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NUREG-2181
Supplement 1

Safety Evaluation Report

Related to the License Renewal of Sequoyah Nuclear Plant Units 1 and 2

Docket Numbers 50-327 and 50-328

Tennessee Valley Authority

Office of Nuclear Reactor Regulation

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ABSTRACT

This document is a supplement to NUREG-2181, "Safety Evaluation Report Related to the License Renewal of the Sequoyah Nuclear Plant, Units 1 and 2," for the license renewal application (LRA) for Sequoyah Nuclear Plant (Sequoyah or SQN), Units 1 and 2. By letter dated January 7, 2013, Tennessee Valley Authority (TVA or the applicant) submitted the LRA in accordance with Title 10, Part 54, "Requirements for Renewal of Operating Licenses for Nuclear Power Plants," of the Code of Federal Regulations. TVA requests renewal of the operating licenses (Facility Operating License Nos. DPR 77 and DPR 79) for a period of 20 years beyond the current expiration at midnight September 17, 2020, for Unit 1, and at midnight September 15, 2021, for Unit 2.

This supplement to NUREG 2181 (SSER) documents the staff's review of supplemental information provided by the applicant since the issuance of the Safety Evaluation Report (SER). This evaluation considered TVA's LRA annual updates dated April 22, 2014, August 17, 2015, and August 28, 2015, supplemental information regarding recent industry operating experience related to SQN Unit 1 reactor vessel internals, Commitment No. 28 revisions (pertaining to reactor vessel internals and surveillance capsule monitoring), information required by 10 CFR 54.21(b), as well as information provided in response to staff requests for additional information. This document discusses only the changes to the SER.

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ABBREVIATIONS

ACRS	Advisory Committee on Reactor Safeguards
ADAMS	Agencywide Documents Access and Management System
AMG	Aging Management Guide
AMP	aging management program
AMR	aging management review
ANS	American Nuclear Society
ANSI	American National Standards Institute
APCSB	Auxiliary Power Conversion System Branch
ASCE	American Society of Civil Engineers
ASM	American Society for Metals
ASME	American Society of Mechanical Engineers
CFR	*Code of Federal Regulations*
CLB	current licensing basis/bases
DOE	Department of Energy
EOC	End(s) of Cycle
EPRI	Electric Power Research Institute
ER	Environmental Report (Applicant's Environmental Report Operating License Renewal Stage)
FOSAR	foreign object search and retrieval
FR	*Federal Register*
GALL	Generic Aging Lessons Learned [Report]
GEIS	Generic Environmental Impact Statement
GL	generic letter
HTP	High Thermal Performance
I&C	instrumentation and control(s)
IEEE	Institute of Electrical and Electronics Engineers
ksi	kilogram(s) per square inch
MeV	mega electron-volts
MEB	metal-enclosed bus
MRP	Materials Reliability Program
N/cm^2	newton(s) per square centimeter
NEI	Nuclear Energy Institute
NRC	U.S. Nuclear Regulatory Commission
NUMARC	Nuclear Management and Resources Council
OE	operating experience
PTLR	pressure-temperature limits report

PWR	pressurized-water reactor
RAI	request for additional information
RCP	reactor coolant pump
RCPB	reactor coolant pressure boundary
RFO	refueling outage
RG	regulatory guide
RVI	reactor vessel internals
SCC	stress-corrosion cracking
SE	safety evaluation
SER	safety evaluation report
SQN	Sequoyah Nuclear Plant
SSER	supplemental safety evaluation report
TAC	Technical Assignment Control
TR	Technical Report
TS	Technical Specification
TVA	Tennessee Valley Authority
UFSAR	updated final safety analysis report
WCAP	Westinghouse Commercial Atomic Power

