

UNITED STATES OF AMERICA  
NUCLEAR REGULATORY COMMISSION

THE ATOMIC SAFETY AND LICENSING BOARD

Marshall E. Miller, Esquire, Chairman  
Dr. Cadet H. Hand, Jr., Member  
Dr. Emmeth A. Luebke, Member



In the Matter of

DUKE POWER COMPANY

(Amendment to Materials License  
SNM-1773 for Oconee Nuclear Station  
Spent Fuel Transportation and  
Storage at McGuire Nuclear Station)

Docket No. 70-2623

October 31, 1980

INITIAL DECISION

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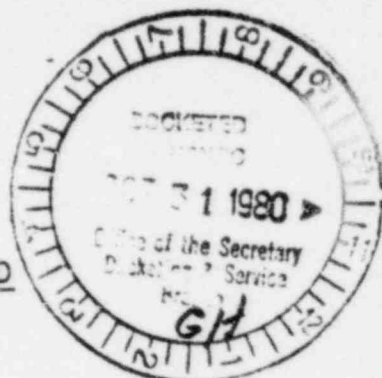
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and Storage at McGuire Nuclear )  
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(October 31, 1980)

I. PRELIMINARY STATEMENT

A. Background

This Initial Decision involves an application for amendment of Special Nuclear Materials License SNM-1773 filed on March 9, 1978, with the Nuclear Regulatory Commission (NRC) by the Duke Power Company (Duke or Applicant). Special Nuclear Materials License No. SNM-1773, which was issued pursuant to 10 CFR Part 70, permits storage of new, unirradiated nuclear fuel at the McGuire Nuclear Power Facility.<sup>1/</sup> In its application for amendment of the license, Duke

<sup>1/</sup> Licensing of the operation of the William B. McGuire Nuclear Station, Units 1 and 2, Docket Nos. 50-369 and 50-370, is the subject of an Initial Decision (Operation License Proceeding) issued by the McGuire Atomic Safety and Licensing Board on April 18, 1979. Duke Power Company (William B. McGuire Nuclear Station, Units 1 and 2), LBP. 79-13, 9 NRC 489 (1979). That Atomic Safety and Licensing Board decision made findings of fact and conclusions of law on matters actually put into controversy by the parties to that proceeding. However, the Atomic Safety and Licensing Board stayed the effect of its decision until further order following the issuance of a supplement to the NRC Staff's Safety Evaluation Report addressing the significance of any unresolved generic safety issues relative to operation of McGuire, Units 1 and 2. 9 NRC, at 547-48.

requested authorization to ship spent nuclear fuel from its Oconee Nuclear Station to the McGuire Nuclear Station for storage in the McGuire Nuclear Station, Unit 1 spent fuel pool commencing in early 1979.

Duke has licenses (Operating Licenses Nos. DPR-38, 47 and 55) to operate its Oconee Nuclear Station Units 1, 2 and 3, which consists of three 2568 MWt, 860 MWe, Babcock and Wilcox pressurized water reactor (PWR) units located on the shore of Lake Keowee in Oconee County, South Carolina. Oconee Units 1, 2 and 3 are presently operating.

Duke's application to amend the license sought authorization to store 400 spent fuel assemblies from the Oconee Facility in the McGuire Unit 1 spent fuel pool. On June 19, 1979, the Nuclear Regulatory Commission issued an amendment to the Oconee operating licenses Nos. 38 and 47 for the Units 1 and 2 spent fuel pool. This amendment authorized the expansion of spent fuel storage capacity in the Oconee Units 1 and 2 spent fuel pool by installation of high-density stainless steel racks.<sup>2/</sup> The Unit 3 Oconee spent fuel pool was expanded

<sup>2/</sup> On March 6, 1979, the Commission issued a "Proposed Issuance of Amendments to Facility Operating Licenses," (44 Fed. Reg. 12303). That Notice stated that the U. S. Nuclear Regulatory Commission was considering issuance of amendments to facility operating licenses Nos. DPR-38, DPR-47 and DPR-55 for the Oconee Nuclear Station, Units Nos. 1, 2 and 3. The amendments would revise the Oconee Station's common technical specifications to permit the expansion of the spent fuel capacity at the Oconee Units 1 and 2 common spent fuel pool from 336 to 750 storage locations, in accordance with the Licensee's application for amendments dated February 2, 1979. That Notice provided the opportunity to intervene and request a hearing. There was no intervention and no hearing in that proceeding. 44 Fed. Reg. 40457 (July 10, 1979). See: Applicant Exh. 30, at 1 (Bostian Testimony, following Tr. 4799). On September 22, 1980, the (See next page for continuation of footnote)

from 216 to 474 storage racks by the issuance of Amendment No. 14, to the Oconee Unit 3 facility operating license, DPR-55.

B. Parties

On July 28, 1978, the NRC issued a notice of "Opportunity for Public Participation in Proposed NRC Licensing Action for Amendment to Materials License SNM-1773 for Oconee Nuclear Station Spent Fuel Transportation and Storage at McGuire Nuclear Station". This notice provided that persons whose interests might be affected by the Licensee's request could file a petition to intervene and request a hearing (43 Fed. Reg. 32905).

Petitions for leave to intervene were filed in accordance with the above Federal Register notice, and the following parties were admitted as intervening parties pursuant to 10 CFR 2.714: Carolina Environmental Study Group (CESG); Carolina Action (CA); Safe Energy Alliance (SEA); Davidson College Chapter of the North Carolina Public Interest Research Group<sup>3/</sup> (PIRG); and Natural Resources

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<sup>2/</sup> (Continued from page 2)  
Commission issued a "Proposed Issuance of Amendments to Facility Operating Licenses" (45 Fed. Reg. 62948), stating that NRC was considering issuance of amendments to expand Units 1 and 2 spent fuel storage capacity from 750 to 1,312 storage locations. No petitions to intervene or requests for hearing were filed by the October 22, 1980 deadline.

<sup>3/</sup> Duke Power Company (Amendment to Materials License SNM-1773 for Transportation of Spent Fuel From Oconee Nuclear Station for Storage at McGuire Nuclear Station), ALAB-528, 9 NRC 146 (1979). With respect to NRDC and PIRG, see also "Supplemental Order Ruling on Petitions for Leave to Intervene", Duke Power Company (Amendment (See next page for continuation of footnote)

Defense Council (NRDC).<sup>4/</sup> In addition, the State of South Carolina was granted leave to participate as an "interested state" pursuant to 10 CFR 2.715(c).

On February 23, 1979, the Board issued an order admitting Contentions 1-3 of CESG, Carolina Action, and Safe Energy Alliance and Contention 4 of Carolina Action. CA, SEA,<sup>5/</sup> and PIRG were dismissed when they failed to respond to interrogatories, to answer pleadings, or to appear by attorney or pro se at the commencement of the hearing.<sup>6/</sup>

A prehearing conference was held by the Board in Bethesda, Maryland on March 13, 1979 relative to the admission of contentions of NRDC. By Order of March 16, 1979, the six contentions of NRDC were admitted by the Atomic Safety and Licensing Board (Licensing Board).<sup>7/</sup>

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<sup>3/</sup> (Continued from page 3)  
to Materials License SNM-1773 for Oconee Nuclear Station Spent Fuel Transportation and Storage at McGuire Nuclear Station), LBP-79-2, 9 NRC 90 (1979); and LBP-79-3, "Order Denying Objections of Natural Resources Defense Council to Supplemental Prehearing Conference Order," 9 NRC 159 (1979). See Order Following Prehearing Conference dated November 2, 1978.

<sup>4/</sup> A timely petition filed by the Natural Resources Defense Council (NRDC) was denied by the Licensing Board by Order of November 2, 1978. That denial was overturned by the Atomic Safety and Licensing Appeal Board in an unpublished Order entered on February 13, 1979 and the Atomic Safety and Licensing Appeal Board granted intervention to NRDC on a discretionary basis.

<sup>5/</sup> SEA had adopted the CESG contentions as its contentions in this proceeding. Thus, it had no separate contentions that were dropped when it was dismissed from the proceeding.

<sup>6/</sup> See Board Orders, respectively, of May 23, 1979; April 12, 1979 and June 1, 1979, at Tr. 337-38.

<sup>7/</sup> "Order Regarding Contentions of Natural Resources Defense Council" (March 16, 1979).



On December 29, 1978, the Nuclear Regulatory Commission Staff (Staff) issued a "Negative Declaration Regarding Proposed Amendment to Materials License SNM-1773" in Docket No. 70-2623 (43 Fed. Reg. 61057).<sup>8/</sup> Based on the analysis in the Environmental Impact Appraisal (December 1978)<sup>9/</sup> for the proposed amendment, the Negative Declaration stated that an Environmental Impact Statement for the particular action was not warranted. A Safety Evaluation Report (SER) was issued by the Staff in January 1979 on the proposed action examining the health and safety aspects of the proposed action.<sup>10/</sup> It concluded that the issuance of the license amendment would not be inimical to the common defense and security and would not constitute an undue risk to the health and safety of the public. The SER further concluded that the request for the license amendment met the requirements of the Atomic Energy Act of 1954, as amended, and the regulations of the Commission, including specifically 10 CFR §70.23(a).<sup>11/</sup>

Hearings in this proceeding were held in Charlotte, North Carolina on June 23, 1979; June 25-June 29, 1979; August 6-9, 1979; in Bethesda, Maryland on September 10-13, 1979; and in Charlotte, North Carolina on April 28-29, 1980. The hearing record was closed

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<sup>8/</sup> Staff Exh. 35 (Tr. 4651).

<sup>9/</sup> Staff Exh. 3 (Tr. 4649).

<sup>10/</sup> Safety Evaluation Report (SER) Staff Exh. 28 (Tr. 4649).

<sup>11/</sup> Ibid., at 10-1.

on April 29, 1980. All parties of record as of the date of close of the hearing called witnesses and filed proposed findings of fact and conclusions of law.<sup>12/</sup> The State of South Carolina, participating pursuant to the provisions of 10 CFR 2.715(c), did not file proposed findings of fact and conclusions of law.

C. Contentions and Issues

Eleven contentions were initially admitted by the Board in this proceeding.<sup>13/</sup> Two of those contentions were dismissed when the parties raising them were dismissed or defaulted in this proceeding for failure to participate.

An additional contention involving a postulated drop of the truck cask used to transport Oconee spent fuel was admitted by the Licensing Board at the request of CESG at the September 11, 1979 hearing.<sup>14/</sup>

Evidence on the contentions in issue was presented by Duke, by the Staff, and by the Intervenors, NRDC and CESG. Extensive cross-examination of the witnesses of each party was undertaken.

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<sup>12/</sup> "Natural Resources Defense Council's Proposed Findings of Fact and Conclusions of Law in the Form of an Initial Decision" (May 29, 1980); "CESG's Proposed Elements of Fact and Conclusions of Law Toward An Initial Decision" (May 28, 1979).

<sup>13/</sup> "Order Following Prehearing Conference" (November 2, 1978); ALAB-528, *supra*, 9 NRC 146 (1979); "Order Regarding Contentions of Natural Resources Defense Council" (March 16, 1979); "Order Concerning Discovery, Contentions and Scheduling" (February 23, 1979).

<sup>14/</sup> Tr. 4181.

The following contentions were admitted by the Board:

NRDC Contentions

1. The proposed action is a step in a proposed program to handle the shortage of spent fuel storage space by shipping and storing spent fuel away from the reactor where it was generated. The proposed action has no independent value in solving the spent fuel storage problem and is inherently premised on the near-term construction of an interim away-from-reactor storage facility. The proposed action, if taken, will bias the final decision on whether to approve the program by foreclosing at-reactor options at both Oconee and McGuire. The proposed action is therefore inconsistent with the conditions 1 and 2 laid down by the NRC in promulgating the criteria for approval of interim spent fuel storage (40 Fed. Reg. 42801). Thus, the proposed action cannot be acted upon until completion of impact statements on the proposed program now being conducted by DOE (Storage of U. S. Spent Power Reactor Fuel (DOE/EIS-0015-D) August 1978, and Supplement, December 1978; Storage of Foreign Spent Fuel (DOE/EIS-0040-D) December 1978; Preliminary Estimates of the Charge for Spent-Fuel Storage and Disposal Services (DOE/ET-0041-D) December 1978) and NRC (Draft Generic Environmental Impact Statement on Handling Storage of Spent Light Water Power Reactor Fuel (NUREG-0404)) (Tr. 7-48).
2. The proposed action is a major federal action significantly affecting the quality of the human environment and cannot be acted upon until preparation of a final environmental impact statement (Tr. 48-60).
3. The following alternatives to the proposed action have not been adequately considered:
  - a. Using Oconee as a last-on, first-off, base-loaded plant to reduce spent fuel discharge requirements.
  - b. Expanding spent fuel pool capacity at Oconee until the spent fuel can be shipped to a legally approved permanent storage facility for nuclear wastes.
  - c. Compaction of spent fuel in existing pools at Oconee.

4. The proposed action increases the exposure to radiation of workers and the general public beyond what is ALARA:
  - a. ALARA can be achieved by on-site expansion of spent fuel pool storage capacity at Oconee, including building another spent fuel pool.
  - b. The residual health risks which remain even if the present NRC regulations on exposures to workers are met are major costs of the proposed action which tip the balance against the proposed action (Tr. 77-85).
5. Applicant overstates the need for action at this time by using the one-core discharge capacity reserve standard as if it were a requirement where in fact it is not a requirement of NRC regulations. Either Applicant should be bound to comply with the one-core discharge capacity standard or it should have to demonstrate on a cost/benefit basis that holding that capability is more valuable than the costs of shipment off-site of one core of spent fuel (Tr. 85-127).
6. Applicant has failed to demonstrate that it is in compliance with applicable Commission regulations with regard to safeguarding spent fuel shipments.

#### CESG Contentions

1. CESG alleges that shipment of Oconee spent fuel to McGuire for storage is unacceptable as compared to other alternatives:
  - a. Modification of the existing Oconee spent fuel pools to provide additional storage capacity;
  - b. Construction of a new and separate spent fuel storage facility at the Oconee site;
  - c. Construction of a new and separate spent fuel storage facility away from the Oconee site, but other than McGuire.
2. CESG alleges that transportation of spent nuclear fuel from the Oconee Nuclear Station for storage at the McGuire Nuclear Station will create an unacceptable hazard by significantly increasing the radiation doses to persons in the region near the proposed transportation routes between the two facilities. Specifically:

- a. There will be an unacceptable incremental burden of radiation dose to persons living in the vicinity of the transportation routes.
  - b. There will be an unacceptable incremental burden of radiation dose to persons traveling over the transportation routes concurrently with spent fuel shipment.
  - c. There is likely to be an unacceptable incremental burden of radiation dose to persons in the vicinity due to an accident or delay in transit.
- 2A. With respect to case three of the cask drop analysis of Applicant's FSAR, 9.1.2.3.2, submitted involving a postulated cask drop accident at the spent fuel pool, the Applicant's analysis and Staff's review are inadequate. Case three involves tipping or dropping and tipping the cask, located above the floor or in contact with the floor level of the pit wall opposite the fuel pool side.
3. Factors set forth in items 1 and 2 above require the preparation of an Environmental Impact Statement because the proposed action is a major federal action of the Commission significantly affecting the quality of the human environment.

#### D. Motions for Summary Disposition

Motions for Summary Disposition were filed in this case by Duke, the NRC Staff, NRDC and CESC. Duke's Motion for Summary Disposition and Motion to Dismiss for failure to participate in the proceedings were granted by the Board against CA, SEA and the PIRG.<sup>15/</sup> The motions of the Applicant and the Staff with respect to summary disposition of the contentions of NRDC and the contentions of CESC were denied.<sup>16/</sup> The summary disposition motions of NRDC and CESC with respect to their contentions were also denied.<sup>17/</sup>

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<sup>15/</sup> Tr. 594-96.

<sup>16/</sup> Tr. 294-95, 336, 595-96, 596-617.

<sup>17/</sup> Tr. 340-41.

The record in this proceeding consists of all the pleadings filed, the transcripts of the prehearing conference, the transcripts of the evidentiary hearings, and all exhibits received during the course of and after the hearings. A list of exhibits appears in Appendix A attached to this Initial Decision.

In making findings of fact and conclusions of law in this Initial Decision, the Board reviewed and considered the entire record and the proposed findings of fact and conclusions of law submitted by the Staff, by Duke, by NRDC and by CESC. The findings of fact and conclusions of law not incorporated directly or inferentially herein are rejected as being unsupported by the evidence of record, or as unnecessary to the rendering of the Initial Decision.

## II. FINDINGS OF FACT ON CONTROVERTED ISSUES

### A. Cascade Plan

Contention No. 1 of NRDC asserts that the proposed action of Duke is a first step in a proposed program or plan to handle the shortage of spent fuel storage space by shipping and storing spent fuel away from the reactor where it was generated.<sup>18/</sup> The existence and nature of the so-called "Cascade Plan" was the subject of evidence addressed to this contention. Duke denied that it had a cascade program, and contended that the proposed action involved only the shipment of 300 spent fuel assemblies from Oconee to McGuire.<sup>19/</sup>

<sup>18/</sup>Contentions, p. 7, supra.

<sup>19/</sup>Applicant's Proposed Findings of Fact and Conclusions of Law, pp. 20-21, 61-68.

