Tennessee Valley Authority, Post Office Box 2000, Soddy-Daisy, Tennessee 37379

March 4, 1994

U.S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, D.C. 20555

Gentlemen:

In the Matter of	)	Docket Nos. 50-327
Tennessee Valley Authority	)	50-328

SEQUOYAH NUCLEAR PLANT (SQN) - UNITS 1 AND 2 - "EVALUATION OF INCREASED FUEL BURNUP ON EQUIPMENT QUALIFICATION"

Reference: NRC letter to TVA dated November 30, 1993

Based upon NRC's review of SQN's justification for continued operation (JCO) listed in the above reference, SQN was requested to perform a reassessment of equipment qualification for 1,000 effective full power days (EFPD) burnup. The purpose of this letter is to provide the revised JCO as requested in the above reference. SQN has reanalyzed the loss-of-coolant-accident analysis to evaluate radiation doses associated with 4.5 percent Uranium (U)235 enrichment nuclear fuel with a reactor core burnup at 1,000 EFPD. The reanalysis is based upon the source terms provided in Technical Information Document 14844 and Regulatory Guide 1.89. Following this analysis, a review of the 10 CFR 50.49 binders was performed. The qualification doses documented in each of the equipment qualification binders were compared to that calculated for 1,000 EFPD. Based upon this comparison, SQN's 10 CFR 50.49 equipment and cabling remain qualifiable to the increased radiation dose.

The enclosure contains the revised JCO that bounds reactor core designs with U235 average enrichments less than 4.5 percent. This includes the Unit 2 Cycle 6, Unit 1 Cycle 7, and Unit 2 Cycle 7 fuel cycles. Further analysis is planned to bound higher U235 enrichments (i.e., 5 percent) for a core burnup cycle of 1,000 EFPD.

D030 1/1

Please direct questions concerning this issue to W. C. Ludwig at (615) 843-7460.

Sincerely,

M. Bellay for

K. P. Powers
Acting Site Vice President
Sequoyah Nuclear Plant

Enclosures
cc (Enclosures):

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Enclosure

Sequoyah Nuclear Plant (SQN)

Justification For Continued Operation (JCO)

For Problem Evaluation Report

SQPER900372*

* Pages 6 through 13 contain proprietary information and have been deleted from the attached JCO. The proprietary information provides the core loading plans for SQN Unit 2 Cycle 6, Unit 1 Cycle 7, and Unit 2 Cycle 7 supplied by Westinghouse Electric Corporation.

No. SQPER 900372 Revision 4

PROBLEM EVALUATION REPORT (PER)/ INCIDENT INVESTIGATION (II) FORM CONTINUATION SHEET

PER/II CONTINUATION

Identify the information that is being continued on this sheet (For example: Description of Condition)

NOTE: Entries made on this sheet shall be signed and dated

JCO FOR SQPER 900372

BACKGROUND

CAQR SQP 900372 addresses the condition where TVA increased fuel enrichments and cycle average exposures to values greater than those assumed in SQN's design basis documents. At the time this PER was written, the design basis documents were based on radiation dose associated with a double ended Large Break LOCA having a reactor core burnup not to exceed 650 Effective Full Power Days (EFPD) with fuel not to exceed 4.0% U235 enrichment. Fuel alterations increased the reactor core burnup level to a maximum of 1000 EFPD with U235 enrichments not to exceed 5.0%. These nuclear fuel changes were made to enable SQN to have longer fuel cycles. Extending the reactor core burnup to 1000 EFPD and increasing the U235 enrichment to 5.0% resulted in a higher radiation dose to plant equipment than that previously calculated in SQNs' design basis documents.

TECHNICAL EVALUATION

As discussed above, SQN EQ design basis documents are currently based on 650 EFPD burn up with 4.0% U235 fuel enrichment; Reference NE calculation SQN TIRPS-48 Rev 5 and TECH SPEC change 90-12. As a result of the conditions addressed in SQPER900372, the subject nuclear fuel parameters may reach 843 EFPD with a maximum of 4.2% enrichment of U235 by the end of the U2C6 fuel cycle (L36 931021800). To asses this condition, the post LOCA reactor core inventories from Oak Ridge National Laboratory (ORNL) ORIGEN computer code (25 910809 001) with 1000 EFPD core burn up and 4.5% U235 enrichment was used as input to the computer models used in SQN TIRPS-48. Additional details of the analysis is provided on sheets 4 and 5.

The new radiation values were forwarded to NE-EE environmental qualification section. A review of the 10CFR50.49 binders was performed and it was determined that all of the equipment remained qualifiable to 4.5% U235 enrichment nuclear fuel with a reactor core burn up at 1000 EFPD. See sheet 3.

No. SQPER 900372 Revision 4

PROBLEM EVALUATION REPORT (PER)/ INCIDENT INVESTIGATION (II) FORM CONTINUATION SHEET

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PER/II CONTINUATION

Identify the information that is being continued on this sheet (For example: Description of Condition)

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JCO FOR SQPER 900372 (CONTINUED)

CONCLUSION

This JCO bounds reactor core designs with U235 average enrichments less than 4.5%. This includes the U2C6, U1C7, and U2C7 fuel cycles; see sheets 6 thru 13. NE is currently evaluating the new approved fuel parameters composed of 5.0% U235 enrichment with a core burn up not to exceed 1000 EFPD.

