ENVIRONMENTAL IMPACT APPRAISAL

BY THE OFFICE OF NUCLEAR REACTOR

REGULATION RELATING TO

MODIFICATION OF THE SPENT FUEL STORAGE POOL

FACILITY OPERATING LICENSE NO. DPR-43

WISCONSIN PUBLIC SERVICE CORPORATION

WISCONSIN POWER AND LIGHT COMPANY

MADISON GAS AND ELECTRIC COMPANY

KEWAUNEE NUCLEAR POWER PLANT

DOCKET NO. 50-305

1.0 DESCRIPTION OF PROPOSED ACTION

In its submittals of November 14, 1977 as supplemented Wisconsin Public Service Corporation et al (the licensee) proposed to increase the total storage capacity of the spent fuel pool (SFP) at Kewaunee Nuclear Power Plant (Kewaunee) from 168 to 990 fuel assemblies.

2.0 NEED FOR INCREASED STORAGE CAPACITY

Kewaunee is a 535 MWe pressurized water reactor located near Two Creeks, Wisconsin. Kewaunee received Facility Operating License No. DPR-43 in December 1973 and has been in commercial operation since 1974. The reactor spent fuel storage pool at Kewaunee contains fuel storage racks for 168 fuel assemblies. This storage capacity will accommodate a full Kewaunee core of 121 fuel assemblies plus an additional 47 fuel assemblies.

During a normal refueling about one third of the fuel assemblies are replaced by new fuel. The period between refueling intervals averages twelve months depending on plant operating history and the system wide outage schedule.

The Kewaunee SFP currently contains 120 spent fuel assemblies from the first three operating cycles. With the projected refueling cycle and the current number of empty spent fuel rack spaces, the spent fuel pool can accommodate the fuel assemblies discharged from only one more operating cycle. It does not have the capacity to accommodate an entire core offload at this time.

By adding an additional 822 fuel storage positions, the proposed modification will accommodate additional spent fuel discharges and maintain the full core offload capability through the mid-1990's.

The proposed modification to the SFP will not alter the external physical geometry or require modifications to the SFP cooling or purification systems. The proposed modification does not affect the rate of spent fuel generation or the total quantity of spent fuel generated during the anticipated operating lifetime of the facility. The proposed modification will increase the number of spent fuel assemblies stored in the SFP and the length of time that some of the fuel assemblies will be stored in the pool.

3.0 FUEL REPROCESSING HISTORY

Currently, spent fuel is not being reprocessed on a commercial basis in the United States. The Nuclear Fuel Service (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 (MFRP) in Morris, Illinois is in a decommissioned condition. Although no plants are licensed for reprocessing fuel, the storage pool at Morris, Illinois and the storage pool at West Valley, New York (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 for storage, even from those power generating facilities that had contractual arrangements with NFS. Construction of the AGNS receiving and storage station has been completed. AGNS has applied for - but has not been granted - a license to receive and store irradiated fuel assemblies in the storage pool at Barnwell prior to a decision on the licensing action relating to the separation facility.

4.0 THE PLANT

The Kewaunee Nuclear Power Plant is described in the Final Environmental Statement (FES) issued by the Commission in December 1972. Kewaunee is a pressurized water reactor (PWR) which produces approximately 535 megawatts net electrical output (MWe). Pertinent descriptions of principal features are summarized below to aid the reader in following the evaluations in subsequent sections of this appraisal.

4.1 Fuel Inventory

The Kewaunee reactor core contains 121 fuel assemblies. The fuel is in the form of slightly enriched uranium dioxide ceramic pellets. The pellets are stacked to an active height of 144 inches within Zircaloy-4 tubular cladding which is plugged and seal-welded at the ends to encapsulate the fuel. Approximately one-third of the assemblies are removed from the reactor and replaced with new fuel each operating cycle.

4.2 Plant Cooling Water Systems

The Kewaunee condenser cooling water and service water systems use water supplied by Lake Michigan. Condenser cooling water is supplied by two half-capacity circulating water pumps, each designed to supply 210,000 gpm to the condenser. The service water system furnishes cooling water to the component cooling water system, the containment fan-coil units, the auxiliary feedwater pumps, diesel generators, air compressors and control room air conditioners. The service water system acts as the heat sink for all equipment vital to plant safety. The service water system supplies cooling water to the spent fuel pool heat exchanger.

