SAFETY EVALUATION OF SHOULDER GAP CLEARANCE

SAN ONOFRE UNITS 2 AND 3

SOUTHERN CALIFORNIA EDISON COMPANY

DOCKET NOS.: 50-361 AND 50-362

1.0 INTRODUCTION

The distance between the top of the fuel rods and the bottom of the upper end fitting in a typical Combustion Engineering (CE) fuel element assembly is commonly called the shoulder gap. During irradiation, fuel rods and fuel assembly guide tubes undergo axial growth at different rates resulting in variations in shoulder gap and possible fuel rod distortion. Therefore, prior to entering the startup mode after each refueling, Southern California Edison (SCE) has committed to either providing a report that demonstrates that the existing fuel element assembly has sufficient available shoulder gap clearance for at least the next cycle of operation, or implementing a modified fuel element assembly design that has adequate shoulder gap clearance for at least the next cycle of operation.

By letter dated May 23, 1986, from M. O. Medford (SCE) to G. W. Knighton (NRC), SCE submitted report CEN-332(S)-P, "SONGS-2 End-of-Cycle 2 Shoulder Gap Evaluation," dated May 1986, which summarizes these end-of-cycle 2 (EOC 2) measurements and inspections and describes the shoulder gap analyses performed to justify the third cycle operation of the SONGS 2 Batch C fuel assemblies and the third and fourth cycle operation of the Batch D fuel assemblies.

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2.0 EVALUATION

The EOC 2 fuel inspection provided shoulder gap measurements and guide tube measurements on two Batch B and 13 Batch C fuel assemblies. All of these assemblies had been similarly inspected after Cycle 1 so that results from two cycles of irradiation were available. Rod-by-rod values of measured shoulder gap changes were compared to predictions obtained with the SIGREEP analytical model. The results show that the SIGREEP predictions bound most of the measured shoulder gap changes after one cycle of operation (892 out of 900) and bound all of the measured changes after two cycles of operation. The Cycle 2 shoulder gap data also shows a significant increase in the margin to the SIGREEP predictions compared to the lesser irradiated Cycle 1 data. Therefore, the staff concludes that the SIGREEP model can be used to conservatively predict shoulder gap changes in Cycle 3 for the SONGS 2 Batch C fuel.

Based on the SIGREEP model, the limiting fuel rod in Batch C was predicted to have greater than a 95% probability of shoulder gap clearance at the EOC 3. Based on the exhibited conservatism of the predictive model for Cycles 1 and 2, the staff concludes that the Batch C fuel assemblies loaded in SONGS 2 satisfy the shoulder gap criterion for Cycle 3 without requiring a modified fuel assembly design.

The Batch C fuel assemblies have the smallest initial shoulder gap and the highest exposure about 44,000 MWD/MTU through Cycle 3. The Batch D fuel

through Cycle 4 will have a peak three cycle rod burnup of about 38,000 MWD/MTU. Therefore, based on the acceptable evaluation of the Batch C fuel, the lower peak rod burnup in Batch D fuel and the 50% longer initial shoulder gaps in Batch D fuel, the staff concludes that the Batch D fuel assemblies are acceptable for operation through Cycle 4 with regard to shoulder gap clearance.

Also, since the SONGS 3 Batch C and D fuel management scheme, design, thermal charactistics, initial dimensions and manufacturing processes are identical to those of SONGS 2, the staff considers this report to be applicable to Cycles 3 and 4 operation of Unit 3.

3.0 CONCLUSION

The staff concludes that the information provided in CEN-332(S)-P demonstrates that the existing Batch C and D fuel element assemblies in SONGS 2 for Cycle 3 operation are acceptable with respect to shoulder gap clearance and satisfies the Unit 2 license commitment. In addition, because of the less limiting Batch D fuel rod, Batch D fuel assemblies are acceptable for operation through Cycle 4 with regard to shoulder gap clearance. These results also are applicable to Cycles 3 and 4 operation of Unit 3 and the report (CEN-332(S)-P), therefore, satisfies the Unit 3 license condition on demonstrating shoulder gap adequacy.

ENCLOSURE 2

SALP INPUT

FACILITY: SONGS 2 and 3
EVALUATION: FUEL SHOULDER GAP CLEARANCE

1. Management Involvement and Control in Assuring Quality.

   The submittal showed evidence of prior planning and adequately stated and understood policies.

   Rating: Category 1

2. Approach to Resolution of Technical Issues from a Safety Standpoint.

   A clear understanding of the issues was demonstrated with technically sound and thorough approaches.

   Rating: Category 1

3. Responsive to NRC Initiatives.

   N/A

4. Enforcement History

   N/A

5. Reporting and Analysis of Reportable Events

   N/A

6. Staffing (Including Management)

   N/A

7. Training and Qualification Effectiveness

   N/A

8. Overall Rating

   Rating: Category 1