The Staff argued that the proposed transshipment is not part of a larger Duke program for the future storage of spent fuel being generated by operating reactors.<sup>20/</sup>

We find that the proposed action involving the transfer of 300 spent fuel assemblies from Oconee to McGuire, is actually the first step in a plan or program to ship excess spent fuel from older nuclear reactors in Duke's system to newer reactors. This so-called Cascade Plan was developed and that name adopted by Duke about 1975.<sup>21/</sup> Cascading, as defined by Ralph W. Bostian, manager of Duke's spent fuel storage options,<sup>22/</sup> meant "that we would move fuel from an operating reactor to another reactor storage pool and upon perhaps filling of that, on to the next pool."<sup>23/</sup>

Duke generated a number of internal memoranda and documents concerning its Cascade Plan. For example, a cost comparison was prepared October 17, 1978, concerning "Reracking Costs" and "Cascade Costs."<sup>24/</sup> In December 1978, a memorandum on alternatives to keep Oconee operating stated that "Duke's plan to alleviate the problem of an overabundance of spent fuel assemblies, until the government develops a program of its own, is to ship these assemblies to the

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<sup>20/</sup> NRC Staff Proposed Findings of Fact and Conclusions of Law, pp. 27-28, 120-122.

<sup>21/</sup> Tr. 419, 544, 547.

<sup>22/</sup> Tr. 405.

<sup>23/</sup> Tr. 418.

<sup>24/</sup> NRDC Exh. 9; Tr. 1140-47.

most recently completed Duke facility."<sup>25/</sup> In a Duke memorandum dated April 26, 1979, entitled "Subject: Cascade Program Cost", it is stated that "The attached tables show our present transfer plans between Oconee, McGuire and Catawba."<sup>26/</sup>

However, it appears that Duke was somewhat less than candid, if not actively devious, in not disclosing its Cascade Plan to the NRC. At a Duke spent fuel storage review held on August 11, 1976, it was reported that "Transportation aspects should be handled internally and should not be addressed in discussions of expansion plans with NRC.... No mention of the cascade approach in licensing documents."<sup>27/</sup>

Duke's frame of mind is also illuminated in a memorandum to high-ranking corporate officials from R. W. Bostian on November 10, 1977, regarding a letter from Congressman John E. Moss concerning spent fuel storage information. It was observed that an enclosed questionnaire "goes into considerable detail regarding past and future spent fuel storage plans and also touches on spent fuel shipping programs" for each reactor on the Duke system. The memorandum then stated that "A number of the staff people on the [Moss] Subcommittee are antinuclear and it is quite possible that the information requested by the questionnaire could be used by intervenor groups.

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<sup>25/</sup> NRDC Exh. 3; Tr. 1202.

<sup>26/</sup> Tr. 444-51.

<sup>27/</sup> App. Exh. 4; Tr. 1004.



I am particularly concerned that our response to the questionnaire will give information on our shipping program providing for transfer of spent fuel assemblies from Oconee to McGuire and from McGuire and Oconee to Catawba."<sup>28/</sup>

In determining the existence and scope of a Cascade Plan or program involving multiple transshipments of spent fuel assemblies, it is necessary to evaluate the weight of the evidence and the credibility of witnesses and testimony. The Board was also able to observe the appearance and demeanor of witnesses in determining credibility. Duke's denial of a Cascade Plan rested largely on the testimony of a panel of witnesses consisting of Ralph W. Bostian, H. T. Snead and R. M. Glover.<sup>29/</sup> Although these witnesses attempted to deny that Duke had developed and was pursuing the Cascade Plan, we do not find such denials to be credible or persuasive. In some instances, these witnesses attempted to give a strained meaning to such terms as "plan" or "program" in order to avoid their usual meaning in documents.<sup>30/</sup> Such an expression as "our present transfer plans between Oconee, McGuire and Catawba" became very imprecise when the witness who had used the words in a memorandum, sought in

<sup>28/</sup> NRDC Exh. 1; Tr. 441-43.

<sup>29/</sup> Tr. 403 et seq. Mr. Bostian was Manager of the System Results and Fuel Management Group of the Steam Production Department (App. Exh. 3); Mr. Snead was Manager of the Nuclear Fuel Services Section working directly for Mr. Bostian (Tr. 405); and Mr. Glover was an Engineer in the Nuclear Fuel Services Section, reporting directly to Mr. Snead (Tr. 406).

<sup>30/</sup> Tr. 442-43, 451, 504-05.

testimony to avoid their normal meaning.<sup>31/</sup> Such present self-serving characterizations cannot be permitted to distort the plain meaning of various documents.

It is often difficult in litigation to ascertain corporate purpose and intent. We therefore regard the actions approved by a management group on August 11, 1976, reported by a Memorandum For File dated August 16, 1976,<sup>32/</sup> as rather enlightening in this regard. The attendees at this meeting included highest level Duke officers, such as three members of its Executive Committee.<sup>33/</sup> This meeting did not concern the musings or dreams of mid-level employees, but it directly involved Duke's corporate decision-makers. It was thus reported that "Management concurred with the study group recommendation of adding additional spent fuel storage to the system."<sup>34/</sup> The approved method of expanding the Catawba pool was subsequently adopted. It was stated that "If possible, the Perkins and Cherokee units are to be isolated from the remainder of the system as far as spent fuel storage is concerned." However, it was further stated that "Fuel handling equipment at McGuire Nuclear Station should be modified to accept Oconee fuel. In the case of Cherokee and Perkins, contingency plans should be developed."<sup>35/</sup>

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<sup>31/</sup> Tr. 446-51.

<sup>32/</sup> App. Exh. 4; Tr. 1004.

<sup>33/</sup> W. S. Lee, President of Duke; A. C. Thies, Senior Vice President in charge of production; and W. H. Owen, Senior Vice President of engineering and construction, Tr. 476, 634.

<sup>34/</sup> App. Exh. 4.

<sup>35/</sup> Id.

Finally, we draw a strong negative inference from the statements indicating deliberate nondisclosure of these plans to NRC, as described above. Such statements as "Transportation aspects should be handled internally and should not be addressed in discussions of expansion plans with NRC", cannot be glossed over nor ignored by us. And we regard as disingenuous, if not downright misleading under all the circumstances, the further note that "Each plant is expanded solely on the basis of meeting its own need for storage space. No mention of the cascade approach in licensing documents."<sup>36/</sup> Although copies of this Memorandum For File were sent to the attendees and other officers of Duke, there was never any corporate disavowal of its contents, which were thus concurred in by its President and Senior Vice Presidents.<sup>37/</sup> The Cascade Plan, whether revealed to NRC or not, has continued to be a Duke policy or program. The latter-day use of euphemisms such as "keeping our options open"<sup>38/</sup> does not alter the nature and scope of this program.

## B. NEPA Considerations

### 1. Scope of Environmental Analysis

The National Environmental Policy Act of 1969 (NEPA) requires in Section 102(2)(C)<sup>39/</sup> the preparation and circulation of a detailed Environmental Impact Statement on all major Federal actions

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<sup>36/</sup> Id.

<sup>37/</sup> Id.

<sup>38/</sup> Tr. 547-48.

<sup>39/</sup> 42 U.S.C. Section 4332(2)(C).

significantly affecting the quality of the human environment. The Commission's Regulations in 10 CFR Part 51 implement NEPA "in connection with the Commission's licensing and regulatory activities."<sup>40/</sup> It is stated that the "principal objective of [NEPA] is to build into the agency decision making process an appropriate and careful consideration of environmental aspects of proposed actions."<sup>41/</sup> These Regulations further specify types of actions that require either an environmental impact statement, a negative declaration supported by an environmental impact appraisal, or no environmental analysis at all.<sup>42/</sup>

If the proposed action is a major Federal action significantly affecting the quality of the human environment, then there must be a "detailed statement by the responsible official on --

- (i) the environmental impact of the proposed action,
- (ii) any adverse environmental effects which cannot be avoided should the proposal be implemented,
- (iii) alternatives to the proposed action,
- (iv) the relationship between local short term uses of man's environment and the maintenance and enhancement of long term productivity, and

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<sup>40/</sup> 10 CFR Section 51.1(b).

<sup>41/</sup> 10 CFR Section 51.1(a).

<sup>42/</sup> 10 CFR Section 51.5.

- (v) any irreversible and irretrievable commitments of resources which would be involved in the proposed action should it be implemented."<sup>43/</sup>

If the foregoing section of NEPA is applicable, the Commission's Regulations implement its requirements by providing that the NRC Staff prepare and circulate a draft environmental impact statement (DES), followed by publication of a final environmental impact statement (FES).<sup>44/</sup>

NEPA further provides that all agencies of the Federal Government shall "(E) study, develop and describe appropriate alternatives to recommend courses of action in any proposal which involves unresolved conflicts concerning alternative uses of available resources...."<sup>45/</sup> This Section E has been held to complement the provisions of Section 102(2)(C)(iii) above, and to require Federal agencies to consider alternatives without regard to the necessity of filing an environmental impact statement under the latter section.<sup>46/</sup>

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<sup>43/</sup> 42 U.S.C. Section 4332(2)(C).

<sup>44/</sup> 10 CFR Section 51.5.

<sup>45/</sup> Section 102(2)(E), 42 U.S.C. 4332(2)(E). This section was originally enacted as Section 102(2)(D) of NEPA. After adoption of another amendment, this provision although unchanged was renumbered as 102(2)(E).

<sup>46/</sup> Hanly v. Kleindienst, 471 F.2d 823, 834-5 (2nd Cir. 1972), cert. denied 412 U.S. 908 (1973); Trinity Episcopal School Corporation v. Romney, 523 F.2d 88 (2nd Cir. 1975).

In making an evaluation of the environmental impact of proposed action under NEPA, the scope of the environmental statement or appraisal must be at least as broad as the scope of the action being taken.<sup>47/</sup> Thus, in determining whether segments of a federal aid highway project were sufficiently extensive for NEPA evaluation, it has been held that "the EIS must therefore take a pragmatic and realistic view of the scope of the action being contemplated. The view must be one neither confined by the literal limits of the specific proposal nor one unbounded except by the limits of the designer's imagination."<sup>48/</sup>

The Appeal Board has had occasion to consider the question whether "in the totality of present circumstances, both the Staff and the Licenising Boards too narrowly drew the outer boundaries of the safety and environmental inquiries."<sup>49/</sup> The Prairie Island and Vermont Yankee proceeding involved requests to expand spent fuel storage capacity by the installation of new, closer spaced spent fuel racks. The Intervenors contended that there was no reasonable assurance that offsite spent fuel repositories would be available when the facilities' operating life came to an end, and therefore

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<sup>47/</sup> Swain v. Brinegar, 542 F.2d 364, 367 (7th Cir. 1976).

<sup>48/</sup> Id., at 369. See also Indian Lookout Alliance v. Volpe, 484 F.2d 11, 18-20 (8th Cir. 1973); Named Individual Members of San Antonio Conservation Society v. Texas Highway Dept., 446 F.2d 1013 (5th Cir. 1971); Thompson v. Fugate, 347 F. Supp. 120, 124 (E. D. Va. 1972).

<sup>49/</sup> Northern States Power Co. (Prairie Island Nuclear Generating Plant, Units 1 and 2) and Vermont Yankee Nuclear Power Corporation (Vermont Yankee Nuclear Power Station), ALAB-455, 7 NRC 41, 45 (1978).

the safety and environmental assessment must take account of the possibility that the expanded pools would become long term repositories (7 NRC at 46). The Applicants and the NRC Staff insisted there (as in the instant proceeding),

"that we need not go beyond Kleppe v. Sierra Club, 427 U.S. 390 (1976), in quest of that answer. We are reminded that all that the applicants' operating licenses (as amended to enable enlargement of spent fuel pool capacity) authorize is the storage of the spent fuel in the pool for the license term. Any further period of storage would necessitate an additional authorization. We are told that Kleppe teaches that the assessment of the environmental impacts associated with that additional authorization can abide the event of the filing of the application for the authorization. By a parity of reasoning, the safety evaluation could likewise be deferred until that time. We find that line of argument unpersuasive" (7 NRC at 47).

The Appeal Board stated that, based upon the assumption that there would be no offsite spent fuel repositories, the Intervenors were not asking for an appraisal of relative costs and benefits of two different future courses of action (continued onsite storage or offsite shipment). Rather, they sought an evaluation of the unavoidable consequence of the indefinite presence onsite of an increased quantity of spent fuel. The Appeal Board went on to state:

"Upon due recognition of these considerations, it becomes equally apparent that Kleppe is entirely inapposite. What the Supreme Court there held was that, in connection with its proposed issuance of four short term coal mining leases in the Northern Great Plains region, the Department of the Interior was not required by the National Environmental Policy Act to prepare an environmental impact statement on the entire region. In reaching that conclusion, the Court relied on the fact that Section 102(2)(C) of NEPA provides that the statement must be addressed to the environmental impact of the proposed action -- including, inter alia, any adverse environmental effects

which cannot be avoided should the proposal be implemented. There was, of course, no suggestion that implementation of the action proposed by Interior -- the issuance of a limited number of short term coal leases -- might entail environmental impacts of a regional scope. And, as the Court noted, the District Court had expressly found that there was no existing or proposed plan or program on the part of the Federal Government for the regional development of the area described in the [plaintiffs'] complaint. 427 U.S. at 400." (7 NRC at 47-8) (Emphasis Supplied)

As indicated above, Kleppe v. Sierra Club, 427 U.S. 390 (1976), involved the necessity of a regional environmental impact statement regarding the development of coal leasing, where there were impact statements for coal leases on both a local and a national scope. The Court found no evidence that the individual coal development projects proposed by private industry and public utilities were integrated into a regional plan or otherwise interrelated. Where no regional plan existed, there "would be no factual predicate for the production of an environmental impact statement of the type envisioned by NEPA." 427 U.S. at 402. The Court continued at footnote 14:

"In contrast, with both an individual coal-related action and the new national coal leasing program, an agency deals with specific action of known dimensions. With appropriate allowances for the inexactness of all predictive ventures, the agency can analyze the environmental consequences and describe alternatives as envisioned by Section 102(2)(C)...." 427 U.S. at 402.

It has been judicially held that environmental impact statements covering an entire coal lease area may be required where the scope of possible projects could involve environmental consequences, even though each mining plan for tracts within the leased area was to a



significant degree an independent project.<sup>50/</sup> The former Federal Power Commission was required to take into account the environmental costs of a coal gasification project as a whole, even though it had jurisdiction only over a lesser portion of the tap and valve facilities involved.<sup>51/</sup> And an impact statement for the liquid metal fast breeder reactor research and development program as a whole was required by NEPA, rather than simply for individual facilities.<sup>52/</sup>

In the instant proceeding, the Staff erred in limiting its NEPA review and analysis only to the environmental impacts associated with the shipment of 300 spent fuel rods from the Oconee to the McGuire nuclear plant. The proper scope of the environmental review should have been the Cascade Plan of multiple transshipments (Section IIA, supra) and the alternatives to it. The Staff made its environmental evaluation by means of a negative declaration supported by an environmental impact appraisal (EIA), under the provisions of 10 CFR Sections 51.5(c) and 51.7. The appropriateness of this procedure is considered infra in Section IIG.

We have expressly found that this application implementing the Cascade Plan is the first step in a plan or program to transship

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<sup>50/</sup> Cady v. Morton, 527 F.2d 786, 795 (9th Cir. 1975).

<sup>51/</sup> Henry v. FPC, 513 F.2d 395, 407 (D.C. Cir. 1975).

<sup>52/</sup> Scientists' Institute for Public Information, Inc. v. Atomic Energy Commission, 481 F.2d 1079, 1085-93 (D.C. Cir. 1973).  
(SIPI)

excess spent fuel from older to newer reactors in Duke's system.<sup>53/</sup> Duke's plan is to alleviate the problem of excess spent fuel assemblies, "until the government develops a program of its own", by shipping those assemblies to the most recently completed Duke facility.<sup>54/</sup> The existence of the Cascade Plan distinguishes the factual situation in this proceeding from that found by the Court in Kleppe, supra, where the District Court had "expressly found that there was no existing or proposed [regional] plan or program...."<sup>55/</sup> As a result of the Cascade Plan, the proper scope of a NEPA evaluation must be as extensive as the scope of the Cascade Plan itself.<sup>56/</sup>

The Cascade Plan as described by Duke is essentially a transportation plan or program. The scope of the NEPA analysis must therefore be as broad as the program itself, which proposes multiple future transshipments of spent fuel assemblies within the Duke system successively from the older to the newer reactors.<sup>57/</sup> This

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<sup>53/</sup> Section IIA, Cascade Plan, supra.

<sup>54/</sup> NRDC Exh. 3; Tr. 1202.

<sup>55/</sup> Kleppe v. Sierra Club, 427 U.S. 390, 400 (1976).

<sup>56/</sup> Swain v. Brinegar, 542 F.2d 364, 367 (7th Cir. 1976); Northern States Power Company (Prairie Island Nuclear Generating Plant, Units 1 and 2) and Vermont Yankee Nuclear Power Corporation (Vermont Yankee Nuclear Power Station), ALAB-455, 7 NRC 41, 47-48 (1978).

<sup>57/</sup> NRDC Exh. 3 and 9; Tr. 418, 444-451, 1202.

transportation plan or program is like a game of musical chairs, which goes on and on until the government develops and provides nuclear waste storage facilities.<sup>58/</sup> In the meantime, numerous spent fuel assemblies are to be transported by truck on the highways of South Carolina and North Carolina. However, this larger Duke plan or program has not been analyzed as such by the Staff in performing its NEPA review.<sup>59/</sup> The public interest in knowing the full dimensions and implications of such a proposed transportation program has not been satisfied. Such a result is apparently intentional, because the instant limited application for a license amendment to permit shipment of spent fuel from Oconee to McGuire, follows the blueprint set forth in the Duke Memorandum For File dated August 16, 1976.<sup>60/</sup> As there recommended, there is "no mention of the cascade approach in licensing documents." And the admonition that "Transportation aspects should be handled internally and should not be addressed in discussions of expansion plans with NRC", has been sedulously heeded.

