ENCLOSURE 1

PROPOSED TECHNICAL SPECIFICATION CHANGE

SEQUOYAH NUCLEAR PLANT UNITS 1 AND 2

DOCKET NOS. 50-327 AND 50-328

(TVA-SQN-TS-93-07)

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3/4.1.1 BORATION CONTROL

3/4.1.1.1 and 3/4.1.1.2 SHUTDOWN MARGIN

A sufficient SHUTDOWN MARGIN ensures that 1) the reactor can be made subcritical from all operating conditions, 2) the reactivity transients associated with postulated accident conditions are controllable within acceptable limits, and 3) the reactor will be maintained sufficiently subcritical to preclude inadvertent criticality in the shutdown condition.

SHUTDOWN MARGIN requirements vary throughout core life as a function of fuel depletion, RCS boron concentration, and RCS T_{avg}. The most restrictive condition occurs at EOL, with T_{avg} at no load operating temperature, and is associated with a postulated steam line break accident and resulting uncontrolled RCS cooldown. In the analysis of this accident, a minimum SHUTDOWN MARGIN of 1.6% delta k/k is required to control the reactivity transient. Accordingly, the SHUTDOWN MARGIN requirement is based upon this limiting condition and is consistent with FSAR accident analysis assumptions. With T_{avg} less than 200°F, the reactivity transients resulting from a postulated steam line break cooldown are minimal and a 1% delta k/k shutdown margin provides adequate protection.

3/4.1.1.3 MODERATOR TEMPERATURE COEFFICIENT (MTC)

~~The limitations on MTC are provided to ensure that the value of this coefficient remains within the limiting conditions assumed for this parameter in the FSAR accident and transient analyses.~~

~~The MTC values of this specification are applicable to a specific set of plant conditions; accordingly, verification of MTC values at conditions other than those explicitly stated will require extrapolation to those conditions in order to permit an accurate comparison.~~

~~The most negative MTC value equivalent to the most positive moderator density coefficient (MDC), was obtained by incrementally correcting the MDC used in the FSAR analyses to nominal operating conditions. These corrections involved subtracting the incremental change in the MDC associated with a core~~

DELETE AND REPLACE WITH INSERT A

~~condition of all rods inserted (most positive MDC) to an all rods withdrawn condition and, a conversion for the rate of change of moderator density with temperature at RATED THERMAL POWER conditions. This value of the MDC was then transformed into the limiting end of cycle life (EOL) MTC value. The 300 ppm surveillance limit MTC value represents a conservative value (with corrections for burnup and soluble boron) at a core condition of 300 ppm equilibrium boron concentration and is obtained by making these corrections to the limiting EOL MTC value.~~ R159 R159

~~The surveillance requirements for measurement of the MTC at the beginning and near the end of each fuel cycle are adequate to confirm that the MTC remains within its limits since this coefficient changes slowly due principally to the reduction in RCS boron concentration associated with fuel burnup.~~

DELETE

3/4.1.1.4 MINIMUM TEMPERATURE FOR CRITICALITY

This specification ensures that the reactor will not be made critical with the Reactor Coolant System average temperature less than 541°F. This limitation is required to ensure 1) the moderator temperature coefficient is within its analyzed temperature range, 2) the protective instrumentation is within its normal operating range, 3) the P-12 interlock is above its setpoint, 4) the pressurizer is capable of being in a OPERABLE status with a steam bubble, and 5) the reactor pressure vessel is above its minimum RT_{NDT} temperature.

3/4.1.2 BORATION SYSTEMS

The boron injection system ensures that negative reactivity control is available during each mode of facility operation. The components required to perform this function include 1) borated water sources, 2) charging pumps, 3) separate flow paths, 4) boric acid transfer pumps, 5) associated heat tracing systems, and 6) an emergency power supply from OPERABLE diesel generators.

