WBN2Public Resource

From: Boyd, Desiree L [dlboyd@tva.gov]
Sent: Wednesday, December 22, 2010 4:34 PM
To: Epperson, Dan; Poole, Justin; Raghavan, Rags; Milano, Patrick; Campbell, Stephen
Cc: Crouch, William D; Hamill, Carol L; Boyd, Desiree L; Knuettel, Edward Terry; Stockton, Rickey A
Subject: TVA letter to NRC_12-22-10_I&C RAI Response
Attachments: 12-22-10_I&C RAI Response_Final.pdf

Please see attached TVA letter that was sent to the NRC today.

The attachments are too large to send by e-mail. For those of you who receive a cc in the mail, the attachments will be included with your letter.

Thank You,

~*~*~*~*~*~*~*~*~*~*~*~*~*~*~*~
Désireé L. Boyd
WBN 2 Licensing Support
Sun Technical Services
dlboyd@tva.gov
423-365-8764
~*~*~*~*~*~*~*~*~*~*~*~*~*~*~*~

Hearing Identifier: Watts_Bar_2_Operating_LA_Public
Email Number: 239

Mail Envelope Properties (7AB41F650F76BD44B5BCAB7C0CCABFAF19A8A18A)

Subject: TVA letter to NRC_12-22-10_I&C RAI Response
Sent Date: 12/22/2010 4:34:16 PM
Received Date: 12/22/2010 4:34:57 PM
From: Boyd, Desiree L

Created By: dlboyd@tva.gov

Recipients:
"Crouch, William D" <wdcrouch@tva.gov>
Tracking Status: None
"Hamill, Carol L" <clhamill@tva.gov>
Tracking Status: None
"Boyd, Desiree L" <dlboyd@tva.gov>
Tracking Status: None
"Knuettel, Edward Terry" <etknuettel@tva.gov>
Tracking Status: None
"Stockton, Rickey A" <rastockton@tva.gov>
Tracking Status: None
"Epperson, Dan" <Dan.Epperson@nrc.gov>
Tracking Status: None
"Poole, Justin" <Justin.Poole@nrc.gov>
Tracking Status: None
"Raghavan, Rags" <Rags.Raghavan@nrc.gov>
Tracking Status: None
"Milano, Patrick" <Patrick.Milano@nrc.gov>
Tracking Status: None
"Campbell, Stephen" <Stephen.Campbell@nrc.gov>
Tracking Status: None

Post Office: TVANUCXVS2.main.tva.gov

Files	**Size**	**Date & Time**
MESSAGE	482	12/22/2010 4:34:57 PM
12-22-10_I&C RAI Response_Final.pdf	399560	

Options
Priority: Standard
Return Notification: No
Reply Requested: No
Sensitivity: Normal
Expiration Date:
Recipients Received:

~~Withhold from Public Disclosure Under 10 CFR 2.390~~

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

December 22, 2010

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 a list of attachments supporting TVA's responses to NRC's requests/questions provided in Enclosure 1. Enclosure 3 contains a list of documents referenced in TVA's responses that are provided in Enclosure 1. Enclosure 4 provides a list of the new Regulatory Commitments contained in this letter.

Attachments 1, 4, 7, 10 and 13 contain information proprietary to Westinghouse Electric Company (WEC). TVA requests that the WEC proprietary demarcated information be withheld from public disclosure in accordance with 10 CFR § 2.390. Attachments 3, 6, 9, 12 and 14 contain the Application for Withholding Proprietary Information from Public Disclosure Affidavits for the WEC documents in Attachments 1, 4, 7, 10 and 13, respectively. Attachments 2, 5, 8 and 11 contain the nonproprietary demarcated versions of the WEC proprietary documents in Attachments 1, 4, 7, and 10 respectively.

During review of the recent Common Q PAMS document submittals, discrepancies were identified in various documents. These discrepancies are identified in Attachment 18.

I declare under penalty of perjury that the foregoing is true and correct. Executed on the 22nd day of December, 2010.

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

Sincerely,

Edwin E. Freeman, Engineering
Watts Bar Unit 2

Enclosures:

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

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

bcc (Enclosures):

Stephen Campbell
U.S. Nuclear Regulatory Commission
MS 08H4A
One White Flint North
11555 Rockville Pike
Rockville, Maryland 20852-2738

Hukam C. Garg
U.S. Nuclear Regulatory Commission
MS 09D2
One White Flint North
11555 Rockville Pike
Rockville, Maryland 20852-2738

William E. Kemper
U.S. Nuclear Regulatory Commission
MS 09E3
One White Flint North
11555 Rockville Pike
Rockville, Maryland 20852-2738

Loren R. Plisco, Deputy Regional Administrator for Construction*
U. S. Nuclear Regulatory Commission
Region II
Marquis One Tower
245 Peachtree Center Ave., NE Suite 1200
Atlanta, Georgia 30303-1257

Enclosure 1
TVA Letter Dated December 22, 2010
Responses to Licensee Open Items to be Resolved for SER Approval

For some NRC RAI requests, this letter provides TVA's initial response. For the other NRC RAI requests 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.**"

1. NRC Request (Item Number 043)

The Post Accident Monitoring System (PAMS) Interim Staff Guidance-6 (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 Safety Evaluation (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 Diversity (D3) analysis was not applicable to PAMS, but provided no justification. The NRC asked for justification since Standard Review Plan (SRP) Chapter 7.5 identified Staff Requirements Memorandum (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 (CQ) 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.

Follow-up NRC Request:

WNA-LI-00058-WBT-P Rev. 1 (1) Section 7 does not include the Reusable Software Element Documents (RSEDs), and it should. (2) Table 6-1 Item No. 15 should also include the RSED Requirements Traceability Matrixes (RTMs).

TVA Response to Follow-up NRC Request:

WNA-LI-00058-WBT-P, Revision 2, "Post-Accident Monitoring System (PAMS) Licensing Technical Report" submitted in TVA Letter to NRC dated December 3, 2010, (Reference 1) contains the following changes to address the NRC requests:

(1) While RSEDs are not specifically mentioned, Section 7 has been revised to be applicable to both hardware and software which includes the RSEDs.

(2) Table 6-1, item 15 reference added for WNA-VR-00280-WBT (RESD)

2. NRC Request (Item Number 050)

How should the "shall" statements outside of the bracketed requirements in Common Q requirements documents be interpreted?

Follow-up NRC Request:

Revised Response is not a statement of fact. System Requirements Specification (SysRS) Rev. 2 (i.e., WNA-DS-01617-WBT Rev. 2) contains many "shalls" that are not within numbered requirements sections, for example:
(1) Page 2-1, Section 2.3.1 – See guidance statement
(2) Page 2-10, top of page 1 – See guidance statement

TVA Response to Follow-up NRC Request:

This item is corrected in the revision 3 requirements documents by removing all "shalls" outside of numbered requirements.

Attachment 1 contains the proprietary version of WNA-DS-01617-WBT-P, Revision 3, "Post Accident Monitoring System - System Requirements Specification," dated November 2010. Attachment 2 contains the non-proprietary version WNA-DS-01617-WBT-NP, Revision 3, "Post Accident Monitoring System - System Requirements Specification," dated December 2010. Attachment 3 contains the Application for Withholding Proprietary Information from Public Disclosure, WNA-DS-01617-WBT-P, Revision 3, "Nuclear Automation Watts Bar 2 NSSS Completion Program I&C Projects, Post Accident Monitoring System - System Requirements Specification" (Proprietary), dated December 6, 2010.

Attachment 4 contains the proprietary version of WNA-DS-01667-WBT-P, Revision 3, "Post Accident Monitoring System – System Design Specification," dated November 2010. Attachment 5 contains the non-proprietary version WNA-DS-01667-WBT-NP, Revision 3, "Post Accident Monitoring System – System Design Specification," dated December 2010. Attachment 6 contains the Application for Withholding Proprietary Information from Public Disclosure, WNA-DS-01667-WBT-P, Revision 3, "Nuclear Automation Watts Bar 2 NSSS Completion Program I&C Projects Post Accident Monitoring System - System Design Specification" (Proprietary), dated December 6, 2010.

Attachment 7 contains the proprietary version of WNA-SD-00239-WBT-P, Revision 3, "Software Requirements Specification for the Post Accident Monitoring System," dated November 2010. Attachment 8 contains the non-proprietary version WWNA-SD-00239-WBT-NP, Revision 3, "Software Requirements Specification for the Post Accident Monitoring System," dated December 2010. Attachment 9 contains the Application for Withholding Proprietary Information from Public Disclosure, WNA-SD-00239-WBT-P, Revision 3, "Nuclear Automation Watts Bar 2 NSSS Completion Program I&C Projects, Software Requirements Specification for the Post Accident Monitoring System" (Proprietary), dated December 8, 2010.

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.

Follow-up NRC Request:

Confirm this item is addressed in Rev. 2 of the Licensing Technical Report.

TVA Response to Follow-up NRC Request:

WNA-LI-00058-WBT-P, Revision 2, "Post-Accident Monitoring System (PAMS) Licensing Technical Report" submitted in TVA Letter to NRC dated December 3, 2010, (Reference 1) contains the following change to address the NRC request:

Section 7, "Commercial Grade Dedication Process," has been revised to describe the general commercial grade dedication process for both hardware and software and uses a description of the AI687 dedication process as an example of how the process is applied.

4. NRC Request (Item Number 068)

By letter dated March 12, 2010 TVA stated that the target submittal date for the "Summary Report on acceptance of (1) AI687, AI688, (2) Upgraded PC node box, (3) flat panels, and (4) power supplies." was September 28, 2010.

Follow-up NRC Request:

Confirm this item is addressed in Rev. 2 of the Licensing Technical Report.

TVA Response to Follow-up NRC Request:

For the commercial grade dedication process, please see the response to Request for Additional Information (RAI) item 3 in this letter, NRC Matrix Item 067.

The component level EQ/Seismic summary reports for the hardware listed above are available for NRC review/audit as described below:

(1) AI687 and AI688, the following documents were submitted in TVA letter to NRC dated October 26, 2010, "Watts Bar Nuclear Plant (WBN) Unit 2 – Instrumentation and Controls Staff Information Requests," (Reference 5):
   a. EQ-EV-62-WBT, Revision 0, "Common Q PAMS Comparison of Tested Conditions for the AI687 and AI688 Common Q Modules and Supporting Components to the Watts Bar Unit 2 (WBT) Requirements," dated September 10, 2010
   b. EQLR-171, Revision 0, "Environmental and Seismic Test Report, Analog Input (AI)687 & AI688 Modules for use in Common Q PAMS," dated September 10, 2010
   c. CN-EQT-10-44, Revision 0, "Dynamic Similarity Analysis for the Watts Bar Unit 2 Post Accident Monitoring System (PAMS)," dated September 28, 2010

(2) Upgraded PC Node Box – As stated in Westinghouse letter WBT-D-2024, dated June 9, 20106 "NRC Access to Common Q Documents at the Westinghouse Rockville Office," (Reference 6), the following documents are available for NRC audit at the Westinghouse Rockville office:
   a. CDI-3722, Revision 7, "Next Generation PC Node Box Commercial Dedication Instruction"
   b. LTR-EQ-10-50 "PC Node Box/Flat Panel Display System Components Qualification Summary"

(3) Flat Panel Displays – As stated in Westinghouse letter WBT-D-2024, dated June 9, 2010 "NRC Access to Common Q Documents at the Westinghouse Rockville Office," (Reference), the following documents are available for NRC audit at the Westinghouse Rockville office:
   a. CDI-3803, Revision 8, "Next Generation Flat Panel Display (FPD) Commercial Dedication Instruction"
   b. LTR-EQ-10-50 "PC Node Box/Flat Panel Display System Components Qualification Summary"

(4) Power supplies – As stated in Westinghouse letter WBT-D-2035 dated June 11, 2010 "NRC Access to Common Q Documents at the Westinghouse Rockville Office" (Reference 7), the following documents are available for NRC audit at the Westinghouse Rockville office:
   a. CDI- 4057, Revision 4, "Commercial Dedication Instruction"
   b. EQ-TP-1 05-GEN, Revision 0, "Electromagnetic Compatibility Test Plan and Procedure for Quint Power Supplies and Safety System Line Filter"
   c. EQ-TP-114-GEN, Revision 0, "Seismic Qualification Test Procedure For Common Q Power Supplies, Quint Power Supplies, Line Filter Assemblies, and South Texas Units 3 & 4 Circuit"
   d. EQ-TP-117-GEN, Revision 0, "Environmental Qualification Test Procedure For Common Q Power Supplies, Quint Power Supplies, and Line Filter Assemblies"

5. NRC Request (Item Number 073)

By letter dated March 12, 2010 TVA stated that the target submittal date for Revision 3 of the IV&V Report covering the Integration phase was October 29, 2010.