4.3 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 December 1972. There will be no change in the waste treatment systems described in Section III.D.2 of the FES because of the proposed modification.

4.4 Purpose of Spent Fuel Pool

The SFP at Kewaunee is designed to store spent fuel assemblies prior to shipment offsite. These assemblies may be transferred from the reactor core to the SFP during a core refueling, or to allow for inspection and/or modification of core internals. The latter may require the removal and storage of up to a full core. The assemblies upon removal from the core are initially intensely radioactive due to their fission product content and have a high residual heat output. They are stored in the SFP to allow for radioactive and thermal decay.

4.5 Spent Fuel Pool Purification System

The SFP purification system includes two pumps, a heat exchanger, two filters, a demineralizer with pre- and post-filters and the required piping, valves and instrumentation. The pumps draw water from the pool. This flow is passed through the filters, demineralizer and heat exchanger and returned to the pool.

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 5.3.1, we conclude that the existing SFP purification system will be able to keep concentrations of radioactivity in the pool water to levels which have existed prior to the modification.

5.0 ENVIRONMENTAL IMPACTS OF PROPOSED ACTION

5.1 Land Use

The Kewaunee SFP is located next to the reactor building. The proposed modification will not alter the external physical geometry of the SFP or the enclosing building. No additional commitment of land is required.

5.2 Water Use

There will be no significant change in plant water usage as a result of the proposed modification. As discussed in the accompanying Safety Evaluation, storing additional spent fuel in the SFP will slightly increase the heat load on the SFP cooling system. This heat load will be transferred to the service water system. The modification will not change the flow rates within these cooling systems. With the increased spent fuel storage capacity, the normal refueling addition without a full core discharge is expected to result in a peak pool temperature below 125°F. The maximum expected

total heat load will occur after discharge of a full core. The SFP cooling system and the RHR system have adequate combined design capacity following discharge of a full core at any time to maintain the pool water temperature below 150°F. Since the temperature of the SFP water during normal refueling operations will remain below 125°F, the rate of evaporation and thus the need for makeup water will not be significantly changed by the proposed modification.

5.3 RADIOLOGICAL

5.3.1 Introduction

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

The additional spent fuel which would be stored due to the expansion would be the oldest fuel which has not been shipped from the plant. This fuel should have decayed at least four years. Experience shows that 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 such material released from the assemblies has consisted of activated corrosion products such as Co-58, Co-60, Fe-59 and Mn-54 which are not volatile. Experience shows that radionuclides that might be released to the water through defects in spent fuel cladding, such as Cs-134, Cs-137, Sr-89 and Sr-90 are also predominately nonvolatile. The primary impact of such nonvolatile radioactive nuclides would be 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 found in the spent fuel pool water appear to be radionuclides present in the reactor coolant system prior to refueling (reactor coolant 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 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 conditions. A few weeks after refueling, the spent fuel cools in the spent fuel pool so that fuel clad temperature is relatively cool. This substantial temperature reduction should reduce the rate of release of fission products from the fuel pellets and decrease 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 and 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' (NFS) storage pool at West Valley, New York. Spent fuel assemblies have been stored in these two pools which, while in a reactor, were determined to have had significant leakage and were therefore removed from the core. After storage in the reactor facility's spent fuel pool, these assemblies fuel were later shipped to either MO or NFS for extended storage. Although this fuel had exhibited significant leakage at reactor operating conditions, there has been no significant leakage from this fuel in the offsite storage facility.

5.3.2 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 defective fuel assemblies. However, we have conservatively estimated that an additional 29 curies per year of Krypton-85 may be released when the modified pool racks are completely filled. This increase would result in an additional total body dose of less than 0.0005 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 0.0005 man-rem/year. This is small compared to the fluctuations in the annual dose this population would receive from national background radiation. Under our conservative assumptions, these exposures represent an increase of less than 0.5% of the exposures from the plant evaluated in the FES for the individual (Table V-2) and the population (Table V-4). Thus, we conclude that the proposed modification will not have any significant impact on exposures offsite.