With the RCS average temperature above 350°F, a minimum of two separate and redundant boron injection systems are provided to ensure single functional capability in the event an assumed failure renders one of the systems inoperable. The boration capability of either flow path is sufficient to provide a SHUTDOWN MARGIN from expected operating conditions of 1.6% delta k/k after xenon decay and cooldown to 200°F. The maximum expected boration capability requirement occurs at EOL from full power equilibrium xenon conditions and requires R161

MONTHLY REACTOR OPERATING REPORT

6.9.1.10 Routine reports of operating statistics and shutdown experience, including documentation of all challenges to the PORVs or Safety Valves, shall be submitted on a monthly basis no later than the 15th of each month following the calendar month covered by the report. R76

CORE OPERATING LIMITS REPORT

6.9.1.14 Core operating limits shall be established and documented in the CORE OPERATING LIMITS REPORT before each reload cycle or any remaining part of a reload cycle for the following:

1. Moderator Temperature Coefficient BOL and EOL limits and 300 ppm surveillance limit for Specification 3/4.1.1.3,
2. Shutdown Bank Insertion Limit for Specification 3/4.1.3.5,
3. Control Bank Insertion Limits for Specification 3/4.1.3.6,
4. Axial Flux Difference Limits for Specification 3/4.2.1,
5. Heat Flux Hot Channel Factor, K(z), and W(z) for Specification 3/4.2.2, and
6. Nuclear Enthalpy Hot Channel Factor and Power Factor Multiplier for Specification 3/4.2.3.

R159

6.9.1.14.a The analytical methods used to determine the core operating limits shall be those previously reviewed and approved by NRC in:

1. WCAP-9272-P-A, "WESTINGHOUSE RELOAD SAFETY EVALUATION METHODOLOGY", July 1985 (W Proprietary).
   (Methodology for Specifications 3.1.1.3 - Moderator Temperature Coefficient, 3.1.3.5 - Shutdown Bank Insertion Limit, 3.1.3.6 - Control Bank Insertion Limits, 3.2.1 - Axial Flux Difference, 3.2.2 - Heat Flux Hot Channel Factor, and 3.2.3 - Nuclear Enthalpy Hot Channel Factor.)
2. WCAP-10216-P-A, "RELAXATION OF CONSTANT AXIAL OFFSET CONTROL F_Q SURVEILLANCE TECHNICAL SPECIFICATION", JUNE 1983 (W Proprietary).
   (Methodology for Specification 3.2.1 - Axial Flux Difference (Relaxed Axial Offset Control) and 3.2.2 - Heat Flux Hot Channel Factor (W(z) surveillance requirements for F_Q Methodology).)
3. WCAP-10266-P-A Rev. 2, "THE 1981 REVISION OF WESTINGHOUSE EVALUATION MODEL USING BASH CODE", March 1987, (W Proprietary).
   (Methodology for Specification 3.2.2 - Heat Flux Hot Channel Factor).

4. INSERT B

3/4.1.1 BORATION CONTROL

3/4.1.1.1 and 3/4.1.1.2 SHUTDOWN MARGIN

A sufficient SHUTDOWN MARGIN ensures that 1) the reactor can be made subcritical from all operating conditions, 2) the reactivity transients associated with postulated accident conditions are controllable within acceptable limits, and 3) the reactor will be maintained sufficiently subcritical to preclude inadvertent criticality in the shutdown condition.

SHUTDOWN MARGIN requirements vary throughout core life as a function of fuel depletion, RCS boron concentration, and RCS T_{avg}. The most restrictive condition occurs at EOL, with T_{avg} at no load operating temperature, and is associated with a postulated steam line break accident and resulting uncontrolled RCS cooldown. In the analysis of this accident, a minimum SHUTDOWN MARGIN of 1.6% delta k/k is required to control the reactivity transient. Accordingly, the SHUTDOWN MARGIN requirement is based upon this limiting condition and is consistent with FSAR safety analysis assumptions. With T_{avg} less than 200°F, the reactivity transients resulting from a postulated steam line break cooldown are minimal and a 1% delta k/k SHUTDOWN MARGIN provides adequate protection.

