Docket Nos. 50-280
and 50-281

MARCH 2 3 1978

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Virginia Electric & Power Company
ATTN: Mr. W. L. Proffitt
Senior Vice President - Power
P. O. Box 26666
Richmond, Virginia 23261

Gentlemen:

The Commission has issued the enclosed Amendments Nos. ~~3 6~~ 37 and ~~3 7~~ 36 to Facility Operating Licenses Nos. DPR-32 and DPR-37 for the Surry Power Station, Units Nos. 1 and 2, respectively. These amendments consist of changes to the Technical Specifications in response to your application dated May 27, 1977, as supplemented August 10, 1977, September 15, 1977, September 29, 1977, December 7, 1977, and February 8, 1978.

These amendments permit the installation of new fuel storage racks in the spent fuel pool which will increase the pool's storage capacity from 464 to 1044 fuel assemblies.

Copies of the Safety Evaluation, Environmental Impact Statement, and the Notice of Issuance are also enclosed.

Sincerely,

Original Signed By

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

Enclosures:
1. Amendment No. ~~3 6~~ 37 to DPR-32
2. Amendment No. ~~3 7~~ 36 to DPR-37
3. Safety Evaluation
4. Environmental Impact Appraisal
5. Notice

cc w/enclosures: See next page

Const

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

VIRGINIA ELECTRIC & POWER COMPANY

DOCKET NO. 50-280

SURRY POWER STATION UNIT NO. 1

AMENDMENT TO FACILITY OPERATING LICENSE

Amendment No. ~~37~~ 38
License No. DPR-32

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

A. The application for amendment by Virginia Electric & Power Company (the licensee) dated May 27, 1977, as supplemented August 10, 1977, September 15, 1977, September 29, 1977 December 7, 1977, and February 8, 1978, complies with the standards and requirements of the Atomic Energy Act of 1954, as amended (the Act) and the Commission's rules and regulations set forth in 10 CFR Chapter I;

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

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

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

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

2. Accordingly, the license is amended by changes to the Technical Specifications as indicated in the attachment to this license amendment, and paragraph 3.B of Facility Operating License No. DPR-32 is hereby amended to read as follows:

   B. Technical Specifications

   The Technical Specifications contained in Appendix A, as revised through Amendment No. 36, are hereby incorporated in the license. The licensee shall operate the facility in accordance with the Technical Specifications.

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

FOR THE NUCLEAR REGULATORY COMMISSION

Victor Stello, Jr., Acting Assistant
Director for Operating Reactors
Division of Operating Reactors

Attachment:
Changes to the Technical
Specifications

Date of Issuance: March 23, 1978

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

VIRGINIA ELECTRIC & POWER COMPANY

DOCKET NO. 50-281

SURRY POWER STATION UNIT NO. 2

AMENDMENT TO FACILITY OPERATING LICENSE

Amendment No. ~~36~~ 37
License No. DPR-37

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

A. The application for amendment by Virginia Electric & Power Company (the licensee) dated May 27, 1977, as supplemented August 10, 1977, September 15, 1977, September 29, 1977, December 7, 1977, and February 8, 1978, complies with the standards and requirements of the Atomic Energy Act of 1954, as amended (the Act) and the Commission's rules and regulations set forth in 10 CFR Chapter I;

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

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

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

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

2. Accordingly, the license is amended by changes to the Technical Specifications as indicated in the attachment to this license amendment, and paragraph 3.B of Facility Operating License No. DPR-37 is hereby amended to read as follows:

   B. Technical Specifications

   The Technical Specifications contained in Appendix A, as revised through Amendment No. ~~36~~37, are hereby incorporated in the license. The licensee shall operate the facility in accordance with the Technical Specifications.

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

FOR THE NUCLEAR REGULATORY COMMISSION

Victor Stello, Jr., Acting Assistant
Director for Operating Reactors
Division of Operating Reactors

Attachment:
Changes to the Technical
Specifications

Date of Issuance: March 23, 1978

ATTACHMENT TO LICENSE AMENDMENT NOS. ~~37~~ 36 AND ~~36~~ 37

FACILITY OPERATING LICENSE NOS. DPR-32 AND DPR-37

DOCKET NOS. 50-280 AND 50-281

Replace the following pages of the Appendix "A" Technical Specifications with the enclosed pages.

Pages

TS 5.4-1
TS 5.4-2
TS 3.10-3

5.4 FUEL STORAGE

Applicability

Applies to the design of the new and spent fuel storage areas.

Objective

To define those aspects of fuel storage relating to prevention of criticality in fuel storage areas; to prevention of dilution of the borated water in the reactor; and to prevention of inadvertent draining of water from the spent fuel storage area.

Specification

A. The reinforced concrete structure and steel superstructure of the Fuel Building and spent fuel storage racks are designed to withstand Design Basis Earthquake loadings as Class I structures. The spent fuel pit has a stainless steel liner to ensure loss of water.

B. The new and spent fuel storage racks are designed so that it is impossible to insert assemblies in other than the prescribed locations. New fuel is stored vertically in an array with a distance of 21 inches between assemblies to assure $k_{eff} \leq 0.90$, even if unborated water were used to fill the new fuel storage area. Spent fuel is stored vertically in an array with a distance of 14 inches between assemblies to assure $k_{eff} \leq 0.95$, even if unborated water were used to fill the spent fuel storage pit. The enrichment of the fuel stored in the spent fuel racks shall not exceed 44 grams of Uranium -235 per axial centimeter of fuel assembly.

C. Whenever there is spent fuel in the spent fuel pit, the pit shall be filled with borated water at a boron concentration not less then 2,000 ppm to match that used in the reactor cavity and refueling canal during refueling operations.

D. The only drain which can be connected to the spent fuel storage area is that in the reactor cavity. The strict step-by-step procedures used during refueling ensure that the gate valve on the fuel transfer tube which connects the spent fuel storage area with the reactor cavity is closed before draining of the cavity commences. In addition, the procedures require placing the bolted blank flange on the fuel transfer tube as soon as the reactor cavity is drained.

References

FSAR Section 9.5 Fuel Pit Cooling System

FSAR Section 9.12 Fuel Handling System

7. When the reactor vessel head is unbolted, a minimum boron concentration of 2,000 ppm shall be maintained in any filled portion of the Reactor Coolant System and shall be checked by sampling at least once every 8 hours.

8. Direct communication between the Main Control Room and the refueling cavity manipulator crane shall be available whenever changes in core geometry are taking place.

9. No movement of irradiated fuel in the reactor core shall be accomplished unitl the reactor has been subcritical for a period of at least 100 hours.

10. A spent fuel cask or heavy loads exceeding 110 percent of the weight of a fuel assembly (not including fuel handling tool) shall not be moved over spent fuel, and only one spent fuel assembly will be handled at one time over the reactor or the spent fuel pit.

11. A spent fuel cask shall not be moved into the Fuel Building until such time as the NRC has reviewed and approved the spent fuel cask drop evaluation.

B. If any one of the specified limiting conditions for refueling are not met, refueling of the reactor shall cease, work shall be initiated to correct the conditions so that the specified limits are met, and no operations which increase the reactivity of the core shall be made.

C. After initial fuel loading and after each core refueling operation and prior to reactor operation at greater than 75% of rated power, the moveable incore detector system shall be utilized to verify proper power distribution.

