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NUCLEAR REGULATORY COMMISSION
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ENVIRONMENTAL IMPACT APPRAISAL BY THE OFFICE OF NUCLEAR REACTOR REGULATION

SUPPORTING AMENDMENT NO. 74 TO DPR-57
AND
AMENDMENT NO. 15 TO NPF-5

GEORGIA POWER COMPANY, ET AL.

E. I. HATCH NUCLEAR POWER PLANT UNITS 1 AND 2

DOCKET NO. 50-321 AND 50-366

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1.0 Description of the Proposed Action

By application dated July 9, 1979, Georgia Power Company (the licensee) requested an amendment to Facility Operating License DPR-57, which was issued for Edwin I. Hatch Nuclear Plant Unit No. 1 on August 6, 1974, and Facility Operating License NPF-5, which was issued for Edwin I. Hatch Nuclear Plant Unit No. 2 on June 13, 1978. The proposed amendments would allow an increase in the storage capacity of the Unit No. 1 spent fuel pool from 840 to 3171 fuel assemblies, and the Unit No. 2 spent fuel pool from 1120 to 2755 fuel assemblies. This increase in the capacity would be accomplished by installing storage racks with a center-to-center spacing of approximately 6.5 inches between adjacent vertical cells in place of the existing racks which have approximately 12 inch center-to-center spacing between cells. No changes would be made in the overall pool dimensions or the pool cooling and purification systems.

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

It is desirable to have enough spent fuel pool storage capacity in reserve to allow for a full core offload. Subsequent to the Unit No. 1 refueling outage in 1979, sufficient reserve for full core offload has not existed in the Unit 1 pool. The licensee proposes to commence the installation of the higher density racks in March, 1980.

Environmental impacts of Units 1 and 2, as designed, were considered in the "Final Environmental Statement for THE EDWIN I. HATCH NUCLEAR PLANT UNIT 1 AND UNIT 2" issued October 1972 by the Directorate of Licensing, U.S. AEC, and in the "Final Environmental Statement related to the operation of EDWIN I. HATCH NUCLEAR PLANT UNIT NO. 2" issued March 1978, by the U. S. Nuclear Regulatory Commission. The purpose of this environmental impact appraisal (EIA) is to determine and evaluate any additional environmental impacts which are attributable to the proposed increase in SFP storage capacity.

2.0 Need for Increased Storage Capacity

According to the licensee's planned refueling schedule, with the present storage rack configuration, full core storage reserve capability will be lost in 1983. This prediction is based on maintaining reserve storage for a single core using the combined storage capacities of both spent fuel pools. This is possible because Unit 1 and Unit 2 share a common refueling floor and a transfer canal which connects the two spent fuel pools. While this capability is not necessary to protect the health and safety of the public, it is desirable to reduce occupational exposures. With the present SFP capacity, the licensee will lose all storage capacity in 1985.

As stated by the licensee, the SFP design was predicted on being able to ship spent fuel offiste for processing after a temporary residence time in the pool for decay of short-lived radioactive fission products. However, spent fuel is not currently being reprocessed on a commercial basis in the United States and storage capacity away from reactor sites is available only on an emergency basis. Additional spent fuel storage capacity is eventually expected to become available at facilities provided by the Department of Energy (DOE); various options are being considered which could result in shipments to such interim facilities in 1984 and to long-term disposition facilities commencing during the 1990-1993 time frame. However, these dates are uncertain since the Congress has not yet authorized or funded these facilities. Furthermore, DOE has stated its intent not to accept spent fuel for interim storage until it has decayed for five years and not to accept it for long-term storage until it has decayed for ten years (so that the fuel can be stored dry without forced-air ventilation). The earliest these conditions can be met by spent fuel discharged from Unit 1 would be in the fall of 1982 for interim storage and the fall of 1987 for long-term storage.

