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OCTOBER 16 1979

Docket Nos. 50-315
and 50-316

Mr. John Dolan, Vice President
Indiana and Michigan Electric Company
Indiana and Michigan Power Company
Post Office Box 18
Bowling Green Station
New York, New York 10004

REGULATORY DOCKET FILE COPY

Dear Mr. Dolan:

The Commission has issued the enclosed Amendment No. 32 to Facility Operating License No. DPR-58 and Amendment No. 13 to Facility Operating License No. DPR-74 for the Donald C. Cook Nuclear Plant, Unit Nos. 1 and 2, respectively. The amendments consist of changes to the Technical Specifications in response to your application transmitted by letter dated November 22, 1978 as supplemented by letters dated January 22, January 24, April 16, June 29, July 27, September 11, September 26 and September 27, 1979.

These amendments permit modification of the spent fuel pool which will increase the storage capacity for fuel irradiated at D. C. Cook from 550 to 2050 fuel assemblies.

Copies of the Safety Evaluation, Environmental Impact Appraisal and the Notice of Issuance and Negative Declaration are also enclosed.

Sincerely,

Original Signed By

A. Schwencer, Chief
Operating Reactors Branch #1
Division of Operating Reactors

Enclosures:
1. Amendment No. 32 to DPR-58
2. Amendment No. 13 to DPR-74
3. Safety Evaluation
4. Environmental Impact Appraisal
5. Notice of Issuance and Negative Declaration

cc: w/enclosures
See next page

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OCTOBER 16 1979

Docket Nos. 50-315
and 50-316

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Indiana and Michigan Power Company
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SURNAME	DWigginton:jb	CSParrish	ASchwencer	WPGammill	RBLACK
DATE	10/10/79	10/9/79	10/15/79	10/15/79	10/17/79

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

October 16, 1979

Docket Nos. 50-315
and 50-316

Mr. John Dolan, Vice President
Indiana and Michigan Electric Company
Indiana and Michigan Power Company
Post Office Box 18
Bowling Green Station
New York, New York 10004

Dear Mr. Dolan:

The Commission has issued the enclosed Amendment No. 32 to Facility Operating License No. DPR-58 and Amendment No. 13 to Facility Operating License No. DPR-74 for the Donald C. Cook Nuclear Plant, Unit Nos. 1 and 2, respectively. The amendments consist of changes to the Technical Specifications in response to your application transmitted by letter dated November 22, 1978 as supplemented by letters dated January 22, January 24, April 16, June 29, July 27, September 11, September 26 and September 27, 1979.

These amendments permit modification of the spent fuel pool which will increase the storage capacity for fuel irradiated at D. C. Cook from 550 to 2050 fuel assemblies.

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A. Schwencer, Chief
Operating Reactors Branch #1
Division of Operating Reactors

Enclosures:
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3. Safety Evaluation
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5. Notice of Issuance and Negative Declaration

cc: w/enclosures
See next page

7911020 239

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Mr. Wade Schuler, Supervisor
Lake Township
Baroda, Michigan 49101

Mr. William R. Rustem (2)
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City of Bridgman, Michigan 49106

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Office of Radiation Programs (AW-459)
U. S. Environmental Protection Agency
Crystal Mall #2
Arlington, Virginia 20460

U. S. Environmental Protection Agency
Federal Activities Branch
Region V Office
ATTN: EIS COORDINATOR
230 South Dearborn Street
Chicago, Illinois 60604

Maurice S. Reizen, M.D.
Director
Department of Public Health
P. O. Box 30035
Lansing, Michigan 48909

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

INDIANA AND MICHIGAN ELECTRIC COMPANY

INDIANA AND MICHIGAN POWER COMPANY

DOCKET NO. 50-315

DONALD C. COOK NUCLEAR PLANT UNIT NO. 1

AMENDMENT TO FACILITY OPERATING LICENSE

Amendment No. 32
License No. DPR-58

1. The Nuclear Regulatory Commission (the Commission) has found that:

   A. The application for amendment by Indiana and Michigan Electric Company (the licensee) dated November 22, 1978, as supplemented by letters dated January 22, January 24, April 16, June 29, July 27, and September 11, September 26 and September 27, 1979, complies with the standards and requirements of the Atomic Energy Act of 1954, as amended (the Act) and the Commission's rules and regulations set forth in 10 CFR Chapter I;

   B. The facility will operate in conformity with the application, the provisions of the Act, and the rules and regulations of the Commission;

   C. There is reasonable assurance (i) that the activities authorized by this amendment can be conducted without endangering the health and safety of the public, and (ii) that such activities will be conducted in compliance with the Commission's regulations;

   D. The issuance of this amendment will not be inimical to the common defense and security or to the health and safety of the public; and

   E. The issuance of this amendment is in accordance with 10 CFR Part 51 of the Commission's regulations and all applicable requirements have been satisfied.

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2. Accordingly, the license is amended by changes to the Technical Specifications as indicated in the attachment to this license amendment, and paragraph 2.C.(2) of Facility Operating License No. DPR-58 is hereby amended to read as follows:

(2) Technical Specifications

The Technical Specifications contained in Appendices A and B, as revised through Amendment No. 32 , are hereby incorporated in the license. The licensee shall operate the facility in accordance with the Technical Specifications.

(5) Spent Fuel Pool Storage

The licensee is authorized to store D. C. Cook, Unit 1 and Unit 2 fuel assemblies, new or irradiated in any combination, up to a total of 2050 fuel assemblies in the shared spent fuel pool at the Donald C. Cook Nuclear Plant subject to the following conditions:

Fuel stored in the spent fuel pool shall not have an enrichment greater than 3.5% Uranium-235 or a fissile fuel density greater than 44.2 grams of Uranium-235 per axial centimeter of fuel assembly or the reactivity equivalent thereof.

(6) Spent Fuel Pool Modifications

The licensee is authorized to modify the spent fuel pool as described in the application dated November 22, 1978 as supplemented by letters dated January 22, January 24, April 16, June 29, July 27, and September 11, September 26, and September 27, 1979. Since spent fuel is now being stored in the spent fuel pool, upon commencement of work on either the existing racks or the new racks in the spent fuel pool in conjunction with replacement of the existing racks with new racks:

(a) the water in the spent fuel pool shall contain at least 2000 ppm boron and shall be maintained at this boron concentration until completion of the rack replacement; and

(b) the boron in the spent fuel pool shall be verified to meet the concentration requirement by chemical analysis at least 3 times per 7 days, with a maximum time interval between samples of 72 hours.

Prior to final conversion to the modified rack design, fuel may be stored, as needed, in either the modified storage racks described in Technical Specification 5.6.2 or in the unmodified storage racks (or both) which are designed and shall be maintained with a center-to-center distance between fuel assemblies placed in the storage racks to ensure a K_{eff} of ≤ 0.95 with the storage pool filled with unborated water, including a conservative allowance for uncertainties as described in Section 9.7 of the FSAR.

3. This license amendment is effective as of the date of its issuance.

FOR THE NUCLEAR REGULATORY COMMISSION

A. Schwencer, Chief
Operating Reactors Branch #1
Division of Operating Reactors

Attachment:
Changes to the Technical
Specifications

Date of Issuance: October 16, 1979

ATTACHMENT TO LICENSE AMENDMENT NO. 32

FACILITY OPERATING LICENSE NO. DPR-58

DOCKET NO. 50-315

Replace the following pages of the Appendix "A" Technical Specifications with teh enclosed pages. The revised pages are identified by Amendment number and contain vertical lines indicating the area of change. The corresponding overleaf pages are also provided for document completeness.

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DRAINAGE

5.6.3 The spent fuel storage pool is designed and shall be maintained to prevent inadvertent draining of the pool below elevation 629'4".

CAPACITY

5.6.4 The fuel storage pool is designed and shall be maintained with a storage capacity limited to no more than 2050 fuel assemblies.

5.7 SEISMIC CLASSIFICATION

5.7.1 Those structures, systems and components identified as Category I Items in the FSAR shall be designed and maintained to the original design provisions contained in the FSAR with allowance for normal degradation pursuant to the applicant Surveillance Requirements.

5.8 METEOROLOGICAL TOWER LOCATION

5.8.1 The meteorological tower shall be located as shown on Figure 5.1-1.

5.9 COMPONENT CYCLIC OR TRANSIENT LIMIT

5.9.1 The components identified in Table 5.9-1 are designed and shall be maintained within the cyclic or transient limits of Table 5.9-1.

a. In accordance with the code requirements specified in Section 4.1.6 of the FSAR, with allowance for normal degradation pursuant to the applicable Surveillance Requirements,

b. For a pressure of 2485 psig, and

c. For a temperature of 650°F, except for the pressurizer which is 680°F.

VOLUME

5.4.2 The total contained volume of the reactor coolant system is 12,612 ± 100 cubic feet at a nominal T_{avg} of 70°F.

5.5 EMERGENCY CORE COOLING SYSTEMS

5.5.1 The emergency core cooling systems are designed and shall be maintained in accordance with the original design provisions contained in Section 6.2 of the FSAR with allowance for normal degradation pursuant to the applicable Surveillance Requirements.

5.6 FUEL STORAGE

CRITICALITY - SPENT FUEL

5.6.1.1: The spent fuel storage racks are designed and shall be maintained with:

a. A k_{eff} equivalent to less than 0.95 when flooded with unborated water, which includes a conservative allowance of 2.6% delta k/k for uncertainties as described in Section 9.7 of the FSAR.

b. A nominal 10.5 inch center-to-center distance between fuel assemblies placed in the storage racks.

5.6.1.2 Fuel stored in the spent fuel storage racks shall have a maximum fissile fuel density of less than or equal to 44.2 grams of Uranium-235 per axial centimeter of fuel assembly or the reactivity equivalent thereof.

CRITICALITY - NEW FUEL

5.6.2 The new fuel pit storage racks are designed and shall be maintained with a nominal 21 inch center-to-center distance between new fuel assemblies such that k_{eff} will not exceed 0.98 when fuel having a maximum enrichment of 3.5 weight percent U-235 is in place and aqueous foam moderation is assumed.

CRANE TRAVEL - SPENT FUEL STORAGE POOL BUILDING*

LIMITING CONDITION FOR OPERATION

3.9.7 Loads in excess of 2500 pounds shall be prohibited from travel over fuel assemblies in the storage pool. Loads carried over the spent fuel pool and the heights at which they may be carried over racks containing fuel shall be limited in such a way as to preclude impact energies over 24,240 in.-lbs., if the loads are dropped from the crane.

APPLICABILITY: With fuel assemblies in the storage pool.

ACTION:

With the requirements of the above specification not satisfied, place the crane load in a safe condition. The provisions of Specification 3.0.3 are not applicable.

SURVEILLANCE REQUIREMENTS

4.9.7.1 Crane interlocks and physical stops which prevent crane travel with loads in excess of 2500 pounds over fuel assemblies shall be demonstrated OPERABLE within 7 days prior to crane use and at least once per 7 days thereafter during crane operation.

4.9.7.2 The potential impact energy due to dropping the crane's load shall be determined to be $\leq$ 24,240 in.-lbs. prior to moving each load over racks containing fuel.

*Shared system with D.C. Cook - Unit 2.

SURVEILLANCE REQUIREMENTS (Continued)

4.9.6.2 Each auxiliary hoist and associated load indicator used for movement of control rods within the reactor pressure shall be demonstrated OPERABLE within 100 hours prior to the start of such operations by performing a load test of at least 700 pounds.

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UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

INDIANA AND MICHIGAN ELECTRIC COMPANY

INDIANA AND MICHIGAN POWER COMPANY

DOCKET NO. 50-316

DONALD C. COOK NUCLEAR PLANT UNIT NO. 2

AMENDMENT TO FACILITY OPERATING LICENSE

Amendment No. 13
License No. DPR-74

1. The Nuclear Regulatory Commission (the Commission) has found that:

   A. The application for amendment by Indiana and Michigan Electric Company (the licensee) dated November 22, 1978, as supplemented by letters dated January 22, January 24, April 16, June 29, July 27, and September 11, September 26 and September 27, 1979, complies with the standards and requirements of the Atomic Energy Act of 1954, as amended (the Act) and the Commission's rules and regulations set forth in 10 CFR Chapter I;

   B. The facility will operate in conformity with the application, the provisions of the Act, and the rules and regulations of the Commission;

   C. There is reasonable assurance (i) that the activities authorized by this amendment can be conducted without endangering the health and safety of the public, and (ii) that such activities will be conducted in compliance with the Commission's regulations;

   D. The issuance of this amendment will not be inimical to the common defense and security or to the health and safety of the public; and

   E. The issuance of this amendment is in accordance with 10 CFR Part 51 of the Commission's regulations and all applicable requirements have been satisfied.

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2. Accordingly, the license is amended by changes to the Technical Specifications as indicated in the attachment to this license amendment, and paragraph 2.C of Facility Operating License No. DPR-74 is hereby amended to read as follows:

(2) Technical Specifications

The Technical Specifications contained in Appendices A and B, as revised through Amendment No. 13, are hereby incorporated in the license. The licensee shall operate the facility in accordance with the Technical Specifications.

(3) (s) Spent Fuel Pool Storage

The licensee is authorized to store D. C. Cook, Unit 1 and Unit 2 fuel assemblies, new or irradiated in any combination, up to a total of 2050 fuel assemblies in the shared spent fuel pool at the Donald C. Cook Nuclear Plant subject to the following conditions:

Fuel stored in the spent fuel pool shall not have an enrichment greater than 3.5% Uranium-235 or a fissile fuel density greater than 44.2 grams of Uranium-235 per axial centimeter of fuel assembly or the reactivity equivalent thereof.