Basis

Detailed instructions, the above specified precautions and the design of the

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

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELATING TO MODIFICATION OF THE SPENT FUEL POOL

SUPPORTING AMENDMENTS NOS. 37 AND 36 TO

FACILITY OPERATING LICENSES NOS. DPR-32 AND DPR-37

VIRGINIA ELECTRIC AND POWER COMPANY

SURRY POWER STATION UNITS NOS. 1 AND 2

DOCKETS NOS. 50-280 AND 50-281

INTRODUCTION

By letter dated May 27, 1977 as supplemented August 10, 1977, September 15, 1977, September 29, 1977, December 7, 1977, and February 8, 1978, Virginia Electric and Power Company (the licensee) proposed amendments to Facility Operating Licenses Nos. DPR-32 and DPR-37 for operation of the Surry Power Station, Units Nos. 1 and 2. The proposed amendments would allow the installation of new, higher capacity fuel storage racks in the common spent fuel pool, which is shared by Units Nos. 1 and 2. The proposed new racks would increase the pool's storage capacity from 464 to 1044 fuel assemblies.

DISCUSSION

A. Existing Facilities

The existing spent fuel pool racks are made or stainless steel, have a permanent storage capacity for 464 fuel assemblies, have a center-to-center fuel assembly spacing of 21 inches and limit the stored fuel maximum neutron multiplication factor, K_{eff}, to less than 0.90.

The existing cooling system was designed to limit the temperature of the pool water to 140°F with 1/3 of a core placed in the pool 150 hours after reactor shutdown.

B. Proposed Facilities

The proposed spent fuel assembly racks are to be made up of individual stainless steel cells to receive one fuel assembly. Each of these cells will be 14.2 feet long, will have a square cross section with an outer dimension of 9.12 inches and will be open at the top and bottom to permit water circulation.

The thickness of the cell wall is 0.090 inches nominal and 0.085 inches minimum. The nominal distance between centers for these cells is 14 inches which, when combined with the overall dimension of the fuel assembly (8.43 inches) gives a fuel region volume fraction of 0.36 for the nominal storage lattice.

Evaluation

A. Criticality Considerations of New Rack Design

The fuel pool criticality calculations for the proposed racks assume no burnable poison or control rods in the fuel assemblies, fresh (i.e., unirradiated) fuel with 3.5 weight percent uranium-235, and no soluble boron in the water. For the present fuel assemblies, 3.5 percent enrichment corresponds to a fuel loading of 44 grams of uranium-235 per axial centimeter of fuel assembly.

Parametric calculations were performed using the HAMMER computer program to obtain four-group cross sections for EXTERMINATOR diffusion theory calculations. The accuracy of this diffusion theory method was checked by comparison with a critical experiment and by comparison with a four group, discrete-ordinates transport calculation, where the cross sections for the three higher energy groups were obtained from the GGC-3 computer program and the thermal group cross sections were obtained from the HAMMER program.

Parametric calculations were made for the maximum possible reduction in storage lattice pitch, eccentric fuel assembly placement, and an increase in fuel pool water temperature from 68°F to 250°F. The licensee's May 27, 1977 submittal states that inadvertent placement of a fuel assembly adjacent to the exterior of a fuel rack was not analyzed because a structure will be provided on the peripheral racks to maintain a center-to center spacing in excess of 17 inches. The maximum neutron multiplication factor calculated for the combined abnormal conditions is 0.925.

The results of the criticality analyses are conservative in comparison with the results of parametric calculations made with other methods for simular fuel pool storage lattices. By assuming new, unirradiated fuel with no burnable poison or control rods, these calculations yield the maximum neutron multiplication factor that could be obtained throughout the life of the nominal fuel assemblies. This includes the effect of the plutonium which is generated during the fuel cycle.

We find that when any number of the fuel assemblies described in the above identified licensee submittals, which have no more than 44 grams of uranium-235 per axial centimeter of fuel assembly are loaded into the proposed racks, the neutron multiplication factor will be less than 0.95.

On this basis, we concluded and the licensee proposed in a December 7, 1977 submittal that the Technical Specifications should be amended to limit the storage of fuel assemblies to those containing no more than 44 grams of uranium-235 per axial centimeter of fuel assembly.

B. Thermal Considerations

The licensed thermal power for each of the Surry Units is 2441 MWth. The licensee plans to refuel every 18 months. This will require the replacement of about the equivalent one-third of the 157 fuel assemblies in each core every year.

The maximum heat load for the spent fuel cooling system was calculated on the basis of a 150 hour time interval after reactor shutdown before completing the transfer of both the normal refueling and full core offloads into the spent fuel pool. On this basis, the maximum heat load for the normal refueling was calculated to be 15.8×10^6 BTU/hr and the maximum heat load for the full core discharge to be 32.8×10^6 BTU/hr.

The licensee stated in the May 27, 1977 submittal that the spent fuel pool cooling system is designed as a seismic Category I system, and that it consists of two complete cooling loops each of which has a design water flow rate of 4200 gallons per minute. Each loop can remove about 34×10^6 BTU/hr while maintaining the fuel pool outlet water temperature at 170°F, assuming that the Component Cooling Water System, which is the heat sink, is at its maximum temperature of 105°F. Thus, with both loops operating this spent fuel pool cooling system is capable of removing about 63×10^6 BTU/hr at a fuel pool outlet water temperature of 170°F and of removing the maximum heat load (full core discharge, i.e., 32.8×10^6 BUT/hr) with a fuel pool outlet water temperature of 137°F.

The spent fuel pool water temperature will be continuously recorded in the control room and an alarm will be annuciated in the control room to alert the operator should this temperature reach 140°F. There are also indicators in the control room to inform the operator when either or both of the spent fuel pool cooling pumps are operating.

Based on a comparison of the spent fuel pool's heat loads, with those obtained by using the method given on pages 9.2.5-8 through 14 of the NRC Standard Review Plan (with the uncertainty factor, K equal to 0.1), we find the licensee's calculated values for the heat load to be acceptable.

Assuming a full array of 1044 stored fuel assemblies, the maximum incremental heat load that will be imposed on the plant by this proposed modification will be that due to eleven annual refuelings, all of which will have had more than three years of cooling. This maximum incremental heat load will be 2.84×10^6 BTU/hr. Since this is less than two percent of the heat rejection capacity of the four loop Component Cooling Water System (CCWS), which has a total heat removal capability of over 200×10^6 BTU/hr, we find that the incremental heat load will have a negligible effect on the component cooling water temperature and that the capacity of the present CCWS is adequate for removing the incremental heat load associated with the proposed modification.

We find that the calculated value of 137°F for the maximum fuel pool outlet water temperature with both spent fuel pool cooling loops operating is consistent with the stated flow rates and design capabilities of the heat exchangers. For the stated flow rates, the temperature increase in the fuel pool outlet water temperature due to the maximum incremental heat load imposed by this proposed modification will be less than 3°F with two loops operating. Also, for the stated flow rates, we find that any single failure in the seismic Category I spent fuel cooling system at the time of the maximum heat load due to a full core offload will not cause the fuel pool outlet water temperature to exceed 170°F. We find this to be acceptable.

We find that the present cooling capacity in the spent fuel pool will be sufficient to handle the incremental heat load that will be added by the proposed modifications. We also find that this incremental heat load will not alter the safety considerations of spent fuel pool cooling from that which we previously reviewed and found to be acceptable.

