Attachments 2 and 8 are to be withheld from public disclosure under 10 CFR 2.390.
When separated from these attachments, this letter is decontrolled.

Tennessee Valley Authority, Post Office Box 2000, Spring City, Tennessee 37381-2000

March 31, 2011

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

Watts Bar Nuclear Plant, Unit 2 — 10 CFR 50.4
NRC Docket No. 50-391

Subject: WATTS BAR NUCLEAR PLANT (WBN) UNIT 2 – INSTRUMENTATION AND CONTROLS STAFF INFORMATION REQUESTS

Reference: 1. Licensee Open Items to be Resolved for SER Approval List

The purpose of this letter is to provide TVA's responses to NRC's information requests on the "Licensee Open Items to be Resolved for SER Approval List." Enclosure 1 to this letter provides TVA's responses to the information requested by NRC.

Enclosure 2 contains the supporting documents for TVA's responses to NRC's requests/questions provided in Enclosure 1. Enclosure 3 contains a list of references on which TVA's responses are based. Enclosure 4 contains the regulatory commitment contained in this letter.

Attachment 2 contains information proprietary to Westinghouse Electric Corporation (WEC). TVA requests that the WEC proprietary information be withheld from public disclosure in accordance with 10 CFR § 2.390. Attachment 3 contains the non-proprietary version of the document. Attachment 4 contains the affidavit for withholding proprietary information from public disclosure. A typographical error was found in Attachments 2 and 3 during preparation of this letter. Reference 40 states it is TVA to NRC letter dated February 22, 2011. The actual date is February 25, 2011.

Attachment 8 contains information proprietary to General Atomic-Electronic Systems Inc. (GA-ESI). TVA requests that the GA-ESI proprietary information be withheld from public disclosure in accordance with 10 CFR § 2.390.

D030
NRR

If you have any questions, please contact William Crouch at (423) 365-2004.

I declare under penalty of perjury that the foregoing is true and correct. Executed on the 31th day of March, 2011.

Respectfully,

David Stinson
Watts Bar Unit 2 Vice President
Enclosures:

1. Responses to Licensee Open Items To Be Resolved For SER Approval
2. List of Attachments
3. List of References
4. Regulatory Commitment

cc (Enclosures):

U. S. Nuclear Regulatory Commission
Region II
Marquis One Tower
245 Peachtree Center Ave., NE Suite 1200
Atlanta, Georgia 30303-1257

NRC Resident Inspector Unit 2
Watts Bar Nuclear Plant
1260 Nuclear Plant Road
Spring City, Tennessee 37381

Enclosure 1
TVA Letter Dated March 31, 2011
Responses to Licensee Open Items to be Resolved for SER Approval

For some NRC requests for additional information (RAIs), this letter provides TVA's initial response. For the other NRC RAIs in this letter, a response has been provided in previous TVA letters to the NRC, and the NRC has subsequently requested additional information. For these requests, the initial TVA response is not repeated below. The additional NRC information requests are identified in this letter as "**Follow-up NRC Requests.**" TVA responses to these items are identified as "**TVA Response to Follow-up NRC Request.**"

The following acronyms/abbreviations are used in this letter:

CDI	Commercial Dedication Instruction
CGD	Commercial Grade Dedication
CGI	Commercial Grade Item
CQ	Common Q
EPRI	Electric Power Research Institute
FAT	Factory Acceptance Test
FSAR	Final Safety Analysis Report
GA-ESI	General Atomic-Electronic Systems Inc.
IEEE	Institute of Electrical and Electronic Engineers Inc.
ISG	Interim Staff Guidance
IV&V	Independent Verification and Validation
LPMS	Loose Part Monitoring System
LTR	Licensing Technical Report
MTTR	Mean Time To Repair
NRC	Nuclear Regulatory Commission
OI	Open Item (from NRC I&C Open Item Matrix)
PAMS	Post Accident Monitoring System
PSB	Power Systems Branch
RCCA	Rod Control Cluster Assembly
RG	Regulatory Guide
RMS	Radiation Monitor System
RRS	Required Response Spectrum
SDS	System Design Specification
SE	Safety Evaluation
SPM	Software Program Manual
SRM	Staff Requirements Memoranda
SRP	Standard Review Plan (NUREG-800)
SRS	Software Requirements Specification
STP	System Test Plan
SyRS	System Requirements Specification
TR	Topical Report
TRS	Tested Response Spectra
TVA	Tennessee Valley Authority
WBN2	Watts Bar Nuclear Plant Unit 2
WEC	Westinghouse Electric Company

Enclosure 1
TVA Letter Dated March 31, 2011
Responses to Licensee Open Items to be Resolved for SER Approval

1. **NRC Request (Item Number 41)**

Please provide the following Westinghouse documents:

(1) *WNA-DS-01617-WBT Rev. 1, "PAMS System Requirements Specification"*
(2) *WNA-DS-01667-WBT Rev. 0, "PAMS System Design Specification"*
(3) *WNA-CD-00018-GEN Rev. 3, "CGD for QNX version 4.5g"*

Please provide the following Westinghouse documents or pointers to where the material was reviewed and approved in the CQ TR or SPM:

(4) *WNA-PT-00058-GEN Rev. 0, "Testing Process for Common Q Safety systems"*
(5) *WNA-TP-00357-GEN Rev. 4, "Element Software Test Procedure"*

NRC Follow up Request:

Issues with the System Test Plan (STP) were discussed in the weekly public meetings. Westinghouse to:

(1) perform STP self assessment., and
(2) Augment Test Summary report to provide missing test plan information

TVA Response to Follow-up NRC Request:

(1) WEC presented the results of the self assessment to the NRC on February 2, 2011.