(3) (t) Spent Fuel Pool Modifications

The licensee is authorized to modify the spent fuel pool as described in the application dated November 22, 1978 as supplemented by letters dated January 22, January 24, April 16, June 29, July 27, and September 11, September 26, and September 27, 1979. Since spent fuel is now being stored in the spent fuel pool, upon commencement of work on either the existing racks or the new racks in the spent fuel pool in conjunction with replacement of the existing racks with new racks:

(i) the water in the spent fuel pool shall contain at least 2000 ppm boron and shall be maintained at this boron concentration until completion of the rack replacement; and

(ii) the boron in the spent fuel pool shall be verified to meet the concentration requirement by chemical analysis at least 3 times per 7 days, with a maximum time interval between samples of 72 hours.

Prior to final conversion to the modified rack design, fuel may be stored, as needed, in either the modified storage racks described in Technical Specification 5.6.2 or in the unmodified storage racks (or both) which are designed and shall be maintained with a center-to-center distance between fuel assemblies placed in the storage racks to ensure a K_{eff} of ≤ 0.95 with the storage pool filled with unborated water, including a conservative allowance for uncertainties as described in Section 9.7 of the FSAR.

3. This license amendment is effective as of the date of its issuance.

FOR THE NUCLEAR REGULATORY COMMISSION

A. Schwencer

A. Schwencer, Chief
Operating Reactors Branch #1
Division of Operating Reactors

Attachment:
Changes to the Technical
Specifications

Date of Issuance: October 16, 1979

ATTACHMENT TO LICENSE AMENDMENT NO. 13

FACILITY OPERATING LICENSE NO. DPR-74

DOCKET NO. 50-316

Replace the following pages of the Appendix "A" Technical Specifications with the enclosed pages. The revised pages are identified by Amendment number of contain vertical lines indicating the area of change. The corresponding overleaf pages are also provided to maintain document completeness.

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CRANE TRAVEL - SPENT FUEL STORAGE POOL BUILDING*

LIMITING CONDITION FOR OPERATION

3.9.7 Loads in excess of 2,500 pounds shall be prohibited from travel over fuel assemblies in the storage pool. Loads carried over the spent fuel pool and the heights at which they may be carried over racks containing fuel shall be limited in such a way as to preclude impact energies over 24,240 in.-lbs., if the loads are dropped from the crane.

APPLICABILITY: With fuel assemblies in the storage pool.

ACTION:

With the requirements of the above specification not satisfied, place the crane load in a safe condition. The provisions of Specification 3.0.3 are not applicable.

SURVEILLANCE REQUIREMENTS

4.9.7.1 Crane interlocks and physical stops which prevent crane travel with loads in excess of 2,500 pounds over fuel assemblies shall be demonstrated OPERABLE within 7 days prior to crane use and at least once per 7 days thereafter during crane operation.

4.9.7.2 The potential impact energy due to dropping the crane's load shall be determined to be $\leq$ 24,240 in.-lbs. prior to moving each load over racks containing fuel.

*Shared system with D. C. COOK - UNIT 1

COOLANT CIRCULATION

LIMITING CONDITION FOR OPERATION

3.9.8 At least one residual heat removal loop shall be in operation.

APPLICABILITY: MODE 6.

ACTION:

a. With less than one residual heat removal loop in operation, except as provided in b. below, suspend all operations involving an increase in the reactor decay heat load or a reduction in boron concentration of the Reactor Coolant System. Close all containment penetrations providing direct access from the containment atmosphere to the outside atmosphere within 4 hours.

b. The residual heat removal loop may be removed from operation for up to 1 hour per 8 hour period during the performance of CORE ALTERATIONS in the vicinity of the reactor pressure vessel hot legs.

c. The provisions of Specification 3.0.3 are not applicable.

SURVEILLANCE REQUIREMENTS

4.9.8 A residual heat removal loop shall be determined to be in operation and circulating reactor coolant at a flow rate of $\geq$ 3000 gpm at least once per 24 hours.

VOLUME

5.4.2 The total water and steam volume of the reactor coolant system is 12,612 ± 100 cubic feet at a nominal T_{avg} of 70°F.

5.5 METEOROLOGICAL TOWER LOCATION

5.5.1 The meteorological tower shall be located as shown on Figure 5.1-1.

5.6 FUEL STORAGE

CRITICALITY - SPENT FUEL

5.6.1.1 The spent fuel storage racks are designed and shall be maintained with:

a. A k_{eff} equivalent to less than 0.95 when flooded with unborated water, which includes a conservative allowance of 2.6% delta k/k for uncertainties as described in Section 9.7 of the FSAR.

b. A nominal 10.5 inch center-to-center distance between fuel assemblies, placed in the storate racks.

5.6.1.2 Fuel stored in the spent fuel storage racks shall have a maximum fissile fuel density of less than or equal to 44.2 grams of Uranium-235 per axial centimeter of fuel assembly or the reactivity equivalent thereof.

CRITICALITY - NEW FUEL

5.6.2 The new fuel pit storage racks are designed and shall be maintained with a nominal 21 inch center-to-center distance between new fuel assemblies such that k_{eff} will not exceed 0.98 when fuel having a maximum enrichment of 3.5 weight percent U-235 is in place and aqueous foam moderation is assumed.

DRAINAGE

5.6.3 The spent fuel storage pool is designed and shall be maintained to prevent inadvertent draining of the pool below elevation 629'4".

CAPACITY

5.6.4 The spent fuel storage pool is designed and shall be maintained with a storage capacity limited to no more than 2050 fuel assemblies.

5.7 COMPONENT CYCLIC OR TRANSIENT LIMIT

5.7.1 The components identified in Table 5.7-1 are designed and shall be maintained within the cyclic or transient limits of Table 5.7-1.

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELATING TO THE MODIFICATION OF THE SPENT FUEL STORAGE POOL

FACILITY OPERATING LICENSE NOS. DPR-58 AND DPR-74

INDIANA AND MICHIGAN ELECTRIC COMPANY

INDIANA AND MICHIGAN POWER COMPANY

DONALD C. COOK NUCLEAR PLANT, UNIT NOS. 1 AND 2

DOCKET NOS. 50-315 AND 50-316

October 16, 1979

7911020269

1.0 INTRODUCTION

By letters dated November 22, 1978 and January 22, 24, April 16, June 29, July 27 and September 11, September 26, and September 27, 1979, the licensees, Indiana and Michigan Electric Company and Indiana and Michigan Power Company (I&MPC), requested an amendment to Facility Operating License Nos. DPR-58 and DPR-74 for the Donald C. Cook Nuclear Plant, Unit Nos. 1 and 2. The request was made to obtain authorization to provide additional storage capacity in the shared spent fuel pool (SFP). The proposed modifications would increase the capacity of the SFP from the present design capacity of 500 spent or irradiated fuel assemblies to a capacity of 2050 fuel assemblies.

The increased SFP capacity would be achieved by installing new racks with a decreased spacing between fuel storage cavities. The present rack design has a nominal center-to-center spacing between fuel storage cavities of 21 inches. The proposed new spent fuel racks would be modular stainless steel structures with individual storage cavities to provide a nominal center-to-center spacing of 10.5 inches. Each stainless steel wall of the individual cavities would contain sheets of Boral (Boron Carbide in an aluminum matrix) to provide for neutron absorption.

The SFP is located in the auxiliary building located between the Unit Nos. 1 and 2 reactor containment buildings. The pool structure is located adjacent to the fuel cask handling and new fuel storage areas and is above the spray additive tank room, the sampling room, the evaporator waste tank rooms, and the hallway in the basement of the auxiliary building. The general arrangement and details of the proposed new spent fuel storage racks are shown in Figures 1-1 through 1-3 of the licensee's submittal of November 22, 1978.

The expanded storage capacity would allow for the continued operation of both Unit Nos. 1 and 2 until about the first part of 1992 while still maintaining the capacity for a full core discharge reserve of 193 locations.

The major safety considerations associated with the proposed expansion of the SFP storage capacity are addressed below. A separate environmental impact appraisal has been prepared for this proposed action.

2.0 DISCUSSION AND EVALUATION

The proposed modification for the spent fuel storage capacity expansion has been reviewed in accordance with the NRC report "OT Position for Review and Acceptance of Spent Fuel Storage and Handling Applications," April 1978.

2.1 Criticality Considerations

After irradiation, spent fuel is removed from the core, transferred from the reactor containment building and placed in the common spent fuel pool. The proposed spent fuel storage racks are to be made up of double-walled stainless steel containers. These will be about 14 feet long and will have a square cross section with an inner dimension of 8.97 inches. The nominal distance between the centers of the stored fuel assemblies, i.e., the lattice pitch, is 10.5 inches. The effective dimension of the square fuel assembly, which was used in the criticality calculations, is 8.432 inches. This results in an overall fuel region volume fraction of 0.645 in the nominal storage lattice cell. Boral plates are to be press fit and seal welded in the cavities between the double stainless steel walls. In its January 14, 1979 submittal I&MPC states that stringent in-process inspection and process controls are imposed during manufacturing of the Boral to assure that the Boral plates contain at least 0.020 grams of the boron ten isotope per square centimeter of plate. In this full array of storage containers there will be two Boral plates between adjacent fuel assemblies. This makes the minimum areal density of boron between fuel assemblies 2.41×10^{21} boron ten atoms per square centimeter.

As stated in I&MPC's November 22, 1978 submittal, the fuel pool criticality calculations are based on unirradiated fuel assemblies with no burnable poison and a fuel loading of 44.2 grams of Uranium-235 per axial centimeter of fuel assembly.

The Exxon Nuclear Company performed the criticality analyses for I&MPC. The basic method was to use the NITAWL and XSDRNPM computer programs with the XSDRN 123 group microscopic cross section data to generate multigroup cross sections for the KENO IV Monte Carlo program. These programs were used to calculate the effective neutron multiplication

factors (k_{eff})* for the fuel pool. Also, CCELL, which is a fuel pin cell program, was used to determine the effects of UO_2 pellet density, moderator temperature, fuel temperature, and U-235 enrichment on the neutron multiplication factor.

Exxon calculated the worst case k_{eff} by assuming a minimum water gap thickness between adjacent storage cells and a maximum water gap temperature of 100°C. I&MPC's November 22, 1978 submittal states that the assumption of a minimized water gap thickness of 0.953 inches, rather than the nominal thickness of 1.118 inches, accounts for all of the tolerances and the possible deformations due to the design and seismic loads. Exxon's calculated value for this worst case k_{eff} is 0.923.

Exxon checked the accuracy of this KENO IV method by calculating several sets of critical experiments. Two of these had Boral plates in them. These were the experiment done by E. B. Johnson and G. E. Whitesides at the Oak Ridge National Laboratory and the one done by S. R. Bierman et al. at the Pacific Northwest Laboratories (PNL-2438). Exxon's calculated values of the k_{eff}'s of those two experiments agreed with the experimental values of 1.00 within the limits of the statistical uncertainty in the Monte Carlo program.

In its January 24, 1979 response to our request for additional information I&MPC stated the following:

1. There are steel structural members on the periphery of the rack modules that will provide an additional two inches of water between any fuel assembly outside of the rack and those in the racks. This two inches of water will prevent an increase in the k_{eff}.

2. Neutron attenuation tests will be performed on the rack modules at the Cook site to verify the presence of the boron.

* k_{eff}, effective multiplication factor, is the ratio of neutrons from fissions in each generation to the total number lost by absorption and leakage in the preceding generations. To achieve criticality in a finite system, k_{eff} must equal 1.0.

3. Sufficient prototypical surveillance specimens will be provided which will permit inspection of both leaking and leak tight Boral cells.

2.1.1 Evaluation

The above results compare favorably with the results of calculations made with other methods for similar fuel pool storage lattices. By assuming new, unirradiated fuel with no burnable poison or control rods, these calculations yield the maximum neutron multiplication factor that could be obtained throughout the life of the fuel assemblies. This includes the effect of the plutonium which is generated during the fuel cycle.

The NRC acceptance criterion for the criticality aspects of high density fuel storage racks is that the neutron multiplication factor in spent fuel pools shall be less than or equal to 0.95, including all uncertainties, under all conditions throughout the life of the racks. This 0.95 acceptance criterion is based on the overall uncertainties associated with the calculational methods, and it is our judgment that this provides sufficient margin to preclude criticality in fuel pools. Accordingly, Technical Specifications limit the neutron multiplication factor, k_{eff}, in spent fuel pools to 0.95. To preclude any unreviewed increase, or increased uncertainty, in the calculated value of the neutron multiplication factor which could raise the actual k_{eff} in the fuel pool above 0.95 without being detected, a limit on the maximum fuel loading is also required. Accordingly, we find that the proposed storage racks will meet the NRC criterion when the fuel loading in the assemblies described in these submittals is limited to 44.2 grams or less of Uranium-235 per axial centimeter of fuel assembly.

We find that I&MPC's proposed neutron attenuation test for the verification of the boron in the racks proposed for the Cook site is satisfactory. However, in this test, if any Boral plates are found to be missing the NRC shall be notified and a complete test on every storage location shall be performed. The licensee has agreed to these conditions.

We find that I&MPC's proposed boron surveillance program as described above is satisfactory for monitoring the condition of the Boral plates.