Assuming that the spent fuel will be stored onsite for several years, Iodine-131 releases from spent fuel assemblies 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.

Storing additional spent fuel assemblies is not expected to increase the bulk water temperature during normal refuelings above the 125°F used in the design analysis. Therefore, it is not expected that there will be any significant change in the annual releases of tritium or iodine as a result of the proposed modification from those 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 water. 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 normally 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 release to the environment. In addition, the plant radiological effluent Technical Specifications, which are not being changed by this action, restrict the total releases of gaseous activity from the plant including the SFP.

5.3.3 Solid Radioactive Wastes

Independent of the proposed modification, the concentration of radionuclides in the pool is controlled by the filters and demineralizer and by the decay of short-lived isotopes. The activity which has been highest during refueling operations while reactor coolant water is introduced into the pool has been decreased to low levels as the pool water has been processed through the filters and demineralizer. The increase of radioactivity as a result of the proposed modification, if any, should be minor because the additional spent fuel to be stored will have been in the pool for four years or more, and therefore 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 50 cubic feet of resin a year from the demineralizer (two additional resin beds/year). The annual average amount of solid waste shipped from Kewaunee during 1976 to 1977 is 2,000 cubic feet per year. This is a small amount of a solid waste shipped from a PWR. The annual average amount of solid waste shipped from a PWR during 1972 to 1976 is more than 8,000 cubic feet per year. If the storage of additional spent fuel were to increase the amount of solid waste from the SFP purification systems by about 50 cubic feet per year, the increase in total waste volume shipped from an average PWR would be less than 0.7%. This would not have any significant environmental impact.

The present spent fuel racks to be removed from the SFP are contaminated and would be disposed of as low level waste at a licensed burial site. We have estimated that less than 6,000 cubic feet of low level solid radwaste will be removed from the SFP because of the proposed modification. Therefore, the total volume of solid radwaste shipped from the plant will be increased by less than 3% per year when averaged over the lifetime of the plant. This will not have any significant environmental impact.

5.3.4 Radioactivity Released to Receiving Waters

There should not be a significant increase in the liquid release of radionuclides from the plant as a result of the proposed modification. The amount of radioactivity on the SFP filter-demineralizer might slightly increase due to the additional aged spent fuel in the pool but this increase of radioactivity should not be released in liquid effluents from the station. In addition, the plant radiological effluent Technical Specifications, which are not being changed by this action, restrict the total releases of activity in liquids from the plant.

The cartridge filter removes insoluble radioactive matter from the SFP water. This is periodically removed to the waste disposal area in a shielded 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 condensate phase separator 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.

Leakage from the SFP is collected in the Auxiliary Building floor drain sumps. This water is transferred to the liquid radwaste system and is processed by the system before any water is discharged to Lake Michigan.

5.3.5 Occupational Exposures

We have reviewed the licensee's plan for the removal, and disposal of the present low density racks and the installation of the new high density racks in two steps (i.e., installing 7 racks in 1979 and 4 racks in the 1980's) with respect to occupational radiation exposure. The total occupational exposure resulting from this modification is estimated to be about 12 man-rem. We consider this to be a conservative estimate. This additional occupational exposure would be a small fraction (about 0.2%) of the total man-rem burden from occupational exposure over the lifetime operation of Kewaunee.

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 and by using relevant assumptions for occupancy times and for dose rates in the spent fuel area from radionuclide concentrations in the SFP water. The spent fuel assemblies themselves contribute a negligible amount to dose rates in the pool area because of the depth of water shielding the fuel. The occupational radiation exposure resulting from the proposed action represents a negligible burden. Based on present and projected operations in the spent fuel pool area, we estimate that the proposed modification

should add less than two 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.

5.3.6 Impacts of Other Pool Modifications

As discussed above, the additional environmental impacts in the vicinity of Kewaunee resulting from the proposed modification are very small fractions (less than 1%) of the impacts evaluated in the Kewaunee FES. These additional impacts are too small to be considered anything but local in character.