TVA Response:

WNA-VR-00283-WBT, Revision 3, "IV&V Summary Report for the Post Accident Monitoring System," covers the Integration phase. Attachment 10 contains the proprietary version of "IV&V Summary Report for the Post Accident Monitoring System," WNA-VR-00283-WBT-P, Revision 3, dated December 2010. Attachment 11 contains the non-proprietary version "IV&V Summary Report for the Post Accident Monitoring System," WNA-VR-00283-WBT-NP, Revision 3, dated December 2010. Attachment 12 contains the Application For Withholding Proprietary Information From Public Disclosure WNA-VR-00283-WBT, Revision 3, "Nuclear Automation Watts Bar 2 NSSS Completion Program I&C Projects, IV &V Summary Report for the Post Accident Monitoring System" (Proprietary), dated December 10, 2010.

6. NRC Request (Item Number 082)

The PAMS Licensing Technical Report (WNA-LI-00058-WBT Revision 0, Dated April 2010), in Section 2.3, lists hardware/software changes to the Common Q PAMS previously reviewed by the NRC. However the Common Q ISG-6 Compliance Matrix does not contain activities that address qualification of all changes specifically:

2.c - CI527 AF100 Peripheral Component Interconnect (PCI) interface card
3. - Common Q TC514 AF100 Fiber Optic Modems (Evolutionary Product Maintenance/Improvements)
4.a - PM646A Processor Module
4.b - CI631 AF100 Communication Interface Module
4.e - DO620 Digital Output Card

Please provide sufficient detail regarding the changes for the NRC to independently evaluate the acceptability of the changes.

Follow-up NRC Request:

During the September 20-21, 2010 audit, TVA agreed to put a description of the commercial grade dedication program and implementation in Rev. 2 of the CQ PAMS LTR.

TVA Response to Follow-up NRC Request:

Please see the response to Item 3 in this letter (NRC Matrix Item 067).

7. NRC Request (Item Number 085)

Please provide a detailed description of the PAMS Maintenance Test Panel (MTP) data link to the plant computer. This description should identify all equipment (model & version) and describe the functions that each piece of equipment performs. This description should be of sufficient detail for the NRC to independently evaluate the statements made in WNA-LI-00058-WBT Rev. 0, Section 5.3.

Follow-up NRC Request:

WEC response states that CQ PAMS LTR Rev. 2 will contain relevant information.

TVA Response to Follow-up NRC Request:

WNA-LI-00058-WBT-P, Revision 2, “Post-Accident Monitoring System (PAMS) Licensing Technical Report” submitted in TVA letter to NRC dated December 3, 2010 (Reference 1), contains the following changes to address the NRC requests:

Section 2.2, “System Description” page 2-3 provides a description of the MTP Fiber-Optic (FO) data link to the plant computer. Section 2.2.1.4, “Hardware” has been expanded to include a table detailing all hardware changes that have occurred since the initial

submittal. Section 2.2.2, "Software" has been expanded to include a table detailing all software changes that have occurred since the initial submittal.

8. 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."

TVA Response:

a. WNA-LI-00058-WBT-P, Revision 2, "Post-Accident Monitoring System (PAMS) Licensing Technical Report" submitted in TVA Letter to NRC dated December 3, 2010, (Reference 1) contains the following changes to address the NRC request:

Section 7, "Commercial Grade Dedication Process" has been revised to describe the general commercial grade dedication process for both hardware and software and uses a description of the AI687 dedication process as an example of how the process is applied.

As listed in Table 6-3, "Westinghouse Watts Bar 2 Common Q PAMS Documents at Westinghouse Rockville Office," the following commercial grade dedication documents are available for NRC audit at the Westinghouse Rockville office:

Document Title	Document #	Rev.
Preparation of Commercial Dedication Instructions (CDIs)	NA 7-4	0
Dedication Of Commercial Grade Items	WEC 7-2	1

Document Title	Document #	Rev.
Commercial Grade Surveys	WEC 7-3	0
Commercial Dedication Report for QNX 4.25G for Common Q Applications	WNA-CD-00018-GEN	3
Next Generation PC Node Box Commercial Dedication Instruction	CDI-3722	7
Next Generation Flat Panel Display (FPD) Commercial Dedication Instruction	CDI-3803	8
Commercial Dedication Instruction	CDI- 4057	4
Commercial Grade Dedication Plan for the QNX Operating System for Common Q Applications	00000-ICE-35444	0
Commercial Grade Dedication Report for the QNX Operating System for Common Q Applications	00000-ICE-37722	0
Commercial Dedication Report for QNX 4.25G for Common Q Applications	WNA-CD-00018-GEN	3
Commercial Grade Dedication Report For The ABB Advant PM646A/PM646B Firmware/Base System Software Version 1.3/8, ACC Advanced Version 1.7/1, AC160 PC and DB Element Library Version 1.5/0 For Common Q Applications	WNA-CD-00029-GEN	0
Commercial Grade Dedication Report for the QNX Operating System for Common Q Applications (00000-ICE-37722, Rev 00)	ML003733136	0

b. It is TVA's understanding that the submittal of the documents listed in (b.i) and (b.ii) is no longer required. Rather, it was agreed, that the inclusion of a description of the commercial grade dedication process in Revision 2 of the Post-Accident Monitoring System (PAMS) Licensing Technical Report, WNA-LI-00058-WBT-P, would be sufficient to address this request.

9. <u>NRC Request (Item Number 140)</u>

The first requirement in the WBN2 PAMS SysRS (i.e., R2.2-1) states: "The PAMS shall be capable of operation during normal and abnormal environments and plant operating modes." The rational for this requirement is that it is necessary to meet Regulatory Guide (RG) 1.97.

What document specifies which RG 1.97 variables are implemented in the Common Q based WBN2 PAMS?

<u>Follow-up NRC Request:</u>

The origin of the requirements in the SysRS are not clearly documented. Rev. 1 of the Common Q PAMS Licensing Technical Report contains an open item that will be addressed in Rev. 2; this open item is to include "TVA's enhanced contract compliance matrix." It is expected that this matrix will address this open item.

TVA Response to Follow-up NRC Request:

WNA-LI-00058-WBT-P, Revision 2, "Post-Accident Monitoring System (PAMS) Licensing Technical Report" submitted in TVA letter to NRC dated December 3, 2010, (Reference 1) contains the following change to address the NRC request:

Section 11, "TVA Contract Compliance Matrix" has been added. Specifically, the items of concern are addressed by Requirements 7 through 19.

10. NRC Request (Item Number 142)

The applicable regulatory guidance for reviewing the WBN2 PAMS SysRS would be IEEE 830 as endorsed by Regulatory Guide 1.172 and BTP 7-14 Section B.3.3.1, "Requirements Activities – Software Requirements Specifications." IEEE 830-1994 Section 4.3.8, "Traceable," states: "A [requirements specification] is traceable of the origin of each of its requirements is clear…"

1. *How did TVA ensure the traceability of each requirement in the WBN2 PAMS SysRS.*

TVA Response:

Traceability of requirements for the WBN Unit 2 Common Q PAMS is ensured by:

a. Preparation of the TVA Contract Compliance Matrix contained in WNA-LI-00058-WBT-P, Revision 2, "Post-Accident Monitoring System (PAMS) Licensing Technical Report" submitted in TVA letter to NRC dated December 3, 2010 (Reference 1).

b. Engineering review/comment/status of each revision of:

i. WNA-DS-01617-WBT, "Post Accident Monitoring System - System Requirements Specification"

ii. WNA-DS-01667-WBT, "Post Accident Monitoring System – System Design Specification" (hardware)

iii. WNA-SD-00239-WBT, "Software Requirements Specification for the Post Accident Monitoring System" (software)

2. *Explain the source(s) of the requirements present in the Post Accident Monitoring System's Software Requirements Specification. To clarify, many documents have requirements that are incorporated by reference into the Software Requirements Specification (SRS), but what served to direct the author to include those various documents in the SRS or, if the requirement is based on the System Requirements Specification, what directed the author to include the requirement there?*

TVA Response:

As documented in the RTM, some software requirements are taken from generic documents. The decision to include generic software requirements was to reduce the overall scope for Common Q features that are unchanged across projects. Westinghouse reviewed the generic PAMS requirements and included those requirements that were applicable to WBN Unit 2 PAMS.

Source: E-mail from Westinghouse (Matthew A. Shakun) to Bechtel (Mark S. Clark), RE: December 22 letter review, dated December 17, 2010 (Reference 13)

3. *Clarify whether the unnumbered paragraphs in the Post Accident Monitoring System's Software Requirements Specification, such as in the section headings, contain requirements or are all such sections simply considered to be informative?*

   Does the same apply to documents referenced by the SRS? Such as WCAP-16096-NP-A, Rev. 1A, "Software Program Manual for Common Q Systems," which is incorporated by reference in requirement R2.3-2 in the SRS.

   R2.3-2 [The PAMS software shall comply with the requirements and guidelines defined in WCAP-16096-NP-A, "Software Program Manual for Common Q Systems" (reference 5).]

   If any requirements are expressed in such unnumbered paragraph form instead of individually identified requirements, please list them, describe why they satisfy the fundamental requirement of unambiguity, and describe how they were verified.

   TVA Response:

   Unnumbered paragraphs in the Post Accident Monitoring System's Software Requirements Specification, such as in the section headings, are informative and are not to be interpreted as requirements. All requirements are explicitly numbered.

   It depends on the document type. The statement would be true for requirements documents (such as the SysRS or SDS) if they were incorporated by reference. However, for the specific item cited, WCAP-16096-NP-A, Rev. 1A, it does not contain numbered requirements. The requirements contained in this document are contained within the text of the various sections.

   Source: E-mail from Westinghouse (Matthew A. Shakun) to Bechtel (Mark S. Clark), RE: December 22 letter review, dated December 17, 2010 (Reference 13)

4. *Are there any sources of requirements in parallel with the Post Accident Monitoring System's Software Requirements Specification? Meaning does the SRS contain, explicitly or by reference, all the requirements that were used in the design phase for the application specific software, or do software design phase activities use requirements found in any other source or document? If so, what are these sources or documents?*

TVA Response:

The Westinghouse SRS, WNA-SD-00239-WBT, Revision 3 contains references to other Westinghouse software requirements documents. Specifically,

00000-ICE-3238, Revision 5, "Software Requirements Specification Post Accident Monitoring System"

00000-ICE-3239, Revision 13, "Software Requirements Specification for the Common Q Generic Flat Panel Display Software"

Source: E-mail from Westinghouse (Matthew A. Shakun) to Bechtel (Mark S. Clark), RE: December 22 letter review, dated December 17, 2010 (Reference 13)

5. *References 12, 27, 29, and 31-44 in the Post Accident Monitoring System's Software Requirements Specification are various types of "…Reusable Software Element…".*

   These references are used in the body of the SRS, for example:"

   R5.3.14-2 [The Addressable Constants CRC error signal shall be TRUE when any CAL CRC's respective ERROR terminal = TRUE (WNA-DS-00315-GEN, "Reusable Software Element Document CRC for Calibration Data" [Reference 12]).]

