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

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

SUPPORTING AMENDMENT NO. 27 AND NO. 8 TO

FACILITY OPERATING LICENSE NOS. NPF-4 AND NPF-7

VIRGINIA ELECTRIC AND POWER COMPANY

NORTH ANNA POWER STATION, UNITS NO. 1 AND NO. 2

DOCKET NOS. 50-338 AND 50-339

Introduction:

By letter dated March 6, 1981 (Serial No. 109), as supplemented by letter dated March 26, 1981 (Serial No. 195), the Virginia Electric and Power Company (the licensee) requested amendments to Facility Operating Licenses, NPF-4 and NPF-7 for the North Anna Power Station, Units No. 1 and 2 (NA-1&2).

The licensee has proposed an enrichment of 4.1 weight percent U-235 in the new and spent fuel storage locations. This storage of increased enrichment fuel is necessary to permit the licensee's participation in a Department of Energy demonstration and evaluation program concerned with high burnup technology. This higher enrichment can permit a higher average discharge burnup of fuel from a reactor.

We have not completed our review of the safety aspects of operating a reactor similar to those at NA-1&2 at an enrichment of 4.1 weight percent U-235 and to an extended burnup of up to 45,000 Mega-watt-days per Metric Ton-Uranium (MWd/MTU).

We have reviewed the safety aspects of storing 4.1 percent fuel in the NA-1&2 new and spent fuel storage racks. We have also reviewed the operation of the NA-1&2 reactors with fuel enriched to 3.7 percent which is an insignificant increase over the current Technical Specifications limit of 3.5 percent. Since we are limiting the operating value to 3.7 percent, the limit on storage will also be 3.7 percent even though the analysis was done for 4.1 weight percent U-235.

We are continuing our review of licensees' requests to operate reactors with an increase in enrichment to 4.1 percent and with burnups to 45,000 MWd/MTU. Also, we note that we are currently engaged in discussions with the nuclear industry regarding investigations to address extended burnup in a generic manner.

Discussion

1. Increased Enrichment and Burnup:

We have reviewed the licensee's submittal in the context of our on-going review of the technology (analyses and data) for extended burnups. We find that there is sufficient information currently available from power reactor operations with similar fuel at other Westinghouse plants to justify operations at NA-1&2 with a fuel discharge batch average burnup up to 33,000 MWd/MTU.

The approval of 33,000 MWd/MTU burnup will allow the licensee to order fuel as requested in May 1981 for a planned discharge burnup of approximately 36,000 MWd/MTU in 1985. However, as stipulated in a similar case for the licensee's Surry Power Station, Units 1 & 2, we will require a safety analysis to explicitly address burnup as an operating parameter whenever planned operations would exceed the maximum batch average discharge value of 33,000 MWd/MTU. Therefore, the licensee should submit a safety analysis prior to the cycle of operation that would exceed the currently approved 33,000 MWd/MTU. If, as presently anticipated, the fuel vendors (including Westinghouse) submit generic safety analyses for our review, and subsequent approval is granted, then the licensee need only cite the approved analysis prior to the next projected burnup extension, and no further analyses will then be required by the licensee.

The licensee has requested that the NA-1&2 Technical Specifications be amended to allow reactor operations at an enrichment of 3.7 percent U-235. This is approximately a 6 percent increase over the present Technical Specification value of 3.5 percent. The reason for granting an increase to 3.7 percent from 3.5 percent is that the licensee will be procuring fuel at a 3.6 percent enrichment and fuel procured has a tolerance on enrichment which could slightly exceed 3.6 percent.

2. Effective Multiplication Factor (Storage Racks)

Changes in the effective multiplication factor for storage racks having an enrichment up to 4.1 weight percent U-235 have been calculated by the same methods previously used to obtain the former enrichment limit of 3.5 weight percent U-235. Scoping calculations and sensitivity studies were performed with the PDQ-7 code with neutron cross-sections prepared by the NUMICE code (a version of the LEOPARD code). The case for 4.1 weight percent U-235 and for nominal dimensions of the storage racks is verified by calculations with the KENO-IV Monte-Carlo code with cross-sections prepared by the AMPX codes. Both of these code combinations are widely used and we find them acceptable. The AMPX-KENO set has been verified by the licensee's consultant (NUS Corporation), and has been shown to be conservative for designs similar to NA.

