



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

March 12, 2013

10 CFR 50.54(f)

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

Sequoyah Nuclear Plant, Units 1 and 2  
Facility Operating Licensing No. DPR-77 and DPR-79  
NRC Docket Nos. 50-327 and 50-328

Watts Bar Nuclear Plant, Unit 1  
Facility Operating License No. NPF-90  
NRC Docket No. 50-390

Watts Bar Nuclear Plant, Unit 2  
Construction Permit No. CPPR-92  
NRC Docket No. 50-391

Subject: **Tennessee Valley Authority (TVA) - Extension Request Regarding the Flooding Hazard Reevaluation Report Required by NRC Request for Information Pursuant to Title 10 of the Code of Federal Regulations 50.54(f) Regarding Recommendation 2.1, Flooding, of the Near-Term Task Force Review of Insights from the Fukushima Dai-ichi Accident**

References:

1. NRC Letter, "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 Review of Insights from the Fukushima Dai-ichi Accident," dated March 12, 2012 (ML12053A340)
2. NRC Letter, "Prioritization of Response Due Dates for Request for Information Pursuant to Title 10 of the Code of Federal Regulations 50.54(f) Regarding Flooding Hazard Reevaluations for Recommendation 2.1 of the Near-Term Task Force Review of Insights from the Fukushima Dai-ichi Accident," dated May 11, 2012 (ML12097A509)

ADD  
NR

3. NRC Letter, "Supplemental Information Related to Request for Information Pursuant to Title 10 of the Code of Federal Regulations 50.43(f) Regarding Flooding Hazard Reevaluations for Recommendation 2.1 of the Near-Term Task Force Review of Insights from the Fukushima Dai-ichi Accident," dated March 1, 2013 (ML13044A561)

On March 12, 2012, the NRC issued the Reference 1 letter to all power reactor licensees and holders of construction permits in active or deferred status. Enclosure 2 of Reference 1 contains specific Requested Actions, Requested Information, and Required Responses for Near Term Task Force (NTTF) Recommendation 2.1 associated with reevaluation of flooding hazards at nuclear power plants. In a letter dated May 11, 2012 (Reference 2), the NRC categorized Sequoyah Nuclear Plant (SQN) and Watts Bar Nuclear Plant (WBN) as "Category 1" plants and established a due date for submission of the flooding hazard reevaluation of March 12, 2013.

In Reference 3, the NRC provided supplemental information stating incomplete Hazard Reevaluation Reports (HRRs) that only contain an analysis of some flooding hazard mechanisms would not be of substantive benefit for staff review and would not be acceptable. Therefore, licensees should not submit partial reports, but should instead submit an extension request on or before March 12, 2013.


The purpose of this letter is to request an extension to the March 12, 2013, due date for the SQN and WBN HRRs to May 29, 2015. This extension request was prepared using the guidance in Reference 3. For extension requests, Reference 3 states the following information should be included: 1) the reason for the delay; 2) a proposed schedule for the submittal of a complete Hazard Reevaluation Report; and 3) the basis for the acceptability of the revised schedule.

The reasons for the delay, detailed information regarding the proposed schedule, and the basis for the acceptability of the revised schedule are included in Enclosure 1 to this letter.

Enclosure 2 contains a list of new regulatory commitments regarding this letter. If you have questions regarding this matter, please contact Kevin Casey at (423) 751-8523.

I declare under penalty of perjury that the foregoing is true and correct. Executed on the 12th day of March 2013.

Respectfully,



J. W. Shea  
Vice President, Nuclear Licensing

Enclosures  
cc: See Page 2

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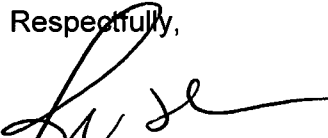
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**ENCLOSURE 1**

**REASON FOR THE DELAY  
AND THE BASIS FOR THE ACCEPTABILITY  
OF THE REVISED SCHEDULE**

## **Introduction**

On March 12, 2012, the NRC issued a letter pursuant to 10 CFR 50.54(f) to all power reactor licensees and holders of construction permits in active or deferred status. Enclosure 2 of the March 12, 2012 50.54(f) letter contains specific Requested Actions, Requested Information, and Required Responses for Near Term Task Force (NTTF) Recommendation 2.1 associated with reevaluation of flooding hazards at nuclear power plants. In a subsequent letter dated May 11, 2012, the NRC categorized Sequoyah Nuclear Plant (SQN) and Watts Bar Nuclear Plant (WBN) as "Category 1" plants and established a due date for submission of the flooding hazard reevaluation of March 12, 2013.

In a letter dated March 1, 2013, the NRC provided supplemental information stating that incomplete Hazard Reevaluation Reports (HRRs) containing an analysis of only some flooding hazard mechanisms would not be of substantive benefit for staff review and would not be acceptable. Therefore, licensees were advised not to submit partial reports, but rather to submit an extension request on or before March 12, 2013.

The purpose of this letter is to request an extension to the March 12, 2013, due date for the SQN and WBN HRRs to May 29, 2015. This extension request was prepared using the guidance in the NRC's March 1, 2013 letter. For extension requests, the March 1, 2013 NRC letter states the following information should be included: 1) the reason for the delay; 2) a proposed schedule for the submittal of a complete Hazard Reevaluation Report; and 3) the basis for the acceptability of the revised schedule. TVA's response to each of these specific requests follows.