   They are also included via tables such as found in requirement R7.1.2-1

   [The Watts Bar 2 PAMS shall use the application-specific type circuits and custom PC elements listed in Table 7.1-1.]

   Do the referenced reusable software element documents include requirements not explicitly stated in the SRS? If so what is their origin?

   TVA Response:

   Requirements for the reusable software elements (RSEDs) are evaluated in WNA-VR-00283-WBT-P, Revision 3, "IV&V Summary Report for the Post Accident Monitoring System," dated December 2010 (Attachment 10).

   RSED traceability is contained in WNA-VR-00280-WBT, Revision 2, "Watts Bar 2 NSSS Completion Program I&C Projects Requirements Traceability Matrix for the Reactor Vessel Level Indication System (RVLIS) Custom PC Elements." This document can be made available for audit at the Westinghouse Rockville office.

At the September 15 public meeting in Rockville, the following actions were agreed to. These items address the traceability concerns with the Software Requirements Specification.

6. *Westinghouse will perform a review of the Requirements Traceability Matrix (RTM), using the issues identified at the 9/15 public meeting as a guide (documented below)*

and update the RTM as required.

TVA Response:

Please see response to letter item 13 (NRC Matrix Item 145).

7. *The next issue of the IV&V report will include the Requirements phase review of the RTM and a partial review for the Design phase.*

TVA Response:

Please see response to letter item 13 (NRC Matrix Item 145).

8. *Westinghouse will add a comments column in the Requirements Traceability Matrix (RTM) to address items not in the SRS or SysRS.*

TVA Response:

A comments column has been added to WNA-VR-00279-WBT, Revision 3, "Watts Bar 2 NSSS Completion Program I&C Projects Requirements Traceability Matrix for the Post Accident Monitoring System."

Source: E-mail from Westinghouse (Matthew A. Shakun) to Bechtel (Mark S. Clark), RE: December 22 letter review, dated December 17, 2010 (Reference 13)

9. *IEEE 830 says you shouldn't have planning information in the SRS. Westinghouse has agreed to remove this information.*

TVA Response:

Westinghouse has confirmed that process requirements have been removed from the SRS.

Source: E-mail from Westinghouse (Andrew P. Drake) to Bechtel (Mark S. Clark), RE: Common Q RAI concerns, dated December 8, 2010 (Reference 17)

10. *IEEE 830 says you shouldn't have process requirements in the SRS. Westinghouse has agreed to remove these requirements.*

TVA Response:

Westinghouse confirmed that process requirements have been removed from the SRS.

Source: E-mail from Westinghouse (Andrew P. Drake) to Bechtel (Mark S. Clark), RE: Common Q RAI concerns, dated December 8, 2010 (Reference)

11. *Westinghouse will perform and document an evaluation of the SRS to ensure compliance with Reg. Guide 1.172 and justify any deviations.*

TVA Response:

WNA-LI-00058-WBT-P, Revision 2, "Post-Accident Monitoring System (PAMS) Licensing Technical Report" submitted in TVA letter to NRC dated December 3, 2010, (Reference 1):

Section 9, "Compliance Evaluation Of The Watts Bar 2 PAMS Software Requirements Specification To IEEE Standard 830-1998 And Regulatory Guide 1.172" has been added.

12. *25 issues identified by V&V where some requirements have not been included in the System Design Specification (SDS) (14) and SRS (11) at the revisions reviewed by V&V. Have these been addressed?*

TVA Response:

The 25 issues are captured in Exception Reports (ERs): V&V-769 and V&V-770. These ERs have all been addressed and the ERs have been closed satisfactorily by Westinghouse IV&V.

Source: E-mail from Westinghouse (Matthew A. Shakun) to Bechtel (Mark S. Clark), RE: December 22 letter review, dated December 17, 2010 (Reference 13)

13. *Some hardware requirements are contained in the SRS instead of the System Design Specification (SDS). These will be removed from the SRS and incorporated into the next revision of the SDS.*

TVA Response:

The hardware requirements in the Software Requirements Specification have been deleted and moved to System Design Specification.

Source: E-mail from Westinghouse (Matthew A. Shakun) to Bechtel (Mark S. Clark), RE: December 22 letter review, dated December 16, 2010 (Reference 15)

14. *RTM item R4.2-2 protection class software set to 0. Needs to be fixed internally. Write CAPs to revise the application restrictions document on AC160.*

TVA Response:

Westinghouse CAPs IR# 10-259-M034 has been issued. This item will be addressed in revision 4 of the RTM.

Source: E-mail from Westinghouse (Matthew A. Shakun) to Bechtel (Mark S. Clark), RE: December 22 letter review, dated December 17, 2010 (Reference 13)

15. *Westinghouse to improve the traceability of the tests that are performed with the function enable (FE) switch in the "ENABLE" position.*

TVA Response:

The tests that are performed with the FE keyswitch in the ENABLE position are defined in the SRS Sections: 6.2 “Manually Initiated Testing,” 7.2.23 “Annunciator Test Display,” 7.2.25 “Saturation Margin Test Display,” and 7.2.26 “Analog Output Test Display.”

16. *Westinghouse to revise documents to be consistent with referring to the FE switch in the “ENABLE” position.*

TVA Response:

Westinghouse has elected to standardize on the terms “FE keyswitch” and “ENABLE.” A review of recent documents for compliance with this comment and commitment was performed with the following results:

a. Revision 3 of the SysRS, and SDS have been revised to use the terms “FE keyswitch.” Revision 3 of the SDS is consistent in use of the term “ENABLE.”

b. SysRS Revision 3 is not consistent in use of the term “ENABLE” as noted below:

   i. R2.5.2.1-2 uses the term “ENABLED” instead of “ENABLE”

   ii. R2.5.2.1.3-3, R2.6.3.3-1, R2.6.3.3-2, R2.6.3.3-3, and R2.6.3.3-7, use the term “Enable” instead of “ENABLE”

c. Revision 3 of the SRS is not consistent in use of the terms “FE keyswitch” and “ENABLE” as noted below:

   i. Tables 7.2-1 “Train A PAMS Data Transmitted to the Plant Computer” and 7.2-2 “Train B PAMS Data Transmitted to the Plant Computer” items 101 and 102 in the SRS refer to the FE switch. All other items in the SRS refer to the FE keyswitch.

   ii. Section 2.1, page 2-4, uses the term “Enable” instead of “ENABLE”

   iii. Requirements R7.2.14-6 and R7.2.16-7 use the term “active” instead of “ENABLE”

   iv. Requirements R7.2.23-2, R7.2.25-2, R7.2.26-2, R7.2.31-4, 7.2.56 FPDS Availability, and R7.2.57-4 use the term “enabled” instead of “ENABLE”

d. WNA-AR-00180-WBT-P, Revision 0, “Failure Modes and Effects Analysis (FMEA) for the Post Accident Monitoring System,” dated October 2010, submitted in TVA letter to NRC dated (Reference) is not consistent in use of the term “FE keyswitch” as noted below:

   i. Section 2.2 “System Description” and Table 3-1 “WB2 PAMS FMEA” refer to the FE switch.

ii. Table 3-1 describes the switch as the “Functional Enable (FE) switch” and the “FE key-switch”

e. Revision 2 of the Licensing Technical Report is not consistent in use of the term “FE keyswitch” as noted below:

i. Sections 2.2, 5.3 use the term (FE) keylock switch on pages 2-3 (2 places), page 5-3, page 5-6 (4 places)

The identified discrepancies in the use of the terms “FE keyswitch” and “ENABLE” in the SysRS, SRS, FMEA and Licensing Technical Report, will be corrected in the next revision of the documents.

17. *The flow of information is from the SysRS to the SDS (hardware) and SRS (software). Describe how the documents are used. Describe in 1.1 of the SysRS. Need a good write up of how the process works.*

TVA Response:

Please see response to letter item 13 (NRC Matrix Item 145).

18. *Westinghouse and TVA will develop a revised schedule for document submittals and provide it to the NRC no later than 9/30/10.*

TVA Response:

The revised document submittal schedule was included as Item 3 NRC Request (Matrix Item Number 142, TVA Commitments Nos. 10 and 17) in TVA letter to NRC dated October 26, 2010 (Reference 5).

19. *TVA will update the Procurement Requisition Resolution Matrix and submit it to show how the Common Q PAMS design meets the contract requirements.*

TVA Response:

The Procurement Requisition Resolution Matrix has been updated and is included in WNA-LI-00058-WBT-P, Revision 2, “Post-Accident Monitoring System (PAMS) Licensing Technical Report,” submitted in TVA letter to NRC dated December 3, 2010, (Reference 1), as Section 11, “TVA Contract Compliance Matrix.”

20. *Westinghouse to add the Software Design Descriptions to the RTM.*

TVA Response:

The Software Design Description documents were added to the RTM in WNA-VR-00279-WBT, Rev 2.

Source: E-mail from Westinghouse (Matthew A. Shakun) to Bechtel (Mark S. Clark), RE: December 22 letter review, dated December 17, 2010 (Reference 13)

21. *Westinghouse to clarify how requirements or documents are incorporated by reference into the Common Q PAMS requirements.*

TVA Response:

When a Common Q PAMS requirements document references a section of another document, all requirements in that section are applicable.

Source: E-mail from Westinghouse (Matthew A. Shakun) to Bechtel (Mark S. Clark), RE: December 22 letter review, dated December 17, 2010 (Reference 13)

22. *Westinghouse to review the use of "shall" outside of numbered paragraphs in requirements documents to ensure that all requirements are captured and clearly identified.*

TVA Response:

See response in letter dated December 22, 2010, item 2 (NRC Matrix Item 050).

23. *Westinghouse to resolve the following questions concerning Software Design Descriptions (SDDs)*

    a. *Is the SDD a standalone document or will it incorporate the generic SDD by reference?*

    b. *What are the SDDs?*

    c. *PAMS is a delta document so how do we capture all the generic requirements for traceability.*

TVA Response:

a. There are three SDDs prepared specifically for the Watts Bar 2 PAMS project. These are listed below in Item b. These documents and superior requirements documents refer to other generic SDDs also listed in Item b.

b. The SDDs developed for this project are:

    i. WNA-SD-00248-WBT, Revision 1, "Watts Bar 2 NSSS Completion Program I&C Projects Software Design Description for the Post Accident Monitoring System Flat Panel Display"

    ii. WNA-SD-00250-WBT, Revision 1, "Watts Bar 2 NSSS Completion Program I&C Projects Software Design Description for the Post Accident Monitoring System AC160 Software"

iii. WNA-SD-00277-WBT, Revision 2, "Watts Bar 2 NSSS Completion Program I&C Projects Software Design Description for the Post Accident Monitoring System Flat Panel Display System Screen Design Details"

iv. Other generic SDDs referenced by the PAMS project are:

(a) 00000-ICE-20157, Revision 18, "Software Design Description for the Common Q Generic Flat-Panel Software"

(b) 00000-ICE-30152, Revision 5, "Software Design Description Post Accident Monitoring System AC160"

(c) 00000-ICE-30140, Revision 4, "Software Design Description for the Common Q Core Protection Calculator System Database and Utility Functions"

c. Refer to WNA-VR-00279-WBT, Revision 3.