For the base case, the calculated value of the effective multiplication factor is 0.916. To this number is added a value of 0.004 to account fo the slightly higher reactivity of the Westinghouse 15X15 and the Babcock and Wilcox 15X15 and 17X17 assemblies which might be stored in the pool. Sensitivity studies were performed to account for the uncertainties in fuel enrichment, center to center spacing, can wall thickness, can distortion, stainless steel composition and eccentric fuel loading. Calculational uncertainties for the 95 percent probability level and the effect of a pool water temperature increase to 212 degrees Fahrenheit were then obtained.

When the mechanical calculational uncertainties are combined statistically and added to the allowances for more reactive fuel and high pool water temperature, a total uncertainty of 0.027 is obtained. The final value for the effective multiplication factor with all uncertainties added is 0.943. This value meets our acceptance criteria of less than or equal to 0.95 for the effective multiplication factor and is acceptable.

3. Radiological Consequences of Accidents:

We have evaluated the radiological consequences of accidents at NA-1&2 based on raising the allowable enrichment of the fuel to 4.1 weight percent U-235. In the absence of information justifying higher burnups at this time, the safety of the proposed change has been evaluated for the new fuel up to 33,000 MWd/MTU.

Certain accidents, such as the steam line break, waste gas tank failure, and volume control tank failure would be unchanged from present evaluations since no changes are being made in the allowable activity of the primary coolant or in the content of the waste gas tank.

The loss-of-coolant accident (LOCA) presumes failure of all fuel rods in the core with the release of all the noble gases and 25 percent of the radioiodines. A change in enrichment should have, at worst, a minor effect on the core content of these nuclides and result in no worse radiological consequences than already evaluated for NA-1&2.

The steam generator tube rupture and fuel handling accidents are assumed to cause some failure of fuel. Again, the increase in enrichment will not cause a major change in the calculated core content of important radionuclides. If more rods were predicted to fail than previously assumed, the cycle-by-cycle reload analyses would include revised radiological consequences.

We conclude therefore, that a change in the fuel enrichment values, as reflected in the Technical Specifications, from the present value of 3.5 percent to 4.1 percent would not substantially change the consequences of accidents, provided the fuel burnup does not exceed the 33,000 MWD/MTU value.

Evaluation:

We have reviewed the safety aspects including accident analysis for operating the NA-1&2 reactors at an enrichment of 3.7 weight percent U-235. This is an increase from the present Technical Specification value of 3.5 percent. This change is less than 6 percent and any consequences of this change on accidents is insignificant. Also, the enrichment change is of small magnitude, and we have not approved operation of the reactors to burnups above those presently approved. Therefore, we find this change to be acceptable.

Environmental Consideration

We have determined that the amendments do not authorize a change in effluent types or total amounts nor an increase in power level and will not result in any significant environmental impact. Having made this determination, we have further concluded that the amendments involve an action which is insignificant from the standpoint of environmental impact and, pursuant to 10 CFR §51.5(d)(4), that an environmental impact statement or negative declaration and environmental impact appraisal need not be prepared in connection with the issuance of these amendments.

Conclusion

We have concluded, based on the considerations discussed above, that: (1) because the amendments do not involve a significant increase in the probability or consequences of accidents previously considered and do not involve a significant decrease in a safety margin, the amendments do not involve a significant hazards consideration, (2) there is reasonable assurance that the health and safety of the public will not be endangered by operation in the proposed manner, and (3) such activities will be conducted in compliance with the Commission's regulations and the issuance of these amendments will not be inimical to the common defense and security or to the health and safety of the public.

Date: April 29, 1981