

January 11, 2012

Ms. Sandra Sloan  
AREVA NP Inc.  
3315 Old Forest Road  
P.O. Box 10935  
Lynchburg, VA 24506-0935

SUBJECT: U.S. NUCLEAR REGULATORY COMMISSION'S SUPPORTING  
DOCUMENT FOR THE CHAPTER 16 TECHNICAL SPECIFICATION  
AUDIT (DOCKET NO. 52-020)

Dear Ms. Sloan:

From October 25–28, 2011, the U.S. Nuclear Regulatory Commission (NRC) staff examined supporting documents related to Chapter 16 of the AREVA NP Inc. (AREVA) U.S. Evolutionary Pressurized Reactor (U.S. EPR) design certification (DC) application at the AREVA facility in Charlotte, North Carolina. The NRC staff reviewed technical documents that contained the Instrumentation Technical Specifications (TS) for the U.S. EPR. The enclosed report presents the details of that activity.

The staff conducted a 4-day audit of the U.S. EPR Instrumentation Technical Specifications (TS) and Bases during the period of October 25–28, 2011, at the AREVA office. NRC Audit Team Reviewers included the following Office of New Reactors staff members: Joseph DeMarshall and Craig Harbuck (Balance of Plant and Technical Specifications Branch), Wendell Morton (Instrumentation and Controls and Electrical Engineering Branch), Getachew Tesfaye and Peter Hearn (EPR Projects Branch).

The initial audit scope was for both AREVA and the NRC staff to concurrently perform a line-by-line review of all Instrumentation LCO 3.3.1 Condition Statements, Surveillance Requirements, Component Item information in Table 3.3.1-1, and Function Item information in Table 3.3.1-2.

In addition to the scheduled entrance and exit meetings, daily status meetings were conducted at the end of each day to update AREVA management on the progress of the audit. A strong AREVA management presence was observed throughout the week. Note that one or more AREVA managers were physically present in the designated meeting room for a significant portion of the audit.

Upon conclusion of the second day, it became evident, due to the breadth, nature, and complexity of the TS material, that it would not be possible to accomplish the initial audit scope in its entirety. The staff communicated this to AREVA during the daily status meeting on Wednesday afternoon, October 26, 2011. Because the U.S. EPR Instrumentation TS are component-based, their structure and format make it necessary to specify additional levels of detail, making them more complex than the function-based Instrumentation TS used in operating plants and the Standard Technical Specifications (STS). The component-based approach to TS adopted by AREVA is a first-of-a-kind initiative used only in the EPR design.

S. Sloan

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In an effort to adequately address all areas of concern and get through as much material as possible, the staff refined the initial audit scope, devoting the final two days of the audit to identifying and describing in detail, specific examples representative of the various types of issues (e.g., discrepancies, inaccuracies, inconsistencies, etc.) that are prevalent throughout the EPR Instrumentation TS and Bases. An "Audit Action Tracking List" containing 23 items (see enclosed) was developed to capture these issues. AREVA has the action to resolve all list items and formally communicate the disposition of all items to the staff.

In accordance with Section 2.390, "Public Inspections, Exemptions, Requests for Withholding," of Title 10 of the *Code of Federal Regulations* Part 2, "Rules of Practice for Domestic Licensing Proceedings and Issuance of Orders," a copy of this letter, and its enclosures will be made available for public inspection at the Commission's Public Document Room, located at One White Flint North, Public File Area O1 F21, 11555 Rockville Pike (first floor), Rockville, Maryland, and via the Agencywide Documents Access and Management System Public Electronic Reading Room on the Internet at the NRC Web site, <http://www.nrc.gov/reading-rm/adams.html>.

If you have any questions regarding this matter, please contact me at 301-415-3361 or via email at [getachew.tesfaye@nrc.gov](mailto:getachew.tesfaye@nrc.gov).