Source: E-mail from Westinghouse (Matthew A. Shakun) to Bechtel (Mark S. Clark), RE: December 22 letter review, dated December 17, 2010 (Reference 13)

24. *For Reusable Software Elements, Westinghouse to describe as qualified libraries by following the SPM and qualified using the Software Elements Test procedure under Appendix B program. Provide a summary of RSEDs generic WCAP. Westinghouse to determine if the WCAP was docketed under the AP1000. RSED concept is not in the SPM. WCAP-15927 AP-1000 does not discuss RCEDs. WCAP process was acceptable.* RSEDs are listed in the SDD References.

TVA Response:

Section 3.2.4.1 of WCAP-15927 describes the RSED design process for custom PC elements and type circuits. The Glossary of Terms in the SPM defines custom PC elements and type circuits as modules. Therefore, the relationship between WCAP-15927 describing the RSED process as circuits, is defined in the SPM requirements for software module development.

WCAP-15927 is on the AP1000 docket.

Source: E-mail from Westinghouse (Matthew A. Shakun) to Bechtel (Mark S. Clark), RE: December 22 letter review, dated December 17, 2010 (Reference 13)

11. NRC Request (Item Number 143)

The WBN2 PAMS Software Requirements Specification (WBN2 PAMS SRS – ML101050202) 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 (one of which is the WBN2 PAMS SysRS). Section 1.1, "Overview," of the WBN2 PAMS SRS states: "This document describes requirements for the major software components …"

(a) Please list and describe each of the "major software components". Please include a description of any NRC review for each of these components.

(b) Please list and describe each of the other software components. Please include a description of any NRC review for each of these components.

(c) What other documents contain the requirements for the other software components?

The WBN2 PAMS System Design Specification (WBN2 PAMS SDS) contains a table (see page iii) titled, "Document Traceability & Compliance," which states that the WBN2 PAMS SysRS was created to support the WBN2 PAMS SysRS. Section 1.1, "Purpose," of the WBN2 PAMS SDS states: "The purpose of this document is to define the hardware design requirements …"

(d) Do the WBN2 PAMS SRS and SDS, together, implement all of the requirements in the WBN2 PAMS SysRS?

(e) Please briefly describe all of the documents that implement the WBN2 PAMS SysRS.

To be addressed by Revision of the Requirements Traceability Matrix (RTM), Software Requirements Specification (SRS), System Requirements Specification (SysRS), and System Design Specification (SysDS).

TVA Response:

(a) and (b) The requested information is provided in the following documents:

i. WNA-LI-00058-WBT-P, Revision 2, "Post-Accident Monitoring System (PAMS) Licensing Technical Report," Table 6-1, "Document Requirements" which lists the software documentation requirements for the Common Q PAMS and Section 11, "TVA Contract Compliance Matrix," submitted in TVA letter to NRC, dated December 3, 2010 (Reference 1).

ii. WNA-DS-01617-WBT-P, Revision 3, "Post Accident Monitoring System- System Requirements Specification," dated December 2010 (Attachment 1)

iii. WNA-SD-00239-WBT-P, Revision 3, "Software Requirements Specification for the Post Accident Monitoring System," dated December 2010 (Attachment 7)

iv. WNA-VR-00279-WBT, Revision 3, "Watts Bar 2 NSSS Completion Program I&C Projects Requirements Traceability Matrix for the Post Accident Monitoring System" (available for NRC audit at the Westinghouse Rockville office)

To the best of TVA's knowledge, no prior NRC review of the software components has been performed.

(c) WNA-VR-00280-WBT, Revision 2, "Watts Bar 2 NSSS Completion Program I&C Projects Requirements Traceability Matrix for the Reactor Vessel Level Indication System (RVLIS) Custom PC Elements" (available for NRC audit at the Westinghouse Rockville office)

(d) No. Please see Item (e) below.

(e) The documents that describe the requirements that implement the WBN Unit 2 SysRS are:

i. WNA-VR-00279-WBT, Revision 3, "Watts Bar 2 NSSS Completion Program I&C Projects Requirements Traceability Matrix for the Post Accident Monitoring System" (available for NRC audit at the Westinghouse Rockville office)

ii. WNA-VR-00280-WBT, Revision 2, "Watts Bar 2 NSSS Completion Program I&C Projects Requirements Traceability Matrix for the Reactor Vessel Level Indication System (RVLIS) Custom PC Elements" (available for NRC audit at the Westinghouse Rockville office)

Source: E-mail from Westinghouse (Matthew A. Shakun) to Bechtel (Mark S. Clark), RE: December 22 letter review, dated December 17, 2010 (Reference 13)

12. <u>NRC Request (Item Number 144)</u>

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?

<u>Follow-up NRC Request:</u>

(1) Items b-d closed to other Open Item nos.

(2) The point of these questions was to understand how the origin of the requirements in the requirements specifications were documented. TVA stated that the origin of the requirements would be demonstrated in Rev. 2 of the CQ PAMS LTR.

TVA Response to Follow-up NRC Request:

(1) Item (a) in the original list, NABU-DP-00014-GEN Revision 2, "Design Process for Common Q Safety Systems," is available for NRC audit at the Westinghouse Rockville office.

(2) WNA-LI-00058-WBT-P, Revision 2, "Post-Accident Monitoring System (PAMS) Licensing Technical Report," submitted in TVA letter to NRC dated December 3, 2010, (Reference 1) contains the following change to address the NRC request:

Section 11, "TVA Contract Compliance Matrix," that identifies the origin of the requirements was added.

13. NRC Request (Item Number 145)

The WBN2 PAMS System Design Specification (WBN2 PAMS SDS) contains a table (see page iii) titled, "Document Traceability & Compliance," which states that the WBN2 PAMS SDS was created to support the WBN2 PAMS SysRS.

(a) Does the WBN2 PAMS SDS implement all of the hardware requirements in the WBN2 PAMS SysRS?

(b) Please briefly describe all of the documents that implement the hardware requirements of the WBN2 PAMS SysRS.

Follow-up NRC Request:

This item is used to track all traceability issues with the System Design Specification (SDS).

At the September 15 public meeting in Rockville, the following actions were agreed to. These items partially address the traceability concerns with the System Design Specification. This item will be updated with the results of the September 20 and 21 Commercial Grade Dedication and SDS RTM audit.

1. *Westinghouse will perform a review of the Requirements Traceability Matrix (RT), using the issues identified at the 9/15 public meeting as a guide (documented below) and update the RTM as required.*

2. *Some hardware requirements are contained in the SRS instead of the System Design Specification (SDS). These will be removed from the SRS and incorporated into the next revision of the SDS.*

3. *25 issues identified by V&V where some requirements have not been included in the SDS (14) and SRS (11) at the revisions reviewed by V&V. Have these been addressed?*

4. *TVA will update the Procurement Requisition Resolution Matrix and submit it to show how the Common Q PAMS design meets the contract requirements.*

5. *The next issue of the IV&V report will include the Requirements phase review of the RTM and a partial review for the Design phase.*

6. *Westinghouse to provide the generic AC160 and flat panel specifications.*

7. *Westinghouse and TVA to develop a schedule of licensing document submittals that can be met by the project team.*

8. *The flow of information is from the SysRS to the SDS (hardware) and SRS (software). Describe how the documents are used. Describe in 1.1 of the SysRS. Need a good write up of how the process works.*

TVA Response to Follow-up NRC Request:

1. The review and update of the RTM is complete. The revised RTM can be made available for NRC audit at the Westinghouse office in Rockville.

2. Please see letter Item (NRC Matrix Item 142, sub item 13).

3. Please see letter Item (NRC Matrix Item 142, sub item 12).

4. Section 11 “TVA Contract Compliance Matrix” was added to WNA-LI-00058-WBT-P, Revision 2, “Post-Accident Monitoring System (PAMS) Licensing Technical Report” submitted in TVA letter to NRC dated December 3, 2010, (Reference 1).

5. WNA-VR-00283-WBT, Revision 1, “IV&V Summary Report for the Post Accident Monitoring System,” submitted in TVA to NRC letter dated December 3, 2010 (Reference 1) includes the Requirements and Design phase reviews.

6. Per Westinghouse letter WBT-D-2268 “NRC Access to Common Q Documents at the Westinghouse Rockville Office,” dated August 16, 2010 (Reference 9), “System Requirements Specification for the Common Q Generic Flat Panel Display,” 00000-ICE-30155, Revision 9 is available for audit at the Westinghouse Rockville office.

The generic AC160 specifications are contained in the documents listed below. The documents are available for NRC audit at the Westinghouse Rockville office in accordance with the letter number referenced.

Letter #	Document Title	Document #	Rev
WBT-D-2024 (Reference 6)	System Requirements Specification for the Common Q Post Accident Monitoring System	00000-ICE-30156	6
WBT-D-2268 (Reference 9)	System Requirements Specification for the Common Q Generic Flat Panel Display	00000-ICE-30155	9
WBT-D-2268 (Reference 9)	Common Q Software Requirements Specification	00000-ICE-3238	5
WBT-D-2268 (Reference 9)	Software Requirements Specification for the Common Q Generic Flat Panel Display Software	00000-ICE-3239	12

Source: E-mail from Westinghouse (Andrew P. Drake) to Bechtel (Mark S. Clark), RE: NRC RAI, dated December 14, 2010 (Reference 16)

7. The revised document submittal schedule was included as item 3 NRC Request (Matrix Item Number 142, TVA Commitments Nos. 10 and 17) in TVA letter to NRC dated October 26, 2010 (Reference 5).

8. The flow of documentation information was provided to the NRC inspector during the Common Q PAMS audit.

   Source: E-mail from Westinghouse (Andrew P. Drake) to Bechtel (Mark S. Clark), RE: RAI on SysRS, dated December 8, 2010 (Reference 18)

14. NRC Request (Item Number 156)

FSAR section 7.2.2.1.1 states that dashed lines in Figure 15.1-1……designed to prevent exceeding 121% of power…….The value of 121% is changed from 118%. The justification for this change states that this was done to bring the text of this section in agreement with section 4.3.2.2.5, 4.4.2.2.6 and table 4.1-1. However, Table 4.1-1 and section 4.3.2.2.5 still show this value as 118%. Justify the change.

Follow-up NRC Request:

TVA needs to justify why some places 121% is used and other places 118% is used. What does 121% or 118% mean?

TVA Response to Follow-up NRC Request:

The following response was provided by Westinghouse letter WBT-D-2690 "Follow Up - NRC Request on 118% and 121 % FSAR Power Levels," dated December 6, 2010 (Reference 2). This corrects the information provided in TVA letter to NRC letter dated October 5, 2010 (Reference 21)

> A review of the markups provided by Westinghouse (Reference 4) and the current Unit 2 FSAR shows that in the context of the Power Range High Neutron Flux, High Setting, the value of 118% is correct. In the context of the peak core power during certain transients to confirm the fuel melt criterion, the value of 121% is correct. A detailed discussion of peak core power during transients is contained in FSAR Chapter 4.3.2.2.5, "Limiting Power Distributions."

15. 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 it 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?

Follow-up NRC 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.

TVA Response to Follow-up NRC Request:

Please see the response to Item 12 in this letter (NRC Matrix Item 144).

16. NRC Request (Item Number 185)

An emphasis is placed on the traceability of requirements in Software 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 it satisfies." Also the NRC considers that the SRS is the complete set of

requirements used for the design of the software, whether it is contained within one document or many. In order to evaluate an SRS against the guidance in the SRP the staff needs access to all the requirements.

References 12, 27, 29, and 31-44 in the Post Accident Monitoring System's Software Requirements Specification are various types of "…Reusable Software Element…".