2.1.2 Conclusion

We find that when any number of fuel assemblies, which I&MPC described in these submittals, which have no more than 44.2 grams of Uranium-235 per axial centimeter of fuel assembly, are loaded into the proposed racks, the k_{eff} in the fuel pool will be less than the 0.95 limit. We also find that in order to preclude the possibility of the k_{eff} in the fuel pool from exceeding this 0.95 limit without being detected, it is necessary, pending NRC review, to prohibit the use of the proposed storage racks for fuel assemblies that contain more than 44.2 grams of Uranium-235 per axial centimeter of fuel assembly. On the basis of the information submitted, and the k_{eff} and fuel loading limits stated above we conclude that the health and safety of the public will not be endangered by the use of the proposed racks.

2.2 Spent Fuel Cooling

The licensed thermal power for D. C. Cook Unit No. 1 is 3,250 MWth and 3,391 MWth for Unit No. 2. A full core in each of the Units consists of 193 fuel assemblies. In its January 22, 1978 submittal I&MPC states that the evaluation of the spent fuel pool cooling system assumes that 65 fuel assemblies will be discharged annually from Unit No. 1 and 88 fuel assemblies will be discharged every 18 months from Unit No. 2. I&MPC assumed a cooling time of 156 hours after the reactor is shut down following 1,080 full power days of operation to calculate the maximum heat load by the method given in NRC Branch Technical Position APCSB 9-2. This gave a maximum in-pool heat generation rate of 54.1 kW per fuel assembly.

The spent fuel pool cooling system as described in Chapter 9 of the D. C. Cook FSAR, consists of two pumps and two heat exchangers. Each pump is designed to pump 2,300 gpm (1.15×10^6 pounds/hr) and each heat exchanger is designed to transfer 14.9×10^6 BTU/hr from 120°F fuel pool water to 95°F component cooling water, which is flowing through the heat exchanger at a rate of 1.49×10^6 pounds per hour.

As shown in Figure 9.4-1 and 9.2-4 of the FSAR the Seismic Category I source of makup water for the spent fuel pool is the chemical and volume control system hold-up tanks. There are three pairs of these tanks, and each pair has a capacity of 128,000 gallons. The hold-up tank recirculation pump, which is rated at 500 gpm, can be used to pump water from these tanks to the spent fuel pool.

The spent fuel pool is monitored both locally during each shift and continuously in the control room. There are both high and low water level alarms (one foot of water difference) in the control room and an alarm for the SFP cooling and purification system pump failure. The SFP temperature is alarmed when the water reaches 180°F and the radiation level is alarmed when the level above the pool reaches 10 mrem. The temperature readings and radiation area monitor alarm are also local to the SFP.

2.2.1 Evaluation

Using the method given on pages 9.3.5-8 through 14 of the NRC Standard Review Plan, with the uncertainty factor, K, equal to 0.1 for decay times longer than 10^7 seconds (about 116 days), we calculate that the maximum peak heat load during the 28th refueling, which would fill the pool, could be 22.6×10^6 BTU/hr and that the maximum peak heat load for a full core off-load that essentially fills the pool could be 41×10^6 BTU/hr. This full core offload was assumed to take place one year after the 25th refueling. We also find that the maximum incremental heat load due to increasing the number of spent fuel assemblies in the pool from 500 to 2,050 would be 6.9×10^6 BTU/hr. (This is the difference in peak heat loads for full core offloads that essentially fill the present and the modified pools.)

We calculate that with both pumps operating, the spent fuel pool cooling system can maintain the fuel pool outlet water temperature below 120°F for the normal refueling offload that fills the pool (2,050 assemblies) and below 130°F for the full core offload that fills the pool (2050 assemblies). With a full core offload that fills the pool (2050 assemblies) and with only one cooling pump operating, the pool temperature can be maintained below 165°F.

In the highly unlikely event that both spent fuel pool cooling systems were to fail at the time when there was a peak heat load from a full core in the pool and the water was at its maximum temperature and minimum possible elevation (i.e., 23 feet of water); we calculate that boiling could commence in about 6-1/2 hours. This elevation of water corresponds to the level the water would reach if the SFP drain line were inadvertently broken at the wall of the SFP in the cask handling area. On September 26, 1979 the licensee committed to remove this line and seal its SFP penetration so that the minimum water elevation would be about 37 feet. We also calculate that after boiling commences the

required water makeup rate will be 85 gpm. We find that 6-1/2 hours will be sufficient time to establish a 85 gpm makeup rate. By sealing the SFP drain line, this time will be increased to about 11 hours.

2.2.2 Conclusion

We find that the present cooling capacity for the spent fuel pool at D. C. Cook Nuclear Plant, Unit Nos. 1 and 2 will be sufficient to handle the incremental heat load that will be added by the proposed modifications. We also find that this incremental heat load will not alter the safety considerations of spent fuel cooling which we previously reviewed and found to be acceptable.

2.3 Installation of Racks and Fuel Handling

The new fuel racks will be installed without removing from the pool the fuel assemblies presently stored there. This involves moving loads over and within the SFP. These loads include the fuel assemblies that must be transferred underwater from existing locations, the removal of the existing rack modules from the SFP and the introduction of the new rack modules.

Using existing procedures, several of the presently stored fuel assemblies will be relocated to other positions in existing rack modules to empty a number of the rack modules. These empty rack modules will be uncoupled and lifted from the pool so as not to be carried over spent fuel stored in the pool.

Several modules of the new racks will then be lifted and lowered into the pool in the space thus vacated, again, so as not to be carried or lifted over spent fuel stored in the pool. After securing these modules all of the stored fuel will then be transferred underwater, using existing procedures, to these new modules. The now empty remainder of the present rack modules will then be removed from the pool and the remaining new rack modules will be lifted into the pool and secured in place. All movement of the rack modules will be done in conformance with existing and new Technical Specifications on crane travel over spent fuel (T.S. 3.9.7).

The licensee's procedures for controlling the movement of portions of the present and new racks which will prevent their movement over spent fuel, are described in Exxon Procedure XN-NS-IP012, which like other detailed procedures, is available for inspection at the D. C. Cook Nuclear Plant.

The NRC staff has underway a generic review of load handling operations in the vicinity of spent fuel pools to determine the likelihood of a heavy load impacting fuel in the pool, and if necessary, the radiological consequences of such an event. Because the Cook 1 and 2 Technical Specifications (3.9.7) prohibit loads greater than 2,500 pounds (the nominal weight of a fuel assembly

and handling tool) to be transported over spent fuel in the SFP, the movement of storage racks over spent fuel assemblies will be prohibited. There are other lighter loads, however, that are handled over stored fuel assemblies. These loads are the New Fuel Assembly Fuel Handling Tool, Thimble Plug Handling Tool, Spent Fuel Assembly Handling Tool, and Burnable Poison Rod Assembly Handing Tool. A set of these tools are used for both 15 x 15 fuel and 17 x 17 fuel. The weights of tools range from 72 pounds to 800 pounds. Although lighter than a single fuel assembly, these could develop greater kinetic energy should they be dropped because of greater potential drop heights. This larger kinetic energy could theoretically cause more damage to stored fuel assemblies than that calculated assuming a single dropped fuel assembly. The licensee has therefore examined the use of these loads and has committed to restricting the height of tool movement over the spent fuel assemblies such that if a tool were to drop, the impact energy would not exceed that of an analyzed spent fuel drop accident, i.e., 24,240 in-lbs. In addition, to insure that the handling tools will not drop the licensee will install a backup cable sling.

2.3.1 Evaluation

Since over one half of the fuel assembly positions will be vacant during reracking, I&MPC should have no difficulty in keeping the rack portion being removed and installed away from the spent fuel that is in the pool.

After the racks are installed in the pool, the fuel handling procedures in and around the pool will be the same as those procedures that were in effect prior to the proposed modifications.

The consequences of fuel handling accidents in the spent fuel pool area are not changed from those presented in the Safety Evaluation Report dated September 1973. This design basis accident is independent of the number of fuel assemblies in the pool and is defined for fuel with the least decay after shutdown for refueling. The accident is assumed to occur at the time after shutdown identified in the Technical Specifications as the earliest time fuel handling operations may begin. The Technical Specifications which prohibit loads greater than 2,500 pounds or loads at heights which would exceed a kinetic energy impact of 24,240 in-lbs. allow flexibility in the movements of fuel and other relatively light loads, while providing reasonable assurance that the consequences of the design basis accident will not be exceeded.

2.3.2 Conclusion

We conclude that there is reasonable assurance that the health and safety of the public will not be endangered by the removal of the present racks and the installation and use of the proposed racks.

2.4 Structural and Mechanical Design and Materials Considerations

The present spent fuel pool storage capacity is 500 fuel assemblies. The proposed replacement racks will permit the storage of up to 2,050 fuel assemblies. These new racks would allow for the continued operation of Unit Nos. 1 and 2 until 1992 while still maintaining the capacity for a full core discharge reserve.

The new racks are to be fabricated primarily from type 304 stainless steel. The individual fuel assemblies will be stored in square fuel storage cells formed from a thicker (0.075") inner shroud of stainless steel, a center sheet of aluminum clad boron carbide, and a thinner (0.030") outer shroud of stainless steel. A flared guide and transition section is provided at the top of each storage cell. The boral sheets provide neutron absorption to allow spacing of fuel assemblies in a 10.5 inch by 10.5 inch cell array. The cells are welded to a stiffened module base which carries vertical loads and an upper box structure consisting of plate diaphragms and a top grid. Horizontal seismic loads are carried to the module base through the plate diaphragms. Tipping is prevented by coupling adjacent racks through a bolted connection at the top grid level.

2.4.1 Evaluation

Structural and Mechanical

The structural and mechanical review consisted of an examination of the following areas: the proposed design criteria, the design loads and load combinations, methods of analysis, and a dropped fuel assembly accident; the material properties and allowable stresses of type 304 stainless steel; the hydrodynamic effects; the fabrication and installation provisions; and the effect of increased loads on the floor slab and liner and on the new support structure to be added beneath the floor slab of the pool.

The material properties for structural components of the spent fuel racks used in the analyses were taken from Appendix I of Section III of the ASME code, i.e., yield and ultimate strength, modulus of elasticity and thermal expansion. Load combinations and acceptance limits are in conformance with the NRC position paper referred to in

2.0 above which referenced acceptance limits of the ASME Section III Code, Subsection NF 3231.1 and 3321.2 as supplemented by paragraphs C.2, C.3, and C.4 of Regulatory Guide 1.124 entitled, "Design Limits and Load Combinations for Class I Linear Type Component Supports."

The seismic contribution to the load combinations was obtained by using both response spectra and time-history analyses. The spent fuel pool is located in the auxiliary building. The response spectra used for analysis of the fuel storage racks were the floor response spectra developed from the seismic analysis of the auxiliary building at the elevation of the spent fuel storage pool floor. Seismic stresses due to the three orthogonal earthquake components were combined by the square root of the sum of the squares (SRSS) method in conformance with Regulatory Guide 1.92 entitled, "Combining Modal Responses and Spatial Components in Seismic Response Analysis." Two percent of critical damping was used for both operating basis earthquake (OBE) and safe shutdown earthquake (SSE) loading consistent with the values used in the FSAR.

No credit was taken for additional damping due to submergence in water. The total mass of the water enclosed in the proposed new storage rack was lumped together with the masses of the fuel assembly and the rack structure in the horizontal direction (for both the response spectra and the history analyses). At the east end of the pool, there is a 12 foot clearance between the new rack structure and the pool wall. The hydrodynamic effects of water on the new rack structure were analyzed in accordance with the methods given in report TID-7024, "Nuclear Reactors and Earthquakes," August 1963. The added hydrodynamic loads increased the horizontal loads in the east-west direction by 8%.

Seismic loads obtained from the response spectra analysis were increased by impact factors of 1.54 and 1.94 for SSE and OBE loads, respectively. These values were obtained by performing time history analyses using the ANSYS computer program to account for the effects of the clearance gap between the storage cells and the fuel assemblies contained herein plus the effects of the new rack structure rocking and sliding on the pool floor.

Two different but equivalent models were employed by the licensee for the two types of seismic analysis. The model used for the

response spectra analysis was a three dimensional model consisting of 251 modes, and 460 structural elements comprised of beams, trusses and membrane elements. The SAP IV computer program was employed for the analysis. The model used for time-history analysis was a lumped mass-spring model which was based on the assumption that all fuel assemblies were moving in phase with each other. Spring stiffnesses of the rack structure in this model duplicated the frequencies and mode shapes of the primary horizontal and vertical modes as determined from the three dimensional model. Friction coefficients for the sliding gap elements were taken from two reports: "Friction Coefficients of Water-Lubricated Stainless Steels for a Spent Fuel Rack Facility," by Professor E. Rabinowicz, MIT, November 5, 1976, and G.E. Report No. 60GL20, "Investigation of the Sliding Behavior of a Number of Alloys Under Dry and Water Lubricated Conditions," by R. E. Lee, Jr., January 22, 1960. The model was subjected to simultaneous, statistically independent horizontal and vertical time-histories at the pool floor whose response spectra enveloped the floor response spectra.

To determine the impact factors, the licensee performed two time-history investigations, one with non-linear effects of the cell to fuel gaps with rack feet sliding taken into consideration and one linear analysis with these gaps closed and the rack feet fixed. The maximum ratios of the non-linear response to the linear response for OBE and SSE are the impact factors which were then applied to all seismic loads obtained from the response spectra analysis.