(2) By agreement between TVA, WEC, and the NRC, the PAMS Test Plan, WNA-PT-00138-WBT, Revision 0, will not be revised. Instead a non-proprietary Common Q PAMS Test Summary Report will be developed and submitted to address the issues with the STP. Attachment 1 contains non-proprietary WNA-TR-02451-WBT, Revision 0, "Test Summary Report for the Post Accident Monitoring System," dated March 2011.

2. **NRC Request (Item Number 043)**

The PAMS ISG6 compliance matrix supplied as Enclosure 1 to TVA letter dated February 5, 2010 is a first draft of the information needed. The shortcomings of the first three lines in the matrix are:

Line 1: Section 11 of the Common Q topical report did include a commercial grade dedication program, but this program was not approved in the associated SE. Westinghouse stated that this was the program and it could now be reviewed. The NRC stated that TVA should identify what they believe was previously reviewed and approved.

Line 2: TVA stated the D3 analysis was not applicable to PAMS, but provided no justification. The NRC asked for justification since SRP Chapter 7.5 identified SRM to SECV-93-087 Item II.Q as being SRP acceptance criteria for PAMS.

Line 3: TVA identified that the Design report for computer integrity was completed as part of the common Q topical report. The NRC noted that this report is applicable for a system

in a plant, and the CQ topical report did not specifically address this PAMS system at Watts Bar Unit 2.

NRC then concluded that TVA should go through and provide a more complete and thorough compliance matrix.

NRC Follow up Request:

It is not quite enough to provide all of the documents requested. There are two possible routes to review that the NRC can undertake: (1) follow ISG6, and (2) follow the CQ SPM. The TVA response that was originally pursued was to follow ISG6, but some of the compliance items for ISG6 were addressed by referencing the SPM. The NRC approved the CQ TR and associated SPM; it may be more appropriate to review the WBN2 PAMS application for adherence to the SPM than to ISG6. In either path chosen, the applicant should provide documents and a justification for the acceptability of any deviation from the path chosen. For example, it appears that the Westinghouse's CDIs are commercial grade dedication plans, but Westinghouse maintains that they are commercial grade dedication reports; this apparent deviation should be justified or explained.

TVA Response to Follow-up NRC Request:

The NRC audited the WEC commercial item dedication process for both hardware and software during the week of February 28 to March 4, 2011. The audit found the processes acceptable. WEC and TVA previously agreed to provide additional information to address this item in Revision 3 of the Licensing Technical Report (LTR).

Attachment 2 contains WNA-LI-00058-WBT-P, "Post-Accident Monitoring System (PAMS) Licensing Technical Report," Revision 3, dated March 2011 (proprietary). Attachment 3 contains WNA-LI-00058-WBT-NP, "Post-Accident Monitoring System (PAMS) Licensing Technical Report," Revision 3, dated March 2011 (non-proprietary). Attachment 4 contains CWA-11-311, Application for Withholding Proprietary Information from Public Disclosure, WNA-LI-00058-WBT-P, Revision 3, "Nuclear Automation Watts Bar 2 NSSS Completion Program I&C Projects, Post-Accident Monitoring System (PAMS) Licensing Technical Report," dated March 14, 2011.

3. **NRC Request (Item Number 067)**

By letter dated March 12, 2010 TVA stated that the target submittal date for the "Commercial Grade Dedication Instructions for AI687, AI688, Upgraded PC node box and flat panels." was September 28, 2010.

NRC Follow up Request:

Section 7 of the WBN2 PAMS LTR should be updated to include:.

(1) non-proprietary description of commercial grade dedication, and

(2) Software example

Commercial grade dedication will also be addressed at the next audit.

TVA Response to Follow-up NRC Request:

The non-proprietary commercial grade dedication (CGD) discussion is included in Attachment 3, WNA-LI-00058-WBT-NP, "Post-Accident Monitoring System (PAMS) Licensing Technical Report," Revision 3, dated March 2011 (non-proprietary), Section 7. The software example is included in Attachment 2, WNA-LI-00058-WBT-P, "Post-Accident Monitoring System (PAMS) Licensing Technical Report," Revision 3, dated March 2011 (proprietary), Section 7.

4. NRC Request (Item Number 069)

By letter dated March 12, 2010 TVA stated that the target submittal date for the "Watts Bar 2 PAMS Specific FAT Report" was October 2010.

As agreed, the Watts Bar 2 PAMS Specific FAT Report will not be submitted. Instead a non-proprietary PAMS Test Summary Report will be submitted.

TVA Response to NRC Request:

Attachment 1 contains non-proprietary WNA-TR-02451-WBT, Revision 0, "Test Summary Report for the Post Accident Monitoring System," dated March 2011.