### **Reason for the Delay**

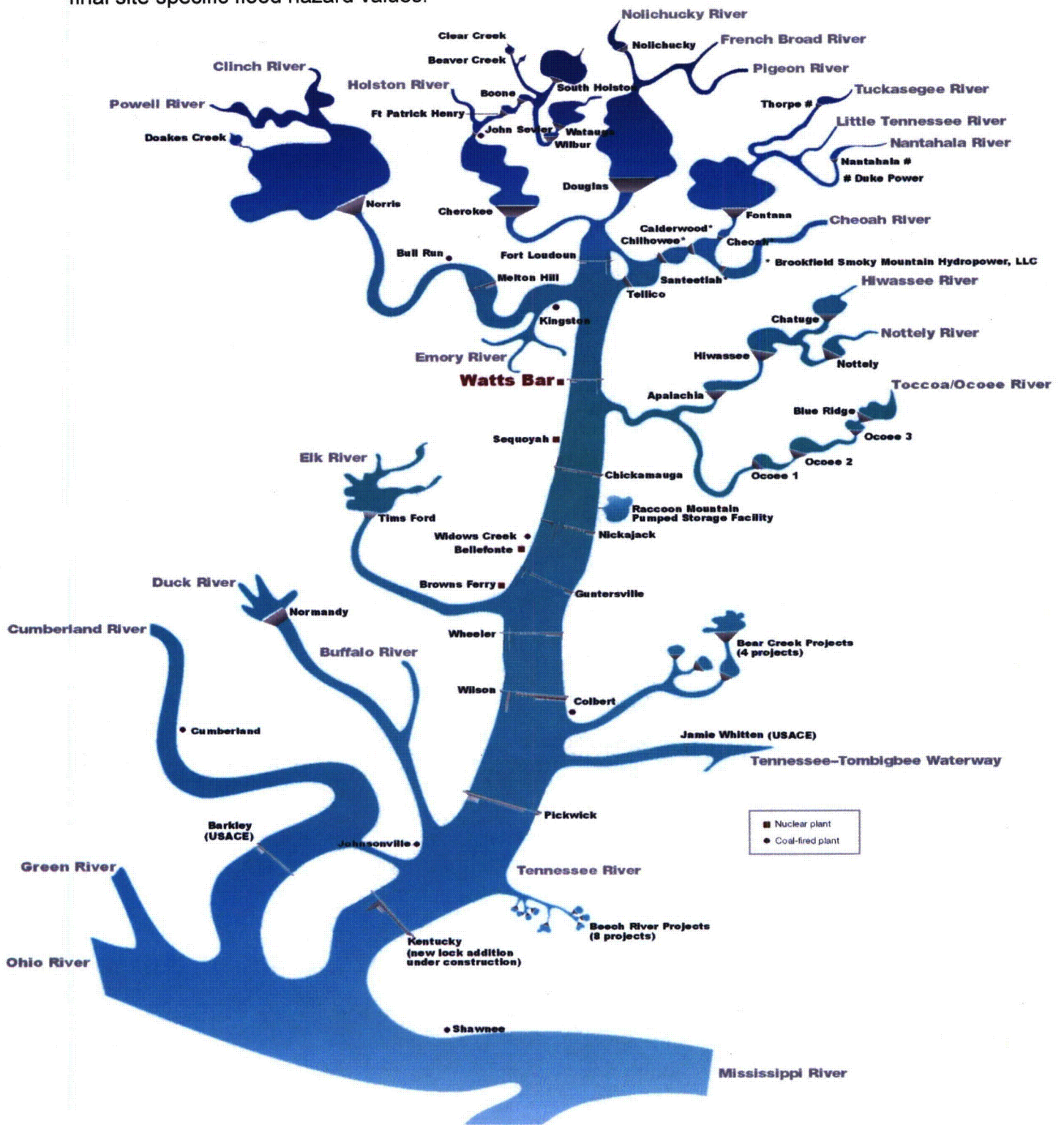
TVA is requesting an extension for completion of the SQN and WBN HRRs until May 29, 2015.

The overall scope of activities required to complete the HRRs for SQN and WBN are described in the section of this enclosure below "Summary of TVA's Hazard Reevaluation Report Project" and depicted in Attachment 1 to this Enclosure. As shown in Attachment 1, substantial activities have been completed to date on the project.

The overarching reason for the additional time is based on the significant number of dams upstream or downstream of SQN and WBN that must be evaluated in order to fully assess the flood hazard for the two sites. Specifically, based on the location of SQN and WBN on the Tennessee River, TVA must evaluate the stability of seventeen upstream and one downstream dam to determine if each of these dams is stable in both probable maximum flood and seismic loading conditions. Both SQN and WBN are located on the Chickamauga Lake, approximately 43.5 miles apart.

The 18 dams that will be analyzed to support the HRRs include Chickamauga, Blue Ridge, Apalachia, Hiwassee, Nottely, Chatuge, Watts Bar, Melton Hill, Norris, Tellico, Fontana, Fort Loudoun, Cherokee, Fort Patrick Henry, Boone, South Holston, Watauga, and Douglas. The dams are shown in Figure 1. As discussed below, the analysis for PMF stability requires substantive field work to develop the data needed to perform the appropriate civil engineering analyses. Similarly, in order to complete the analyses of seismic stability of the affected dams, applicable dam specific seismic hazards must be developed. While TVA has made substantial progress in preparing to develop the seismic hazard, the final dam specific seismic hazard curves will need to be reviewed against the NRC's planned Interim Staff Guidance on this subject matter, which TVA understands is projected to be issued in May 2013. Upon completion

of the stability analyses, TVA will need to perform the associated simulations that develop the final site specific flood hazard values.



**Figure 1**  
Pictorial of Tennessee Valley Authority Dams

## **Summary of TVA's Hazard Reevaluation Report Project**

TVA has developed a project plan that includes the actions needed to complete the HRR required by Enclosure 2 of the March 12, 2012, 50.54(f) letter. The schedule details of the project plan are included in Attachment 1 of this Enclosure. The key actions and analysis within the scope of the project are listed below:

1. Migrate TVA Tennessee River modeling from the Simulated Open Channel Hydraulic (SOCH) code to U.S. Army Corps of Engineers (USACE) Hydraulic Engineering Center River Analysis System (HEC-RAS) program.
  - a. Geometry for eight reservoirs
  - b. Develop unsteady flow rules for use in the HEC-RAS model
  - c. Calibrate the HEC-RAS model
2. Perform analysis to confirm critical storm probable maximum precipitation (PMP) selection.
3. Perform local intense precipitation analysis for both SQN and WBN.
4. Perform analysis of Sunny Day dam failures for seven scenarios upstream of SQN and WBN. The selection of dams is based on failure of Watts Bar dam only and cascading failures on each of the upstream reaches.
5. Perform probable maximum flood (PMF) simulations for SQN and WBN, using two separate storms, of the Tennessee River system assuming all upstream and downstream dams are stable. Also to be included are consideration of the following:
  - a. Attributing for the volume of all dams within the watershed using the National Inventory of Dams by distributing inflows uniformly over six days, and
  - b. Revision to earthen embankment breach sizes using updated methodology, consistent with dam stability Interim Staff Guidance (ISG), which is anticipated to be issued by the NRC in May 2013.
6. Evaluate stability of the 18 dams under PMF conditions consistent with the dam stability ISG.
  - a. Collect geotechnical data
  - b. Perform 2D analysis
  - c. Perform 3D analysis as required on a limited basis
7. Perform PMF simulation using results of PMF stability analysis as input assumptions. Consideration will be given to the following:
  - a. Assuming no downstream dam failures;
  - b. Including downstream dam failures;
  - c. Attributing for the volume of National Inventory of Dams; and,
  - d. Revision to earthen embankment breach sizes using updated methodology.
8. Develop applicable dam specific seismic hazards based on methodology as described in the dam stability ISG.

9. Evaluate seismic stability of the 18 dams consistent with dam stability ISG.

- a. Collect geotechnical data
- b. Perform 2D analysis
- c. Perform 3D analysis, as required on a limited basis

Note, due to the large number of dams in the watershed that are within close proximity to one another, TVA is working in parallel with the NRC in developing a methodology for spatial scenarios, i.e., accounting for earthquake loading for dams in close spatial proximity. TVA will present a proposed spatial scenarios methodology to the NRC by June 30, 2013.

10. Perform simulation for seismic combined events as described in the dam stability ISG using results of seismic stability analysis as input.

- a. Eight single simulations assumed
- b. Seven simulations assumed for combinations of dams failing under seismic loading

11. Perform simulations to quantify uncertainties. Consideration will be given to the following:

- a. Mannings "n" variations;
- b. 100 percent runoff
- c. Gate operability;
- d. Peak/Lag Unit Hydrograph; and,
- e. Controlling warning time seismic.