Based on the above information, there is clearly a need for additional onsite spent fuel storage capacity to assure continued operation of Units 1 and 2, with full core off-load capability, after the fall of 1983. The proposed expansion of the total SFP capacity to 6026 assemblies* would provide this capability until the fall of 1997, using annual refueling cycles. If longer refueling cycles (such as 18-months) were adopted after the next cycle for Hatch Units 1 and 2, the present full-core off-load capability would not be extended beyond 1983. Thus, additional storage capacity is needed even if extended refueling cycles are adopted.

3.0 The Facility

Units 1 and 2 each have a boiling water reactor (BWR) with a maximum design power level of 2436 megawatts thermal (MWt). Steam generated in the reactor can be used in turbine-generators to produce up to 786 MWe for Unit 2.

Principal features of the facility which are pertinent to this evaluation are briefly described below for convenience in following the discussion in subsequent sections of this appraisal. More details are presented in the final environmental statements (FES mentioned in section 1 and in the Safety Evaluation Reports (SER) issued by the staff in May, 1973 (Unit 1) and June, 1978 (Unit 2).

* 80 spaces are included in the Unit 2 pool by retaining 4 of the existing storage racks. There are also 10 defective fuel locations in each pool.

3.1 Fuel Inventory

The weight of fuel, as uranium in each reactor is approximately 227,000 pounds. The fuel is contained in long sealed tubes called fuel rods. A cluster of 62 fuel rods arranged in a 8x8 array makes up each of the 560 fuel assemblies in a reactor. (Unit 1 has a mixture of 7x7 and 8x8 arrays.)

The proposed modification of the SFP would not change the quantity of uranium fuel used in the reactor over the anticipated operating life of the facility and would not change the rate at which spent fuel is generated by the facility. The added storage capacity would increase the number of spent fuel assemblies that could be stored in the SFP and the length of time that some of the fuel assemblies could be stored in the pool.

3.2 Purpose of the Spent Fuel Pool

Spent fuel assemblies are intensely radioactive due to their fresh fission product content when initially removed from the core and they have a high thermal output. The SFP was designed for storage of these assemblies to allow for radioactive and thermal decay prior to shipping them to a reprocessing facility. The major portion of decay occurs in the first 150 days following removal from the reactor core. After this period, the spent fuel assemblies may be withdrawn and placed in heavily shielded casks for shipment. Space permitting, the assemblies may be stored for longer periods, allowing continued fission product decay and thermal cooling.

3.3 Spent Fuel Pool Cooling and Purification System

The SFP is provided with a cooling system to remove residual heat from the fuel stored in the pool and purification equipment to maintain the quality and clarity of the water in which the fuel assemblies are immersed. The system is discussed in detail in Hatch Unit 1 FSAR Section 10.4 and Hatch Unit 2 FSAR Section 9.1.3; and in Section 9.1.3 of the SER.

The cooling system is designed to maintain the pool water temperature at or below 125°F under normal refueling conditions (with 25% of a core that has an average residual time of four years before being placed in the pool 150 hours after shutdown, plus 25% of a core that has been in storage for one year from a previous refueling operation. Under abnormal conditions, the cooling system is designed to maintain the pool water temperature below 150°F after reaching an equilibrium cycle, with an entire core removed. Two cooling loops are provided for Unit 1 and one cooling loop for Unit 2. Each Unit 1 loop has a full capacity (610 gpm) circulating pump and a heat exchanger designed to remove heat from the pool at a rate of 4.25×10^6 BTU/hour. The Unit 2 loop has a full capacity circulating pump (650) gpm and a heat exchanger designed to remove heat from the pool at a rate of 4.25×10^6 BTU/hour. The three loops are cross-connected for flexibility in the event of a component failure.

In operation, a circulating pump draws water from one end of the pool, circulates it through a heat exchanger and filter/demineralizer and returns it to the other end of the pool. The SFP clean up system consists of a filter vessel, a resin trap, a holding pump, a precoat mixing tank and pump and the required piping, valves and instrumentation. There is also a skimmer system to remove surface dust and debris from the SFP.

3.4 Cooling Water Systems

The heat exchangers in the SFP cooling system discharge the heat from the SFP to the Reactor Building Closed Cooling Water (RBCCW) system which is designed to cool auxiliary equipment located in the reactor building. This system is cooled via heat exchangers by water from the plant service water system which is pumped from the river water intake structure to the plant auxiliary cooling systems and returned to the service water discharge.

