UNITED STATES
NUCLEAR REGULATORY COMMISSION
REGION II
245 PEACHTREE CENTER AVENUE NE, SUITE 1200
ATLANTA, GEORGIA 30303-1257

March 18, 2013

EA-13-045

Mr. Joseph W. Shea
Vice President, Nuclear Licensing
Tennessee Valley Authority
1101 Market Street, LP 3D-C
Chattanooga, TN 37402-2801

SUBJECT: SEQUOYAH NUCLEAR PLANT - NRC INSPECTION REPORT 05000327/2013010, 05000328/2013010; PRELIMINARY GREATER THAN GREEN FINDING AND APPARENT VIOLATION

Dear Mr. Shea:

On February 28, 2013, the U.S. Nuclear Regulatory Commission (NRC) completed an inspection at your Sequoyah Nuclear Plant Units 1 and 2. The enclosed inspection report documents the inspection results which were discussed on March 14, 2013, with you and other members of your staff.

The inspection examined activities conducted under your license as they relate to safety and compliance with the Commission's rules and regulations and with the conditions of your license. The inspectors reviewed selected procedures and records, observed activities, and interviewed personnel.

The enclosed inspection report discusses one finding and associated Apparent Violation (AV) involving the site's flood mitigation strategy. Additional information regarding the basis for the NRC staff's significance determination is provided as an attachment to this letter. This finding was evaluated using the NRC Reactor Oversight Process (ROP).

This finding has preliminarily been determined to be Greater Than Green, a finding of greater than very low safety significance, that may require additional NRC inspections. As described in the enclosed report, the finding involved the failure to translate the design basis related to onsite flooding into specifications, drawings, procedures, and instructions. Specifically, Sequoyah's existing design documentation including current licensing documents and configuration controlled drawings for the Essential Raw Cooling Water (ERCW) Pumping Station did not contain information to identify flood barriers to prevent water from flooding the building during a design basis flood (DBF). The ERCW Intake Station is required to remain dry during flood mode operations. Portions of the ERCW walls and penetrations are relied upon to withstand all static and dynamic forces imposed by the DBF. As a result of degraded or missing flood penetration seals, the ERCW pump station would not have remained functional when subjected

to the design basis Probable Maximum Flood (PMF) and other less severe flooding events. The PMF is the flood that may be expected from the most severe combination of critical meteorological and hydrologic conditions that are reasonably possible in a particular drainage area. Flooding of the ERCW Pumping Station would have resulted in submerging service water equipment relied on during DBF events which would have compromised the function of the Emergency Diesel Generators (EDGs). Failure of the EDGs would have resulted in an ineffective flood mitigation strategy to protect core cooling. The risk significance of this finding was based on postulated credible flooding events. There was no actual adverse impact on public health and safety.

This issue was assessed based on the best available information, using the applicable Significance Determination Process (SDP) in accordance with Inspection Manual Chapter (IMC) 0609, Appendix M. Following the initial review of this matter using preliminary quantitative analysis, Appendix M was used considering the uncertainties in the bounding analysis and the insights from the qualitative review. There is a lack of quantitative data and probabilistic risk assessment tools to accurately assess the risk significance of the performance deficiency in a timely manner. We also understand that this finding is not an immediate safety concern because compensatory measures have been in place since December 15, 2012, to address this degraded condition by mitigating the consequences of the degraded penetration seals during a postulated flooding event and that permanent repairs are in progress. The finding is also an apparent violation of NRC requirements and is being considered for escalated enforcement action in accordance with the NRC Enforcement Policy which can be found on the NRC's Web site at http://www.nrc.gov/about-nrc/regulatory/enforcement/enforce-pol.html.

In reviewing the risk significance of this issue, the staff noted potential risk contribution from floods of greater frequency and levels which are below the DBF, such as the 100-year return period flood. To refine the risks associated with this finding, additional insights into flooding event frequencies, Large Early Release Frequency (LERF) considerations, equipment failure timelines during flooding events, and potential recovery actions of the involved equipment would be beneficial to the NRC. The final resolution of this finding will be conveyed in separate correspondence.