SECTION 1

INTRODUCTION AND GENERAL DISCUSSION

1.1 Introduction

This document is the first supplement to NUREG 2181, "Safety Evaluation Report Related to the License Renewal of Sequoyah Nuclear Plant (Sequoyah or SQN), Units 1 and 2, for the license renewal application (LRA) for Sequoyah Nuclear Plant (Sequoyah or SQN), Units 1 and 2," as filed by Tennessee Valley Authority (TVA or the applicant). By letter dated January 7, 2013, TVA submitted its application to the U.S. Nuclear Regulatory Commission (NRC) for renewal of the Sequoyah, Units 1 and 2, operating licenses for an additional 20 years. The NRC staff (the staff) prepared this report to summarize the results of its safety review of the LRA for compliance with Title 10, Part 54, "Requirements for renewal of operating licenses for nuclear power plants," of the Code of Federal Regulations (10 CFR Part 54). This information includes information committed to by TVA as documented in Commitment No. 28 (pertaining to reactor vessel internals), information required by 10 CFR 54.21(b), updated information and commitments in response to the recent industry operating experience, as well as information provided in response to staff requests for additional information. This document discusses only the changes to the safety evaluation report (SER). Unless otherwise noted, the staff reviewed and considered information submitted through August 28, 2015. This supplemental safety evaluation report (SSER) supplements portions of SER Sections 2, 3, and Appendices A through D.

In accordance with 10 CFR 54.21(b), the NRC requires that, each year following submission of the LRA and at least 3 months before the scheduled completion of the staff's review, the applicant submit an LRA amendment identifying any current licensing basis (CLB) changes to the facility that materially affect the contents of the LRA, including the updated final safety analysis report supplement. With annual updates dated April 22, 2014, August 17, 2015, and August 28, 2015, the applicant submitted an LRA update which summarizes the CLB changes that have occurred during the staff's review of the LRA. This submission satisfies 10 CFR 54.21(b) requirements up to the publication of this document. For this supplement, the staff reviewed the information in the latest LRA annual update and found all proposed CLB changes to be acceptable or have no effect on the staff's findings.

The staff does not have any further changes or updates to this section of the SER.

SECTION 2

STRUCTURES AND COMPONENTS SUBJECT TO AGING MANAGEMENT REVIEW

2.5 Scoping and Screening Results: Electrical and Instrumentation and Control Systems

2.5.1 Electrical and Instrumentation and Controls Commodity Groups

2.5.1.1 Summary of Technical Information in the Application

The staff's summary of technical information in the application evaluation is as documented in subsection in the "Summary of Technical Information in the Application" subsection 2.5.1.1 of NUREG-2181.

2.5.1.2 Staff Evaluation

The staff's evaluation of the applicant's electrical and instrumentation and control (I&C) systems is as documented in the "Staff Evaluation" subsection of Section 2.5.1.2 of NUREG 2181. This evaluation remains the same with the exception of the supplemental information that follows.

The staff reviewed LRA Section 2.5, the second annual update to license renewal application (LRA) Section 2.5, and updated final safety analysis report (UFSAR) Chapters 7 and 8 using the evaluation methodology described in SER section 2.5 and the guidance in SRP-LR Section 2.5, "Scoping and Screening Results: Electrical and Instrumentation and Controls Systems."

By letter dated August 14, 2015 (ADAMS Accession No. ML15226A592), the applicant provided a second annual update to the SQN LRA Section 2.5 regarding the removal of penetrations SQN-1-PENE-302-0026-S and SQN-1-PENE-302-0040-S from the EQ program. The staff held a conference call with the applicant on August 20, 2015, to clarify the license renewal scoping of electrical components associated with the referenced non-EQ penetrations. Based on the staff's discussions with the applicant, the staff understands that: 1) SQN electrical and I&C penetration assemblies in the EQ program (10 CFR 50.49) are not subject to aging management review (AMR), 2) electrical components associated with non-EQ penetrations (such as SQN-1-PENE-302-0026-S and SQN-1-PENE-302-0040-S) are within the scope of license renewal, 3) all non-EQ cables and connections associated with both EQ and non-EQ electrical and I&C penetration assemblies are evaluated in the insulated cables and connections commodity group that is subject to AMR as identified in Table 2.5-1, and 4) the pressure boundary function of non-EQ penetration assemblies are evaluated in Section 2.4.1. By letter dated August 28, 2015, the applicant supplemented the second annual update to the SQN LRA Section 2.5 to reflect these clarifications. Therefore, since cables and connections associated with the referenced non-EQ penetrations are within the scope of license renewal and subject to AMR, the staff's concern is resolved.

2.5.1.3 Conclusion

The staff's conclusion for the scoping and screening results for electrical and I&C systems is documented in the "Scoping and Screening Results: Electrical and Instrumentation and Control Systems" subsection 2.5.1.3 of NUREG 2181. The staff does not have any changes or updates to its conclusion.