Details of the Plant Service Water Systems are discussed in Section 9.2.1 of the SER. During full load operation of Units 1 and 2, a total thermal load of approximately 1.5×10^{11} BTU/hour will be dissipated to the environment. Of this amount, approximately 8.5×10^{6} BTU/hour (about 5.6×10^{3}%) will be contributed by the system under normal operating conditions. If necessary to offload a full core to the SFP, the contribution of the service water system would increase to approximately 10.8×10^{6} BTU/hour for a short time, but the total thermal load dissipated by the plant would diminish to about 7.5×10^{10} BTU/hour as one of the units is shut down. Heat in the service water is normally dissipated by evaporation in the cooling towers to the atmosphere.

3.5 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) ated March 1978. There will be no change in the waste treatment system described in Section 3.2.3 of the FES because of the proposed modification.

4.0 Environmental Impacts of the Proposed Action

4.1 Land Use

The external dimensions of the SFP will not change because of the proposed expansion of its storage capacity; therefore, no additional commitment of land is required. The SFP is intended to store spent fuel assemblies under water for a period of time to allow shorter-lived radioactive isotopes to decay and to reduce their thermal heat output. This type of use will remain unchanged by the modification but the additional storage capacity would provide for a total of 23 normal refuelings compared to 9 such refuelings at present. Thus, the proposed modification would result in more efficient use of the land already designed for spent fuel storage.

4.2 Water Use

As indicated in Section 2.2 of the attached Safety Evaluation for the proposed modification, we have verified that the existing SFP cooling system can maintain the same pool water temperatures specified for the original fuel storage configuration. Although the heat to be dissipated would increase somewhat, the amount of makeup water required for pool operation would be essentially the same as that previously considered, since the design temperature limits and rate of water circulation through the pool remain the same.

However, storing additional fuel in the SFP would increase the heat load transferred to the Reactor Building Closed Cooling Water (RBCCW) system and then to the plant service water system by a maximum of 1.275×10^7 BTU/hour. This is less than .01% of the total heat load from both Units, and would be dissipated by evaporation from the cooling towers to the atmosphere with no noticeable effects.

4.3 Nonradiological Effluents

No additional chemicals or biocides are to be used because of the SFP expansion. Therefore, the only nonradiological effluent attributable to the amendment would be the additional heat load of up to 1.275×10^7 BTU/hour dissipated from the plant service water system. This additional heat load is negligible compared to the capability of the Plant Service Water System (1.5×10^{11} BTU/hour.

4.4 Radiological Impacts

4.4.1 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 at least 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 predominately 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 the fuel clad temperature is relatively cool, approximately 180 F. 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 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' (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.

4.4.2 Effect of Fuel Failure on the SFP

Experience indicates that there is little radionuclide leakage from Zircaloy-clad spent fuel stored in pools for over a decade. Operators at several reactors have discharged, stored, and/or shipped relatively large numbers of Zircaloy-clad fuel elements which developed defects during reactor exposures, e.g., Ginna, Oyster Creek, Nine Mile Point, and Dresden Units Nos. 1 and 2. Based on the operational reports submitted by licensees and discussions with the operators, there has not been any significant leakage of fission products from spent reactor fuel stored in the MO pool or the NFS pool. Several hundred Zircaloy-clad assemblies which developed one or more defects in-reactor are stored in the Morris pool without need for isolation in special cans. Detailed analysis of the radioactivity in the pool water indicates that the defects are not continuing to release significant quantities of radioactivity.

A recent Battelle Northwest Laboratory (BNL) report, "Behavior of Spent Nuclear Fuel in Water Pool Storage: (BNWL-2256 dated September 1977), states that radioactivity concentrations may approach a value up to 0.5 μCi/ml during fuel discharge in the SFP. After the refueling, the SFP ion exchange and filtration units will reduce and maintain the pool water in the range of 10^{-3} to 10^{-4} μCi/ml.