3/4.1.1.3 MODERATOR TEMPERATURE COEFFICIENT (MTC)

~~The limitations on moderator temperature coefficient (MTC) are provided to ensure that the value of this coefficient remains within the limiting condition assumed in the FSAR accident and transient analyses.~~

~~The MTC values of this specification are applicable to a specific set of plant conditions; accordingly, verification of MTC values at conditions other than those explicitly stated will require extrapolation to those conditions in order to permit an accurate comparison.~~

~~The most negative MTC value equivalent to the most positive moderator density coefficient (MDC), was obtained by incrementally correcting the MDC used in the FSAR analyses to nominal operating conditions. These corrections~~

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~~3/4.1.1.3 MODERATOR TEMPERATURE COEFFICIENT (Continued)~~

~~involved subtracting the incremental change in the MDC associated with a core condition of all rods inserted (most positive MDC) to an all rods withdrawn condition and, a conversion for the rate of change of moderator density with temperature at RATED THERMAL POWER conditions. This value of the MDC was then transformed into the limiting end of cycle life (EOL) MTC value. The 300 PPM surveillance limit MTC value represents a conservative value (with corrections for burnup and soluble boron) at a core condition of 300 ppm equilibrium boron concentration and is obtained by making these corrections to the limiting EOL MTC value.~~ R146 R146

~~The surveillance requirements for measurement of the MTC at the beginning and near the end of the fuel cycle are adequate to confirm that the MTC remains within its limits since this coefficient changes slowly due principally to the reduction in RCS boron concentration associated with fuel burnup.~~

DELETE

3/4.1.1.4 MINIMUM TEMPERATURE FOR CRITICALITY

This specification ensures that the reactor will not be made critical with the Reactor Coolant System average temperature less than 541°F. This limitation is required to ensure 1) the moderator temperature coefficient is within it analyzed temperature range, 2) the protective instrumentation is within its normal operating range, 3) the P-12 interlock is above its setpoint, 4) the pressurizer is capable of being in a OPERABLE status with a steam bubble, and 5) the reactor pressure vessel is above its minimum RT_{NDT} temperature.

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With the RCS average temperature above 350°F, a minimum of two separate and redundant boron injection system are provided to ensure single functional capability in the event an assumed failure renders one of the flow paths inoperable. The boration capability of either flow path is sufficient to R147

MONTHLY REACTOR OPERATING REPORT

6.9.1.10 Routine reports of operating statistics and shutdown experience, including documentation of all challenges to the PORVs or Safety Valves, shall be submitted on a monthly basis no later than the 15th of each month following the calendar month covered by the report. R64

CORE OPERATING LIMITS REPORT

6.9.1.14 Core operating limits shall be established and documented in the CORE OPERATING LIMITS REPORT before each reload cycle or any remaining part of a reload cycle for the following:

1. Moderator Temperature Coefficient BOL and EOL limits and 300 ppm surveillance limit for Specification 3/4.1.1.3,

2. Shutdown Bank Insertion Limit for Specification 3/4.1.3.5,

3. Control Bank Insertion Limits for Specification 3/4.1.3.6,

4. Axial Flux Difference Limits for Specification 3/4.2.1, R146

5. Heat Flux Hot Channel Factor, K(z), and W(z) for Specification 3/4.2.2, and

6. Nuclear Enthalpy Hot Channel Factor and Power Factor Multiplier for Specification 3/4.2.3.

6.9.1.14.a The analytical methods used to determine the core operating limits shall be those previously reviewed and approved by NRC in:

1. WCAP-9272-P-A, "WESTINGHOUSE RELOAD SAFETY EVALUATION METHODOLOGY", July 1985 (W Proprietary).
   (Methodology for Specifications 3.1.1.3 - Moderator Temperature Coefficient, 3.1.3.5 - Shutdown Bank Insertion Limit, 3.1.3.6 - Control Bank Insertion Limits, 3.2.1 - Axial Flux Difference, 3.2.2 - Heat Flux Hot Channel Factor, and 3.2.3 - Nuclear Enthalpy Hot Channel Factor.)

2. WCAP-10216-P-A, "RELAXATION OF CONSTANT AXIAL OFFSET CONTROL F_Q SURVEILLANCE TECHNICAL SPECIFICATION", JUNE 1983 (W Proprietary).
   (Methodology for Specification 3.2.1 - Axial Flux Difference (Relaxed Axial Offset Control) and 3.2.2 - Heat Flux Hot Channel Factor (W(z) surveillance requirements for F_Q Methodology).)

