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

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELATED TO AMENDMENT NO. 45 TO FACILITY OPERATING LICENSE NO. NPF-1

PORTLAND GENERAL ELECTRIC COMPANY

THE CITY OF EUGENE, OREGON

PACIFIC POWER AND LIGHT COMPANY

TROJAN NUCLEAR PLANT

DOCKET NO. 50-344

1.0 Background

By application dated May 12, 1980 (Ref. 1), Portland General Electric Company (the licensee) proposed to amend Operating License NPF-1 to permit installation of two assemblies with a maximum of three rods per assembly with dummy (solid) stainless steel (SS) rods. Specifically, it was requested that the requirements of Technical Specification 5.3.1, that each fuel assembly in the core should contain 264 Zircaloy-4 clad fuel rods, be waived to permit replacement with the dummy SS rods in two locations which have been subject to cross flow (baffle jetting).

The reason for the proposed change was that the fuel inspection performed during refueling after cycle 2 operation revealed that significant degradation of one fuel rod in two separate fuel assemblies had occurred. One fuel assembly was located on the outside of the core adjacent to a baffle corner during the second cycle of operation. The other fuel assembly had been located on the outside of the core adjacent to a baffle corner during the first cycle and had then been moved to an inside position during the second cycle. The method of failure was identified as fuel rod vibration caused by impingement of cross flow through the baffle joint at the corner. A description of the incident is provided in Licensee Event Report (LER) 80-06 (Ref. 2).

2.0 Evaluation

A review was conducted based on (a) fuels (materials) and (b) physics (neutronic) considerations. Materials considerations included the likelihood of further damage to modified peripheral assemblies, and potential effects on fuel assembly structural integrity. Physics concerns mainly involved the potential effects on power distribution, and surveillance requirements.

2.1 Materials Considerations

With regard to the likelihood of further damage to the modified peripheral assemblies, PGE cited (Ref. 1) Westinghouse analyses that indicated that potential damage is restricted to the three fuel pins adjacent to the gap between baffle plates. The W analytical models are substantiated by the fact that no instances have been observed to date damage to fuel rods other than those adjacent to the gap, for a baffle of the Trojan configuration. Thus, replacing the most susceptible fuel rod (the one most nearly aligned with the baffle plate gap) with a dummy rod should reduce the likelihood of further baffle-jetting-induced damage at that rod location during cycle 3, while replacement of the two adjacent rods would provide additional assurance that the central rod will not impinge on fuel rods during any jetting-induced vibratory motion. Moreover, the increased stiffness of the stainless steel dummy rods compared with normal fuel rods

should tend to reduce the amplitude of the baffle jetting-induced vibration, thereby reducing the likelihood of propagation of damage to adjacent rods. The above factors thus provide support for the licensee's belief that the stainless steel rods will provide a satisfactory temporary corrective solution to the baffle jetting problem.

With regard to the effect of the stainless steel dummy rods on fuel assembly structural response, it was noted by the licensee that the structural response is dominated by the skeleton design of the assembly, that is, the axial loads are taken up primarily by the guide thimbles rather than the fuel rods. Therefore, there is substantial reason to believe that the overall effect of replacing three of the 264 fuel rods with dummy stainless steel rods on the capability of the assembly to withstand normal operating seismic or refueling loads should be negligible.

Notwithstanding the apparent reasonableness of the above arguments concerning the material performance aspects of the dummy stainless steel rods, we believe that further surveillance is required, both to confirm the adequacy of the temporary fix as well as to assure that further baffle jetting failures have not occurred at the other ten "inside corner" baffle locations. Potential surveillance requirements were discussed with PGE representatives (Ref. 3). At that time the PGE representatives asserted that the reactor coolant

radiochemistry could be used to ascertain the status of the core (with regard to number and general location of fuel failures) and that further surveillance was, therefore, unnecessary. Further information concerning the radiochemistry aspects of baffle jetting was subsequently submitted by Westinghouse (Ref. 4). While we believe that radiochemistry monitoring and analysis holds considerable promise as an alternative or an adjunct to physical surveillance of the fuel, that approach is sufficiently novel to require more extensive review than could be carried out on a schedule consistent with the cycle 3 reload. Therefore, we will require the licensee to perform a visual examination of the 12 fuel assemblies located near "inside" baffle corners (10 standard assemblies plus 2 modified assemblies) to assure that further unanticipated baffle jetting wear has not occurred. As a general rule, however, we would be receptive to the use of radiochemistry approaches to fuel performance monitoring, and we would be willing to review future submittals in this area (e.g., cycle 4 reload).

2.2 Physics - Neutronics Considerations

As acknowledged by the licensee (Ref. 1), replacing an active fuel rod with a dummy rod has the effect of causing a small local flux increase with a redistribution of power to the adjacent fuel pins. Because only two assemblies will be modified, the change is asymmetric and will introduce a flux tilt into the core. However,

Since the assemblies are on the periphery of the core and are in low power regions, the effects of the asymmetry on power distribution are expected to be very small; viz., about 0.2% quadrant tilt throughout the cycle. Moreover, since measured power distributions will be compared with predicted power distributions every month, these comparisons will be a good indicator of whether the core is operating as desired.

The licensee is required to submit a report of the physics startup tests to the NRC within 90 days of completion of the tests. The report will include measured vs. predicted power distributions at low power and at full power, as well as temperature coefficient, rod worth, and boron endpoint comparisons.

3.0 Summary

In summation, based on our review of the predicted effects of the proposed change, the physics startup test report commitment, and the required fuel surveillance, we find the change acceptable for cycle 3 operation. The acceptance is limited to the placement of the modified assemblies in the two peripheral core locations B12 and M2. If the licensee desires either to relocate these two assemblies or to increase the number of modified assemblies in future reloads, further application and review will be required.

4.0 Environmental Conclusion

We have determined that the proposed license 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.

5.0 Conclusion

We have concluded, based on the considerations discussed above, that: (1) because the proposed license amendment does not involve a significant increase in the probability or consequences of accidents previously considered and does not involve a significant decrease in a safety margin, 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.

6.0 References

1. C. Goodwin, Jr. (PGE), Letter to Robert A. Clark (NRC), Transmitting License Change Application 61, May 12, 1980.

2. License Event Report 80-006/01T-0, April 25, 1980.

3. M. Tokar and C. Trammell (NRC), Telecommunication with G. Baer (PGE), May 30, 1980.

4. George Rymer (W), Telecon-BR-DFOS to M. Tokar (NRC), June 10, 1980.