Finally, this appears to be the only opportunity for a NEPA review of the entire Cascade highway transportation of spent fuel program. The Staff's witness who was the project manager for the Duke licensing action (Brett S. Spitalny), testified that if the Catawba license application was approved, Catawba in the future could

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<sup>58/</sup> NRDC Exh. 3; Tr. 541-42.

<sup>59/</sup> Tr. 576-79; NRC Staff Proposed Findings of Fact and Conclusions of Law, pp. 27-28, 120-22.

<sup>60/</sup> App. Exh. 4.

receive Oconee spent fuel and there would be no need to have a proceeding such as this.<sup>61/</sup> If NRC is to take the "hard look"<sup>62/</sup> that NEPA is designed to require of Federal decision makers, then it must at some point look at the entire program together with its necessary ramifications. The NRC should not frustrate a fair NEPA review in reasonable depth by permitting any licensee to truncate or fragment the area of inquiry by a crabbed definition of the proposed action.

## 2. Five-Factor Balancing Test

In 1975 the Commission, pointing to a possible future shortage of spent fuel storage capacity, announced its intention to prepare a generic environmental impact statement (GEIS) on the subject to enable it to examine in a broad context the various alternatives for increasing that capacity.<sup>63/</sup> Although noting that the shortage would occur at individual reactors and that the issues involved in alleviating it could be addressed in individual licensing reviews, the Commission determined that "from the standpoint of longer range policy, this matter can profitably be examined in a broader context."<sup>64/</sup>

The Commission also considered whether licensing actions designed "to ameliorate a possible shortage of spent fuel storage capacity, including such actions as the issuance of operating license amendments

<sup>61/</sup> Tr. 588, 590-92; Staff Exh. 16A, at 3.

<sup>62/</sup> Kleppe, *supra*, 427 U.S. at 410, footnote 21; SIPI, *supra*, 481 F.2d at 1086-89; NRDC v. Morton, 458 F.2d 827, 838 (D.C. Cir. 1972).

<sup>63/</sup> Intent to Prepare Generic Environmental Impact Statement on Handling and Storage of Spent Light Water Power Reactor Fuel, 40 Fed. Reg. 42801-02 (September 16, 1975).

<sup>64/</sup> 40 Fed. Reg. at 42802.

to permit increases in the storage capacity of reactor spent fuel pools...or the licensing of independent spent fuel storage facilities" should be deferred pending the issuance of the GEIS.<sup>65/</sup> The Commission concluded that there should be no general deferral of licensing actions, based on its evaluation of the following five specific factors:

- (1) It is likely that each individual licensing action of this type would have a utility that is independent of the utility of other licensing actions of this type;
- (2) It is not likely that the taking of any particular licensing action of this type during the time frame under consideration would constitute a commitment of resources that would tend to significantly foreclose the alternatives available with respect to any other individual licensing action of this type;
- (3) It is likely that any environmental impacts associated with any individual licensing action of this type would be such that they could adequately be addressed within the context of the individual license application without overlooking any cumulative environmental impacts;

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<sup>65/</sup> Ibid.

- (4) It is likely that any technical issues that may arise in the course of a review of an individual license application can be resolved within that context; and
- (5) A deferral or severe restriction on licensing actions of this type would result in substantial harm to the public interest. As indicated, such a restriction or deferral could result in reactor shutdowns as existing spent fuel pools become filled. It now appears that the spent fuel pools of as many as ten reactors could be filled by mid-1978. These ten reactors represent a total of about 6 million kilowatts of electrical energy generating capacity. The removal of these reactors from service could reduce the utilities' service margins to a point where reliable service would be in jeopardy, or force the utilities to rely more heavily on less economical or more polluting forms of generation that would impose economic penalties on consumers and increase environmental impacts."<sup>66/</sup>

It was further stated:

"The Commission expects that any licensing action intended to ameliorate a possible shortage of spent fuel storage capacity during this interim period would be accompanied by an environmental impact statement (10 CFR Section 51.5(a)) or impact appraisal (10 CFR Section 51.5(c)) tailored to the facts

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<sup>66/</sup> Ibid.

of the case. Since the Commission's general conclusions with respect to the five factors, as set forth above, may not fit the factual circumstances of particular licensing actions, the five factors will be applied, weighed and balanced within the context of these statements or appraisals in reaching licensing determinations."<sup>67/</sup>

In order to evaluate the impact of these five factors on the "factual circumstances" of this particular case, we must apply and weigh these factors to the situation as it exists in the real world. The Licensing Board notes that the Staff issued its "Final Generic Environmental Impact Statement on Handling and Storage of Spent Light Water Power Reactor Fuel" (FGEIS), NUREG-0575, in August 1979. However, we further note, as the Applicant points out, that the Commission has not yet acted on this subject.<sup>68/</sup> As the FGEIS itself states, "The Final Environmental Statement prepared by the staff is submitted to the Commission for its consideration" (Foreword, p. i). We also note the Staff's prior position that a June 1, 1979 letter from NRDC counsel to the Commission could postpone "issuance of the final Commission GEIS" to a later date (Nuclear Regulatory Staff Response in Opposition to Natural Resources Defense Council Motion for Suspension of Hearing Schedule, dated June 15, 1979, p. 13). The NRDC June 1, 1979 letter to the Commission challenged the "validity and objectivity of the generic review" by the Staff because of its adversary position in this and other cases. The Commission

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<sup>67/</sup> Ibid. See also Portland General Electric Company (Trojan Nuclear Plant), ALAB-531, 9 NRC 263, 269-71 (1979).

<sup>68/</sup> Applicant's Proposed Findings, p. 5, footnote 3; Applicant's Response to NRDC's Proposed Findings, p. 2, footnote 2.

was therefore requested to act itself upon the final GEIS, working with its General Counsel and the Office of Policy Evaluation (page 5, footnote 2 and attachment to NRDC Motion for Suspension of Hearing Schedule, dated June 1, 1979).<sup>69/</sup> Accordingly, we reject the Staff's argument that its issuance of a proposed FGEIS renders unnecessary any further consideration of the five-factor balancing test.<sup>70/</sup>

a. Independent Utility

The first element to be considered is the Commission's Factor 1, which states:

"It is likely that each individual licensing action of this type would have a utility that is independent of the utility of other licensing actions of this type."

The Commission has addressed this issue of the independent utility of proposed actions in connection with the March 28, 1979 accident at Three Mile Island Unit 2 Nuclear Power Plant (TMI-2).<sup>71/</sup> Substantial amounts of radioactively contaminated waste water had been collected in tanks at the facility. The Staff recommended that the licensee be permitted to operate a filtration and ion exchange decontamination system (EPICOR-II) to decontaminate intermediate-level radioactive waste water held in the auxiliary building tanks.

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<sup>69/</sup> Cf. Commission's Memorandum and Order regarding Metropolitan Edison Company (Three Mile Island Nuclear Station, Unit 2), Docket No. 50-320, (October 16, 1979, Slip Opinion pp. 3-4; CLI-80-25, 11 NRC 781 (1980); Negative Declaration of the Commission, 44 Fed. Reg. 61279 (October 24, 1979).

<sup>70/</sup> Staff's Proposed Findings, pp. 129-30.

<sup>71/</sup> Commission's Memorandum and Order regarding Metropolitan Edison Company (Three Mile Island Nuclear Station, Unit 2), Docket No. 50-320 (October 16, 1979).



The Commission directed the technical staff, pursuant to NEPA, to prepare an environmental assessment of the use of EPICOR-II. At page 4 of the Slip Opinion, the Commission said:

"Based on Commission review of the facts and analysis in the staff's environmental assessment [NUREG-0591] and written and oral discussion of the comments, the Commission has determined that the proposed operation of EPICOR-II will not have a significant effect on the environment. Pursuant to 10 CFR 51.7 and 51.50(d) the staff is directed to issue a negative declaration stating that an environmental impact statement for the proposed action will not be prepared." (See also Negative Declaration of the Commission, 44 Fed. Reg. 61279 (October 24, 1979).)

With respect to the independent utility question, it was further stated:

"In reaching this conclusion the Commission has taken note of comments which argue that the Commission has violated NEPA by considering the impact of EPICOR-II separately and apart from the overall impact of a complete program for decontamination of TMI-2. The Commission does not believe this 'illegal segmentation' argument is well-founded in this case. In meeting NEPA requirements an agency may focus on the impact of a single action, even when it is arguably a segment of a larger program, when the action has independent utility. See e.g., Lookout Alliance v. Volpe, 484 F.2d 11 (8th Cir. 1973); Friends of the Earth v. Coleman, 513 F.2d 295 (9th Cir. 1975). The Commission finds that use of EPICOR-II meets this test." (Slip Opinion, p. 5)

It was noted that the Council on Environmental Quality had found that the prompt decontamination of the intermediate-level waste water through the EPICOR-II system was an operation necessary to control the immediate impacts of an emergency situation (40 CFR Section 1506.11), without passing upon the legality of the Commission's actions under NEPA (Ibid.) The Commission continued:

"The independent utility of EPICOR-II is emphasized by the fact that decontamination of the intermediate-level water appears by a considerable margin to be the best available response to the impending accumulation of intermediate-level waste water in excess of adequately shielded storage capacity.... These benefits of EPICOR-II operation, together with the reduction of occupational exposure to workers in the auxiliary building, establish the independent utility of the system, thereby confirming that pursuant to NEPA environmental aspects of EPICOR-II may be evaluated separately from an overall programmatic analysis of cleanup at TMI-2." (Slip Opinion, pp. 5-7)

Subsequently, the Commission decided to prepare a programmatic environmental impact statement on the decontamination and disposal of radioactive wastes at TMI-2. In its Statement of Policy and Notice of Intent to Prepare a Programmatic Environmental Impact Statement (44 Fed. Reg. 67738 (November 27, 1979)), it stated:

"The Commission does recognize, however, that as with its EPICOR-II approval action, any action taken in the absence of an overall impact statement will lead to arguments that there has been an inadequate environmental analysis, even where the Commission's action itself is supported by an environmental assessment."

The TMI-2 EPICOR-II controversy has also been before the courts. In Susquehanna Valley Alliance v. Three Mile Island, 619 F.2d 231 (3rd Cir. 1980), it was alleged that the NRC, by fragmenting its consideration of the intermediate-level contaminated water without preparing an environmental impact statement, had violated its NEPA duty. The Court of Appeals stated that "Segmentation of a large or cumulative project into smaller components in order to avoid designating the project a major federal action has been held to be unlawful" (Ibid. at 240). The lower court's dismissal of

this court of the complaint for lack of subject matter jurisdiction was held to be in error. However, this holding did not necessarily mean that injunctive relief should be granted on remand, because it "may be that NRC will convince the court that its fragmentation of the contaminated water problem was entirely proper, or at least within the range of permissible agency discretion on the timing of environmental impact statements" (Ibid. at 241). The reviewing court further held that it had no occasion to determine what effect the NRC's November 21, 1979 Statement of Policy and Notice of Intent to Prepare a Programmatic Environmental Impact Statement, supra, might have on the proper disposition of this issue (Ibid. at 242).

The highway segmentation cases have discussed NEPA issues arising from the noncomprehensive consideration of larger highway projects divisible into smaller parts. It has been held that segments that fit into an overall highway plan should be as large as feasible under usual construction and financing practices, and at least have an independent utility by meaningful terminal points.<sup>72/</sup> The scope of an environmental impact evaluation should be at least as broad as the action being taken, and piecemealing should be avoided so that an assessment of the impact will be meaningful.<sup>73/</sup> But if a section of highway has local utility and connects logical

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<sup>72/</sup> Indian Lookout Alliance v. Volpe, 484 F.2d 11, 19 (8th Cir. 1973); Named Individual Members of San Antonio Conservation Society v. Texas Highway Dept., 446 F.2d 1013 (5th Cir. 1971); Thompson v. Fugate, 347 F. Supp. 120 (E.D. Va. 1972).

<sup>73/</sup> Swain v. Brinegar, 542 F.2d 364, 367-68 (7th Cir. 1976).

termini, it is not necessary to have a corridor EIS for a much larger stretch of highway.<sup>74/</sup>

The segmentation of a larger plan or program into smaller components was held to be an evasion of NEPA requirements, where the postal service considered only the impact of constructing a new mail facility about seven miles from an old facility, without considering the environmental impact of abandonment of the old facility.<sup>75/</sup> Environmental impact statements have been required for overall projects where individual actions were related to them logically or geographically.<sup>76/</sup> This was true even where the federal agency only had jurisdiction over a lesser portion of the project.<sup>77/</sup> However, separate phases of large dam projects have been held to be essentially independent, so that impact statements were permitted as to the individual projects.<sup>78/</sup>

The "factual circumstances" in the instant proceeding show that Duke's multiple spent fuel transshipment or Cascade program does not have independent utility within the meaning of Factor 1.

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<sup>74/</sup> Conservation Society of Southern Vermont v. Secretary of Transportation, 531 F.2d 637 (2nd Cir. 1976).

<sup>75/</sup> City of Rochester v. United States Postal Service, 541 F.2d 967, 972-73 (2nd Cir. 1976).

<sup>76/</sup> Susquehanna Valley Alliance v. Three Mile Island, 619 F.2d 231, 240, fn. 11 (3rd Cir. 1980); SIPI, supra, 481 F.2d 1079, 1086-89.

<sup>77/</sup> Henry v. FPC, 513 F.2d 395, 407 (D.C. Cir. 1975).

<sup>78/</sup> Sierra Club v. Froehlke, 534 F.2d 1289 (8th Cir. 1976); Trout Unlimited v. Morton, 509 F.2d 1276 (9th Cir. 1974). See also Friends of the Earth v. Coleman, 513 F.2d 295 (9th Cir. 1975).

The Commission decided that there should be no "general deferral, and that these related licensing actions may continue," for the time required to prepare a generic statement (40 Fed. Reg. at 42802). The "related licensing actions" that may continue were defined as "licensing actions intended to ameliorate a possible shortage of spent fuel storage capacity, including such actions as the issuance of operating license amendments to permit increases in the storage capacity of reactor spent fuel pools or reprocessing plant spent fuel storage pools, or the licensing of independent spent fuel storage facilities" (Ibid.). The three<sup>79/</sup> ameliorative licensing actions included in the above description, wherein the Commission considered the question of deferral, were discussed in the context of the Commission's concern that the "generic impact statement should not serve as a justification for a fait accompli" (40 Fed. Reg. at 42802). The carefully chosen language used by the Commission regarding the avoidance of a fait accompli, is especially apt when applied to the described "related licensing actions", which include the enlargement of spent fuel pool capacity or the construction of independent spent fuel storage facilities. These types of construction could indeed constitute accomplished facts by the time a generic impact statement was approved, if it were not for the

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<sup>79/</sup> On April 7, 1977, President Carter announced the indefinite deferral of all civilian reprocessing of spent nuclear fuel, so the second licensing action described above is not presently available (Tr. 4515). Applicant has a contract with Allied General Nuclear Services to reprocess Oconee spent fuel at the proposed reprocessing plant in Barnwell, South Carolina, Tr. 411 and App. Exh. 2 at p. 1-1.

Commission's general findings of independent utility under Factor 1 and a favorable balancing of the other four factors.

The Commission's reasoning justifying the licensed enlargement of the capacity of spent fuel pools does not appear to be applicable to multiple transshipment schemes such as the Cascade Plan. It is true that in describing the projected generic environmental impact statement, the alternatives to be addressed under paragraph (2) included:

"(d) Storage of spent fuel from one or more reactors at the storage pools of other reactors" (Ibid.).

However, such an alternative to be considered in the generic environmental impact statement was not given the Commission's seal of approval any more than another alternative that immediately followed it, namely:

"(e) Ordering that generation of spent fuel (reactor operation) be stopped or restricted" (Ibid.).

The Duke Cascade Plan, standing alone, does not have independent utility. It merely transports spent fuel from older to newer reactors in sequence, but its utility is interdependent with other factors. While its first step may temporarily remove spent fuel assemblies from Oconee Units 1, 2 and 3, this is accomplished only at the expense of prematurely using up equivalent spent fuel storage space at the McGuire facility. This multiple transshipment process goes on and on, involving the premature using up of storage space at Catawba and possibly the Perkins and Cherokee facilities as well.<sup>80/</sup>

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<sup>80/</sup> App. Exh. 4.

In addition to the interdependence of Oconee and the various other Duke spent fuel pools, the Cascade Plan also depends upon the interim or ultimate availability to Duke of government waste management or storage facilities. As an internal memorandum aptly put it, "Duke's plan to alleviate the problem of an overabundance of spent fuel assemblies, until the government develops a program of its own, is to ship these assemblies to the most recently completed Duke facility."<sup>81/</sup>

The Cascade Plan is essentially a nuclear waste transportation and transshipment program. It does not involve the independent utility of increases in or enlargement of the onsite storage capacity of reactor spent fuel pools, as contemplated by the Commission,<sup>82/</sup> and often approved in NRC proceedings.<sup>83/</sup> As the Commission has stated, there "appear to be a number of possible alternatives for increasing spent fuel storage capacity including, among other things, increasing the storage capacity at present reactor sites, and construction of independent spent fuel storage facilities" (40 Fed. Reg. at 42802). These possible alternatives possess the requisite independent utility; the Cascade Plan does not.

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<sup>81/</sup> NRDC Exh. 3; Tr. 1202, 4763.

<sup>82/</sup> 40 Fed. Reg. at 42802.

<sup>83/</sup> Dairyland Power Cooperative (LaCrosse Boiling Water Reactor), LBP-80-2, 11 NRC 44 (1980); Portland General Electric Company (Trojan Nuclear Plant), ALAB-531, 9 NRC 263 (1979); Northern States Power Company (Prairie Island Nuclear Generating Plant, Units 1 and 2) and Vermont Yankee Power Corporation (Vermont Yankee Nuclear Station), ALAB-455, 7 NRC 41 (1978).