12. Prepare HRRs with results and interim actions, as required.

The proposed schedule provided in Attachment 1 of this Enclosure provides a completion date for all of these activities of May 29, 2015. Actions completed to date are noted with an "A" in the "Finish" column. TVA will provide 6-month status reports to the SQN and WBN NRC Project Managers to provide a status of completed actions and progress to completing the HRRs starting in September, 2013.

The proposed schedule includes schedule uncertainty based on an estimated number of seismic dam failure simulations, because seismic dam evaluations are not yet complete. The schedule estimates eight single upstream seismic dam failure simulations and seven combinations of upstream seismic dam failure simulations. These estimates were derived based on review of historic dam failure scenarios. Upon receipt of the dam stability ISG and review of the analysis methodology, TVA will provide the status of the dam stability analysis work as part of the first 6-month status report to the SQN and WBN NRC Project Managers to communicate any changes in the number of required simulations.



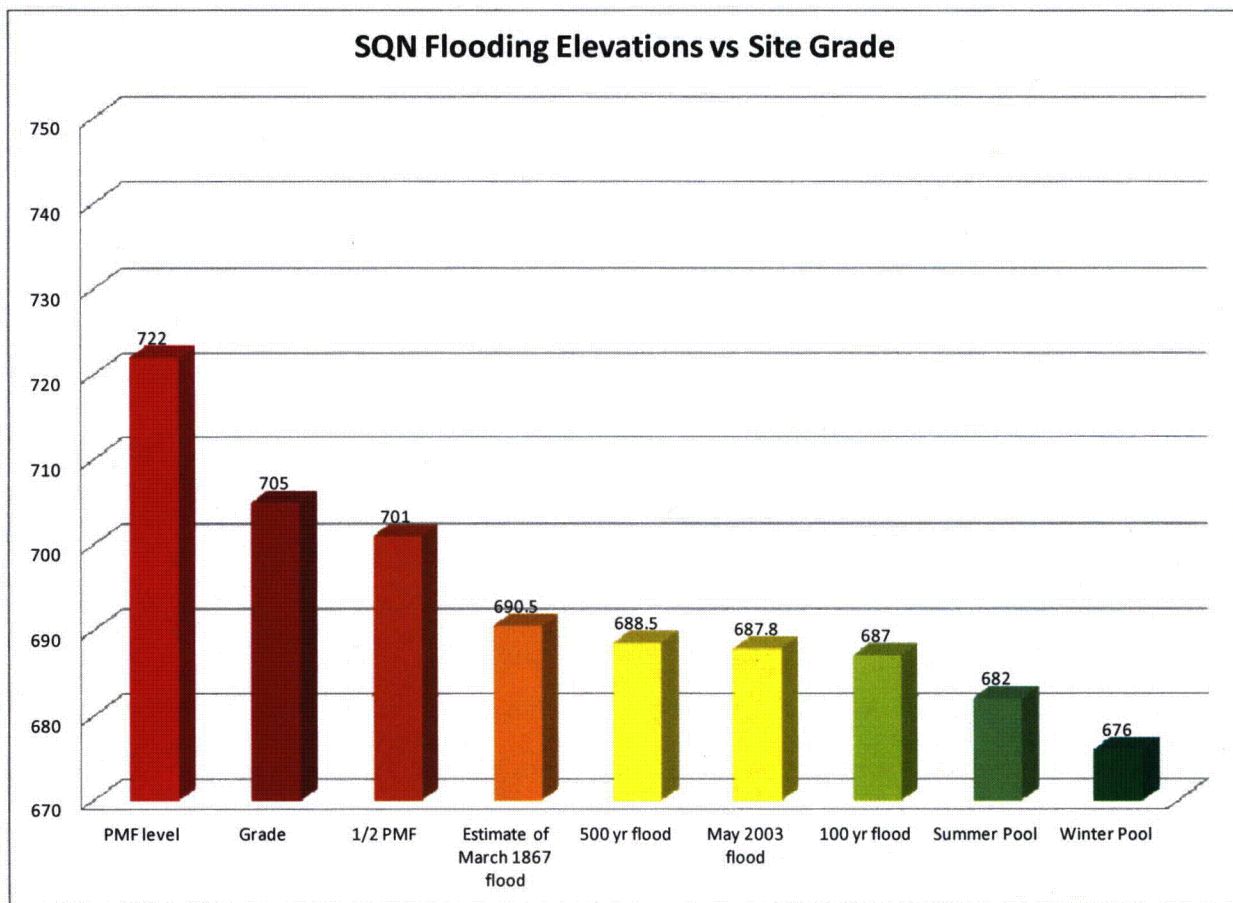
## **Basis for the Acceptability of the Revised Schedule**

TVA is requesting the proposed schedule extension be accepted based on the factors discussed below.

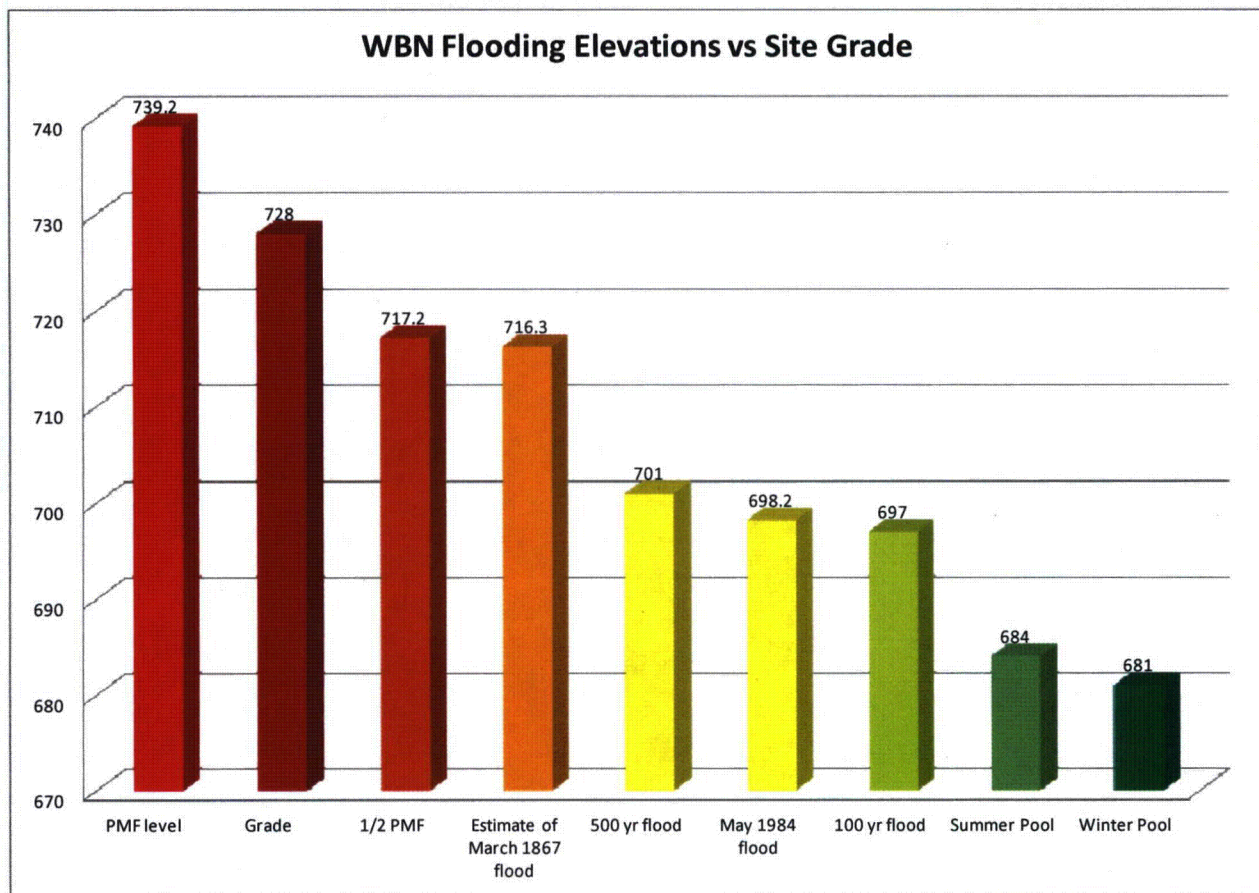
The NRC's March 12, 2012, 50.54(f) cover letter states that the current regulatory approach and the resultant plant capabilities provide confidence that an accident with consequences similar to the Fukushima accident is unlikely to occur in the United States. The NRC letter concluded that continued plant operation and the continuation of licensing activities do not pose an imminent risk to public health and safety.