In accordance with NRC Inspection Manual Chapter (IMC) 0609, Significance Determination Process, we intend to complete our risk evaluations using the best available information and issue our final significance determination within 90 days of the date of this letter. The Significance Determination Process encourages an open dialogue between the NRC staff and the licensee; however, the dialogue should not impact the timeliness of the staff's final determination. Before the NRC makes its final decision on this matter, we are providing you an opportunity to either: (1) present to the NRC your perspectives on the facts and assumptions used by the NRC to arrive at this finding and the significance at a Regulatory Conference, or (2) submit your position on this finding to the NRC in writing. If you request a Regulatory Conference, it should be held within 30 days of the receipt of this letter and we encourage you to submit supporting documentation at least one week prior to the conference to make the conference more efficient and effective. If a Regulatory Conference is held, it will be open for public observation. The NRC will also issue a press release to announce the conference. If you decide to submit only a written response, such a submittal should be sent to the NRC within 30 days of the receipt of this letter. If you decline to request either a Regulatory Conference or submit a written response, you relinquish your right to appeal the final significance

determination; in that, by not doing either you fail to meet the appeal requirements stated in the Prerequisites and Limitations sections of Attachment 2 of IMC 0609.

If you choose to provide a written response, it should be clearly marked as "Response to Apparent Violation in Inspection Report No. 05000327; 328/2013010"; EA-13-045, and should include for the apparent violation: the reason for the apparent violation, or, if contested, the basis for disputing the apparent violation; the corrective steps that have been taken and the results achieved; the corrective steps that will be taken to avoid further violations; and the date when full compliance will be achieved. Your response may reference or include previously docketed correspondence, if the correspondence adequately addresses the required response. If an adequate response is not received within the time specified or an extension of time has not been granted by the NRC, the NRC will proceed with its enforcement decision.

Please contact Scott Shaeffer at (404) 997-4521 within 10 days of the date of this letter to notify the NRC of your intended response. If we have not heard from you within 10 days, we will continue with our significance determination decision. The final resolution of this matter will be conveyed in separate correspondence.

Since the NRC has not made a final determination as to the significance of this issue, no Notice of Violation is being issued at this time. Please be advised that the characterization of the apparent violation described in the enclosure may change as a result of further NRC review. You will be advised by separate correspondence of the results of our deliberations on this matter.

In accordance with 10 CFR 2.390 of the NRC's "Rules of Practice," a copy of this letter, its enclosure, and your response, if you choose to provide one, will be made available electronically for public inspection in the NRC Public Document Room or from the NRC's Agencywide Documents Access and Management System (ADAMS), accessible from the NRC Web site at http://www.nrc.gov/reading-rm/adams.html. To the extent possible, your response should not include any personal privacy, proprietary, or safeguards information so that it can be made available to the Public without redaction.

Sincerely,
/RA/

Richard P. Croteau, Director
Division of Reactor Projects

Docket No.: 50-327, 50-328
License No.: DPR-77, DPR-79

Enclosures:
1. NRC Inspection Report 05000327; 328/2013010
   w/Attachment: Supplemental Information
2. Phase 3: Degraded Intake Pumping Station
   Flooding Barriers **(OFFICIAL USE ONLY – SECURITY RELATED INFORMATION)**

cc w/encls: (See page 4)

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U. S. NUCLEAR REGULATORY COMMISSION

REGION II

Docket Nos.:	50-327, 50-328
License Nos.:	DPR-77, DPR-79
Report Nos.:	05000327/2013-010, 05000328/2013-010
Licensee:	Tennessee Valley Authority (TVA)
Facility:	Sequoyah Nuclear Plant, Units 1 and 2
Location:	Sequoyah Access Road Soddy-Daisy, TN 37379
Dates:	August 1, 2012 through February 28, 2013
Inspectors:	G. Smith, Senior Resident Inspector W. Deschaine, Resident Inspector
Approved by:	Scott M. Shaeffer, Chief Reactor Projects Branch 6 Division of Reactor Projects

SUMMARY OF FINDINGS

IR 05000327/2013-010, 05000328/2013-010; 08/1/2012 – 02/28/2013; Sequoyah Nuclear Plant, Units 1 and 2; Operability Determinations and Functionality Assessments