SECTION 3

AGING MANAGEMENT REVIEW RESULTS

This section of the supplemental safety evaluation report (SSER) evaluates aging management programs (AMPs) and aging management reviews (AMRs) for Sequoyah Nuclear Plant (SQN), by the staff of the U.S. Nuclear Regulatory Commission (NRC) (the staff).

The staff's supplemental evaluation for the Reactor Vessel Internals Program and the Reactor Vessel Surveillance Program are detailed below. There were no updates to AMRs.

3.0 Applicant's Use of the Generic Aging Lessons Learned Report

3.0.3 Aging Management Programs

3.0.3.2 AMPs Consistent with the GALL Report with Exceptions or Enhancements

3.0.3.2.17 Reactor Vessel Internals Program

The summary of the Reactor Vessel Internals Program (License Renewal Application (LRA) Section B.1.34) and the staff's evaluation of the Reactor Vessel Internals Program are as documented in Section 3.0.3.2.17 of NUREG 2181, "Safety Evaluation Report Related to the License Renewal of Sequoyah Nuclear Plant Units 1 and 2," as documented in Agencywide Documents Access and Management System (ADAMS) Accession No. ML15187A206). This evaluation supplements the evaluation in the final SER Section 3.0.3.2.17 and provides an updated operating experience (OE) evaluation of the recent reactor vessel capsule event that occurred in Unit 1 during the spring 2015 refueling outage (RFO) for the unit.

Summary of Technical Information in the Application. The summary of the technical information for the applicant's Reactor Vessel Internals Program is as documented in the "Summary of Technical Information" subsection in Section 3.0.3.2.17 of NUREG-2181.

Staff Evaluation. The staff's evaluation of the applicant's Reactor Vessel Internals Program is as documented in the "Staff Evaluation" subsection of Section 3.0.3.2.17 of NUREG-2181, with the exception of the supplemental OE that follows.

Operating Experience. As discussed in the applicant's letter dated July 10, 2015, SQN, Unit 1, inservice inspections of the reactor vessel internals (RVI) components during the End of Cycle (EOC) 20 outage revealed that two reactor vessel surveillance capsules had become dislodged from their basket holders. The inspections also revealed that capsule pieces or specimens from at least one of these capsules had become loose inside the Unit 1 reactor vessel. Tennessee Valley Authority (TVA or the applicant) noted damage in some cases to some RVI component.

The staff noted that any damage to RVI components would need to be assessed in order to demonstrate that stress profiles for the damaged components would remain bounded by those assumed for the as built component configurations in the Electric Power Research Institute (EPRI) Materials Reliability Program (MRP) Technical Report (TR) MRP 227 A or the EPRI MRP reports used to develop the inspection and evaluation guidelines in TR MRP 227 A. The staff also noted that any damage that occurred from the impacts of the loose parts (e.g., causing

cold work to the affected components) could potentially create a preferential site for the initiation of further degradation effects, such as stress corrosion cracking (SCC), during the period of extended operation. Therefore, the staff concluded that the impact of this OE event would need to be evaluated further by the applicant for any impacts on the assumptions used to develop the inspection and evaluation criteria in MRP 227 A.

By letter dated June 22, 2015, the staff issued Request for Additional Information (RAI) 3.0.3.2.17 1a, Parts 1 and 2, requesting that the applicant address these issues. In RAI 3.0.3.2.17 1a, Part 1, the staff asked the applicant to provide an adequate technical justification for not considering the potential effects of loose part induced cold work on the likelihood of degradation of the damaged RVI, in particular the long term prospects for initiation of SCC in the damaged internals. In RAI 3.0.3.2.17 1a, Part 2, the staff asked the applicant to provide a basis for not performing subsequent reinspections of the damaged locations of the Unit 1 RVI components using inspection methods that will effectively identify impact related damage.

The applicant responded to RAI 3.0.3.2.17 1a, Parts 1 and 2, in a letter dated August 3, 2015. In its response to RAI 3.0.3.2.17 1a, Part 1, the applicant stated that any light scratches or rub marks in RVI components that were impacted by loose parts during plant operations after the capsule dislodged event would not be cold worked sufficiently to change the stress profiles of the components during plant operations. The applicant also indicated that, for components with deep rubs, the applicant's analysis sufficiently demonstrated that either the components were in areas of low stress due to their design locations and configurations, or the stress levels of the components were less than 5 ksi. The applicant further stated that, based on these observations and evaluations, it concluded that (a) potential loose part induced surface cold work is not expected to have a significant impact on the affected RVI components, and (b) the assumptions used in the screening and expert panel review of MRP 191 and the inspection and evaluation guidance of MRP 227 A still remain valid for the SQN Unit 1 RVI components.

