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

ENVIRONMENTAL IMPACT APPRAISAL BY THE OFFICE OF NUCLEAR REACTOR REGULATION SUPPORTING AMENDMENT NO. 54 TO DPR-63

NIAGARA MOHAWK POWER CORPORATION
NINE MILE POINT NUCLEAR STATION, UNIT NO. 1
DOCKET NO. 50-220

1.0 Introduction and Discussion

The spent fuel storage capacity at the Nine Mile Point Nuclear Station, Unit 1 was originally 800 BWR fuel assemblies, or storage for approximately 1.5 cores from the unit. This capability was later increased to a maximum of 1140 BWR fuel assemblies. This limited storage capability was in keeping with the expectation generally held in the industry that spent fuel would be kept onsite for a period of 3 to 5 years and then shipped offsite for reprocessing and recycling of the fuel.

Reprocessing of spent fuel did not develop as had been anticipated, however, and in September 1975, the Nuclear Regulatory Commission (NRC, the Commission) directed the NRC staff (the staff) to prepare a Generic Environmental Impact Statement (GEIS, the Statement) on spent fuel storage. The Commission directed the staff to analyze alternatives for the handling and storage of spent light water power reactor fuel with particular emphasis on developing long range policy. The Statement would consider alternative methods of spent fuel storage as well as the possible restriction or termination of the genration of spent fuel through nuclear power plant shutdown.

A Final Generic Environmental Impact statement on Handling and Storage of Spent Light Water Power Reactor Fuel (NUREG-0575), Volumes 1-3 (the FGEIS) was issued by the NRC in August 1979. In the FGEIS, consistent with the long range policy, the storage of spent fuel is considered to be interim storage, to be used until the issue of permanent disposal is resolved and implemented.

One spent fuel storage alternative considered in detail in the FGEIS is the expansion of onsite fuel storage capacity by modification of the existing spent fuel pools. Applications for fifty such spent fuel capacity increases have been reviewed and approved. The finding in each case has been that the environmental impact of such increased storage capacity is negligible. However, since there are variations in storage pool designs and limitations caused by the spent fuel already stored in some of the pools, the FGEIS recommends that licensing reviews be done on a case-by-case basis to resolve plant specific concerns.

In addition to the alternative of increasing the storage capacity of the existing spent fuel pool, other spent fuel storage alternatives are discussed

in detail in the FGEIS. The finding of the FGEIS is that the environmental impact costs of interim storage are essentially negligible, regardless of where such spent fuel is stored. A comparison of the impact-costs of the various alternatives reflect the advantage of continued generation of nuclear power versus its replacement by coal fired power generation. In the bounding case considered in the FGEIS, that of shutting down the reactor when the spent fuel storage capacity is field, the cost of replacing nuclear stations before the end of their normal lifetime makes this alternative uneconomical.

This Environmental Impact Appraisal (EIA) addresses the environmental concerns related only to expansion of the Nine Mile Point Unit 1 spent fuel storage pool. Additional discussion of the alternatives to increasing the storage capacity of existing spent fuel pool is contained in the FGEIS.

1.1 Description of the Proposed Action

In their submittals of March 22 and December 21, 1978, the Niagara Mohawk Power Corporation (the licensee) proposed to increase the licensed total storage capacity of the spent fuel pool (SFP) at Nine Mile Point Nuclear Station Unit 1 (NMP-1) from 1984 with several options to a maximum of 3009 fuel assemblies.

In their submittal dated June 24, 1983 the licensee selected an option in which the maximum licensed capacity would be storage capacity for 2776 BWR fuel assemblies consisting of 1066 flux trap spaces and 1710 poisoned spaces. The 1066 flux trap racks would remain in the north half of the pool and the existing racks in the south half of the pool would be replaced with up to 1710 poisoned spaces in high density racks. This would provide storage for spent fuel generated at Nine Mile Point - 1 while maintaining full core off load capability through the 1994 refueling outage.

The environmental impacts of the Nine Mile Point - 1 facility, as designed, were considered in the NRC's Final Environmental Statement (FES) issued January 1974 relative to the continuation of construction and operation of the facility. The licensee was later authorized to increase the storage capacity from 800 to 1140 by our Safety Evaluation dated March 5, 1976. This is the third proposed SFP modification for NMP-1. The second, which was evaluated in the Safety Evaluation and Environmental Impact Appraisal supporting Amendment 21 to the license dated January 27, 1978. That action increased the licensed storage capacity of the SFP from 1140 to 1984 fuel assemblies.