This inspection was conducted by the resident inspectors. One Apparent Violation was identified. The significance of most findings is indicated by their color (Green, White, Yellow, or Red) using Inspection Manual Chapter (IMC) 0609, "Significance Determination Process" (SDP) dated June 2, 2011. Findings for which the SDP does not apply may be Green or be assigned a severity level after NRC management review. Cross-cutting aspects are determined using IMC 0310 “Components Within the Cross-Cutting Areas” dated October 28, 2011. All violations of NRC requirements are dispositioned in accordance with the NRCs Enforcement Policy dated June 7, 2012. The NRC's program for overseeing the safe operation of commercial nuclear power reactors is described in NUREG-1649, "Reactor Oversight Process," Revision 4, dated December 2006.

A. NRC-Identified and Self-Revealing Findings

Cornerstone: Mitigating Systems

- TBD: The licensee identified an apparent violation (AV) of 10 CFR 50, Appendix B, Criterion III, Design Control, for the failure to ensure that the Essential Raw Cooling Water (ERCW) pumping station would be maintained dry during a design basis flood as required by Sequoyah’s Current Licensing Basis (CLB). The inspectors determined that the failure of the licensee to provide adequate design control to ensure that the ERCW pumping station would be maintained dry during a design basis flood as required by Sequoyah’s Current Licensing Basis (CLB) was a performance deficiency. Specifically, the design basis of Sequoyah’s ERCW Pumping Station was not translated into design requirements and drawings that would prevent water from flooding the building during a design basis flood. In addition, some ERCW conduit seals intended to be flooding barriers were not maintained as designed and were found incapable of performing their intended design function. This performance deficiency was considered more than minor because it was associated with the Protection Against External Factors attribute of the Reactor Safety/ Mitigating Systems Cornerstone and adversely affected the cornerstone objective of ensuring availability, reliability, and capability of systems that respond to initiating events to prevent undesirable consequences (i.e., core damage). Specifically, the lack of flood barriers (conduit seals or plugs) would cause the ERCW building to flood. Flooding the ERCW building would cause a loss of the ERCW strainers and traveling water screens, which would eventually cause a loss of safety function for both units’ ERCW trains. Loss of the all ERCW function would lead to loss of the site Emergency Diesel Generators (EDGs) to perform their function and would lead to core damage. This has an impact of greater than very low safety significance. The NRC concluded that the significance of the finding is preliminarily Greater than Green. Because the safety significance of this finding is potentially Greater than Green it is being treated as an NRC-identified finding.

The finding was determined to have a cross-cutting aspect in the Work Practices component of the Human Performance cross-cutting area [H.2(c)] for failure to provide adequate design documentation to address flood barriers. This would have adversely affected nuclear safety during a design basis flood (DBF). (Section 1R15)

B. Licensee-Identified Violations

None.

REPORT DETAILS

1. REACTOR SAFETY

Cornerstones: Initiating Events, Mitigating Systems, and Barrier Integrity

1R15 Operability Determinations and Functionality Assessments

a. Inspection Scope

The inspectors evaluated the technical adequacy of the three operability evaluations described in the Problem Evaluation Reports (PERs) listed below, to ensure that TS operability was properly justified and the subject component or system remained available, such that no unrecognized increase in risk occurred. The inspectors compared the operability evaluations to Updated Final Safety Analysis Report (UFSAR) descriptions to determine if the system or component's intended function(s) were adversely impacted. In addition, the inspectors reviewed compensatory measures implemented to determine whether the compensatory measures worked as stated and the measures were adequately controlled. The inspectors also reviewed a sampling of PERs to assess whether the licensee was identifying and correcting any deficiencies associated with operability evaluations. Documents reviewed are listed in the Attachment. The inspectors completed three samples.

