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ENVIRONMENTAL IMPACT APPRAISAL BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELATING TO THE MODIFICATION OF THE SPENT FUEL STORAGE POOL

FACILITY OPERATING LICENSE NO. DPR-23

CAROLINA POWER AND LIGHT COMPANY

H. B. ROBINSON STEAM ELECTRIC PLANT UNIT 2

DOCKET NO. 50-261

Contents

1.0 INTRODUCTION AND DISCUSSION

A Final Generic Environmental Impact Statement (FGEIS) on Handling and Storage of Spent Light Water Power Reactor Fuel (NUREG-0575, Volumes 1-3) was issued by the Nuclear Regulatory Commission (NRC) August 1979. The NRC staff evaluated and analyzed alternative handling and storage of spent light-water power-reactor fuel with emphasis on long range policy. Consistent with the long range policy, the storage of spent fuel addressed in the FGEIS 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 the onsite fuel storage capacity by modification of the existing spent fuel pools (SFPs). On the date of issuance of the FGEIS (August 1979), 40 applications for SFP capacity expansions were approved with the finding in each case that the environmental impact of the proposed increased storage was 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 SFPs, 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, where spent fuel generation is terminated, the cost of replacing nuclear stations before the end of their normal lifetime makes this alternative uneconomical.

This Environmental Impact Appraisal (EIA) incorporates the appraisal of environmental concerns applicable to expansion of the Robinson Unit 2 SFP.

For additional discussion of the alternatives to increasing the storage capacity of existing SFPs, refer to the FGEIS. This EIA consists of three major parts plus a summary and conclusion. The three parts are: (1) descriptive material, (2) an appraisal of the environmental impacts of the proposed action, and (3) an appraisal of the environmental impact of postulated accidents.

1.1 Description of the Proposed Action

By application dated December 1, 1980, as supported by letters dated April 10, May 11, June 15, June 18, and August 28, 1981, Carolina Power and Light Company (CP&L) (the licensee) requested an amendment to Facility Operating Licenses No. DPR-23 for the H. B. Robinson Steam Electric Plant Unit 2 (Robinson Unit 2). The proposed amendment would allow an increase in the storage capacity of the Robinson Unit 2 Spent Fuel Pool (SFP) from 276 to 544 storage locations.

The environmental impacts of Robinson Unit 2 as designed, were considered in the Final Environmental Statement (FES) issued in April 1975. The purpose of this EIA is to determine and evaluate any additional environmental impacts which are attributable to the proposed increase in the SFP storage capacity of the plant.

1.2 Need for Increased Storage Capacity

Robinson Unit 2 is a pressurized water reactor with a licensed power of 2300 MWt.

The reactor core contains 157 fuel assemblies.

The modifications evaluated in this EIA are the proposals by the licensee to increase the spent fuel pool storage capacity from 276 to 544 spaces.

The proposed increase would be accomplished by replacing the existing fuel storage racks with new, more compact, neutron absorbing racks. The proposed rack design uses a nominal 10.5 inch center-to-center spacing in each direction. The old racks had nominal 21 or 15.5-inch center-to-center spacing in each direction. This modification would extend spent fuel storage capability past mid-1987 compared to early 1983 with the current capacity. The increase in capacity would extend the capability for a full core discharge from 1982 to 1986. This capability, while it is not needed to protect the health and safety of the public, is desirable in the event of a need for a reactor vessel inspection or repair. Such off-load capability would reduce occupational exposures to plant personnel.

Currently, spent fuel is not being reprocessed on a commercial basis in the United States. The Nuclear Fuel Services (NFS) plant at West Valley, New York, was shut down in 1972 for alterations and expansion; 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) 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, and the storage pool at West Valley, New York (on land owned by the State of New York and leased to NFS through 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 contractural arrangements with NFS. GE is accepting additional spent fuel for storage at the MO only from a limited number of utilities. 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 of facility. The future of this facility is uncertain.

1.3 Radioactive Wastes

The station 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 Robinson Unit 2 FES dated April 1975. There will be no change in the waste treatment systems described in Section 3.5 of the FES because of the proposed modification.

1.4 SFP Cleanup System

The SFP cooling and cleanup system consists of a single loop with a circulation pump, heat exchanger, filter, demineralizer, and the required piping, valves and instrumentation. The pumps draw water from the pool. This flow is passed through the heat exchangers and then returned to the pool. Approximately 5 percent (100 gpm) of the loop flow is bypassed through the filter and ion exchanger to maintain the clarity and purity of the water.