In this EIA we have evaluated any additional environmental impacts which are attributable to the proposed increase proposed by the licensee in their March 22, and December 21, 1978 submittals in the SFP storage capacity for the Station.

1.2 Need For Increased Storage Capacity

A spent fuel storage pool is currently provided at Nine Mile Point - 1 with 1066 spaces in high density flux trap racks in the north half of the spent fuel pool and 520 spaces in the existing original racks in the south half of the pool. With the exception of 22 spaces, all spaces in the north half of the pool are full. Twenty four fuel assemblies from the north half of the pool will be re-inserted into the reactor core. Therefore, a total of 46 spaces in the north half and 520 spaces in the south half will be available for fuel storage. During the 1984 refueling a total of 200 fuel assemblies will be discharged into the pool. If the proposed modification is not completed, the ability to fully discharge the reactor core would be lost following the upcoming refueling outage. The proposed modification would be full core discharge capability through the 1994 refueling outage.

1.3 Fuel Reprocessing History

Currently, spent fuel is not being reprocessed on a commercial basis in the United States. The Nuclear Fuel Services (NFS) plant at West Valley, New York, was shutdown in 1972 for alterations and expansion; in September 1977, NFS informed the Commission that it was withdrawing from the nuclear fuel reprocessing business. The pool is on land owned by the State of New York. NFS's lease with the State of New York expired in 1980 and their license has been suspended. The State of New York has requested the utilities who own the spent fuel presently stored in the pool to remove it. The Allied General Nuclear Services (AGNS) proposed plant in Barnwell, South Carolina, is not licensed to operate. The General Electric Company's (GE) Morris Operation (MO) in Morris, Illinois is in a decommissioned condition. Although no plants are licensed for reprocessing fuel, the storage pool at Morris, Illinois is licensed to store spent fuel. On May 4, 1982, the license held by GE for spent fuel storage activities at its Morris Operation was renewed for another 20 years. GE is not accepting any additional spent fuel for storage at this facility.

2.0 THE FACILITY

The principal features of the spent fuel storage and handling at Nine Mile Point - 1 as they relate to this action are described here as an aid in following the evaluations in subsequent sections of this environmental impact appraisal.

2.1 The Spent Fuel Pool (SFP)

Spent fuel assemblies are intensely radioactive due to their fresh fission product content when initially removed from the core; also, 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.

2.2 SFP Cooling System

The spent fuel and cooling system (SFPCS) at the Nine Mile Point Nuclear Station, Unit 1 consists of two pumps in parallel, with a pump and heat exchanger in series. The heat removal design capability of each heat exchanger is 6.8×10^6 Btu/hr at 116F and 8.3×10^6 Btu/hr at 125F.

Heat is transferred from the spent fuel pool cooling system to the reactor building closed cooling water system. The reactor building closed cooling water system, in turn, transfers heat to the service water system. The RHR system is also a closed system cooled by service water. The service water system is a once-through cooling system in which strained water from Lake Ontario is supplied from pumps in the intake structure and returned to the lake after removing heat from a number of systems, including the reactor building closed cooling water and the RHR systems.

2.3 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 NRC"s Final Environmental Statement (FES) dated January 1974. There will be no change in the waste treatment systems described in Section 3.5 of the FES because of the proposed modification.

2.4 Spent Fuel Pool Cleanup System

The SFP cooling and cleanup system consists of two surge tanks, two circulating pumps, two heat exchangers, two precoat filter-demineralizers and the required piping, valves and instrumentation. The pumps draw water from the surge tanks and discharge it through the heat exchangers and the filter-demineralizers to the SFP. One loop with a single filter-demineralizer and heat exchanger is used normally. The second loop is on standby available to operate in parallel with the other loop to provide additional cooling and filtration.

3.0 ENVIRONMENTAL IMPACTS OF THE PROPOSED ACTION

3.1 Nonradiological Consequences of the Proposed Action

The nonradiological environmental impacts of Nine Mile Point - 1, as designed, were considered in the FES issued January 1974. Increasing the number of

assemblies stored in the existing fuel pool will not cause any new nonradiological environmental impacts not previously considered. The amounts of waste heat emitted by the unit as a result of the proposed increased spent fuel storage capacity will increase slightly (less than one percent), but will result in no measurable increase in impacts upon the environment.

3.2 Radiological Consequences of the Proposed Action

3.2.1 Introduction

The potential offsite radiological environmental impact associated with the expansion of spent fuel storage capacity at Nine Mile Point - 1 has been evaluated.