Sincerely,

*/RA/*

Getachew Tesfaye, Sr. Project Manager  
EPR Projects Branch  
Division of New Reactor Licensing  
Office of New Reactors

Docket No. 52-020

Enclosure:  
As stated

cc w/encl: See next page

In an effort to adequately address all areas of concern and get through as much material as possible, the staff refined the initial audit scope, devoting the final two days of the audit to identifying and describing in detail, specific examples representative of the various types of issues (e.g., discrepancies, inaccuracies, inconsistencies, etc.) that are prevalent throughout the EPR Instrumentation TS and Bases. An "Audit Action Tracking List" containing 23 items (see enclosed) was developed to capture these issues. AREVA has the action to resolve all list items and formally communicate the disposition of all items to the staff.

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If you have any questions regarding this matter, please contact me at 301-415-3361 or via email at [getachew.tesfaye@nrc.gov](mailto:getachew.tesfaye@nrc.gov).

Sincerely,

/RA/

Getachew Tesfaye, Sr. Project Manager  
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Office of New Reactors

Docket No. 52-020

Enclosure:  
As stated

cc w/encl: See next page

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(Revised 12/13/2011)

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**U.S. NUCLEAR REGULATORY COMMISSION  
OFFICE OF NEW REACTORS  
DESIGN CERTIFICATION SUPPORTING DOCUMENT EXAMINATION**

Report No: 05200020-2011-001

Organization: AREVA NP Inc.

Applicant Contacts: Dennis Williford

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Nuclear Industry: AREVA NP Inc., designs, builds, and starts up nuclear steam supply systems and supplies fuel, engineering services, and replacement components to U.S. nuclear utilities. AREVA NP Inc. is one of the three major regions under AREVA NP. The other major regions include France (AREVA NP SAS) and Germany (AREVA NP GmbH).

Dates: October 25, 26, 27, and 28, 2011

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## **1.0 SUMMARY**

From October 25 to October 28, 2011, U.S. Nuclear Regulatory Commission (NRC) staff examined supporting documents related to Chapter 16 of the AREVA NP Inc. (AREVA) U.S. Evolutionary Pressurized Reactor (U.S. EPR) design certification (DC) application at the AREVA facility in Charlotte, North Carolina. The NRC staff reviewed technical documents that contained the Instrumentation Technical Specifications (TS) for the U.S. EPR. Examining such information with the applicant allows the staff to conduct its review more efficiently. Specifically, the staff gains a better understanding of the basis underlying the formal application and identifies areas where additional information should be submitted to allow a licensing decision on the application.

Enclosure

The bases for the examination were:

- Title 10 of the *Code of Federal Regulations* (10 CFR), Section 50.36, "Technical specifications"
- "Final Policy Statement on Technical Specifications Improvements for Nuclear Power Plants," 7590-01-P

As a result of the supporting document examination, the staff developed an Audit Action Item Tracking List, which contained instrumentation TS issues and comments and in appropriate areas identified completion paths. The Audit Action Tracking List is listed below.

## **2.0 STATUS OF PREVIOUS AUDITS**

There were no previous NRC supporting document examinations in support of the U.S. EPR Instrumentation TS Review.

## **3.0 AUDIT RESULTS**

The staff conducted a 4-day audit of the U.S. EPR Instrumentation Technical Specifications (TS) and Bases during the period of October 25-28, 2011 at the AREVA office in Charlotte, North Carolina. NRC Audit Team Reviewers included the following NRO staff members: Joseph DeMarshall (CTSB), Craig Harbuck (CTSB), Wendell Morton (IC&E Branch 1), Getachew Tesfaye (EPR Projects Branch), and Peter Hearn (EPR Projects Branch).