5. NRC Request (Item Number 138)

By letter dated February 3, 2010, Westinghouse informed TVA that certain PAMS documentation has been completed

(a) The draft ISG6 states that a commercial grade dedication plan should be provided with an application for a Tier 2 review.

By letter dated February 5, 2010, TVA stated that the commercial grade dedication plan was included in the Common Q Topical Report Section 11, "Commercial Grade Dedication Program." Section 11 includes a description of the Common Q Commercial Grade Dedication Program, and states: "A detailed review plan is developed for each Common Q hardware or software component that requires commercial grade dedication."

Please provide the commercial grade dedication plans for each Common Q hardware or software component that has not been previously reviewed and approved by the NRC.

(b) The draft ISG6 states that a commercial grade dedication report should be provided within 12 months of requested approval for a Tier 2 review.

(i) Please provide 00000-ICE-37722 Rev. 0, "Commercial Grade Dedication Report for the QNX Operating System for Common Q Applications."

(ii) Please provide WNA-CD-00018-GEN Rev. 3, "Commercial Dedication Report for QNX 4.25G for Common Q Applications."

NRC Follow up Request:

Commercial grade dedication will be addressed at the next audit.

The description of the commercial grade dedication process in the CQ PAMS LTR Rev. 2 should be updated to include a non-proprietary description and to include a software example.

TVA Response to Follow-up NRC Request:

The non-proprietary CGD discussion is included in Attachment 3, WNA-LI-00058-WBT-NP, "Post-Accident Monitoring System (PAMS) Licensing Technical Report," Revision 3, dated March 2011 (non-proprietary), Section 7. The software example is included in Attachment 2, WNA-LI-00058-WBT-P, "Post-Accident Monitoring System (PAMS) Licensing Technical Report," Revision 3, dated March 2011 (proprietary), Section 7.

6. NRC Request (Item Number 144)

The WBN2 PAMS Software Requirements Specification (WBN2 PAMS SRS) contains a table (see page iii) titled, "Document Traceability & Compliance," which states that the WBN2 PAMS SRS was created to support the three documents identified (two of these documents have been provided on the docket).

(a) Please describe the third document (i.e., NABU-DP-00014-GEN Revision 2, "Design Process for Common Q Safety Systems").

(b) Please describe the flow of information between these three documents.

(c) Does the PAMS SRS implement the requirements in these three documents?

(d) Please describe if and how these three documents are used in the development of the PAMS Software Design Description.

(e) Do the WBN2 V&V activities include verification that the requirements of these three documents have been incorporated into the WBN2 PAMS SRS?

NRC Follow up Request:

CQ PAMS LTR Rev. 2 Sections 11 & 12 do not adequately demonstrate the origin of requirements in SysRS. TVA to describe how to address concern.

TVA Response to Follow-up NRC Request:

Section 13, "Origin Tracing of WBN2 PAMS System Requirements Specification" was added to the LTR, Revision 3, to address this concern. Attachment 2 contains WNA-LI-00058-WBT-P, "Post-Accident Monitoring System (PAMS) Licensing Technical Report," Revision 3, dated March 2011 (proprietary).

7. NRC Request (Item Number 183)

An emphasis is placed on traceability in System Requirements Specifications in the SRP, in the unmodified IEEE std 830-1993, and even more so given the modifications to the standard listed in Regulatory Guide 1.172, which breaks with typical NRC use of the word "should" to say "Each identifiable requirement in an SRS must be traceable backwards to the system requirements and the design bases or regulatory requirements that is satisfies."

On page 1-2 of the Post Accident Monitoring System's Software Requirements Specification in the background section, is the sentence "Those sections of the above references that require modification from the generic PAMS are defined in the document" referring purely to the changes from WNA-DS-01617-WBT "Post Accident Monitoring System-System Requirements Specification" or is it saying that there are additional changes beyond those and that the SRS defines them?

If there are additional changes, what is their origin?

NRC Follow up Request:

The point behind this open item was that TVA must demonstrate that the origin of each requirement in the WEC requirements specification is known and documented. TVA stated that this information would be in CQ PAMS LTR Rev. 2.

CQ PMS LTR Rev. 2 Sections 11 & 12 do not provide this information. TVA to provide a plan to address requested information.

TVA Response to Follow-up NRC Request:

This item was addressed by updating the Contract Compliance Matrix and adding Section 13, "Origin Tracing of WBN2 PAMS System Requirements Specification," to the LTR, Revision 3, to address this concern. Attachment 2 contains WNA-LI-00058-WBT-P, "Post-Accident Monitoring System (PAMS) Licensing Technical Report," Revision 3, dated March 2011 (proprietary).

8. NRC Request (Item Number 202)

The letter (ML0003740165) which transmitted the Safety Evaluation for the Common Q topical report to Westinghouse stated: "Should our criteria or regulations change so that our conclusions as to the acceptability of the report are invalidated, CE Nuclear Power and/or the applicant referencing the topical report will be expected to revise and resubmit their respective documentation, or submit justification for continued applicability of the topical report without revision of the respective documentation." Question No 81 identified many criteria changes; please revise the respective documentation or submit justification for continued applicability of the topical report.

NRC Follow up Request:

Summary provided in Licensing Technical Report Rev. 2 has been reviewed and found to be unacceptable.