- PER 610005 – essential raw cooling water (ERCW) leak path
- PER 594536 – Seal Conduit at ERCW to prevent Flood Water Entry
- PER 594568 – Install threaded plug at ERCW to prevent Flood Water Entry

b. Findings

Degraded Intake Pumping Station Flooding Barriers

Introduction: The licensee identified an apparent violation (AV) of 10 CFR 50, Appendix B, Criterion III, Design Control, for the failure to ensure that the ERCW pumping station would be maintained dry during a design basis flood as required by Sequoyah's Current Licensing Basis (CLB).

Description: On March 12, 2012, the NRC sent a letter to licensees, entitled "Request for Information Pursuant to Title 10 of the Code of Federal Regulations 50.54(f) Regarding Recommendations 2.1, 2.3, and 9.3, of the Near-Term Task Force (NTTF) Review of Insights from the Fukushima Dai-Ichi Accident," (ADAMS Accession No. ML12053A340). Enclosure 4 of the letter requested licensees to perform external flooding walkdowns using an NRC-endorsed walkdown methodology (ADAMS Accession No. ML12056A050). Nuclear Energy Industry (NEI) document 12-07 titled, "Guidelines for Performing Verification Walkdowns of Plant Protection Features," (ADAMS Accession No. ML12173A215) provided the NRC-endorsed methodology for assessing external flood protection and mitigation capabilities to verify that plant

features, credited in the CLB for protection and mitigation from external flood events, and are available, functional, and properly maintained. TVA incorporated NEI 12-07 into their walkdown procedure CTP-FWD-100, "Flood Protection Walkdowns NEI 12-07," issued on July 12, 2012.

During these NTTF-2.3 Fukushima reviews, which included reviews of applicable drawings, the licensee discovered that the ERCW pumping station penetrations may not have adequate seals in the lower levels of the building. This is contrary to FSAR Section 2.4A.2.1 that states the ERCW pumping station will be maintained dry during flood mode. The FSAR also states that the ERCW pumping station's walls and penetrations are designed to withstand all static and dynamic forces imposed by the design basis flood (DBF). The licensee entered these issues in their Corrective Action Program (CAP) as PERs 610005, 594536, and 594568.

PERs 594536 & 594568 were entered into the licensee's CAP on August 13, 2012, to document two open penetrations in the North side wall of the ERCW pumping station near the East corner around elevation 713 feet and 719 feet. Both of these penetrations were missing a threaded plug and would let flood water enter the 2A ERCW Bay. The subject holes were later plugged by the licensee. PER 610005 was entered into the licensee's CAP on September 16, 2012, documenting that conduit duct banks at the ERCW pumping station may not have water stops installed to keep water from entering the building. This was based on review of applicable drawings and not actual inspection of the penetrations.

During their evaluation, the licensee reviewed Sequoyah's Current Licensing Basis (CLB) and evaluated what design output (i.e. flood barrier) was installed to ensure that the ERCW pumping station shall be maintained dry during flood mode. The licensee identified Drawing 1,2-45W880-26 which allowed for different types of conduit seals to be installed in the plant, including the conduit duct banks entering the ERCW pumping station. These seals would be subjected up to approximately 30 feet of water head pressure during the postulated DBF events. Based on the drawings, most of these seals did not appear to be adequate to protect against water intrusion for these design basis flood pressures. The licensee entered this discovery into their CAP as PER 636178.

Based on questions from the NRC on September 19, 2012, the licensee was unable to locate a detailed drawing that showed what was actually installed in the field. Based on this information, the licensee developed a functional evaluation (FE) for PER 610005 and concluded that the potential lack of adequate water stops in the conduit duct banks at the ERCW pumping station result in a non-conformance with Sequoyah's CLB. The FE stated that this condition was non-conforming due to failure to meet FSAR Section 2.4.A.2.1 and this was also a degraded condition requiring a compensatory measure in order for the design basis flood event to be successfully mitigated. As a compensatory measure, the licensee installed four temporary sump pumps, one associated with each ERCW non-safety related building sump. These pumps were rated at 600 gallon per minute (gpm). In addition, the licensee issued Design Change Notice (DCN) 23097 to

insert more robust conduit seals into manhole 33, the location of the seals for the conduit duct banks entering the ERCW pumping station.