C. Structural and Material Considerations

We reviewed the supporting arrangements for the proposed racks including their restraints, in accordance with the criteria described in Section 3.7 and 3.8 of the Standard Review Plan. The scope of our review included the design, fabrication and installation procedures; the structural analysis for all loads on the racks and pool, including seismic and impact loadings; load combination; structural acceptance criteria; quality assurance requirements for design, fabrication and installation; and applicable industry codes.

Units Nos. 1 and 2 are served by a common fuel building which houses the stainless steel lined spent fuel pool. The pool base slab forms a part of the fuel building foundation mat. The proposed new racks will use the same floor pads that anchored the original spent fuel racks. These new racks are made of type 304 stainless steel and consist of two basic components; (a) support system, (b) spent fuel assembly storage cells. The support system consists primarily of the four corner cells which interface with the spent fuel pool floor pads and two sets of horizontal grid members which are supported by four corner cells and which provide the geometric restraints for for the inner cells. The inner cells rest directly on the spent fuel pool floor. Diagonal bracings provide the restraints for lateral loads. The rack system is not restrained by the pool walls; the horizontal seismic loads are transmitted from the rack structure to the pool floor through restraint devices which use the existing floor pads. The vertical seismic loads are essentially transmitted directly to the pool floor by each storage cell. The corner storage cells are nominally 9.44 inches square (O.D.) with 0.25 inch wall thickness and the inner cells are nominally 9.12 inches square (O.D.) with 0.090 inch walls.

The design of the new rack system is such that it can be installed during the plant operation.

The supporting arrangement for the storage rack modules and their restraints; the design, fabrication and installation procedures; the structural design and analyses method for all loadings including the seismic and impact loadings, the load combinations; the structural acceptance criteria; the quality control for the design, the fabrication and installation procedures; and the applicable industry codes were all reviewed in accordance with the applicable portions of Sections 3.7 and 3.8 of the Standard Review Plan. The amplified floor response spectra for the spent fuel pool floor were developed using the broad band spectral shape in accordance with the Regulatory Guide 1.60, and the associated damping values are in accordance with the Regulatory Guide 1.61. Maximum responses from three components of seismic excitation were combined in accordance with the requirements of the Regulatory Guide 1.92.

The existing pool structure has been analyzed to account for the increased dead load and seismic loads and the structure has been found acceptable.

The spent fuel storage rack modules, their associated hardware, the rack bases, the seismic lateral restraint systems, and the pool liner are constructed entirely of type 304 stainless steel. Since the possibility of long term storage of spent fuel exists, the long term effects of the pool environment of the racks, fuel cladding and pool linear are being investigated. Based upon our preliminary review and previous operating experience, we have concluded that for the expected temperatures and quality of the demineralized pool water, and taking no credit for in-service inspection, there is reasonable assurance that no significant corrosion of the racks, the fuel cladding or the pool liner will occur over the lifetime of the plant. However, if the results of our ongoing generic review indicate contrary to expectations, that additional protective measures are warranted to protect the racks, the fuel cladding or the liner from the effects of corrosion, the necessary steps and/or inspection programs will be determined to assure that an acceptable level of safety is maintained.

The analyses, design, fabrication, and installation of the proposed rack system are in accordance with accepted criteria. Elastic design methods and allowable stresses defined in Part 1 of the American Institute of Steel Construction "Specification for the Design, Fabrication and Erection of Structural Steel for Building" dated February 1969 based on the yield stress value for stainless steel were adopted for the proposed modification.

The seismic response of the fuel storage rack system was initially calculated by taking into account 2% additional damping due to submergence in water. However, additional response calculations were made eliminating the additional damping due to submergence in water. However, additional response calculations were made eliminating the additional damping and the resulting load on the floor embedment pads exceeded the calculated allowable value by 5%. Since the nominal exceedance is with the accuracy limits of engineering calculations, and it is conservative to ignore the damping effect of submergence in water, we find the proposed seismic analysis procedure acceptable.

The effects of the additional loads on the existing pool structure due to the new storage racks have been examined. The pool structural integrity and leak tightness were determined to be adequate under the new loading conditions.

There is no evidence at this time to indicate that corrosion of the fuel cladding, the stainless steel racks or the linear will occur at the temperatures and quality of the demineralized water present in this pool.

We find that the subject modification proposed by the license is acceptable, and satisfies the applicable requirements of the General Design Criteria 2, 4 and 61.

D. Installation Considerations

The new storage racks will be installed while there are about 370 spent fuel assemblies stored in the pool. This will leave five racks empty. These empty racks will be removed first to make room for the high density racks. The 125 ton fuel building crane will be used to lift the new racks off of the truck and transport them to the spent fuel cask lay down area, but this crane can only be moved over one end of the fuel pool. A special lifting rig will be provided to: (1) remove the present racks from the pool; (2) move the new racks from the cask lay down area; and (3) install the new racks in the pool. This lifting rig will be mounted on the movable platform and will have positive capture devices which will preclude the possibility of accidentally dropping a fuel rack during handling. The licensee states that all movement of spent fuel racks will be controlled by written administrative procedures which will prohibit the movement of spent fuel racks over locations in the pool where fuel assemblies are stored.

Because of the potential for accidental dropping of these fuel storage racks, it is the NRC staff's view that prior to using the special rig to move fuel racks, the licensee should test its capability to lift up to 1.25 times the weight of the heaviest rack with suitable precautions taken to safely absorb the shock of a dropped test load. Accordingly, provided that this test is satisfactorily performed and provided all movements of spent fuel racks are controlled by explicit administrative procedures which prohibit the movement of racks over spent fuel assemblies, we find that the risk in the installation of the new racks will be acceptably low.

After the new racks are installed, the fuel handling procedures in and around the pool will be the same as those that were in effect prior to the proposed modifications, and the consequences of a fuel handling accident will be the same as those reported in Section 14.4.1 of the FSAR and subsequently found acceptable by the staff.

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

E. Postulated Spent Fuel Shipping Cask and Fuel Handling Accidents

The NRC staff has underway a generic review of load handling operations in the vicinity of spent fuel pools to determine the likelihood of a heavy load impacting fuel in the pool and if necessary, the radiological consequences of such an event. Since Surry Technical Specifications have a requirement to prohibit the movement of loads in excess of 110% of the weight of a fuel assembly (not including tool) over fuel assemblies in the SFP, we have concluded that the likelihood of a heavy load handling accident is sufficiently small that the acceptability of the proposed modification is not affected, and that no additional restrictions on load handling operations in the vicinity of the SFP are necessary while this generic review is underway.

Also, we are adding, with the licensee's agreement, a Technical Specification which will prohibit the use of a spent fuel cask in the fuel building until we have approved an evaluation of the cask use.

We find that the consequences of fuel handling accident in the spent fuel pool area are not changed from those presented in the Safety Evaluation Report dated February 1972.

F. Occupational Radiation Exposure

We have evaluated the increment in onsite occupational dose resulting from the proposed increase in stored fuel assemblies on the basis of information supplied by the licensee and by using realistic assumptions for occupancy times and for dose rates in the spent fuel area from radionuclide concentrations in the SFP water. The spent fuel assemblies themselves contribute a neglible 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 will add less than one percent to the total annual occupational radiation exposure burden at this facility. The small increase in radiation exposure will not affect the licensee's ability to maintain individual occupational doses to as low as is reasonably achievable and within the limits of 10 CFR 20. Thus, we conclude that storing additional fuel in the SFP will not result in any significant increase in doses received by occupational workers.