LTR Section 9 evaluates the compliance of the SRS to IEEE 830-1998. There are two issues with this evaluation:

(1) IEEE 830-1998 is not the current SRP acceptance criteria. IEEE 830-1998 has not been formally endorsed by a regulatory guide.

(2) Westinghouse committed to evaluate the SRS against 830 when the NRC identified several inconsistencies.

(3) Yes ISG-4 is one new criteria, and an evaluation against it has been provided.

(4) In addition, LTR Rev. 2 Section 13 states: "The applicable NRC regulatory guides, IEEE and EPRI industry standards for the common Q PAMS are shown below. Compliance to these codes and standards are stated in Section 4 of Reference 1." Reference 1 is the common Q topical report.

TVA Response to Follow-up NRC Request:

(1) As discussed on Page 9-1 of the LTR (Attachment 2), a comparison of IEEE 830-1993 and IEEE 830-1998 was performed; and it was determined that the 1998 version enveloped all the requirements of the 1993 version, which is endorsed by Regulatory Guide 1.172. Therefore, the use of IEEE 830-1998 is acceptable.

(2) Table 9.1, "IEEE Std 830-1998 Compliance," of the LTR (Attachment 2) evaluates the Software Requirements Specification (SRS) against the requirements of IEEE 830-1998.

(3) See TVA to NRC letter, "Watts Bar Nuclear Plant (WBN) Unit 2 – Instrumentation And Controls Staff Information Requests," dated February 25, 2011 (Reference 3), Attachment 4, "Common Q PAMS Regulatory Guide and IEEE Standard Analysis."

(4) This section of the LTR (Attachment 2) has been relocated to Section 15. The comment has been addressed by adding Reference 40 to TVA to NRC letter dated February 25, 2011, Attachment 4, which is the "Common Q PAMS Regulatory Guide and IEEE Standard Analysis."

9. NRC Request (Item Number 212)

By letter dated June 18, 2010 (ML101940236) TVA stated (Enclosure 1, Attachment 3, Item No. 3) that the PAMS system design specification and software requirements specification contain information to address the "Design Report on Computer Integrity, Test and Calibration..." The staff has reviewed these documents, and it is not clear how this is the case.

(1) Please describe how the information provided demonstrates compliance with IEEE 603-1991 Clauses 5.5, 5.7, 5.10, & 6.5.

(2) Please describe how the information provided demonstrates conformance with IEEE 7-4.3.2-2003 Clauses 5.5 & 57.

NRC Follow up Request:

(a) IEEE 603 Clause 5.5 basically states that conditions identified in IEEE 603 Clauses 4.7 & 4.8 must be addressed in the design. Energy supply conditions have not been identified, or explicitly addressed.

(b) WNA-AR-00189-WBT Rev. 0 Table 5-2 shows a MTTR of 7.2 hours. It is not clear how this satisfies the contractual item No. 179.

TVA Response to Follow-up NRC Request:

(a) This item was addressed in TVA to NRC letter, "Watts Bar Nuclear Plant (WBN) Unit 2 – Instrumentation And Controls Staff Information Requests," dated March 16, 2011 (Reference 4).

(b) The Contract Compliance Matrix Item 179 in Revision 3 of the LTR was revised to show this item as a deviation and to reflect TVA's acceptance of the 7.2 hour MTTR value. Attachment 2 contains WNA-LI-00058-WBT-P, "Post-Accident Monitoring System (PAMS) Licensing Technical Report," Revision 3, (proprietary), dated March 2011.

10. NRC Request (Item Number 213)

By letter dated June 18, 2010 (ML101940236) TVA stated (Enclosure 1, Attachment 3, Item No. 3) that the PAMS system design specification and software requirements specification contain information to address the "Theory of Operation Description." The staff has reviewed these documents, and it is not clear how this is the case. The docketed material does not appear to contain the design basis information that is required to evaluate compliance with the Clause of IEEE 603.

(1) *Please provide the design basis (as described in IEEE 603 Clause 4) of the Common Q PAMS.*

(2) *Please provide a regulatory evaluation of how the PAMs complies with the applicable regulatory requirements for the theory of operation.*

For example: Regarding IEEE 603 Clause 5.8.4 (1) What are the manually controlled protective actions? (2) How do the documents identified demonstrate compliance with this clause?

NRC Follow up Request:

The identified documentation does not include the design bases. Please provide schedule for providing the requested information.

TVA Response to Follow-up NRC Request:

The Regulatory Guide 1.97 classification of the Common Q PAMS variables is documented in TVA Design Criteria WB-DC-30-7, "Post Accident Monitoring Instrumentation," which was submitted as Attachment 5 in TVA to NRC letter, "Watts Bar Nuclear Plant (WBN) Unit 2 – Instrumentation And Controls Staff Information Requests," dated June 18, 2010 (Reference 1).

The hardware design bases for the Common Q PAMS are described in the WBN Unit 2 FSAR, Section 7.5.1.8, "Post Accident Monitoring System (PAMS)."