The HRR project includes analyses that contain beyond-design-basis scenarios. In accordance with Enclosure 2 of the March 12, 2012, 50.54(f) letter item 1.d, interim evaluations and actions will be taken or planned to address any reevaluated higher flooding hazards relative to the design basis. These interim evaluations and actions, if any, will be included in the complete SQN and WBN HRRs. The status of current interim evaluations and actions completed or planned to address current licensing basis and to improve margin for SQN and WBN are described in Attachment 2 of this Enclosure.

TVA's position is that, assessed qualitatively as discussed below, the reevaluated flooding hazard is a very low probability event. Figures 2 and 3 below compare the potential (100 year (yr), 500 yr, 1/2 PMF, and PMF) and historical Tennessee River system (March 1867 and May 1984/May 2003) flooding elevations to site grade elevations. The historical maximum observed river elevation for both SQN and WBN occurred in March 1867 and reached estimated elevations of 690.5 feet at SQN and 716.3 feet at WBN, both of which are below current site grade. Since regulation of the Tennessee River system has been established, the maximum observed river elevation at SQN is 687.8 feet due to a May 2003 flood and at WBN is 698.2 feet due to a May 1984 flood, both of which are below site grade. While the flooding elevations listed in Figures 2 and 3 only consider coincident river elevations due to precipitation events alone and do not consider combinations of events which could lead to site flooding (e.g., flooding event coincident with a seismic event causing a dam failure), the recorded history of the Tennessee River system indicates that no historical floods have exceeded plant grade and TVA's position is that the probability of such event occurring within the extension request timeframe is very low.



**Figure 2**  
Comparison of SQN Flooding Elevations (both historic and potential) vs Site Grade



**Figure 3**  
Comparison of WBN Flooding Elevations (both historic and potential) vs Site Grade

TVA operates the Tennessee River reservoir system and has extensive experience and expertise in managing river and stream flooding scenarios. TVA staffs a River Forecasting Center (RFC) twenty-four hours a day to monitor and manage the system through a continuous process. The operating plan, referred to as a river forecast, is monitored and modified as necessary to meet operating objectives to the extent possible. The current plan is monitored by checking observed discharges and reservoir elevations against those that were planned, and modifications are made in response to changing demands on the system (e.g., more or less hydropower needed) and changes in weather which result in more or less streamflow coming into the reservoir than was anticipated when the current reservoir forecast was developed.

The forecasting cycle begins with data collection and validation including: 1) rainfall measurements from over 200 rain gages throughout the valley showing how much precipitation has occurred; 2) streamgage measurements from over 60 streamgages located throughout the valley showing the elevation of the river levels, and where appropriate, the amount of stream flow; and 3) reservoir headwater, tailwater, and discharge measurements at 35 TVA dams, four Brookfield Smoky Mountain Hydropower (formally Alcoa) dams, and nine U. S. Army Corps of Engineers (USACE) dams. These data are then validated and questionable data are flagged for further review and correction as necessary.

The river forecasting staff also reviews the latest precipitation forecast. The forecast will contain a quantitative precipitation forecast over the next 10 days, broken down into 5 geographical

areas within the Tennessee Valley. In addition to area average rainfall amounts, the forecast issuer includes possible high spot amounts. There are usually three forecasts provided: 1) a "most likely" forecast that reflects what the forecast issuer thinks will happen; 2) a "minimum" forecast, that estimates a lower limit (i.e., the precipitation will be at least this amount); and 3) a "maximum" forecast that estimates an upper limit not likely to be exceeded.

Both the observed rainfall data and forecasted precipitation data is entered into a river modeling software program which includes both tributary and main river reservoirs. When the entire system has been scheduled, instructions to the individual dams are provided which direct both power generation and sluice or gated spillway configurations to manage the river system to support TVA operating objectives of flood control, navigation, hydropower production, water supply for TVA thermal facilities and other industries and municipalities, water quality, recreation and fisheries.

The RFC also maintains a Notification Directory of key internal and external contacts who are to be notified when certain flooding criteria are occurring or expected to occur. The forecasting staff documents when these required notifications are made. They include the National Weather Service, various state and local Emergency Management Agencies, local government agencies, corporations, TVA watershed team staff, and TVA engineering personnel. Included in the notifications directory are instructions to notify both SQN and WBN when certain potential flooding scenarios are forecasted.

By procedure, both SQN and WBN are informed by the RFC when a major flood producing storm (average area rainfall of six inches above Chattanooga, TN) is projected. The River Emergency Operations Center (REOC) will then be activated and 3 hour communications will be established between the REOC and SQN and WBN. When SQN and WBN are notified that the REOC is activated due to flood conditions, the site shift managers will then take actions to staff the operations control center and additional staff will be activated to begin any additional flooding preparations.

