Tennessee Valley Authority, 1101 Market Street, Chattanooga, Tennessee 37402

CNL-15-146

August 3, 2015

10 CFR 50.4
10 CFR Part 54

ATTN: Document Control Desk
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555-0001

Sequoyah Nuclear Plant, Units 1 and 2
Facility Operating License Nos. DPR-77 and DPR-79
NRC Docket Nos. 50-327 and 50-328

Subject: **Response to NRC Request for Information regarding the Review of the Sequoyah Nuclear Plant, Units 1 and 2, License Renewal Application, Set 25 (TAC NOS. MF0481 and MF0482)**

References:

1. TVA Letter to NRC, "Sequoyah Nuclear Plant, Units 1 and 2 License Renewal," dated January 7, 2013

2. NRC letter to TVA, "Safety Evaluation Report Related to the Sequoyah Nuclear Plant, Units 1 and 2, License Renewal Application (TAC NOS. MF0481 and MF0482)," dated January 29, 2015

3. TVA letter to NRC, "Sequoyah Nuclear Plant - Revision to Reactor Pressure Vessel Surveillance Capsule Withdrawal Schedule for License Renewal," dated May 14, 2015

4. TVA Letter to NRC, "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," dated July 10, 2015

5. NRC letter to TVA, "Request 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)," dated June 22, 2015

By letter dated January 7, 2013 (Reference 1), Tennessee Valley Authority (TVA) submitted a License Renewal Application (LRA) to the Nuclear Regulatory Commission (NRC) to renew the operating licenses for the Sequoyah Nuclear Plant (SQN), Units 1 and 2. The request would extend the licenses for an additional 20 years beyond the current expiration date.

Reference 2 provided NRC's final Safety Evaluation Report that concluded that TVA's LRA was complete and indicated that all open items were closed. In Reference 3, TVA provided a revised Reactor Vessel Surveillance Capsule (RVSC) Withdrawal Schedule for SQN Unit 1 following the dislodged RVSCs found in SQN Unit 1 during the end of cycle R20 Refueling Outage. In Reference 4, TVA revised License Renewal Commitment #28 associated with the revised RVSC withdrawal schedule and provided TVA's review of the impacts to the SQN Reactor Vessel Internals Aging Management Program.

By Reference 5, NRC requested that TVA provide additional information to address any damage to reactor vessel internals from the dislodged capsule pieces. The NRC requested that TVA provide the information within 30 days from the date of the Reference 5 letter, i.e., by July 22, 2015. During a teleconference between TVA and the NRC on July 20, 2015, TVA discussed the proposed responses to the Reference 5 request for additional information (RAI). Based on NRC feedback, TVA has modified the proposed RAI response. The NRC agreed to a revised due date of August 3, 2015.

The enclosure to this letter provides the requested additional information.

Please address any questions regarding this submittal to Erin Henderson, SQN Site Licensing Manager, at (423) 843-7170.

I declare under penalty of perjury that the foregoing is true and correct. Executed on this 3rd day of August 2015.

Respectfully,

J. W. Shea
Vice President Nuclear Licensing

Enclosure:

Responses to NRC Requests for Additional Information regarding Sequoyah Nuclear Plant Unit 1 License Renewal

cc: (Enclosure)
NRC Regional Administrator, Region II
NRC Senior Resident Inspector
NRC Project Manager – Sequoyah Nuclear Plant

ENCLOSURE

Tennessee Valley Authority

Responses to NRC Requests for Additional Information regarding Sequoyah Nuclear Plant Unit 1 License Renewal

ENCLOSURE

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Responses to NRC Requests for Additional Information regarding
Sequoyah Nuclear Plant Unit 1 License Renewal

RAI 3.0.3.2.17-1a (Surveillance Capsule Operating Experience Followup)

Background:

During Refueling Outage No. 20 at Sequoyah Nuclear Plant (SQN), Unit 1, inservice inspections of the reactor vessel internals (RVI) revealed that two reactor pressure vessel (RPV) surveillance capsules had become dislodged from their baskets and that capsule pieces or specimens from at least one of these capsules had become loose inside the Unit 1 RPV. Apparent damage to some RVI components was noted by Tennessee Valley Authority (TVA or the applicant).

Issue:

Any damage to RVI components should be assessed to demonstrate that stress profiles for the damaged components remains bounded by those assumed for the as-built component configurations in the applicable Materials Reliability Program (MRP) reports; this is regardless of whether the damage was induced by an age-related aging effect.

In addition, the staff is concerned that any damage that occurred from the impacts of the loose parts (e.g., causing cold work to the affected components) could create a preferential site for initiation of degradation, such as stress corrosion cracking, during the period of extended operation. Evaluation should adequately address the use of future examinations of the damaged locations using inspection methods that will address this issue.