Initial audit scope was for both AREVA and the NRC staff to concurrently perform a line-by-line review of all Instrumentation LCO 3.3.1 Condition Statements, Surveillance Requirements, Component Item information in Table 3.3.1-1, and Function Item information in Table 3.3.1-2. The staff felt that a line-by-line review was necessary on the basis that (1) the TS had undergone extensive revision (e.g., incorporation of new material and large scale changes to previously approved information) because the I&C design had not been finalized, (2) incorporation of proposed I&C design changes was adding to the complexity of the U.S. EPR component-based TS, (3) the latest round of Chapter 7 RAI responses contained insufficient information for the staff to make a determination regarding the inclusion of additional function processor and manual actuation switch components in the TS, and (4) Instrumentation LCO 3.3 and associated Bases Section B 3.3 in Revision 3 of the DCD contained numerous technical errors and provided insufficient guidance. Staff Instrumentation TS review efforts have been expanded as a direct result of the items identified above. Initial audit scope was also to include a concurrent review by AREVA and the NRC staff of Instrumentation Bases Section B 3.3 in its entirety to ensure completeness, accuracy, and alignment with LCO 3.3, along with a concurrent review of all outstanding draft open item RAI responses.

In addition to the scheduled Entrance and Exit meetings, daily status meetings were conducted at the end of each day to update AREVA management on the progress of the audit. A strong AREVA management presence was observed throughout the week. Note that one or more AREVA managers were physically present in the designated meeting room for a significant portion of the audit.

Upon conclusion of the second day, it became evident, due to the breadth, nature, and complexity of the TS material, that it would not be possible to accomplish the initial audit scope



in its entirety. The staff communicated this to AREVA during the daily status meeting on Wednesday afternoon, October 26, 2011. Because the U.S. EPR Instrumentation TS are component-based, their structure and format make it necessary to specify additional levels of detail, making them more complex than the function-based Instrumentation TS used in operating plants and the Standard Technical Specifications (STS). The component-based approach to TS adopted by AREVA is a first-of-a-kind initiative used only in the EPR design. Although good progress was made with respect to communicating and resolving a number of key issues during the first two days, the depth and length of discussion necessary to work through and effectively resolve the types of issues unique to a component-based TS approach proved to be a challenging and time consuming process. In an effort to adequately address all areas of concern and get through as much material as possible, the staff refined the initial audit scope, devoting the final two days of the audit to identifying and describing in detail, specific examples representative of the various types of issues (e.g., discrepancies, inaccuracies, inconsistencies, etc.) that are prevalent throughout the EPR Instrumentation TS and Bases. A twenty-three item "Audit Action Tracking List" (see attached) was developed to capture these issues. AREVA has the action to resolve all list items and formally communicate the disposition of all items to the staff. The audit action list is not "attached" but is "provided below".

During the exit meeting on Friday afternoon, October 28, 2011, the staff informed AREVA that there was still a significant amount of challenging Phase 4 TS work that needed to be completed in order to provide the kind of high quality Instrumentation TS LCO and Bases product necessary for the staff to perform an efficient and effective review. The staff also stated that a major part of this work effort would need to focus on Action List Item 16-13, and that it would be necessary for AREVA to perform a rigorous line-by-line evaluation of all line item information (e.g., Applicable Modes or Other Specified Conditions, Required Number, Conditions, Footnotes, etc.) in Tables 3.3.1-1 and 3.3.1-2 in order to ensure the proper and accurate alignment/mapping of all component and associated function information. In closing, the staff commented that the audit provided an effective means of ensuring that (1) AREVA has a better understanding and greater appreciation of the unique challenges posed by the EPR component-based TS approach, (2) AREVA is fully aware of the challenging work that lies ahead and the concerted effort necessary to adequately address and effectively resolve the issues identified by the staff, and (3) AREVA and the staff share the same mutual understanding regarding the present status and remaining scope of the U.S. EPR Instrumentation TS LCO and Bases.