During the storage of the spent fuel under water, both volatile and nonvolatile radioactive nuclides may be released to the water from the surface of the assemblies or from defects in the fuel cladding. Most of the material released from the surface of the assemblies consists of activated corrosion products such as Co-58, Co-60, Fe-59 and Mn-54, which are not volatile. The radionuclides that might be released to the water through defects in the cladding, such as Cs-134, Cs-137, Sr-89 and Sr-90, are also predominantly nonvolatile at the temperature conditions that exist in pool storage. The primary impact of such nonvolatile radioactive nuclides is their contribution of 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 the radionuclides in the pool water apepar to be radionuclides that were present in the reactor coolant system prior to refueling (which becomes mixed with water in the spent pool during refueling operations), or crud dislodged from the surface of the spent fuel during transfer from reactor core to the SFP. During and after refueling, the spent fuel pool cleanup system reduces the radioactivity concentrations considerably.

A few weeks after refueling, the spent fuel cools in the pool so that the fuel cladding temperature is relatively cool, approximately 180F. This substantial temperature reduction reduces the rate of release of fission products from the fuel pellets, and decreases the gas pressure in the gap between pellets and cladding, 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 licensees, and discussions with storage facility 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.

3.2.2 Radioactive Material Released to the 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 not significant release of fission products from defected fuel. However, we have conservatively estimated that for this proposed SFP modificaiton an additional 23 curies per year of Krypton-85 may be released from the SFP when the modified pool is filled from 1984 to 3009 spent fuel assemblies. This increase would result in an additional total body dose of less than 0.0001 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 then 0.0003 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 less than 0.2% 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.

We have also conservatively estimated the additional curies per year of Krypton-85 that may be released from the SFP when the modified pool is completely filled from 1140 to 3009 fuel assemblies. The 140 fuel assemblies is the original licensed capacity of the NMP-1 SFP. The licensee's first proposed SFP modification which increased the licensed storage capacity of the SFP from 1140 to 1984 fuel assemblies was evaluated in the Environmental Impact Appraisal dated January 27, 1978, for NMP-1. This estimate, 56 curies per year Krypton-85, is the maximum additional annual amount of gaseous activity that may be released from the NMP-1 SFP because the capacity of the SFP has been increased above the original licensed storage capacity of 1140 assemblies. This increase would result in an additional annual total body dose to an individual at the site boundary and to the population around the plant out to 50 miles is also less than 0.0001 man-mrem/year and 0.0003 man-rem/year, respectively, above these exposures given in the NMP-1 FES. These exposures are also small compared to the fluctuations in the annual dose this population

receives from background radiation and are also less than 0.2% of the exposures from the plant evaluated in the NMP-1 FES. Thus, we conclude that the proposed modification of the SFP will not have any significant impact on offsite exposures.

Assuming that the spent fuel will be stored on site 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.

Storage of additional spent fuel assemblies in the pool is not expected to increase the bulk water temperature during normal refuelings above the 125F used in the design analysis. Therefore, it is not expected that there will be any significant change in the annual release of tritium or iodine as a result of the proposed modification from that previously evaluated in the FES.

Most airborne releases from the plant result from leakage of reactor coolant which contains tritium and iodine in higher concentrations than the spent fuel pool. Therefore, even if there were a slightly higher evaporation rate from the spent fuel pool, the increase in tritium and iodine released from the plant as a result of the increase in stored spent fuel would be small compared to the amount 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.

3.2.3 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 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 66 cubic feet a year from the filter-dimeralizer over that for the SFP with the originally licensed capacity of 1140 fuel assemblies. The annual amount of solid waste shipped from the site was

about 18,300 cubic feet for 1972 to 1977. If the storage of additional spent fuel does increase the amount of solid waste from the SFP purification systems by about 66 cubic feet per year, the increase in total waste volume shipped would be less than 0.4% and would not have any significant environmental impact.

The present spent fuel racks to be removed from the SFP because of the proposed modification are contaminated and will be disposed of as low level solid waste. The licensee has estimated that less than 14,300 cubic feet of solid radwaste will be removed from the plant because of the proposed modification. This includes the solid radwaste shipped from the plant because of the 1978 modification of the SFP. Therefore, the total waste shipped from the plant should be increased by less than 2% per year when averaged over the lifetime of the plant. This will not have a significant environmental impact.

3.2.4 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 release of radioactivity in liquid effluents from the plant.