Request:

(1) 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 reactor internals, in particular the long term prospects for initiation of stress corrosion cracking in the damaged internals.

(2) Provide a basis for not performing subsequent re-inspections of the damaged locations of the Unit 1 reactor internals using inspection methods that will effectively address impact-related damage.

TVA Response to Question 1

As detailed in LTR-RIAM-15-40 (Enclosure 2 of Reference 1), there were several categories of observations made for the Sequoyah Nuclear Plant (SQN) Unit 1 Reactor Vessel Internals (RVI) during refueling outage No. 20. These were scratches, rub marks, staining or red rust corrosion marks, and some small pieces of debris.

- The scratches and light rub marks are surface damage only and would typically only indicate the removal of the surface oxide to reveal the shiny base metal underneath. Any cold work caused in this way would be limited to the very near surface and is expected to be no higher than the near-surface cold work left behind by the original fabrication processes of the component. This type of superficial damage is not expected to increase the likelihood of cracking or to have an impact on the conclusions of the expert panel review in MRP-191 (Reference 2).

- Deep rub marks may have left slightly more surface cold work behind, depending on how they were formed. However, the deep rub marks discovered in the SQN Unit 1 RVI components were located at low stress locations. Even considering the possible localized loss of component cross-sectional area and the potential slight increase in cold work, cracking is not expected and the likelihood of failure considered in MRP-191 is unchanged. The following details are provided regarding the specific deep rub marks:

    - The stress at the location of the rub mark on the instrument guide extension G-5 (see Figure 1) was evaluated. The stress was calculated to be well below 5 ksi even if a hypothetical reduction in depth of 5% is assumed along with a conservative stress concentration factor. Thus, the rub on the instrument guide extension would not have an impact on the potential for cracking in this component.

    - The location of the rub mark on the bottom plate of the energy absorber (see Figure 2) is an area of low stress because of the geometry and function of the component. Structurally, this plate only supports its own weight and is subject to minimal effects from thermal or flow-induced stresses during operation. Thus, the rub on the plate would not have an impact on the potential for cracking in this component.

- Staining and red rust corrosion marks are likely a result of low alloy steel pieces resting in contact with the RVI component for some time without moving. By the very presence of the staining, it shows that there was no cold work-inducing process occurring, such as rubbing or impacting.

- The small pieces of debris were dispositioned and did not appear to be associated with impact or rubbing damage, which could have caused localized cold work.

Based on these observations and evaluations, potential loose part-induced surface cold work is not expected to have a significant impact on the affected RVI components. Thus, the assumptions used in the screening and expert panel review of MRP-191 and the inspection and evaluation guidance of MRP-227-A are still valid for the SQN Unit 1 RVI.

TVA Response to Question 2

Expanded subsequent re-inspections of the locations with observed off-normal conditions in the SQN Unit 1 RVI are not necessary based on the existing dispositions and inspections. As noted in the response to question 1 of this RAI and letter LTR-RIAM-15-40 (Enclosure 2 of Reference 1), the observed off-normal conditions were all dispositioned as having no impact on the current aging management program at SQN. The SQN aging management program is based on implementation of the industry guidance of MRP-227-A and the existing ASME Section XI 10-year in-service inspection (ISI) program at SQN Unit 1. Because the observations during Refueling Outage No. 20 have no impact on the current aging management program and they did not create an increased potential for stress corrosion cracking due to imposing cold work, no additional inspections are required. Without a driver for degradation initiation or propagation, there is no basis to identify or technically justify a cause for concern that this operating experience would cause a non-compliance with or need for a change in existing MRP-227-A period of extended operation component aging management requirements. The current MRP-227-A guidance remains unchanged for SQN Unit 1, and the existing RVI aging management program provides reasonable assurance of the integrity and functionality of the RVI.

Potential for Additional Loose Parts

Following discovery of the failed specimen components in the Unit 1 reactor vessel, Foreign Object Search and Retrieval (FOSAR) and 10-year ISI inspections were performed during transfer of the lower internals and after placement on the stand. The total areas inspected for loose parts included the reactor vessel, the upper and lower internals, the cavity floor, and the fuel assemblies. FOSAR was recorded and performed prior to the 10-year ISI inspections to prevent debris from limiting the inspection coverage. Loose parts found during the inspections were either removed with gripping tools or vacuumed into a debris basket.