**ENCLOSURE 1  
ATTACHMENT 1**

**PROPOSED SCHEDULE FOR THE SUBMITTAL  
OF COMPLETE HAZARD REEVALUTED REPORTS  
FOR THE SEQUOYAH AND WATTS BAR NUCLEAR PLANT**

TVA - Proposed Schedule for Submittal of Complete HRRs for SQN and WBN

12-Mar-13 14:08

Activity ID	Activity Name	Start	Finish	2012		2013		2014		2015						
				M	J	J	A	S	O	N	D	J	F	M	A	M
<b>NRC-2.1.2.01 NRC HRR Extension Submittal ORIGINAL</b>																
<b>NRC-2.1.2.01.01 Develop Model Inputs for Reevaluation</b>																
NRC.HRR.1000	Develop HEC-RAS Geometry (8 Reservoirs)	15-May-12 A	2-Nov-12 A	■■■■■												
NRC.HRR.1010	Develop Initial HEC-RAS Unsteady Flow Rules and Calibrate Model	6-Jun-12 A	30-Oct-12 A	■■■■■												
WBN01.010.0895	Review & Select Dam Breach Size (Based on Draft NEI Dam Breach White Paper)	28-Nov-12 A	11-Dec-12 A		■											
WBN01.010.0905	Perform Evaluation of Dynamic Routing in HEC-RAS	28-Nov-12 A	11-Dec-12 A		■											
WBN01.010.0915	Test Sensitivity to Instantaneous vs. Progressive Failure	28-Nov-12 A	11-Dec-12 A		■											
WBN01.010.0875	Perform Literature Review of HMR Use	30-Nov-12 A	19-Dec-12 A		■											
WBN01.010.0925	Perform Initial Test to Address NID Screening	3-Dec-12 A	13-Dec-12 A		■											
WBN01.010.0885	Perform Analysis to Confirm Critical Storm Selection	10-Dec-12 A	29-Jan-13 A		■■■■											
WBN01.010.01030	Develop National Inventory of Dams Inflows	9-Jan-13 A	30-Jan-13 A		■											
WBN04.085.0300	Perform - Sunny Day Watts Bar Dam East Embankments Failure	28-Jan-13 A	20-Feb-13 A		■											
WBN04.035.0300	Perform - 21,400 Storm (PMF) Assume All Dams Stable and NID Inflows Included	4-Feb-13 A	20-Feb-13 A		■											
WBN04.045.0300	Perform - 7980 BG March Storm (PMF) Assume All Dams Stable and NID Inflows Included	7-Feb-13 A	29-Mar-13		■■■											
NRC.HRR.1020	Confirm Model Input Technical Justifications	13-Mar-13	13-Mar-13*					■								
NRC.HRR.1030	Revise Reservoir Unit Hydrographs	14-Mar-13	13-Jun-13		■■■■■											
NRC.HRR.1040	TVA Determines Rainfall Run-off Model		18-Mar-13*				◆									
NRC.HRR.1050	Migrate TVA Legacy Codes to Industry Standards (Includes Baseflow and Other Losses)	19-Mar-13	7-Aug-13		■■■■■											
NRC.HRR.1060	Develop New HEC-RAS Geometry for Upstream Reaches	1-Apr-13*	22-Nov-13		■■■■■											

Remaining Level of Effort  
  Actual Work  
 Actual Level of Effort  
  Remaining Work

TVA - Proposed Schedule for Submittal of Complete HRRs for SQN and WBN

12-Mar-13 14:08

Activity ID	Activity Name	Start	Finish	2012					2013					2014					2015								
				M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A
NRC.HRR.1070	Develop Inflows for 8 Scenarios	10-Oct-13	15-Jan-14																								
<b>NRC-2.1.2.01.02 Calibrate Model</b>																											
NRC.HRR.2000	Calibrate HEC-RAS Model (8 Reservoirs)	13-Aug-12 A	2-Nov-12 A																								
NRC.HRR.2010	Calibrate New HEC-RAS Geometry for Upstream Reaches	18-Oct-13	31-Dec-13																								
NRC.HRR.2020	Validate Revised Unit Hydrographs During Calibration		31-Dec-13																								
<b>NRC-2.1.2.01.03 Local Intense Precipitation</b>																											
NRC.HRR.3000	Perform WBN Local Intense Precipitation Analysis	24-Sep-12 A	5-Mar-13																								
NRC.HRR.3010	Perform SQN Local Intense Precipitation Analysis	7-Dec-12 A	6-Mar-13																								
NRC.HRR.3005	TVA Checks and Verifies WBN Local Intense Precipitation Analysis	6-Mar-13	19-Mar-13																								
NRC.HRR.3015	TVA Checks and Verifies SQN Local Intense Precipitation Analysis	7-Mar-13	20-Mar-13																								
<b>NRC-2.1.2.01.04 Flooding from Rivers and Streams</b>																											
NRC.HRR.4000	Develop PMF Dam Rating Curves for 18 Dams	1-Oct-13	24-Jun-14																								
NRC.HRR.4010	Develop HEC-RAS Unsteady Flow Rules for PMF	25-Jun-14	24-Oct-14																								
NRC.HRR.4110	Perform PMF Simulations (21,400 sq mi Storm)	27-Oct-14	23-Dec-14																								
NRC.HRR.4120	Perform PMF Simulations (7,980 sq mi Storm)	27-Oct-14	23-Dec-14																								
NRC.HRR.4020	Determine Controlling Precipitation Event		23-Dec-14																								
NRC.HRR.4210	Perform PMF Simulations (21,400 sq mi Storm) Downstream Dam Failure	24-Dec-14	23-Feb-15																								
NRC.HRR.4220	Perform PMF Simulations (7,980 sq mi Storm) Downstream Dam Failure	24-Dec-14	23-Feb-15																								
<b>NRC-2.1.2.01.05 Dam Breaches and Failures</b>																											

Remaining Level of Effort   Actual Work  
Actual Level of Effort   Remaining Work