3. WCAP-10266-P-A Rev. 2, "THE 1981 REVISION OF WESTINGHOUSE EVALUATION MODEL USING BASH CODE", March 1987, (W Proprietary).
   (Methodology for Specification 3.2.2 - Heat Flux Hot Channel Factor).

4. INSERT B

6.9.1.14.b The core operating limits shall be determined so that all applicable limits (e.g., fuel thermal-mechanical limits, core thermal-hydraulic limits, ECCS limits, nuclear limits such as shutdown margin, and transient and accident analysis limits) of the safety analysis are met.

Insert A

The limitations on MTC are provided to ensure that the value of this coefficient remains within the limiting condition assumed in the Updated Final Safety Analysis Report (UFSAR) analyses.

The MTC values of this specification are applicable to a specific set of plant conditions; accordingly, verification of MTC values at conditions other than those explicitly stated will require extrapolation to those conditions in order to permit an accurate comparison.

The most negative MTC, which is equivalent to the most positive moderator density coefficient (MDC), was obtained by incrementally correcting the MDC used in the UFSAR analyses to nominal operating conditions. These corrections involved: (1) a conversion of the MDC used in the UFSAR safety analyses to its equivalent MTC, based on th rate of change of moderator density with temperature at RATED THERMA_ POWER conditions; and (2) subtracting from this value the largest differences in MTC observed between end of life (EOL), all rods withdrawn, RATED THERMAL POWER conditions, and those most adverse conditions of moderator temperature and pressure, rod insertion, axial power skewing, and xenon concentration that can occur in normal operation and lead to a significantly more negative EOL MTC at RATED THERMAL POWER. These corrections transformed the MDC value used in the UFSAR safety analyses into the limiting EOL MTC value. The 300-ppm surveillance limit MTC value represents a conservative MTC value at a core condition of 300-ppm equilibrium boron concentration, and is obtained by making corrections for burnup and soluble boron to the limiting EOL MTC value.

The surveillance requirements for measurement of the MTC at the beginning and near the end of the fuel cycle are adequate to confirm that the MTC remains within its limits since this coefficient changes slowly principally because of the reduction in RCS boron concentration associated with fuel burnup.

Insert B

WCAP-13631-P-A, "Safety Evaluation Supporting a More Negative EOL Moderator Temperature Coefficient Technical Specification for the Sequoyah Nuclear Plants," March 1993 (W Proprietary). (Methodology for Specification 3.1.1.3 - Moderator Temperature Coefficient)

ENCLOSURE 2

PROPOSED TECHNICAL SPECIFICATION CHANGE

SEQUOYAH NUCLEAR PLANT UNITS 1 AND 2

DOCKET NOS. 50-327 AND 50-328

(TVA-SQN-TS-93-07)

DESCRIPTION AND JUSTIFICATION FOR

END OF LIFE MODERATOR TEMPERATURE COEFFICIENT RELAXATION

Description of Change

TVA proposes to modify the Sequoyah Nuclear Plant (SQN) Units 1 and 2 technical specifications (TSs) to revise bases Section B 3/4.1.1.3 and Administrative Section 6.9.1.14.a. This proposed TS change includes a reanalysis of the end of life (EOL) moderator temperature coefficient (MTC) limit derivation. This methodology is SQN specific and removes conservative assumptions regarding control rod positioning. This methodology will be referenced in TS Section 6.9.1.14.a for the Core Operating Limits Report (COLR), and is described in the bases for TS 3/4.1.1.3. Upon approval, each unit's COLR will be revised and submitted as required by TS 6.9.1.14.c.

Bases B 3/4.1.1.3 MTC will be revised to describe the new methodology used to calculate the EOL MTC based on Westinghouse Commercial Atomic Power (WCAP) 13631.

Analytical methods in TS 6.9.1.14.a that are used to determine the core operating limits add WCAP-13631 as analytical method No. 4.

Reason for Change

Higher enrichments and longer cycles have caused the EOL MTC to become more negative in recent SQN cycles. The SQN Unit 1 Cycle 6, 300-parts-per-million (ppm) surveillance measurement for EOL MTC was very close to the limit that would have caused surveillance testing to be repeated every 14 effective full power days (EFPD) for the remainder of the cycle. The design calculations for Unit 2 predict that its EOL MTC will be more negative, and therefore closer to the limit, than Unit 1.