In its review, the staff noted that the applicant's OE review provides sufficient demonstration that any loose part impacts on the RVI components have not appreciably changed the component conditions from those evaluated in the design basis for those RVI components. The staff finds that the applicant has provided an acceptable basis to conclude that the inspection and evaluation criteria in MRP 227 A remain valid because the applicant has demonstrated that there has not been sufficient damage to the RVI components such that operational stress profiles for the components would no longer be bounded by those assumed in MRP 227 A, or in the background MRP reports used to develop MRP 227 A.

In its response to RAI 3.0.3.2.17 1a, Part 2, the applicant stated that it would continue to implement foreign object search and retrieval (FOSAR) inspections for further loose parts that may have resulted from the surveillance capsule failure event. The applicant also stated that it retrieved any loose parts, which were detected as a result of the past FOSAR inspections subsequent to the capsule failure event, using gripping tools or by vacuum into a debris basket. The applicant further stated that, since the startup of Unit 1 following the capsule dislodged event, the loose part monitoring activities have not identified any indication of loose parts in the Unit 1 reactor vessel.

In addition, the applicant stated that, if Foreign Material Exclusion inspections in subsequent Unit 1 RFOs find loose parts, the findings will be entered into the corrective action program for further evaluation of potential impacts to the Reactor Vessel Internals Program. The staff finds this to be an acceptable basis for resolving any questions regarding potential undetected loose parts from this event because the staff has confirmed that the applicant's basis is consistent

with implemented Operating Experience Commitment 37 and with LRA Section A.1, Appendix A. RAI 3.0.3.2.17 1a, Parts 1 and 2, are resolved.

Based on this review, the staff concludes that the applicant has adequately evaluated and resolved the impact of the reactor vessel surveillance capsule dislodged event on the program element criteria for the Reactor Vessel Internals Program and that the applicant has provided sufficient demonstration that the assumptions and criteria in MRP 227 A remain valid with respect to this OE event.

UFSAR Supplement. The staff's evaluation of the applicant's updated final safety analysis report (UFSAR) supplement of Reactor Vessel Internals Program (LRA Appendix A, Section A.1.34) is as documented in "UFSAR Supplement" subsection in Section 3.0.3.2.17 of NUREG-2181.

Conclusion. On the basis of its audit and review of the applicant's Reactor Vessel Internals Program, the staff determined that the program elements for which the applicant claimed consistency with the Generic Aging Lessons Learned (GALL) Report are consistent. Also, the staff reviewed the enhancements and confirmed that their implementation prior to the period of extended operation will make the AMP adequate to manage the applicable aging effects. The staff concludes that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained in a way consistent with the current licensing basis (CLB) for the period of extended operation, as required by Title 10 of the Code of Federal Regulations (10 CFR) section 54.21(a)(3). The staff also reviewed the updated UFSAR supplement for this AMP and concludes that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

The staff also concludes that the applicant has properly evaluated the impacts of the reactor pressure vessel surveillance capsule dislodge event and the assumptions used to develop the criteria in the MRP-227-A report, as applicable to the design of RVI components at Units 1 and 2. The applicant has demonstrated that the inspection and evaluation activities will remain valid for Units 1 and 2 with respect to the OE event during the period of extended operation.

3.0.3.2.18 Reactor Vessel Surveillance Program

Supplement to SER Section 3.0.3.2.18, "Reactor Vessel Surveillance Program."

The staff's evaluation of the applicant's Reactor Vessel Surveillance Program (LRA Section B.1.35) is documented in Section 3.0.3.2.18, "Reactor Vessel Surveillance Program," of NUREG-2181, "Safety Evaluation Report Related to the License Renewal of Sequoyah Nuclear Plant Units 1 and 2," July 31, 2015 (ADAMS Accession No. ML15187A206). Following the Unit 1 event in which two reactor vessel surveillance capsules were dislodged from capsule holders and were damaged during the Cycle 20 operation (November 2013 – April 2015), the applicant revised the Reactor Vessel Surveillance Program (LRA Section B.1.35), as described below. The following safety evaluation supplements the staff's evaluation regarding the Reactor Vessel Surveillance Program that is documented in Section 3.0.3.2.18 of NUREG-2181.

