, 1985 that this work would be begin momentarily, and reported on July 30, 1985 that construction had begun but that the NRC had not yet issued a license for the dry cask storage facility. See Licensee's letters served on all parties. In a letter of July 9, 1985, we advised Licensee's counsel that we wished to be kept informed about intervening developments provided such information was served on all parties.

Federal site, one with a 21-assembly capacity and one with a 24-assembly capacity. The former was delivered in December 1984, and the latter is scheduled for delivery in February 1986. In addition, at the time of the hearing, the Licensee was in the process of ordering a third cask, this one with a capacity of 24 assemblies. This third cask is scheduled for delivery in September 1985. Id. at 9.

65. At the time of the hearing DOE was scheduled to begin receiving Surry spent fuel for storage in the already-delivered cask in July 1985.[17] These shipments were expected to take about two months. Id. If this program was completed on schedule, the number of assemblies that would have to have been removed from the Surry spent fuel pool prior to the July 5, 1986, outage at Surry Unit 1 would have been reduced by 21 assemblies, leaving 34 assemblies to be removed in order to preserve full core reserve after that outage. Shipment of spent fuel for the next cask, consisting of 24 assemblies, was scheduled to begin in October 1985 and to require about two months. Successful completion of this portion of the program would leave the Licensee ten spaces short of full core reserve after the 1986 Surry Unit 1 refueling period. Id. If another cask were delivered, as planned, in February 1986, shipment of 24 additional assemblies could begin in March or April of that year.

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[17] The Licensee reported in its letter of July 30, 1985, that DOE had accepted 12 of the spent fuel assemblies and shipped them to the DOE facility in Idaho, and that these shipments would continue until 9 additional assemblies have been accepted and delivered to the Idaho facility, thus filling the first dry storage cask.

Id. at 10. Thus, if all three of these shipping campaigns were carried out more or less on schedule, full core reserve would be assured, without any shipments to North Anna, for the period immediately following the Surry Unit 1 outage and until the October 17, 1986, outage at Surry Unit 2. Id. at 11; Smith, Tr. 258. Even so, an additional 46 assemblies would have to be removed from the Surry pool before the October 17, 1986, Surry Unit 2 outage. See Smith (I), ff. Tr. 247, at App. 2. Of course, if the Surry dry cask storage facility were licensed by NRC and completed in early-to-mid 1986, it could be used to avoid the loss of full core reserve during the October 17, 1986, Surry Unit 2 outage and thereafter. See finding 62, supra.

66. The Licensee would prefer to use dry cask storage and forego shipping from Surry to North Anna to the extent consistent with the preservation of full core reserve at Surry. Smith (I), ff. Tr. 247, at 18. The foregoing discussion, of course, reveals that chances are very good that the Licensee's dry cask options will materialize in time to avoid the necessity for shipping fuel from Surry to North Anna at this time. Id. Nevertheless, the Cooperative Agreement Program, involving as it does a maximum of four casks, would not, in the best of circumstances, permit the preservation of full core reserve indefinitely. Id. at 9. The Licensee hopes, of course, that an NRC license for the proposed Surry dry cask storage facility will be issued during 1985, but that license has not yet been issued. It is conceivable, moreover, that the license will not be issued or that, if issued, it might be revoked by NRC at some future date for reasons that

cannot now be foreseen. If that were to happen, the Licensee would have no immediately available option for providing additional storage for its Surry spent fuel unless it could ship spent fuel assemblies from Surry to North Anna. Id. at 18.

67. In addition, § 111(a)(5) of NWPA, 42 U.S.C. § 10151(a)(1) (1982), explicitly makes utilities primarily responsible for interim storage of their spent nuclear fuel until a federal repository is available. The Act provides for limited federal interim storage for utilities, but only if they are unable to provide their own storage through the use of transshipment, dry cask storage or new fuel pools. 42 U.S.C. § 10155(b)(1)(A), (B) (1982). Indeed, utilities are required by 10 CFR Part 53, if they are to qualify to use Federal interim storage, to demonstrate to NRC that they have "diligently" pursued these options. Id. at 18-19. In the event that both dry cask storage and transshipment were unavailable, the Licensee might have to apply for federal interim storage. The Licensee could qualify for federal interim storage only if it could show that it had diligently pursued the authorization for receipt and storage of Surry fuel at North Anna that it seeks in this proceeding. Thus, given its shortage of spent fuel storage space at Surry, Licensee has little choice but to seek the authorization that is the subject of this proceeding. Id. at 19.

Comparative Costs

68. Under various scenarios, the cost of the dry cask storage option would probably be within the range of eleven to eighteen million

dollars, and the cost of transshipment would probably be within the range of eight to twenty-two million dollars. Smith, Tr. 268-270.

Comparative Environmental Effects

69. The Staff's Environmental Assessment of July 3, 1984 noted that inherent in the Licensee's application for an amendment to its operating licenses to allow the receipt and storage at North Anna of 500 spent fuel assemblies from Surry is the transshipment of this spent fuel. To the extent pertinent in this case, the EA concluded that an environmental impact statement need not be prepared since the receipt, storage and transshipment involved "no significant change in types or significant increase in the amounts of any effluents that may be released off-site and there is no significant increase in individual or cumulative occupational radiation exposure." Staff Ex. 1 at 4, 29-30. Attached to the EA was the Staff's Finding of No Significant Impact which stated that, in light of the conclusions in the EA, the transshipment, receipt and storage of Surry spent fuel assemblies will not either separately or combined significantly impact on the quality of the human environment, and thus that an environmental impact statement need not be prepared.