These references are used in the body of the SRS, for example:

R5.3.14-2 [The Addressable Constants CRC error signal shall be TRUE when any CAL CRC's respective ERROR terminal = TRUE (WNA-DS-00315-GEN, "Reusable Software Element Document CRC for Calibration Data" [Reference 12]).]

They are also included via tables such as found in requirement R7.1.2-1

[The Watts Bar 2 PAMS shall use the application-specific type circuits and custom PC elements listed in Table 7.1-1.]

Do the referenced reusable software element documents include requirements not explicitly stated in the SRS? If so what is their origin?

Follow-up NRC Request:

(1) 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.
(2) TVA also said it would provide a RTM for the RSED.

TVA Response to Follow-up NRC Request:

(1) Please see the response to Item 12 in this letter (NRC Matrix Item 144).

(2) There is no RTM for development of the individual reusable software elements. As listed in item 15 of Table 6-1, "Document Requirements," of WNA-LI-00058-WBT-P, Revision 2, "Post-Accident Monitoring System (PAMS) Licensing Technical Report," submitted in TVA letter to NRC, dated December 3, 2010 (Reference 1), a RTM for implementation of the RSEDs (WNA-VR-00280-WBT) for the WBN Unit 2 Common Q PAMS has been developed. This document is available for NRC audit at the Westinghouse Rockville office.

17. NRC Request (Item Number 187)

By letter dated June 18, 2010, TVA docketed responses to NRC requests for information.

1) Enclosure 1, Item No. 33 of the TVA letter dated June 18, 2010, did not identify any connection from the PAMS Operator Modules (OMs) to the plant computer and printers; however, Figure 2.1-1 of the PAMS System Requirements Specification (WNA-DS-01617-WBT Rev. 1 – ML101680578) shows a TCP connection from the OMs to the plant computer and printer. Please explain.

2) Please clarify whether any digital safety-related systems or components have a digital communications path to non-safety-related systems or with safety related systems in another division. If so, NRC staff will need these paths identified on the docket.

Follow-up NRC Request:

Revise Response

TVA Response to Follow-up NRC Request:

A review of the following documents determined that the connection between the OM and the plant computer has been changed to a connection to a printer:

1. WNA-DS-01617-WBT-P, Revision 3, "Post Accident Monitoring System - System Requirements Specification," dated November 2010 (Attachment 1)

2. WNA-DS-01667-WBT-P, Revision 3, "Post Accident Monitoring System – System Design Specification," dated November 2010 (Attachment 4)

3. WNA-LI-00058-WBT-P, Revision 2, "Post-Accident Monitoring System (PAMS) Licensing Technical Report," dated November 2010, submitted in TVA to NRC letter December 3, 2010 (Reference 1)

Review of the newly released Common Q PAMS documents listed below confirmed they correctly show a connection from the OM to a printer and not the plant computer. None of the other newly released documents contain a figure of the Common Q PAMS system showing the connection from the OM. The exception is WCAP-17351 which was created to allow a non-proprietary version of a generic Common Q document to be submitted on the docket and was not intended to reflect the WBN Unit 2 configuration.

Note: The OM printer connection is only used for maintenance. A printer is not normally connected to the OM. To use the OM printer connection, the FE keyswitch must installed and be in the "ENABLE" position.

1. WNA-TP-02988-WBT, Revision 0, "Post Accident Monitoring System Channel Integration Test/Factory Acceptance Test," dated November 2010, submitted in TVA to NRC letter December 3, 2010 (Reference 1)

2. WNA-AR-00180-WBT-P, Revision 0, "Failure Modes and Effects Analysis (FMEA) for the Post Accident Monitoring System," dated October 2010, submitted in TVA to NRC letter November 5, 2010 (Reference 12)

18. NRC Request (Item Number 202)

The letter (ML0003740165) which transmitted the Safety Evaluation (SE) 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.

Follow-up NRC Request:

Submit Licensing Technical Report R2

TVA Response to Follow-up NRC Request:

WNA-LI-00058-WBT-P, Revision 2, "Post-Accident Monitoring System (PAMS) Licensing Technical Report," (LTR) submitted in TVA letter to NRC dated December 3, 2010, (Reference 1) contains the following change to address the NRC request:

Section 9, "Compliance Evaluation of the Watts Bar 2 PAMS Software Requirements Specification to IEEE Standard 830-1998 and Regulatory Guide 1.172" to show the origin of the requirements has been added.

The descriptions and commitments in the Topical Report (TR) still apply. The LTR provides compliance evidence to the new ISG-04 criteria. The statement in the SE means that the TR can be evaluated against later NRC criteria when it appears.

Source: E-mail from Westinghouse (Matthew A. Shakun) to Bechtel (Mark S. Clark), RE: December 22 letter review, dated December 17, 2010 (Reference 13)

19. 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 & 5.7.

Follow-up NRC Request:

Application specific requirements for testing. This cannot be addressed in a topical report. Evaluation of how the hardware meets the regulatory requirements.

WEC to provide the information and determine where the information will be located.

TVA Response:

1. IEEE-603 1991

5.5 System Integrity. The safety systems shall be designed to accomplish their safety functions under the full range of applicable conditions enumerated in the design basis.

TVA Response: The applicable conditions and Common Q PAMS system compliance are contained in WNA-LI-00058-WBT-P, Revision 2, "Post-Accident Monitoring System (PAMS) Licensing Technical Report" submitted in TVA letter to NRC dated December 3, 2010, (Reference 1) Section 11, "Contract Compliance Matrix" items:

- 87 and 88 Seismic
- 89, 90, 91, 92 and 185 EMI/RFI
- 300, 301 and 302 Environmental

5.7 Capability for Test and Calibration. Capability for testing and calibration of safety system equipment shall be provided while retaining the capability of the safety systems to accomplish their safety functions. The capability for testing and calibration of safety system equipment shall be provided during power operation and shall duplicate, as closely as practicable, performance of the safety function. Testing of Class 1E systems shall be in accordance with the requirements of IEEE Std 338-1987 [3]. Exceptions to testing and calibration during power operation are allowed where this capability cannot be provided without adversely affecting the safety or operability of the generating station. In this case:

(1) appropriate justification shall be provided (for example, demonstration that no practical design exists),

(2) acceptable reliability of equipment operation shall be otherwise demonstrated, and

(3) the capability shall be provided while the generating station is shut down.

TVA Response: The requirements for test and calibration and Common Q PAMS system compliance are contained in WNA-LI-00058-WBT-P, Revision 2, "Post-Accident Monitoring System (PAMS) Licensing Technical Report," Section 11, "TVA Contract Compliance Matrix" items:

- 202 self test
- 350 Maintenance Bypass
- 351 Loop Tuning Parameters,
- 400 and 401 3.7.2 Testing, Calibration, and Verification

- 402, 403 and 404, 3.7.3 Channel Bypass or Removal from Operation

5.10 Repair. The safety systems shall be designed to facilitate timely recognition, location, replacement, repair, and adjustment of malfunctioning equipment.

TVA Response: The requirements for repair and Common Q PAMS system compliance are contained in WNA-LI-00058-WBT-P, Revision 2, "Post-Accident Monitoring System (PAMS) Licensing Technical Report" Section 11, "TVA Contract Compliance Matrix" items:

- 179 Mean time to repair
- 202 self test
- 398 3.7 Maintenance
- 399 3.7.1 Troubleshooting

6.5 Capability for Testing and Calibration

6.5.1 Means shall be provided for checking, with a high degree of confidence, the operational availability of each sense and command feature input sensor required for a safety function during reactor operation. This may be accomplished in various ways; for example:

(1) by perturbing the monitored variable,

(2) within the constraints of 6.6, by introducing and varying, as appropriate, a substitute input to the sensor of the same nature as the measured variable, or

(3) by cross-checking between channels that bear a known relationship to each other and that have readouts available.

6.5.2 One of the following means shall be provided for assuring the operational availability of each sense and command feature required during the post-accident period:

(1) Checking the operational availability of sensors by use of the methods described in 6.5.1.

(2) Specifying equipment that is stable and retains its calibration during the post-accident time period.

TVA Response: The requirements for sense and command feature testing and Common Q PAMS system compliance are contained in WNA-LI-00058-WBT-P, Revision 2, "Post-Accident Monitoring System (PAMS) Licensing Technical Report" Section 11 "TVA Contract Compliance Matrix" items:

- 10, display of sensor diagnostic information
- 202 self test
- 205 self diagnostics and watchdog timer
- 264 through 271, system self checks
- 311 system status displays
- 341 alarms
- 344 on-line diagnostics

2. IEEE 7-4.3.2-2003

5.5 System integrity

In addition to the system integrity criteria provided by IEEE Std 603-1998, the following are necessary to achieve system integrity in digital equipment for use in safety systems:

— Design for computer integrity

— Design for test and calibration

— Fault detection and self-diagnostics

5.5.1 Design for computer integrity

The computer shall be designed to perform its safety function when subjected to conditions, external or internal, that have significant potential for defeating the safety function. For example, input and output processing failures, precision or round off problems, improper recovery actions, electrical input voltage and frequency fluctuations, and maximum credible number of coincident signal changes.

If the system requirements identify a safety system preferred failure mode, failures of the computer shall not preclude the safety system from being placed in that mode. Performance of computer system restart operations shall not result in the safety system being inhibited from performing its function.

TVA Response: Common Q PAMS system reliability and failure modes are described in:

- WNA-AR-00180-WBT, Revision 0, "Failure Modes and Effects Analysis (FMEA) for the Post Accident Monitoring System"

- WNA-AR-00189-WBT, Revision 0 "Post Accident Monitoring System Reliability Analysis"

The requirements for mean time between failure and Common Q PAMS system compliance are contained in WNA-LI-00058-WBT-P, Revision 2, "Post-Accident Monitoring System (PAMS) Licensing Technical Report," Section 11 "TVA Contract Compliance Matrix," item 178.

5.5.2 Design for test and calibration

Test and calibration functions shall not adversely affect the ability of the computer to perform its safety function. Appropriate bypass of one redundant channel is not considered an adverse effect in this context. It shall be verified that the test and calibration functions do not affect computer functions that are not included in a calibration change (e.g., setpoint change).

V&V, configuration management, and QA shall be required for test and calibration functions on separate computers (e.g., test and calibration computer) that provide the sole verification of test and calibration data. V&V, configuration management, and QA shall be required when the test and calibration function is inherent to the computer that is part of the safety system.

V&V, configuration management, and QA are not required when the test and calibration function is resident on a separate computer and does not provide the sole verification of test and calibration data for the computer that is part of the safety system.

TVA Response: The requirements for test and calibration and Common Q PAMS system compliance are contained in WNA-LI-00058-WBT-P, Revision 2, "Post-Accident Monitoring System (PAMS) Licensing Technical Report," Section 11, "TVA Contract Compliance Matrix," items:

- 202 self test

- 350 Maintenance Bypass

- 351 Loop Tuning Parameters

- 400 and 401 3.7.2 Testing, Calibration, and Verification

- 402, 403 and 404, 3.7.3 Channel Bypass or Removal from Operation

5.5.3 Fault detection and self-diagnostics

Computer systems can experience partial failures that can degrade the capabilities of the computer system, but may not be immediately detectable by the system. Self-diagnostics are one means that can be used to assist in detecting these failures. Fault detection and self-diagnostics requirements are addressed in this sub-clause.

The reliability requirements of the safety system shall be used to establish the need for self-diagnostics. Selfdiagnostics are not required for systems in which failures can be detected by alternate means in a timely manner. If self-diagnostics are incorporated into the system requirements, these functions shall be subject to the same V&V processes as the safety system functions.

