

November 26, 2013

Mr. Pedro Salas, Director
U.S. EPR New Plants Regulatory Affairs
AREVA NP Inc.
3315 Old Forest Road
P.O. Box 10935
Lynchburg, VA 24506-0935

SUBJECT: NUCLEAR REGULATORY COMMISSION INSPECTION REPORT
NO. 05200020/2013-203 AND NOTICE OF VIOLATION

Dear Mr. Salas:

On September 9 through September 12, 2013, the U.S. Nuclear Regulatory Commission (NRC) staff conducted an inspection at your AREVA NP Inc. facility in Lynchburg, VA. The purpose of this technically-focused, routine, limited scope inspection was to review your quality assurance program implementation in accordance with Appendix B, "Quality Assurance Criteria for Nuclear Power Plants and Fuel Reprocessing Plants," to Title 10 of the *Code of Federal Regulations* (10 CFR) Part 50, "Domestic Licensing of Production and Utilization Facilities." This inspection focused primarily on design and software control associated with the large break and small break loss of coolant accident analysis and application of the results to the containment analysis, in support of your Design Certification application that is currently under NRC review. The enclosed report presents the results of this inspection. This NRC inspection report does not constitute NRC endorsement of your overall quality assurance or Part 21 programs.

Based on the results of this inspection, the NRC staff has determined that a Severity Level IV violation of NRC requirements occurred. The violation was evaluated in accordance with the NRC Enforcement policy, which is available on the NRC's web site at <http://www.nrc.gov/about-nrc/regulatory/enforcement/enforce-pol.html>. The violation is cited in the enclosed Notice of Violation (Notice) and the circumstances surrounding it are described in detail in the subject inspection report. The violation is being cited in the Notice because the NRC inspectors identified two examples where AREVA failed to adequately implement measures to assure that conditions adverse to quality are promptly identified and corrected. In the first example, AREVA failed to evaluate the extent of condition for the input errors in the RELAP5/MOD2-B&W input decks developed for a large break loss-of-coolant accident analysis. In the second example, AREVA failed to evaluate the extent of condition for the programmatic issue of open design change reviews (DCRs) that were suspended when work was delayed in 2010 and not identified as needing to be completed to support restart of Design Certification application.

You are required to respond to this letter and should follow the instructions specified in the enclosed Notice when preparing your response. Your response to the Notice should also address extent of condition for input errors to software performing safety-related calculations, and for open DCRs that were suspended when work was delayed in 2010 and not identified as needing to be completed to support restart of Design Certification application. If you have

additional information that you believe the NRC should consider, you may provide it in your response to the Notice. The NRC review of your response to the Notice will also determine whether further enforcement action is necessary to ensure compliance with regulatory requirements.

In accordance with 10 CFR 2.390, "Public Inspections, Exemptions, Requests for Withholding," of the NRC's "Rules of Practice and Procedure," a copy of this letter, its enclosures, and your response will be made available electronically for public inspection in the NRC Public Document Room or from the NRC's Agencywide Documents Access and Management System (ADAMS) accessible from the NRC web site at <http://www.nrc.gov/reading-rm/adams.html>. To the extent possible, your response, (if applicable), should not include any personal privacy, proprietary, or Safeguards Information so that it can be made available to the public without redaction. If personal privacy or proprietary information is necessary to provide an acceptable response, then please provide a bracketed copy of your response that identifies the information that should be protected and a redacted copy of your response that deletes such information. If you request that such material be withheld from public disclosure, you must specifically identify the portions of your response that you seek to have withheld and, provide in detail, the bases for your claim (e.g., explain why the disclosure of information will create an unwarranted invasion of personal privacy or provide the information required by 10 CFR 2.390(b) to support a request for withholding confidential commercial or financial information). If Safeguards Information is necessary to provide an acceptable response, please provide the level of protection described in 10 CFR 73.21, "Protection of Safeguards Information: Performance Requirements."

Sincerely,

/RA/

Kerri A. Kavanagh, Chief
Quality Assurance Vendor Inspection Branch
Division of Construction Inspection
and Operational Programs
Office of New Reactors

Docket No.: 05200020

Enclosures:

1. Notice of Violation
2. Inspection Report No. 05200020/2013-203

additional information that you believe the NRC should consider, you may provide it in your response to the Notice. The NRC review of your response to the Notice will also determine whether further enforcement action is necessary to ensure compliance with regulatory requirements.