TVA - Proposed Schedule for Submittal of Complete HRRs for SQN and WBN

12-Mar-13 14:08

Activity ID	Activity Name	Start	Finish	2012				2013				2014				2015															
				M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A
				Gantt chart showing activity bars with colors indicating effort levels (Actual vs Remaining).																											
NRC.ROP.5000	Nuclear Seismic Stability Evaluation of 18 TVA Dams	12-Sep-12 A	31-Mar-14	[Gantt bar: Dark blue (Actual Work) from 12-Sep-12 to 31-Mar-14]																											
NRC.ROP.5010	PMF Stability Evaluation of 18 TVA Dams	12-Sep-12 A	31-Mar-14	[Gantt bar: Dark blue (Actual Work) from 12-Sep-12 to 31-Mar-14]																											
NRC.HRR.5020	Develop Single Dam Rock Outcrop Seismic Hazard Data for Nuclear Seismic Stability Evaluation	25-Feb-13 A	15-May-13	[Gantt bar: Green (Remaining Work) from 25-Feb-13 to 15-May-13]																											
NRC.HRR.5040	Determine Multiple Seismic Dam Failure Methodologies	18-Mar-13*	31-May-13	[Gantt bar: Green (Remaining Work) from 18-Mar-13 to 31-May-13]																											
NRC.HRR.5500	Perform 7 Sunny Day Failure Simulations	1-May-13	17-Nov-14	[Gantt bar: Green (Remaining Work) from 1-May-13 to 17-Nov-14]																											
NRC.HRR.5030	NRC Issues Dam Failure ISG		1-May-13*	[Gantt diamond: Green (Remaining Work) at 1-May-13]																											
NRC.HRR.5050	Provide PMF Headwater and Tailwater Data to RO&R		8-May-13*	[Gantt diamond: Green (Remaining Work) at 8-May-13]																											
NRC.ROP.5015	Provide 500 year flood Headwater and Tailwater Data to RO&R		8-May-13*	[Gantt diamond: Green (Remaining Work) at 8-May-13]																											
NRC.ROP.5020	Provide 25 year flood Headwater and Tailwater Data to RO&R		8-May-13*	[Gantt diamond: Green (Remaining Work) at 8-May-13]																											
NRC.HRR.5025	Provide Single Dam Seismic Hazard Data to RO&R		15-May-13*	[Gantt diamond: Green (Remaining Work) at 15-May-13]																											
NRC.HRR.5035	TVA Provides NRC Dam Stability Evaluations Methodology		27-Jun-13*	[Gantt diamond: Green (Remaining Work) at 27-Jun-13]																											
NRC.HRR.5110	Perform Multiple Seismic Dam Failure Methodology Development Simulation Study Run #1	28-Jun-13	2-Aug-13	[Gantt bar: Green (Remaining Work) from 28-Jun-13 to 2-Aug-13]																											
NRC.HRR.5045	Provide Attenuated Seismic Hazard Data to RO&R (Multiple Seismic Dam Failure)	3-Jul-13	26-Sep-13	[Gantt bar: Green (Remaining Work) from 3-Jul-13 to 26-Sep-13]																											
NRC.HRR.5120	Perform Multiple Seismic Dam Failure Methodology Development Simulation Study Run #2	5-Aug-13	9-Sep-13	[Gantt bar: Green (Remaining Work) from 5-Aug-13 to 9-Sep-13]																											
NRC.HRR.5130	Perform Multiple Seismic Dam Failure Methodology Development Simulation Study Run #3	10-Sep-13	15-Oct-13	[Gantt bar: Green (Remaining Work) from 10-Sep-13 to 15-Oct-13]																											
NRC.HRR.5140	Perform Multiple Seismic Dam Failure Methodology Development Simulation Study Run #4	16-Oct-13	20-Nov-13	[Gantt bar: Green (Remaining Work) from 16-Oct-13 to 20-Nov-13]																											
NRC.ROP.5030	RO&R Performs Multiple Seismic Dam Failures Simulations	19-Nov-13	27-May-14	[Gantt bar: Green (Remaining Work) from 19-Nov-13 to 27-May-14]																											
NRC.HRR.5150	Perform Multiple Seismic Dam Failure Methodology Development Simulation Study Run #5	21-Nov-13	27-Dec-13	[Gantt bar: Green (Remaining Work) from 21-Nov-13 to 27-Dec-13]																											
NRC.HRR.5060	Develop Seismic Dam Rating Curves for 18 Dams	10-Jan-14	3-Jun-14	[Gantt bar: Green (Remaining Work) from 10-Jan-14 to 3-Jun-14]																											

█ Remaining Level of Effort   
 █ Actual Work  
█ Actual Level of Effort   
 █ Remaining Work







**ENCLOSURE 1  
ATTACHMENT 2**

**FLOODING INTERIM ACTIONS FOR  
SEQUOYAH NUCLEAR PLANT  
AND  
WATTS BAR NUCLEAR PLANT**

## Flood Hazard Interim Actions

Since 2008, TVA has been updating the inputs to the flood hazard model. TVA has updated channel geometry sections with bathymetry data, updated unit hydrographs, reassessed the spillway behaviors during extreme flood and updated the model to reflect current reservoir operating procedures. TVA has identified and implemented a series of actions to ensure compliance and improve margin to potential flood events in the recent past. Specifically, TVA committed to the NRC in a letter dated June 13, 2012, to implement certain actions at the Watts Bar and Sequoyah Nuclear Plants and at dams owned and operated by TVA. These actions, and specifically those that implement modifications to the design and operation of the affected facilities (i.e., WBN, SQN, and affected TVA owned dams), provide substantive enhancements to the protection of the plants against the flooding risks identified in the current licensing basis. These actions, as well as the status, of each action are presented below. TVA has identified additional actions which are discussed below. In addition, during the periodic updates on the status of the HRR project, TVA is prepared to discuss the merits of additional interim actions in the updates as partial results become available.

### ACTIONS COMMITTED BY LETTER DATED JUNE 13, 2012

1. By July 20, 2012, TVA will submit a License Amendment Request to update the WBN, Unit 1 Updated Final Safety Analysis Report to reflect the updated hydrologic analysis methods and results, including the analysis of the rim leakage paths discussed at the May 31, 2012, public meeting between TVA and NRC Staff.

**STATUS:** Completed, Letter submitted July 19, 2012 (Accession Nos. ML12236A164, ML12236A165, ML12236A167).

2. By August 10, 2012, TVA will submit a License Amendment Request to update the SQN, Units 1 and 2 Updated Final Safety Analysis Report to reflect the updated hydrologic analysis methods and results, including the analysis of the rim leakage paths discussed at the May 31, 2012, public meeting between TVA and NRC Staff.

**STATUS:** Completed, Letter submitted August 10, 2012 (Accession Nos. ML12226A561, ML12226A562, ML12226A563).

3. By August 31, 2012, TVA will issue and initially perform a procedure for a semi-annual inspection of the compensatory measure for flood protection of the WBN, Unit 1 Thermal Barrier Booster pumps and motors. The inspection will verify:

- a. The condition of the permanent building attachments; and
- b. The inventory, storage, physical protection, and condition of the materials and consumables required for erection of the temporary flood protection panels during a postulated PMF event.

Inspections will continue until the compensatory measure is replaced by a permanent plant modification.

**STATUS:** Completed, Initial inspections completed August 30, 2012.

4. By August 31, 2012, TVA will issue and initially perform a procedure for a semi-annual inspection to verify the condition of the SQN, Units 1 and 2 Spent Fuel Pit Cooling Pump Enclosure caps. Inspections will continue until the design change is completed to document the SQN, Units 1 and 2 Spent Fuel Pit Cooling Pump Enclosure caps as a permanent plant feature.

**STATUS:** Completed, Initial inspections completed August 28, 2012.

5. By August 31, 2012, TVA will issue and initially perform a procedure for a semi-annual inspection to verify the inventory, storage, physical protection, and condition of the materials and consumables required to implement the compensatory measure for the common SQN, Units 1 and 2 Diesel Generator Building. Inspections will continue until the compensatory measure is replaced by a permanent plant modification.

**STATUS:** Completed, Initial inspections completed August 28, 2012.

6. By August 31, 2012, TVA will perform an analysis of the Design Basis Flood for SQN, Units 1 and 2 and WBN, Unit 1 that assumes a failure of a section of the HESCO flood barriers and earthen embankments at Fort Loudoun, Cherokee, Tellico, and Watts Bar dams.

**STATUS:** Completed, Analysis completed on August 31, 2012.

**UPDATE:** Letter summarizing results submitted October 30, 2012 (Accession No. ML12307A227), as required by Letter from NRC to TVA, "Confirmatory Action Letter -Watts Bar Nuclear Plant, Unit 1, and Sequoyah Nuclear Plant, Units 1 and 2, Commitments to Address External Flooding Concerns (TAC Nos. ME8805, ME8806, and ME8807)," dated June 25, 2012 (Accession No. ML12165A527).