In handling defective fuel, the BNL study found that the vast majority of failed fuel does not require special handling and is stored in the same manner as intact fuel. Two aspects of the defective fuel account for its favorable storage characteristics. First, when a fuel rod perforates in-reactor, the radioactive gas inventory is released to the reactor primary coolant. Therefore, upon discharge, little additional gas release occurs. Only if the failure occurs by mechanical damage in the basin are radioactive gases released in detectable amounts, and this type of damage is extremely rare. In addition, most of the gaseous fission products have short half-lives and decay to insignificant levels. The second favorable aspect is the inert character of the uranium oxide pellets in contact with water. This has been determined in laboratory studies and also by casual observations of pellet behavior when broken rods are stored in pools.

4.4.3 <u>Radioactive Material Released to Atmosphere</u>

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 an additional 161 curies per year of Krypton-85 may be released from the SFP when the modified pools are completely filled from 1960 to 6026 fuel assemblies. 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 0.0004 man-rem/year. This is small compared to the fluctuations in the annual dose this population would receive from natural background radiation. This exposure represents an increase of much less than 0.1% of the exposure from the plant evaluated in the FES. 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 in the pool should not increase the bulk water temperature during normal refuelings above the 125 F used as a design condition for the present storage capacity. Therefore, there should not 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 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. 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.

4.4.4 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 spent fuel in the pool, but this increase of radioactivity should not be released in liquid effluents from the plant. The plant radiological effluent technical specifications, which are not being changed by this action, restrict the total releases of liquid radioactivity from the plant.

The spent fuel pool has its own filter-demineralizer systems and under normal circumstances the SFP water is not transferred to the liquid radwaste system for processing. Therefore no increase in liquid effluents from the plant is expected as a result of the modification. The fuel pool filter-demineralizer resins are periodically backwashed with water whenever the effluent conductivity exceeds specified limits or the differential pressure across the demineralizer exceeds specified limits. Each backwash cycle generates 2.5 ft^3 of spent resin. Spent demineralizer resins are collected in a spent resin tank and processed for modification as described in Section 4.0.

Leakage from the SFP would be collected in leak collection systems which consist of embedded stainless steel channels behind the stainless steel liner plate. These channels direct the flow to the reactor building floor radwaste drain sumps through the pool leak detection system. The leakage would then be transferred to the liquid radwaste system and processed by the system before any water is discharged from the plant. There have not been signs of leakage from the pool from Unit 1. However should leakage occur it can be detected by several methods (e.g., increase of the make-up water, unusual frequency of operation of the sump pump). Presence of large leaks is annunciated in the control-room by level switches on the sumps.

4.4.5 Solid Radioactive Wastes

The concentration of radionuclides in the pool is controlled by the filter-demineralizer and by decay of short-lived isotopes. The activity is high during refueling operations while reactor coolant water is introduced into the pool and decreases as the pool water is processed through the filter-demineralizer. 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 a significant 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 100 cubic feet a year from the filter-demineralizer. This represents a conservative factor of two increase in the present amount of solid waste from the SFPs for the increase of the spent resins from additional backwash cycles. The annual amount of solid waste shipped from the site was about 18,000 cubic feet for 1975 to 1977. If the storage of additional spent fuel does increase the amount of solid waste from the SFP purification systems by about 100 cubic feet per year, the increase in total waste volume shipped would be about 0.5% and would not have any significant environmental impact.

The present aluminum spent fuel racks, control rod storage racks, safety curtains and seismic restraints to be removed from the Hatch 1 SFP because of the proposed modification are contaminated and will be disposed of as low level solid waste. Because the Hatch 2 SFP is uncontaminated, it is expected that the racks removed from Unit 2 will be stored in a warehouse for future sale or use. The licensee has estimated that about 10,000 cubic feet of solid radwaste will be removed from the plant because of the proposed modification and sent to a licensed burial site. However, with contaminated Hatch 2 SFP racks, this amount of radwaste would be increased to about 20,000 cubic feet. Therefore, the total waste shipped from the plant would be increased by less than 3% over the lifetime of the plant. This should not have a significant environmental impact.