Point Beach Nuclear Plant Units 1 and 2 are located on a lakefront site 4.5 miles south of the Kewaunee site. By letter dated March 21, 1978, Wisconsin Electric Power Company proposed increasing the spent fuel storage capacity at both units at Point Beach. Operation of Point Beach Units 1 and 2 was evaluated by the NRC staff in the Final Environmental Statement dated May 1972.

The only impact of any potential environmental significance at Kewaunee from the proposed SFP modification at Point Beach would be the increased gaseous effluent attributable to the Point Beach SFP modification. We have conservatively estimated an additional 62 curies per year of Krypton 85 may be released from both units at Point Beach when their modified pool is completely filled. This additional Krypton 85 would result in an additional total body dose, that might be received by an individual near Point Beach or by the estimated population within a 50 mile radius, of less than 0.0005 mrem/year and 0.002 manrem/year, respectively.

Summing the additional exposures resulting from the proposed SFP modifications at both Kewaunee and Point Beach shows the additional total body dose that might be received by an individual and by the estimated population out to 50 miles is less than .001 mrem/year and 0.0025 manrem/year, respectively. These summed exposures are small compared to the fluctuations in the annual dose this population recieves from natural background radiation and represents an increase of less than 2% of the exposures evaluated in either the Kewaunee or the Point Beach FES. We have concluded that these dose estimates are not significant and they are conservative because they neglect the distance between the Kewaunee and Point Beach sites.

Based on the above, we conclude that a proposed SFP modification at any other existing facility should not significantly contribute to the environmental impact of the Kewaunee Nuclear Power Plant and that the proposed Kewaunee SFP modification should not contribute significantly to the environmental impact of any other facility.

5.3.7 Evaluation of Radiological Impact

As discussed above, the proposed modification would not significantly increase the radiological impact evaluated in the Kewaunee FES.

6.0 ENVIRONMENTAL IMPACT OF POSTULATED ACCIDENTS

Although the new high density racks will accommodate a larger inventory of spent fuel, we have determined that the installation and use of the racks will not change the environmental impact of a postulated fuel handling accident in the SFP area from those values reported in the FES for Kewaunee dated December 1972.

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. Kewaunee currently has a Technical Specification (TS 3.8.a.7) which does not allow heavy loads greater than the weight of a fuel assembly to be transported over or placed in either part of the SFP when spent fuel is stored in that part. The licensee plans to install the new high density racks in two steps. During the second phase of rack installation, placement of new racks will be permitted only if the racks do not traverse directly above spent fuel stored in either the north or south pool. We have concluded that the likelihood of a heavy load handling accident is sufficiently small that the proposed modification is acceptable.

7.0 ALTERNATIVES

In regard to this licensing action, the staff has considered the following alternatives: (1) reprocessing of spent fuel, (2) storage at an independent commercial facility; (3) storage at another nuclear facility; (4) shutdown of the facility.

7.1 Reprocessing of Spent Fuel

As discussed earlier, none of the three commercial reprocessing facilities in the U.S. are currently operating. The General Electric Company's Midwest Fuel Recovery Plant (MFRP) at Morris, Illinois is in a decommissioned condition. On September 22, 1976, Nuclear Fuel Services, Inc. (NFS) informed the Nuclear Regulatory Commission that they were "withdrawing from the nuclear fuel reprocessing 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 the separation facility is essentially complete. On July 3, 1974, AGNS applied for a materials license to receive and store up to 400 metric tons uranium (MTU) in spent fuel in the onsite storage pool, on which construction has been completed. Hearings on the materials license application have not been completed.

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 plant would include a storage pool that could store up to 7,000 MTU in spent fuel.

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 that: "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."

The Nuclear Regulatory Commission issued an order dated December 30, 1977 terminating proceedings to license reprocessing facilities. (42 FR 65334)

The licensee had intended to reprocess the spent fuel to recover and recycle the uranium and plutonium in the fuel. Due to a change in national policy and circumstances beyond WPSC's control, reprocessing of the spent fuel is not an available option at this time. Even if national policy were changed tomorrow to allow reprocessing of spent fuel, the time required to process the current national inventory of spent fuel would be approximately ten years.