70. The EA of July 3, 1984 did not discuss the alternative method of constructing a dry cask storage facility at the Surry Power Station. However, on April 12, 1985, the Staff issued an Environmental Assessment of the Licensee's proposal to construct a dry storage cask facility at its Surry Power Station (the Surry EA). Staff Ex. 3. The Surry EA examines a wide-range of alternatives. Id. at 8-14. One of

these alternatives examined in the Surry EA was Licensee's proposal to transship and receive Surry spent fuel at North Anna. The Surry EA observed that this alternative had been separately assessed in the Staff's EA and in the Finding of No Significant Impact issued July 3, 1984 which found that action to have no significant impacts. Id. at 9 and 64. It includes a description of the proposed Surry dry cask storage facility. Id. at 28-36. It analyzes the environmental impacts of construction on land use and terrestrial resources, on water use and aquatic resources, on air quality and on noise levels. Id. at 39-40. The Surry EA also examines the expected operational effects of the facility including those due to direct radiation, to radioactivity releases in gaseous effluents and to radioactivity releases in liquid effluents. Id. at 41-51. It analyzes off-site dose commitments to individuals and to the nearby population, as well as collective occupational dose commitments. Id. at 42-44. The Surry EA reviews the potential environmental effects of accidents and the potential for sabotage attacks on the facility. Id. at 45, 56-58. The analysis concludes that no significant construction impacts are anticipated, that the radiological impacts from liquid and gaseous effluents during normal operation will fall within the scope of the impacts evaluated for reactor operations that were assessed in the Surry Units 1 and 2 Final Environmental Impact Statements, that the radiological impacts due to potential accidents are only a small fraction of acceptable limits, and that no significant non-radiological impacts are expected during operation. See id. at 60-61. The document's ultimate conclusion is

that the dry cask storage facility at Surry will not significantly affect the quality of the human environment, and thus that an environmental impact statement is not warranted and a Finding of No Significant Impact is appropriate. Id. at 61-62.

Use of Resources

71. The proposed action will not involve any noteworthy conflict in the use of resources such as lead, steel, copper, resin, cement, labor, vehicles, casks and road systems. Lahs et al., ff. Tr. 346, at 24-27; Cleary, Tr. 349. CCLC did not cross-examine the Staff's witness upon this subject. Any space in the North Anna spent fuel pool preempted by Surry fuel can be replaced when needed either by consolidating fuel in the North Anna pool or by installing dry casks at North Anna. Smith (I), ff. Tr. 247, at 14-15.

CONCLUSIONS OF LAW

The Board has considered all of the evidence presented by the parties. Based upon a review of the entire record in this proceeding and the foregoing Findings of Fact, the Board concludes that the Director of Nuclear Reactor Regulation should be authorized to issue to the Licensee, upon making requisite findings with respect to matters not embraced in this Initial Decision, an amendment to North Anna Units 1 and 2 operating licenses to permit the receipt and storage of 500 spent fuel assemblies from the Surry Power Station, Units 1 and 2.

ORDER

WHEREFORE, IT IS ORDERED, in accordance with the Atomic Energy Act, as amended, the National Environmental Policy Act, as amended, and regulations of the Nuclear Regulatory Commission, and based upon the findings and conclusions set forth herein, that the Director of Nuclear Reactor Regulation is authorized to issue to the Licensee, Virginia Electric and Power Company and Old Dominion Electric Cooperative, an amendment to their North Anna Units 1 and 2 operating Licenses (NPF-4 and NPF-7) to permit the receipt and storage of 500 spent fuel assemblies from the Surry Power Station, Units 1 and 2.

In accordance with 10 CFR § 2.764, this Initial Decision will become effective immediately upon issuance. Pursuant to 10 CFR § 2.760(a) of the Commission's Rules of Practice this decision will constitute the final decision of the Commission forty-five (45) days from the date of issuance, unless an appeal is taken in accordance with 10 CFR § 2.762 or the Commission directs otherwise. See also 10 CFR §§ 2.764, 2.785, and 2.786.

Any party may take an appeal from this decision by filing a Notice of Appeal within ten (10) days after service of this decision. Each appellant must file a brief supporting its position on appeal within thirty (30) days after filing its Notice of Appeal, (forty (40) days if the Staff is the appellant). Within thirty (30) days after the period has expired for filing and service of the briefs of all appellants, (forty (40) days in the case of the Staff), a party who is not an appellant may file a brief in support of or in opposition to the

appeal of any other party. A responding party shall file a single, responsive brief regardless of the number of appellant's briefs filed. See 10 CFR § 2.762(c).

IT IS SO ORDERED.

THE ATOMIC SAFETY AND
LICENSING BOARD

Sheldon J. Wolfe, Chairman
ADMINISTRATIVE JUDGE

Dr. Jerry R. Kline
ADMINISTRATIVE JUDGE

Dr. George A. Ferguson
ADMINISTRATIVE JUDGE

Dated in Bethesda, Maryland
this 3rd day of September, 1985.