4.4.6 Occupational Radiation Exposures

We have reviewed the licensee's plans for the removal and disposal of the low density racks and the installation of the high density racks with respect to occupational radiation exposure. The occupational exposure for the operation is estimated by the licensee to be about 14 man-rem for modificaton of Unit 1. If Unit 2 can be modified while it is uncontaminated, no additional occupational exposure will result. If however, Unit 2 becomes contaminated prior to the modification, then an additional 14 man-rem could result. We consider this to be a reasonable estimate because it is based on dose rate measurements and occupancy factors for individuals performing a specific job during the modification. This operation is expected to be a small fraction of the total 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 occupancy times and dose rates in the spent fuel pool area. The spent fuel assemblies themselves will 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 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.

4.4.7 Impacts of Other Pool Modifications

As discussed above, the additional environmental radiological impacts in the vicinity of Hatch 1/2 resulting from the proposed modification are very small fractions (less than 1%) of the impacts evaluated in the Hatch 1/2 FES. These additional impacts are too small to be considered anything but local in character.

Based on the above, we conclude that an SFP modification at any other facility should not significantly contribute to the environmental impact of Hatch 1/2 and that the Hatch 1/2 SFP modification should not contribute significantly to the environmental impact of any other facility.

4.4.8 Impacts on the Community

The new storage racks were fabricated offsite and shipped to the Hatch Plant, where they are stored. Only a few truck or rail shipments would be involved in shipment of these racks and disposal of the present ones. The impacts of dismantling the present racks and installing the new ones will be limited to those normally associated with metal working activities. During fuel handling operations, the impacts will be confined to the refueling floor of the reactor building. Consequently, no significant impact on the community is expected to result from the fuel rack conversion or subsequent operation with increased storage of spent fuel in the SFP.

4.5 Evaluation of Radiological Impact

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

5.0 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 radiological consequences of a postulated fuel handling accident in the SFP area from those values reported in the FES dated June 13, 1978.

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 the main crane meets the requirements of NUREG-0554, we have concluded that the likelihood of a heavy load handling accident is sufficiently small that the proposed modification is acceptable and no additional restrictions on load handling operations in the vicinity of SFP are necessary while our review is under way.

6.0 Alternatives

The staff has considered the following alternatives to the proposed expansion of the SFP storage capacity at Hatch Units 1 and 2: (1) reprocessing the spent fuel; (2) shipment of spent fuel to a separate fuel storage facility; (3) shipment of spent fuel to another reactor site; (4) lengthening the fuel cycles; (5) reduced plant operation; and (6) shutdown of Units 1 and 2. These alternatives are discussed below.

6.1 Reprocessing of Spent Fuel

As discussed earlier, none of the three commercial reprocessing facilities in the United States is currently operating. The General Electric Company's Midwest Fuel Recovery Plant at Morris, Illinois (MO) has not been licensed and Nuclear Fuel Services, Inc. (NFS) informed the Nuclear Regulatory Commission on September 22, 1976, that it was "withdrawing from the nuclear fuel reprocessing business." The NFS facility is on land owned by the State of New York and leased to NFS through 1980. The Allied-General Nuclear Services (AGNS) reprocessing plant at Barnwell, South Carolina, received a construction permit on December 18, 1970. In October 1973, AGNS applied for an operating license for the reprocessing facility; construction of the reprocessing facility is essentially complete but no operating license has been granted. On July 3, 1974, AGNS applied for a materials license to receive and store up to 400 MTU of spent fuel in the onsite storage pcol, on which construction has also been complrted but hearings with respect to this application have not been held and no license has been granted.