Repeated surveillance measurements of MTC are undesirable because they require perturbing normal reactor operation. In addition, if the EOL MTC limit of -40 percent mille/degree Fahrenheit (pcm/°F) is exceeded, the unit must be placed in hot shutdown within 12 hours per TS 3.1.1.3.b.

The proposed TS changes would change the 300-ppm surveillance limit from -31 pcm/°F to -37.5 pcm/°F and the EOL MTC limit from -40 pcm/°F to -45 pcm/°F. This will substantially reduce the chance that repeated surveillance measurements would be required.

Justification for Change

The current EOL MTC limit was derived by assuming that the most negative MTC that could occur was at EOL rated thermal power (RTP) with all control rods fully inserted (all rods in [ARI]) even though TSs do not allow operation under these conditions. Under these conditions, the MTC must be less than the MTC used in the accident analysis (-52.68 pcm/°F that is equivalent to the moderator density coefficient of 0.43 delta k/k/gram/cubic centimeter used in the accident analysis). Since a measurement of MTC could not be made at those conditions, the change in MTC from ARI RTP to all rods out (ARO) RTP was calculated and the limit was set on the ARO RTP MTC.

The new Westinghouse Electric Corporation methodology requires the EOL (0-ppm boron) MTC to be more positive than the accident analysis MTC at the conditions of moderator temperature and pressure, rod insertion, axial power shape, and xenon concentration that cause the most negative MTC and are allowable during normal operation. This new methodology ensures that the accident analysis MTC is still bounding for all operating conditions. A conservative adjustment to the accident analysis MTC is applied for each of the conditions that can affect MTC (moderator temperature and pressure, rod insertion, axial power shape, and xenon concentration) to calculate the TS limit for nominal conditions (ARO equilibrium xenon, design temperature, and pressure). Thus, when the TS limit is met, no allowable operating conditions will cause the accident analysis MTC to be exceeded.

The 300-ppm surveillance limit is derived from the EOL limit by conservatively calculating the change expected in MTC between EOL and the 300-ppm surveillance. The proposed new methodology reduces the conservatism in calculating this change by looking at recent SQN cycles and calculating a change that is expected to be bounding. This would reduce that change in MTC between the 300-ppm surveillance limit and the EOL limit from 9 pcm/°F to 7.5 pcm/°F. The validity of this value would be confirmed each cycle as part of the reload design process.

This methodology, as presented in a site specific WCAP, has been reviewed and approved by NRC for South Texas Project Units 1 and 2. It has also been implemented at several other sites such as Vogtle and Farley Nuclear Plants.

Environmental Impact Evaluation

The proposed change request does not involve an unreviewed environmental question because operation of SQN Units 1 and 2 in accordance with this change would not:

1. Result in a significant increase in any adverse environmental impact previously evaluated in the Final Environmental Statement (FES) as modified by the staff's testimony to the Atomic Safety and Licensing Board, supplements to the FES, environmental impact appraisals, or decisions of the Atomic Safety and Licensing Board.

2. Result in a significant change in effluents or power levels.

3. Result in matters not previously reviewed in the licensing basis for SQN that may have a significant environmental impact.

Enclosure 3

PROPOSED TECHNICAL SPECIFICATION CHANGE

SEQUOYAH NUCLEAR PLANT UNITS 1 AND 2

DOCKET NOS. 50-327 AND 50-328

(TVA-SQN-TS-93-07)

DETERMINATION OF NO SIGNIFICANT HAZARDS CONSIDERATION

FOR END OF LIFE MODERATOR TEMPERATURE COEFFICIENT RELAXATION

Significant Hazards Evaluation

TVA has evaluated the proposed technical specification (TS) change and has determined that it does not represent a significant hazards consideration based on criteria established in 10 CFR 50.92(c). Operation of Sequoyah Nuclear Plant (SQN) in accordance with the proposed amendment will not:

1. Involve a significant increase in the probability or consequences of an accident previously evaluated.

   The more negative end of life (EOL) moderator temperature coefficient (MTC) does not significantly increase the probability of an accident previously evaluated in the Updated Final Safety Analysis Report (UFSAR). No new performance requirements are being imposed on any system or component such that any design criteria will be exceeded. The conservative moderator density coefficient (MDC) assumption in the current analyses of record has been confirmed to remain bounding for the more negative proposed TS value. Therefore, no change in the modeling of the accident analysis conditions or response is necessary in order to implement this change.