The filter-demineralizer resins are periodically flushed with water to the solid waste system and are not regenerated. 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 would be collected in the reactor building floor drain sumps. 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.

3.2.5 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 entire operation is estimated by the licensee to be between 15 and 20 man-rem. We consider this to be a reasonable estimate because it is based on relevent

experience of dose rate measurements and occupancy factors for individuals performing the same specific jobs during the 1978 modification of the NMP-1 SFP. This operation is expected to be a small fraction of the total man-rem burden from occupational exposure per year.

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.

3.2.6 Impacts of Other Pool Modification

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

James A. FitzPatrick Nuclear Power Plant (FitzPatrick) is located on the same site as NMP-1. By letter dated July 26, 1978, the Power Authority of the State of New York proposed increasing the spent fuel storage capacity at FitzPatrick. Operation of FitzPatrick was evaluated in the FitzPatrick Final Environmental Statement dated March 1973.

The impact of any environmental significance at NMP-1 from the proposed SFP modification at FitzPatrick is the additional gaseous effluent from the FitzPatrick SFP modification. We have conservatively estimated an additional 99 curies per year of Krypton 85 may be released from FitzPatrick when its 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 NMP-1 or by the estimated population within a 50 mile radius, of less than 0.001 mrem/year and 0.005 man-rem/year, respectively.

Summing the additional exposures resulting from the SFP modifications at both NMP-1 and FitzPatrick 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 .0011 mrem/year and .0053 man-rem/year, respectively. These summed exposures are small compared to the fluctuations in the annual dose this population receives from natural background radiation and represent an increase of less than 0.1% of the combined exposures evaluated in the FitzPatrick FES and the NMP-1 FES. These estimates are not significant.

Based on the above, we conclude that a SFP modification at any other facility should not significantly contribute to the environmental impact of NMP-1 and that the SFP modification should not contribute significantly to the environmental impact of any other facility.

3.3 Environmental Impact of Spent Fuel Handling 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 January 1974.

The heavy load handling operations associated with the installation of the new poison type racks in the south end of the pool will be accomplished without handling of heavy loads over stored spent fuel. Further, general heavy load handling operations will be accomplished in accordance with the general guidelines of NUREG-0612, "Control of Heavy Loads at Nuclear Power Plants."

Therefore, we have concluded then that the likelihood of a heavy load handling accident is sufficiently small that the proposed modifications are acceptable, and no additional restriction on load handling operations in the vicinity of the SFP are required.

3.4 Radiological Impacts to the Population

The proposed increase of the storge capacity of the SFP will not create any significant additional radiological effects to the population. The additional total body dose that might be received by an individual at the site boundary, and by the estimated population within a 50-mile radius, is less than 0.0001 mrem/yr and 0.0003 man-rem/yr, respectively. These doses are small compared to the fluctuations in the annual dose this population receives from background radiation. This population dose represents an increase of less than 0.2 percent of the dose previously evaluated in the FES for the Nine Mile Point Nuclear Station, Unit 1. We find this to be an insignificant increase in dose to the population resulting from the proposed action.

4.0 Summary

The findings contained in the Final Generic Environmental Statement on Handling and Storage of Spent Light Water Power Reactor Fuel, (the FGEIS) issued by the NRC in August 1979, were that the environmental impact of interim storage of spent fuel was negligible, and the cost of the various alternatives reflect the advantage of continued generation of nuclear power with the accompanying spent fuel storage. Because of the differences in spent fuel pool designs,

the FGEIS recommended licensing spent fuel pool expansions on a case-by-case basis. Expansion of the spent fuel storge capacity at Nine Mile Point Nuclear Station, Unit 1 does not significantly change the radiological impact evaluated by the NRC in the FES issued in January 1974. As discussed in Section 3.4 of this EIA, the additional total body dose that might be received by an individual at the site boundary or the estimated population within a 50-mile radius is less than 0.0001 mrem/yr and 0.003 man-rem/yr respectively, and is less than the natural fluctuations in the dose this population would receive from background radiation. The occupational exposure for the modifications of the SFP is estimate by the licensee to be 15 to 20 man-rem. This is conservative. Operation of the plant with additional spent fuel in the SFP is not expected to increase the occupational radiation exposure by more than one percent of the total annual occupational exposure at the two units.

5.0 Basis and Conclusion For Not Preparing an Environmental Impact Statement

We have reviewed the proposed modifications 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), the issuance of a negative neclaration to this effect is appropriate.

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