The licensee performed an evaluation of the effects of two postulated cases of a dropped fuel assembly. The first case was that of an assembly falling vertically directly on one cell but rotated 45° such that the corners of the assembly hit the sides of the cell in a diamond pattern. This case produced maximum force and deflection of an individual cell. The second case was that of an assembly falling vertically at the center of a group of four cells, resulting in the maximum force applied to the rack structure. The dynamic response of the rack structure to the two drop accidents indicated: (1) inelastic deformations were limited to the immediate areas of assembly impact, and (2) all other rack member stresses were within the limits specified by the load combinations and allowable stresses permitted by the NRC.

The spent fuel storage rack modules are designed in conformance with the fabrication, installation, and examination criteria of the 1977 ASME Code, Section III, Subsection NF, Articles NF-2000, NF-4000, and NF-5000, with the following two exceptions. First, documentation and certification programs for code qualified components were in conformance with Exxon Nuclear Company's Quality Assurance/Quality Control program, which is in compliance with ANSI N45.2 and 10 CFR 50, Appendix B, rather than being stamped as per NF-4120. Second, except for neutron poison material, identification markings as per NF-4122 were not provided for components of the fuel rack. However, the fabricator is required to demonstrate a material control program which will insure that only certified material is used. We find these provisions acceptable.

The floor slab modifications were done in conformance with the FSAR Design Criteria, specifically the ACI-318-63 Code (American Concrete Institute). Hand calculations were performed to determine the modification necessary to support the additional load of approximately 2.7 million pounds, resulting from the increased rack weight of 518,000 lbs. and increased fuel weight of 2,170,000 lbs. The modification consisted of adding steel, wide flange sections and cover plated tubular columns under the supporting slab. The modifications then allows for a limit capacity of the slab of 415 kip-feet per foot slab width and 272 kip-feet per foot width for positive and negative ultimate bending moment capacity, respectively, as well as 71 kips per foot width ultimate shear capacity. By comparison, the analysis determined the minimum load bearing capacities required to be 316 kip per foot, 177 kip per foot and 53 kip per foot for positive ultimate moment, capacity, negative ultimate moment and ultimate shear, respectively. We find the proposed modification acceptable.

Swelling

In August 1978, the staff was made aware of a problem at the Monticello facility regarding spent fuel storage racks similar in design to those proposed here. The problem there involved inleakage of water into the stainless steel cells, such that hydrogen gas was generated due to oxidation of exposed aluminum material. This gas caused a pressure buildup and resultant swelling of those stainless steel cells such that a fuel assembly located at an affected storage location could not be readily removed. A discussion of how this potential problem has been considered at D. C. Cook is provided below.

The proposed D. C. Cook cells use boral material sealed between an inner and outer stainless steel shroud. The cells are supplied to Exxon Nuclear Company by Brooks and Perkins, Incorporated. The stainless steel shroud (or cladding) is type 304. The boral consists of an 1100 series aluminum and boron carbide matrix core sandwiched between two layers of 1100 series aluminum cladding. The stainless steel shrouds are seal-welded together at both ends such that the annulus between the shrouds is leaktight. The inner shroud is thicker (0.075") than the the outer shroud (0.030") to provide protection against inward swelling of the cell and binding of stored fuel assembly. In the event that there are leaks allowing water to enter the annulus, there will be corrosion of the aluminum with hydrogen gas as an off product. Once the pressure buildup within the composite exceeds the confining pressure of the cell material and hydostatic head, the outer shroud will bulge outward and will not contact the fuel bundle. In an effort to minimize the consequences of water leakage into the cell annulus, the licensee will impose strict welding procedures, welding operations and qualifications of welders in accordance with the requirements of the ASME Code, Section IX, and nondestructive examination requirements, in accordance with ASME Section V. In addition, leaktightness tests will be conducted by immersing the fuel storage cell in water while pressurizing the cell annulus with helium gas. Leaks are detected by helium gas bubbles escaping to the surface.

Corrosion

In the controlled environment of the spent fuel pool water, which is high quality demineralized water (with dissolved boric acid) maintained at relatively low temperatures by a cooling and cleanup system, the spent fuel pool liner, the proposed storage racks and the spent fuel itself have an extremely low potential for corrosion. Weekly chemical analyses are performed for, among other things, flourides and chlorides in the SFP water. The results have always been below the licensee's detectibility level.

Cracking of Stainless Steel Components

On July 26, 1979, the Office of Inspection and Enforcement issued IE Bulletin No. 79-17 on Pipe Cracks in Stagnant Borated Water Systems at PWR Plants. This Bulletin was concerned with pipe cracking incidents, the latest at Three Mile Island Unit No. 1, in safety-related stainless steel piping systems and portions of systems which contain oxygenated, stagnant or essentially stagnant borated water. The cracks at the Three Mile Island Unit No. 1 occurred in heat affected zones of Type 304 stainless steel and

appeared to be intergranual stress corrosion cracks (IGSCC). In the Zion spent fuel pool expansion hearing, questions were raised on the applicability of Bulletin 79-17 to the materials and conditions in the Zion SFP. As a result of staff questions on the D. C. Cook proposed amendment, the licensee submitted on September 27, 1979, his responses to similar questions asked by the Zion Board.

The piping and liner are Type 304 stainless steel. The pool circulation is maintained by the cooling and purification system and by natural circulation around the spent fuel in the pool. Special care has been taken in the fabrication of the racks to minimize any sensitization in the heat affected zones which is a necessary requirement for IGSCC in weldments. The SFP liner was fabricated from the low carbon version of 304 and all welding was controlled to minimize or eliminate carbide precipitation in the heat affected zone. Piping in the pool cooling and purification system has a low potential for cracking since flow is not stagnant, the water purity is maintained, and controlled welding procedures were used in fabrication to minimize any problems.

2.4.2 Evaluation

The analyses, the design, the fabrication and the planned installation of the proposed fuel rack storage system including the addition of a support wall under the pool floor, and the analysis of the structural loads imposed by dynamic, static, seismic and thermal loadings are in accordance with accepted criteria, and the acceptance criteria for the appropriate portions of the NRC OT Position for Review and Acceptance of Spent Fuel Pool Storage and Handling Applications, April 1978.

The mechanical properties for the materials used in the rack design were those consistent with a pool normal operating temperature of 150°F and maximum temperature of 240°F. The quality assurance procedures for the materials, the fabrication, the installation and the examination of the new rack structures are in acceptable general conformance with the accepted requirments of ASME Code, Section III, Subsection NF, Articles NF-2000, NF-4000 and NF-5000.

The effects of the additional loads on the existing pool structure due to the proposed racks have been examined. The pool structural integrity including the addition of a support wall beneath the pool in the spray additive tank room is assured by conformance with the original FSAR acceptance criteria. In turn, this provides adequate assurance that the pool will remain leaktight.

There is no evidence at this time to indicate that corrosion of the fuel assemblies, the stainless steel rack structures or the fuel pool liner will occur at the temperatures and quality of the demineralied water (with dissolved boric acid) to be maintained in the pool. The welding techniques and procedures and the non-destructive examination techniques provide a high level of confidence that the annuli containing the boral in the installed cells will be leaktight. Although no cell inleakage is likely to occur, tests were conducted which demonstrated that if isolated cases of leakage should occur in service, any swelling of the cells would not represent a safety hazard.

If the boral plates (B_4C/Al matrix) in a cell should, through inleakage, be exposed to the spent fuel pool water, galvanic coupling between the aluminum-boral liner, aluminum binder and the stainless steel shroud of the cell could occur. Deterioration of the boral would be limited to edge attack by general corrosion and pitting corrosion of the cell's aluminum liner and binder in the general area of the leak path. The B_4C neutron adsorption particles are inert to the pool water and would become embedded in corrosion products preventing loss of the B_4C particles. Thus, this small amount of deterioration would have no effect on neutron shielding, attenuation properties or criticality safety.

To aid in verifying the above conclusions, the licensee has committed to conduct a long-term fuel storage surveillance program to verify that the spent fuel storage cells retain the material stability and mechanical integrity over the life of the spent fuel storage racks under actual spent fuel pool service conditions. Sample specimens will be placed in the SFP and will be periodically examined visually and by weight analysis. The licensee has also agreed to apply the results of Bulletin 79-17 investigations on stress corrosion cracking to the SFP and other systems in the D. C. Cook facility in order to help prevent the development of cracks.

Based upon our review to date of the corrosion potential in spent fuel pool environments and previous operating experience, we have concluded that, for the temperature and the quality of the pool demineralized water (with dissolved boric acid), there is reasonable assurance that no corrosion of the stainless steel in the racks, the fuel cladding or the pool liner will occur over the lifetime of the plant, that would significantly impact the structural integrity of the racks. Since the possibility of long-term storage of spent fuel exists, the effects of the pool environment on the racks, fuel cladding and pool liner are under continued surveillance.

2.4.3 Conclusion

The structural and mechanical aspects of the proposed racks have been evaluated based upon NRC guidance provided in the report entitled, "OT Position for Review and Acceptance of Spent Fuel Storage and Handling Applications," April 1978. Based upon our review of the analyses, the design done by the licensee, and the commitments to apply Bulletin 79-17 results to the D. C. Cook facility, we conclude that the rack structure itself, the supporting pool liner and slab when strengthened by the proposed additional support wall under the pool slab are capable of supporting the applied loads without exceeding relevant stresses of subsection NF and Regulatory Guide 1.124 or the FSAR Design Criteria. As previously stated, we find the material, fabrication, installation and examination criteria acceptable. We conclude that these aspects of the proposed modifications to the D. C. Cook spent fuel storage are in conformance with NRC requirements.

2.5 Occupational Radiation Exposure

Rack Removal and Disposal

We have reviewed the licensee's plans for the removal and disposal of the present racks and the installation of the proposed racks with respect to occupational radiation exposure. The removal of the old racks and installation of new racks will be done with remote handling tools. No divers will be required. Decontamination of the old racks will be done underwater in the SFP using high pressure water jets. Such exposure for this operation is estimated by the licensee to range from about 18 to 20 man-rem. We consider this to be a conservative estimate. This estimate represents a small fraction of the total man-rem burden from occupational exposure at the plant.

The licensee has presented alternative plans for the disposal of the present rack modules which considered removing and crating the modules

intact versus removing, cutting and then crating the dismantled modules. It is unlikely that the licensee will dispose of the present rack modules intact because this will preclude the use of standard shipping packages and increase the cost and time to dispose of the racks. The licensee is considering two methods of disposal: (1) crating the modules semi-whole which will reduce the man-rem exposure involved with a major cut up of these racks or (2) cutting the modules into small sections which would permit more efficient packaging in the shipping containers. This second alternative would result in a smaller volume of radioactive waste to be disposed of with resulting economic and environmental benefits, i.e., fewer waste shipments and conservation of low level waste burial site space. However, it would also require the licensee to expend extra effort to cut the old racks with some increase in occupational exposure. The licensee has estimated that the occupational exposure to decontaminate the old racks and dispose of them semi-whole would be about 4 man-rem while to decontaminate and cut into small sections would be about 6 man-rem. The licensee has not estimated the occupational exposure to decontaminate and crate the modules whole but the exposure for this is estimated to be less than that for semi-whole disposition. The licensee has not yet quantified a cost-benefit analysis of the alternatives so that selection of a disassembly and disposal method has not been finalized. The licensee will estimate the exposures associated with the different ways to dispose of the present rack modules from measurements of the activity levels on them when they are removed from the pool, decontaminated and otherwise ready for disposal. At that time, taking into account alternative disposal costs and exposures, the licensee will select the method of disassembly for disposal so that exposures will be kept to levels that are as low as is reasonably achievable.

Use of the Proposed Racks After Installation

We have estimated the increment in onsite occupational dose resulting from the proposed increase in stored fuel assemblies on the basis of information supplied by the licensee for dose rates in the pool area from radionuclide concentrations in the pool water and the spent fuel assemblies. The spent fuel assemblies will contribute a negligible fraction of the dose rates in the pool area because of the depth of water shielding the fuel.

Consequently, the occupational radiation exposure resulting from the additional spent fuel in the pool represents a negligible burden.

A site visit review of the SFP area revealed a 4" line penetrating a wall of the pool. If this line should break at the wall, the pool water would drain to 23 feet above the floor. Our calculations show that the pool surface radiation level with only 23 feet of water in the pool would be between 1 and 10 R per hour. The licensee, on September 26, 1979, committed to remove the line and seal the penetration to remove this consideration. We find that removal of this line is both prudent and acceptable.

Based on present and projected operations in the pool area, we estimate that the proposed modification should add less than one percent to the total annual occupational radiation exposure burden at this facility. The small increase in radiation exposure will not affect the licensee's ability to maintain individual occupational doses to as low as is reasonably achievable and within the limits of 10 CFR Part 20. Thus, we conclude that storing additional fuel in the SFP will not result in any significant increase in doses received by occupational workers.

2.6 Radioactive Waste Treatment

The plant at present has radioactive waste treatment systems designed to collect and process the gaseous, liquid and solid wastes that contain radioactive material. These waste treatment systems were evaluated in the staff's D. C. Cook SER dated September 1973. The licensee has proposed no change in these waste treatment systems because of the proposed modification. Based on our review, we find no need for changes in these systems because of the proposed modifications. There will be no change in the conclusions of the evaluation of these systems as described in Section 11 of the D. C. Cook SER because of the proposed pool modification.

3.0 SUMMARY

Our evaluation supports the conclusion that the proposed modification to the D. C. Cook Unit Nos. 1 and 2 SFP are acceptable because:

1. The increase in occupational radiation exposure to individuals due to the storage of additional fuel in the SFP would be negligible.