Chapter 16 October 2011 Audit Action Item Tracking

Item #	NRC Issue/Comment	Path Forward
16-1	The SAS MSRCV Pressure Control Function in Table 3.3.1-1 does not include a setpoint (it is shown as N/A). This function has multiple setpoints, including a sliding linear function.	
16-2	What is the basis for the number of SAS Function Required Divisions in Table 3.3.1-1. Some functions require only 2 divisions (to support 2 mechanical trains). It is unclear if the others SAS Functions require 3 or 4 I&C divisions when 4 mechanical trains are required.	
16-3	Implementation of SAS Function LCO Condition Statements, Required Actions, and associated Bases for the SAS Functions in Table 3.3.1-1 is incomplete.	
16-4	Current Table 3.3.1-1 lists 72 required Self-Powered Neutron Detectors. It is unclear what the basis is for the number of required SPNDs.	
16-5	Is there a need to add RPMS Primary Coil Temperature sensor to Table 3.3.1-1? What would the surveillance requirements involve?	After a presentation by the AREVA SME, the audit team decided to keep this item out of tech specs – Item RESOLVED.
16-6	Rod Position Measurement System Black Box and RCCA analog position indication in table 3.3.1-1 currently lists several SR (3.3.1.5, 3.3.1.7, 3.3.1.11). Need to resolve if these SR's are appropriate for Analog Position Indication (including Temperature Compensation).	
16-7	Signal Conditioning and Distribution System (SCDS) currently lists the required number as one per division. This would be very limiting based on the most limiting Black Box input to the SCDS. Need to re-review the I&C design to define if the SCDS will remain at the division level or if it will be defined to a lower level (maybe down to the sensor level).	
16-8	While reviewing various uses of SR 3.3.1.8 – Perform Actuating Device Operational Test (ADOT), questions arose regarding whether or not the ADOT definition, as defined in Tech Report 10315, could be appropriately applied to the Tech Specs. <b>See NOTE 1</b>	
16-9	The new change in tech specs for PACS was to remove it as a TS and address in the bases as “operability of the PACS is addressed as part of the actuated component.”	The Audit team did not agree with this change. A PACS tech spec was added back into Table 3.3.1-1 as a ‘Functional Unit’ – required 1 per actuated device. The condition now reads: one or more PACS priority modules inoperable – enter the appropriate LCO for the inoperable actuated device – immediately. – Item RESOLVED

Item #	NRC Issue/Comment	Path Forward
16-10	APU revised condition statements O, P, Q, R, S were added to Interim Rev 4 to clarify how to address loss of an APU(s) in the Protection System. The Audit team agreed with the changes making minor changes to conditions, but could not immediately resolve proposed changes to completion times. Also, conditions needing 3 out of 4 voting have not been reviewed, 3 out of 4 Permissive Logic was discussed and understood by the team. Associated APU Bases discussions need to provide the necessary justification for the completion times selected.	
16-11	ALU revised condition statements T, U, W, X, Y were added to Interim Rev 4 to clarify how to address loss of an ALU(s) in the Protection System. A potential error was found on drawing 7.3-1 Sheet 5 with the actuation logic that may need to be changed (or to and). The Audit team agreed with the changes (assuming the drawing change) making minor changes to conditions, but could not immediately resolve proposed changes to completion times. Also, may need to define a condition for the loss of one ALU for a non-EDG function. Associated ALU Bases discussions need to be revised to provide the necessary justification for the completion times selected.	
16-12	During a review of tech spec Table 3.3.1-1 requirements in shutdown modes, a review of the logic in Figure 7.3-24 found that the I&C design of this function may not support the requirement of 2 operable PSRVs in Modes 5/6 with only 2 Divisions available.	
16-13	During a review of how tech spec Tables 3.3.1-1 and 3.3.1-2 specify shutdown mode requirements, several examples were presented that identified the fact that problems still remain with respect to identification of the accurate and appropriate Applicable Mode, Required Number, and condition/required action information necessary to ensure proper alignment/mapping of 1) Permissive Functions 2) Manual Actuation Switches (Permissive and non-Permissive), 3) Associated Functions, and 4) Associated Components.	
16-14	A global issue with all ADOT testing as it is defined in Tech Report 10315 and carried over to the Tech Spec Surveillances (i.e., adequacy of the ADOT testing strategy currently specified for the MCR-RSS Transfer Switches (SR 3.3.3.1), and the RSS SICS Manual Actuation Switches (SR 3.3.3.2)). <b>See NOTE 1</b>	

