Nuclear Operating Company
South Texas Project Electric Generating Station P.O. Box 289 Wadsworth, Texas 77483

August 23, 2004
NOC-AE-04001779
FILE NO.: G25
10CFR50.12

U. S. Nuclear Regulatory Commission
Attention: Document Control Desk
One White Flint North
11555 Rockville Pike
Rockville, MD 20852

South Texas Project
Unit 1
Docket No. STN 50-498
Response to Request for Additional Information
Request for Exemption for Cladding Material
Specified In 10CFR50.44, 10CFR50.46 and 10CFR50 Appendix K

Reference: Request for Exemption for Cladding Material Specified in 10CFR50.44, 10CFR50.46 and 10CFR50 Appendix K, T. J. Jordan to NRC Document Control Desk, dated May 27, 2004 (NOC-AE-04001731)

Pursuant to 10CFR50.12, the South Texas Project requested Nuclear Regulatory Commission approval of an exemption to allow use of a different fuel cladding material as an alternative to that specified in the Code of Federal Regulations. The regulations as written presume Zircaloy or ZIRLO™ is used as fuel rod cladding material. The South Texas Project intends to use up to eight lead test assemblies containing fuel rods with Optimized ZIRLO™ cladding in Unit 1 beginning in Cycle 13. The attachment to this letter supplements the referenced request with responses to questions prepared by NRC reviewers.

Commitments are listed in the attachment.

If there are any questions, please contact either Philip L. Walker at 361-972-8392 or me at 361-972-7902.

T. J. Jordan
Vice President,
Engineering & Technical Services

PLW

Attachment: Request for Exemption for Cladding Material Specified in 10CFR50.44, 10CFR 50.46 and 10CFR Part 50 Appendix K - Response To Request For Additional Information

A001

STI: 31782200

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SOUTH TEXAS PROJECT

UNIT 1

REQUEST FOR EXEMPTION FOR CLADDING MATERIAL
SPECIFIED IN 10CFR50.44, CFR 50.46 AND 10 CFR PART 50 APPENDIX K

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

By letter dated May 27, 2004, the South Texas Project requested an exemption from the requirements of 10CFR50.46, and 10 CFR Part 50 Appendix K. This exemption will allow up to eight lead test assemblies (LTAs) fabricated with Optimized ZIRLO™, a version of ZIRLO™ with a reduced tin content, to be used in Unit 1. The Nuclear Regulatory Commission (NRC) staff, having reviewed the information provided by the South Texas Project, has requested the following additional information in order to complete their evaluation:

1. Describe the fuel management guidelines and supporting safety analyses used to ensure that the LTAs are not placed in limiting core locations.

   Response:

   Non-limiting core regions are where LTAs can operate with greater margin to thermal limits than does the lead non-LTA assembly under normal operating conditions. The South Texas Project Unit 1 Cycle 13 fuel loading pattern has been developed to place the eight lead test assemblies in core feed locations where the peaking factors are projected to be below those of the limiting assembly in the core. With the operating margin, the lead test assemblies will not be limiting from a LOCA peaking factor limit or DNB design criteria under normal operating conditions.

2. The exemption request does not specify fuel duty targets for the eight LTAs.

   a) Please provide fuel duty targets for the eight LTAs, including projected burnup for each reload cycle.

   b) Is the projected burnup expected to exceed the current licensed limit for ZIRLO™?

   c) Is the projected fuel duty expected to exceed limits of less than 100 microns of predicted oxidation with no blistering or spallation?

   Response:

   a) The South Texas Project Unit 1 lead test assembly program is not designed to achieve a specific fuel duty target.

      The currently projected lead rod burnup for these assemblies at the end of the first cycle is < 29,000 MWD/MTU, based on a Cycle 12 shutdown burnup of 21,000 MWD/MTU (nominal) and a Cycle 13 shutdown burnup of 20,700 MWD/MTU (inclusive of coastdown). Loading plans beyond the first cycle of LTA operation have not been finalized.