The other type of individual licensing action which would have independent utility under Factor 1 is illustrated by the TMI-2 decision concerning EPICOR-II, supra. There, the decontamination of intermediate-level waste water had the independent utility of reducing or eliminating the radioactivity of the water in the auxiliary building. This prevented the accumulation of waste water in excess of adequately shielded storage capacity, and reduced the occupational exposure to workers in the auxiliary building (Slip Opinion, pp. 6-7). This was independently beneficial, regardless of whatever other programmatic cleanup actions were taken in the future.

Obviously the multiple transshipments of the Cascade Plan do not operate to reduce or eliminate radioactive waste. Transporting spent fuel elements about the country does not significantly alter their form or change their quality. A juggler with many balls in the air may give the illusion of purposeful motion, but the number of balls for which he or she is ultimately responsible is not changed. We hold that the transshipment of spent fuel elements from Oconee to McGuire does not have independent utility under Factor 1.

b. Foreclosure of Alternatives

The Commission's Factor 2 provides:

"It is not likely that the taking of any particular licensing action of this type during the time frame under consideration would constitute a commitment of resources that would tend to significantly foreclose the alternatives available with respect to any other individual licensing action of this type" (40 Fed. Reg. at 42802).



The commitment of both material and nonmaterial resources must be considered in connection with the Duke transshipment plan. Material resources would include spent fuel shipping casks, trucks, fuel, men and materials, use of space and environmental resources (air, aquatic and terrestrial resources), equipment modification, and construction and operation of fixed-base facilities.<sup>84/</sup> While not insignificant, it is not likely that the commitment of such resources in the physical sense would tend to significantly foreclose available alternatives.<sup>85/</sup>

However, it is likely that the Duke plan would foreclose alternatives by the commitment of nonmaterial resources. If transshipments were licensed, it is probable that Duke would simply pursue its Cascade Plan, and would not adopt other alternatives available to it. For example, although reracking of Oconee spent fuel pools was a viable alternative to increase storage capacity,<sup>86/</sup> Duke has always been reluctant to do so. In 1975, it felt that "it was impractical" to rerack the Oconee Units 1 and 2 pool.<sup>87/</sup> In March 1978, Duke asserted that "Since space for interim storage of the fuel in the Oconee 1 and 2 pool is not available this option [reracking] is not considered viable."<sup>88/</sup> But in February 1979,

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<sup>84/</sup> Staff Exh. 16A, pp. 4-5.

<sup>85/</sup> Staff Exh. 3 (EIA), p. 63.

<sup>86/</sup> *Id.*, at 56.

<sup>87/</sup> Tr. 419 (Bostian).

<sup>88/</sup> Information Supporting Storage of Oconee Spent Fuel at McGuire, March 9, 1978, pp. 18-22, cited in NRDC Motion for Suspension of Hearing Schedule, dated June 1, 1979, p. 4.

Duke conceded that "If licensing delays do not extend beyond the June time frame requested reracking can proceed without necessitating shipment of spent fuel off site" (letter to Harold Denton from William O. Parker, Jr., dated February 2, 1979).<sup>89/</sup>

The Staff's Environmental Impact Appraisal (EIA), dated December 1978, stated that such reracking was a viable alternative, but accepted the excuse that the "time required to rerack the basin, 15 months, is greater than the time remaining before the shortage of spent fuel storage space at Oconee impacts on production of electricity."<sup>90/</sup> A Duke witness later testified that "we believed high density racks were a licenseable means of storage in October 1978."<sup>91/</sup>

In spite of those erroneous negative representations and excuses for not taking action, Duke did in fact finally perform the high density reracking of the Oconee Units 1 and 2 spent fuel pool, and prior to November 21, 1979, eleven of the fourteen modules were in place.<sup>92/</sup> Duke is also in the process of seeking an amendment to its Oconee license to authorize installation of poison racks at the Units 1 and 2 pool.<sup>93/</sup>

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<sup>89/</sup> Id., p. 4.

<sup>90/</sup> Staff Exh. 3, pp. 53, 56.

<sup>91/</sup> App. Exh. 30, p. 2 (Bostian).

<sup>92/</sup> App. Exh. 30, p. 1 (Bostian); Applicant's Response to NRDC's Proposed Findings (June 13, 1980), p. 6.

<sup>93/</sup> App. Exh. 30, p. 2.

In a curious twist in reasoning, Duke now asserts that "Clear indications that spent fuel storage options have not been foreclosed are evidenced by Applicant's subsequent application for high density reracking and its stated intent to seek approval of poison reracking for its Oconee Units 1 and 2 pool."<sup>94/</sup> However, the opposite inference appears to be more plausible. These actions demonstrate that it was the lack of a transshipment license approval which compelled Duke, reluctantly and belatedly, to rerack and thereby extend its on-site storage capacity to 1991 (App. Exh. 30).

A decision-date report that was provided to the Licensing Board in the instant proceeding on September 13, 1979, showed that Duke would be at a decision point regarding poison rack installations at Oconee by December 1979. When asked why Duke had decided to seek approval for reracking with poison racks, the Duke witness (Ralph W. Bostian) testified:

"Principally for the same reasons we chose to install high density racks. We were at a key decision point and there were uncertainties associated with the alternatives. As an insurance measure we felt it necessary to take this step. Although it too would be subject to the uncertainties of the licensing process."<sup>95/</sup>

The Staff's witness (Brett S. Spitalny) testified similarly that "As a result of delays in this proceeding and the need to acquire additional storage space, Duke has exercised their option to use these alternatives, as evidenced by their recent actions."<sup>96/</sup>

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<sup>94/</sup> Applicant's Proposed Findings, p. 22, footnote 18; Cf. NRC Staff's Proposed Findings, para. 63, p. 40.

<sup>95/</sup> App. Exh. 30, p. 2. Cf. Tr. 4767.

<sup>96/</sup> Staff Exh. 36, p. 4.

It is thus reasonable to infer that Duke's various reracking decisions have been made reluctantly, as late as possible, and probably under the impact of the perceived "delays" and "uncertainties of the licensing process" in connection with the instant spent fuel transportation proceeding. It is therefore likely that licensing the Duke transshipment plan would tend to significantly foreclose other alternatives, and that the Cascade Plan would be pursued by it as a "quick fix" preferred to other available alternatives.<sup>97/</sup>

c. Cumulative Environmental Impacts

The Commission's Factor 3 states:

"It is likely that any environmental impacts associated with any individual licensing action of this type would be such that they could adequately be addressed within the context of the individual license application without overlooking any cumulative environmental impacts" (40 Fed. Reg. at 42802).

Inasmuch as the evaluation of potential environmental impacts has been limited to the transportation of 300 spent fuel assemblies from Oconee to McGuire, any "cumulative environmental impacts" which could be associated with the Duke Cascade Plan, *supra*, have been overlooked by the Staff within the meaning of Factor 3.<sup>98/</sup> No attempt has been made to address possible cumulative impacts

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<sup>97/</sup> Cf. Commission's Memorandum and Order regarding Metropolitan Edison Company (Three Mile Island Nuclear Station, Unit 2), Docket No. 50-320 (October 16, 1979), Slip Opinion, p. 7, fn. 5; Portland General Electric Company (Trojan Nuclear Plant), ALAB-531, 9 NRC 263, 268 (1979).

<sup>98/</sup> Staff Exh. 3, pp. 63-4; Tr. 576-79; NRC Staff Proposed Findings, pp. 120-22.

associated with future multiple transshipments of spent nuclear fuels, contrary to the requirements of Factor 3.

d. Resolution of Technical Issues

Factor 4 was stated to be:

"It is likely that any technical issues that may arise in the course of a review of an individual license application can be resolved within that context" (40 Fed. Reg. at 42802).

The likelihood that technical issues could not be resolved in the course of a licensing review is not a significant factor, as the projected transshipments do not present technical issues that cannot be resolved in this proceeding.<sup>99/</sup>

e. Risk of Reactor Shutdowns

"A deferral or severe restriction on licensing actions of this type would result in substantial harm to the public interest. As indicated, such a restriction or deferral could result in reactor shutdowns as existing spent fuel pools become filled. It now appears that the spent fuel pools of as many as ten reactors could be filled by mid-1978. These ten reactors represent a total of about 6 million kilowatts of electrical energy generating capacity. The removal of these reactors from service could reduce the utilities' service margins to a point where reliable service would be in jeopardy, or force the utilities to rely more heavily on less economical or more polluting forms of generation that would impose economic penalties on consumers and increase environmental impacts."

Denial of licensing of spent fuel assembly multiple transshipments will not jeopardize the continued operation of the Oconee

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<sup>99/</sup> NRDC's Proposed Findings, p. 14, footnote 11; Applicant's Response to NRDC's Proposed Findings, p. 9.

nuclear facility. Duke has recently completed the installation of eleven modules for the high density reracking at the spent fuel pool for Units 1 and 2.<sup>100/</sup> A decision was made by it not to install the three remaining modules yet because of the likelihood that poison racks would be installed there in the near future, and hence it would be less expensive to rerack once instead of twice.<sup>101/</sup> The effect of this high density reracking is to provide Oconee spent fuel storage capacity until September 1982, including sufficient capacity for a Full Core Reserve (FCR).<sup>102/</sup>

The installation of poison racks for the Oconee 1 and 2 pool has been the subject of the letting of bids by Duke, under which the work is scheduled for completion by March-April 1981, assuming timely regulatory approval. The record does not show any objections to the increase of onsite storage capacity by poison reracking, nor any likelihood of licensing delays. Intervention petitions must be filed by October 22, 1980 (45 Fed. Reg. 62948). This action will provide 1,312 storage locations, which will allow Oconee to maintain FCR storage capacity through November 1986. This modification will also defer loss of all onsite storage to September 1987.<sup>103/</sup> In addition, the poison reracking of Unit 3

<sup>100/</sup> Applicant's Exh. 30.

<sup>101/</sup> Ibid.

<sup>102/</sup> Tr. 4761.

<sup>103/</sup> Staff Exh. 36, p. 4; Licensee Exh. 30, p. 2; Tr. 4750, 4762.

spent fuel pool would extend Oconee FCR storage capacity to April 1991.<sup>104/</sup>

Although Duke contends that offsite transshipment of spent fuel assemblies from Unit 3 is necessary for poison reracking, there is some evidence that onsite transfers from pool 3 to pool 1 and 2 could be accelerated, possibly to 50 transfers in a 25-workday month.<sup>105/</sup> If necessary, the working month could be increased to 30 days. At that rate, poison racks could be installed in pool 3 by the middle of 1983, and storage capacity thereby extended to 1991. It therefore appears that a denial of a transshipment license will not result in a shutdown of the Oconee reactor within the meaning of Factor 5, nor in consequential harm to the public interest.

The Commission further stated, with regard to the five-factor balancing test,

"Since the Commission's general conclusions with respect to the five factors, as set forth above, may not fit the factual circumstances of particular licensing actions, the five factors will be applied, weighed and balanced within the context of these statements or appraisals in reaching licensing determinations" (40 Fed. Reg. at 42802).

In applying the five factors to the circumstances of the instant proceeding, upon balance the Duke multiple transshipment plan should be denied. The licensing action would not have independent utility, and it is likely that it would constitute a commitment of resources that would tend to significantly foreclose available

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<sup>104/</sup> Staff Exh. 36, Enclosure 2.

<sup>105/</sup> Tr. 4779-83.

alternatives. Possible cumulative environmental impacts have not been adequately considered, and a denial of the licensing action would not cause a shutdown of the Oconee reactors.

C. Adequacy of Environmental Impact Appraisal

The Commission's Notice of Intent to Prepare Generic Environmental Impact Statement further provided:

"The Commission expects that any licensing action intended to ameliorate a possible shortage of spent fuel storage capacity during this interim period would be accompanied by an environmental impact statement (10 CFR §51.5(a)) or impact appraisal (10 CFR §51.5(c)) tailored to the facts of the case" (40 Fed. Reg. at 42802).

The Staff determined that an environmental impact statement under NEPA, Section 102(2)(C) need not be prepared because "the impacts will not significantly affect the quality of the human environment."<sup>106/</sup> The Staff therefore prepared only a negative declaration and an environmental impact appraisal (EIA).<sup>107/</sup> However, the Staff failed to take into account or to adequately evaluate certain significant aspects of Duke's multiple transshipment plan, and thereby failed to produce an impact statement "tailored to the facts of the case" (40 Fed. Reg. at 42802).

In the first place, the Staff wholly failed to consider in its EIA the Duke Cascade Plan or multiple transshipment program or scheme. The Staff's witness testified that he was aware of at least some

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<sup>106/</sup> Staff Exh. 3 (EIA), pp. IV and V, 65.

<sup>107/</sup> Ibid.



aspects of the Cascade Plan 6 or 7 months prior to issuance of the EIA, but chose to permit segmentation of the plan by Duke.<sup>108/</sup> However, this decision and the bases for it were not disclosed or discussed in the EIA (Ibid.). The evidence concerning the existence and scope of the Cascade Plan has been discussed above (Sections II, A and B1, pp. 10-24, supra), and will not be repeated here.

Next, the unusual if not unique nature of even the Oconee to McGuire segment of the transshipment plan was not adequately identified or analyzed in the EIA. The proposed transportation of spent fuel assemblies from Oconee to McGuire would involve a distance one way of about 170 miles (270 Km), or a 340-mile round trip for each truck cask.<sup>109/</sup> The Staff assumed that on each trip the "two drivers would probably not spend more than five hours in the truck cab" (EIA, 5.3.1, p. 30). Oddly, the Staff also assumed that each shipment "would travel the 270 km (170 mi) in 6 hours" (Ibid., 5.3.2, p. 31). In any event, it was proposed that 300<sup>110/</sup>

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<sup>108/</sup> Tr. 572-74, 576 (Brett S. Spitalny); Staff Exh. 36, p. 4.

<sup>109/</sup> Staff's Proposed Findings, para. (61), p. 39.

<sup>110/</sup> Duke's application to amend the license (Special Nuclear Materials License SNM-1773) seeks authorization to store 400 spent fuel assemblies from the Oconee facility to the McGuire spent fuel pool (Staff's Proposed Findings, p. 2). However, the Staff's witness testified that it proposed a license condition to limit the number of transported fuel assemblies to 300 (Tr. 572).

such shipments of high-level radioactive waste would be made in the period of one year,<sup>111/</sup> at a frequency of one per day.<sup>112/</sup> The number of round trips between Oconee and McGuire per month for the transportation of spent fuel was testified to be 25.<sup>113/</sup> Duke owns one truck cask, which it intends to use for the 300 shipments of spent fuel assemblies from Oconee to McGuire.<sup>114/</sup>

It is apparent that an unusually intensive shipping program is to be established by Duke. Some 300 shipments are to be made within a year, at the rate of 25 per month. To the extent that the same primary routes are used, this means that every day for a six-day work week for a year, a large truck loaded with a spent fuel cask carrying radioactive materials will pass each house, building or establishment located on that highway. There will be round trips of the spent fuel cask each day in every city, county or rural area through which such routes pass.

The Staff's witnesses testified that spent fuel casks have been allowed in the public transportation system for the past 30 years, and that as of 1972, about 3,600 shipments had been made with two reported highway accidents.<sup>115/</sup> The annual shipping rate for spent fuel in the United States was estimated for 1975 as about 270 shipments per year.<sup>116/</sup>

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<sup>111/</sup> Staff's Proposed Findings, para. 118, p. 69.

<sup>112/</sup> Tr. 571.

<sup>113/</sup> Tr. 4753 (Ralph W. Bostian); 4781 (R. M. Glover).

<sup>114/</sup> Staff Exh. 36, p. 2, Enclosure 1.

<sup>115/</sup> Staff Exh. 9, p. 5.

<sup>116/</sup> Ibid.

At the rate of 300 spent fuel shipments in one year, the Oconee to McGuire transportation alone would be greater than the annual total of all such shipments in the entire country. It would also be almost 10 per cent of all shipments of spent fuel for 30 years prior to 1972. It is likely that such an unusual concentration of shipments in a period of one year might or could intensify some of the risks and problems associated with the transportation of high-level radioactive waste or spent fuel.<sup>117/</sup> However, the EIA does not even identify this unusually intensive use of the public highways in North and South Carolina, let alone analyze it or evaluate its ramifications in relation to possible environmental or safety impacts.

The Commission has indicated that impact statements concerning the handling and storage of spent reactor fuel should include an analysis of "Environmental, social, and economic costs and benefits" (40 Fed. Reg. at 42802). However, the instant EIA does not adequately consider the potential social consequences of transshipment. The social impact categories involved in an analysis of the highway transportation of radioactive materials could reasonably be expected to include psychological, sociological and political impacts.

The question of NRC consideration of community fears and psychological stress under NEPA has assumed special significance

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<sup>117/</sup> Based on the above history of two reported accidents in 3,600 shipments, the probability of a highway accident involving a spent fuel shipment can be calculated to be about  $5.6 \times 10^{-4}$  per shipment. If each of Duke's proposed shipments is exposed to an equal risk, the probability of one accident occurring in 300 shipments would be about  $1.7 \times 10^{-4}$ , or one in six.

following the Three Mile Island accident on March 28, 1979.<sup>118/</sup>  
The Commission considered the subject in a proceeding before it involving a Staff recommendation that the licensee be authorized to commence a controlled purging of TMI-2 reactor building atmosphere in order to remove the remaining radioactive Krypton-85. The Staff had prepared a draft Environmental Assessment, which had received numerous public comments which were included in the final draft. The Commission stated:

"The Environmental Assessment contains ample evidence to show that risk to physical health from the proposed purge or from any of the alternative decontamination methods considered by the staff would be negligible. See Table 1.1, NUREG-0662. The assessment also addresses the effects on the psychological well-being of persons living in the vicinity of TMI. The staff concluded that psychological stress resulting from the proposed venting of Kr-85 will be less than from any of the alternatives including the alternative of taking no action. Testimony at the June 5, 1980 oral briefing by expert consultants on the question of psychological stress supported this conclusion and indicated that purging the containment should have the net effect of reducing the stress which otherwise would occur if positive steps are not taken promptly to proceed with decontamination and reduce uncertainty about the present and future condition of TMI-2" (Ibid. at 783).