If reliability requirements warrant self-diagnostics, then computer programs shall incorporate functions to detect and report computer system faults and failures in a timely manner. Conversely, self-diagnostic functions shall not adversely affect the ability of the computer system to perform its safety function, or cause spurious actuations of the safety function. A typical set of self-diagnostic functions includes the following:

— Memory functionality and integrity tests (e.g., PROM checksum and RAM tests)

— Computer system instruction set (e.g., calculation tests)

— Computer peripheral hardware tests (e.g., watchdog timers and keyboards)

— Computer architecture support hardware (e.g., address lines and shared memory interfaces)

— Communication link diagnostics (e.g., CRC checks)

Infrequent communication link failures that do not result in a system failure or a lack of system functionality do not require reporting.

When self-diagnostics are applied, the following self-diagnostic features shall be incorporated into the system design:

a) Self-diagnostics during computer system startup
b) Periodic self-diagnostics while the computer system is operating
c) Self-diagnostic test failure reporting

TVA Response: The requirements for fault detection and self diagnostics and Common Q PAMS system compliance are contained in WNA-LI-00058-WBT-P, Revision 2, “Post-Accident Monitoring System (PAMS) Licensing Technical Report,” Section 11, “TVA Contract Compliance Matrix,” items:

- 107 error free download
- 202 self test

- 205 self diagnostics and watchdog timer
- 263 primary and backup communication
- 264 through 271, continuous on-line self checks
- 311 system status displays
- 341 alarms,
- 344 on-line diagnostics

5.7 Capability for test and calibration

No requirements beyond IEEE Std 603-1998 are necessary.

TVA Response: No response required.

Westinghouse concurrence: E-mail from Westinghouse (Andrew P. Drake) to Bechtel (Mark S. Clark), RE: RAI 212 Response - Errors in the Contract Compliance Matrix, dated December 17, 2010 (Reference 14)

20. NRC Request (Item Number 244)

Section 8.2.2 of the Common Q SPM (ML050350234) states that the Software Requirements Specification (SRS) shall be developed using IEEE 830 and RE 1.172. Clause 4.8, "Embedding project requirements in the SRS," of the IEEE 830 states that an SRS should address the software product, not the process of producing the software. In addition Section 4.3.2.1 of the SPM states "Any alternatives to the SPM processes or additional project specific information for the ...Software Configuration Management Program (SCMP)...shall be specified in the Project Quality Plan (PQP).

Contrary to these two statements in the SPM, the WBN2 PAMS SRS (ML101050202) contains many process related requirements, for example all seventeen requirements in Section 2.3.2, "Configuration Control," address process requirements for configuration control.

Please explain how the above meets the intent of the approved SPM.

Follow-up NRC Request:

SysRS Rev. 2 also contains process requirements that are more appropriately incorporated into process documentation.

TVA Response to Follow-up NRC Request:

As shown in the listed documents, process related requirements have been deleted from the SRS and SysRS in Revision 3:

Attachment 1 contains proprietary version of WNA-DS-01617-WBT-P, Revision 3, "Post Accident Monitoring System-System Requirements Specification," dated December 2010.

Attachment 7 contains the proprietary version of WNA-SD-00239-WBT-P, Revision 3, "Software Requirements Specification for the Post Accident Monitoring System," dated December 2010.

Source: E-mail from Westinghouse (Andrew P. Drake) to Bechtel (Mark S. Clark), RE: Common Q RAI concerns, dated December 8, 2010 (Reference 17)

21. NRC Request (Item Number 250)

The SPM describes the software and documents that will be created and placed under configuration control. The SCMP (e.g., SPM Section 6, "Software Configuration Management Plan") describes the implementation tasks that are to be carried out. The acceptance criterion for software Configuration Management (CM) implementation is that the tasks in the SCMP have been carried out in their entirety. Documentation should exist that shows that the configuration management tasks for that activity group have been successfully accomplished. Please provide information that shows that the CM tasks have been successfully accomplished for each life cycle activity group.

Follow-up NRC Request:

10/25/10 is a partial response. Still waiting on Software Test Plan and all other testing documentation.

TVA Response to Follow-up NRC Request:

The following documentation shows that the configuration management tasks for that activity group have been successfully accomplished.

1. WNA-LI-00058-WBT-P, Revision 2, "Post-Accident Monitoring System (PAMS) Licensing Technical Report," submitted in TVA letter to NRC dated December 3, 2010, (Reference 1) contains the following changes to address the NRC requests:

   a. Section 2.2.1, "Hardware/Software Change Process," has been added to describe the process of how changes are evaluated.

   b. Section 2.2.2, "Software," has been expanded to include a table detailing evolutionary software changes that have occurred since the initial submittal and the change evaluation of the life cycle.

2. WNA-PT-00138-WBT, Revision 0, "Nuclear Automation Watts Bar 2 NSSS Completion Program I&C Projects, Post Accident Monitoring System Test Plan," (Proprietary), dated November 2010 submitted in TVA letter to NRC, dated December 3, 2010 (Reference 1).

22. 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.

Follow-up NRC Request:

10/25/10 is a partial response. Still waiting on Software Test Plan and all other testing documentation.

TVA Response to Follow-up NRC Request:

Please see the response Item 21 in this letter (NRC Matrix Item 250).

23. NRC Request (Item Number 252)

The SPM contain requirements for software requirements traceability analysis and associated documentation (see Section 5.4.5.3, "Requirements Traceability Analysis"). Please provide information that demonstrates that requirements traceability analysis has been successfully accomplished.

Explain response to AP1000 audit report.
RTM docketed NRC awaiting V&V evaluation of RTM.

TVA Response

The following responses are based on WBN Unit 2 Common Q PAMS traceability:

Software requirements traceability analysis is described in the following documents:

1. WNA-LI-00058-WBT-P, Revision 2, "Post-Accident Monitoring System (PAMS) Licensing Technical Report," submitted in TVA letter to NRC dated December 3, 2010, (Reference 1) Section 11, "TVA Contract Compliance Matrix"

2. WNA-VR-00279-WBT, "Watts Bar 2 NSSS Completion Program I&C Projects Requirements Traceability Matrix for the Post Accident Monitoring System" (available for NRC audit at the Westinghouse Rockville office)

3. WNA-VR-00280-WBT, "Watts Bar 2 NSSS Completion Program I&C Projects Requirements Traceability Matrix for the Reactor Vessel Level Indication System (RVLIS) Custom PC Elements" (available for NRC audit at the Westinghouse Rockville office)). This document addresses the RSEDs used in the WBN Unit 2 Common Q PAMS.

The V&V evaluation of the RTM is documented in Section 2.2.2 of the following documents:

1. The Independent Verification & Validation (IV&V) report covering the Concept and Definition phases ("Nuclear Automation Watts Bar Unit 2 NSSS Completion Program I&C Projects, IV&V Summary Report for the Post Accident Monitoring System," (Proprietary), WNA-VR-00283-WBT, Revision 1, dated November 2010), submitted in TVA Letter to NRC dated December 3, 2010 (Reference 1).

2. The Independent Verification &Validation (IV&V) report covering the Design and Implementation phases ("Nuclear Automation Watts Bar Unit 2 NSSS Completion Program I&C Projects, IV&V Summary Report for the Post Accident Monitoring System," (Proprietary), WNA-VR-00283-WBT, Revision 2, dated November 2010), submitted in TVA letter to NRC dated December 3, 2010 (Reference 1).

3. The integration phase is covered in Attachment 10, the proprietary version of "IV&V Summary Report for the Post Accident Monitoring System," WNA-VR-00283-WBT-P, Revision 3, dated December 2010. Attachment 11 contains the non-proprietary version of "IV&V Summary Report for the Post Accident Monitoring System," WNA-VR-00283-WBT-NP, Revision 3, dated December 2010. Attachment 12 contains the "Application For Withholding Proprietary Information From Public Disclosure WNA-VR-00283- WBT-P, Revision 3, "IV &V Summary Report for the Post Accident Monitoring System," (Proprietary)," dated December 2010.

24. NRC Request (Item Number 276)

In order for the staff to review the effects of multi control systems failure, provide the summary of the analyses documenting the effect on the plant based on the following events: (1) loss of power to all control systems powered by a single power supply; (2) failure of each instrument sensor which provides signal to two or more control systems; (3) Break of any sensor impulse line which is used for sensors providing signals to two or more control systems; and (4) failure of digital system based on the common cause software failure affecting two or more control systems. For each of these events, confirm that the consequences of these events will not be outside chapter 15 analyses or beyond the capability of operators or safety systems.

Follow-up NRC Request:

TVA changed the response in the latest write-up. The scope of the question applies to all non safety related control systems and is not limited to just three system listed by the TVA. TVA could use to envelope other control systems by Unit 1 analysis if they applies to Unit 2 systems also.

TVA Response to Follow-up NRC Request:

All non-safety related control systems were reviewed in the context of this question. The review found that failures of non-safety related control systems based on the scenarios in this RAI, do not have consequences which will put the plant outside the Chapter 15 analyses.

25. NRC Request (Item Number 301)

1. *TVA is requested to address the consequences of software common cause failure including all potential resulting failures (i.e. total loss of CERPI, system fail as-is).*
2. *In addition, address how the actions stipulated in the plant Technical Specifications will be taken when the CERPI system indications are lost. Information notice IN 2010-10 (ML100080281) addresses the need to consider software failures and the actions required to assure that the plant will stay within its licensing basis.*
3. *Provide FMEA in support of your response.*
4. *FSAR Table 7.7-1, Plant Control System Interlocks lists interlock C-11 to block automatic rod withdrawal when 1/1 Control Bank D rod position is above setpoint. This interlock capability would be lost in case of total loss of CERPI. How is the rod block assured for this event?*
5. *How is automatic rod withdrawal affected in case of total loss of signals from the CERPI to the ICS? Is this interlock fail safe?*
6. *FSAR chapter 15, Section 2.3.2.1 states that the resolution of the rod position indicator channel is 5% of span (7.2 inches). The CERPI system accuracy specified in the CERPI System requirements Specification, WNDS-DS-00001_WBT, Rev. 2 is 12 steps or 5.19%. The specified system accuracy seems to be greater than the accuracy assumed in the FSAR Chapter 15. Please clarify this anomaly.*

Follow-up NRC Request:

1. *Please explain how various alarms will continue to annunciate on software lockup? Need better explanation to understand the rationale behind the response.*

2. *Total failure of software and lock-up alone would normally be detected. Staff is also concerned by undetected failure within the digital system that could prevent proper system operation. A failure or fault that is detected can be addressed; however, failures that are non-detectable may prevent a system actuation when required or may result in a partial actuation. Please address the consequences of an undetected failures on system operation and alarms and interlocks including control bank D interlock. (See note 1 in the Comments column of this open item for reference)*

TVA Response to Follow-up NRC Request:

1. The following response is based on the information contained in Westinghouse letter WBT-D-2722, “Response To Question On CERPI RAI #301,” dated December 6, 2010 (Reference 3).

   TVA believes the follow-up question is related to the statement found in the response to question 2 of NRC Matrix Item 301, submitted in TVA letter to NRC, “Watts Bar Nuclear Plant (WBN) Unit 2 – Instrumentation and Controls Staff Information Requests,” dated November 24, 2010, (Reference 8) “Any failure of a hardware/software component (resulting in processor lock-up) would be immediately annunciated (Main Control Room alarm).”

The CERPI system will not annunciate various system alarms if the software is in a lockup condition. However, the system will annunciate an alarm based on the PLC watchdog relay dropping out because the software has "locked up" the processor. So, even if the PLC locks up, an alarm is generated to alert the operators in the Main Control Room (MCR).