2. The installation and use of the new fuel racks does not alter the potential consequences of the design basis accident for the SFP, i.e., the rupture of a single fuel assembly and the subsequent release of the assembly's radioactive inventory within the gap.

3. The likelihood of an accident involving heavy loads in the vicinity of the spent fuel pools is sufficiently small that, with the additional kinetic energy limit for lighter loads, no other restrictions on load movement are necessary while our generic review of the issues is underway.

4. The physical design of the new storage racks will preclude criticality for any credible moderating condition with the limits to be stated in the Technical Specifications.

5. The SFP has adequate cooling with existing systems.

6. The capacity of the existing radioactive waste treatment systems remains adequate.

7. The structural design and the materials of construction are adequate to assure safe storage of D. C. Cook generated spent fuel in the pool environment for the duration of plant lifetime and to withstand the seismic loading of the design earthquakes.

4.0 CONCLUSION

We have concluded, based on the considerations discussed above, that: (1) there is reasonable assurance that the health and safety of the public will not be endangered by operation in the proposed manner, and (2) such activities will be conducted in compliance with the Commission's regulations and that the proposed action to permit installation and use of high density spent fuel storage racks in the spent fuel pool at the D. C. Cook Nuclear Power Station will not be inimical to the common defense and security or to the health and safety of the public.

Date: October 16, 1979

ENVIRONMENTAL IMPACT APPRAISAL BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELATING TO THE MODIFICATION OF THE SPENT FUEL STORAGE POOL

FACILITY OPERATING LICENSE NOS. DPR-58 AND DPR-74

INDIANA AND MICHIGAN ELECTRIC COMPANY

INDIANA AND MICHIGAN POWER COMPANY

DONALD C. COOK NUCLEAR PLANT, UNIT NOS. 1 AND 2

DOCKET NOS. 50-315 AND 50-316

October 16, 1979

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1.0 DESCRIPTION OF PROPOSED ACTION

By letters dated November 22, 1978, and January 22, 24, April 16, June 29, July 27 and September 11, September 26 and September 27, 1979, the Indiana and Michigan Electric Company and the Indiana and Michigan Power Company (the licensees) requested an amendment to Facility Operating License Nos. DPR-58 and DPR-74 for the Donald C. Cook Nuclear Plant, Unit Nos. 1 and 2. The request was made to obtain authorization to provide additional storage capacity in the spent fuel pool (SFP). The proposed modification would increase the capacity of the SFP from the present design capacity of 500 fuel assemblies to a capacity of 2050 fuel assemblies.

The increased SFP capacity would be achieved by installing new racks with a decreased spacing between fuel storage cavities. The proposed new spent fuel racks would have stainless steel walls which contain sheets of boral (Boron Carbide in an alumnium matrix) to provide for neutron absorption. The SFP is located in the auxiliary building located between the Unit Nos. 1 and 2 reactor containment buildings. The pool is located adjacent to the fuel cask handling and new fuel storage areas and is above the spray additive tank room, the sampling room, the evaporator waste tank rooms, and the hallway in the basement of the auxiliary building. The general arrangement and details of the proposed new spent fuel storage racks are shown in Figures 1-1 through 1-3 of the licensee's submittal of November 22, 1978.

The expanded storage capacity would allow for the continued operation of both Unit Nos. 1 and 2 beyond May 1980 and until approximately the first part of 1992 while still maintaining the capacity for a full core discharge reserve of 193 locations. Without this offload capability, the Unit 1 shutdown would occur in May 1981 and Unit 2 in October 1982.

The proposed modification would not increase the volume of the spent fuel pool or involve significant modifications to the SFP cooling or purification systems. However, a support wall will be added in the spray additive tank room below the current pool to restore original design margins to assure sufficient support for the added weight of the increased number of fuel assemblies. The proposed modification would not affect in any manner the quantity of uranium fuel consumed by the reactor over its anticipated operating life and thus in no way would affect that amount of spent uranium fuel discharged from the reactor. The rate of spent fuel discharged and the total quantity discharged during the

the anticipated operating lifetime of Unit No. 1 and Unit No. 2 would be unchanged as a result of the proposed expansion. The modification would increase the number of these spent fuel assemblies that could be stored in the SFP of each unit at one time and the storage time of some.

2.0 FUEL REPROCESSING HISTORY

Currently, spent fuel is not being reprocessed on a commercial basis in the United States. The Nuclear Fuel Services (NFS) plant at West Valley, New York, was shut down in 1972 for alterations and expansions; on September 22, 1976, NFS informed the Commission that they were withdrawing from the nuclear fuel reprocessing business. The Allied-General Nuclear Services (AGNS) proposed plant in Barnwell, South Carolina is not licensed to operate. The General Electric Company's (GE) Midwest Fuel Recovery Plant in Morris, Illinois, now referred to as Morris Operation (MO), is in a decommissioned condition. Although no plants are licensed for reprocessing fuel, the MO storage pool and the NFS plant storage pool (on land owned by the State of New York and leased to NFS thru 1980) are licensed to store spent fuel. The storage pool at West Valley is not full but NFS is presently not accepting any additional spent fuel. Construction of the AGNS plant receiving and storage station has been completed. AGNS applied for but has not been granted, a license to receive and store irradiated fuel assemblies, prior to a decision on the licensing action relating to the separation facility. The NRC review for an operating license was stopped and AGNS does not have an interest in operating the facility for spent fuel storage only.

3.0 THE FACILITY

D. C. Cook Unit Nos. 1 and 2 (the facilities) are described in the Final Environmental Statement (FES) related to operation of these facilities issued by the Commission in August 1973. These facilities have a pressurized water reactor (PWR) rated at 1,054 and 1,100 megawatts (MWe) net electrical output, respectively. Pertinent descriptions of principal features of each facility as it currently exists are summarized below to aid the reader in following the evaluations in subsequent sections of this appraisal.

3.1 Station Cooling Water Systems

The D. C. Cook service water system is a once-through cooling system. Water is pumped from Lake Michigan at a flow rate of approximately 1,645,000 gallons per minute, circulated through the turbine services and nuclear services cooling systems and returned to Lake Michigan via the circulating water system discharge piping. During normal operations the total heat load for the service water system is approximately 15.5×10^9 BTU/hr.

The component cooling water system, which is cooled by the nuclear services portion of the service water system, is designed to remove heat from major components in the station, including the components associated with the removal of heat from the spent fuel pool.

3.2 Radioactive Wastes

The plant contains waste treatment systems designed to collect and process the gaseous, liquid and solid waste that might contain radioactive material. The waste treatment systems are evaluated in the Final Environmental Statement (FES) dated August 1973. There will be no change in the waste treatment systems described in Section III.D.2 of the FES because of the proposed modification.

3.3 Spent Fuel Pool Cleanup Systems

The SFP cleanup system consists of a cartridge filter and an ion exchanger and the required piping, valves and instrumentation. This system is in parallel to the two SFP cooling loops in the SFP cooling system. Each of the two SFP cooling pumps draws water from the SFP, circulates it through a heat exchanger and the SFP cleanup system and returns it to the SFP. The ion exchanger may be bypassed.

Because we expect only a small increase in radioactivity released to the pool water as a result of the proposed modification as discussed in Section 4.3, we conclude that the SFP purification system will keep concentrations of radioactivity in the pool water to levels which have existed prior to the modification. We also expect that there will be no significant increase in radioactive wastes collected in the cleanup system.

4.0 ENVIRONMENTAL IMPACTS OF PROPOSED ACTION

4.1 Land Use

The proposed modifications are essentially ones increasing the capacity of an existing structure to accommodate more spent fuel assemblies. It will not alter the external physical geometry of the structures for either unit. The SFP was designed to store spent fuel assemblies under water for a period of time to allow shorter lived radioactive isotopes to decay and to reduce the associated thermal heat output. The Commission has never set a limit on how long spent fuel assemblies could be stored onsite. The longer the fuel assemblies decay, the less radioactivity they contain. The proposed modifications will not change the basic land use of the SFP. The pool was intended to store spent fuel. This use will remain unchanged by the proposed modifications.

4.2 Water Use

There will be no significant change in plant water consumption or use as a result of the proposed modifications. As discussed subsequently (in paragraph 4.4), storing additional spent fuel in the SFP will slightly increase the heat load on the SFP cooling system. This heat is transferred in turn to the component cooling water system and to the service water system. The modifications will not change the flow rate within these cooling systems. The temperature of the SFP water during normal refueling operations and with only one SFP cooling pump running is expected to remain below 134°F, as compared to the 120°F used as the design basis in the FSAR. Therefore, the rate of evaporation and thus the need for makeup water will not be significantly changed by the proposed modifications.

4.3.0 Radiological

4.3.1 Introduction

The potential offsite radiological environmental impacts associated with the expansion of the spent fuel storage capacity were evaluated and determined to be environmentally insignificant as addressed below.

The additional spent fuel which would be stored due to the expansion is the oldest fuel which has not been shipped from the plant. This fuel should have decayed about three years. During the storage of the spent fuel under water, both volatile and nonvolatile radioactive nuclides may be released to the water from the surface of the assemblies or from defects in the fuel cladding. Most of the material released from the surface of the assemblies consists of activated corrosion products such as Co-58, Co-60, Fe-59, and Mn-54 which are not volatile. The radionuclides that might be released to the water through defects in the cladding, such as Cs-134, Cs-137, Sr-89 and Sr-90, are also predominantly nonvolatile. The primary impact of such nonvolatile radioactive nuclides is their contribution to radiation levels to which workers in and near the SFP would be exposed. The volatile fission product nuclides of most concern that might be released through defects in the fuel cladding are the noble gases (xenon and krypton), tritium and the iodine isotopes.

Experience indicates that there is little radionuclide leakage from spent fuel stored in pools after the fuel has cooled for several months. The predominance of radionuclides in the spent fuel pool water appear to be radionuclides that were present in the reactor coolant system prior to refueling (which becomes mixed with water in the spent fuel pool during refueling operations) or crud dislodged from the surface of the spent fuel during transfer from the reactor core to the SFP. During and after refueling, the spent fuel pool cleanup system reduces the radioactivity concentrations considerably. It is theorized that most failed fuel contains small, pinhole-like perforations in the fuel cladding at the reactor operating condition of approximately 800°F. A few weeks after refueling, the spent fuel cools in the spent fuel pool so that fuel clad temperature is relatively cool, approximately 180°F. This substantial temperature reduction reduces the rate of release of fission products from the fuel pellets and decreases the gas pressure in the gap between pellets and clad, thereby tending to retain the fission products within the gap. In addition, most of the gaseous fission products have short half-lives and decay to insignificant levels within a few months. Based on the operational reports submitted by the licensees or discussions with the operators, there has not

been any significant leakage of fission products from spent light water reactor fuel stored in the Morris Operation (MO) (formerly Midwest Recovery Plant) at Morris, Illinois, or at Nuclear Fuel Services, Inc. (NFS) storage pool at West Valley, New York. Spent fuel has been stored in these two pools which, while it was in a reactor, was determined to have significant leakage and was therefore, removed from the core. After storage in the onsite spent fuel pool, this fuel was later shipped to either MO or NFS for extended storage. Although the fuel exhibited significant leakage at reactor operating conditions, there was no significant leakage from this fuel in the offsite storage facility.*

4.3 Radioactive Material Released to Atmosphere

With respect to gaseous releases, the only significant noble gas isotope attributable to storing additional assemblies for a longer period of time would be Krypton-85. As discussed previously, experience has demonstrated that after spent fuel has decayed 4 to 6 months, there is no significant release of fission products from defected fuel. However, we have conservatively estimated that less than an additional 105 curies per year of Krypton-85 may be released from the SFP when the modified pool is completely filled. This increase would result in an additional total body dose of less than 0.001 mrem/year to an individual at the site boundary. This dose is insignificant when compared to the approximately 100 mrem/year that an individual receives from natural background radiation. The additional total body dose to the estimated population within a 50 mile radius of the plant is less than 0.01 man-rem/year. This is small compared to the fluctuations in the annual dose this population would receive

* NEDO 21326-I, January 1977, "Consolidated Safety Analysis Report for Morris Operations," Morris, Illinois, Vol. I.

ASME publication (Morris Operations) 77-JPGC-NE-15 by L. L. Denio, et al., "Control of Nuclear Fuel Storage Basin Water Quality by Use of Powered Ion Exchange Resins and Zeolites," June 19, 1977.

from natural background radiation. This exposure represents an increase of less than 0.5% of the exposure from the plant evaluated in the FES in Tables V-6 and V-7. Thus, we conclude that the proposed modification will not have any significant impact on the exposures offsite.

Assuming spent fuel will be stored in the SFP for several years, Iodine-131 releases to the SFP water will not be significantly increased because of the expansion of the fuel storage capacity since the Iodine-131 inventory in the fuel will decay to negligible levels between refuelings.

The storage of additional spent fuel assemblies should not increase the bulk water temperature during normal refuelings above the 120°F used in the design analysis. Therefore, it is not expected that there will be any significant change in the annual release of tritium or iodine as a result of the proposed modification from that previously evaluated in the FES.