Summary of Technical Information in the Application. The summary of the technical information for the applicant's program is as documented in the "Summary of Technical Information" subsection in Section 3.0.3.2.18 of NUREG-2181, with the exception that follows.

In its letter dated July 10, 2015, the applicant revised Enhancement 2 of the applicant's program to include an updated reference that addresses changes to the Unit 1 reactor vessel surveillance capsule withdrawal schedule (ADAMS Accession No. ML15197A176). The applicant's letter indicates that the revision to Enhancement 2 results from the Unit 1 surveillance capsules event.

Staff Evaluation. The staff's evaluation of the applicant's program is as documented in the "Staff Evaluation" subsection in Section 3.0.3.2.18 of NUREG-2181, with the exception of Enhancement 2 as described below.

Enhancement 1. The summary of Reactor Vessel Surveillance Program, Enhancement 1, for the applicant's program is as documented in the "Enhancement 1" subsection in Section 3.0.3.2.18 of NUREG-2181.

Enhancement 2. In its letter dated July 10, 2015, the applicant indicated that Enhancement 2 of the program is revised as a result of the following Unit 1 event regarding dislodged surveillance capsules.

During the Unit 1 End of Cycle (EOC) 19 outage, the applicant relocated Capsule S to a higher fluence location (40-degree azimuthal location) in accordance with the staff-approved capsule withdrawal schedule documented in the safety evaluation dated September 27, 2013 (ADAMS Accession No. ML13240A320). During the EOC 19 outage, Capsule W (standby capsule) was also relocated to another higher fluence location (220-degree azimuthal location) for potential future use. During the EOC 20 outage, applicant's inspections revealed that Capsules S and W of Unit 1 had been dislodged from their designated capsule basket holders and the materials test specimens contained in the capsules had been damaged.

The applicant also indicated that, since these surveillance specimens were no longer available to provide neutron embrittlement data, a request for revision to the Unit 1 capsule withdrawal schedule was submitted to the NRC by letter dated May 14, 2015 (ADAMS Accession No. ML15134A377). In its proposed revision to the Unit 1 surveillance capsule withdrawal schedule, the applicant's plan is to relocate Unit 1 Capsule V to a higher fluence location (140-degree azimuthal location) during the EOC 21, 22, or 23 outage. In its plan, the applicant will also withdraw the relocated capsule during the EOC 31 outage. The applicant further indicated that the proposed revision to the capsule withdrawal schedule is consistent with GALL Report AMP XI.M31 because the fast neutron fluence for capsule withdrawal is between one and two times the peak reactor vessel wall neutron fluence of Unit 1 (2.66x1019 n/cm2; E > 1 MeV) projected at the end of the period of extended operation. For example, the applicant indicated that, if Unit 1 Capsule V is relocated during the EOC 23 outage and withdrawn during the EOC 31 outage, the fast neutron fluence for the capsule withdrawal will be 2.97x1019 n/cm2 (E > 1 MeV), consistent with the guidance in the GALL Report. In addition, the applicant indicated that Unit 1 Capsule Z will not be relocated and will remain as a standby capsule in the reactor vessel.

In its letter dated July 10, 2015, the applicant revised Enhancement 2 to include an updated reference to the May 14, 2015, submittal which addresses the proposed revision to the Unit 1 capsule withdrawal schedule. The applicant also revised Commitment No. 28, Item B associated with Enhancement 2 and the UFSAR supplement (LRA Section A.1.35), consistent with the revision to Enhancement 2.

In addition, the applicant's July 10, 2015, letter states that the direct cause of this event is installation errors and installation procedural inadequacies. By letter dated August 3, 2015, the

applicant supplemented the July 10, 2015, letter indicating that it planned to perform visual inspections on the two Unit 2 surveillance capsules that were relocated during the Unit 2 EOC 20 outage in Fall 2015 (ADAMS Accession No. ML15215A656). The applicant also indicated that these inspections will be performed to confirm that the relocated surveillance capsules are adequately recessed and seated into the groove in the top region of the capsule holder. The applicant further stated that the root cause analysis for the Unit 1 event did not identify any potential aging effect as a direct or contributing cause. The applicant also provided the following inspection results to support the conclusion of the root cause analysis.