7.2 Independent Spent Fuel Storage Facility

An alternative to expansion of onsite spent fuel pool storage is the construction of new "independent spent fuel storage installations" (ISFSI). Such installations could provide storage space in excess of 1,000 metric tons of uranium (MTU) of spent fuel. This is far greater than the capacities of onsite storage pools. Fuel storage pools at GE Morris and NFS are functioning as ISFSIs although this was not the original design intent. Likewise, if the AGNS receiving and storage station at its Barnwell, South Carolina reprocessing plant were licensed to accept spent fuel, it would be functioning as an ISFSI. The AGNS position, however, has generally been that it will not commercially operate a ISFSI. The license for the GE facility at Morris, Illinois was amended on December 3, 1975 to increase the storage capacity to about 750 MTU*; as of August 30, 1978, approximately 310 MTU were stored in the pool in the form of 1,196 assemblies. The staff has discussed the status of storage space at Morris Operations (MO) with GE personnel. We have been informed that GE is primarily operating the MO facility to store either fuel owned by GE (which had been leased to utilities) or fuel which GE had previously contracted to reprocess.** We understand

*An application for an 1100 MTU capacity addition is pending, but proceedings have been suspended indefinitely.

**GE letter to NRC dated May 27, 1977.

that the present GE policy is not to accept spent fuel for storage except for that fuel for which GE has a previous commitment. 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, since NFS withdrew from the fuel reprocessing business, correspondence we have received indicates that NFS is not at present accepting additional spent fuel for storage even from those reactor facilities with which they had contracts. The status of the storage pool at AGNS was discussed above.

With respect to construction of new ISFSIs, Regulatory Guide 3.24, "Guidance on the License Application, Siting, Design, and Plant Protection for an Independent Spent Fuel Storage Installation," issued in December 1974, recognizes the possible need for ISFSIs and provides recommended criteria and requirements for water-cooled ISFSIs. Pertinent sections of 10 CFR Parts 19, 20, 30, 40, 51, 70, 71 and 73 would also apply. On October 6, 1978, the Commission proposed a new regulation to provide for the issuance of licenses to store spent fuel in independent spent fuel storage installations. The proposed 10 CFR Part 72 "Licensing Requirements for the Storage of Spent Fuel in an Independent Spent Fuel Installation (ISFSI)" specifies procedures and requirements for the issuance of such licenses along with requirements for the siting, design, operation and recordkeeping activities of the facilities.

The staff has estimated that at least five years would be required for completion of an independent fuel storage facility. This estimate assumes one year for preliminary design; one year for preparation of the license application, Environmental Report, and licensing review in parallel with one year for detail design; two and one-half years for construction and receipt of an operating license; and one-half year for plant and equipment testing and startup.

Industry proposals for independent spent fuel storage facilities 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 having nuclear plants in operation or contemplated for 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, 1975). In 1974, E. R. Johnson Associates estimated their construction cost at approximately $20 million.

Several licensees have evaluated construction of a separate independent spent fuel storage facility and have provided cost estimates. Connecticut Yankee, for example, estimated that to build an independent facility with a storage capacity of 1,000 MTU (BWR and/or PWR assemblies) would cost approximately $54 million and take about 5 years to put

into operation. Commonwealth Edison estimated the construction cost to build a fuel storage facility at about $10,000 per fuel assembly. To this would be added to costs for maintenance, operation, safeguards, security, interest on investment, overhead, transportation and other costs.

On December 2, 1976, Stone and Webster Corporation submitted a topical report requesting approval for a standard design for an independent spent fuel storage facility. The facility is designed to store approximately 1433 tons of spent fuel, or the amount produced by 30 years of operation at a 1300 megawatt plant. No specific locations were proposed, although the design is based on location near a nuclear power facility. We estimated present day cost for such a fuel storage installation to be about $26 million. This does not include client costs associated with the nuclear power facility site preparation. On July 12, 1978 the staff concluded that the proposed approach and conceptual design were acceptable.