Most airborne releases from the plant result from leakage of reactor coolant which contains tritium and iodine in higher concentrations than the spent fuel pool. Therefore, even if there were a slightly higher evaporation rate from the spent fuel pool, the increase in tritium and iodine released from the plant as a result of the increase in stored spent fuel would be small compared to the amount now released from the plant and that which was previously evaluated in the FES. If levels of radioiodine become too high, the air can be diverted to charcoal filters for the removal of radioiodine before its release to the environment. The plant radiological effluent Technical Specifications, which are not being changed by this action, restrict the total releases of gaseous radioactivity from the plant, including the SFP, to low levels.

4.3.3 Solid Radioactive Wastes

The concentration of radionuclides in the pool is controlled by the filter and ion exchanger and by decay of short-lived isotopes. The activity will be highest during refueling operations

while reactor coolant water is processed through the filter and ion exchanger. The increase of radioactivity, if any, should be minor because the additional spent fuel to be stored is relatively cool, thermally, and radionuclides in the fuel will have decayed significantly.

While we believe that there should not be an increase in solid radwaste due to the modification, as a conservative estimate, we have assumed that the amount of solid radwaste may be increased by 30 cubic feet of resin a year from the demineralizer (an additional resin bed/year). The annual amount of solid waste shipped from the Cook nuclear plant between 1975 and 1978 averaged about 20,000 cubic feet per year. If the storage of additional spent fuel does increase the amount of solid waste from the SFP purification system by about 30 cubic feet per year, the increase in total waste volume shipped would be less than 0.2% and would not have any significant environmental impact.

The present spent fuel racks to be removed from the SFP are contaminated and will be disposed of as low level waste. The licensee has stated that less than 21,100 cubic feet of solid radwaste will be removed from the SFP because of the proposed modification. If cut into small pieces, the volume of the present racks shipped from the plant would be about 360 cubic feet. Based on the 21,100 cubic foot value, the total waste shipped from the plant would be increased by less 3% per year when averaged over the lifetime of the plant. This additional low level waste will not have any significant environmental impact.

4.3.4 Radioactivity Released to Receiving Waters

The amount of radioactivity on the SFP filter and demineralizer might increase slightly due to the additional spent fuel in the pool, but there should be no significant increase in the liquid release of radionuclides from the plant as a result of the proposed modification.

The cartridge filter removes insoluble radioactive matter from the SFP water. This filter is periodically removed to the solid

waste disposal area in a sheilded cask and placed in a shipping container. The insoluble matter will be retained on the filter or remain in the SFP water.

The demineralizer resins are periodically flushed with water to the spent resin storage tank. The water used to transfer the spent resin is decanted from the tank and returned to the liquid radwaste system for processing. The soluble radioactivity will be retained on the resins. If any activity should be transferred from the spent resin to this flush water, it would be removed by the liquid radwaste system.

The plant is designed to prevent an uncontrolled radioactivity release in the event of a leak in the spent fuel pool liner. Visual observations can be made to determine if there are leaks in the SFP liner. A five zone leak detection system beneath the SFP liner is designed to collect any leakage and direct it to the auxiliary building sump. Any leakage bypassing this system would be revealed as a leak in the ceiling of any of the rooms beneath the SFP. This leakage would also collect in the auxiliary building sump. Water from both of these sumps would be monitored for radioactivity and appropriately processed prior to release. To date, no water leakage from the SFP has been observed.

4.3.5 Occupational Radiation Exposures

We have reviewed the licensee's plans for the removal and disposal of the existing racks and the installation of the new racks with respect to occupational radiation exposure. The removal of the old racks and installation of new racks will be done with remote handling tools. No divers will be required. Decontamination of the old racks will be done underwater in the SFP using high pressure water jets. The occupational exposure for the entire operation is estimated by the licensee to be between about 18 and 20 man-rem. We consider this to be a conservative estimate. This operation is expected to be a small fraction of the total annual man-rem burden from occupational exposure.

We have estimated the increment in onsite occupational dose resulting from the proposed increase in stored fuel assemblies on the basis of information supplied by the licensee for dose rates in the spent fuel pool area from radionuclide concentrations in the SFP water and from the spent fuel assemblies. The spent fuel assemblies will contribute a negligible amount to dose rates in the pool area because of the depth of water shielding the fuel. Consequently, the occupational radiation exposure resulting from the additional spent fuel in the pool represents a negligible burden.

A review of the SFP area revealed a 4" line which penetrates one wall of the pool. If this line should break at the wall, the water in the pool would drain to 23 feet. Our calculations show that the pool surface radiation level with only 23 feet of water would be between 1 and 10 R per hour. The licensee, on September 26, 1979 committed to remove the line and seal the penetration to remove this consideration. The radiation exposure for this removal is estimated to be less than 0.25 man-rem.

Based on present and projected operations in the spent fuel pool area, we estimate that the proposed modification should add less than one percent to the total annual occupational radiation exposure burden at this facility. Thus, we conclude that storing additional fuel in the SFP will not result in any significant increase in doses received by occupational workers.

4.3.6 Impacts of Other Pool Modifications

The additional radiological impacts discussed above are too small to be considered anything but local in character. There are no other nuclear facilities with spent fuel pools in the vicinity of D. C. Cook. Therefore, we conclude that a SFP modification at any other facility should not significantly contribute to the environmental impact of the Cook Unit Nos. 1 and 2 and that the Cook Unit Nos. 1 and 2 SFP modification should not contribute significantly to the environmental impact of any other facility.

4.3.7 Evaluation of Radiological Impact

As discussed above, the proposed modification does not significantly change the radiological impact evaluated in the FES.

4.4 Nonradiological Effluents

There will be no change in the chemical or biocidal effluents from the plant as a result of the proposed modifications. However, the plant thermal discharge will be increased somewhat by the proposed modifications. At present, the pool has the ability and would be permitted to contain 500 fuel assemblies which could have a maximum heat load when the pool is full and contains a recently discharged 1/3 core (due to reloading) and a subsequent offloading of one full core (1-1/3 core recently

removed from the reactors). This heat load is calculated to be 34 x 10^6 BTU/hr. This heat load is to be discharged to Lake Michigan via heat exchangers in the SFP cooling system and the component cooling water system.

With the proposed modifications, the maximum heat load (which again would occur for a full pool containing a recent addition of 1-1/3 cores) would be increased due to an increase of 1,450 stored assemblies. This increase would be 6.9 x 10^6 BTU/hr. The total peak heat load would be 41 x 10^6 BTU/hr for the modified SFP.

The total station thermal discharge to Lake Michigan without the proposed modifications would be approximately 15.5 x 10^9 BTU/hr. With the proposed modifications, this total discharge would be increased by no more than 6.9 x 10^6 BTU/hr, which is less than .05%. We find this increase not to be significant.

4.5 Impacts on the Community

The new storage racks will be fabricated in modular units offsite and shipped to the facility. No environmental impacts on the environs outside the spent fuel storage building are expected during removal of the existing racks and installation of the new racks. The supporting wall to be placed under the pool floor slab will be fabricated in place and will be of steel reinforced steel tubular construction. The impacts within this building are expected to be limited to those typically associated with normal metal working and fabrication activities.

No environmental impact on the community is expected to result from the fuel rack conversion or from the subsequent operation with the increased storage of spent fuel in the SFP.

5.0 Environmental Impact of Postulated Accidents

Although the new racks will accommodate a larger inventory of spent fuel, we have determined that the installation and use of the racks will not change the radiological consequences of a postulated fuel handling accident in the SFP area from those values reported in the Cook Unit Nos. 1 and 2 FES dated August 1973.

Additionally, the NRC staff has under way a generic review of load handling operations in the vicinity of spent fuel pools to determine the likelihood of a heavy load impacting fuel in the pool and, if necessary, the radiological consequences of such an event. Because Cook Unit Nos. 1 and 2 are required to prohibit loads greater than 2,500 pounds (the nominal weight of a fuel assembly and handling tool) from being transported over spent fuel in the SFP, the movement of storage racks over spent fuel will be prohibited. There are other lighter loads, however, identified by the licensee, that are handled over stored fuel assemblies. These loads are the New Fuel Assembly Fuel Handling Tool, Thimble Plug Handling Tool, Spent Fuel Assembly Handling Tool, and Burnable Poison Rod Assembly Handling Tool. A set of these tools are used for both 15 x 15 fuel and 17 x 17 fuel. The weight of tools range from 72 pounds to 800 pounds. Although lighter than a single fuel assembly, these could develop greater kinetic energy should they be dropped because of greater potential drop heights. This larger kinetic energy could theoretically cause more damage to stored fuel assemblies than that calculated assuming a single dropped fuel assembly. The licensee has therefore examined the use of these loads and has committed to restricting the height of tool movement over the spent fuel assemblies such that if a tool were to drop, the impact energy would not exceed that of an analyzed spent fuel drop accident, i.e., 24,240 in-lbs. In addition, to insure that the handling tools will not drop, the licensee will install a backup cable sling.

6.0 Alternatives

With respect to D. C. Cook SFP, we have considered the following spent fuel storage alternatives:

1. Increase storage capacity as proposed,
2. Reprocessing of spent fuel,
3. Storage at independent spent fuel storage installations (ISFSI),
4. Offsite storage in SFPs of other reactors,
5. Shut down of facility (storage in reactor pressure vessel).
6. Conservation measures and extended operating cycles.

6.1 Increase the Storage Capacity of the SFP as Proposed

The total estimated installed capital cost of the proposed D. C. Cook new storage modifiation is $4,700,000. Of this amount, $3,150,000 is for the new racks, $400,000 is for installation and construction costs (including removal and disposal of the existing racks and adding the support wall beneath the pool floor slab) and $1,500,000 is for engineering and other indirect costs. This equates to about $3,030 for each additional proposed fuel assembly storage space. The benefit is continued operation of the D. C. Cook Nuclear Plant and electric power generation beyond May 1980 with capability to offload one full core from either reactor (193 fuel assemblies) and beyond May 1981 (Unit No. 1) and October 1982 (Unit No. 2) without such offload capability.

6.2 Reprocessing of Spent Fuel

As discussed earlier, none of the three commercial reprocessing facilities in the U. S. is currently operating. The Morris Operation (MO) is in a decommissioned condition. On September 22, 1976, Nuclear Fuel Services, Inc. (NFS) informed the Nuclear Regulatory Commission that it was "withdrawing from the nuclear fuel processing business." The Allied-General Nuclear Services (AGNS) reprocessing plant received a construction permit on December 18, 1970. In October 1973, AGNS applied for an operating license for the separation facility (construction of which is essentially complete). On July 3, 1974, AGNS applied for a materials license to receive and store up to 400 metric tonnes of uranium (MTU) in spent fuel in the completed onsite storage pool. As discussed below, NRC terminated AGNS's application for an operating license. Since AGNS has stated that they have no interest in operating the facility for only spent fuel storage, hearings on the materials license application have been indefinitely suspended.

In 1976, Exxon Nuclear Company, Inc. submitted an application for a proposed Nuclear Fuel Recovery and Recycling Center (NFRRC) to be located at Oak Ridge, Tennessee. The NFRRC would include a storage pool that could store up to 7,000 MTU in spent fuel. The Exxon application for the NFRRC construction permit has also been terminated as discussed below.

On April 7, 1977, the President issued a statement outlining his policy on continued development of nuclear energy in the U. S. The President stated: "We will defer indefinitely the commercial reprocessing and recycling of the plutonium produced

in the U. S. nuclear power programs. From our own experience, we have concluded that a viable and economic nuclear power program can be sustained without such reprocessing and recycling."

On December 30, 1977 NRC ordered (42 FR 65334) the termination of the pending fuel cycle licensing actions involving GESMO (Docket No. RM-50-5), Barnwell Nuclear Fuel Plant Separations Facility, Uranium Hexafluoride Facility, and Plutonium Product Facility (Docket No. 50-332, 70-1327 and 70-1821), Exxon's NFRRC (Docket No. 50-564), the Westinghouse Electric Corporation Recycle Fuel Plants (Docket No. 70-1432), and the Nuclear Fuel Services, Inc. West Valley Reprocessing Plant (Docket No. 50-201). The Commission also announced that it would not at this time consider any other application for commercial facilities for reprocessing spent fuel, fabricating mixed-oxide fuel, and related functions. At this time, any consideration of these or comparable facilities has been deferred for the indefinite future. Reprocessing is not a reasonable alternative to the proposed expansion of the D. C. Cook SFP. Accordingly, no estimate of cost is considered appropriate.

6.3 Storage at Independent Spent Fuel Storage Installation

An alternative to expansion of onsite SFP storage would be the construction of new "independent spent fuel storage installations" (ISFSI). Such installations could provide storage space in excess of 5,000 MTU of spent fuel assemblies. This is far greater than the capacities of onsite storage pools such as at D. C. Cook.

Fuel storage pools at MO and NFS are functioning as ISFSIs although this was not the original design intent. Likewise, if the receiving and storage station at the AGNS reprocessing plant were to be licensed to accept spent fuel, it also would be functioning as an ISFSI. The license for MO was amended on December 3, 1975 to increase the storage capacity to about 750 MTU; approximately 306 MTU are now stored in the pool.

We have discussed the status of MO with GE personnel and have been informed* that GE is primarily using the storage space there for GE-owned fuel (which had been leased to utilities)

* GE letter to NRC dated May 27, 1977.

or for fuel which GE had previously contracted to reprocess. We were informed that the present GE policy is not to store spent fuel unless GE has previously committed to do so.**

There is no such commitment for D. C. Cook. The NFS facility has capacity for about 260 MTU, with approximately 170 MTU presently stored in the pool. The storage pool at West Valley, New York is on land owned by the State of New York and leased to NFS thru 1980. Although the storage pool at West Valley is not full, NFS has indicated that it is not accepting additional spent fuel for storage even from those reactor facilities with which it had reprocessing contracts.