- The two dislodged Unit 1 capsules (Capsules S and W) are those that had been relocated in the Unit 1 reactor vessel during the prior outage (EOC 19 outage). The two remaining Unit 1 capsules (Capsules V and Z), which had not been relocated in the reactor vessel during the EOC 19 outage, remain intact and secured.

- A visual inspection was conducted on the accessible areas of the two remaining Unit 1 capsules and their respective capsule holders. The inspections revealed no signs of degradation.

- A visual inspection was also conducted on the external surfaces of the capsule holders from which the two Unit 1 capsules had been dislodged. The inspections revealed no signs of degradation.

In its review, the staff finds that Enhancement 2 as revised by letter dated July 10, 2015, is acceptable because (1) the revised enhancement adequately includes an updated reference to the May 14, 2015, submittal that requests NRC review of revision to the Unit 1 capsule withdrawal schedule in accordance with 10 CFR Part 50, Appendix H; and (2) the applicant confirmed that the proposed revision to the Unit 1 capsule withdrawal schedule is consistent with the recommendation in GALL Report AMP XI.M31 regarding the capsule fluence range for the period of extended operation. In addition, the staff approved the applicant's request for revision to the Unit 1 capsule withdrawal schedule in accordance with 10 CFR Part 50, Appendix H, as documented in the NRC letter dated September 4, 2015 (ADAMS Accession No. ML15244B222).

Enhancement 3. The summary of Reactor Vessel Surveillance Program, Enhancement 1, for the applicant's program is as documented in the "Enhancement 3" subsection in Section 3.0.3.2.18 of NUREG-2181.

Operating Experience. The staff's evaluation of the operating experience regarding the applicant's program is as documented in the "Operation Experience" subsection in Section 3.0.3.2.18 of NUREG-2181.

UFSAR Supplement. The staff's evaluation of the applicant's UFSAR supplement of Reactor Vessel Surveillance Program (LRA Section A.1.35) is as documented in the "UFSAR Supplement" subsection in in Section 3.0.3.2.18 of NUREG-2181, with the exception that follows.

As previously discussed in the evaluation section for Enhancement 2 above, the applicant revised the UFSAR supplement by letter dated July 10, 2015. The staff finds the revised UFSAR supplement acceptable because it adequately includes an updated reference to the

May 14, 2015, submittal which addresses the proposed revision to the Unit 1 capsule withdrawal schedule

Conclusion. On the basis of its audit and review of the applicant's Reactor Vessel Surveillance Program, the staff determined that the program elements for which the applicant claimed consistency with the GALL Report are consistent. The staff also reviewed the enhancements and confirmed that their implementation prior to the period of extended operation will make the AMP adequate to manage the applicable aging effects. The staff concludes that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained in a way consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3). In addition, the staff reviewed the updated UFSAR supplement for this AMP and concludes that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

SECTION 5

REVIEW BY THE ADVISORY COMMITTEE ON REACTOR SAFEGUARDS

In accordance with Title 10 of the *Code of Federal Regulations* Part 54, "Requirements for renewal of operating licenses for nuclear power plants," the Advisory Committee on Reactor Safeguards (ACRS) performed a detailed review of the license renewal application for Sequoyah Nuclear Plant, Units 1 and 2. The ACRS issued a report discussing the results of the review which was enclosed in Section 5 of NUREG-2181. This supplemental safety evaluation report was submitted to the ACRS for review, and the ACRS had no further comments regarding the supplemental information and evaluation performed by the staff.

SECTION 6

CONCLUSION

The staff concludes that the additional information provided by Tennessee Valley Authority does not alter the conclusion proffered in the safety evaluation report issued in January 2015 and that the requirements of Title 10 of the *Code of Federal Regulations* section 54.29(a) have been met.

APPENDIX A

SEQUOYAH NUCLEAR PLANT, UNITS 1 AND 2, LICENSE RENEWAL COMMITMENTS

During the review of the Sequoyah Nuclear Plant (Sequoyah, SQN), Units 1 and 2, license renewal application (LRA) by the staff of the U.S. Nuclear Regulatory Commission, Tennessee Valley Authority (TVA, the applicant) made commitments related to aging management programs to manage the aging effects of structures and components. During the period of review for this supplemental safety evaluation report, one commitment was revised. The following table lists the updated commitment along with the implementation schedules and sources for the commitment.