On a short-term basis (i.e., prior to 1983) an independent spent fuel storage installation does not appear to be an acceptable alternative based on cost or availability in time to meet the licensee's needs. It is also unlikely that the total environmental impacts of constructing an independent facility and shipment of spent fuel would be less than the minor impacts associated with the proposed modification.

In the long-term, the U. S. Department of Energy (USDOE) 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 1995. The design is based on storing the spent fuel in a retrievable condition for a minimum of 25 years. The criteria for acceptance is that the spent fuel must have decayed a minimum of ten years so it can be stored in dry condition without need for forced air circulation. As an interim alternative to the long term retrievable storage facility, on October 18, 1977, USDOE announced a new "spent nuclear fuel policy". USDOE 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. It was announced by USDOE at a public meeting held on October 26, 1977, that this interim storage is expected to be available in the 1981-1982 time frame. USDOE thru their Savannah River Operations Office is preparing a conceptual design for a possible spent fuel storage pool of about 5000 MTU capacity. DOE has requested, but has not received, Congressional authorization for design and construction of their interim spent fuel storage facility. Based on our discussions with USDOE personnel, it appears that the earliest such a pool could be licensed to accept spent fuel would be about 1983. The interim facility(s) would be designed for storage of the spent fuel under

water. USDOE stated that it was their intent to not accept any spent fuel that had not decayed a minimum of five (5) years.

As indicated in the President's energy policy statement of April 29, 1977, the preferred solution to the spent fuel storage program is to have the nuclear power plants store their spent fuel on-site until the government long term storage facility is operable, which is now estimated to be about 1995. For those nuclear power plants that cannot store the spent fuel on-site until the permanent long-term storage facility is available, USDOE intends to provide limited interim storage facilities.

This interim storage is not expected to be available until 1983. A National Waste Repository would not be available until approximately 1995. If the Kewaunee SFP is not modified as proposed, the Kewaunee Plant would have to shutdown in 1980 since the SFP would be essentially full. The date that interim storage would be available is not known at this time with sufficient precision to provide for planning. Since these facilities would not be available when needed, the Kewaunee plant would be forced to shutdown. Therefore, this is not an alternative. The impact of plant shutdown as compared with the negligible environmental consequences of the proposed modification is discussed below.

The proposed increase in storage capacity will allow Kewaunee to operate until the mid-1990's by which time some form of interim storage is expected to be operable and available to the licensee.

7.3 Storage at Another Reactor Site

Kewaunee is the only nuclear power station owned by WPSC. Therefore, WPSC does not have an option of storage of Kewaunee fuel at another WPSC station. The alternative of storage at another nuclear power station not owned and operated by the licensee is also not realistic. According to a survey conducted and documented by the former Energy Research and Development Agency, up to 46 percent of the operating nuclear power plants will lose the ability to refuel during the period 1975-1984 without additional spent fuel storage pool expansions or access to offsite storage facilities. Thus, the licensee cannot rely on any other power facility to provide additional storage capability except on a temporary basis. If space were available in another reactor facility, the cost would probably be comparable to the cost of storage at a commercial storage facility and would only forestall, for a limited time, shutdown of Kewaunee.

In the absence of a general policy regarding interfacility transfer and storage of spent fuel, such action is being decided on a case-by-case basis. In view of this, storage at another reactor site would not afford the timely relief needed here. Therefore, storage at another reactor site is not a realistic alternative to the proposed action.

7.4 Shutdown of Facility

If Kewaunee were forced to shutdown for lack of space to store spent fuel, there would be the loss of the economic benefit from the facility (generation of electric energy) and a cost associated with purchase of replacement energy and maintaining the facility in a standby condition far in excess of the cost of the proposed modification.

The licensee estimates that the loss of revenues from the idle unit would be about $125,000/day. This is consistent with comparable data for other operating reactors.

7.5 Summary of Alternatives

In summary, the alternatives (1) to (3) described above are presently not available to the licensee or could not be made available in time to meet the licensee's need. Assuming the nonavailability of alternatives (1) to (3), WPSC would be forced to shutdown Kewaunee if the proposed additional spent fuel storage capacity is not available. Even if available, alternatives (2) and (3) do not provide the operating flexibility of the proposed action and are likely to be more expensive than the proposed modification.