G. Radioactive Waste Treatment

The station contains waste treatment systems designed to collect and process the gaseous, liquid and solid wastes that might contain radioactive material. The waste treatment systems are evaluated in the Safety Evaluation Report (SER) dated February 1972 for the station. There will be no change in the waste treatment systems or in the conclusions of the evaluation of these systems in Section 11.0 of the SER because of the proposed modification.

SUMMARY

Our evaluation supports the conclusion that the licensee's proposed modification to increase the capacity of the spent fuel pool is acceptable because:

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

(2) The spent fuel pool cooling system has adequate cooling capacity.

(3) The structural design and materials of construction are adequate.

(4) The installation and use of the new fuel racks does not alter the potential consequences of the design basis accident for the spent fuel pool, i.e., the rupture of all rods in a single fuel assembly and the subsequent release of the radioactive inventory within the gap of each of those rods.

(5) The increase in the spent fuel pool storage capacity is not affected by considerations of a postulated cask drop accident because cask movement over the pool will be prohibited by Technical Specifications until our review of the postulated cask drop accident has been completed.

(6) The increase in occupational radiation exposure will be negligible.

(7) Waste treatment systems are still adequate.

CONCLUSION

We have concluded, based on the considerations discussed above, that: (1) there is reasonable assurance that the health and safety of the public will not be endangered by operation in the proposed manner, and (2) such activities will be conducted in compliance with the Commission's regulations and the issuance of this amendment will not be inimical to the common defense and security or to the health and safety of the public.

Date: March 23, 1978

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

ENVIRONMENTAL IMPACT APPRAISAL

BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELATING TO MODIFICATION OF THE SPENT FUEL POOL

FACILITY OPERATING LICENSE NOS. DPR-32 AND DPR-37

VIRGINIA ELECTRIC AND POWER COMPANY

SURRY POWER STATION UNIT NOS. 1 AND 2

DOCKET NOS. 50-280 AND 50-281

1.0 Description of Proposed Action

By letter dated May 27, 1977, and as supplemented August 10, 1977, September 15, 1977, September 29, 1977, December 7, 1977, and February 8, 1978. Virginia Electric and Power Company (the licensee) proposed amendments to Facility Operating Licenses DPR-32 and DPR-37 for operation of the Surry Power Stations, Unit Nos. 1 and 2. The proposed amendments would allow the installation of new, higher capacity fuel storage racks in the Surry spent fuel pool (SFP). The proposed racks modification would increase the SFP storage capacity from 464 to 1044 fuel assemblies.

The modification evaluated in this environmental impact appraisal is the proposal by the licensee to replace the existing spent fuel storage racks with closer spaced racks. The rack spacing would be changed from 21 inches center-to center spacing to 14 inches center-to-center spacing of the individual spent fuel cells.

2.0 Need for Storage Capacity

The Surry Power Station, Unit Nos. 1 and 2, were issued Operating Licenses on May 25, 1972, and January 29, 1973, respectively. As of March 1, 1978, Unit No. 1 had operated through almost 4 complete cycles and Unit 2 had operated through 3 complete cycles. After each fuel cycle, approximately one-third of the fuel assemblies has been discharged permanently from the core and stored in the spent fuel pool. As of March 1, 1978, no spent fuel has been shipped from the site and 373 fuel assemblies are presently in the spent fuel pool. The present licensed storage capacity of the SFP is 464 fuel assemblies.

The need to expand the storage capacity of the SFP or to locate alternate storage exists now. It is prudent engineering practice to reserve room in a SFP to off-load a full core should this be necessary to inspect or repair core internals. At present, the licensee does not have room in the SFP to off-load a full core.

A full core discharge capability has not been possible following the refueling of Unit No. 2 in September 1977. Unless additional storage is made available, sufficient storage capacity to accommodate a normal refueling will not be available after refueling of Unit No. 1 scheduled for April 1978.

The proposed expanded storage capacity of 580 additional assemblies would provide room for somewhat over 19 refuelings. The total capacity of 1044 assemblies is based on the physical layout of the SFP and is not related to a specific refueling schedule.

The proposed modification would extend the spent fuel storage capacity of the pool through to 1982 and leave room for a complete core discharge up to that time (assuming a refueling occurs once every 18 months). In our evaluation, we considered the impacts which may result from storing up to an additional 580 spent fuel assemblies in the SFP.

The proposed modification will not alter the external physical geometry of the spent fuel pool or require additional modifications to the SFP cooling or purification systems. The proposed modification does not affect in any manner the quantity of uranium fuel to be burned in the reactor over the anticipated operating life of the facility and thus in no way affects the generation of spent uranium fuel by the facility. The rate of spent fuel generation and the total quantity of spent fuel generated during the anticipated operating lifetime of the facility and transferred the SFP remains unchanged as a result of the proposed expansion. The modification will increase the number of spent fuel assemblies that can be stored in the SFP at a given time as well as the length of time that some of these assemblies can be stored there. On the basis of the evaluation discussed herein, we have considered that the storage capacity of the Surry SFP should be increased.

3.0 Fuel Reporcessing History

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

4.0 The Facility

The Surry Power Station is more fully described in a May 1972 Final Environmental Statement (FES) related to operation of the facility. Each plant has a pressurized water reactor (PWR), which produces 2441 Megawatts thermal (MWt) and has a gross electrical output of 822.5 Megawatts (MWe). Pertinent descriptions of principal features are summarized below.

4.1 Fuel Inventory

Each reactor contains 157 fuel assemblies. Each of these assemblies is in a cluster of 204 fuel rods or sealed tubes arranged in a 15x15 array. The weight of the fuel, as UO_2, is approximately 175,600 pounds.

4.2 Cooling Water System

The cooling water system is a once-through cooling system. Water is pumped from the James River at a flow rate of approximately 1,680,000 gallons per minute (840,000 gpm per unit), circulated through the turbine condensers and plant auxiliary cooling systems, and returned to the James River at a point nearly 6 miles upstream of the intake. At operating power of 2441 MWt, the cooling water will be warmed approximately 14°F before being discharged back into the river. During full power operation, 11. $9x10^9$ Btu/hr will be discharged into the river. Further details of this system are discussed in Section III.D of the FES.

The Component Cooling Water System is designed to remove heat from major components in the station including the components associated with removal of heat from the spent fuel pool.

4.3 Radioactive Wastes

The station contains waste treatment systems designed to collect and process the gaseous, liquid and solid waste that might contain radioactive material from both units. The waste treatment systems for Units 1 and 2 are evaluated in the Final Environmental Statement (FES) dated May 1972, respectively. There will be no change in the waste treatment systems described in Section III.D.2 of the FES because of the proposed modification.

4.4 Purpose of SFP

The SFP was designed to store spent fuel assemblies prior to shipment to a reprocessing facility. These assemblies are transferred from the reactor core to the SFP to accomplish a core refueling, or to allow for inspection or modification of core internals, which may require the removal and storage of up to a full core. The assemblies are initially intensely radioactive (due to their fresh fission product content) and have a high thermal output. They are stored in the SFP to allow for radioactive and thermal decay.