We find that the proposed expansion of the spent fuel pool will not appreciably affect the capability and capacity of the existing spent fuel pool cleanup system. More frequent replacements of filters or demineralizer resin, required when the differential pressure exceeds a predetermined limit or demineralization effectiveness is reduced, can offset any potential increase in radioactivity and impurities in the pool water as a result of the expansion of stored spent fuel. Thus we have determined that the existing fuel pool cleanup system with the proposed high density fuel storage (1) provides the capability and capacity of removing radioactive materials, corrosion products, and impurities from the pool and thus meets the requirements of General Design Criterion 61 in Appendix A of 10 CFR Part 50 as it relates to appropriate systems to fuel storage; (2) is capable of reducing occupational exposures to radiation by removing radioactive products from the pool water, and thus meets the requirements of Section 20.1(c) of 10 CFR Part 20 as it relates to maintaining radiation exposures as low as is reasonably achievable; (3) confines radioactive materials in the pool water into the filters and demineralizers, and thus meets Regulatory Position C.2.f(c) of Regulatory Guide 8.8, as it relates to reducing the spread of contaminants from the source; and (4) removes

suspended impurities from the pool water by filters, and thus meets Regulatory Position C.2.f(3) of Regulatory Guide 8.8, as it relates to removing crud from fluids through physical action.

On the basis of the above evaluation, we conclude that the existing spent fuel pool cleanup system meets GDC 61, Section 20.1(c) of 10 CFR Part 20 and the appropriate sections of Regulatory Guide 8.8 and, therefore, is acceptable for the proposed high density fuel storage.

2.0 ENVIRONMENTAL IMPACTS OF THE PROPOSED ACTION

2.1 Non-radiological

The environmental impacts of Robinson Unit 2, as designed, were considered in the FES. Increasing the number of assemblies stored in the spent fuel pool will not cause any new environmental impacts. The amounts of waste heat emitted by Robinson Unit 2 will increase slightly (less than one percent), resulting in no measurable increase in impacts upon the environment.

2.2 Radiological

2.2.1 Introduction

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

Since the present racks will accommodate spent fuel from five normal (annual) refuelings, the additional storage would consist of spent fuel which has decayed at least five years. During the storage of the spent fuel under water, both volatile and nonvolatile radioactive nuclides may be released to the water from the surface of the assemblies or from defects in the fuel cladding. Most of the material released from the surface of the assemblies consists of activated corrosion products such as Co-58, Co-60, Fe-59 and Mn-54 which are not volatile. The radionuclides that might be released to the water through defects in the cladding, such as Cs-134, Cs-137, Sr-89 and Sr-90, are also predominantly nonvolatile. The primary impact of such nonvolatile radioactive nuclides is their contribution 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 radionuclides in the SFP water appear to be radionuclides that were present in the reactor coolant system prior to refueling (which becomes mixed with water in the SFP 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 SFP purification 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 SFP 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 the operational reports submitted by the licensees or discussions with the operators, there has not been any significant leakage of fission products from spent light water reactor fuel stored in the MO (formerly Midwest Recovery Plant) at Morris, Illinois, or at the 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 SFP, 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.

2.2.2 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. However, we have conservatively

estimated that an additional 80 curies per year of Krypton-85 may be released when the modified pool is completely filled. This increase would result in an additional total body dose to an individual at the site boundary of less than .0008 mrem/year. 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 0.003 man-rem/year. This is less than the natural fluctuations in the dose this population would receive from natural background radiation. Under our conservative assumptions, these exposures represent an increase of less than 0.05% of the exposures from the station evaluated in the FES for the individual at the site boundary and the population. Thus, we conclude that the proposed modification will not have any significant nor measurable 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 refueling.

Storing additional spent fuel assemblies is not expected to increase the bulk water temperature above 150°F during normal refuelings as 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 station result from leakage of reactor coolant which contains tritium and iodine in higher concentrations than the SFP. Therefore, even if there were a higher evaporation rate from the SFP, the increase in tritium and iodine released from the station as a result of the increase in stored spent fuel would be small compared to the amount normally released from the station and that which was previously evaluated in the FES. If it is desired to reduce levels of radioiodine, the air can be diverted to charcoal filters for the removal of radioiodine before release to the environment. In addition, the station radiological effluent Technical Specifications which are

not being changed by this action, limit the total releases of gaseous activity from Robinson-2.