Alternative (4), plant shutdown, would be much more expensive than the proposed action because of the need to provide replacement power. In addition to the economic advantages of the proposed action, we have determined that the expansion of the storage capacity of the SFP for Kewaunee would have a negligible environmental impact.

8.0 EVALUATION OF PROPOSED ACTION

8.1 Unavoidable Adverse Environmental Impacts

8.1.1 Physical Impacts

As discussed above, expansion of the storage capacity of the SFP would not result in any significant unavoidable adverse environmental impacts on the land, water, air or biota of the area.

8.1.2 Radiological Impacts

As discussed in Section 5.3, expansion of the storage capacity of the Kewaunee SFP will not create any significant additional radiological effects. The additional total body dose that might be received by an individual or the estimated population within a 50-mile radius is less than 0.0005 mrem/yr and 0.0005 man-rem/yr, respectively. These exposures are small compared to the fluctuations in the annual dose this population receives from background radiation and represent an increase of less than 0.5% of the exposures from the plant evaluated in the Kewaunee FES. The total occupational exposure of workers during removal of the present storage racks and installation of the new racks is estimated to be about 12 man-rem. This is a small fraction (about 0.2 percent) of the total man-rem

burden from occupational exposure at the station during its lifetime. Operation of the plant with additional spent fuel in the SFP is not expected to increase the occupational radiation exposure by more than two percent of the present total annual occupational exposure at this facility.

8.2 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 SFP will not change the evaluation of long-term use of the land as described in the FES for Kewaunee. In the short-term, the proposed modification would permit the expected benefits (i.e., production of electrical energy) to continue.

8.3 Irreversible and Irretrievable Commitments of Resources

8.3.1 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 Kewaunee. 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.

8.3.2 Material Resources

It is not likely that taking 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 time frame under consideration is two years, the staff's estimate of the time necessary to complete the generic environmental statement on handling and storage of spent fuel from light water reactors. The action proposed will not have any significant effect on whether similar actions are or should be taken at other nuclear reactors since it will not affect either the need for or availability of storage facilities at other nuclear reactors. Nor will the added capacity here 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 racks of stainless steel and B_4C. These materials are readily available in abundant supply. In the context of this criterion, the staff concludes that the amount of material (steel, boron, carbon) required for the racks for Kewaunee is insignificant and does not represent an irreversible commitment of natural resources.

The longer term storage of spent fuel assemblies withdraws the unburned uranium from the fuel cycle for a longer period of time. Its usefulness as a resource in the future, however, is not changed.

The provision of longer onsite storage does not result in any cumulative effects due to plant operation since the throughput of materials does not change. Thus the same quantity of radioactive material will have been produced when averaged over the life of the plant. This 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 resources need be allocated because the other design characteristics of the SFP remain unchanged.

8.4 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 and 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. This has been done as summarized below.

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

The reactor core for Kewaunee contains 121 fuel assemblies. In its submittal of November 14, 1977, WPSC presented their estimated schedule for refueling. The facility is scheduled to be refueled annually, with about 40 fuel assemblies generally scheduled to be replaced. 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 a year prior to shipment to a reprocessing facility. Therefore, a pool storage capacity for 168 assemblies was considered adequate. 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.

Kewaunee received its operating license in December 1973 and is presently in its fourth operating cycle. The SFP currently contains spent fuel assemblies from the first three operating cycles. With the present spent fuel storage racks, Kewaunee has room to store the 40 spent fuel assemblies that are scheduled to be replaced in 1979 but not those scheduled to be replaced in 1980. If expansion of the storage capacity of this SFP is not approved, or if an alternative

storage facility for the spent fuel is not located, Kewaunee will have to shut down in 1980 or earlier. As discussed under alternatives (Section 7.0,, an alternate storage facility is not now available. As a long term solution to the spent fuel storage problem, the Federal government is planning to provide a retrievable repository for spent fuel around 1995.