The CERPI system alarms (that connect to the plant annunciator system) are wired to specific alarm relays within the CERPI system. With the exception of the watchdog alarm relay, the alarm relay coils are actuated by the PLC Digital Output Module. The plant annunciator wiring connects to either the Normally Open (NO) or the Normally Closed (NC) contacts of the associated alarm relay. The watchdog relay is configured such that when a timeout condition occurs (the PLC locks up), the watchdog relay de-energizes, and a CERPI System Trouble alarm is annunciated in the MCR.

2. As previously stated;

   a. For all accidents analyzed in WBN Unit 2 FSAR, Chapter 15, no credit is taken for the rod position indication system. For all continuous rod withdrawal accidents analyzed in WBN Unit 2 FSAR, Chapter 15, no credit is taken for any rod stop/block. Based on this, an undetected failure of the CERPI would not have any impact on the WBN Unit 2 accident analysis.

   b. Concerning the impact on Bank D, CERPI cabinet relays A-KX-18 and B-KX-18 are the PLC controlled components of Rod Withdrawal Limit. The relays are "active low" requiring power to activate the contacts in the control circuit. Total loss of CERPI will open the contacts and block Automatic Rod Withdrawal. Additionally, Annunciator window 64F will annunciate to show "C-11 BANK D AUTO WITHDRAWAL BLOCKED." Therefore, this would not result in an undetected failure. In the event of an undetected failure that kept relays A-KX-18 and B-KX-18 energized, the worst case scenario would be a continuous rod withdrawal event. This event is already addressed in the Chapter 15 accident continuous rod withdrawal accident analysis which takes no credit for rod stops/blocks.

26. NRC Request (Item Number 318)

TVA has provided the following documents for RM-1000 equipment qualification:

1. *Qualification Test Report for RM-1000 Processor Module and Current-To-Frequency Converter 04508905-QR (January 2001)*
2. *Qualification Test Report Supplement, RM-1000 Upgrades 04508905-1SP (June 2006)*
3. *Qualification Test Report Supplement, RM-1000 Upgrades 04508905-2SP (June 2008)*
4. *Qualification Test Report Supplement, RM-1000 Upgrades 04508905-3SP (May 2008)*

Please clarify whether all of these are fully applicable to WBN2 or are they applicable with exceptions? If with exceptions, then please clarify what those are.

Supplement 3 was issued one month prior to supplement 2. Please explain the reason for the same.

Follow-up NRC Request:

Response update required. It is clear that 04508903-2SP and -3SP are not applicable.

(1) *The response for applicability of 04508905-QR and -1SP to RM-1000 and I to F converter is not clear.*

(2) *Check page numbers of Appendix F (missing/duplicate pages).*

(3) *Check applicability of Appendix C to RM1000 instead of RM2300?*

All equipment qualification reports including supplements 2SP and 3SP have been reviewed as vendor drawings for WBN-2.

(4) *Please explain the reason for applicability of one report and not the other.*

Further all TVA/Bechtel reviews seems to be dispositioned as Code 4, "Review not required. Work may proceed." The applicable reports should have been reviewed prior to dispositioning them.

(5) *Please explain the apparent lack of review of WBN-2 applicable documents.*

(6) *Was appropriate review guidance used?*

TVA Response to Follow-up NRC Request:

NOTE: The response for the current to frequency (I to F) converter in item 1 below is a reversal of the response previously provided in TVA to NRC letter dated October 29, 2010 (Reference). General Atomics Electronic Systems Inc. (GA-ESI) notified TVA of this change on December 8, 2010 (Reference 20).

(1) The applicability of the qualification reports from GA-ESI e-mail dated December 10, 2010 (Reference 19) is as follows:

a. 04508905-QR "Qualification Test Report for RM-1000 Processor Module and Current-to-Frequency Converter" is applicable to the WBN Unit 2 RM-1000 and I to F converter modules.

b. 04508905-1SP "Supplement to Qualification Test Report for RM-1000 Processor Module and Current-to-Frequency Converter" is applicable to the WBN Unit 2 RM-1000 module.

c. 04508905-1SP is not applicable to the WBN Unit 2 I to F converter module.

d. 04508905-2SP "Qualification Test Report Supplement, I-F Converter Upgrades" is applicable to the WBN Unit 2 I to F converter module.

GA-ESI provided two other reports required to support qualification of the containment high range radiation monitors. The report descriptions are from GA-ESI e-mail on December 8, 2010 (Reference 20). The reports are:

e. GA-ESI Report 04038903-QSR, "Qualification Summary Report for Watts Bar Nuclear Plant Unit 2 Replacement Radiation Monitors." The report is the principle report and the starting point for all the radiation monitors provided as part of the replacement contract. The report describes each monitor, referenced to the technical manual for the physical and functional description and lists the major components of the monitor system. Report Section 3 identifies the TVA Watts Bar Unit 2 Environmental, Seismic, Electromagnetic Compatibility (EMC), and software requirements for each monitor. In Section 4 a brief description of GA-ESI generic qualification programs for all radiation monitoring equipment in each of the four above areas is provided. The qualification basis for each monitor is provided in a separate supplement to the principle report and is identified in Section 5.

f. GA-ESI Report 04038903-7SP, "Qualification Basis for 04034101-001 (2-RE-90-271, -272, -273, & -274) [TVA Note: These are the containment post accident high range radiation monitors.]:" GA-ESI Report 04038903-7SP is divided into subsections to address the Environmental, Seismic, EMC, and Software qualification basis for the High Range Area Monitors. Within each subsection, the HRAM is compared to a tested or analyzed article to demonstrate similarity and/or evaluate differences, the tests that were performed, and evaluation to demonstrate qualification. In most cases, the qualification basis references other documents. In addition to qualification, a section is provided that lists the life of those replaceable components that have life expectancy less than 40 years.

(2) This is addressed by response to RAI Question 336 in TVA to NRC letter dated November 24, 2010 (Reference 8)

(3) This is addressed by response to RAI Question 337 in TVA to NRC letter dated November 24, 2010 (Reference 8)

(4) The 04508905-3SP Qualification Test Report Supplement, RM-1000 Upgrades" is not applicable to WBN Unit 2 (Reference 19).

Please see Item 1, above, for applicability of the other reports.

(5) TVA provided the proprietary versions of the reports by letter dated March 12, 2010 (Reference 10). By letter dated July 15, 2010 (Reference), TVA provided the non-proprietary version of the reports and included a copy of the proprietary report which had been erroneously marked as having not been reviewed. 04508905-QR report has been reviewed by TVA. The review of the remaining reports is ongoing.

(6) See item 5.

27. NRC Request (Item Number 331)

As a follow up of OI 190, Staff has reviewed the proprietary version of the DMIMS-DX™ system description to verify the conformance claims in the FSAR. Staff has noted the following insufficiencies and discrepancies between the FSAR and the proprietary version of the system description for loose parts monitoring system provided by TVA.

1) *FSAR, Amendment 100, page 7.6-5 states, "During baseline testing, the reactor vessel and steam generator are impacted three feet from each sensor with a force of 0.5 ft-lb. Loose parts detection is accomplished at a frequency of 1 kHz to 20 kHz, where background signals from the RCS are acceptable. Spurious alarming from control rod stepping is prevented by a module that detects CRDM motion commands and automatically inhibits alarms during control rod stepping.*

   The online sensitivity of the DMIMS-DX™ is such that the system will detect a loose part that weighs from 0.25 to 30lb and impacts with a kinetic energy of 0.5 ft-lb on the inside surface of the RCS pressure boundary within 3 ft of a sensor."

   The source of this information is not cited nor is it described in the system description. TVA to provide the source of the information and update the system description as needed.

2) *Regulatory Guide (RG) 1.133, rev.1, regulatory position C.1.g states that, "Operability for Seismic and Environmental Conditions. Components of the loose-part detection system within containment should be designed and installed to perform their function following all seismic events that do not require plant shutdown, i.e., up to and including the Operating Basis Earthquake (OBE). Recording equipment need not function without maintenance following the specified seismic event provided the audio or visual alarm capability remains functional. The system should also be shown to be adequate by analysis, test, or combined analysis and test for the normal operating radiation, vibration, temperature, and humidity environment.*

   FSAR, Amendment 100, page 7.6-5 states, "The DMIMS-DX™ audio and visual alarm capability will remain functional after an Operating Basis Earthquake (OBE). All of the DMIMS-DX™ components are qualified for structural integrity during a Safe Shutdown Earthquake (SSE) and will not mechanically impact any safety-related equipment." Paragraphs 4.c and 4.d of the system description are not consistent with the seismic qualifications described in the FSAR. TVA to provide the source of the information contained in the FSAR and update the system description as needed.

3) *The system description clearly describes the "In-containment equipment" and "DIMMS-DX Cabinet equipment. The FSAR should be updated to reflect the equipment locations for clarification purposes.*

4) The information regarding frequency ranges of the sensors is included on page 7.6-6 of Amendment 100 of the FSAR but the system description does not contain this information. Please provide the source of this information and update the system description to reflect the appropriate information.

5) Please provide information as to how the in-containment components are qualified for vibration as addressed in regulatory position C.1.g of RG 1.133.

TVA Partial Response:

Items 1) through 4) were addressed in the partial response provided in TVA to NRC letter dated October 29, 2010. Item 5 is addressed as follows:

TVA has reviewed the information provided by Westinghouse describing how the Loose Part Monitoring System (LPMS) sensor is qualified for normal operating conditions provided in Westinghouse letter WBT-D-2782, dated December 17, 2010 (Reference 11), as addressed in regulatory position C.1.g of Regulatory Guide 1.133 and found it acceptable. Vibration qualification is not applicable to the softline cable. Due to the installation location (junction boxes mounted to the shield or fan room walls) and previous seismic qualification, vibration qualification of the charge converter/preamplifier is not required. This completes the response to this item.

28. 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.

TVA Response:

TVA has reviewed the information provided by Westinghouse describing how the Loose Part Monitoring System (LPMS) sensor is qualified for normal operating conditions provided in Westinghouse letter WBT-D-2782, dated December 17, 2010 (Reference 11), as addressed in regulatory position C.1.g of Regulatory Guide 1.133 and found it acceptable. The qualification information on the softline cable and charge converter/preamplifier is being assembled and will be submitted by March 11, 2011.

29. NRC Request (Item Number 340)

***(1)** Provide test result curves for all EMI/RFI tests listed in Table 3.2.3 (page 3-8) of the Qualification Test Report 04508905-QR. **(2)** In addition, please provide the standards or the guidance documents used as the source for ENV 50140, EN 55011 Class A, and EN 55022 Class B.*

TVA Response:

The following responses are based on e-mail: GA-ESI to Bechtel, dated December 8, 2010 (Reference 20):

(1) The EMI/RFI tests described in Table 3-2 are based on GA-ESI Report 04509050 and are summarized in GA-ESI Report 04508905-QR. The independent laboratory report, with curves, is part of GA-ESI report 04509050. Subsequent to issuing GA-ESI Report 04508905-QR, additional EMC testing was performed in accordance with TVA specific requirements. The results of the subsequent EMC testing are reported in GA-ESI Report 04038800. GA-ESI Report 04038800 includes the test curves, and the report is used as the basis for EMC qualification of the Upper and Lower Inside Containment Post Accident Radiation Monitors (2-RE-90-271 through -274). The results of the testing and the acceptability of the RM-1000 monitors for use at WBN Unit 2 are addressed in GA-ESI Report 04038903-7SP. This report will be submitted no later than January 28, 2010.