2.2.3 Solid Radioactive Wastes

The concentration of radionuclides in the pool is controlled by the filter and the demineralizer and by decay of short-lived isotopes. The activity is highest during refueling operations while reactor coolant water is introduced into the pool, and decreases as the pool water is processed through the filter and demineralizer. The increase of radioactivity, if any, should be minor because of the capability of the cleanup system to remove radioactivity to acceptable levels.

The licensee does not expect any significant increase in the amount of solid waste generated from the spent fuel pool cleanup systems due to the proposed modification. While we generally agree with the licensee's conclusion, as a conservative estimate we have assumed that the amount of solid radwaste may be increased by an additional two resin beds (60 cubic feet) a year due to the increased operation of the spent fuel pool cleanup system. The annual average volume of solid waste shipped from H. B. Robinson during 1973 through 1980 was 21,000 cubic feet. If the storage of additional spent fuel does increase the amount of solid waste from the SFP cleanup systems by about 60 cubic feet of dewatered spent resin (or approximately 120 cubic feet of solidified spent resin) per year, the increase in total waste volume shipped would be less than 1% and would have no significant additional environmental impact.

The present spent fuel racks to be removed from the SFP because of the proposed modification are contaminated and the licensee states that the old racks will be disposed of as low level solid waste after cleaning of surface contamination by spray washing and/or by hydrolasing. We estimate that approximately 3,800 cubic feet of solid radwaste (old racks) will be removed from the plant because of the proposed modification, assuming the old racks will be disposed of without reducing the volume by appropriate cutting and/or crushing prior to shipment. Averaged over the lifetime of the plant, this would increase the total waste volume shipped from the facility by less than 1%. This will have no significant additional environmental impact.

2.2.4 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. Since the SFP cooling and cleanup system operates as a closed system, only water originating from cleanup of SFP floors and resin sluice water need be considered as potential sources of radioactivity.

It is expected that neither the quantity nor activity of the floor cleanup water will change as a result of this modification. The SFP demineralizer resin removes soluble radioactive matter from the SFP water. These resins are periodically flushed with water to the spent resin storage tank. The amount of radioactivity on the SFP demineralizer resin might increase slightly due to the additional spent fuel in the pool, but the soluble radioactivity should be retained on the resins. If any activity is transferred from the spent resin to the flush water, it will be removed by the liquid radwaste system since the sluice water is returned to the liquid radwaste system for processing. After processing in the liquid radwaste system, the amount of radioactivity released to the environment as a result of the proposed modification would be negligible.

2.2.6 Impacts of Other Pool Modifications

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

Based on the above, we conclude that a SFP modification at any other facility should not significantly contribute to the environmental impact at Robinson Unit 2 and that the Robinson Unit 2 SFP modification should not contribute significantly to the environmental impact of any other facility.

2.3 Summary

On the basis of this review we conclude that the environmental impacts associated with modification and operation of the expanded spent fuel pool will have negligible adverse effects.

3.0 ENVIRONMENTAL IMPACTS 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 or spent fuel cask drop accident in the SFP area from those values reported in the FES for Robinson Unit 2 dated April 1975.

Additionally, the NRC staff has underway a generic review of load handling operations in the vicinity of SFPs to determine the likelihood of a heavy load impacting fuel in the pool and, if necessary, the radiological consequences of such an event. Because Robinson Unit 2 will be required to prohibit loads greater than 3000 pounds (the normal weight of a fuel assembly, control rod and handling tool) to be transported over spent fuel in the SFP, we have concluded that the likelihood of any other heavy load handling accident is sufficiently small that the proposed mofidication is acceptable and no additional restrictions on load handling operations in the vicinity of the SFP are necessary while our review is underway.

4.0 SUMMARY

The Final Generic Environmental Impact Statement (FGEIS) on Handling and Storage of Spent Light Water Power Reactor Fuel concluded 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 SFP designs the FGEIS recommended licensing SFP expansions on a case-by-case basis. For Robinson Unit 2, expansion of the storage capacity of the SFP does not significantly change the radiological impact evaluted in the FES. As discussed in Section 2.2.2, the additional total body dose that might be received by an individual or the estimated population within a 50-mile radius is less than 0.0008 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 estimated by the licensee to be 173 man-rem. Operation of the station 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 station.

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 amendments 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 declaration to this effect is appropriate.

Dated: June 8, 1982