The Common Q PAMS indications are used to support operator response to events described in Chapter 15 of the WBN Unit 2 FSAR such as:

RCCA/RCCA Bank dropped/misaligned
Steam Generator Tube Rupture
Inadvertent Loading of a Fuel Assembly Into an Improper Position
Loss of Shutdown Power
Major Reactor Coolant System Pipe Ruptures (Loss Of Coolant Accident)
Major Secondary System Pipe Rupture

11. NRC Request (Item Number 245)

Section 5.8 of the Common Q SPM (ML050350234) identifies the required test documentation for systems developed using the Common Q SPM. Please provide sufficient information for the NRC staff to independently assess whether the test plan for WBN2 PAMS, is as described in the SPM (e.g., Section 5.8.1)..

NRC Follow up Request:

Issues with the Common Q TR & SPM were discussed in the weekly public meetings. Westinghouse to perform Common Q TR & SPM compliance self assessment

TVA Response to Follow-up NRC Request:

WEC presented the results of the self-assessment to the NRC on February 2, 2011. The results were further reviewed by TVA during the NRC Common Q PAMS audit conducted during the week of February 28 to March 4, 2011. Corrections to WNA-TR-02451-WBT, "Test Summary Report for the Post Accident Monitoring System," (Attachment 1) and the self-assessment were made as a result of the TVA review to ensure this comment was fully addressed.

By agreement between TVA, WEC, and the NRC, the PAMS Test Plan, WNA-PT-00138-WBT, Revision 0, will not be revised. Instead, a non-proprietary Common Q PAMS Test Summary Report will be developed and submitted to address the issues with TR and SPM compliance. Attachment 1 contains non-proprietary WNA-TR-02451-WBT, Revision 0, "Test Summary Report for the Post Accident Monitoring System," dated March 2011.

12. NRC Request (Item Number 246)

Section 4.3.2.1, "Initiation Phase" of the Common Q SPM (ML050350234) requires that a Project Quality Plan (PQP) be developed. Many other sections of the SPM identify that this PQP should contain information required by ISG6. Please provide the PQP. If "PQP" is not the name of the documentation produced, please describe the documentation produced and provide the information that the SPM states should be in the PQP.

NRC Follow up Request:

Issues with the Common Q TR & SPM implementation were discussed in the weekly public meetings. Westinghouse to perform Common Q TR & SPM compliance self assessment.

TVA Response to Follow-up NRC Request:

The results of the Common Q TR and SPM self assessment were reviewed by WEC with the NRC on February 2, 2011.

The WEC WBN Unit 2 NSSS Completion I&C Projects Project Quality Plan, WNA-PQ-00220-WBT, Revision 1, is available for NRC audit at the WEC Rockville Office and was available for review during the NRC Common Q PAMS audit during the week of February 28 to March 4, 2011. During the audit, the results of the WEC Quality Assurance in-process audit of the Common Q PAMS project was reviewed by the NRC inspector with no issues identified.

13. NRC Request (Item Number 251)

The SPM describes the software testing and documents that will be created. The SPM also describes the testing tasks that are to be carried out. The acceptance criterion for software test implementation is that the tasks in the SPM have been carried out in their entirety. Please provide information that shows that testing been successfully accomplished.

NRC Follow up Request:

Issues with the Common Q TR & SPM implementation were discussed in the weekly public meetings. Westinghouse to perform Common Q TR & SPM compliance self assessment.

TVA Response to Follow-up NRC Request:

WEC reviewed the results of the Common Q TR and SPM self-assessment with the NRC on February 2, 2011.

By agreement between TVA, WEC, and the NRC, the PAMS Test Plan, WNA-PT-00138-WBT, Revision 0, will not be revised. Instead, a non-proprietary Common Q PAMS Test Summary Report will be developed and submitted to address the issues with TR and SPM compliance. Attachment 1 contains non-proprietary WNA-TR-02451-WBT, Revision 0, "Test Summary Report for the Post Accident Monitoring System," dated March 2011.

14. NRC Request (Item Number 323)

WCAP-13869 revision 1 was previously reviewed under WBN Unit 1 SER SSER 13 (Reference 8). Unit 2 references revision 2. An analysis of the differences and their acceptability will be submitted to the NRC by November 15, 2010

NRC Follow up Request:

The staff is confused with the response since both units have reference leg not insulated. Rev. 2 should apply to Unit 1 also and there should be no difference between Unit 1 and 2.

TVA Response to Follow-up NRC Request:

The differences between the Revision 1 and Revision 2 WCAPs are documented in Attachment 12, "WCAP 13869 Revision 1 to Revision 2 Change Analysis", to TVA to NRC letter dated October 29, 2010 (Reference 2). The design bases for the response to feedwater break inside containment, as documented in Chapter 15 of the WBN Unit 2 FSAR, are the same for WBN Unit 1. Since WBN Unit 2 is required to match the WBN Unit 1 licensing basis to the extent practical, the decision was made to revise the WBN Unit 2 FSAR to agree with the WBN Unit 1 FSAR, which uses Revision 1.

15. NRC Request (Item Number 335)

LPMS: Reference to OI-331, sub item 2.

Provide analysis, test, or combined analysis and test for normal operating radiation, temperature, and humidity environment per regulatory position C.1.g of RG 1.133. As an alternate TVA may confirm that the required equipment has been qualified for the environments stated in RG 1.133, position C.1.g and that TVA has reviewed the test report and found it acceptable.