Table A-1 Sequoyah License Renewal Commitments

Item Number	Commitment	UFSAR Supplement Section/LRA Section	Enhancement or Implementation Schedule	Source
28	A. Revise **Reactor Vessel Surveillance Program** procedures to consider the area outside the beltline, such as nozzles, penetrations and discontinuities, to determine if more restrictive P-T limits are required than would be determined by just considering the reactor vessel beltline materials. B1. Revise Unit 2 Reactor Vessel Surveillance Program procedures to incorporate an NRC-approved schedule for capsule withdrawals to meet ASTM E185-82 requirements, including the possibility of operation beyond 60 years (refer to the TVA Letter to NRC, "Sequoyah Reactor Pressure Vessel Surveillance Capsule Withdrawal Schedule Revision Due to License Renewal Amendment," dated 01/10/13, ADAMS Accession No. ML13032A251; NRC final safety evaluation report approved on 09/27/13, ADAMS Accession No. ML13240A320). B2. Revise Unit 1 Reactor Vessel Surveillance Program procedures to incorporate an NRC-approved schedule for capsule withdrawals to meet ASTM E185-82 requirements, including the possibility of operation beyond 60 years (refer to the TVA Letter to NRC, "Sequoyah Nuclear Plant, Revision to Reactor Pressure Vessel Surveillance Capsule Withdrawal Schedule for License Renewal," dated May 14, 2015). C. Revise Reactor Vessel Surveillance Program procedures to withdraw and test a standby capsule to cover the peak fluence expected at the end of the period of extended operation.	B.1.35	SQN1: Prior to 03/17/2020 SQN2: Prior to 03/15/2021	Letter ML13190A276 (7/1/13) Letter ML15197A176 (7/10/15)

This Commitment Revision supersedes all previous versions.

APPENDIX B

CHRONOLOGY

This appendix lists chronologically the routine licensing correspondence between the staff of the U.S. Nuclear Regulatory Commission (NRC) (the staff) and the Tennessee Valley Authority (TVA, the applicant) for Sequoyah Nuclear Plant (SQN), Units 1 and 2, during the period of review for this supplemental safety evaluation report. This appendix also lists other correspondence regarding the staff's review of the license renewal application (LRA) (under Docket Nos. 50-327 and 50-328).

Table B-1 Chronology

Date	Accession No.[a] or *Federal Register* No.	Subject
9/27/2013	ML13240A320	Letter to Mr. Joseph W. Shea, TVA, "Sequoyah Nuclear Plant, Units 1 and 2 - Revise the Reactor Pressure Vessel Material Surveillance Capsule Withdrawal Schedule Due to License Renewal Amendment (TAC Nos. MF0631 and MF0632)."
5/14/2015	ML15134A377	Letter from Mr. Joseph W. Shea, TVA, "Sequoyah, Units 1 and 2 - Revision to the Reactor Pressure Vessel Surveillance Capsule Withdrawal Schedule for License Renewal."
6/22/2015	ML15159B164	Letter to Mr. Joseph W. Shea, TVA, "Requests for Additional Information for the Review of the Sequoyah Nuclear Plant, Units 1 and 2, License Renewal Application – Set 25 (TAC Nos. MF0481 and MF0482)."
6/23/2015	ML15152A031	Summary of Telephone Conference Call Held on May 13, 2015, between the U.S. NRC and TVA, concerning RAI, Set 24 Pertaining to the Sequoyah Nuclear Plant License Renewal Application. (TAC Nos. MF0481 and MF0482)
7/10/2015	ML15197A176	Letter from Mr. Joseph W. Shea, TVA, "Sequoyah, Units 1 and 2 - Revision to Commitment No. 28 and Review of Impacts to the SQN Reactor Vessel Internals Aging Management Program Due to Dislodged Reactor Vessel Surveillance Capsules in Unit 1 Reactor."
8/3/2015	ML15215A647	Letter from Mr. Joseph W. Shea, TVA, "Sequoyah Nuclear Plant, Units 1 and 2 – Response to NRC Request for Information regarding the Review of the License Renewal Application, Set 25 (TAC Nos. MF0481 and MF0482)."
8/3/2015	ML15215A656	Letter from Mr. Joseph W. Shea, TVA, "Supplement to TVA Letter, "Sequoyah Nuclear Plant - Revision to Commitment No. 28 and Review of Impacts to the SQN Reactor Vessel Internals Aging Management Program Due to Dislodged Reactor Vessel Surveillance Capsules in Unit 1 Reactor."
8/17/2015	ML15226A592	Letter from Mr. Joseph W. Shea, TVA, "Second Annual Update to the Sequoyah Nuclear Plant, Units 1 and 2, License Renewal Application (TAC Nos. MF0481 and MF0482)."
8/28/2015	ML15240A145	Letter from Mr. Joseph W. Shea, TVA, "Supplement to Second Annual Update to the Sequoyah Nuclear Plant, Units 1 and 2, License Renewal Application (TAC Nos. MF0481 and MF0482)."