The Commission concluded that the purging should be carried out promptly, and the "[p]hysical health impacts will be negligible, and a long term reduction in the sources of psychological stress is

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<sup>118/</sup> Metropolitan Edison Company (Three Mile Island Nuclear Station, Unit 2), CLI-80-25, 11 NRC 781 (1980).

expected."<sup>119/</sup> Although the Commission has not yet acted with finality on the psychological impact issue, we note that the Staff made such a study and evaluation in TMI-2, even where it concluded that an environmental assessment was sufficient and that health risks would be negligible.

In the instant proceeding, there were limited appearance statements from the following local government representatives, organizations and individuals:

Local Government

Charlotte City Council  
County Commissioner of Mecklenburg County  
Gaston County Board of Commissioners  
Gaston County Manager  
Greenville County Council  
Lincoln County, N. C. Board of County Commissioners  
Mayor, Charlotte, North Carolina (Eddie Knox)  
Mayor, Greenville, South Carolina (Max M. Heller)

Organizations

Carolina Action  
Gaston Taxpayer Association  
League of Women Voters of North Carolina  
Palmetto Alliance  
Safe Energy Alliance  
Sierra Club  
Student Legislature of UNCC

Individuals

Belk, Donald R.  
Dalton, H. McRae, Jr.  
Dalton, Rebecca E.  
Douglas, J. Scott

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<sup>119/</sup> Ibid. at 786. In footnote 9, the Commission noted that it has not yet determined whether psychological stress is a health concern under the Atomic Energy Act and/or an environmental impact cognizable under NEPA, and that it is presently considering those issues in connection with the TMI-1 restart proceeding.

Dykes, Virginia  
Ervin, Louise G.  
Kelley, Ella  
Kennerly, Fred M.  
Kiefer, Nancy R.  
McIntosh, W. Guy  
Mando, Anna  
Roberts, Carcos  
Robinson, Faye S.  
Setzer, Bobby R.  
Sife, Mimi  
Sparge, Linda

As the Applicant notes, the primary concerns of those persons related to accidents and the radiological consequences thereof.<sup>120/</sup> Concerns were expressed by governmental bodies through whose territory the spent fuel casks would pass, such as the City of Charlotte and the Counties of Mecklenburg, Lincoln and Gaston. Such limited appearance statements are not evidence and we do not take them as proof of the matters asserted. However, such statements do reflect substantial public interest in and concern over the proposed highway shipments of spent fuel. We do not consider such statements to be read as requiring that "federal law yield to local resolutions", as Duke fears.<sup>121/</sup> But to reflect in an EIA an appropriate appreciation of apprehensions expressed by the public, does not ask too much of the Staff in tailoring its environmental review to the facts in this particular case.

It is interesting to note that a Duke witness (Ralph W. Bostian) testified several times that the changing political climate was a

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<sup>120/</sup> Applicant's Response to CESG's Proposed Findings, p. 3.

<sup>121/</sup> Ibid., at 4.

factor to be considered in evaluating transshipment of spent fuel.<sup>122/</sup>

He testified:

"Question. Can you tell me what are the political considerations you had reference to?

Answer. (Witness Bostian) The political considerations are the local concerns that have been expressed to us by cities and counties along the transfer route.

Question. Are those considerations such that if you could rerack Oconee 1 and 2 in time to not lose full core reserve that you would abandon transshipping between Oconee and McGuire?

Answer. I don't think that I could answer that yes or no at this point. I think we will have to see the implications of the new NRC regulations [concerning safeguards], see to what degree they allay the concerns of the communities through which this will be going. If the opposition that we have seen developing subsides, then we would certainly consider transshipment, but if it continues to develop we would certainly have to consider other alternatives."<sup>123/</sup>

In spite of the logical concern of Duke over these political and social impacts, the EIA does not analyze or adequately consider them. The EIA is inadequate and insufficient to support a negative declaration under NEPA and 10 CFR Sections 51.5, 51.7.

<sup>122/</sup> Tr. 424, 453, 512-13.

<sup>123/</sup> Tr. 454. This testimony was given on June 20, 1979. Most of the limited appearance statements described above were given or filed subsequent to that date.

D. Consideration of Alternatives

The pertinent statutory provisions with regard to consideration of alternatives appear in NEPA, Section 102 (42 U.S.C. Section 4332) as follows:

"The Congress authorizes and directs that, to the fullest extent possible:  
... (2) all agencies of the Federal Government shall --  
... (C) include in every recommendation or report on proposals for legislation and other major Federal actions significantly affecting the quality of the human environment, a detailed statement by the responsible official on -- ... (iii) alternatives to the proposed action, ... (E) study, develop, and describe appropriate alternatives to recommended courses of action in any proposal which involves unresolved conflicts concerning alternative uses of available resources." <sup>124/</sup>

It has been observed that Paragraph (iii) of NEPA, Section 102 (2)(C) "is a terse notation for: 'The alternative ways of accomplishing the objectives of the proposed action and the results of not accomplishing the proposed action.'" <sup>125/</sup> An analysis of such alternatives has been held to be the "linchpin" of environmental analysis. <sup>126/</sup>

<sup>124/</sup> Prior to 1975 (P.L. 94-83), subpart (E) of Section 102(2) was lettered as subpart (D). The wording of the subpart was not changed by that amendment.

<sup>125/</sup> Natural Resources Defense Council, Inc. v. Morton, 458 F.2d 827, 833 (D.C. Cir. 1972).

<sup>126/</sup> United States Energy Research and Development Administration et al. (Clinch River Breeder Reactor Plant), CLI-76-13, 4 NRC 67, 89 (1976). See also Monroe County Conservation Society, Inc. v. Volpe, 472 F.2d 693, 697-98 (2nd Cir. 1972).



The legislative history of NEPA indicates the importance of the consideration of alternatives by the statement that "...the agency shall develop information and provide descriptions of the alternatives in adequate detail for subsequent reviewers and decision makers, both within the executive branch and the Congress, to consider the alternatives along with the principal recommendations."<sup>127/</sup>

The alternatives available here to Duke, in addition to multiple highway transshipments, include compacting spent fuel by reracking Oconee pools with stainless steel racks, or poison racks, or pin compaction, and the construction of an Independent Spent Fuel Storage Installation (ISFSI).

#### 1. Reracking Spent Fuel Pools

Additional spent fuel storage capacity can be obtained at Oconee 1 and 2 pool by reracking with high-density stainless steel racks, to provide 414 additional spaces (Staff Exh. 13, 750-336 = 414). The Staff's EIA states that "This [reracking] option is technically viable but does not meet the immediate needs of the applicant."<sup>128/</sup> That conclusion was based on the EIA statement in 1978 that "The time required to rerack the basin, 15 months, is greater than the time remaining before the shortage of spent fuel storage space at

<sup>127/</sup> S. Rep. No. 91-296, 91st Cong., 1st Sess., 21. See also Trinity Episcopal School Corporation v. Romney, 523 F.2d 88, 93 (2nd Cir. 1975); Hanly v. Kleindienst, 471 F.2d 823, 834-35 (2nd Cir. 1972), cert. denied 412 U.S. 908 (1973); Calvert Cliffs' Coordinating Committee v. AEC, 449 F.2d 1109, 1114 (D. C. Cir. 1971).

<sup>128/</sup> Staff Exh. 3, p. 58.

Oconee impacts on production of electricity" (Ibid. at 53, 56). However, that erroneous conclusion was overtaken by events. The stainless steel reracking option was not only "technically viable," but it was in fact completed by Duke prior to November 21, 1979, as described in Section B2e, pages 41-4, supra.<sup>129/</sup> Thus, the EIA excuse for not adopting this alternative has vanished, and the negative conclusion should likewise vanish. Duke has thereby extended its storage capacity at least to September 1982, including full core reserve. Obviously, this is a preferable alternative because it eliminates any risk, however small, of radioactive releases to the public from the proposed intensive highway transportation of spent fuel.

It also appears that the capacity of Oconee 1 and 2 pool will be further increased to 1,312 spaces by the installation of poison racks for which Duke has already contracted, thereby extending FCR storage capacity to 1991 (Ibid.). There are additional ways to further increase the storage capacity of the Oconee spent fuel pools, including pin compaction and dry storage.<sup>130/</sup> Although these methods were sometimes referred to rather disparagingly by the Staff and Duke as "emerging technologies",<sup>131/</sup> at other times they were

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<sup>129/</sup> Applicant's Exh. 30.

<sup>130/</sup> Applicant's Exh. 3, at 8.

<sup>131/</sup> Tr. 1155-60; Staff's Proposed Findings, pp. 23, 26, fn. 89; Applicant's Proposed Findings, p. 33, fn. 25.

described as promising future developments which could relieve Duke of the necessity to build an ISFSI.<sup>132/</sup> We note that the original testimony herein was subsequently amended to indicate that the Maine Yankee Atomic Power Company has now filed an application for an amendment to its operating license (44 Fed. Reg. 61273), to authorize expansion of its onsite storage capacity through a modified pin storage concept.<sup>133/</sup>

The evidence shows that the expansion of spent fuel storage capacity at Oconee by the various methods discussed above is both viable and preferable to the proposed alternative of intensive highway transportation by truck of the spent fuel assemblies.

## 2. Independent Spent Fuel Storage Installation (ISFSI)

Another alternative or option available to Duke to resolve its spent fuel storage problem is the construction of an independent spent fuel storage installation (ISFSI). This method is one of the alternatives expressly described by the Commission as "licensing actions intended to ameliorate a possible shortage of spent fuel storage capacity."<sup>134/</sup>

There is no dispute that construction of an ISFSI, either onsite or offsite, is feasible and was considered by Duke as an

<sup>132/</sup> Tr. 2806; Staff's Proposed Findings, p. 26; Applicant's Proposed Findings, p. 20.

<sup>133/</sup> Staff Exh. 36, at 2; Applicant's Proposed Findings, p. 33, fn. 25.

<sup>134/</sup> 40 Fed. Reg. at 42802.

alternative.<sup>135/</sup> Although spent fuel storage facilities that are not part of reprocessing plants do not now exist, there have been proposals by private industry to construct and operate them. In 1974, E. R. Johnson Associates, Inc. and Merrill, Lynch, Pierce, Fenner and Smith, Inc. issued a series of joint proposals to a number of electric utility companies, offering to provide such facilities.<sup>136/</sup> That proposed ISFSI project was presented at the American Nuclear Society meeting in November 1975. The construction cost was estimated at \$9,000 per spent fuel assembly (Ibid.).

Stone and Webster had also developed a standard design for an ISFSI which Duke was previously aware of and had evaluated.<sup>137/</sup> The cost was \$10,000 per assembly, not including the costs of additional supporting systems, equipment and structures (Ibid.)

The Staff's estimate for the construction of an ISFSI onsite at Oconee, consisting of 1,500 assemblies, was \$37,500,000 or \$25,000 per assembly. Duke's corresponding estimates were \$51,750,000 or \$34,500 per assembly. An offsite ISFSI of the same capacity was estimated by the Staff at \$38,250,000 or \$27,500 per assembly. Duke's comparable estimate was \$52,488,000 or \$36,961 per assembly.<sup>138/</sup>

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<sup>135/</sup> Staff Exh. 3, at 52.

<sup>136/</sup> Ibid., at 51.

<sup>137/</sup> Tr. 1119-26; NRDC Exh. 4, 5, 10; Staff Exh. 3, at 52 and 58.

<sup>138/</sup> Staff Exh. 13; Staff's Proposed Findings, p. 21.

### 3. Comparison of Alternatives

The EIA does not objectively appraise and evaluate the alternatives available to Duke to avoid extensive highway transshipments of radioactive spent fuel. As discussed above, the EIA persists in concluding that despite reracking options, the "most preferred alternative" is the transshipment of spent fuel.<sup>139/</sup> This conclusion apparently has not changed even though the stated fears of reracking time delays, impacting on electric power generation at Oconee, have proven to be erroneous.<sup>140/</sup> Likewise, the Staff's concerns about reracking costs and occupational exposure appear to have been eliminated by Duke's completed installation of stainless steel high density racks and its firm decision and contract for the installation of poison racks.<sup>141/</sup>

The principal objections to the ISFSI relied on by Duke<sup>142/</sup> and the Staff<sup>143/</sup> concern the projected cost and length of time required for construction. However, there were wide variations in cost estimates for 1,500 assemblies, ranging from \$15,000,000 (Stone & Webster, Staff's Proposed Findings, at 21 and 27), to \$37,500,000 (Ibid., Staff), to \$51,750,000 (Ibid., Duke). These cost estimates have also been put at \$55-61 million dollars by the Staff (Ibid., at

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<sup>139/</sup> Staff Exh. 3, at 53, 56, 57.

<sup>140/</sup> Section IID1, pages 53-5, supra; Applicant's Exh. 30.

<sup>141/</sup> Staff Exh. 3, at 53, 56, 59; Applicant's Exh. 30.

<sup>142/</sup> Applicant's Proposed Findings, pp. 31, 49-50.

<sup>143/</sup> Staff's Exh. 3, at 50-52, 58; Staff's Proposed Findings, pp. 23-27.

23) and by Duke at the same figures (Applicant's Proposed Findings, p. 31) or at \$55,824,000 (Ibid. at 50).<sup>144/</sup>

It appears likely that these various cost figures were bandied about to give an illusion of precision, but that the Staff never gave this matter a "hard look" in depth. Little or no effort was apparently made to explore the Stone & Webster proposals in a meaningful manner. The EIA analysis of the Applicant's construction of an ISFSI was superficial.<sup>145/</sup> The Staff also rather curiously stated, "Moreover, the environmental impacts to the air and aquatic and terrestrial environment resulting from construction of an ISFSI are not evaluated in this proceeding but are likely to be significant."<sup>146/</sup> In any event, in weighing alternatives the cheapest is not necessarily the best or the safest. The cost of an ISFSI was compared to the costs of transshipment, but no consideration was given to comparing such costs to the many hundreds of millions of dollars that Ocoee or other Duke nuclear facilities have cost or will cost.

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<sup>144/</sup> There were further variations in cost estimates for 1,500 assemblies and 2,300 assemblies described by Staff witnesses Clayton L. Pittiglio, Jr. (Staff Exh. 27A, pp. 1, 5), and Darrell A. Nash (Staff Exh. 26A and B). For example, Duke's cost estimate of \$51,689,000 consisted of structure (5,964,000); equipment (\$17,106,000); engineering labor and overhead (\$14,384,000); and unspecified contingencies at 25%; plus interest during construction (\$14,235,000). Duke has the capability of constructing its own nuclear facilities, and of being its own architect/engineer and constructor (Staff Exh. 27A, pp. 1, 5; Applicant's Exh. 7, Table 4).

<sup>145/</sup> Staff Exh. 3, pp. 50-52.

<sup>146/</sup> Staff's Proposed Findings, p. 27, para. 37.

The impact of the time (45-60 months) required to bring an ISFSI on line has also been the subject of horror stories. The EIA assumed that approximately five years would be required for the approval, construction and completion of an ISFSI. On that basis, it then concluded that "The earliest an ISFSI could be built by the applicant is 1984; well beyond the date when storage shortage at Oconee will force its shutdown."<sup>147/</sup> This dire assumption of a shutdown is of course not correct, as reracking can extend Oconee storage capacity to 1991,<sup>148/</sup> but nevertheless the Staff's resolute opposition to an ISFSI alternative has remained steadfast.

The evidence in this proceeding was not persuasive in proving, by statistical analyses or engineering studies, that serious spent fuel transportation accidents or malevolent conduct could not occur. For example, the EIA analysis of possible sabotage of spent fuel in transit was rendered at least partially obsolete and invalid by the Commission's subsequent (June 15, 1979) actions instituting regulations requiring safeguard measures to be applied to spent fuel shipments.<sup>149/</sup> Subsequent to that institution of regulations, the Commission on June 3, 1980 approved additional amendments to the interim regulations, further specified types of safeguards required for spent fuel highway shipments (amendments to 10 CFR Sections 73.1, 73.37, 73.72; Appendix D of 10 CFR Part 73).<sup>150/</sup>

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<sup>147/</sup> Staff Exh. 3, at 52.

<sup>148/</sup> Applicant's Exh. 30. See also Section D1, Reracking Spent Fuel Pools, pp. 53-55, supra.

<sup>149/</sup> 44 Fed. Reg. 34466 (June 15, 1979). See also Staff's Proposed Findings, at 84.

<sup>150/</sup> 45 Fed. Reg. 37399 (June 3, 1980). See also NUREG-0561, Rev. 1.

The factors to be considered in analyzing the risks involved in spent fuel shipments were thus described by the Commission:

"The NRC continually reexamines the adequacy of its regulations for the protection of the public health and safety against deliberate acts. Part of this reexamination consists of studies and research projects. One of these studies, conducted by Sandia Laboratories and published in draft form in May 1978 as SAND-77-1927, concluded that serious public health consequences could result in the event of successful sabotage of a spent fuel shipment in a heavily populated area.... NRC has not pursued quantitative risk studies for safeguards because of extreme difficulty in adequately quantifying the various factors contributing to risk. This view was expressed in the Reactor Safety Study (WASH 1400) and sustained by the Lewis panel's peer review of that document. The Lewis Panel Report (NUREG/CR-0400) states: 'The risk from sabotage was not calculated in the Reactor Safety Study. The omission was deliberate, and proper, because it was recognized that the probability of sabotage of a nuclear power plant cannot be estimated with any confidence.' Similarly, estimates of the probability of successful sabotage of spent fuel shipments cannot be made with any confidence."<sup>151/</sup>

As to the possible consequences of successful sabotage of spent fuel shipments, the Commission further said:

"The Commission frequently uses the concept of risk in its deliberations concerning the need for new regulations and did so in this case. The Commission found that the likelihood of successful sabotage is uncertain inasmuch as the existence of a credible adversary organization cannot be ruled out and the response of spent fuel and spent fuel casks to credible explosive sabotage is subject to large uncertainty. With respect to consequences, it appears that the release of a small fraction of the inventory of a spent fuel cask as respirable particles could produce serious consequences in a heavily populated area."<sup>152/</sup>

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<sup>151/</sup> 45 Fed. Reg. at 37402.