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. However, licensing review of this application was discontinued in 1977 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 that: "We will defer indefinitely the commercial reprocessing and recycling of the plutonium produced in the 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 23, 1977, the Nuclear Regulatory Commission terminated the fuel cycle licensing actions involving mixed oxide fuel (GESMO) (Docket No. RM-50-5), the AGNS' Barnwell Nuclear Fuel Plant Separation Facility, Uranium Hexafluoride Facility and Plutonium Product Facility (Docket Nos. 50-332, 70-1327 and 70-1821), the Exxon Nuclear Company, Inc. Nuclear Fuel Recovery and Recycling Fuels Plant (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 applications for commercial facilities for reprocessing spent fuel, fabricating mixed-oxide fuel, and related functions. Consideration of these or comparable facilities has been deferred indefinitely. Accordingly, the Staff considers that shipment of spent fuel to such facilities for reprocessing is not a feasible alternative to the proposed expansion of Hatch SFP storage capacity, especially when considered in the relevant time frame - i.e., 1983 and at least several years thereafter - when the expanded capacity will be needed. Even if the government policy were changed tomorrow to allow reprocessing of spent fuel, the present backlog of spent fuel at various plants and the time it would take to bring adequate reprocessing capacity on line would require that current spent fuel be stored somewhere for up to another 10 years.

6.2 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 MTU of spent fuel. This is far greater than the capacities of onsite storage pools. The fuel storage pools at MO and NFS are functioning as smaller ISFSIs although this was not the original design intent. The license for the GE facility was amended on December 3, 1975 to increase the storage capacity to about 750 MTU; and, as of August 30, 1978, 310 MTU was stored in the pool in the form of 1196 spent fuel assemblies. An application for an 1100 MTU capacity addition is pending and the present schedule calls for completion in 1980 if approved. However, by a motion dated November 8, 1977, General Electric requested the Atomic Safety and Licensing Board to suspend indefinitely further proceedings on this application. This motion was granted.

The staff has discussed the status of storage space at Morris with GE personnel. We were informed that GE is primarily operating the MO facility to store either fuel owned by GE (which had been leased to utilities on an energy basis, or fuel which GE had previously contracted to reprocess. We were also informed that the present GE policy is not to accept spent fuel for storage except fuel for which GE has a previous commitment.* There is no such commitment for Hatch spent fuel. Storage of the Hatch spent fuel at the existing reprocessing facilities is not a viable alternative to the expansion of the Hatch spent fuel pools.

*GE letter to NRC dated May 27, 1977. The licensee had a reprocessing contract which was terminated by GE.

The NFS facility has capacity for about 260 MTU, with approximately 170 MTU presently stored in the pool at West Valley. Although the storage pool is not full, NFS has indicated that it is not accepting additional spent fuel, even from the reactor facilities with which it had reprocessing contracts.

If the receiving and storage station at Barnwell is eventually licensed to accept spent fuel, as discussed in Section 6.1, it would be functioning as an ISFSI until the reprocessing facilities there are licensed to operate. The pool has unused space for about 400 MTU, but AGNS has indicated that it does not wish to operate the storage facility without reprocessing. The cost of shipping assemblies from Hatch to Barnwell has been estimated by the licensee as $1,200 per assembly compared to $2,345 per assembly for the proposed expansion at Hatch. Storage charges at AGNS would be additional.

With respect to construction of new ISFSIs, on October 6, 1978 the NRC proposed a new Part 72 of its regulations specifying procedures and requirements for the issuance of relevant licenses, along with requirements for the siting, design, operation and record keeping activities of the facilities (43 FR 46309). The staff has estimated that at least five years would be required for completion of an ISFSI. 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 additional 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, Vol. 22, TANSAO 22-1-836, 1975). In 1974, E. R. Johnson Associates estimated the construction cost would be equivalent to approximately $9,000 per spent fuel assembly.

Several licensees have evaluated construction of an ISFSI and have provided cost estimates. In 1975, Connecticut Yankee, for example, estimated that 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. The Commonwealth Edison Company estimated the construction cost of an ISFSI in 1975 at about $10,000 per fuel assembly. To this would be added the costs for maintenance, operation, safeguards, security, interest on investment, overhead, transportation and other costs. These costs are significantly larger than the estimated cost of the increased storage capacity which will be obtained by expending the present reactor pools (approximately $2,345/assembly).

For 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 long term repository to provide Government storage of unreprocessed spent fuel rods in a retrievable condition. It is estimated that the long-term storage facility will start accepting commercial spent fuel in the time frame of 1990 to 1993. 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, 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. DOE, through its Savannah River Operations Office, is preparing a conceptual design for an interim spent fuel storage pool of about 5000 MTU capacity. Congressional authorization has been requested to borrow $300 million for design and construction of this facility.