NRC Follow up Request:

The report addresses this open item, however, the maximum Reactor Containment Temperature is not addressed within the report and the staff needs this information to approve the maximum temperature qualification of 70° C for the preamplifier cable (Microdot Connector) end. TVA stated that they will provide the Containment maximum temperature and reference the environmental report which this data is taken from in their next letter, which is expected on Tuesday 3/29/2011.

TVA Response to Follow-up NRC Request:

The maximum WBN Unit 2 containment upper compartment normal operating temperature of 110 °F (43.3 °C) is shown on TVA environmental drawing 2-47E235-41 Revision 0. The maximum WBN Unit 2 containment lower compartment normal operating temperature of 150 °F (65.6 °C) is shown on TVA environmental drawing 2-47E235-42 Revision 0.

16. NRC Request (Item Number 344)

Unit 1 SE discussed in Section 7.6.5, "Valve Power Lockout." There is no section in FSAR which provides discussion on this subject. SE section discusses compliance with PSB-18. Provide a discussion which can be used by the staff to determine similar conclusion as Unit 1 and if the design is similar to Unit 1 then make a statement to that effect. Also provide the list of the valves where power lockout during normal reactor operation is utilized for valves whose inadvertent operation could affect plant safety.

NRC Follow up Request:

The provided response does not demonstrate compliance with the PSB.

TVA Response to Follow-up NRC Request:

SER Supplement 0, Section 8.3.1.8 states:

"8.3.1.8 Application of the Single Failure Criterion to Manually Controlled Electrically Operated Valves

With regard to safety-related manually controlled, electrically operated valves, the staff asked the applicant to provide

(1) an evaluation of all safety-related fluid systems to identify all such valves whose failure (that is, failure to operate on demand or undesired spurious operation) could result in the loss of capability to perform a system safety function

(2) a description of the means provided to meet the single-failure criterion in safety-related fluid systems where it is identified that a single failure, as defined above, would result in the loss of capability to perform the system safety function

In response, the applicant identified 17 such valves and documented in Section 7.6.6 of the FSAR that the design for these valves consists of modified control circuits. The modified circuit utilizes redundant contacts which are wired before and after each opening and closing coil. Based on its review of the information provided by the applicant, the staff concluded that the above provisions are in accordance with BTP ICSB 18 of SRP Appendix 8-A, with the exception of redundant valve position indication.

Subsequently, the applicant stated that the method of locking out power with the required redundant instrumentation is shown on electrical drawing 45W760-63-2 Based on this drawing, the staff concludes that the design meets the staff's position and is acceptable."

SER Supplement 5 states:

6.3.2 Evaluation,

"In the SER, the staff stated that the applicant will lock out power from certain valves in the emergency core cooling system (ECCS) whose misalignment might affect ECCS effectiveness. Some of these valves would be required to operate following a LOCA, and the manual restoration of power would add to post-accident operational complexity. By letters dated September 15, 1982, and April 10, 1985, the applicant stated Watts Bar would use modified control circuits for these valves to ensure that no single failure would be able to energize the opening or closing coils of the valve operators. The design uses redundant contacts that are wired before and after each opening and closing coil. In addition, clear protective covers will be attached to the main control board over each respective control switch to prevent inadvertent actuation. As discussed in SER Sections 7.6.4 and 8.3.1.8, the staff found this design acceptable. Accordingly, power will not be locked out from the following valves during operation:

(1) hot-leg injection line valves

(2) valves from residual heat removal (RHR) discharge to safety injection (SI) and charging pump suction

(3) RHR suction valves from containment sump

(4) RHR discharge valves

(5) SI pump suction valve from refueling water storage tank

(6) SI miniflow valve

In addition, the applicant evaluated other valves that may be used for SI miniflow, RHR to SI cross-connect, and SI injection, but for which the consequences of single failure would be acceptable. Power will also not be locked out from these valves. This revision is acceptable to the staff. This review was tracked under TAC 63630."

The design of WBN Unit 2 mirrors the design WBN Unit 1. As a result, the locked valves for PSB-18 are the same for WBN Unit 2 as for WBN Unit 1, and the list in the Unit 2 FSAR Section 7.6.6 is accurate for Unit 2.

17. NRC Request (Item Number 345)

Provide the normal temperatures and expected periods of high/low temperature excursions to assess aging requirements. TVA to further clarify if 86°F for 40 years was used as the qualification requirement for aging tests. This has been stated in some of the subsections under section 4.2 of the 04508905-QR report but the rationale for using 86°F (includes an internal temperature rise of 18°F) for 40 years has not been justified in the 04508905-QR report or the supplement reports. TVA to provide the rationale for this acceptance criteria for WBN-2.

NRC Follow up Request:

How is the 40 year life verified for the radiation monitor?

Clarification Required:

(1) Regulatory Guide 1.209 endorses with the exceptions IEEE 323-2003. One of these exceptions is that the documentation applicable to qualification in a mild environment should be consistent with the guidance given in Section 7.2 for the harsh environment.

(2) TVA has provided synopsis of test information in support of environmental qualification in the 2/25/2011 letter. TVA to describe compliance to the guidance of Section 7.2 of IEEE 323.

(3) Please explain the basis for stating that the radiation monitors are qualified for 40 years. Please note that qualification requirements of the computer based I&C equipment needs to follow the guidance in RG 1.209.