The proposed licensing action (i.e., installing new racks of a design that permits storing more assemblies in the same space) would allow Kewaunee to continue to operate until the mid-1990's and until the proposed Federal repository is expected to be in operation. The proposed modification will also provide the licensee with additional core offload 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 at Kewaunee has utility which is independent of the utility of other licensing actions designed to ameliorate a possible shortage of spent fuel capacity.

b. 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 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 SFP.

The proposed increased storage capacity of Kewaunee SFP has been considered to be a nonmaterial resource and was evaluated relative to proposed similar licensing actions within a two year period (the time we estimate necessary to complete the generic environmental statement) 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 affect 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.

We conclude that the expansion of the SFP at Kewaunee, prior to the preparation of the generic statement, does not constitute a commitment of either material or nonmaterial resources that would tend to significantly foreclose the alternatives available with respect to any other individual licensing actions designed to ameliorate a possible short of spent fuel storage capacity.

c. 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?

Potential nonradiological and radiological impacts resulting from the fuel rack conversion and subsequent operation of the expanded SFP at this facility were considered by the staff.

No environmental impacts outside the spent fuel storage building are expected during removal of the existing racks and installation of the racks. The impacts within this building are expected to be limited to those normally associated with metal working activities and to the controlled, low level occupational radiation exposure to the personnel involved.

The potential nonradiological environmental impact attributable to the additional heat load in the SFP was determined 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 SFP and have concluded that they would not result in radioactive effluent releases that significantly affect the quality of the human environment during either normal operation of the expanded SFP or under postulated fuel handling accident conditions.

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

This Environmental Impact Appraisal and the accompanying Safety Evaluation respond to the questions concerning health, safety and environmental concerns.

No environmental impacts outside the spent fuel storage building are expected during removal of the existing racks and installation of the racks. The impacts within this building are expected to be limited to those normally associated with metal working activities and to the controlled, low level occupational radiation exposure to the personnel involved.

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

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

We have evaluated the alternatives to the proposed action, including storage of the additional spent fuel offsite and ceasing power generation from the plant when the existing SFP is full. We have determined that there are signficant economic advantages associated

with the proposed action and that expansion of the storage capacity of the SFP will have a negligible environmental impact. Accordingly, deferral or severe restriction of the action here proposed would result in substantial harm to the public interest.

9.0 BENEFIT-COST BALANCE

This section summarizes and compares the cost and the benefits resulting from the proposed modification to those that would be derived from the selection and implementation of each alternative. Table 9.0 presents a tabular comparison of these costs and benefits. The benefit that is derived from four of these alternatives is the continued operation of Kewaunee and production of electrical energy. Reprocessing of spent fuel is not an option in the foreseeable future and has no associated cost or benefit. The alternative of storage at another nuclear plant this is not possible at this time nor in the foreseeable future except on a short-term emergency basis. The final alternative, plant shutdown, has a high identifiable cost and no associated 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 Kewaunee Nuclear Power Plant issued in December 1972.

10.0 BASIS AND CONCLUSION FOR NOT PREPARING AN ENVIRONMENTAL IMPACT APPRAISAL

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. We have determined, based on this assessment, that the proposed license amendment will not significantly affect the quality of the human environment. Therefore, the Commission has determined that an environmental impact statement need not be prepared and that, pursuant to 10 CFR 51.5(c), issuance of a negative declaration to this effect is appropriate.

DATED: December 1, 1978

TABLE 9.0

SUMMARY OF COST-BENEFITS

Alternative	Cost	Benefit
Reprocessing of Spent Fuel	-	None - This alternative is not available either now or in the foreseeable future.
Pool Expansion as Proposed	$2200 per assembly	Continued Operation and Energy Generation
Storage at Independent Facility	$19,800 - $33,000 per assembly	Continued Operation and Energy Generation - This alternative will not be available within the next five years.
Storage at Reprocessor's Facility	Approximately $3,800 per assembly	Continued Operation and Energy Generation - This alternative is not available now or in the foreseeable future.
Storage at Other Nuclear Plants	----	Continued Operation and Energy Generation - This alternative is not available now nor is it likely to become available in the future.
Reactor Shutdown	Approximately $125,000/day	None