On December 12. 2012, the licensee opened one of the four bays for manhole 33 to help plan the work orders to fix the potentially inadequate water stops as documented in PER 610005. Based on their observations, the licensee determined that the ERCW Station Building was at risk of flooding during a design basis flood due to numerous conduit penetrations not being protected with adequate or missing flooding seals. The lack of flood seals would allow flood waters to enter the ERCW building at a rate greater than the existing or additional temporary sump pumps could remove. This condition placed both units in an unanalyzed condition that significantly degraded plant safety (10 CFR 50.72 (b)(3)(ii)(B)), and could prevent the fulfillment of the safety related function of ERCW needed to shutdown the reactor and maintain it in a safe shutdown condition. The licensee made a subsequent eight hour NRC notification for this discovery (Event Notification #48584). The licensee entered this condition into their CAP as an "A" level PER (PER 655763) which requires a Root Cause Analysis (RCA).

Subsequently, the licensee revised their original FE for PER 610005. Specifically, revision 1 of this FE determined that the temporary sump pumps that they had installed on November 19, 2012, under Temporary Alteration Control Form (TACF) 0-12-011-067, did not have adequate capacity to keep up with the amount of water that potentially could enter through the conduit duct banks. This determination was made after the licensee performed a hydraulic calculation of the potential flow rate into the ERCW pumping station through the conduit banks and the flow rate that the sump pumps could remove. The licensee revised Temporary Alteration Control Form (TACF) 0-12-011-067 to add larger capacity sump pumps (rated at 1866 gpm) that would ensure water could be removed from the ERCW bays if the design basis flood occurred until adequate seals could be installed. These larger capacity sump pumps were installed on December 15, 2012. The inspectors reviewed the updated FE and determined that these compensatory measures were adequate to mitigate the potential in leakage of flood water into the ERCW structure during a postulated flooding event.

Analysis: The inspectors determined that the failure of the licensee to provide adequate design control to ensure that the ERCW pumping station would be maintained dry during a design basis flood as required by Sequoyah's Current Licensing Basis (CLB) was a performance deficiency. Specifically, the design basis of Sequoyah's Essential Raw Cooling Water (ERCW) Pumping Station was not translated into design requirements and drawings that would prevent water from flooding the building during a design basis flood. In addition, some ERCW conduit seals intended to be flooding barriers were not maintained as designed and were found incapable of performing their intended design function. This performance deficiency was considered more than minor because it was associated with the Protection Against External Factors attribute of the Reactor Safety/ Mitigating Systems Cornerstone and adversely affected the cornerstone objective of ensuring availability, reliability, and capability of systems that respond to initiating events to prevent undesirable consequences (i.e., core damage). Specifically, the lack of flood barriers (conduit seals or plugs) would cause the ERCW building to flood. Flooding the

ERCW building would cause a loss of the ERCW strainers and traveling water screens, which would eventually cause a loss of safety function for both units' ERCW trains. Loss of the all ERCW function would lead to loss of the site EDGs to perform their function and would lead to core damage. This has an impact of greater than very low safety significance. The NRC concluded that the significance of the finding is preliminarily Greater than Green.

A senior reactor analyst performed a Phase III evaluation in accordance with IMC 609, "Significance Determination Process," Appendix M, and determined that the treatment of this issue as a Greater than Green finding was appropriate given the frequencies associated with certain flooding events (e.g., PMP). However, certain rainfall events that could cause the performance deficiency to be revealed are of less severity, but greater frequency than a PMP and would add to the risk. Assessing these additional risk inputs would involve a much greater detailed analysis, thus is the basis for recommending the impact to be of Greater than Green significance. Because the safety significance of this finding is potentially Greater than Green it is being treated as an NRC-identified finding.

The finding was determined to have a cross-cutting aspect in the Work Practices component of the Human Performance cross-cutting area [H.2(c)] for failure to provide adequate design documentation to address flood barriers. This would have adversely affected nuclear safety during a DBF event.

Enforcement: 10 CFR 50, Appendix B, Criterion III, "Design Control," states in part, that measures shall be established to assure that applicable regulatory requirements and the design basis as specified in the license are correctly translated into specifications, drawings, procedures, and instructions.