Based on recent DOE testimony before Congress, it appears that the earliest DOE's interim storage pool would be licensed to accept spent fuel would be about 1984. However, DOE has also stated its intent not to accept any spent fuel that has not decayed for a minimum of five years. Since Hatch spent fuel would thus not be accepted before 1984, the licensee would have to store the spent fuel elsewhere until that time, in order to continue operation with full-core off-load capability after the fall of 1983.

Based on the above information, neither an independent spent fuel storage installation or a Government interim storage facility appears to be a feasible alternative to meet the licensee's needs. The staff does not regard the alternative of storing spent fuel at Morris, West Valley or Barnwell as offering a significant environmental advantage over construction and use of an expanded storage facility at Hatch. The availability of this alternative is speculative and it also would be considerably more expensive. Furthermore, constructing a new ISFSI or a Governmental interim storage facility would clearly have a greater environmental impact than the proposed action. It would require additional land and considerable equipment and structures, whereas installing new racks at Hatch requires only the small amount of material necessary to construct the racks and minor personnel exposure during installation, if the present racks are contaminated prior to their removal.

6.3 Storage at Another Reactor Site

A possibility is to ship the spent fuel from Hatch to the licensee's Vogtle Nuclear Plant (a PWR) Unit 1 which has an expected inservice date of November 1984. This schedule cannot prevent Hatch from losing its full core reserve capacity in 1983; furthermore, the estimated cost would be greater than that of expanding the Hatch pools, as shown below:

1.	Cost of BWR spent fuel storage racks	$1,300/assembly
	Installation (9%)	120
	Contingencies (10%)	130
	Engineering, supervision and overhead (including licensing) (20%)	250
		$1,800/assembly
2.	Cost of transportation (with cask rental)	$1,200/assembly
3.	Total Cost	$3,000/assembly

These costs do not reflect the loss of storage space at Vogtle.

Storage of spent fuel at another reactor facility outside the GPC system would be physically possible but is not considered a realistic alternative. Most operating reactors in the United States are experiencing shortages in spent fuel storage capacity and could not efficiently provide storage space for spent fuel from other plants. According to a survey conducted 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.

6.4 Lengthening the Fuel Cycle

Most of the present fuel cycles for light water reactors were based on the premise that spent fuel would be reprocessed and the fissionable material recovered and recycled. With the change in national policy to a "throw- away" cycle, the industry is evaluating higher initial loadings, higher burnups, recycling of low burnup fuel assemblies and extension of periods between refuelings. These types of changes generally are not an immediate alternative. To obtain data to support higher burnups, exposure of experimental fuel in reactors for several years will be necessary. Th~ lead time for design and procurement of core reloads is one to two years. However, in the long run, redesigning the fuel cycle can extend the time between refuelings by 50 to 100%. The number of fuel assemblies that would be replaced during each refueling would increase, but the total number of spent fuel assemblies generated over the lifetime of the facility would be reduced.

In planning fuel cycles, however, there are other factors that have to be taken into consideration other than just minimizing the number of spent fuel assemblies generated. For example, utilities normally try to schedule refuelings during the spring and fall to avoid having the facility shut down during peak load periods. The licensee currently designs annual reload cycles for the units at Hatch Nculear Power Station. To date, three annual reload cycles have been completed at Unit 1 and the first cycle is currently in operation at Unit 2.

Based on studies performed to date, GPC currently considers the initiation of extended cycle design to be economically unattractive for Hatch Units Nos. 1 and 2, particularly since the 1980 reload bundles have already been purchased and they are designed for an annual cycle.

The staff has considered the effects of 18-mont eload cycles and concluded that adoption of the 18-month cycles ..ter the next cycle for Hatch Units Nos. 1 and 2 would not extend the present full-core off-load capability beyond 1983. Therefore, this arrangement would not meet the station's need for additional storage capacity in 1984 when storage in DOE interim facilities may become possible.