Date	Accession No.[a] or *Federal Register* No.	Subject
8/28/2015	ML15236A067	Summary of Telephone Conference Call Held on August 20, 2015, between the U.S. NRC and TVA, concerning the August 17, 2015 Annual Update to the Sequoyah Nuclear Plant License Renewal Application. (TAC Nos. MF0481 and MF0482)
9/1/2015	ML15233A035	Summary of Telephone Conference Call Held on July 20, 2015, between the U.S. NRC and TVA, concerning RAI, Set 25 Pertaining to the Sequoyah Nuclear Plant License Renewal Application. (TAC Nos. MF0481 and MF0482)
9/4/2015	ML15238A342	Summary of Telephone Conference Call Held on July 22, 2015, between the U.S. NRC and TVA, concerning RAI, Set 25 Pertaining to the Sequoyah Nuclear Plant License Renewal Application. (TAC Nos. MF0481 and MF0482)
9/24/2015	ML15244B222	Letter to Mr. Joseph W. Shea, TVA, "Sequoyah Nuclear Plant, Units 1 and 2 – Revision To The Unit 1 Reactor Vessel Surveillance Capsule Schedule For License Renewal (TAC NOS. MF6620 AND MF6621)"

[a] Accession numbers can be used to find documents in the NRC's Agencywide Documents Access and Management System.

APPENDIX C

PRINCIPAL CONTRIBUTORS

This appendix lists the principal contributors for the development of this supplemental safety evaluation report and their areas of responsibility.

Table C-1 Principal Contributors

Name	Responsibility
Buford, Angela	Reviewer – Structural
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Doutt, Cliff	Reviewer – Electrical
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Marshall, Michael	Management Oversight
Medoff, Jim	Reviewer – Reactor Systems
Miller, Chris	Management Oversight
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Morey, Dennis	Management Oversight
Purtcher, Patrick	Reviewer – Reactor Vessel Internals
Sayoc, Emmanuel	Project Management
Wittick, Brian	Management Oversight
Zimmerman, Jacob	Management Oversight

APPENDIX D

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This appendix lists the references used throughout this supplemental safety evaluation report for review of the license renewal application (LRA) for Sequoyah Nuclear Plant (SQN), Units 1 and 2.

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11. ABSTRACT (200 words or less)

This supplemental safety evaluation report (SER) documents the technical review of the Sequoyah Nuclear Plant Units 1 and 2 (SQN), license renewal application (LRA) by the United States Nuclear Regulatory Commission (NRC) staff (the staff). By letter dated January 7, 2013, Tennessee Valley Authority (TVA) submitted the LRA in accordance with Title 10 of the Code of Federal Regulations Part 54, "Requirements for Renewal of Operating Licenses for Nuclear Power Plants." TVA requests renewal of the SQN operating licenses (Operating Licenses Nos. DPR-77 and DPR-79) for a period of 20 years beyond the current expiration at midnight September 17, 2020 and September 15, 2021, for Unit 2, respectively. This supplemental SER documents the staff's review and findings related to recent SQN Unit 1 reactor vessel internals operating experience events.

SQN is located approximately 9.5 miles northeast of Chattanooga, Tennessee. The NRC issued SQN construction permits on May 27, 1970, and the operating licenses for SQN on September 17, 1980, for Unit 1, and September 15, 1981, for Unit 2. SQN is a dual pressurized water reactor nuclear steam supply system, with four coolant loops for each unit furnished by Westinghouse Electric Corporation. SQN has a licensed power output of 3455 megawatts thermal.

This supplemental SER presents the status of the staff's review of information through August 28, 2015, the cutoff off date for consideration in the supplemental SER.

12. KEY WORDS/DESCRIPTORS (List words or phrases that will assist researchers in locating the report.)
10 CFR Part 54
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