The Sequoyah licensing basis related to onsite flooding is specified in UFSAR Section 2.4, "Hydrologic Engineering" and states in part, that the Essential Raw Cooling Water (ERCW) Intake Station will be maintained dry during a Design Basis Flood (DBF).

UFSAR Section 2.4.2.2, "Flood Design Considerations" states, "Protective measures are taken to ensure that all safety-related systems and equipment in the ERCW pump station will remain functional when subjected to the maximum flood level."

UFSAR Section 2.4A.2.1, "Flooding of Structures" states, "Only the Reactor Building, the Diesel Generator Building (DGB), and the Essential Raw Cooling Water Intake Station will be maintained dry during the flood mode. Walls and penetrations are designed to withstand all static and dynamic forces imposed by the DBF."

Contrary to the above, prior to December 15, 2012, the licensee failed to translate the design basis related to onsite flooding into specifications, drawings, procedures, and instructions. Specifically, Sequoyah's existing design documentation including current licensing documents and configuration controlled drawings for the ERCW Pumping Station do not contain information to identify Design Basis flood barriers to prevent water from flooding the building during a design basis flood. As a result, the ERCW pump

station would not remain functional when subjected to the PMF and other lesser flooding events, the ERCW Intake Station would not remain dry during flood mode, and portions of the ERCW walls and penetrations would not withstand all static and dynamic forces imposed by expected floods.

This violation is being treated as an AV, consistent with Section 2.3.3 of the NRC Enforcement Policy and is identified as AV 05000327, 328/2013010-01: Degraded Intake Pumping Station Flooding Barriers.

4OA6 Meetings

Exit Meeting Summary

On March 14, 2013, the resident inspectors presented the inspection results to Mr. J. Carlin and other members of his staff, who acknowledged the findings. The inspectors asked the licensee whether any of the material examined during the inspection should be considered proprietary. No proprietary information was identified.

SUPPLEMENTAL INFORMATION

KEY POINTS OF CONTACT

Licensee personnel
J. Carlin, Site Vice President
S. Connors, Operations Manager
J. Cross, Chemistry Manager
A. Day, Radiation Protection Manager
C. Dieckmann, Manager, Maintenance
J. Johnson, Program Manager Licensing
A. Little, Site Security Manager
T. Marshall, Director Safety and Licensing
M. Meade, Flooding Manager
S. McCamy, Quality Assurance Manager
P. Noe, Site Engineering Director
P. Pratt, Work Control Manager
R. Proffitt, Licensing Manager
P. Simmons, Plant Manager
K. Smith, Director of Training

NRC personnel
S. Lingam, Project Manager, Office of Nuclear Reactor Regulation

LIST OF ITEMS OPENED, CLOSED, AND DISCUSSED

Opened

05000327, 328/2013010-01	AV	Degraded Intake Pumping Station Flooding Barriers (Section 1R15)

LIST OF DOCUMENTS REVIEWED

Section R15: Operability Determinations and Functionality Assessments

Licensing Documents
UFSAR Section 2.4.A.2.1
TRM 3.7.6, "Flood Protection"
Regulatory Guide 1.59, "Design Basis Floods for Nuclear Power Plants"
Design Criteria Document: SQN-DC-V-12.1, "Sequoyah Nuclear Plant – Flood Protection Provisions

Calculations
CDQ000020080054, Rev. 0, 1, 2 and 3 PMF Determination for Tennessee River Watershed
CDQ000020080080, Rev. 2, Flood Levels at WBN and SQN from Seismic Dam Failures
CDQ000020080054, Rev. 3 (PMF Stillwater Elevation)
SCG1S120 (PMF + Wind Wave)

Procedures
AOP-N.03, External Flooding, Revision 42

Corrective Action Documents (PERs)
610005 – ERCW leak path
594536 – Seal Conduit at ERCW to prevent Flood Water Entry
594568 – Install threaded plug at ERCW to prevent Flood Water Entry
636178 -
655763 -

Work Orders
113783351
113786322

Drawings
1,2-45W880-26

Other
Event Notification #48584
TACF 0-12-011-067
DCN 23097