<sup>152/</sup> 45 Fed. Reg. at 37402-403.



Similarly, in analyzing occupational radiation exposures expected to result from the alternatives being considered (transshipment, reracking, or ISFSI) by the Staff, it was indicated that such calculations were substantially lacking in precision or certainty. In this regard the Staff stated:

"There would be no basis, therefore, for concluding that any of the three actions is clearly to be preferred from the point of view of radiation risk because of the inexact nature of the estimating process... Estimates of radiation dose for actions involving handling radioactive materials are very imprecise."<sup>153/</sup>

The risks of truck highway accidents involving some release of radioactive materials likewise cannot be ruled out solely by statistical analyses or engineering studies. It is not enough in weighing alternatives simply to conclude that spent fuel casks "would not breach in most accident situations,"<sup>154/</sup> or that the "probability of the accident occurring is remote,"<sup>155/</sup> or "the likelihood of a severe accident involving a cask is remote."<sup>156/</sup> There have been two reported serious truck accidents in about 3,600 highway shipments of radioactive spent fuel, fortunately neither involving radioactive releases.<sup>157/</sup> The accident probabilities suggested by two highway accidents per 3,600 shipments are not insignificant (Section C, fn. 117, p. 47, supra). The possibility

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<sup>153/</sup> Staff's Proposed Findings, para. 77-78, pp. 48-49.

<sup>154/</sup> Ibid., at para. 132, p. 75.

<sup>155/</sup> Staff Exh. 3, p. 37.

<sup>156/</sup> Staff's Proposed Findings, para 138, p. 78.

<sup>157/</sup> Ibid., at para. 135, p. 77. See also Staff's Exh. 9, at 5-6.

of highway accidents must also be viewed in the context of Duke's intensive shipment schedule of 300 casks in one year from Oconee to McGuire, to say nothing of the larger Cascade Plan.

One of the disturbing characteristics of accidents is that they often involve an unusual combination of low probability factors to produce a wholly unexpected result, as the Three Mile Island accident proved so dramatically and unhappily. Serious accidents unfortunately cannot be warded off by some statistical magic wand, as the very first or second shipment could be that "remotely probable" event. As a responsible regulatory agency, the NRC must be sensitive to public health and safety as well as environmental factors in weighing alternatives. Even Duke's representative took account of social and political impacts involved in licensing the transportation of radioactive nuclear waste. Mr. Ralph W. Bostian testified that local concerns had been expressed to Duke by cities and counties along the transfer route, and that if "the opposition that we have seen developing subsides, then we would certainly consider transshipment, but if it continues to develop we would certainly have to consider other alternatives."<sup>158/</sup> Surely NRC should be no less sensitive in considering alternatives which eliminate highway spent fuel transportation risks.

On balance, the evidence shows that the alternatives of reracking or construction of an ISFSI are preferable to Duke's transshipment proposals, whether involving the Cascade Plan or the one-a-day transportation of 300 casks of spent fuel in one year.

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<sup>158/</sup> Tr. 454.

E. ALARA

One of the questions involved in this proceeding concerns the issue of whether the transshipment action would result in radiation exposures that are not as low as is reasonably achievable (ALARA) when compared to the other spent fuel storage options available to Duke. The ALARA principle is set forth in 10 CFR 20.1(c) as follows:

"In accordance with recommendations of the Federal Radiation Council, approved by the President, persons engaged in activities under licenses issued by the Nuclear Regulatory Commission pursuant to the Atomic Energy Act of 1954, as amended, and the Energy Reorganization Act of 1974 should, in addition to complying with the requirements set forth in this part, make every reasonable effort to maintain radiation exposures, and releases of radioactive materials in effluents to unrestricted areas, as low as is reasonably achievable. The term 'as low as is reasonably achievable' means as low as is reasonably achievable taking into account the state of technology, and the economics of improvements in relation to benefits to the public health and safety, and other societal and socioeconomic considerations, and in relation to the utilization of atomic energy in the public interest."

NRDC raised the ALARA issue by its Contention 4, which stated:

"The proposed action increases the exposure to radiation of workers and the general public beyond what is ALARA.

a. ALARA can be achieved by on-site expansion of spent fuel pool storage capacity at Oconee, including building another spent fuel pool.

b. The residual health risks which remain even if the present NRC regulations, on exposures to workers are met, are major costs of the proposed action which tip the balance against the proposed action" (Tr. 77-85).

As a threshold matter, we consider the arguments of Duke<sup>159/</sup> and the Staff<sup>160/</sup> that the ALARA concept does not apply to the alternatives

<sup>159/</sup> Applicant's Proposed Findings, p. 36-37; Applicant's Response to NRDC's Proposed Findings, pp. 12-13.

<sup>160/</sup> Staff's Proposed Findings, pp. 116-19.

to spent fuel storage, but rather applies only when the appropriate alternative has been selected. All parties cite Northern States Power Co. (Prairie Island Nuclear Generating Plant, Units 1 and 2) and Vermont Yankee Nuclear Power Corporation (Vermont Yankee Nuclear Power Station), ALAB-455, 7 NRC 41 (1978), as supporting their respective positions. Those cases involved the expansion of spent fuel storage capacity by the removal and disposal of the existing fuel storage racks in the pools and the substitution of new racks. The licensing board on its own initiative examined whether the proposed method of rack disposal (racks cut into pieces and placed in drums) met ALARA standards when compared to an alternative method (racks crated and shipped offsite intact). The Appeal Board held that "whether a particular method of rack disposal meets the ALARA test does not hinge entirely upon the existence or nonexistence of some alternative, feasible method which would occasion a lesser amount of radiation exposure" (7 NRC at 56). A footnote further stated that "It bears emphasis that the ALARA standard comes into play only after it has been determined that the applicant's proposal will comply with all other requirements imposed by Part 20, including the absolute limitations on permissible doses, levels and concentrations set forth in 10 CFR 20.101 et seq." (Ibid., fn. 13).

That case does not preclude an ALARA analysis of the viable alternatives here for spent fuel transshipment, namely reracking of Oconee pools or construction of an ISFSI. Rather, ALARA contemplates a comparison with other alternatives to determine whether a proposed

method of handling spent fuel storage does indeed maintain radiation exposures to levels "as low as is reasonably achievable."

Applicant reviewed and estimated the doses associated with the proposed action and the alternatives thereto as follows:

<u>Viable Alternatives</u>	<u>Total Dose (person-rem)</u>	<u>Dose Differences (person-rem)</u>
1. Modification of Existing ONS Spent Fuel Pool, Unit 1-2	84	35
2. Installation of Poison Racks, Units 1, 2 and 3	107	58
3. Construction of Separate Fuel Storage Facility at Oconee	49	0
4. Construction of Separate Fuel Storage Facility away from Oconee but not at McGuire	72	23
5. Shipping/Storage at McGuire	65	16

(Applicant's Exhibit 15, p. 3)

The Staff also evaluated the alternatives to transshipment and storage at McGuire, and applied the guidelines of Regulatory Guide 8.8 (Revision 3, June 1978) ("Information Relevant to Ensuring that Occupational Radiation Exposures at Nuclear Power Stations Will Be As Low As Is Reasonably Achievable"), in its evaluation. The additional options evaluated included reracking the Oconee spent fuel pool with stainless steel racks, reracking the Oconee pools with poison racks, and construction of an ISFSI at the Oconee site. The comparisons of the one-time doses and the doses per year for continued

operation and storage of the spent 300 fuel assemblies were as follows: (Staff Exh. 11A, 11C and 20).

<u>Alternative</u>	<u>ESTIMATED DOSE FROM OPTIONS</u> <u>(Per 300 Fuel Assemblies)</u>	
	<u>One-Time Doses</u>	<u>Doses Per Year</u> <u>Thereafter</u>
Transshipment to McGuire	30 person-rem (handling fuel) 15.6 person-rem (driving) 45.6 person-rem	9.3 person-rem/yr (operating pool)
Re-racking (Oconee pool)	76 person-rem (pool work)	18.6 person-rem/yr (operating pool)
Re-racking Oconee Pool (with poison racks)**	76 person-rem (pool work)	18.6 person-rem/yr (operating pool)
New pool at Oconee	30 person-rem (handling fuel)	9.3 person-rem/yr (operating pool)
New pool at any other site	30 person-rem (handling fuel) 15.6 person-rem (drivers)*	9.3 person-rem/yr (operating pool)

\* Would depend upon distance to be travelled.

\*\* Would involve extensive time delays (Staff Exh. 11-A)

The Staff found that the total man-rem doses projected to result from comparison of the alternatives would be the same general dose range over a period of years, and there is therefore no reason to conclude that any of the actions is clearly to be preferred based on radiation risks. The "inexact nature" of the estimating process produces this result (Staff Exh. 11A, Tr. 2627; Exh. 20). The choices among the alternatives considered must be made on a basis other than radiation doses, since the record shows that the alternatives do not

differ much among themselves in this respect,<sup>161/</sup> because accurate estimates are very difficult to make.<sup>162/</sup>

NRDC's Contention 4.b asserts that there are substantial residual health risks that tip the balance against the proposed action even if the action complies with Commission regulations. Residual health risks from exposure to ionizing radiation are genetic risks and may be expressed in subsequent generations as congenital abnormalities, constitutional and degenerative diseases and other illnesses having some degree of genetic determination. The cancer risk from exposure to ionizing radiation is of concern to NRDC.

The Staff's witnesses testified that the health effects, both somatic and genetic, projected from conservative estimates of dose exposure, either in terms of occupational exposure or in terms of public exposure, would be negligibly small (Staff Exh. 10A, 10B; Tr. 2459, 2627, 3055). Such testimony was based on the assumptions that somatic risks (i.e., the risk of cancer) and a significant portion of the genetic risks of health effects from ionizing radiations, are directly and linearly proportional to radiation dose and dose rate.

Genetic effects for the range of doses involved were based on the 1972 National Academy of Science Report of the Committee on the Biological Effects of Ionizing Radiation (BEIR). The risk of cancer

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<sup>161/</sup> Staff Exh. 20, at 4-5.

<sup>162/</sup> Staff Exh. 11A, at 5; Exh. 20, at 4-5.

was based on updated BEIR-III data. Projections of health risk were based on a range of doses extending from 80 to 150 man-rems for two options, reracking and transshipment. Those doses are quite small (0.2% to 0.3%) compared to the expected normal operational occupational exposure at Oconee Units 1, 2 and 3 over the assumed thirty-year facility lifetime. The testimony showed that the proposed action would not represent a major genetic health cost because of the small number of genetic effects.

GENETIC EFFECTS COMPARISON FOR TWO OPTIONS

<u>Option</u>	<u>Dose (Man-rem)</u>	<u>Genetic Effects First Generation</u>	<u>Total Genetic Effects at Equilibrium</u>
1	80-150	0.002 - .004	0.02 - 0.03
2	120	0.003	0.02

Option 1 is reracking at Oconee.  
Option 2 is transshipment to McGuire.

Even if the dose estimates are low by a factor of 10, it results in a maximum equilibrium estimate of 0.3 effects.<sup>163/</sup>

The cancer effects are projected as:

CANCER CASE COMPARISON FOR TWO OPTIONS  
(Single Exposure)

<u>Option</u>	<u>Dose (Man-rem)</u>	<u>Total Incidence</u>	<u>Fatal</u>
1 (Reracking Oconee)	80-150	.04 - .08	.01 - .02
2 (Transshipment to McGuire)	120	.06	.0002 <sup>164/</sup>

<sup>163/</sup> Staff Exh. 10A, at 3; Table II as revised.

<sup>164/</sup> Staff Exh. 10A, Table IV as revised.



For a single exposure to low-level radiation, the maximum estimate of total cancers, assuming BEIR-III was low by a factor of 10, would be 0.8, and the estimate for fatal cancers would be 0.2. For the reracking case at Oconee and the transshipment to McGuire case, the estimates for total incidence and fatal cancers, and for genetic effects are very low and within the same range (Staff Exh. 10A). Although there is general agreement that a significant proportion of somatic and genetic health risks are directly proportional to the magnitude of the radiation dose, there is controversy over the magnitude of the dose-effect response at low-radiation dose and dose rate. This controversy is based on the results of studies of various exposed populations. These studies report that exposure to low-level radiation may be about an order of magnitude (about 10 times) more effective in producing health effects than the estimates given in the BEIR Report. Applying the factor of 10 to the estimates of genetic effects results in a maximum equilibrium estimate of 0.3 effects. The Staff concludes that, even if the BEIR estimates were low, this action does not represent a major genetic health cost.

Based on the record, the Board finds that there is no basis for NRDC's Contention 4.b since there are virtually no health effects from routine transshipment actions. The somatic effects and genetic effects of uneventful transportation actions are negligible.

#### F. Routine Transportation Dose Impacts

The issue involving projected dose impacts resulting from the routine or uneventful transportation of Oconee spent fuel was raised

by CESG Contention 2. That contention stated:

- "CESG contends that transportation of spent nuclear fuel from the Oconee Nuclear Station for storage at the McGuire Nuclear Station will create an unacceptable hazard by significantly increasing the radiation doses to persons in the region near the proposed transportation routes between the two facilities. Specifically:
- a. There will be an unacceptable incremental burden of radiation dose to persons living in the vicinity of the transportation routes.
  - b. There will be an unacceptable incremental burden of radiation dose to persons traveling over the transportation routes concurrently with spent fuel shipment.
  - c. There is likely to be an unacceptable incremental burden of radiation dose to persons in the vicinity due to an accident or delay in transit."

CESG Contention 2(a)

The Staff testified that the incremental radiation dose from routine transportation to persons living in the vicinity of transportation routes would be small. This radiation dose was calculated with data presented in "Environmental Survey of Transportation of Radioactive Materials to and From Power Plants," WASH 1238. Additional Staff analyses based on "The Transportation of Radioactive Material by Air and Other Modes," NUREG-0170, corroborated the analysis based on WASH 1238. The analysis determined that for 300 shipments passing 42,000 people living near the route, the group dose to the population along the route was 0.1 man-rem, which constitutes 0.0024 percent of the dose received from annual background radiation. This value was not significantly affected by changes in routing due to the application of new safeguards regulations (Staff Exh. 6, 37).

The Staff analyzed the effect of routine transportation upon the maximally dosed individual (called the maximum individual), a person defined as standing 30 meters from the roadway as each of the shipments passed, and determined that such an individual would receive a dose of 0.02 mrem, which is the equivalent of 0.02 percent of the dose received annually from naturally occurring sources. The dose to the maximum individual was affected by changes in routing, as the dose of 0.02 mrem increased to 0.3 mrem due to travel through small towns. This 0.3 mrem dose is equivalent to 0.3 percent of the dose received annually from naturally occurring sources (Staff Exh. 37).

The Staff analyzed the radiation doses to persons present at truck stops at the same time as spent fuel shipments, as CESH Contention 2(a) could be interpreted to include such individuals. A scenario considering a person one meter from the cask for three minutes, a condition not normally expected, was examined. In this instance, the individual would receive a dose of 0.0013 rem, which would be 1.3 percent of the dose received from annual background radiation. This dose is not dependent on routing. The Staff concluded that health effects associated with population doses resulting from routine or uneventful transportation were too small to estimate (Staff Exh. 6, 37).

The Applicant's testimony also stated that doses to the public from routine transportation along the transportation route would be small fractions of the doses received annually from natural background

radiation, and that the health effects associated with radiation doses to persons living in the vicinity of the transportation routes would be small (App. Exh. 8, 9, 12, 15; Tr. 1265, 2877, 1824).

CESG witness Riley testified that, in general, distances between the radioactive source and the public or workers would be smaller than those represented in the Applicant's and Staff's testimony, and radioactive exposures would therefore be larger (CESG Exh. 5, 9). Calculations by Staff of dose to persons along the route assumed the maximum exposed individual at 30 m. distance. CESG testified that there are places of business along interstate 84 which are closer and that habitations along secondary roads are closer (Tr. 2393, 2413-14). The shorter distance was not numerically specified. Even if the maximum individual were postulated to be only three meters from the roadway as each of the 300 shipments passed, the dose to that person would increase by a factor of 100 to 2 mrem. This dose is still only two percent of the dose received annually from naturally occurring sources (Staff Exh. 6, App. Exh. 12).

New Commission regulations became effective dealing with the safeguarding of spent fuel shipments after the filing of the Staff's EIA and its Exhibits 6 and 9 relative to CESG Contention 2. The new safeguards regulations (45 Fed. Reg. 37399), specifically 10 CFR Sections 73.1, 73.37 and 73.72, went into effect on July 3, 1980. Additional testimony was presented discussing the effect of changes in potential routing. The Staff determined that the doses from routine transportation remained similar to those originally developed,

based upon trade-offs in speed of transport, distance traveled, type of roadway and population density along the routes (Staff Exh. 37).

