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

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

SUPPORTING AMENDMENT NO. 60 TO PROVISIONAL OPERATING LICENSE NO. DPR-18

ROCHESTER GAS AND ELECTRIC CORPORATION

R. E. GINNA NUCLEAR POWER PLANT

DOCKET NO. 50-244

## 1.0 INTRODUCTION AND BACKGROUND

By letter dated February 23, 1983, Rochester Gas and Electric Corporation (the licensee) requested an amendment to the Appendix A Technical Specifications appended to Provisional Operating License No. DPR-18 for the R.E. Ginna Nuclear Power Plant. The amendment would permit the storage of spent fuel with an unirradiated fuel assembly enrichment of 4.25 weight percent U-235. By letter dated September 12, 1983, the licensee provided additional information to support the amendment request.

A Notice of Consideration of Issuance of Amendment and Proposed No Significant Hazards Consideration Determination and Opportunity for Hearing related to the requested action was published in the Federal Register on October 26, 1983 (48 FR 49595). No requests for hearing and no public comments were received.

## 2.0 DISCUSSION AND EVALUATION

### 2.1 Analysis Methods

The criticality aspects of the storage of Westinghouse fuel assemblies incorporating axial natural uranium blankets in the spent fuel storage pool have been analyzed using the PDQ-7 computer code for reactivity determination with four energy group neutron cross sections generated by the LEOPARD code, as modified by Pickard, Lowe and Garrick, Incorporated (PLG). These codes have been benchmarked against both Westinghouse and Battelle Pacific Northwest Laboratories critical experiments with pellet diameters, water-to-fuel ratios and U-235 enrichments similar to the Ginna design. This benchmarking led to the conclusion that the calculational model is capable of determining the multiplication factor ($k_{eff}$) of the Ginna spent fuel racks with a combined LEOPARD/PDQ-7 model bias of .0071 $\Delta k$ and a .0024 $\Delta k$ uncertainty corresponding to a 95 percent probability at a 95 percent confidence level.

### 2.2 Spent Fuel Rack Analysis

The criticality of fuel assemblies in the spent fuel storage rack is prevented by maintaining a checkerboard configuration with a minimum separation of 16.86 inches between assemblies. Although spent fuel is normally stored in borated pool water containing approximately 2000 ppm boron, the NRC acceptance criterion for spent fuel storage is that there is a 95 percent probability at a 95 percent confidence level (including uncertainties) that $k_{eff}$ of the fuel assembly array will be less than 0.95 when fully flooded with unborated water. The fuel assemblies are assumed to be unirradiated with a U-235 enrichment of 4.25 weight percent.

Although the basic cell calculation is performed for unborated water at a uniform pool temperature of 68°F, the reactivity effect on an increase in water temperature to 200°F is included as an additional bias. Other calculational biases included are the effects of calculational mesh size variations and axial neutron leakage. In addition, uncertainties due to mechanical and fuel fabrication tolerances are included as perturbations on the calculated basic cell reactivity. The total reactivity effect on these biases and uncertainties assure that the maximum multiplication factor ($k_{eff}$) of the spent fuel racks (moderated by unborated water) will be no greater than 0.9463 with a 95 percent probability at the 95 percent confidence level (95/95).

## 2.3 New Fuel Rack Analysis

The Ginna new fuel storage racks accommodate 44 fuel assemblies in 4 rows of 11 assemblies. Although new fuel assemblies are stored in a dry condition, the condition of optimum moderation is considered in the analysis in accordance with the NRC acceptance criterion for new fuel storage. The NRC acceptance criterion for new fuel storage is that the spacing between fuel assemblies is sufficient to maintain the $k_{eff}$ less than 0.95 when fully loaded and flooded with unborated water. Furthermore, the $k_{eff}$ will not exceed 0.98 with fuel of the highest anticipated reactivity in place assuming optimum moderation. The fuel assemblies are assumed to be unirradiated with a uniform axial enrichment distribution of 4.25 weight percent U-235 in each fuel rod.

The neutron multiplication factor of the new fuel storage racks in a fully flooded condition with a water density of 1.0 gm/cc is calculated to be less than 0.88. Analyses of the optimum moderation condition is calculated by assuming the entire rack is surrounded by full density water and varying the water density inside the rack area. An optimum moderation condition is approached at water densities below 0.1 gm/cc. However, when neutron leakage effects are considered, the maximum neutron multiplication factor at low densities is found to be about 0.70 at a water density of about 0.075 gm/cc. Therefore, the analysis shows that the NRC acceptance criterion for new fuel storage is met.

## 2.4 Accident Conditions

Postulated events such as the inadvertent placement of an assembly in a non-fuel storage location is considered to be an abnormal condition and appropriate credit is taken for the soluble boron that is present in the pool water which is more than sufficient to compensate for the positive reactivity of the extra fuel assembly. In its assessments, the staff does not consider it necessary to assume two unlikely independent, concurrent events to ensure protection against a criticality accident.

## 3.0 SUMMARY

Based on the above, the staff concludes that the storage racks meet the requirements of General Design Criterion 62 as regards criticality. Also, the staff concludes that any number of Westinghouse 14X14 fuel assemblies of maximum enrichment no greater than 4.25 weight percent U-235 may be stored in the new and spent fuel racks of Ginna. These conclusions are based on the following considerations:

1. Calculational methods which have been verified by comparison with experiment have been used.

2. Conservative assumptions have been made about the enrichment of the fuel to be stored and the pool conditions.

3. Credible accidents have been considered.

4. Suitable uncertainties have been considered in arriving at the final value of the multiplication factor.

5. The final effect multiplication factor value meets our acceptance criterion.

The staff also finds that the proposed changes adequately account for the reload fuel enrichment increase and are, therefore, acceptable.

## 4.0 ENVIRONMENTAL CONSIDERATION

The staff has determined that the amendment does not authorize a change in effluent types or total amount nor an increase in power level and will not result in any significant environmental impact. Having made this determination, the staff has 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.

## 5.0 CONCLUSION

The staff has further 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.

## 6.0 ACKNOWLEDGEMENT

L. Kopp prepared this evaluation.

Dated: February 8, 1984