The major portion of decay occurs in the first 150 days following removal from the reactor core. After this period, the assemblies may be withdrawn and placed into a heavily shielded fuel cask for offsite shipment. Space permitting, the assemblies may be stored for an additional period allowing continued fission product decay and thermal cooling prior to shipment.

4.5 Spent Fuel Pool Cooling and Purification Systems

The SFP is provided with a cooling loop which removes residual heat from fuel stored in the SFP. The SFP cooling and cleanup system (SFPCCS) was designed to maintain the SFP water temperature less than or equal to 140°F during normal refueling operations. The cooling and cleanup system is described in Section 9.5 of the FSAR.

The existing SFP cooling and cleanup system consists of two 4200 gpm circulating pumps, two heat exchangers, two purification pumps, filters, demineralizer and the required piping, and instrumentation. The pumps draw water from the pool, circulate it through a heat exchanger and return it to the pool. Component Cooling Water cools the heat exchanger. The clarity and purity of the water is maintained by passing approximately 150 gpm of the system flow through a 45 ft^3 demineralizer and filter. There is also a separate skimmer system to remove surface dust and debris from the SFP.

Because we expect only a small increase in radioactivity released to the pool water a result of the proposed modification as discussed in Section 5.3.1, we conclude the exisiting spent fuel pool purification system is adequate for the proposed modification and will keep the concentrations of radioactivity in the pool water to acceptably low levels.

5.0 Environmental Impacts of Proposed Action

5.1 Land Use

The proposed modification will not alter the external physical geometry of the SFP. The SFP was designed to store spent fuel assemblies under water for a period of time to allow shorter lived radioactive isotopes to decay and to reduce the associated thermal heat output. The Commission has never set a limit on how long spent fuel assemblies could be stored on-site. The longer the fuel assemblies decay, the less radioactivity they contain. The proposed modification will not change the basic land use of the SFP. The pool was designed to store the spent fuel assemblies for up to 8 normal refuelings. The modification would provide storage for up to 19 normal refuelings. The pool was intended to store spent fuel. This use will remain unchanged by the proposed modification.

5.2 Water Use

There will be no significant change in plant water consumptions or use as a result of the proposed modification. As discussed subsequently, storing additional spent fuel in the SFP will increase the heat load on the SFP cooling system, which is transferred to the component cooling water system and to the service water system. The modification will not change the flow rate within these cooling systems. Since the temperature of the SFP water during normal refueling operations will remain below the 140°F evaluated in the FES, the rate of evaporation and thus the need for makeup water will not be significantly changed by the proposed modification.

5.3 Radiological

5.3.1 Introduction

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

The additional spent fuel which could be stored due to the expansion is fuel which will have decayed at least four 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 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 spent fuel pool so that 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 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 not significant leakage from this fuel in the offsite storage facility.

5.3.2 Radioactive Material Released to Atmosphere

With respect to gaseous releases, the only significant noble gas isotope attributable to storing additional assemblies for a longer period of time would be Krypton-85. As discussed previously, experience has demonstrated that after spent fuel has decayed 4 to 6 months, there is no significant release of fission products from defected fuel. However, we have conservatively estimated that an additional 80 curies per year of Krypton-85 may be relased for both units when the modified pools are completely filled. This increase would result in an additional total body dose at the site boundary to an individual of less than 0.0005 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 0.0001 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 0.5% of the exposures from the plant evaluated in the FES for the individual (FES Table 5.7) and the population (FES Table 5.8). 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 for each unit.

Storing additional spent fuel assemblies is not expected to increase the bulk water temperature above the 140°F during normal refuelings used in the design analysis. Therefore, it is not expected that there will be any significant change in evaporation rates or the release of tritium or iodine as a result of the proposed modification from that previously evaluated. 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 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 radioiodine before release to the environment.

5.3.3 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 high 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 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 45 cubic feet of resin a year from the demineralizer (an additional resin bed/year). The annual average amount of solid waste shipped from both units during 1973, 1974 and 1976 is 26,800 cubic feet per year for both units. This does not include 1975 because of the exceptionally large volume of wastes shipped that year. If the storage of additional spent fuel does increase the amount of solid waste from the SFP purification system by about 45 cubic feet per year, the increase in total waste volume shipped would be less than 2% and would not have any significant environmental impact.

In addition to the above, there are also the present spent fuel racks to be removed from the SFP from both units and to be disposed of. Averaged over the lifetime of the station, this will increase the total waste shipped from the plant by less than 2% and would not have any significant environmental impact.

5.3.4 Radioactivity Released to Receiving Waters

There should not be a significant increase in the liquid release of radionuclides from the station as a result of the proposed modification. The amount of radioactivity on the SFP filter and 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 station.

The cartridge filter removes insoluble radioactive matter from the SFP water. This is periodically removed to the waste disposal area in a shielded cask and placed in a shipping container. The insoluble matter will be retained on the filter or remain in the SFP water.

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

5.3.5 Occupational Exposures

We have reviewed the licensee's plan for the removal, disassembly and disposal of 26 low density racks and the installation of 29 high density racks for both units with respect to occupational radiation exposure. The occupational radiation exposure for this operation is estimated by the licensee to be about 11 man-rem. We consider this to be a reasonable estimate. This operation is expected to be performed only once during the lifetime of the station and will therefore represent a very 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 and by utilizing realistic assumptions for occupancy times and for dose rates in the spent fuel pool area from radionuclide concentrations in the SFP water. The spent fuel assemblies themselves contribute a negligible amount to dose rates in the pool area because of the depth of water shielding the fuel. The occupational radiation exposure resulting from the proposed action represents a negligible burden. Based on present and projected operations in the spent fuel pool area, we estimate that the proposed modification will add less than one percent to the total annual occupational radiation exposure burden at this facility. The small increase in radiation exposure will not affect the licensee's ability to maintain individual occupational doses to as low as is reasonably achievable and within the limits of 10 CFR 20. Thus, we conclude that storing additional fuel in the SFP will not result in any significant increase in doses received by occupational workers.

5.3.6 Evaluation of Radiological Impact

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

5.4 Nonradiological Effluents

There will be no change in the chemical or biocidal effluents from the plant as a result of the proposed modification.

The only potential offsite nonradiological environmental impact that could arise from this proposed action would be an additional discharge of heat to the atmosphere or to the James River. Each SFP cooling system was designed for a heat removal capability of 34 x 10^6 BTU/hr. Each system was conservatively designed to maintain pool average temperature at less than 140°F with 1/3 core of fully burned up fuel assemblies placed in the pool 150 hours after reactor shutdown This was based on a normal refueling heat load of 15.75 x 10^6 BTU/hr.

The maximum incremental heat load attributable to the proposed rack modification will be 2.84 x 10^6 BTU/hr. This heat load is less than two percent of the heat rejection capacity of the four loop Component Cooling Water System, which has a total heat removal capability of over 200 x 10^6 BTU/hr and will have a negligible impact on the component cooling water temperature. The present system is adequate for removing this incremental heat load.

5.5 Impacts on the Community

The new storage racks will be fabricated offsite and shipped to the facility. No environmental impacts on the environs outside the spent fuel storage building are expected during removal of the existing racks and installation of the new racks. The impacts within this building are expected to be limited to those normally associated with metal working activities. No significant environmental impact on the community is expected to result from the fuel rack conversion or from the subsequent operation with the increased storage of spent fuel in the SFP.