Based on the above, we conclude that these MO, NFS and AGNS facilities are not available to D. C. Cook as ISFSIs.

We also considered under this alternative the construction of new ISFSIs. Regulatory Guide 3.24, "Guidance on the License Application, Siting, Design and Plant Protection for Independent Spent Fuel Storage Installation," issued in December 1974, recognized this alternative and provided regulatory guidance for water-cooled ISFSIs. Pertinent sections of 10 CFR Parts 19, 20, 30, 40, 51, 70, 71 and 73 would also apply.

We estimated that at least 5 years would be required to construct an ISFSI. We assumed one year for preliminary design, 1 year in which to prepare the license application and environmental report, to obtain approval for construction licensing and to finalize the design, 2-1/2 years for construction and to obtain an NRC operating license, and 1/2 year for plant and equipment testing and startup.

Industry proposals for ISFSIs are scarce to date. In late 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 with nuclear plants in or near operation, offering to provide independent storage services for spent nuclear fuel. A paper on this proposed project was presented at the American Nuclear Society meeting in November 1975 (ANS Transactions 1975 Winter Meeting, Vol. 22, TANSAO 22-1-836, 1975). In 1974, E. R. Johnson Associates estimated construction costs would approximate $9,000 per spent fuel assembly.

** An application for an 1,100 MTU capacity addition is pending. Present schedule calls for completion in 1980 if approved. However, by motion dated November 8, 1977 General Electric Company requested the Atomic Safety and Licensing Board to suspend indefinitely further proceedings on this application. This motion was granted

Several licensees have evaluated construction of a separate ISFSI. The Connecticut Yankee Atomic Power Company, for example, estimated that an ISFSI with a capacity of 1,000 MTU would cost approximately $54 million and take about 5 years to construct and have ready for operation. The Commonwealth Edison Company estimated the construction costs of an ISFSI at about $10,000 per spent fuel assembly; to this would be added costs for maintenance, operation, safeguards, security, interest on investment, overhead, transportation and other costs.

On December 2, 1976, Stone and Webster Engineering Corporation submitted a Topical Report requesting NRC approval for a standard design ISFSI intended for siting near nuclear power facilities. Based on discussions with Stone and Webster, we estimated that the present day cost for such a fuel storage installation would be about $24 million, exclusive of site preparation costs. On July 12, 1978 we concluded that the proposed approach and conceptual design are acceptable.

Based on the above facts, on a short-term basis (i.e., prior to 1985), an ISFSI is not available as an alternative. One would not be available in time to meet the licensee's needs. It is also unlikely that the environmental impacts of this alternative, on a delayed availability basis, would be less than the minor impacts associated with the proposed D. C. Cook modifications. This is based on the fact that offsite transportation would be involved and a structure, pool, and supporting systems would have to be erected and installed for an ISFSI, whereas for the D. C. Cook modifications, only new storage racks and a support wall are involved.

In the long-term, the U. S. Department of Energy (DOE) is modifying its program for nuclear waste management to include design and evaluation of a retrievable storage facility to provide government storage at central locations for unreprocessed spent fuel rods. The pilot plant is expected to be completed by late 1985 or 1986. It is estimated that the long-term storage facility will start accepting commercial spent fuel in the time frame of 1993 or 1996. The design is based on storing the spent fuel in a retrievable condition for a minimum of 25 years with eventual storage in a geologic formation. The announced criterion for acceptance is expected to be that the spent fuel must have decayed a minimum of ten years so it can be stored in a dry condition without need for forced air circulation. As an interim alternative to the long-term retrievable storage facility, on October 18, 1977, DOE announced a new "spent nuclear fuel policy." DOE will

determine industry interest in providing interim fuel storage services on a contract basis. If adequate private storage services cannot be provided, the government will provide interim fuel storage facilities. These interim facilities would be designed for storage of the spent fuel under water. The announced criterion states that spent fuel will not be accepted for interim storage until it has decayed for a minimum of five years. DOE, through its Savannah River Operations Office, is preparing a conceptual design for an interim spent fuel storage pool of about 5,000 MTU capacity. Congressional authorization has been requested to borrow $300 million (about $30,000 per spent PWR fuel assembly) for design and construction of this facility. DOE has issued generic environmental impact statements analyzing the impacts associated with alternatives with respect to implementation of this domestic and foreign spent fuel storage policy ("Storage of U. S. Spent Power Reactor Fuel," DOE/EIS-0015 dated August 1978). The reports emphasize that the preferred policy approach is encouragement for expanded storage of spent fuel in basins at reactor sites (i.e., increasing the storage capacity of existing spent fuel pools and construction of new, interim storage pools at reactor sites).

Another aspect of the announced policy is that the Federal government will charge a one-time fee to fully recover all the government's costs for spent fuel storage and disposal. DOE has recently published the proposed charges for interim and permanent storage of spent fuel by the U. S. Government ("Charge for Spent Fuel Storage," DOE/EIS-0041 dated December 1978). The reference fee structure assumes a "use-based" or dual cost center pricing philosophy in which those utilities requiring both storage and disposal will pay a single fee for both of those services together, while those requiring only disposal (having suitable storage independent of the government facilities) would pay for disposal only. The total proposed charges (in 1978 dollars) for disposal only are $115 per kg and $202 per kg for both storage and disposal. A PWR fuel assembly contains in the order of 0.5 metric tons of uranium (MTU) while a typical BWR fuel assembly contains about 0.2 MTU. The costs to the utilities and to their customers will be about $44,000 more per PWR fuel assembly and $17,600 more per BWR fuel assembly if the utility cannot store the spent fuel onsite until such time as the permanent surface and/or geologic repository is ready to accept spent fuel.

Based on recent testimony before Congress on HR 2586 (June 25-27, 1979), the proposed "Spent Nuclear Fuel Act of 1979" (which would authorize DOE to receive title to spent fuel and to acquire or construct facilities for interim storage and ultimate disposal of spent fuel), it appears that the earliest DOE could have a storage pool licensed to accept spent fuel would be about 1984 or 1985. It should be noted that in a report to the Congress dated June 27, 1979 ("Federal Facilities for Storing Spent Nuclear Fuel - Are They Needed"), the Comptroller General recommended that DOE "should not develop an interim spent fuel storage program but, instead, should concentrte its efforts on getting resolution to whether commercial spent fuel will be processed and how and where spent fuel will be permanently stored." GAO recommended that spent fuel be stored at reactor sites, either in existing or new storage pools. For those utilities where this is not practical, GAO recommended that DOE pursue purchase or lease of the storage pools at the three existing but closed reprocessing plants (NFS, MO and AGNS).

In summary, an independent away from reactor (AFR) spent fuel storage installation is not available now and is not likely to be available in time to meet the licensees' needs. Thus, this is not a viable alternative to the proposed action.

6.4 Offsite Storage in SFPs of Other Reactors

The D. C. Cook Units are the only nuclear power reactors owned by the licensee. Offsite storage at other reactors would have to be by agreement between nuclear plant owners.

According to a survey conducted and documented by the former Energy Research and Development Administration, up to 27 of the operating nuclear power plants will lose the ability to refuel during the period 1977-1986 without additional spent fuel storage pool expansions or access to offsite storage facilities. Thus, the licensee cannot assuredly rely on any other power facility to provide additional storage capability except on a short-term emergency basis. If space were available in another reactor facility, it is unlikely that the cost would be less than storage onsite as proposed.

Based on the above facts, we have concluded that storage at another reactor site is not a realistic alternative at this time, or in the foreseeable future for the D. C. Cook Nuclear Plant.

6.5 Shutdown of Facility

Upon filling the SFP as presently designed, there would be no ability to reload the core for the next operating cycle. When the cycles of operation ending in 1982 would be completed, the D. C. Cook reactors would be forced to shut down (Unit No. 1 in May, Unit No. 2 in October) for lack of space to store spent fuel. There would be a resultant energy availability loss and an associated loss of economic benefit from the facilities, a cost associated with the purchase of replacement energy and the cost of maintaining the facilities in a standby condition.

The licensee has estimated that shut down of D. C. Cook Unit Nos. 1 and 2 (rated at 2,154 megawatts net electrical output) would result in replacement power costs alone of $1,500,000 per day. This is based on the differential costs of producing energy from D. C. Cook as compared to production from other available units in the American Electric Power systems. The licensee's estimates were based on the assumption that on a daily basis, with D. C. Cook Unit Nos. 1 and 2 operating at 100% power, the replacement costs would be about $1,500,000. In other words, D. C. Cook was assumed to have a 100% capacity factor.

We also have reviewed the differential costs of not operating D. C. Cook, as well as other facilities in that area of the country. We believe that a more appropriate capacity factor to consider, on an annual basis, would be on the order of 60-70%. In view of this, the replacement costs associated with the D. C. Cook using the production costs provided by the licensee for alternate units, would be on the order of $900,000 to $1,050,000 per day. For a shut down of any appreciable duration, these costs still would quickly exceed the costs associated with the proposed modification (e.g., at $900,000 per day these costs would exceed a modification cost of $4,700,000 is less than 2 months).

6.6 Conservation Measures and Extended Operating Cycles

Although there is no certainty that there are realistic alternatives at this time to the action proposed, the staff investigated energy conservation measures and extended operating cycles as alternatives to the proposed expansion.

D. C. Cook Unit Nos. 1 and 2 are the most economical to operate of the licensee's units and therefore would be used as a "base load" unit (operated at constant maximum power) even with any energy conservation program envisioned. If, instead, these nuclear units were preferentially operated at reduced power, as permitted by any net reductions in power demand, the cost of power from less

economical units would result in a higher cost per kW-hr to the consumer of the power delivered. In essence, this alternative is equivalent to the shutdown alternative. Assuming that conservation and reduced loading of the facility could have the benefit of extending operation by a factor of two, the increased differential costs to the consumer would still be significant ($0.75 million/day) in that the kW-hr replacement power would extend for twice the time period, but at half the rate.

We have considered the potential for D. C. Cook to be operated with extended operating cycles, i.e., 18 months between refuelings for Unit 1 rather than the present cycle of approximately 12 months and 20-30 months rather than 15-21 months for Unit 2. To do so, however, would involve higher fuel utilization, or burnups, which would necessitate a reconsideration of the potential results of accidents. This has not yet been assessed by the NRC and therefore the extended operating cycle is not available as an alternative at this time. The amount of savings realized under such a program would be consistent with the extra power taken from each fuel assembly. The extension of a fuel cycle, but at a lower average power level, results in no benefits because the amount of fuel discharged to the SFP over the long run is not decreased. Such an option is therefore not a true alternative.

6.7 Summary of Alternatives

In summary, alternatives (2) and (3) above are either presently not available to the licensee or could not be made available in time to meet the licensee's needs. Alternative (3) would be more expensive than the proposed modification. Alternative (4) would preempt storage space needed by another facility. Alternative (5), the shut down of D. C. Cook would be much more expensive than the proposed action because of the need to provide replacement power. Alternative (6), conservation measures and extended operating cycles, is equivalent to shutdown in costs to the public and would still require SFP modifications since the amount of fuel used during the life of the plant would not substantially decrease. We have determined that the expansion of the storage capacities of the SFP for the D. C. Cook plant would

have a negligible environmental impact. Accordingly, considering the economic advantages of the proposed action, we find that deferral or severe restriction of the action here proposed would result in substantial harm to the public interest with no significant benefits accruing from such deferral or restriction.

7.0 EVALUATION OF PROPOSED ACTION

7.1 Unavoidable Adverse Environmental Impacts

7.1.2 Radiological Impacts

As discussed in Section 4.0, expansion of the storage capacity of the SFP will not create any significant additional radiological effects. Because there are no other nuclear plants near D. C. Cook and the additional radiological impacts are local in character, the SFP modification at any other plant should not significantly contribute to D. C. Cook Unit Nos. 1 and 2 and the D. C. Cook Unit Nos. 1 and 2 SFP modification should not contribute significantly to the environmental impact of any other plant. The additional total body dose that might be received by an individual and the estimated population within a 50 mile radius are less than 0.001 mrem/year and 0.01 man-rem/year, respectively. These exposures are small compared to the fluctuations in the annual dose this population receives from background radiation. The population exposure represents an increase of less than 0.5% of the exposures from the plant evaluated in the FES. The occupational radiation exposure of workers during removal of the present storage racks and installation of the new racks is estimated by the licensee to be between about 18 and 20 man-rem. Removal of the 4" drain line from the SFP and cutting up the old storage racks for disposal will require an additional estimated 2-3 man-rem. These exposures are a small fraction of the total man-rem burden from occupational exposure at the plant. Operation of the plant with additional spent fuel in the SFP is not expected to increase the occupational radiation exposure by more than one percent of the present total annual occupational exposure at this facility.

7.1.3 Relationships Between Local Short-Term Use of Man's Environment and the Maintenance and Enhancement of Long-Term Productivity

Expansion of the storage capacity of the SFPs will not change the evaluation of long-term use of the land as described in the FES for D. C. Cook. In the short term, the proposed modifications would permit the expected benefits (i.e., production of electrical energy and minimizing reliance upon foreign oil) to continue.

7.1.4 Irreversible and Irretrievable Commitments of Resources

Water, Land and Air Resources

The proposed action will not result in any significant change in the commitments of water, land, and air resources as identified in the FES for D. C. Cook. No additional allocation of land would be made. The land area now used for the SFP would be used more efficiently by adopting the proposed action.