TVA Response to Follow-up NRC Request:

(1) After review, GA-ESI report 04038903-7SP, "Qualification Basis for 04034101-001 (2-RE-90-271, -272, -273 & -274)", submitted on TVA to NRC letter dated February 25, 2011 (Reference 3) follows the applicable guidance of Reg. Guide 1.209 for IEEE 323 section 7.2 documentation. The information is either contained in or referenced in the report. The documents are part of the GA-ESI permanent records and the appropriate GA-ESI records are part of the permanent TVA WBN Unit 2 quality records.

(2) The following IEEE 323 section 7.2 documentation requirements for equipment located in a harsh environment are not applicable for equipment located in a mild environment:

k. Aging mechanisms are not required by Reg. Guide 1.209
l. Qualified life determination is not required by Reg. Guide 1.209
m. Age conditioning test results are not required by Reg. Guide 1.209

The remaining documentation requirements are applicable in whole or in part to the RM-1000 radiation monitors. As described in item 1 above, GA-ESI report 04038903-7SP, Qualification Basis for 04034101-001 (2-RE-90-271, -272, -273 & -274), either contains or references the required documentation.

(3) As stated in Regulatory Guide 1.209, there is no need to establish a qualified life. This is addressed in the next to the last sentence of the second paragraph on page 2 which states: "In addition, because of ready accessibility for monitoring and maintenance in mild environments, the need to establish a qualified life does not apply." It is further discussed in the last paragraph on page 6 which states: "This guide does not intend to imply that a qualified life should be established for I&C systems in mild environments. Therefore, for the purposes of this guide, qualification is a validation of design to demonstrate that a safety-related computer-based I&C system is capable of performing its safety function under the specified environmental and operational stresses."

18. NRC Request (Item Number 354)

RG 1.180 endorsed the guidance of IEEE-1050-1996 with clarifications regarding Instrumentation and Control Equipment Grounding to minimize the effects of EMI/RFI and power surge related effects on the safety-related I&C systems. (1)TVA to describe the grounding of the I&C equipment (2) and to state whether or not it follows the guidance of IEEE Std 1050-1996.

TVA Response to NRC Request:

(1) The WBN Unit 2 grounding system design is in accordance with WB-DC-30-32, Revision 3, "Design Criteria For Grounding" (Attachment 5). I&C equipment grounding is described in Section 2.2.3C.1, "I&C Grounding System" (page 15). The design is based on IEEE 80-1986, "IEEE Guide for Safety in AC Substation Grounding."

(2) The design of the WBN grounding system predates IEEE 1050. As a result WBN Units 1 and 2 do not follow the guidance of IEEE 1050 or Regulatory Guide 1.180.

19. NRC Request (Item Number 355)

Staff has not found the stated exclusion zone for EMI/RFI interfering devices (e.g. hand-held radio devices) in the submitted documents. TVA to provide the distance for the exclusion zones if not provided already. If it is already submitted information then please point to the source of the information.

TVA Response to NRC Request:

Cautions and distance limitations for WBN Unit 1 legacy equipment are documented in TVA procedure TI-134, Revision 0, "Control of Portable Two-Way Radios," (Attachment 7) Appendix B. Where WBN Unit 2 uses the same legacy equipment, the same cautions and distance limitations apply.

New equipment is procured and tested to TVA Standard Specification SS E18.14.01, Revision 3, "Electromagnetic Interference (EMI) Testing Requirements for Electronic Devices" (Attachment 6). The TVA specification is conservative with respect to Regulatory Guide 1.180, Revision 1. The specification requires that equipment not be susceptible to external interference or create external interference. New equipment is either tested by the manufacturer or tested in the TVA EMI test facility to ensure it meets the specification. If issues are found, the equipment is modified and installation documents are revised to eliminate the issue(s). This is true for the RM-1000 radiation monitors which were tested prior to installation in Browns Ferry at 10v/meter ("Browns Ferry High Range Radiation Monitor dated December 8, 2006). Based on this, no exclusion zone for radio use is required for the RM-1000 radiation monitors in WBN Unit 2.

20. NRC Request (Item Number 356)

The attachment number refers to your February 25, 2011 letter. RM-1000 Qualification Test Report 04508905-QR (Attachment 23); page 4-27 in Table 4-22 shows that RM-3 output failed during the OBE and SSE tests. The justification for failure of this RM-3 output is not explained in the report or any of the appendices in the report. Please provide the resolution for this failure. Please note that a similar failure was reported in the test in Table 4-21 which was resolved in Appendix F, Closed Nonconforming Material Reports.

TVA Response to NRC Request:

The loss of the RM-3 output (current to frequency (I/F) converter output) was determined to be a result of a defect in the shaker table (described in section 4.3.6 page 4-23) which exposed the test articles to unexpected high G's. This caused a failure in the RM-1000 high voltage power supply output. This power supply was being used as a piece of test equipment to power the I/F converter and provide outputs to monitor I/F converter performance during the test. The resolution was to retest the I/F converter using a functional RM-1000 module at a later time (December 1998). The balance of the components (non-failed) were tested to completion during the original testing runs in the November 1998 time frame.