7. By August 31, 2012, TVA's Nuclear Power Group will issue and initially perform procedures for semi-annual inspections of the temporary HESCO flood barriers installed at Cherokee, Fort Loudoun, Tellico, and Watts Bar reservoirs. These inspections will:
  - a. Ensure the temporary HESCO flood barriers remain in place and are not structurally degraded as specified by the manufacturer's written specifications and recommendations;
  - b. Verify the inventory and staging of the material required to fill the gaps that exist; and
  - c. Ensure that adequate physical security (e.g., fences and locks) is provided for the staged material against theft.

These inspections will continue until a permanent modification is implemented to prevent overtopping the Cherokee, Fort Loudoun, Tellico, and Watts Bar dams due to the Probable Maximum Flood.

**STATUS:** Completed, Initial inspections completed August 29, 2012.

**UPDATE:** Frequency of inspection has been increased to monthly effective December 3, 2012.

8. By March 31, 2013, TVA will install a permanent plant modification to provide flood protection with respect to the Design Basis Flood level for the WBN, Unit 1 Thermal Barrier Booster pumps and motors.

**STATUS:** Design change in progress, installation currently scheduled to be completed by March 31, 2013.

9. By March 31, 2013, TVA will install a permanent plant modification to provide flood protection with respect to the Design Basis Flood level for the WBN, Unit 1 Spent Fuel Pit Cooling pumps and motors.

**STATUS:** Design change in progress, installation currently scheduled to be completed by March 31, 2013.

10. By March 31, 2013, TVA will install permanent plant modification to provide flood protection with respect to the Design Basis Flood level for the common SQN, Units 1 and 2 Diesel Generator Building.

**STATUS:** Design change in progress, installation currently scheduled to be completed by March 31, 2013.

11. By March 31, 2013, TVA will implement the design change to document the SQN, Units 1 and 2 Spent Fuel Pit Cooling Pump Enclosure caps as a permanent plant feature.

**STATUS:** Design change in progress, installation currently scheduled to be completed by March 31, 2013.

12. By April 30, 2013, TVA will provide the results of the evaluation conducted in compliance with the National Environmental Policy Act (NEPA) Environmental Impact Statement (EIS) Status to define the permanent modifications to prevent overtopping the embankments of the Cherokee, Fort Loudoun, Tellico, and Watts Bar dams.

**STATUS:** Initial conceptual design and alternatives have been developed to support Draft Environmental Impact Statement (DEIS). The DEIS was issued for public review and comment on September 28, 2012. TVA held a public meeting to accept comments on the DEIS on October 25, 2012, in Lenoir City, Tennessee. The public comment period closed November 19, 2012. TVA is now reviewing the comments and preparing the final EIS, which will be issued early 2013.

13. TVA will implement permanent modifications to prevent overtopping of the embankments of the Cherokee dam due to the Probable Maximum Flood. The final solution will be established in an evaluation conducted in compliance with the National Environmental Policy Act (NEPA) Environmental Impact Statement (EIS). Based on the current NEPA EIS schedule, these permanent modifications are scheduled to be installed by October 31, 2015.

**STATUS:** Design change in progress based on the DEIS proposed conceptual design to be implemented on schedule by October 2015.

14. TVA will implement permanent modifications to prevent overtopping of the embankments of the Fort Loudoun dam due to the Probable Maximum Flood. The final solution will be established in an evaluation conducted in compliance with the National Environmental Policy Act (NEPA) Environmental Impact Statement (EIS). Based on the current NEPA EIS schedule, these permanent modifications are scheduled to be installed by October 31, 2015.

**STATUS:** Design change in progress based on the DEIS proposed conceptual design to be implemented on schedule by October 2015.

15. TVA will implement permanent modifications to prevent overtopping of the embankments of the Tellico dam due to the Probable Maximum Flood. The final solution will be established in an evaluation conducted in compliance with the National Environmental Policy Act (NEPA) Environmental Impact Statement (EIS). Based on the current NEPA EIS schedule, these permanent modifications are scheduled to be installed by October 31, 2015.

**STATUS:** Design change in progress based on the DEIS proposed conceptual design to be implemented on schedule by October 2015.

16. TVA will implement permanent modifications to prevent overtopping of the embankments of the Watts Bar dam due to the Probable Maximum Flood. The final solution will be established in an evaluation conducted in compliance with the National Environmental Policy Act (NEPA) Environmental Impact Statement (EIS). Based on the current NEPA EIS schedule, these permanent modifications are scheduled to be installed by October 31, 2015.

**STATUS:** Design change in progress based on the DEIS proposed conceptual design to be implemented on schedule by October 2015.

#### **ADDITIONAL ACTIONS PLANNED - SEQUOYAH**

1. TVA will modify (extend) the traveling water screen vent piping to prevent the intrusion of water into the intake pumping station during a PMF event. In addition, TVA will install flood protection for personnel access door PS-5.
2. TVA will modify (extend) the fill ports for the 7-day tanks outside of the Diesel Generator Building (DGB) to prevent intrusion of flood water during a PMF event and also allow filling of the tanks during such event. The fill piping will also be encased in concrete for protection. The urinal in the restroom at the DGB is also to be removed and the drain and supply lines will be capped in order to prevent water from intruding into the building during a PMF event.
3. TVA will replace forty-eight seals in conduits which lead into the lower elevation of the Essential Raw Cooling Water (ERCW) Intake Pumping Station with a sealant which is designed to withstand a larger amount of pressure to ensure the lower floors of the building remain watertight.
4. TVA is revising the flood mode operation Abnormal Operating Procedure (AOP) N.03, "External Flooding," to facilitate more efficient transition to flood mode operation. To ensure the AOP can be appropriately implemented, TVA will perform a drill to the revised SQN flood mode operation AOP-N.03 by December 31, 2013. TVA will provide details of the planned drill to the revised SQN flood mode operation AOP-N.03 by August 29, 2013.
5. TVA has identified that certain flood mode related spool pieces will be modified to reduce the implementation time for the flood mode AOP N.03. These modifications impact

Essential Raw Cooling Water (ERCW), Component Cooling System (CCS), High Pressure Fire Protection (HPFP), and Auxiliary Feedwater (AFW), and include the modification of the following six flood mode spool pieces:

- 0-SPPC-067-0529, 16-inch diameter ERCW supply to CCS spool piece
- 0-SPPC-067-0530, 16-inch diameter CCS discharge to ERCW spool piece
- 1-SPPC-026-0650, 6-inch diameter HPFP supply to AFW spool piece
- 1-SPPC-026-0651, 6-inch diameter HPFP supply to AFW spool piece
- 2-SPPC-026-0650, 6-inch diameter HPFP supply to AFW spool piece
- 2-SPPC-026-0651, 6-inch diameter HPFP supply to AFW spool piece

TVA will provide the NRC a schedule for completion of modifications to the Sequoyah Nuclear Plant flood mode spool pieces by June 30, 2013.