In accordance with 10 CFR 2.390, "Public Inspections, Exemptions, Requests for Withholding," of the NRC's "Rules of Practice and Procedure," a copy of this letter, its enclosures, and your response will be made available electronically for public inspection in the NRC Public Document Room or from the NRC's Agencywide Documents Access and Management System (ADAMS) accessible from the NRC web site at <http://www.nrc.gov/reading-rm/adams.html>. To the extent possible, your response, (if applicable), should not include any personal privacy, proprietary, or Safeguards Information so that it can be made available to the public without redaction. If personal privacy or proprietary information is necessary to provide an acceptable response, then please provide a bracketed copy of your response that identifies the information that should be protected and a redacted copy of your response that deletes such information. If you request that such material be withheld from public disclosure, you must specifically identify the portions of your response that you seek to have withheld and, provide in detail, the bases for your claim (e.g., explain why the disclosure of information will create an unwarranted invasion of personal privacy or provide the information required by 10 CFR 2.390(b) to support a request for withholding confidential commercial or financial information). If Safeguards Information is necessary to provide an acceptable response, please provide the level of protection described in 10 CFR 73.21, "Protection of Safeguards Information: Performance Requirements."

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1. Notice of Violation
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NRC-002

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(Revised 09/12/2013)

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NOTICE OF VIOLATION

AREVA NP Inc.
Lynchburg, VA 23602

Docket No. 05200020

During an Nuclear Regulatory Commission (NRC) inspection conducted at the AREVA NP Inc. facility in Lynchburg, VA on September 9 – 12, 2013, a violation of NRC requirements was identified. In accordance with NRC Enforcement Policy, the violation is listed below:

Criterion XVI, "Corrective Action," of Appendix B, "Quality Assurance Criteria for Nuclear Power Plants and Fuel Reprocessing Plants," to Title 10 of the *Code of Federal Regulations* (10 CFR) Part 50, "Domestic Licensing of Production and Utilization Facilities," states, in part, that "Measures shall be established to assure that conditions adverse to quality, such as failures, malfunctions, deficiencies, deviations, defective material and equipment, and nonconformances are promptly identified and corrected."

Section 16.0, "Corrective Action," of AREVA NP Inc.'s ANP-10266, Revision 4, "AREVA NP, Inc., Quality Assurance Plan (QAP) Design Certification of the U.S. EPR Topical Report," dated December 13, 2012, subsection 16.2, "General," states in part that, "procedures are established by AREVA NP Inc. to ensure prompt identification and correction of conditions adverse to quality, such as failures, malfunctions, deficiencies, deviations, defective material and equipment, and nonconformances during the design, procurement, fabrication, inspection and testing of items."

Contrary to the above, as of September 12, 2013, AREVA NP Inc. failed to adequately implement measures to assure that conditions adverse to quality, such as failures, malfunctions, deficiencies, deviations, defective material and equipment, and nonconformances are promptly identified and corrected in two examples. In the first example, AREVA NP Inc. failed to evaluate the extent of condition for the input errors in the RELAP5/MOD2-B&W input decks developed for a large break loss-of-coolant accident analysis. In the second example, AREVA NP Inc. failed to evaluate the extent of condition for the programmatic issue of open design change reviews (DCRs) that were suspended when work was delayed in 2010 and not identified as needing to be completed to support restart of Design Certification application.

This issue has been identified as Violation 05200020/2013-203-01.

This is a Severity Level IV violation (Section 6.5d of the NRC Enforcement Policy)

Pursuant to the provisions of 10 CFR 2.201, "Notice of Violation," AREVA NP Inc. is hereby required to submit a written statement or explanation to the U.S. Nuclear Regulatory Commission, ATTN: Document Control Desk, Washington, DC 20555-001, with a copy to the Chief, Quality Assurance Vendor Inspection Branch, Division of Construction Inspection and Operational Programs, Office of New Reactors, within 30 days of the date of the letter transmitting this Notice of Violation (Notice). This reply should be clearly marked as "Reply to a Notice of Violation" and should include for each violation: (1) the reason for the violation, or, if contested, the basis for disputing the violation or severity level; (2) the corrective steps that have been taken and the results achieved; (3) the corrective steps that will be taken; and (4) the date when full compliance will be achieved. Your response may reference or include previous docketed correspondence if the correspondence adequately addresses the required response. Where good cause is shown, consideration will be given to extending the response time.