7.1.5 Material Resources

It is not likely that the licensing action here proposed would constitute a commitment of resources that would tend to significantly foreclose the alternatives available with respect to any other individual licensing action designed to ameliorate a possible shortage of spent fuel storage capacity. The added SFP capacity proposed will not significantly affect the need for the total additional storage space presently planned at reprocessing facilities for which licensing actions are pending. In order to carry out the proposed modifications, the licensee will require custom-made racks of stainless steel, aluminum boron and carbide and a support wall of reinforced steel. These materials are readily available in abundant supply. In the context of this criterion, we conclude that the amount of material required for this modification is insignificant and does not represent an irrevesible commitment of natural resources.

The longer term storage of spent fuel assemblies withdraws the unburned fissionable material from the fuel cycle for a longer period of time. The usefulness of this material as a resource in the future, however, would not be changed. The provision of longer onsite storage would not result in any cumlative effects due to plant operation since the throughput of materials would not change. Thus the same quantity of radioactive material will have been produced when averaged over the life of the plant. The licensing action would not constitute a commitment of resources that would affect the alternatives available to other nuclear power plants or other actions that might be taken by the industry in the future to alleviate fuel storage problems. No other significant resources need be allocated because, except for the addition of a support wall under the SFP slab, the other design characteristics of the SFP remain unchanged.

8.0 Commission Policy Statement Regarding Spent Fuel Storage

On September 16, 1975, the Commission announced (40 FR 42801) its intent to prepare a generic environmental impact statement on handling the storage of spent fuel from light water reactors. In this notice, it also announced its conclusion that it would not be in the public interest to defer all licensing actions intended to ameliorate a possible shortage of spent fuel storage capacity pending completion of the generic environmental impact statement.*

The Commission directed that in the consideration of any such proposed licensing action, the following five specific factors should be applied, balanced, and weighed in the context of the required environmental statement or appraisal.

1. Is it likely that the licensing action here proposed would have a utility that is independent of the utility of of other licensing actions designed to ameliorate a possible shortage of spent fuel capacity?

The reactor cores for D. C. Cook Unit Nos. 1 and 2 contain 193 fuel assemblies each. In its submittal of November 22, 1978, the licensees presented its estimated schedule for refueling. Unit Nos. 1 and 2 are scheduled to be refueled at approximately 12 and 15-21 month intervals with about 65 and 88 fuel assemblies, respectively, scheduled to be replaced at each refueling. The spent fuel pool was designed on the basis that a fuel cycle** would be in existence that would only require storage of spent fuel for about one year prior to shipment to a reprocessing

* The generic environmental statement (NUREG-0575) was issued August 1979. This environmental impact appraisal was performed independently and thus, the five factors were applied, balanced and weighed as provided for in the Commission's directive. The generic statement is before the Commission for its consideration. Pending Commission action on that document, the staff believes it appropriate to continue to address the five factors setout in the Commission's notice of September 16, 1975

** As used here fuel cycle refers to mining, processing into fuel assemblies, irradiation in the reactor, and reprocessing the irradiated fuel assemblies into new fuel assemblies.

facility. Therefore, a capacity to store 500 assemblies in the shared pool (about two and two-thirds of a full core) was considered adequate. This would have provided for complete unloading of one reactor core even if the spent fuel from the previous refuelings were still in the pool. It is prudent engineering practice to reserve space in the SFP to receive an entire reactor core, should this be necessary to inspect or repair core internals or because of other operational considerations.

The D. C. Cook Unit Nos. 1 and 2 began commercial operation on January 18, 1975 and March 10, 1978, respectively. With the present spent fuel storage racks, there will not be sufficient room to store an additional normal discharge of spent fuel by the spring of 1981. If expansion of the storage capacity of the SFP is not approved, or if an alternate storage facility for the spent fuel is not located, D. C. Cook Units will have to shut down in 1982.

The proposed licensing action (i.e., approve installing new racks of a design that permits storing more assemblies in the same space) would allow D. C. Cook to continue to operate beyond 1982 and until the proposed Federal repository is expected to be in operation. The proposed modification will also provide the licensee with additional flexibility which is desirable even if adequate offsite storage facilities hereafter become available to the licensee.

We have concluded that a need for additional spent fuel storage capacity exists at D. C. Cook which is independent of the utility of other licensing actions designed to ameliorate a possible shortage of spent fuel storage capacity.

2. Is it likely that the taking of the action here proposed prior to the preparation of the generic statement would constitute a commitment of resources that would tend to significantly foreclose the alternatives available with with respect to any other licensing actions designed to ameliorate a possible shortage of fuel storage capacity?

With respect to this proposed licensing action, we have considered commitment of both material and nonmaterial resources. The material resources considered are those to be used in the expansion of the D. C. Cook SFP.

The increased storage capacity of the SFP was considered as a nonmaterial resource and was evaluated relative to proposed similar licensing actions at other nuclear power plants, fuel reprocessing facilities and fuel storage facilities. We have determined that the proposed expansion in the storage capacity

of the SFP is only a measure to allow for continued operation and to provide operational flexibility at the facility, and will not foreclose similar licensing actions at other nuclear power plants. Similarly, taking this action would not commit the NRC to repeat this action or a related action in 1992, at which time the modified pool is estimated to be full if no fuel is removed.

We conclude that the expansion of the SFP at D. C. Cook prior to the formal Commission adoption of the generic statement, does not constitute a commitment of either material or nomaterial resources that would tend to significantly foreclose the alternatives available with respect to any other individual licensing actions designed to ameliorate a possible shortage of spent fuel storage capacity.

3. Can the environmental impacts associated with the licensing action here proposed be adequately addressed within the context of the present application without overlooking any cumulative environmental impacts?

We have considered the potential nonradiological and radiological impacts resulting from the fuel racks conversion and subsequent operation of the expanded capacity SFP at this station.

We find that there will be no significant environmental impacts on the environs outside the spent fuel storage building during removal of the existing racks, installation of the new racks, and the addition of the support wall under the SFP floor slab. We conclude that the impacts within this building will be limited to those normally associated with metal working and construction activities and with the occupational radiation attributable to these activities.

The potential nonradiological environmental impact attributable to the additional heat load in the SFP was determined by us to be negligible compared to the existing thermal effluents from the facility.

We have considered the potential radiological environmental impacts associated with the expansion of the SFPs and have concluded that they would not result in radioactive effluent releases that significantly affect the quality of the human environment during normal operation of the expanded capacity SFP or under postulated fuel handling accident conditions allowed by the facility license.

4. Have the technical issues which have arisen during the review of this application been resolved within the context?

Yes. We believe that this Environmental Impact Appraisal and the accompanying Safety Evaluation have responded to all technical issues concerning health, safety and the environment which have arisen during our review.

5. Would a deferral or severe restriction on this licensing action result in substantial harm to the public interest?

We have evaluated the impact of deferral of the proposed action as it relates to the public interest. As we have seen, there are significant economic advantages associated with this proposed action, and expansion of the storage capacity of the SFP will have a negligible environmental impact. Therefore, it is clear that the proposed action itself is in the public interest.

Deferral of this action until the formal Commission adoption of the Final Generic Environmental Impact Statement (FGEIS) would not be in the public interest. There is nothing in the FGEIS which is in conflict with the conclusions presented here, namely that the proposed rack modification is both a cost-effective and an environmentally benign approach to the spent fuel storage problem as an interim measure.

While it is true that D. C. Cook does not face certain long term shut down until 1982, there are other factors which weigh in favor of issuing the proposed amendments now. Following the refueling of D. C. Cook Unit No. 1 in the spring of 1980, the existing SFP will not have sufficient room to accommodate a full core (193 assemblies) should this be necessary to effect repairs, for example, to return the unit to service. Therefore, after this point in time, either or both D. C. Cook Units face the possibility of shut down at any time due to lack of a full core reserve in the SFP. While no serious adverse consequences to the public health and safety or the environment would likely result from this action itself, the reactor shut down would, of course, remove the unit from service, and this in turn could adversely affect the licensee's ability to meet electrical energy needs, or force the operation of other plants which are less economical to operate or which have greater environmental impact, and thereby result in substantial harm to the public interest.

Based on the foregoing, we conclude that public interest consideration weighs in favor of taking the proposed action now.

We have applied, balanced, and weighed the five specific factors and have concluded that this action to expand the spent fuel pool is in the public interest.

9.0 Cost-Benefit Balance

This section summarizes and compares the costs and benefits resulting from the proposed modification to those that would be derived from the selection and implementation of alternatives. Table 6.0 presents a tabular comparison of these costs and benefits. The benefit from two of these alternatives, if available, would be the continued operation of D. C. Cook or other production of demanded electrical energy. The remaining alternatives (i.e., reprocessing of the D. C. Cook spent fuel or its storage at other nuclear plants) are not possible at this time or in the foreseeable future except on a short term emergency basis and, therefore, have no associated cost or benefit.

From examination of the table, it can be seen that the most cost-effective alternative is the proposed SFP modification. As evaluated in the preceding sections, the environmental impacts associated with the proposed modification would not be significantly changed from those analyzed in the Final Environmental Statement for D. C. Cook Unit Nos. 1 and 2 issued in August 1973.

10.0 Basis and Conclusion for Not Preparing an Environmental Impact Statement

We have reviewed this proposed facility modification relative to the requirements set forth in 10 CFR Part 51 and the Council of Environmental Quality's Guidelines, 40 CFR 1500.6 and have applied, weighed, and balanced the five factors specified by the Nuclear Regulatory Commission in 40 CFR 42801. We have determined that the proposed license amendment will not significantly affect the quality of the human environment and that there will be no significant environmental impact attributable to the proposed action other than that which has already been predicted and described in the Commission's Final Environmental Statement for the facility dated August 1973. Therefore, the Commission has found that an environmental impact statement need not be prepared, and that pursuant to 10 CFR 51.5(c), the issuance of a negative declaration to this effect is appropriate.

Date: October 16, 1979

TABLE 6.0

SUMMARY OF COST vs. BENEFITS

	Alternative	Cost	Benefit
(1)	Increase Storage Capacity of D. C. Cook SFP	$3,030/assembly	Continued operation of D. C. Cook and production of electrical energy.
(2)	Reprocessing of Spent Fuel	N/A	None. This alternative is not available either now or in the foreseeable future.
(3)	Storage at ISFSI	$9,000 to $10,000 per assembly	This alternative may not be available when needed. If available it would allow continued operation and production of electrical energy at D. C. Cook.
(4)	Offsite Storage in SFPs of Other Reactors	N/A	None (before 1985). This is not available on a short-term basis (i.e., before about 1985).
(5)	Shutdown of Facility	$27 to $31 million per month	None. No production of electrical energy.
(6)	Conservation and Extended Operating Cycle	$14 to $16 million per month	Would stretch out refueling. SFP capacity would last longer. Would require somewhat fewer assemblies for a given amount of power - but not yet analyzed or approved.

7590-01

UNITED STATES NUCLEAR REGULATORY COMMISSION

DOCKET NOS. 50-315 AND 50-316

INDIANA AND MICHIGAN ELECTRIC COMPANY

INDIANA AND MICHIGAN POWER COMPANY

NOTICE OF ISSUANCE OF AMENDMENT TO FACILITY OPERATING LICENSE AND NEGATIVE DECLARATION

The U. S. Nuclear Regulatory Commission (the Commission) has issued Amendment No. 32 to Facility Operating License No. DPR-58, and Amendment No. 13 to Facility Operating License No. DPR-74 issued to Indiana and Michigan Electric Company and Indiana and Michigan Power Company (the licensee), which revised Technical Specifications for operation of Donald C. Cook Nuclear Plant, Unit Nos. 1 and 2 (the facilities) located in Berrien County, Michigan. The amendments are effective as of the date of issuance.

The amendments permit modifications of the spent fuel storage pool which will increase the capacity for on-site storage of fuel irradiated at the D. C. Cook plant from 550 to 2050 fuel assemblies.

The application for the amendments complies with the standards and requirements of the Atomic Energy Act of 1954, as amended (the Act), and the Commission's rules and regulations. The Commission has made appropriate findings as required by the Act and the Commission's rules and regulations in 10 CFR Chapter I, which are set forth in the license amendments. Notice of Proposed Issuance of the amendment was published in the Federal Register on January 11, 1979 (44 FR 2439).

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The Commission has prepared an Environmental Impact Appraisal dated October 16, 1979 and has concluded that an enviromental impact statement for this particular action is not warranted because the actions authorized by this license amendment will not significantly affect the quality of the human environment.

For further details with respect to this action, see (1) the application for amendments dated November 22, 1978, as supplemented by letters dated January 22, January 24, April 16, June 29, July 27, and September 11, September 26 and September 27, 1979; (2) Amendment Nos. 32 and 13 to License Nos. DPR-58 and DPR-74, and (3) the Commission's related Safety Evaluation and Environmental Impact Appraisal. All of these items are available for public inspection at the Commission's Public Document Room, 1717 H Street, N.W., Washington, D.C. and at the Maude Reston Palenske Memorial Library, 500 Market Street, St. Joseph, Michigan 49085. A copy of items (2) and (3) may be obtained upon request addressed to the U. S. Nuclear Regulatory Commission, Washington, D.C. 20555, Attention: Director, Division of Operating Reactors.

Dated at Bethesda, Maryland, this 16th day of October, 1979.

FOR THE NUCLEAR REGULATORY COMMISSION

A. Schwencer, Chief
Operating Reactors Branch #1
Division of Operating Reactors