Total estimated doses to the public from routine transport did increase from 0.08 man-rem to as much as 0.3 man-rem, depending on the change in routes. These increases in estimates were mostly due to an increase in dose to persons traveling the same direction as the spent fuel shipments. The largest of these doses, about 0.3 man-rem, represents 0.04 percent of annual background population dose. Routing changes also affected the dose to the maximum individual along the route due to increases in travel through small towns. The dose to this hypothetical individual from 300 shipments would be 0.3 mrem instead of the 0.02 mrem presented in the EIA. The 0.3 mrem dose is equivalent to 0.3 percent of the dose received annually from naturally occurring sources. This dose is within the range of normal fluctuations in background radiation.<sup>165/</sup>

Based on the testimony relative to the effect of changed routing on the issues raised by CESG Contention 2, the Board finds that such routing changes have only a small effect on route-related impacts. The Board finds that the incremental radiation doses from routine transportation both to the population at large and to a postulated maximum individual are small when compared to the dose levels of background radiation which are encountered annually by the population at large. The Board finds that health effects associated with the

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<sup>165/</sup> Staff Exh. 37. See also Applicant's Exh. 24, 25, 32.

small increased doses to persons living in the vicinity of the transportation routes are within acceptable limits, if transshipment is necessary and if there are no preferable alternatives.

CESG Contention 2(b)

The Staff has examined the radiation dose to persons traveling over the transportation routes concurrently with the spent fuel shipments. The doses were calculated based on NUREG-0170, Appendix D. For travel in the direction opposite to that of the shipments, the cumulative population dose, assuming 300 shipments in one year, was calculated to be about 0.04 man-rem. The average dose to an individual per shipment would be 0.00000003 rem, and the dose to a hypothetical individual who passed each of the 300 shipments would be about 0.00001 rem. This latter dose represents about 0.01 percent of the background dose received by such an individual during one year. These impacts are not affected by routing changes (Staff Exh. 6, 37).

The cumulative dose to persons traveling in the same direction and at the same speed as the shipment was calculated to be about 0.8 man-rem. Changes in routing increase this value by a factor ranging from 1.2 to 4, depending on the route analyzed. The increase is due primarily to the slower, closer-following traffic assumed on the alternative routes. The largest of these doses, about 0.3 man-rem, represents 0.04 percent of the annual background population dose. The Staff has examined the case of a car following the spent

fuel shipment at a distance of approximately 100 feet for a period of four hours. The individual dose in this case would be 0.00036 rem per occupant of the vehicle, or 0.36 percent of the dose received from annual background radiation. These values would not be changed by alternative routing.

CESG's witness disagreed with the Staff's assumption for a tail-gater traveling at a separation distance of 100 feet from the spent fuel cask, and testified that the following distance should more nearly approximate 10 feet, producing doses about 100 times those found by the Staff in its EIA (CESG Exh. 5). This was contradicted by CESG's oral testimony that the "following distance" distribution would peak at about 30 to 40 feet (Tr. 2415). This would cause doses a factor of 10 higher than those calculated by the Staff; 3.6 mrem instead of 0.36 mrem to each occupant or approximately 0.36 percent of the annual dose received from naturally occurring sources. Even if this dose were increased by a factor of 100 in CESG's worst case, each occupant would receive 36 mrem if he were to travel 10 feet directly behind the truck carrying the spent fuel cask for a 4-hour period. This dose amounts to approximately 36 percent of the dose received annually from naturally occurring sources.

Forty students in a school bus stopped in a traffic jam alongside a shipment of spent fuel for three hours would receive a total exposure of 3 man-rem (CESG Exh. 5). Cross-examination revealed these calculations to be unrealistic in several respects (Tr. 2430-42).

Based on this record, the Board finds that the radiation doses to persons traveling over the transportation routes concurrently with spent fuel shipments are small when compared with the annual background radiation doses which are received by the population at large. The health effects associated with these doses are correspondingly small and are considered to be within acceptable limits, provided that transshipment is necessary and that there are no preferable alternatives.

CESG Contention 2(c)

The Staff analyzed the increase in radiation doses to persons in the vicinity of a spent fuel shipment during a delay in transit. CESG alleged that such doses would be unacceptably large. The Staff examined the case where a traffic jam occurs, extending for a period of three hours, in an area with a population of 10,000 persons per square mile, uniformly distributed. Population dose in this case would be less than 0.2 man-rem and the maximum exposed individual three meters from the cask would receive a dose of 15 mrem. These doses were calculated applying a regulatory limit of 10 mrem per hour at two meters from the vehicle. Operating experience has indicated that dose rates would be significantly lower. The population dose constitutes 0.02 percent of the dose received from annual background radiation (Staff Exh. 6).

The designs of spent fuel casks are regulated by the Department of Transportation and by the Nuclear Regulatory Commission. Spent



fuel shipping casks are massive, durable, heavy casks. Such casks are generally cylindrical in shape and about 20 feet long. The basic components include a steel inner vessel which contains the fuel elements, which is surrounded by several inches of shielding encased in a steel jacket. Several inches of hydrogenous material, such as water, surround the steel inner jacket and a steel outer jacket completes the package. A cask may also be equipped with sacrificial impact limiters to absorb forces involved in impact accidents (Staff Exh. 9).

The Staff testified that the casks are designed to withstand, without release of radioactive material in excess of the regulatory limits specified in 10 CFR Part 71.36(a)(2), a severe accident damage test sequence simulating the effects of severe impact, puncture, fire and immersion in water as specified in Appendix B of 10 CFR Part 71. The test sequence includes:

- (1) a free fall from a height of 30 feet onto an essentially unyielding horizontal surface, striking the surface in a position for which maximum damage is expected;
- (2) a free drop of 40 inches striking (in a position which is expected to cause maximum damage) the top end of a vertical, cylindrical steel bar six inches in diameter and at least eight inches long, mounted on an essentially unyielding horizontal surface;

- (3) a thermal test in which the cask is exposed to a heat input equivalent to that of an oil fire (1,475 degrees F. for 30 minutes); and
- (4) immersion in water to the extent that all portions of the cask are under at least three feet of water for a period of not less than eight hours. These test conditions provide reasonable assurance that the cask will withstand the most severe transportation accidents without the release of significant radioactivity.

CESG testified that the spent fuel shipping casks that were tested at the Sandia Laboratories were not the same as the casks to be used in the Oconee to McGuire transfer. The design and dimensions of the Sandia-tested casks were different from the NFS-4 (Sandia 77-0270; 77-1462c; Applicant's Exh. 21). The NFS-4 casks have not been subject to any physical tests, including those of 10 CFR Section 70 Appendix A. It was determined analytically that the cask design was adequate to pass the test and meet Certificate No. 6698 requirements. The capacity of the NFS-4 cask to meet these requirements is a matter of engineering judgment, however reasonable (Tr. 1299).

The Board finds there is no real assurance that a severe spent fuel transport accident cannot occur. The NFS-4 shipping casks to be used have not been tested for severe accident conditions.

Consequences of an accident could be significant. Even if it is a "safe" accident, i.e., the radioactive exposure to workers and the public falls within regulatory limits, it could as shown by the TMI experience become a widely publicized media event with serious social, political and economic consequences for the public as well as the entire industry.

#### G. Cask Drop Accident

CESG was permitted to amend its Contention 2 to encompass cask drop accidents. The amendment to Contention 2 reads as follows:

"With respect to case three of the cask drop analysis of Applicant's FSAR 9.1.2.3.2, submitted involving a postulated cask drop accident at the spent fuel pool, the Applicant's analysis and Staff's review are inadequate. Case three involves tipping or dropping and tipping the cask, located above the floor or in contact with the floor level of the pit wall opposite the fuel pool side" (Tr. 4181).

An overhead crane brings the shipping cask to and lowers it into a special water-filled pit near one end of the fuel storage building. Here the fuel assemblies are placed into and taken out of the shipping cask under water used as shielding. It is during this cask handling operation that the question arises of possible inadvertent cask drop into the fuel storage pool. Case three postulates that the cask is dropped so that it catches the far edge of the cask pit and then falls toward the spent fuel pool. Applicant testified that in a case three tipping incident the spent fuel cask would not fall into the spent fuel pool. Administrative controls to be implemented by the Applicant are designed to make it highly unlikely that the

cask would ever be in a position to tip into the storage pool (Applicant's Exh. 27, 28; Tr. 4332-33, 4339-41, 4347).

The Staff has analyzed the cask drop accident for both NFS-4 and NLI-1/2 casks at the McGuire spent fuel pool. The Staff testified it did not have sufficient detail regarding Applicant's calculations to positively confirm the energy-absorbing qualities of the cask and concrete wall to prevent the cask from pivoting about the dividing wall and tipping into the spent fuel pool. The Staff, therefore, accepted an administrative control restricting the traveling path of the cask to ensure that the cask would not fall into the spent fuel pool. The administrative control limits the path of travel such that any drop of the cask would not result in its falling into the spent fuel pit. The Staff proposed a license condition incorporating the administrative control to preclude the possibility of a spent fuel cask entering the spent fuel pool. The license condition proposed by the Staff would read as follows:

"Handling spent fuel at the McGuire Nuclear Facility is limited to the NFS-4 and NLI-1/2 spent fuel casks and crane travel is to be restricted by administrative controls to the path presented in Exhibit 1 when spent fuel casks are being handled" (Staff Exh. 33).

CESG testimony challenged the conclusions reached by the Applicant that, even if the scenario in case three were to happen, i.e., that the crane cable would fail so that the cask is dropped and catches the far edge of the cask pit and then falls forward toward the spent fuel pool, there would be sufficient energy absorption to prevent the cask from falling into the spent pool. In the

initial position least favoring gyration into the pool, about 60% of the potential energy would have to be absorbed to prevent the drop. CESG, after confirming the drop with crude models, built a more dimensionally accurate model, with the exception of a collapsible neutron shield, and found that the cask gyrated into the pool. A demonstration from the least favorable initial position was witnessed by Staff and Applicant. The fall across the fuel pool wall was recorded on videotape. This demonstration confirmed CESG testimony that the situation is sufficiently complex that a model could provide guidance. Cross-examination revealed that there were sufficient differences between the models and the actual cask and walls as to call the results of the test into question (CESG Exh. 13, 15; Tr. 4462-95, 4877-92).

The parties were asked by the Board to provide numerical analyses of the consequences of an assumed incident involving a cask dropped into the McGuire spent fuel pool with respect to (1) the effects of the resulting radioactive releases on the general public and plant operating personnel, and (2) the potential for achieving criticality in the pool. Applicant and Staff provided testimony in this regard (App. Exh. 33 and Staff Exh. 40, 41, 42, 43 and 44).

Applicant testified that there would be local bending of the fuel storage racks when the 25-ton cask dropped into the pool. The Oconee fuel protrudes above the top of the fuel racks and would be damaged by the dropping of the cask. It was determined that approximately sixty fuel assemblies would be damaged resulting in some

radioactive releases to the building and into the atmosphere. Applicant concluded that there would be no offsite radiation exposure in excess of the guidelines of 10 CFR 100, and would be well within the guidelines of that document (App. Exh. 33).

The Staff evaluation showed the possibility of 76 spent fuel assemblies being damaged by the cask drop. The radiological releases would be within 10 CFR Part 100 limits. In addition, the Staff performed analyses for the McGuire spent fuel pool considering both Oconee and McGuire spent fuel assemblies. The Staff examined the potential consequences of damaging 500 Oconee spent fuel assemblies aged for 270 days, as well as the consequences of damaging McGuire spent fuel aged 40 days or one year. In all cases, the potential consequences were fractions of the exposure guidelines of 10 CFR Part 100.

The Staff examined the occupational doses to plant employees in the event of a cask drop accident. Regardless of whether one is postulating the rupture of Oconee or McGuire spent fuel assemblies, the doses to workers would be within the exposure guidelines of 10 CFR Part 100 for accidents (i.e., 25 rem whole body and 300 rem thyroid). For McGuire fuel, which is the worst case, exposure to workers in the vicinity of the spent fuel pool would be less than 100 mrem whole body and less than 300 rem thyroid. The whole body doses would also be a small fraction of the quarterly limit (i.e., 3 rem) for occupational exposure to workers in 10 CFR Part 20 (Staff Exh. 43, 44).

With regard to criticality, Staff witnesses testified that such a hypothetical cask drop incident on Oconee or McGuire spent fuel would result in a  $k$  effective of approximately 0.92, well below the value of 1.0 necessary to achieve criticality. Applicant's testimony with regard to Oconee spent fuel gave a similar result, a  $k$  effective of approximately 0.95. With respect to McGuire new fuel, Staff testified that without taking into account realistic conditions, the  $k$  effective associated with a cask drop of such fuel could be as high as 1.06. However, taking into account the actual situation at the McGuire spent fuel pool, including separation between fuel assemblies, actual enrichment percent of fresh fuel, angle iron separating assemblies, and burnable poisons and considering a 2% factor for uncertainties, the calculations would result in a  $k$  effective of 0.98. Staff testified that a reactor completely shut down has a  $k$  effective of approximately 0.94-0.95. A  $k$  effective of 0.98 is considered a safe value in that each succeeding generation of neutrons would result in a smaller and smaller value of  $k$  effective. The Staff testified that in the event of such an incident, the fuel pins would probably be damaged and the lattice structure of the assemblies would be disrupted, resulting in a large decrease in  $k$  effective. The Staff concluded that even if a cask fell into the McGuire spent fuel pool impacting McGuire fresh fuel, it is highly unlikely that criticality would be achieved (Staff Exh. 40; A- . 33; Tr. 4943-47, 4978-88).

The criticality evaluations depend on the concentration of boron in the spent fuel pool. It was assumed to be 2,000 parts per million (ppm) in their calculations. A decrease by 100 ppm would result in an approximate increase in  $k$  effective of 1%. Hypothetically then, criticality could be achieved if there was a significant reduction in the boron concentration at the same time that the cask fell into the McGuire spent fuel pool, compacting spent fuel contained therein. Applicant's witness testified that the boron concentration in the spent fuel pool is governed by station limits set at 2,000 ppm plus or minus 5 ppm. Surveillance requirements mandate that such concentrations be checked twice a week. Applicant's witness testified that, during the operation of the Oconee Units, the boron concentration in the spent fuel pools has never been out of specification. The McGuire spent fuel pool is essentially the same as the Oconee spent fuel pool, and thus similar results should be expected. Applicant's witness also testified that the only method of lowering the boron concentration would be to dilute the spent fuel pool water with unborated water. However, level alarms on the pool would alert the operator in the event of such an occurrence. Applicant concluded that a decrease in the concentration of boron in the spent fuel pool was highly unlikely. Staff testimony was consistent with this conclusion (Tr. 4973, 4985, 5075-92).

The Board finds that if a spent fuel shipping cask were dropped into the storage pool, at the very least, it would result in a release of radioactivity into the building and the atmosphere. The



evaluations show that resulting worker doses and general population doses are expected to be below regulatory criteria. Nevertheless, such an incident could become a matter of great concern. As to a criticality accident, it would be a close call in the case of dropping the cask on new fuel in storage. It could create a large radioactive mess in an uncontained building. Avoidance of criticality would depend mainly on having the boron level in the pool water (as a neutron absorber or "poison") at or very near the specified level of 2,000 parts per million. A criticality event in an open building could be very serious.

The Board finds that the most effective remedy to avoid these undesirable circumstances would be not to transship the spent fuel. If it must be done in spite of our adverse holding herein, emphasis should be placed on using a physical barrier to positively prevent casks from dropping into the fuel pool.

#### H. Other Contentions

Most of the issues raised by the admitted contentions have been considered above, either directly or by necessary implication. However, the following contentions are specifically addressed here for the sake of completeness of review:

##### NRDC Contention 3

"The following alternatives to the proposed action have not been adequately considered:  
a. The alternative of using Oconee as a last-on, first-off, base loaded plant to reduce spent fuel discharge requirements is not considered.

b. The alleged economic cost of increased purchases of power if Oconee is shut down is speculative because there is insufficient information to justify the conclusion."

Regarding Contention 3(a), Applicant testified that the Oconee units are not designed for cyclic operation, and are constrained by operating limits. The transient thermal conditions shorten the life of the turbine rotors. The build-up of Xenon in the reactor core under these operating conditions has been well documented. The high Xenon level delays the return to full load. From an operating standpoint, the units could not follow the system load, should such an attempt be made. Operation in a cyclical manner would be very costly in terms of system production expense. Operating the Oconee units in base yields the lowest total system production cost. Operation in any other mode requires more energy to be produced from units burning coal, at a considerably higher fuel cost.<sup>166/</sup>

With regard to Contention 3(b), cost of purchased power, Applicant stated that the shutdown of Oconee would become expensive in terms of replacement power in two ways. The energy not produced by Oconee would have to be replaced so far as possible by energy produced from other generating units on the Duke system, which burn either coal or oil. That energy which could not be provided from within the Applicant's system would have to be purchased from sources external to the system.

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<sup>166/</sup> Applicant's Exh. 13, at 3-4.

Based on the evidence regarding NRDC Contention 3a, the Board finds that the Oconee units are not designed for cyclic operation and the alternative of using Oconee as a last-on, first-off plant is not acceptable.

NRDC Contention 5

"Applicant overstates the need for action at this time by using the one-core discharge capacity reserve standard as if it were a requirement where in fact it is not a requirement of NRC regulations. Either Applicant should be bound to comply with the one-core discharge capacity standard or it should have to demonstrate on a cost/benefit basis that holding that capability is more valuable than the costs of shipment off-site of one core of spent fuel" (Tr. 85-127).

Applicant testified that during a three-year period beginning in 1974 all Oconee units made at least one full core discharge. In the absence of four defuelings during that period of time, full core storage space was available and no added cost was incurred for replacement power because of the lack of Full Core Reserve (FCR). In each of these four defuelings, there would not have been a hazard to the public health and safety had the FCR not been available. Had the FCR not been available, the fuel would have remained in the core with the unit out of service until the FCR was restored in the core or sufficient storage space secured elsewhere.