Item #	NRC Issue/Comment	Path Forward
16-15	During the discussion of DAS incorporation into Tech Specs, the audit team questioned the mode of applicability for DAS (D2 permissive inhibits DAS below 10 percent power). A review of FSAR Section 7.8 confirmed this design, which was added by DCR 113-7002954 on 3/9/2010 which states: D2 is intended to allow the operator to reach the shutdown states without inadvertent DAS function actuation. Also, a setpoint column is required to be added to Table 3.3.4-1. NRC Chapter 7 reviewers are verifying this Section 7.8 design. AREVA was challenged to provide the bases for the D2 permissive 10% RTP value	
16-16	Tech Spec Calibration definition was written to support PS. DAS uses the PS definition information. Is a dedicated DAS CALIBRATION definition (and associated SR Bases discussion) warranted, and should a conventional COT definition (and associated SR Bases discussion) that addresses Setpoint Verification (methodology yet to be determined i.e., Analog Bistable, FPGA, etc.) be created to support DAS operation?	
16-17	Update DAS Bases Discussions for actions B.1, C.1, D.1 to be consistent with STS.	
16-18	Reconcile applicability of the Conventional Actuation Logic Test to DAS (i.e., as a minimum, shall include a continuity check of output devices) – Note that this definition of the conventional ALT was added to TS definition section 1.1 to support the DAS LCO.	
16-19	During a review of Manual Actuation Switches in Table 3.3.1-1, a question on how the Extra Borating System Manual Switch works. There is no logic drawing and it not clear what is being credited for this Manual Switch (Isolation or Actuation).	
16-20	During a review of Manual Actuation Switches in Table 3.3.1-1, a number of the switches were identified as not necessary to be included in Tech Specs. This section needs to be reviewed and verified with controlling design (Chapter 15, Chapter 6). Associated Manual Actuation Switches Bases discussions need to be revised to provide the necessary justification for the completion times selected.	
16-21	Required actions for inoperable P17 Permissive Function are inadequate, a review needs to be completed and incorporated as appropriate.	
16-22	Current Table 3.3.1-1 lists Self-Powered Neutron Detectors (SPND) calibration referencing SR 3.3.1.2. It is unclear that CALIBRATION, as it is presently defined in Definitions Section 1.1, can be appropriately applied for the SPNDs sensor calibration due to the necessary interface with the Aeroball Measurement System, which is also referenced in this SR.	

Item #	NRC Issue/Comment	Path Forward
16-23	Trip Actuation Devices in Table 3.3.1-1 were reviewed. The Audit team agreed making minor changes to conditions, but could not immediately resolve proposed changes to completion times. Associated Trip Actuation Device Bases discussions need to be revised to provide the necessary justification for the completion times selected.	

Note 1: NRC Issue/Comment for Actuating Device Operational Test (ADOT) applicability to TS:

Item 16-8/16-14 – Regarding the Actuating Device Operational Test (ADOT), the staff has the following concerns:

1. The ADOT, as defined in the TS Definitions Section 1.1, may not be universally applicable to safety system surveillance testing (PS, RSS, DAS) and is not fully consistent with the ADOT, as defined by ANP-10315P – Reference SR 3.3.1.8 which is the surveillance to perform ADOT is used at various times in TSs.
2. ADOT, as documented in ANP-10315P, is not necessarily sufficient to be used as a method of performing surveillances for each I&C safety system. This is a global concern with how the applicant intends to perform surveillances from ANP-10315P and how it is carried over to Tech. Spec. surveillances (testing the adequacy of MCR-RSS Transfer switches [SR 3.3.3.1] and RSS SICS Manual Actuation Switches[SR 3.3.3.2]).
  - a. For example, the Manual system level actuation switches would not be adequately tested using the ADOT in ANP-10315P because:
    - i. The No-Go test is initiated at the ALU using the Service Unit, and does not incorporate the switches on the SICS
    - ii. The Go test is initiated from the PICS and is not germane to TSs.

