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

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

SUPPORTING AMENDMENT NO. 66 TO LICENSE NO. DPR-36

MAINE YANKEE ATOMIC POWER COMPANY

MAINE YANKEE ATOMIC POWER STATION

DOCKET NO. 50-309

1.0 Introduction

By letter dated September 29, 1982 (Reference 1), the licensee proposed revision to the Maine Yankee (MY) Technical Specifications (TS) on the maximum level of nominal enrichment of the uranium fuel allowed in the reactor. This revision reflected proposed changes in the MY cycle 7 Core Performance Analysis (Reference 2, YAEC-1324) submitted by letter dated September 17, 1982.

Historically, Maine Yankee has utilized fuel enriched to about 3% maximum. The first MY core used a maximum enrichment of 2.95 weight percent U-235. In cycle 2 this was lowered to 2.90 weight percent, but raised again to 3.03 weight percent in cycle 3. In subsequent cycles (4, 5 and 6), this remained the maximum enrichment.

In cycle 7, the licensee proposes to increase the maximum enrichment in new fuel to 3.30 weight percent U-235. The cycle 7 core is expected to attain a cycle average full power lifetime of 12,000 MWD/MT. This is higher than achieved in previous cores.

2.0 Evaluation

This safety evaluation is based on two considerations. The first is the operational safety of the reactor itself in utilizing this higher level of fuel enrichment. The second consideration is the safe storage of this fuel (either new or irradiated form) when it is placed in new fuel storage racks or in the fuel storage pool.

2.1 Reactor Safety

A review of the Reference Safety Analysis for the operation of Maine Yankee during cycle 7 is contained in Reference 2.

Each transient and accident considered in earlier safety analyses is reviewed and/or re-evaluated for cycle 7. The incidents considered are categorized as follows:

1) Anticipated Operational Occurrences (AOO) for which the Reactor Protection System (RPS) assures that no violation of Specified Acceptable Fuel Design Limits (SAFDL) will occur.

2) Anticipated Operational Occurrences (AOO) for which an initial steady-state overpower margin must be maintained in order to assure acceptable results.

3) Postulated Accidents.

In most cases the parameters considered in these earlier analyses bound the cycle 7 values. For those transients where the parameters for cycle 7 are outside the bounds considered in previous safety analyses, a new analysis is provided. These are:

1) Boron Dilution
2) CEA Ejection
3) CEA Withdrawal
4) CEA Drop
5) Seized RCP Rotor

A summary of results for cycle 7 is presented in Reference 2.

The results of analyses presented in Reference 2 demonstrate that design criteria as specified in the FSAR and the NRC ECCS Acceptance Criteria will be met for operation of Maine Yankee during cycle 7. The summary of the results of each incident analyzed (including the Reference cycle result and the appropriate design limit) illustrates that Specified Acceptable Fuel Design Limits (SAFDL) on DNB and fuel centerline melt, the primary coolant system ASME code pressure limit, and the 10 CFR 100 site boundary dose limits are not violated for any of the incidents considered.

The maximum computed peak clad temperature following a LOCA for operation within the limits specified is 2149°F and is below the 2200°F limit given in 10 CFR 50.46. Maximum calculated cladding oxidation and hydrogen generation are 5.52% and less than 1%, respectively.

Startup Verification

The licensee will conduct a startup test program which includes low power physics and power escalation tests for the purpose of:

1) Verifying that the core is correctly loaded and there are no anomalies present which could cause problems later in the cycle;

2) Verifying that the calculated model used will correctly predict core behavior during the cycle.

We have evaluated the licensee's methods in References 1 and 2. In all cases the licensee has used referenced methods previously approved by the NRC. These methods confirm the safe operation of Maine Yankee with the new core design using fuel enriched to 3.30 weight percent U-235. We therefore find the licensee's analysis and results acceptable in allowing use of fuel of 3.30 weight percent U-235 in the reactor.

2.2 Fuel Storage Safety

Reviews of fuel storage safety at Maine Yankee are contained in References 3, 4 and 5. These references examine the possibility of a criticality accident in the fuel storage pool as well as the dry (new fuel) storage racks. In Reference 3, results are presented for k_{eff} of the fuel storage pool racks as a function of fuel enrichment. K_{eff} is found to increase only by 0.02 as fuel enrichment is increased from 3.0 to 3.5 weight percent U-235. In the original safety analysis for the current fuel pool racks (Reference 4), k_{eff} was found to be approximately 0.773 for a fuel enrichment of 3.2 percent, well below the current requirement for $k_{eff} = 0.90$. Thus, even at 3.30 weight percent enrichment, k_{eff} should be at an acceptable level.

New fuel is stored dry in racks that have a center-to-center spacing of 20 inches (Reference 5). This dimension was chosen because it provides a considerable margin of subcriticality even if the new fuel storage area were filled with demineralized water.

We have previously evaluated the licensee's methods in References 3, 4 and 5 and found them acceptable. We therefore find the licensee's analysis for storage of 3.30 weight percent U-235 fuel acceptable.

3.0 Technical Specification Changes

The Maine Yankee TS define those design criteria essential in providing safe system operation. Section 1.3 A of the TS contains specifications on including maximum nominal fuel enrichment. Maine Yankee has proposed that this specification be changed to 3.30 weight percent U-235, consistent with the proposed reload program. We have reviewed this change in TS in terms of the safety issues discussed in Section 2.0. Based on this review, we find this change to the Maine Yankee TS acceptable.

4.0 Conclusion

Based on our evaluations and conclusions in Sections 2.0 and 3.0 of this safety evaluation we find the proposed use of 3.30 weight percent U-235 fuel enrichment at Maine Yankee acceptable.

Environmental Consideration

We have determined that the amendment does 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 amendment involves 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 this amendment.

Conclusion

We have concluded, based on the considerations discussed above, that: (1) because the amendment does not involve a significant increase in the probability or consequences of an accident previously evaluated, does not create the possibility of an accident of a type different from any evaluated previously, and does not involve a significant reduction in a margin of safety, the amendment does 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 this amendment will not be inimical to the common defense and security or to the health and safety of the public.

Date: October 29, 1982

Principal Contributors:

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References

1. Letter from Maine Yankee Atomic Power Company to US NRC dated September 29, 1982 (MN 82-189).

2. "Maine Yankee Cycle 7 Core Perfomance Analysis" September 1982 YAEC-1324.

3. Letter from Maine Yankee Atomic Power Company to US NRC dated October 5, 1981, FMY-81-151.

4. Safety Evaluation Supporting Amendment No. 11 to Facility Operating License No. DPR-36 dated October 31, 1975.

5. "Maine Yankee Atomic Power Station Final Safety Analysis Report".