As a general rule, an additional 8,000 tons of coal will be burned each day an Oconee unit is idle if there is sufficient coal-fired capacity in reserve. If not and if purchase power is unavailable, it is then necessary to operate oil-fired combustion turbines. Applicant's twenty-four combustion turbines consume 930,000 gal

The cost to produce the replacement energy can be determined with a considerable degree of certainty. The average variable operating, maintenance and fuel costs for Applicant's base-load units have been calculated to be the following in 1979:<sup>167/</sup>

<u>Unit(s)</u>	<u>Cost in \$/Mwh</u>	
	<u>Variable O &amp; M</u>	<u>1979 Average Fuel</u>
Belews Ck. 1 & 2	.192	12.80
Marshall 1 & 2	.366	16.55
Marshall 3 & 4	.431	16.28
Allen 5	1.082	13.66
Oconee 1, 2 & 3	.525	4.44

The cost to purchase energy is speculative in the sense that Applicant has no contract at present by which such energy could be purchased. However, based on experience with short term power purchases which have been made in the past, a reasonable estimate of the cost of purchased power can be made. The probable cost of firm capacity would be between \$3.25 and \$3.75 per kW-month, plus the cost of energy which would be no less than 20 mills per kWh. Based on an average value of \$3.50 per kW-month, the cost of a one-year contract to replace the Oconee capacity would be \$108,360,000. Assuming a minimum energy cost equal to that of the Applicant's fossil-fuel units, the cost of purchased energy would be \$257,514,000. The total cost of purchased power to replace Oconee for one year would be \$365,874,000. There is no assurance that firm power could be contracted for at any price when needed (Applicant Exh. 13).<sup>168/</sup>

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<sup>167/</sup> Ibid.

<sup>168/</sup> Ibid.

of No. 2 fuel oil per day when operated at full load. Applicant testified that the minimum cost of not operating an Oconee unit is \$165,000 per day (Applicant Exh. 3, 13; Tr. 1677-78).

Applicant testified that it was preferable to maintain a FCR discharge capacity for each unit or for each of the Oconee pools. The current plan is to maintain at least one FCR discharge at each site (Tr. 753, 756, 757, 761, 774, 1036).

The Staff testified that the Commission does not require a full-core reserve capability at a reactor site. It recognizes the benefits of having storage capability such as a full-core reserve, and would encourage the licensee to have it. The NRC previously considered and rejected the addition of a regulation requiring a FCR. None of the postulated situations presented any compelling safety basis for requiring maintenance of a full-core reserve, but lack of such capability could be costly in terms of extended outage time. The benefits from prudent design, in availability of the facility and reduction of man-rem exposures for inspections and repairs, are self evident and the licensing staff points out these benefits to applicants and licensees, but has not established a basis for imposing a requirement to maintain full core reserve fuel storage capability (Tr. 2676-77; Staff Exh. 18A).

The Commission neither requires that utilities maintain an FCR capability, nor prohibits utilities from using an FCR capability to operate their reactors. It is not within the jurisdiction of the

Board to find for or against the requirement of a FCR capability at the Oconee plant. It would not be the basis for selecting any of the alternatives to spent fuel storage expansion.

### III. CONCLUSIONS OF LAW

The Board makes the following Conclusions of Law, based upon the entire record and all the evidence in this proceeding, including our consideration and evaluation of the Staff's Safety Evaluation Report, Environmental Impact Appraisal, and Negative Declaration, and the application for license amendment submitted by Duke on March 9, 1978, the written and oral testimony of all of the witnesses, the answers elicited from those witnesses by questions from the Board and cross-examination by the parties, the exhibits admitted into evidence, the Rules of Practice of the Commission, the Atomic Energy Act of 1954 as amended, the National Environmental Policy Act as amended, and relevant NRC decisions and case law.

1. There is not a reasonable assurance that the activities authorized or encompassed by the license amendment can be conducted without endangering the health and safety of the public.
2. The issuance of the license amendment could be inimical to the health and safety of the public.

3. The issuance of the license amendment and activity thereunder would significantly affect the quality of the human environment, and therefore require the preparation of an environmental impact statement, consideration of alternatives pursuant to Sections 102(2)(C)(iii) and 102(2)(E) and preparation of a cost-benefit balance under the National Environmental Policy Act of 1969 as amended (42 U.S.C. 4332), and Part 51 of the Commission's Regulations (10 CFR, Part 51).
4. The Staff's Environmental Impact Appraisal and Negative Declaration are improperly segmented and unduly limited in scope, inadequate in the consideration of reasonably predictable environmental impacts, and fail to properly evaluate and give weight to preferable alternatives, as required by NEPA and the Commission's Regulations.
5. The appropriate course of action from an environmental and safety viewpoint is the denial of the requested license amendment.

#### IV. ORDER

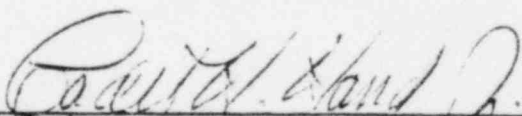
It is ORDERED, in accordance with the Atomic Energy Act as amended, the National Environmental Policy Act as amended, and the Regulations of the Nuclear Regulatory Commission, and based on the

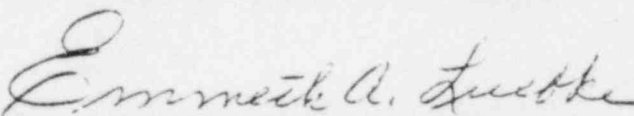
findings of fact and conclusions of law set forth herein, that the requested license amendment be and the same is hereby DENIED.

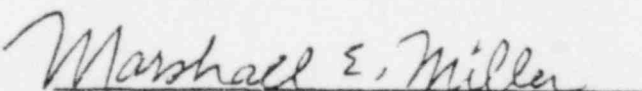
In accordance with 10 CFR 2.760, 2.762, 2.764, 2.785 and 2.786, this Initial Decision shall constitute the final action of the Commission forty-five (45) days after the issuance thereof, subject to any review pursuant to the above-cited Rules of Practice. Exceptions to this Initial Decision may be filed by any party within ten (10) days after service of this Initial Decision. A brief in support of the exceptions shall be filed within thirty (30) days thereafter (forty (40) days in the case of the NRC Staff). Within thirty (30) days of the filing and service of the brief of the appellant (forty (40) days in the case of the NRC Staff), any other party may file a brief in support of, or in opposition to, the exceptions.

IT IS SO ORDERED.

THE ATOMIC SAFETY AND  
LICENSING BOARD

  
Dr. Cadet H. Hand, Jr., Member

  
Dr. Emmeth A. Luebke, Member

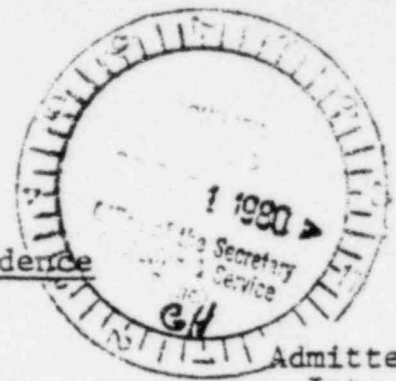
  
Marshall E. Miller, Chairman

Dated at Bethesda, Maryland  
this 31st day of October 1980.



APPENDIX A

List of Exhibits Admitted in Evidence



<u>No.</u>	<u>Applicant Exhibits</u>	<u>Admitted Into Evidence</u>
1	Memorandum from T. L. Bradley to W. O. Parker of June 15, 1979, regarding, "Spent Fuel Storage Study For Oconee and McGuire"	1201
2	Information Supporting Storage of Oconee Spent Fuel at McGuire (March 9, 1978)	651
3	Testimony of Ralph W. Bostian	1062
4	Memorandum of H. T. Sneed of August 16, 1976 regarding, "Spent Fuel Storage Review 8/11/76"	1201
5	"Report to the President by the Interagency Review Group on Nuclear Waste Management (March 1979)"	1053
6	Testimony of S. B. Hager	1236
8	Testimony of Robert H. Jones	1356
9	Testimony of Dr. B. John Garrick	2729
10	Testimony of Roger W. Carlson	1361
11	"Risk Analysis of Transporting Oconee Spent Nuclear Fuel to the McGuire Nuclear Station" prepared by Pickard, Lowe and Garrick, Inc. for Duke Power Company, June 1979	2729
12	Testimony of Dr. Leonard D. Hamilton	1460
13	Testimony of D. H. Sterrett	1704
15	Testimony of Lionel Lewis	1724
16A-P	Survey Worksheets of NRDC	2029
17	Draft Worksheet/rough Notes Concerning Prairie Island Nuclear Plant	2040
18	Letter from Worth Bateman to the Honorable John Dingell (April 4, 1979)	2035

<u>No.</u>	<u>Applicant Exhibits</u>	<u>Admitted Into Evidence</u>
19	October 18, 1977 DOE Information Sheets Regarding Spent Fuel Policy	2278
20	Oconee Capacity Factors	2376
21	Table I Regarding Cask Comparison Figures	2457
22	Stipulation Regarding Testimony of Garrick	2729
23A-H	Applicant Responses to NRC Questions	3723
24	Supplemental Testimony of Dr. Leonard Hamilton	2949
25	Supplemental Testimony of Dr. B. John Garrick	3949
26	Qualifications Statement of C. L. Ray, Jr.	4329
27	Diagram of Truck Cask/Fuel Pool-sketch #3	4329
28	McGuire Nuclear Station Truck Cask Drop Analysis Case #3	4628
29	Letter from W. O. Parker to Harold R. Denton, March 2, 1979	4510
30	Further Supplemental Testimony of Ralph W. Bostian	4799
31	Spent fuel shipping schedule assuming no McGuire shipments, no shipments during refueling or receipt of new fuel at sender or receiver	4799
32	Supplemental Testimony of Lionel Lewis	4804
33	Letter from W. L. Porter to Board with attached Affidavit of S. B. Hager, February 12, 1980	5101
<u>NRC Staff Exhibits</u>		
2	Professional Qualification of Carl B. Sawyer	1465
3	Environmental Impact Appraisal Related to Spent Fuel Storage of Oconee Spent Fuel at McGuire Nuclear Station- Unit 1 Spent Fuel Pool, December 1978	4649
4	Professional Qualifications of C. Vernon Hodge	1515

<u>No.</u>	<u>NRC Staff Exhibits</u>	<u>Admitted Into Evidence</u>
5	Professional Qualifications of Resley D. Glenn	1517
6	Testimony of C. Vernon Hodge and R. Daniel Glenn	1547
7	Errata Sheet Regarding Amendment of Materials License, Duke Power Company Spent Fuel Storage of Oconee Spent Fuel at McGuire Nuclear Station, Unit 1, Docket No. 70-2623	4649
8	Professional Qualifications of Jerry E. Jackson	1551
9	Testimony of C. Vernon Hodge and Jerry E. Jackson	1551
10A	Testimony of Dr. Michael A. Parsont	2627
10B	Professional Qualifications of Dr. Michael A. Parsont	2627
11A	Testimony of Dr. John V. Nehemias	2627
11B	Professional Qualifications of John V. Nehemias	2627
11C	Affidavit of Dr. John V. Nehemias, dated May 11, 1979	2624
12	Regulatory Guide 8.8, Revision 3 (June 1978)	2629
13	Testimony of Brett S. Spitalny and R. Daniel Glenn	3841
15	Statement of Professional Qualifications of Brett S. Spitalny	3841
16A	Testimony of Brett S. Spitalny and John P. Roberts	3841
16B	Statement of Professional Qualifications of John P. Roberts	3841
17A	Testimony of Darrel A. Nash	3841
17B	Testimony of Darrel A. Nash (related to NRDC Contention 3)	3841
17C	Statement of Qualifications of Darrel A. Nash	3841
18A	Testimony of T. Jerrell Carter, Jr.	3841
18B	Professional Qualifications of T. Jerrell Carter, Jr.	3841
19A	Testimony of Brett S. Spitalny	3841

<u>No.</u>	<u>NRC Staff Exhibits</u>	<u>Admitted Into Evidence</u>
19B	Testimony of Brett S. Spitalny and R. Daniel Glenn	3841
19C	Testimony of Brett S. Spitalny and R. Daniel Glenn (related to Contention 1 of CESG)	3841
19D	Testimony of Brett S. Spitalny (related to CESG Contention 3)	3841
20	Testimony of John V. Nehemias	3053
21	Supplemental Testimony of Michael A. Parsont	3054
22	Spitalny Worksheet for Spent Fuel Discharge from Duke Facilities	3841
24	Second Errata Sheet Regarding Amendment of Materials License, Duke Power Company Spent Fuel Storage of Oconee Spent Fuel at McGuire Nuclear Station -- Unit 1, Docket No. 70-2623	4649
25	Diagram of Unit 3 Spent Fuel Pool	3922
26A	Testimony of Darrel A. Nash	3841
26B	Supplemental Testimony of Darrel A. Nash	3841
27A	Testimony of Clayton L. Pittiglio, Jr.	3841
27B	Statement of Professional Qualifications of Clayton L. Pittiglio, Jr.	3841
28	Safety Evaluation Report Related to Spent Fuel Storage of Oconee Spent Fuel at McGuire Station Unit Spent Fuel Pool, Duke Power Company (January 1979)	4649
29	U. S. Nuclear Regulatory Commission Certificate of Compliance, Certificate No. 6698, Revision No. 8	3922
30	Radiation Exposures Associated with Increasing the Storage Capacity of Spent Fuel Pools	4077
31	Professional Qualifications of Richard J. Kiessel	4185
32	Professional Qualifications of Vincent T. H. Leung	4187

<u>No.</u>	<u>NRC Staff Exhibits</u>	<u>Admitted Into Evidence</u>
33	Staff Report Related to Spent Fuel Storage of Oconee Spent Fuel at McGuire Nuclear Station -- Unit 1, Duke Power Company, Docket No. 70-2623	4647
34	Diagram of Fuel Pool Area Cask Route	4458
35	Negative Declaration Regarding Proposed Amendment to Material License SNM-1773, 43 <u>Fed. Reg.</u> 61057 (December 29, 1978)	4651
36	Testimony of Brett S. Spitalny	4855
37	NRC Staff Testimony of R. Daniel Glenn and C. Vernon Hodge	4870
38	NRC Attachment to Testimony of R. Daniel Glenn and C. Vernon Hodge	4870
40	Testimony of Charles R. Morotta	4990
41	Testimony of Edward Lantz	4990
42	Testimony of Dr. Jack N. Donohew	5026
43	Affidavit of Jack N. Donohew (regarding Oconee Fuel in the McGuire Pool)	5026
44	Affidavit of Jack N. Donohew (regarding McGuire Fuel in the McGuire Spent Fuel Pool)	5026

NRDC Exhibits

2	Memorandum of H. T. Sneed (March 23, 1979)	1202
3	Handwritten Memorandum of R. M. Glover (approximate time-frame of writing is December 1978)	1202
5	Handwritten Memorandum of R. Glover (December 8, 1978)	1202
7	Memorandum of R. Michael Glover (April 26, 1979)	1202
8	Handwritten Memorandum of R. Glover (October 17, 1978)	1202

<u>No.</u>	<u>NRDC Exhibits</u>	<u>Admitted Into Evidence</u>
9	Handwritten Memorandum of R. Glover regarding Cost Comparison of Re-racking Oconee Units 1 and 2 Pool with transshipment (October 17, 1978)	1202
10	Letter from Mr. W. Willoughby, II, Stone and Webster Engineering Corporation to Mr. Furman Wardell, Duke Power Company, enclosing Stone and Webster's Interim Spent Fuel Storage Facility Study (September 6, 1978)	1202
12	Handwritten memo of R. Glover (Notes from meeting w/design on reracking) (October 17, 1978)	1202
13A	Brief Resume of Dimitri Rotow	2229
13B	Testimony of Dimitri Rotow	2229
13C	NRDC Findings on the Alleged Need for Acquisition or Construction of an Away from Reactor Spent Fuel Storage Facility	2229
13D	"No Need for AFR's" (May 1, 1979)	2229
14A	Testimony of Arthur R. Tamplin and Thomas B. Cochran	2370
14B	Professional Qualifications of Arthur R. Tamplin	2370
14C	Resume of Thomas B. Cochran, PhD.	2370
15	Testimony of Arthur R. Tamplin, PhD.	2370
16	Testimony of Arthur R. Tamplin (II)	2370
17A	Affidavit of Thomas B. Cochran, PhD. (May 25, 1979)	2370
18	Affidavit of Thomas B. Cochran, PhD. (May 1, 1979)	2370
19	Letter from H. T. Sneed, Duke Power Company, to Worth Bateman, DOE (March 7, 1979)	2368
<u>CESG Exhibits</u>		
2	NRC Inspection Report Nos. 50-269/78-15, 50-270/78-15 and 50-287/78-16 (pages I-VII through I-X)	1735
4	Statement of Professional Qualifications of Jesse L. Riley	2412

<u>No.</u>	<u>CESG Exhibits</u>	<u>Admitted Into Evidence</u>
5	Testimony of Jesse L. Riley (Admitted for limited purpose but not as evidence)	2455
11	Letter from A. Schwencer, NRC, to W. O. Parker, Jr., Duke Power Company (September 10, 1976) and enclosures	4295
13	The Cask Drop Problem, Testimony of Jesse L. Riley	4467
14	Cover letter for group of Amendments No. 38 to the FSAR for McGuire to Mr. Harold R. Denton, NRC (August 31, 1979)	4630
15	Supplemental Testimony of Jesse L. Riley	4911
16	Spent Fuel Shipping Schedule Introduced by Applicant as Applicant Exhibit No. 31 with Handwritten Notes of Jesse L. Riley	5114