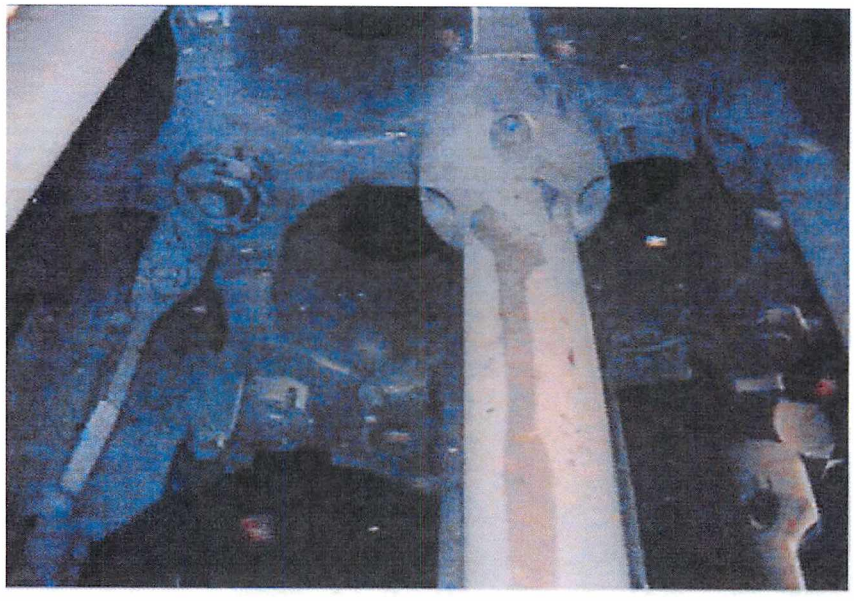
TVA's inspections provide a high confidence level that loose parts were retrieved. If any loose parts remain, they are expected to be of insufficient size to cause impact damage.

Following startup from the Unit 1 refueling outage, loose part monitoring has not identified any indication of loose parts in the Unit 1 reactor vessel. If Foreign Material Exclusion (FME) inspections in subsequent Unit 1 refueling outages find loose parts, the findings will be entered into the corrective action program for further evaluation of potential impacts to the RVI program. This is consistent with TVA's implemented Operating Experience commitment 37 and Section A.1 of the SQN License Renewal Application Appendix A.

References:

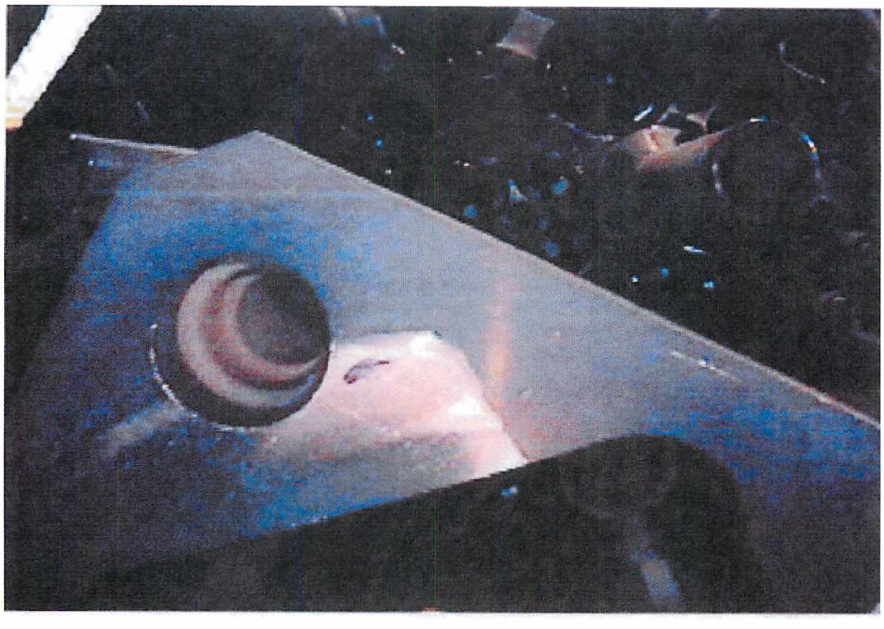
1. TVA Letter to NRC, "Sequoyah Nuclear Plant – Revision to Commitment No. 28 and Review of Impacts to the SQN Reactor Vessel Internals Aging Management Program Due to Dislodged Reactor Vessel Surveillance Capsules in Unit 1 Reactor," dated July 10, 2015

2. Materials Reliability Program: Screening, Categorization, and Ranking of Reactor Internals Components for Westinghouse and Combustion Engineering PWR Design (MRP-191). EPRI, Palo Alto, CA: 2006. 1013234



Deep rub shown on instrument guide extension G-5.

Figure 1



Deep rub on bottom surface of energy absorber ~180°.

Figure 2