Staff comment - ANP-10315P would need ADOT(s) that are tailored to each Safety System so that the surveillances can be adequately performed. The specific ADOT for each safety system would need a condensed description added to the TS Bases for each safety system. The new ADOT definitions would need to be consistent between the TS Bases and ANP-10315P.

### 3.1 Documents Examined

The staff reviewed the following documents at the AREVA office in Charlotte, North Carolina:

- All Instrumentation LCO 3.3.1 Condition Statements, Surveillance Requirements, Component item information in Table 3.3.1-1 and Function item information in Table 3.3.1-2.
- The Bases Section B 3.3
- All outstanding draft open item RAI responses (including FSAR markups) scheduled for submittal by 9/30/11

### 3.2 Interaction with AREVA Staff

On October 25, 26, 27 and 28, 2011, AREVA engineers were available at the Charlotte, North Carolina, facility. The NRC staff interviewed the AREVA engineers to gain a better understanding of how the supporting documents were used by AREVA in developing the application and reaching the conclusions in the application.

Additionally, in addition to the scheduled Entrance and Exit meetings, daily status meetings were conducted at the end of each day to update AREVA management on the progress of the audit. In the entrance meeting on October 25, 2011, the NRC team discussed the scope of the examination, outlined the documents to be examined, and established interfaces with AREVA's staff and management involved in the U.S. EPR DC application development. In the exit meeting on October 28, 2011, the NRC team discussed the activities conducted with representatives of AREVA's management and staff.

The NRC staff did not retain any of AREVA's documents from these presentations and relied on their personal notes and interactions to develop issues for resolution (see Section 3.3 below).

### **3.3 Issue Resolution**

As a result of the supporting document examination, the staff identified various issues with the U.S. EPR Instrumentation Technical Specifications (TS) and Bases. Upon conclusion of the second day, it became evident, due to the breadth, nature, and complexity of the TS material, that it would not be possible to accomplish the initial audit scope in its entirety. The staff communicated this to AREVA during the daily status meeting on Wednesday afternoon, October 26, 2011. Because the U.S. EPR Instrumentation TS are component-based, their structure and format make it necessary to specify additional levels of detail, making them more complex than the function-based Instrumentation TS used in operating plants and the Standard Technical Specifications (STS). The component-based approach to TS adopted by AREVA is a first-of-a-kind initiative used only in the EPR design. Although good progress was made with respect to communicating and resolving a number of key issues during the first 2-days, the depth and length of discussion necessary to work through and effectively resolve the types of issues unique to a component-based TS approach proved to be a challenging and time consuming process. In an effort to adequately address all areas of concern and get through as much material as possible, the staff refined the initial audit scope, devoting the final two days of the audit to identifying and describing in detail, specific examples representative of the various types of issues (e.g., discrepancies, inaccuracies, inconsistencies, etc.) that are prevalent throughout the EPR Instrumentation TS and Bases. A twenty-three item "Audit Action Tracking List" (see attached) was developed to capture these issues. AREVA has the action to resolve all list items and formally communicate the disposition of all items to the staff.

### **3.4 Conclusions**

In closing, the staff commented that the audit provided an effective means of ensuring that (1) AREVA has a better understanding and greater appreciation of the unique challenges posed by the EPR component-based TS approach, (2) AREVA is fully aware of the challenging work that lies ahead and the concerted effort necessary to adequately address and effectively resolve the issues identified by the staff, and (3) AREVA and the staff share the same mutual understanding regarding the present status and remaining scope of the U.S. EPR Instrumentation TS LCO and Bases.

#### 4.0 PARTIAL LIST OF AREVA STAFF CONTACTED

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