6.0 Environmental Impact of Postulated Accidents

Although the new high density racks will accommodate a larger inventory of spent fuel, we have determined that the installation and use of the racks will not change the radiological consequences of a postulated fuel handling accident in the SFP area from those values reported in the FES for Surry Units 1 and 2 dated May 1972.

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. Surry Power Station will have requirements to prohibit the movement of heavy loads over fuel assemblies in the SFP. Also, the licensee has agreed to a Technical Specification change that will prohibit the entry of a spent fuel cask into the Fuel Building until we have completed our review of the postulated dropped fuel cask accident.

Therefore, we have concluded that the likelihood of a heavy load handling accident is sufficiently small that the proposed modification is acceptable and no additonal restrictions on load handling operations in the vicinity of the SFP are necessary while our review is under way

7.0 Alternatives

In regard to this licensing action, we have considered the following alternatives: (1) shipment of spent fuel to a fuel reprocessing facility, (2) shipment of spent fuel to a separate fuel storage facility, (3) shipment of spent fuel to another reactor site and (4) ceasing operation of the facility. These alternatives are considered in turn.

The total construction cost associated with the proposed modification is estimated to be about $1, 200,000 or approximately $2070 for each of the 580 additional fuel assemblies that the increased storage capacity will accommodate. While this is costly, as discussed below, the alternatives are more costly.

7.1 Reprocessing of Spent Fuel

As discussed earlier, none of the three commercial reprocessing facilities in the U.S. is currently operating. The Morris Operation (MO) is in a decommissioned condition. On September 22, 1976, Nuclear Fuel Services, Inc. (NFS) informed the Nuclear Regulatory Commission that they were "withdrawing from the nuclear fuel processing business." The Allied-General Nuclear Services (ASNS) reprocessing plant received a construction permit on December 18, 1970. In October 1973, ASNS applied for an operating license for the separation facility; construction of the separation facility is essentially complete. On July 3, 1974, ASNS applied for a materials license to receive and store up to 400 MTU in spent fuel in the on-site storage pool, on which construction has been completed. Hearings have not been completed on the materials license application. However, even if AGNS decides to proceed with operation of the Barnwell facility in light of the President's policy statement of April 7, 1977, discussed below, the separations plant will not be licensed until the issues presently being considered in the GESMO proceedings are resolved and the GESMO proceedings are complete.

In 1976, Exxon Nuclear Company, Inc. submitted an application for a proposed Nuclear Fuel Recovery and Recycling Center (NRFRC) to be located at Oak Ridge, Tennessee. The plant would include a storage pool that could store up to 7000 MTU in spent fuel.

On April 7, 1977, the President issued a statement outlining his policy on continued development of nuclear energy in the U.S. The President stated that: "We will defer indefinitely the commercial reprocessing and recycling of the plutonium produced in the U.S. nuclear power programs. From our own experience, we have concluded that a viable and economic nuclear power program can be sustained without such reprocessing and recycling."

On December 23, 1977, the Nuclear Regulatory Commission announced that it would order the termination of the now-pending fuel cycle licensing actions involving GESMO (Docket No. RM-50-5), Barnwell Nuclear Fuel Plant Separations Facility, Uranium Hexfluoride Facility, and Plutonium Product Facility (Docket No. 50-332, 70-1327 and 70-1821), the Exxon Nuclear Company, Inc., Nuclear Fuel Recovery and Recycling Center (Docket No. 50-564), the Westinghouse Electric Corporation Recycle Fuels Plants (Docket No. 70-1432), and the Nuclear Fuel Services, Inc. West Valley Reprocessing Plant (Docket No. 50-201). The Commission also announced that it would not at this time consider any other applications for commercial facilities for reprocessing spent fuel, fabricating mixed-oxide fuel, and related functions. At this time, any consideration of these or comparable facilities has been deferred for the indefinite future. Accordingly, we consider that shipment of spent fuel to such facilities for reprocessing is not a reasonable alternative to the proposed expansion of the Surry SFP especially when considered in the relevant Surry timeframe - i.e., after 1978 - when expanded capacity at Surry will be needed.

The licensee had intended to reprocess the spent fuel to recover and recycle the uranium and plutonium in the fuel. Due to a change in national policy and circumstances beyond the licensee's control, reprocessing of the spent fuel is not an available option at this time.

7.2 Independent Spent Fuel Storage Facility

An alternative to expansion of onsite SFP storage is the construction of new "independent spent fuel storage installations" (ISFSI). Such installations could provide storage space in excess of 1000 MUT of spent fuel. This is far greater than the capacities of onsite storage pools. Fuel storage pools at MO and NFS are functioning as ISFSIs although this was not the original design intent. Likewise, if the receiving and storage station at AGNS is licensed to accept spent fuel, it would be functioning as an ISFSI until the separations facility is licensed to operate. The license for MO was amended on December 3, 1975 to increase the storage capacity to about 750 MTU; approximately 306 MTU are now stored in the pool. The staff has discussed the status of storage space at Morris Operations (MO) with GE personnel. We have been informed that GE is primarily operating the MO facility to store either fuel owned by GE (which had been leased to utilities on an energy basis) or fuel which GE had previously contracted to reprocess. We were informed that the present GE policy is not to accept spent fuel for storage except for that fuel for which GE has a previous commitment.* The NFS facility has capacity for about 260 MTU, with approximately 170 MTU presently stored in the pool. The storage pool at West Valley, New York is on land owned by the State of New York and leased to NFS thru 1980. Although the storage pool at West Valley is not full, since NFS withdrew from the fuel reprocessing business, correspondence we have received indicates that they are not at present accepting additional spent fuel for storage even from these reactor facilities with which they had contracts.

*An application for an 1100 MTU capacity addition is pending. Present schedule calls for completion in 1980 if approved.

The licensee has a contract with AGNS to process spent fuel. Even if AGNS receives a license to store spent fuel, storage capacity is limited at AGNS. Specifically, the AGNS pool holds about 360 MTU, and it estimated that all AGNS customers would discharge about 1700 MTU by mid-1978. Considering all of the uncertainties above, shipment of spent fuel to AGNS is not a reliable alternative in the near term.

The license has also investigated the economic and technical feasibility of shipping spent fuel offsite to an Independent Spent Fuel Storage Installation (ISFSI) assuming that an ISFSI were to be available. The licensee estimates storage and transportation costs in excess of $40,000,000 or $70,000 for each fuel assembly. With respect to construction of new ISFSIs, Regulatory Guide 3.24, "Guidance on the License Application, Siting, Design and Plant Protection for an Independent Spent Fuel Storage Installation," issued in December 1974, recognizes the possible need for ISFSIs and provides recommended criteria and requirements for water-cooled ISFSIs. Pertinent sections of 10 CFR Parts 19, 20, 30, 40, 51, 70, 71 and 73 would also apply.

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

Industry proposals for independent spent fuel storage facilities are scarce to date. In late 1974, E. R. Johnson Associates, Inc. and Merrill Lynch, Pierce, Fenner and Smith, Inc. issued a series of joint proposals to a number of electric utility companies having nuclear plants in operation or contemplated for operation, offering to provide independent storage services for spent nuclear fuel. A paper on this proposed project was presented at the American Nuclear Society meeting in November 1975. In 1974, E. R. Johnson Associates estimated their construction cost at approximately $9000 per spent fuel assembly. At this rate it would cost the licensee over 5.2 million to store the additional 580 spent fuel assemblies that the proposed modification would accommodate, plus additional costs for shipment and safeguarding the fuel.