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ASSESSMENT OF 1000 EFPD WITH 4.5% ENRICHMENT

The 1000 EFPD radiation values provided by the attached sheets were reviewed to determine if equipment qualification was impacted. The SQN EQ design is currently based on 650 EFPD. The qualification doses documented in each each of the EQ binders was compared to that shown on the sheets for 1000 EFPD and all of our 10CFR50.49 equipment and cabling remains qualifiable when using these numbers.

Prepared James Tool 2/7/94

Checked Navin Shah 2/8/94

ASSESSMENT OF 1000 EFPD WITH 4.5% U235 ENRICHMENT

SQN EQ design basis evaluations are currently based on 650 EFPD burn up with 4.0% U235 fuel enrichment; Reference NE calculation SQN TIRPS-48 Rev 5 and TECH SPEC change 90-12. As a result of the conditions addressed in SQPER900372, the subject nuclear fuel parameters may reach 843 EFPD with a maximum of 4.2% enrichment of U235 by the end of the U2C6 fuel cycle (L36 931021800). To asses this condition, the post LOCA reactor core inventories from Oak Ridge National Laboratory (ORNL) ORIGEN computer code (25 910809 001) with 1000 EFPD burn up and 4.5% U235 enrichment was used as input to the computer models used in SQN TIRPS-48. The results are provided below in rads and are compared to the current design basis radiation levels. The change in radiation levels are also given in (%).

Room or Area	100 Day Acc. 650 EFPD @ 4.0% U235	100 Day Acc. 1000 EFPD @ 4.5% U235	
Upper Containment			
Gamma	2.79+07	3.07+07	+10%
Beta	3.42+08	3.13+08	-8.5%
Lower Containment			
Gamma	2.43+07	2.73+07	+12%
Beta	3.42+08	3.13+08	-8.5%
Accumulator, Fans, Instrument Rooms			
Gamma	1.35+07	1.07+07	-21%
Beta	3.42+08	3.13+08	-8.5%
Raceway			
Gamma	1.64+07	1.21+07	-26%
Beta	3.42+08	3.13+08	-8.5%
Ice Bed Condenser			
Gamma	1.02+07	1.12+07	+9.8%
Beta	3.42+08	3.13+08	-8.5%
Annulus			
Gamma	8.15+06	*	
Beta	5.40+05	5.04+05	-6.7%

*Gamma doses in the annulus varies as shown below:

00° thru 280° = 6.61+06	281° thru 291° = 6.75+06
**291° thru 318° = 1.06+07	318° thru 328° = 6.75+06
328° thru 360° = 6.61+06	

** Region within the annulus that gamma increased, +30%.

It is noted that beta radiation was reduced inside containment as a result of reducing the post LOCA Cs inventory from 50% to 1%, to be consistent with TID 14844, and the noble gas spectrum change due to the extended burn up.

In the Auxiliary Building, gamma radiation in the air spaces increased 7.4 %. Gamma dose to equipment from ECCS piping located in the pipe chase, CCP, RHRP, SIP rooms and the respective heat exchanger rooms increased 52%.

ASSESSING EQ IMPACT USING 1000 EFPD WITH 4.5% U235 ENRICHED FUEL

On January 4, 1994, NE-NM provided NE-EE an Assessment Of 1000 EFPD With 4.5% U235 Enrichment to determine what impact, if any, continuous operation of the U2C6 fuel cycle will have on the EQ analysis, as a result of the adverse condition addressed in SQPER 900372. Butch Woodley requested additional information that will provide further explanation in performing this task.

INSIDE CONTAINMENT

Data in the Assessment Of 1000 EFPD With 4.5% U235 Enrichment was compared to the current design basis radiation doses (650 EFPD @ 4.0% U235) inside containment. The percent difference in these doses was also provided in the right column. The impact to the EQ analysis can be evaluated by multiplying the radiation values in the EQ Binders (via Location Specific Dose (LSD) Calculations or Radiation QIRs) times the percent delta dose from the upper and lower containment values as needed. For example, if a lower containment LSD Calculation provided a gamma and beta dose values of 8.4E6 rads and 9.7E7 rads respectively, the impact would be evaluated in the following manner since Gamma increased 12% and Beta decreased 8.5%:

New Gamma = 1.12 X 8.4E6 rads = 9.41E6 rads
New Beta = .915 X 9.7E7 rads = 8.88E6 rads

ANNULUS

In the Annulus, gamma and beta radiation are less than the doses inside containment therefore, the equipment in the Annulus that penetrate containment should inherently be qualified. If there exist equipment in the Annulus that does not penetrate containment, use the radiation doses provided for the Annulus as they apply.

AUXILIARY BUILDING

In the Auxiliary Building, gamma radiation in areas with out ECCS piping increased 7.4 %. In areas with ECCS piping (ie...pipe chase, CCP, RHRP, SIP rooms and the respective heat exchanger rooms) gamma radiation increased 52%. The impact to the EQ analysis would be evaluated in the same manner as shown above inside containment.

New Gamma In Spaces Without ECCS Pipimg = 1.074 X LSD calculation
New Gamma In Spaces With ECCS Piping = 1.52 X LSD calculation

If you have any questions with regard to this subject matter, consult NM Radiation Protection.

Calvin W. Burrell Jr.
January 7,1994