(2) ENV 50140, EN 55011, and EN 55022 are British Standard Institution (BSI) publications concerning equipment electromagnetic and radio frequency performance. The standard titles are shown below:
   a. ENV 50140 - Electromagnetic Compatibility - Basic Immunity Standard - Radiated Radio-Frequency Electromagnetic Field - Immunity Test
   b. EN 55011 - Industrial, scientific and medical equipment - Radio-frequency disturbance characteristics - Limits and methods of measurement
   c. EN 55022 - Information technology equipment - Radio disturbance characteristics - Limits and methods of measurement

30. NRC Request (Item Number 341)

FSAR Tables 3.10 list seismically qualified equipment. However, these tables do not list the containment high range radiation monitors. Please add them to the appropriate FSAR table(s) or justify why they should not be included in the FSAR 3.10 series of tables.

TVA Response:

A review of WBN Unit 2 FSAR Amendment 102, Chapters 3.10, 11 and 12 was performed. The reviewer was unable to locate seismic qualification information for the radiation monitoring system in those chapters. A review of Chapter 3.11 confirmed that radiation monitoring is included in the environmentally qualified systems.

It appears that seismic qualification of the radiation monitoring equipment was unintentionally omitted from FSAR Chapter 3.10. FSAR Chapter 3.10 will be updated to include the qualified radiation monitoring equipment in a future FSAR amendment.

31. NRC Request (Item Number 342)

Please confirm that RM-1000 monitors and the associated equipment is supplied power from redundant battery backed class 1E power sources.

TVA Response:

The RM-1000 containment high range radiation monitors are powered from 2-RM-90-271 and 2-RM-90-273 – Vital Power Board 2-III Breaker 45 Train A and 2-RM-90-272 and 2-RM-90-274 – Vital Power Board 2-IV Breaker 47 Train B. The vital power boards are battery backed.

32. NRC Request (Item Number 343)

Seismic RRS in the 04508905-QR report Figures 3-2 and 3-3 show Required Response Spectra (RRS) to be greater than 20 g's. The Test Response Spectra (TRS) in Figures 4-11 and 4-12 appears to be limited to about 15 g maximum. ***(1)*** *Please explain this apparent lack of consistency between the RRS and the TRS.* ***(2)*** *Will this document be revised to take care of this inconsistency?*

TVA Response:

(1) The cause of the difference between the RRS and TRS was a test equipment failure at the test facility. When the test equipment failed, the facility was unable to use the table capable of 20gs. Rather than delay testing for six months, the facility proposed and GA-ESI agreed to use a smaller table with a lower capability. The justification was that the resulting TRS would still envelope the majority of U.S. nuclear plants RRS.

(2) To TVA's knowledge GA-ESI does not plan to revise this report. This is a baseline report that is used as a basis for producing individual plant specific reports.

33. TVA Project Manager Commitment (This commitment was not tracked in "Licensee Open Items to be Resolved for SER Approval List")

The NRC reviewer requested that the available qualification information be provided before December 31, 2010.

Actions Taken to Address Commitment:

The TVA Project Manager contacted Westinghouse and requested an advance copy of the final qualification report be submitted by December 10, 2010. Attachment 13 contains EQ-QR-68-WBT, Revision 0-A, "Qualification Summary Report for Post-Accident Monitoring System (PAMS)," dated December 2010. This is a preliminary version of the report. The information is subject to change. Attachment 14 contains the Application for Withholding Proprietary Information from Public Disclosure, EQ-QR-68-WBT, Revision 0-A, "Watts Bar Unit 2 NSSS Completion Program I&C Projects, Qualification Summary Report for Post-Accident Monitoring System (PAMS)" (Proprietary).

Enclosure 2
TVA Letter Dated December 22, 2010
List of Attachments

1. WNA-DS-01617-WBT-P, Revision 3, “Post Accident Monitoring System - System Requirements Specification”, dated November 2010

2. WNA-DS-01617-WBT-NP, Revision 3, “Post Accident Monitoring System - System Requirements Specification”, dated November 2010

3. Application for Withholding Proprietary Information from Public Disclosure, WNA-DS-01617-WBT-P, Revision 3, “Nuclear Automation Watts Bar 2 NSSS Completion Program I&C Projects, Post Accident Monitoring System - System Requirements Specification” (Proprietary), dated December 6, 2010

4. WNA-DS-01667-WBT-P, Revision 3, “Post Accident Monitoring System – System Design Specification,” dated November 2010

5. WNA-DS-01667-WBT-NP, Revision 3, “Post Accident Monitoring System – System Design Specification,” dated November 2010

6. Application for Withholding Proprietary Information from Public Disclosure, WNA-DS-01667-WBT-P, Revision 3, “Nuclear Automation Watts Bar 2 NSSS Completion Program I&C Projects Post Accident Monitoring System - System Design Specification” (Proprietary), dated December 6, 2010

7. WNA-SD-00239-WBT-P, Revision 3, “Software Requirements Specification for the Post Accident Monitoring System,” dated November 2010

8. WNA-SD-00239-WBT-NP, Revision 3, “Software Requirements Specification for the Post Accident Monitoring System,” dated November 2010

9. Application for Withholding Proprietary Information from Public Disclosure, WNA-SD-00239-WBT-P, Revision 3, “Nuclear Automation Watts Bar 2 NSSS Completion Program I&C Projects, Software Requirements Specification for the Post Accident Monitoring System” (Proprietary), dated December 8, 2010

10. WNA-VR-00283-WBT-P, Revision 3, “IV&V Summary Report for the Post Accident Monitoring System,” dated December 2010

11. WNA-VR-00283-WBT-NP, Revision 3, “Nuclear Automation Watts Bar 2 NSSS Completion Program I&C Projects, IV&V Summary Report for the Post Accident Monitoring System,” dated December 2010

12. Application For Withholding Proprietary Information From Public Disclosure WNA-VR-00283- WBT-P, Revision 3, “IV &V Summary Report for the Post Accident Monitoring System” (Proprietary), dated December 2010

13. EQ-QR-68-WBT, Revision 0-A, “Qualification Summary Report for Post-Accident Monitoring System (PAMS),” dated December 2010

14. Application for Withholding Proprietary Information from Public Disclosure, EQ-QR-68-WBT, Revision 0-A, “Watts Bar Unit 2 NSSS Completion Program I&C Projects, Qualification Summary Report for Post-Accident Monitoring System (PAMS)” (Proprietary)

Enclosure 2
TVA Letter Dated December 22, 2010
List of Attachments

15. Not used

16. Not used

17. Not used

18. Common Q PAMS Document Review Discrepancies

Enclosure 3
TVA Letter Dated December 22, 2010
List of References

1. TVA Letter to NRC, dated December 3, 2010 “Watts Bar Nuclear Plant (WBN) Unit 2 – Instrumentation and Controls Staff Information Requests” (T02 101203 001)

2. Westinghouse letter WBT-D-2690, dated December 6, 2010, “Follow Up -NRC Request on 118% and 121 % FSAR Power Levels” (25402-011-G26-GAKS-05717-001)

3. Westinghouse letter WBT-D-2722, dated December 6, 2010, “Response To Question On CERPI RAI #301” (25402-011-G26-GAKS-05718-001)

4. Westinghouse letter WBT-D-2340, dated August 30, 2010, “FSAR Markups Units 1 and 2 118% vs 121% and Correction to RAI Response SNPB 4.3.2-7” (25402-011-G26-GAKS-04760-001)

5. TVA Letter to NRC , dated October 26, 2010, “Watts Bar Nuclear Plant (WBN) Unit 2 – Instrumentation and Controls Staff Information Requests” (T02 101026 011)

6. Westinghouse letter WBT-D-2024, dated June 9, 2010, “NRC Access to Common Q Documents at the Westinghouse Rockville Office” (25402-011-G26-GAKS-03825-001)

7. Westinghouse letter WBT-D-2035, dated June 11, 2010, “NRC Access to Common Q Documents at the Westinghouse Rockville Office” (25402-011-G26-GAKS-03845-001)

8. TVA Letter to NRC, dated November 24, 2010, “Watts Bar Nuclear Plant (WBN) Unit 2 – Instrumentation and Controls Staff Information Requests” (T02 10112 4001)

9. Westinghouse letter WBT-D-2268, dated August 16, 2010, “NRC Access to Common Q Documents at the Westinghouse Rockville Office” (25402-011-G26-GAKS-04605-001)

10. TVA Letter to NRC, dated March 12, 2010, “Watts Bar Nuclear Plant (WBN) Unit 2 - Additional Information Regarding Final Safety Analysis Report (FSAR), Chapter 7, "Instrumentation And Controls" Review”

11. Westinghouse letter WBT-D-2782, dated December 17, 2010, “Response to Request for Loose Parts Monitoring System Qualification Documents” (25402-011-G26-GAKS-05859-001)

12. TVA Letter to NRC, dated November 5, 2010, “Watts Bar Nuclear Plant (WBN) Unit 2 – Instrumentation and Controls Staff Information Requests” (T02 101105 006)

13. E-mail from Westinghouse (Matthew A. Shakun) to Bechtel (Mark S. Clark), RE: December 22 letter review, dated December 17, 2010

14. E-mail from Westinghouse (Andrew P. Drake) to Bechtel (Mark S. Clark), RE: RAI 212 Response - Errors in the Contract Compliance Matrix, dated December 17, 2010

15. E-mail from Westinghouse (Matthew A. Shakun) to Bechtel (Mark S. Clark), RE: December 22 letter review, dated December 16, 2010

16. E-mail from Westinghouse (Andrew P. Drake) to Bechtel (Mark S. Clark), RE: NRC RAI, dated December 14, 2010

Enclosure 3
TVA Letter Dated December 22, 2010
List of References

17. E-mail from Westinghouse (Andrew P. Drake) to Bechtel (Mark S. Clark), RE: Common Q RAI concerns, dated December 8, 2010

18. E-mail from Westinghouse (Andrew P. Drake) to Bechtel (Mark S. Clark), RE: RAI on SysRS, dated December 8, 2010

19. E-mail from General Atomics Electronic Systems Inc. (Paul Berner) to Bechtel (Mark S. Clark), RE: RM-1000 Qualification Documents, dated December 10, 2010

20. E-mail from General Atomics Electronic Systems Inc. (Paul Berner) to Bechtel (Mark S. Clark), RE: New NRC RAIs on the RM-1000 High Range Radiation Monitors, dated December 8, 2010

21. TVA Letter to NRC, dated October 5, 2010 “Watts Bar Nuclear Plant (WBN) Unit 2 – Instrumentation and Controls Staff Information Requests” (T02 101005 001)

22. TVA Letter to NRC, dated October 29, 2010 “Watts Bar Nuclear Plant (WBN) Unit 2 – Instrumentation and Controls Staff Information Requests” (T02 101029 002)

23. TVA Letter to NRC, dated July 15, 2010 “Watts Bar Nuclear Plant (WBN) Unit 2 – Instrumentation and Controls Staff Information Requests” (T02 100719 002)

Enclosure 4
TVA Letter Dated December 22, 2010
List of New Regulatory Commitments

1. The qualification information on the LPMS softline cable and charge converter/preamplifier will be submitted by March 11, 2011.

2. The discrepancies identified in the Contract Compliance Matrix of WNA-LI-00058-WBT-P, Revision 2, "Post-Accident Monitoring System (PAMS) Licensing Technical Report," will be corrected in Revision 3 of the document.

3. FSAR Chapter 3.10 will be updated to include the qualified radiation monitoring equipment in a future FSAR amendment.

4. The RM-1000 qualification reports 04038903-QSR and 04038903-7SP will be submitted no later than January 28, 2011.

5. The Common Q PAMS document discrepancies identified in TVA letter to NRC dated December 22, 2010, Attachment 15, will be corrected in the next revision of the identified documents. TVA will submit the revised documents within two weeks of receipt from Westinghouse.