Several licensees have evaluated construction of a separate independent spent fuel storage facility and have provided cost estimates. Connecticut Yankee, for example, estimated that to build an independent facility with a storage capacity of 1,000 MTU (BWR and/or PWR assemblies) would cost approximately $54 million and take about 5 years to put into operation. Commonwealth Edison estimated the contruction cost to build a full storage facility at about $10,000 per fuel assembly. To this would be added to costs for maintenance, operation, safeguards, security, interest on investment, overhead, transportation and other costs.

On December 2, 1976, Stone and Webster Corporation submitted a topical report requesting approval for a standard design for an independent spent fuel storage facility. No specific locations were proposed, although the design is based on siting it near a nuclear power facility. No estimated costs for fuel storage were included in the topical report.

On a short term basis (i.e., prior to 1985) an independent spent fuel storage installation is not a viable alternative based on cost or availability in time to meet the licensee's needs. It is also unlikely that the total environmental impacts of constructing an independent facility and shipment of spent fuel would be less than the minor impacts associated with the proposed action.

Additional storage capacity could be made available by the licensee building a new storage pool, either on or offsite. The licensee estimates this would cost $20,000,000 or $34,000 per fuel assembly. This alternative would require two or three years and would not satisfy the near term requirements

The proposed increase in storage capacity will allow Surry Station to continue to operate until 1982 with full core offload capability, by which time interim storage and the Federal repository for spent fuel are expected to be available.

7.3 Storage at Another Site

The licensee owns and operates the North Anna Power Station located approximately 125 miles NW of Surry.

Shipment of spent fuel from Surry to North Anna would be a very short-term solution. Assuming a full core discharge capability is maintained and the spent fuel from Surry 1 and 2, in excess of Surry's existing storage capacity, and North Anna 1 and 2 spent fuel is stored in the pool, a full core discharge capability at North Anna for its fuel would be exceeded in 1983. If full core discharge reserve capacity is not maintained, the existing North Anna storage capacity would be exceeded in 1984.

Also, offsite shipment for short time storage of spent fuel is uneconomical because of the additional handling and shipping costs. Assuming that truck casks are available, it is estimated that the cost of shipping the 580 assemblies which could otherwise be stored at Surry with the use of high density storage racks in the period 1978 through 1984 would be in excess of 2.5 million dollars or $4300 per fuel assembly. This cost is based on preliminary cost data with no firm contractural arrangements. In comparison to the proposed modification, shipment of spent fuel to North Anna is not an economically acceptable alternative.

According to a survey conducted and documented by the Energy Research and Development Agency, up to 46% of the operating nuclear power plants will lose the ability to refuel during the period 1975-1984 without additional spent fuel storage pool expansions or access to offsite storage facilities. Thus, the licensee cannot 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, the cost would probably be comparable to the cost of storage at a commercial storage facility.

7.4 Shutdown of Facility

Storage of additional spent fuel from Surry Station in the existing racks is possible for only a short period of time. As discussed above, if expansion of the SFP capacity is not approved and if alternate storage space is not located, the licensee would be unable to unload further spent fuel after April 1978 and would have to shut down the two Surry plants in 1978 and 1979 (It should be noted that these dates may be affected slightly by the shutdown of Surry Unit Nos. 1 and 2 for steam generator replacement now scheduled for October 1978 and November 1979 respectively). This would halt the generation of 1576

Megawatts net of electrical energy. The licensee has estimated that a shutdown of Surry would result in annual cost of replacement power in excess of $132 million per unit. This cost is based on today's dollar and would continue over the few years additional storage time that the proposed modification would provide. The $264 million annual cost would consist of additional fuel, increased purchased power and capacity changes.

7.5 Summary of Alternatives

In summary, alternatives (1) and (2) above are either presently not available to the licensee or could not be made available in time to meet the licensee's needs. Alternative (2) and alternative(3) would be more expensive than the proposed modification and would not provide the operating flexibility of the proposed action and certainly for alternative (3), might preempt storage space needed by another facility. The alternative of ceasing operation of the facility would be much more expensive than the proposed action because of the need to provide replacement power. In addition to the economic advantages of the proposed action, we have determined that the expansion of the storage capacities of the SFP for the Surry plant would have a negligible environmental impact. Accordingly, deferral or severe restriction of the action here proposed would result in substantial harm to the public interest.

8.0 Evaluation of Proposed Action

8.1 Unavoilable Adverse Environmental Impacts

8.1.1 Physical Impacts

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

8.1.2 Radiological Impacts

Expansion of the storage capacity of the SFP would not create any significant additional adverse radiological effects. A discussed in Section 5.3 the additional total body dose that might be received by an individual or the estimated population within a 50 mile radius is less than 0.0005 mrem/yr and 0.0001 man-rem/yr, respectively, and is less than the natural fluctuations in the dose this population would receive from background radiation. The total dose to workers during removal of the present storage racks and installation of the new racks is estimated to be about 11 man-rem. Operation of the faiility with additional spent fuel in the SFP is expected to increase the occupational radiation exposure by more than 1% of the present total annual operational burden at this facility.

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

Expansion of the storage capacity of the SFP, which would permit the facility to continue to operate until offsite storage facilities are expected to be available for interim or long-term storage of spent fuel, will not change the evaluation previously made in the Surry FES.

8.3 Irreversible and Irretrievable Commitments of Resources

8.3.1 Water, Land and Air Resources

The proposed action would not result in any significant change in the commitments of water, land and air resources as identified in the FES. No additional allocation of land would be made; the land area now used for the SFP would be used more efficiently by reducing the spacings between fuel assemblies.

8.3.2 Material Resources

Under the proposed modification, the present spent fuel storage racks would be replaced by new racks that will increase the storage capacity of the SFP by 580 fuel assemblies. In its submittal, the licensee estimated that the amount of material resources that would be consumed by the proposed modification would be approximately 400,000 pounds of 304 stainless steel. The amount of stainless steel used annually in the United States is about 2.8 x 10" pounds. The amount of stainless steel required for fabrication of the new racks is a small amount of this resource consumed annually in the United States. We conclude that the amount of material requied for the new racks is insignificant and does not represent a significant irreversible commitment of material resources.

Storage of spent fuel assemblies for a longer term would prolong the fuel cycle of the stored fuel beyond that originally envisioned. Its usefulness as a resource in the future, however, would not be changed. The provision of longer on-site storage does not result in any cumulative effects due to facility operation since the throughput of materials have been produced when averaged over the life of the facility. This licensing action would not constitute a commitment of resources that would affect the alternatives available to other nuclear power facilities or other actions that might be taken by the industry in the future to alleviate fuel storage problems. No other resources would need to be allocated because the other design characteristics of the SFP would remain unchanged.

We conclude that the proposed expansion of the SFP at the Surry facility does not constitute a commitment of either material or nonmaterial resources that would tend to significantly foreclose the alternatives available with respect to any other individual licensing action designed to ameliorate a possible shortage of spent fuel storage capacity.