   The consequences of an accident previously evaluated in the UFSAR are not significantly increased because of the more negative EOL MTC. The dose predictions presented in the UFSAR remain valid such that no more severe consequences will result.

2. Create the possibility of a new or different kind of accident from any previously analyzed.

   The more negative EOL MTC does not create the possibility of an accident that is different than any already evaluated in the UFSAR. No new failure modes have been defined for any system or component nor has any new limiting single failure been identified. Conservative assumptions for MDC have already been modeled in the UFSAR analyses, and it has been determined that the more negative MTC values to be implemented in the TS will continue to be bounded by these assumptions.

3. Involve a significant reduction in a margin of safety.

   The evaluation of the more negative EOL MTC has taken into account the applicable TSs and has bounded the conditions under which the specifications permit operation. The applicable TSs are the bases for TS 3/4.1.1.3 and Section 6.9.1.14.a that list methods approved by NRC for use in determining the core operating limits. The values of the limiting condition of operation and surveillance requirements are located in the Core Operating Limits Report. The analyses that support these TSs have been evaluated. The results as presented in the UFSAR remain bounding for the more negative EOL MTC. Therefore, the margin of safety, as defined in the bases to these TSs, is not significantly reduced.

Enclosure 4

PROPOSED TECHNICAL SPECIFICATION CHANGE

SEQUOYAH NUCLEAR PLANT UNITS 1 AND 2

DOCKET NOS. 50-327 AND 50-328

(TVA-SQN-TS-93-07)

PROPRIETARY INFORMATION NOTICE

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APPLICATION FOR WITHHOLDING

AND

AFFIDAVIT

L38 930408 804

Westinghouse Electric Corporation
Energy Systems
Box 355
Pittsburgh Pennsylvania 15230-0355

93TV*-G-0019
ET-NSL-OPL-I-93-161
April 2, 1993

Mr. J. T. Robert
Nuclear Fuel Economics
Tennessee Valley Authority
1101 Market Street
BR 6N 60A
Chattanooga, Tennessee 37402-2810

TENNESSEE VALLEY AUTHORITY
Sequoyah Units 1 and 2
End Of Life Moderator Temperature Coefficient Relaxation
Safety Evaluation Report (WCAPs-13631 and 13650)

Dear Mr. Robert:

This letter transmits 3 copies each of proprietary (WCAP-13631) and non-proprietary (WCAP-13650) versions of "Safety Evaluation Supporting a More Negative EOL Moderator Temperature Coefficient Technical Specification for the Sequoyah Nuclear Plant Units 1 and 2", dated March 1993, for your submittal to the NRC for review and approval.

In addition to the proprietary and non-proprietary WCAPs, there a e four other enclosures for your use:

1. Information which should be included in your NRC transmittal letter.
2. Proprietary Information Notice to be attached to your NRC transmittal letter.
3. Copyright Notice to be attached to your NRC transmittal letter
4. Westinghouse letter "Application for Withholding Proprietary Information from Public Disclosure" (CAW-93-435) with Affidavit CAW-93-435.

Please transmit the original of Item 4 to the NRC in your transmittal.

If you have any questions, please do not hesitate to contact us.

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Chattanooga

Very truly yours,

N. R. Metcalf
N. R. Metcalf
Project Engineer
Mktg. & Customer Projects

LVT/cld
Enclosures

CLD242:LVT/032493

93TV*-G-0019
ET-NSL-OPL-I-93-161
April 2, 1993

cc: L. Evans. (W) Chattanooga Sales
D. M. Lafever, Sequoyah Site

CLD242:LVT/032493

93TV*-G-0019
ET-NSL-OPL-I-93-161
April 2, 1993

bcc:	T. W. Wallace	EC W538A	1L, 1A
	L. V. Tomasic	EC E4-09	1L, 1A
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