21. NRC Request (Item Number 357)

In Attachment 5, Qualification Test Report Supplement, RM-1000 (04508905-1SP), Attachment 6, Qualification Test Report Supplement, I/F Converter Upgrade (04508905-2SP), and Attachment 23, Qualification Test Report for RM-1000 Processor Module and Current-To-Frequency Converter (04508905-QR), the applicant made a statement that the results for these tests are provided in SE document 04508903-1TR. Please provide SE document 04508903-1TR for the staff to review. If this report has been submitted earlier then please advise us the letter number and date by which it was submitted.

TVA Response to NRC Request:

Attachment 8 contains the proprietary version of the GA-ESI qualification report 04508903-1TR, "Seismic Qualification Test Results RM-1000 and Current-to Frequency (I/F) Converter," original release, dated April 1999. TVA will submit the nonproprietary version of this GA-ESI qualification report and its affidavit for withholding information from public disclosure within 2 weeks of receipt from the vendor.

22. NRC Request (Item Number 358)

The attachment numbers refer to your February 25, 2011 letter. In Attachment 2, "Wyle Test Report 41991 Safety Shutdown Earthquake (SSE) Test Response Spectra (TRS) Plots" all five (5) pages, in Attachment 5, "General Atomics Electronic Systems 04508905-1SP," page 5-5, Figure 5-2, and in Attachment 23, Qualification Test Report for RM-1000 Processor Module and Current-To-Frequency Converter (04508905-QR)," page 4-25, Figure 4-5 X-Axis SSE Test Response Spectra (TRS) versus Required Response Spectra (RRS), it shows that the TRS were below the RRS at various frequency (5% Damping). Please provide an explanation regarding why this is acceptable.

TVA Response to NRC Request:

The purpose of the 04508905-1SP, page 5-5, Figure 5-2 and Figure 5-1 on the previous page was to support the assertion that the Display Module from the RM-2000 is qualified as used in the RM-1000. That graph has the RRS plotted at 16 g; if it is re-plotted at 15 g (per CEB-SS-5.10 Rev. 3, Figure 3.1), then it meets your requirements and the TRS does not drop below the RRS.

In the document 04508905-QR, Figure 4-5 on page 4-25 is the TRS for the first test performed. See page 4-38 of the same document for the second TRS graph which was performed on December 4, 1998. Again, the retest was required because of the failed I/F converter output previously mentioned.

Enclosure 2
TVA Letter Dated March 31, 2011
Responses to Licensee Open Items to be Resolved for SER Approval

List of Attachments

1. Westinghouse Electric Company WNA-TR-02451-WBT, Revision 0, "Test Summary Report for the Post Accident Monitoring System," dated March 2011 (non-proprietary)

2. Westinghouse Electric Company WNA-LI-00058-WBT-P, "Post-Accident Monitoring System (PAMS) Licensing Technical Report," Revision 3, dated March 2011 (proprietary)

3. Westinghouse Electric Company WNA-LI-00058-WBT-NP, "Post-Accident Monitoring System (PAMS) Licensing Technical Report," Revision 3, dated March 2011 (non-proprietary)

4. Westinghouse Electric Company CWA-11-3131, Application for Withholding Proprietary Information from Public Disclosure, WNA-LI-00058-WBT-P, Revision 3, "Nuclear Automation Watts Bar 2 NSSS Completion Program I&C Projects, Post-Accident Monitoring System (PAMS) Licensing Technical Report (Proprietary)," dated March 14, 2011

5. TVA Design Criteria WB-DC-30-32, Revision 3, Design Criteria For Grounding

6. TVA Standard Specification SS EI8.14.01, Revision 3, "Electromagnetic Interference (EMI) Testing Requirements For Electronic Devices"

7. TVA Procedure TI-134, Revision 0, "Control of Portable Two-Way Radios"

8. GA-ESI qualification report 04508903-1TR, "Seismic Qualification Test Results RM-1000 and Current-to Frequency (I/F) Converter," original release, dated April 1999

Enclosure 3
TVA Letter Dated March 31, 2011
Responses to Licensee Open Items to be Resolved for SER Approval

List of References

1. TVA to NRC letter "Watts Bar Nuclear Plant (WBN) Unit 2 – Instrumentation And Controls Staff Information Requests," dated June 18, 2010

2. TVA to NRC letter "Watts Bar Nuclear Plant (WBN) Unit 2 – Instrumentation And Controls Staff Information Requests," dated October 29, 2010

3. TVA to NRC letter "Watts Bar Nuclear Plant (WBN) Unit 2 – Instrumentation And Controls Staff Information Requests," dated February 25, 2011

4. TVA to NRC letter "Watts Bar Nuclear Plant (WBN) Unit 2 – Instrumentation And Controls Staff Information Requests," dated March 16, 2011

Enclosure 4
TVA Letter Dated March 31, 2011
Responses to Licensee Open Items to be Resolved for SER Approval

Regulatory Commitment

Attachment 8 contains the proprietary version of the GA-ESI qualification report 04508903-1TR, "Seismic Qualification Test Results RM-1000 and Current-to Frequency (I/F) Converter," original release, dated April 1999. TVA will submit the nonproprietary version of this GA-ESI qualification report and its affidavit for withholding information from public disclosure within two weeks of receipt from the vendor.