      The LTA peaking factors will be below those of the limiting fuel assembly. Consequently, the fuel duty index for the LTAs will be well within the values experienced over the plant operating history.

b) The projected burnup does not exceed the current licensed limit for ZIRLO™. The LTAs have not yet been considered for a high burnup program.

c) The 100-micron best estimate oxidation value is an internal Westinghouse limit that will not be exceeded with the projected South Texas Project fuel duty values. By maintaining best estimate oxidation <100 microns, no blistering or spallation is expected.

3. The exemption request does not specify post-irradiation examinations for the eight LTAs. Please provide the details of the examinations (e.g., visual, fuel assembly length, assembly bow, cladding oxidation, etc.) planned for the LTAs.

Response:

The South Texas Project Optimized ZIRLO™ irradiation program is one of several irradiation programs involving Optimized ZIRLO™. Each of these irradiation programs involves post-irradiation examinations. The detailed examination for each program is determined based on the fuel duty, cycle performance, need for specific information, and time available on site during refueling outages. The actual post-irradiation examination plan for the South Texas Project Optimized ZIRLO™ LTAs will be defined at a later date.

The following are typical LTA post-irradiation examinations:

- **Fuel Assembly Integrity:** All four faces of the LTAs are visually examined to confirm the mechanical integrity of the assembly.
- **Fuel Rod Removal:** The removed rods are examined/ inspected in rack-level equipment and subjected to fuel rod visual examination, rod profilometry, and rod oxide thickness measurement.
- **Cell Size:** This examination determines the grid cell size of each grid in the assembly.
- **Fuel Rod Integrity:** Mechanical integrity of the fuel rod is confirmed by visual examination.
- **Rod Profilometry:** This examination determines rod diameter change due to cladding creep. The data is used to evaluate the rod retention force.
- **Assembly Length:** This examination provides assembly growth data.
- **Fuel Rod Wear:** Fuel rod wear is quantified to determine the loss of cross-sectional area at each wear site over the length of the rod.
- **Assembly Bow:** This examination determines change in assembly straightness.
- **Rod-to-Nozzle Gap:** This examination provides rod growth data.

- **Grid Width:** Measurement of the distance between the two spring slots on the outer strap on selected grids is used to determine the grid width change from the non-irradiated nominal dimension.
- **Fuel Rod Wear:** Fuel rod wear is quantified to determine the loss of cross-sectional area at each wear site over the length of the rod.
- **Grid Oxide Thickness:** Oxide thickness is measured on the outer grid straps of one face from each of the selected grids in a manner similar to that used for fuel rod oxide measurements.
- **Rod Cluster Control Assembly Drag:** This test determines the extent of thimble tube straightness.
- **Fuel Rod Oxide Thickness:** Oxide thickness is measured on the outer grid straps of one face from each of the selected grids in a manner similar to that used for fuel rod oxide measures.

4. How will South Texas ensure that fuel performance models and fuel duty predictions remain conservative for this developmental cladding material, especially in subsequent cycles?

Response:

The change in the specification of the ZIRLO™ content is expected to enhance the cladding performance. The expected performance of the Optimized ZIRLO™ for material properties, corrosion, and thermal creep is described in the original exemption request. No credit for improved performance will be assumed in fuel performance evaluations of the lead test assemblies. The Byron Station lead test assembly program has confirmed the expected performance of "low tin" ZIRLO™ and the acceptability of the Westinghouse fuel performance models. In addition, end-of-cycle post-irradiation examinations will be used to validate the acceptability of the fuel performance models. Post-irradiation examination measurements will be compared to the model predictions. Significant deviations from these predictions will be addressed and reconciled in the fuel performance models.

COMMITMENTS

- No credit for improved performance will be assumed in fuel performance evaluations of the lead test assemblies.
- End-of-cycle post-irradiation examinations will be used to validate the acceptability of the fuel performance models.
- Post-irradiation examination measurements will be compared to the model predictions.
- Significant deviations from these predictions will be addressed and reconciled in the fuel performance models.