## **ADDITIONAL PLANNED ACTIONS - WATTS BAR**

1. TVA will install flood protection for the Elevation 741 ft. Stairwell 1L door W1 and Stairwell 1R door W2 into the Elevation 722 ft. floor elevation in the WBN Intake Pumping Station. These barriers will protect the electrical equipment associated with the ERCW and HPFP pumps and motors during a PMF event. The flood barrier door frames will be permanently mounted to the inside of the stairwells (1L and 1R) at the jambs for each door (W1 and W2 respectively) for installation of the barrier. The flood barriers will be stored in frames mounted to the wall inside of their respective stairwells. Each of these modifications above will include a minimum of two (2) feet additional margin above the current design basis flood level.
2. Permanent flood protection barriers and sealing of other ancillary equipment have been designed to protect the Main Control Room Chiller and Shutdown Boardroom Chiller Air Conditioning system chilled water circulating pumps and other ancillary supporting equipment.
3. TVA is revising the flood mode operation Abnormal Operating Instruction (AOI) 7.01, "Maximum Probable Flood," to facilitate more efficient transition to flood mode operation. To ensure the AOI can be appropriately implemented, TVA will perform a drill to the revised WBN flood mode operation AOI-7.01 by December 31, 2013. TVA will provide details of the planned drill to the revised WBN flood mode operation AOI-7.01 by August 29, 2013.
4. TVA has identified that certain flood mode related spool pieces will be modified to reduce the implementation time for the flood mode AOI-7.01. These modifications impact Essential Raw Cooling Water (ERCW) and Component Cooling System (CCS), and include the modification of the following five flood mode spool pieces:
  - 0-SPPC-067-0529, 20-inch diameter ERCW supply to CCS spool piece
  - 0-SPPC-067-0557, 16-inch diameter CCS discharge to ERCW spool piece
  - 0-SPPC-067-0558A, 3-inch diameter ERCW supply to CCS spool piece
  - 0-SPPC-067-0559A, 3-inch diameter ERCW supply to CCS spool piece
  - 0-SPPC-067-0687, 3-inch diameter ERCW supply to CCS spool piece

TVA will provide the NRC a schedule for completion of modifications to the Watts Bar Nuclear Plant flood mode spool pieces by June 30, 2013.

## ENCLOSURE 2

### LIST OF COMMITMENTS

1. TVA will provide 6-month status reports to the Sequoyah and Watts Bar Nuclear Plant NRC Project Managers to provide a status of completed actions and progress to completing the Hazard Reevaluation Reports starting in September, 2013. TVA will provide the status of the dam stability analysis work as part of the first 6-month status report to communicate any changes in the number of required simulations.
2. TVA will provide the NRC a schedule for completion of modifications to the Sequoyah and Watts Bar Nuclear Plant flood mode spool pieces by June 30, 2013.
3. TVA will present a proposed methodology for spatial scenarios to the NRC by June 30, 2013.
4. TVA will provide details of the planned drill to the revised Sequoyah Nuclear Plant flood mode operation Abnormal Operating Procedure (AOP) N.03, "External Flooding," and revised Watts Bar Nuclear Plant flood mode operation Abnormal Operating Instruction (AOI) 7.01, "Maximum Probable Flood," by August 29, 2013.
5. TVA will perform a drill to the revised Sequoyah Nuclear Plant flood mode operation Abnormal Operating Procedure (AOP) N.03, "External Flooding," by December 31, 2013.
6. TVA will perform a drill to the revised Watts Bar Nuclear Plant flood mode operation Abnormal Operating Instruction (AOI) 7.01, "Maximum Probable Flood," by December 31, 2013.
7. TVA will provide the Sequoyah Nuclear Plant Flooding Hazard Reevaluation Report to the NRC by May 29, 2015.
8. TVA will provide the Watts Bar Nuclear Plant Flooding Hazard Reevaluation Report to the NRC by May 29, 2015.

**LICENSING TRANSMITTAL TO NRC SUMMARY AND CONCURRENCE SHEET**  
 The Purpose of this Concurrence Sheet Is to Assure the Accuracy and Completeness of TVA Submittals to the NRC. All Blocks on this Form Must Be Completed.

DATE DUE: 03/12/2013		Kevin E. Casey	
SUBJECT: Tennessee Valley Authority (TVA) - Extension Request Regarding the Flooding Hazard Reevaluation Report Required by NRC Request for Information Pursuant to Title 10 of the Code of Federal Regulations 50.54(f) Regarding Recommendation 2.1, Flooding, of the Near-Term Task Force Review of Insights from the Fukushima Dai-ichi Accident			
<b>REGULATORY CONSIDERATIONS</b>			
(B) Oath or Affirmation	<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO	(E) Posting Requirements	<input type="checkbox"/> YES <input checked="" type="checkbox"/> NO
(C) Licensing Verification	<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO	(F) FSAR IMPACT	<input type="checkbox"/> YES <input checked="" type="checkbox"/> NO
(D) New Commitments	<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO	(G) OGC Consultation	<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO
(H) LIC-109 Review	<input type="checkbox"/> YES <input checked="" type="checkbox"/> N/A	(I) Engineering Independent Technical Review (ITR)	<input type="checkbox"/> YES * <input checked="" type="checkbox"/> NO
*Engineering (only):		n/a /	Design Change #   n/a
_____ INDEPENDENT TECHNICAL REVIEWER			
(J) Licensing (only):		/	
_____ PEER CHECKER			
<b>CONCURRENCE (K)</b>			
A concurrence signature reflects that the signatory has assured that the submittal is appropriate and consistent with TVA Policy, applicable commitments are approved for implementation and supporting documentation for submittal completeness and accuracy has been prepared.			
NAME	ORGANIZATION	SIGNATURE	DATE
B. A. Wetzel	Corp Nuc Lic		
N. C. Gannon	Fukushima Project		
E. J. Vigluicci	OGC		
J. D. Williams	GM, NPG Engineering		
R. J. Whalen	VP Nuc Engineering		
D. H. Schavey	VP, NBO		
(L) Licensing (only):		/	
_____ QUALITY REVIEWER			

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<b>REGULATORY CONSIDERATIONS</b>			
(B) Oath or Affirmation	<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO	(E) Posting Requirements	<input type="checkbox"/> YES <input checked="" type="checkbox"/> NO
(C) Licensing Verification	<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO	(F) FSAR IMPACT	<input type="checkbox"/> YES <input checked="" type="checkbox"/> NO
(D) New Commitments	<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO	(G) OGC Consultation	<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO
(H) LIC-109 Review	<input type="checkbox"/> YES <input checked="" type="checkbox"/> N/A	(I) Engineering Independent Technical Review (ITR)	<input type="checkbox"/> YES * <input checked="" type="checkbox"/> NO
*Engineering (only):		n/a	/
INDEPENDENT TECHNICAL REVIEWER		Design Change #	
		n/a	
(J) Licensing (only):			
PEER CHECKER			
<b>CONCURRENCE (K)</b>			
A concurrence signature reflects that the signatory has assured that the submittal is appropriate and consistent with TVA Policy, applicable commitments are approved for implementation and supporting documentation for submittal completeness and accuracy has been prepared.			
NAME	ORGANIZATION	SIGNATURE	DATE
M. McBrearty	Site Licensing - SQN		
T. B. Marshall	DSL - SQN		
M. A. Meade	Site Hydrology		
J. T. Carlin	Site VP		
(L) Licensing (only):			
QUALITY REVIEWER			