6.5 Reduced Plant Output

Nuclear plants are usually base-loaded because of their lower costs of generating a unit of electricity compared to other thermal power plants on the system. Therefore, reducing the plant output to reduce spent fuel generation is not an economical use of the resources available. The total production costs remain essentially constant, irrespective of plant output. Consequently, the unit cost of electricity is increased proportionately at a reduced plant output. We note that Hatch Unit 1 has been operating at a cumulative capacity factor of approximately 60% and Hatch Unit 2 about 75%; but Units 1 and 2 would have to operate at about half of this capacity factor to avoid filling the SFP prior to the fall of 1984, when government interim storage facilities, if available, may accept spent fuel from Hatch. If the plant is forced to substantially reduce output because of spent fuel storage restrictions, the licensee would be required to purchase replacement power or operate its higher cost fossil-fired units, if available, without any accompanying environmental advantage. The cost of electricity would therefore be increased without any likely reduction of environmental impact.

Alternative	Cost	Benefit
6. Reactor Shutdown	Replacement electricity costs are estimated to be as much as $650,000/day if both units are shut-down, plus the costs of maintenance and security of the plant.	Environmental impacts associated with plant operation would cease but the generation of replacement electricity elsewhere would probably create no less impacts.
7. Increased storage capacity of Hatch SFP	$7,345/assembly space added	Continued production of electrical energy by Hatch Units 1 & 2

Note: This cost-benefit analysis was commenced prior to the issuance of NUREG-0575, Final Generic Environmental Impact Statement on Handling and Storage of Spent Light Water Power Reactor Fuel dated August 1979, and is provided in lieu of a reference to the generic statement.

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?

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 on the environs outside of the spent fuel storage building are expected during removal of the existing racks and installation of the new racks. The impacts within this building are expected to be limited to those normally associated with metal working activities and to the occupational radiation exposure to the personnel involved.

The additional thermal effluent from the station and the additional water use associated with storage of the greater number of spent fuel assemblies were determined to be very small compared to those presently associated with Units 1 and 2. Expansion of the SFP would not result in radioactive effluent releases that could significantly affect the quality of the human environment during either normal operation of the expanded SFP or under postulated fuel handling accident conditions.

We have therefore concluded that the environmental impacts associated with this licensing action have been adequately addressed without overlooking any cumulative impacts.

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

This Environmental Impact Appraisal and the related Safety Evaluation adequately address the health, safety and environmental technical issues which have arisen during consideration of this application.

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

The staff has evaluated the impact of deferral of the proposed action as it relates to the public interest. We have found that there are significant economic advantages associated with this proposed action, and that 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.

While it is true that Hatch does not face certain shutdown until 1984, there are other factors which weigh in favor of issuing the proposed amendment now. Following the refueling of Unit 2 in the spring of 1983, the existing SFP will not have sufficient room to accommodate a full core (560 assemblies) should this be necessary to effect repairs, for example, to return the unit to service. After this point in time, Hatch faces the possibility of shutdown 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 shutdown would, of course, remove the unit from service. 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 have greater environmental impact, thereby resulting 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 the proposed expansion of the spent fuel pool is in the public interest.

8.0 Benefit-Cost Balance

As discussed in Section 4 of this assessment, expansion of the Hatch SFP storage capacity would not result in any significant adverse environmental impacts on the land, water, air or biota of the area and it would not create any significant radiological effects.

During construction, the impacts on the community would be limited to those of a few truck or rail shipments carrying the new storage racks to the station and removing the present racks. No incremental occupational exposure of workers would occur if the modification is accomplished, as planned, before the present racks must otherwise be used for storage of spent fuel beginning in the fall of 1980. However, if the racks are removed after being contaminated, the total occupational exposure is estimated to be less than 28 man-rem.

9.0 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 Guidlines, 40 CFR 1500.6, and have applied, weighed, and balanced the five factors specified by the Nuclear Regulatory Commission in 40 FR 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 Final Environmental Statement dated October 1972 and the Unit 2 Final Environmental Statement dated March 1978. Therefore, the staff 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.