8.4 Commission Policy Statement Regarding Spent Fuel Storage

On September 16, 1975, the Commission announced (40 F.R. 42801) its intent to prepare a generic environmental impact statement on handling the storage of spent fuel from light water reactors. In this notice, the Commission also announced its conclusion that it would not be in the public interest to defer all licensing actions intended to ameliorate of possible shortage of spent fuel storage capacity pending completion of the generic environmental impact statement. A draft of this statement "Draft Generic Environmental Impact Statement" NUREG-0404 issued in March 1978, concludes that increasing the capacities of individual spent fuel storage pools is environmentally acceptable.

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

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

With the existing storage racks, the SFP does not have sufficient storage capacity to accommodate a full core discharge although it is prudent engineering practice to reserve space in the SFP to receive an entire reactor core, should this be necessary to inspect or repair core internals or because of other operational considerations. The SFP will be full after the refueling scheduled for the April 1978. The spent fuel must be stored onsite or elsewhere if the facility is to be refueled. If expansion of the SFP capacity is not approved or if an alternate storage facility is not available, the licensee would have to shutdown the two units one in late 1978 one in early 1979. As discussed under alternatives, an alternate storage facility is not now available. Storage onsite is an interim solution to allow the plant to continue to operate.

The proposed licensing action (i.e., installing new racks of a design that permits storing more assemblies in the same space) would provide the licensee with additional flexibility which is desirable even if adequate offsite storage facilities hereafter become available to the licensee.

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

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

The increased storage capacity at the Surry SFP was considered as a nonmaterial resource and was evaluated relative to proposed similar licensing actions at other nuclear power plants, fuel reprocessing facilities and fuel storage facilities. We have determined that the proposed expansion in the storage capacity of the SFP is only a measure to allow for continued operation and to provide operational flexibility at the facility, and will not affect similar licensing actions at other nuclear power plants. Similarly, taking this action would not necessarily commit the NRC to repeat this action or a related action in 1982 at which time the modified pool is estimated to be full except for full core offload capability.

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

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

Potential non-radiological 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 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 potential non-radiological environmental impact attributable to the additional heat load in the SFP was determined to be negligible compared to the existing thermal effluents from the facility.

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

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

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

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

We have evaluated the alternative to the proposed action, including storage of the additional spent fuel offsite and ceasing power generation from the plant when the existing SFP is full. We have determined that there are significant economic advantages associated with the proposed action and that expansion of the storage capacity of the SFP will have a negligible environmental impact. Should the proposed modification be deferred or severely restricted one of the Surry Units would have to shutdown as early as 1978 due to an inability to refuel the core. As discussed in Section 7.4, such a shutdown would result in considerable additional costs to the licensee which would result in higher energy cost for the public. Accordingly, deferral or severe restriction of the action here proposed would result in substantial harm to the public interest.

9.0 Benefit-Cost Balance

This section summarizes and compares the benefits and cost resulting from the proposed modification to those that would be derived from the selection and implementation of each alternative. The table below presents a tabular comparison. The benefit that would be derived from three of these alternatives is the continued operation of the facility and its production of electrical energy. As shown in the table, the reactor shutdown and subsequent storage of fuel in the reactor vessel would result in the cessation of this electrical energy production. The remaining alternatives, storage at other nuclear power facilities or at a reprocessor's facility are not possible at this time and, therefore, have no associated cost or benefit.

From examination of the table, it can be seen that the most cost-effective alternative is the proposed SFP modification. As evaluated in the proceeding sections, the environmental impacts associated with the proposed modification would not be significantly changed from those analyzed in the Final Environmental Statement for Surry issued in May 1972.

10.0 Basis and Conclusion for Not Preparing an Environmental Impact Statement

We have reviewed this proposed facility modification relative to the requirements set forth in 10 CFR Part 51 and the Council of Environmental Quality's Guidelines, 40 CFR 1500.6. We have determined that the proposed license amendment will not significantly affect the quality of the human environment. 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.

SUMMARY OF COST-BENEFITS

Alternative	Cost	Benefit
Reprocessing of Spent Fuel	-	none- This alternative is not available either now or in the foreseeable future.
Increase storage capacity of Spent Fuel Pool	$2070 per assembly	Continued Operation and production of electrical energy.
Storage at Independent Commercial Facility	$9,000 to $10,000 per assembly	Continued operation and production of electrical energy
New Storage Pool on or off-site at Surry	$34,000 per assembly	not available in the short term
Storage at North Anna	$4300 per assembly	Continued operation and production of electrical energy
Storage at other nuclear power facilities	This alternative is not available at this time.	
Storage at Reprocessors' Facility	This alternative is not available at this time.	
Reactor Shutdown	$264 million a year	None - No production of electrical energy

SUMMARY OF ENVIRONMENTAL COSTS AND BENEFITS
ASSOCIATED WITH INCREASE IN SPENT FUEL POOL STORAGE CAPACITY

Factor	Cost	Benefit
Land Use	no change	Continued production of electircal energy beyond 1978
Water Use	insignificant	" " "
Radiological	insignificant	" " "
Nonradiological	insignificant	" " "
Socio-economic	insignificant	" " "

UNITED STATES NUCLEAR REGULATORY COMMISSION

DOCKETS NOS. 50-280 AND 50-281

VIRGINIA ELECTRIC AND POWER COMPANY

NOTICE OF ISSUANCE OF AMENDMENTS TO FACILITY OPERATING RECENSES

The U. S. Nuclear Regulatory Commission (the commission) has issued Amendments Nos. 37 and 36 to Facility Operating Licenses Nos. DPR-32 and DPR-37, issued to Virginia Electric and Power Company (the licensee), which revised Technical Specifications for operation of the Surry Power Saation, Unit Nos. 1 and 2 (the facilities) located in Surry County, Virginia. The amendments are effective as of the date of issuance.

These amendments permit the installation of new fuel storage racks in the spent fuel pool which will increase the pool's storage capacity from 464 to 1044 fuel assemblies.

The application for the amendment complies with the standards and requirements of the Atomic Energy Act of 1954, as amended (the Act), and the Commission's rules and regulations. The Commission has made appropriate findings as required by the Act and the Commission's rules and regulations in 10 CFR Chapter I, which are set forth in the license amendment. Notice of Proposed Issuance of Amendment to Provisional Operating License in connection with this action was published in the FEDERAL REGISTER on June 20, 1977 (42 FR 31202). No request for a hearing or petition for leave to intervene was filed following notice of proposed action.

The Commission has prepared an environmental impact appraisal for the revised Technical Specifications and has concluded that an environmental impact statement for this particular action is not warranted because there will be no significant environmental impact attributable to this action.

For further details with respect to this action, see (1) the application for amendment dated May 27, 1977, as supplemented August 10, 1977, September 15, 1977, September 29, 1977, December 7, 1977, and February 8, 1978, (2) Amendments Nos. 37 and 36 to License Nos. DPR-32 and DPR-37, respectively, (3) the Commission's related Safety Evaluation and (4) the Commission's Environmental Impact Appraisal. All of these items are available for public inspection at the Commission's Public Document Room, 1717 H Street, N.W., Washington, D. C. and at the Swen Library, College of William and Mary, Williamsburg, Virginia. A copy of items (2), (3) and (4) may be obtained upon request addressed to the U.S. Nuclear Regulatory Commission, Washington, D. C. 20555, Attention: Director, Division of Operating Reactors.

Dated at Bethesda, Maryland, this 23rd day of March 1978.

FOR THE NUCLEAR REGULATORY COMMISSION

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