If you contest this enforcement action, you should also provide a copy of your response, with the basis for your denial, to the Director, Office of Enforcement, U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001.

Because your response will be made electronically for public inspection in the NRC Public Document Room or from the NRC's document system, accessible from the NRC Web site at <http://www.nrc.gov/reading-rm/adams.html>, to the extent possible, it should not include any personal privacy, propriety, or Safeguards Information so that it can be made available to the public without redaction. If the personal privacy or propriety information is necessary to provide an acceptable response, then please provide a bracketed copy of your response that identifies the information that should be protected and a redacted copy of your response that deletes such information. If you request withholding of such material, you must specifically identify the portions of your response that you seek to have withheld and provide in detail the basis for your claim of withholding (e.g., explain why the disclosure of information will create an unwarranted invasion of personal privacy or provide the information required by 10 CFR 2.390(b) to support a request for withholding confidential commercial or financial information). If Safeguards Information is necessary to provide an acceptable response, please provide the level of protection described in 10 CFR 73.21, "Protection of Safeguards Information: Performance Requirements."

In accordance with 10 CFR 19.11, "Posting of Notices to Workers," you may be required to post this notice within 2 working days of receipt.

Dated this 26th day of November 2013.

**U.S. NUCLEAR REGULATORY COMMISSION
OFFICE OF NEW REACTORS
DIVISION OF CONSTRUCTION INSPECTION AND OPERATIONAL PROGRAMS
VENDOR INSPECTION REPORT**

Docket No.: 05200020

Report No.: 05200020/2013-203

Vendor: AREVA NP Inc.
3315 Old Forest Road
P.O. Box 10935
Lynchburg, VA 24506-0935

Vendor Contact: Pedro Salas
Director of Regulatory Affairs
E-mail: pedro.salas@areva.com
434-832-0935

Nuclear Industry Activity: AREVA NP Inc. is designing the U.S. EPR™ (an advanced third-generation, pressurized water reactor design) and is using the RELAP5/MOD2-B&W and GOTHIC Methodology for large break and small break loss-of-coolant accident analyses. AREVA NP Inc. is using the results of these analyses in the containment design analyses included in the U.S. EPR Design Certification application, which is currently under Nuclear Regulatory Commission review.

Inspection Dates: September 9 through 12, 2013

Inspection Team: Thomas Kendzia NRO/DCIP/QVIB Team Leader
Eugene Huang NRO/DCIP/EVIB
Shie-Jeng Peng NRO/DSRA/SCVB
Clinton Ashley NRO/DSRA/SCVB
Robert Mathis III R2/DCI/CIB1

Approved by: Kerri A. Kavanagh, Chief
Quality Assurance Vendor Inspection Branch
Division of Construction Inspection
and Operational Programs
Office of New Reactors

EXECUTIVE SUMMARY

AREVA NP Inc.
05200020/2013-203

The U.S. EPR™ (EPR) is an advanced, third-generation, pressurized water reactor design that has been designed and developed mainly by Framatome (now AREVA NP Inc.), Electricité de France (also known as EDF) in France, and Siemens AG in Germany. In Europe, this reactor design was called European Pressurized Reactor. The internationalized name of this reactor is Evolutionary Power Reactor, but it is now simply named EPR by AREVA NP Inc. (AREVA). AREVA is designing the EPR and has submitted the EPR design to the NRC for design certification in accordance with 10 CFR Part 52, "Licenses, Certifications, and Approvals for Nuclear Power Plants." AREVA is using the RELAP5/MOD2-B&W and GOTHIC Methodology for large break and small break loss-of-coolant accident analyses and using the results in the containment design analysis.

From September 9 through 12, 2013, the U.S. Nuclear Regulatory Commission (NRC) inspectors conducted a technically-focused, routine, limited-scope inspection at the AREVA facility in Lynchburg, VA. The purpose of this inspection was to verify that AREVA's quality assurance (QA) program, policies, and procedures support the AREVA EPR Design Certification application that is currently under NRC review and meet the requirements of Appendix B, "Quality Assurance Criteria for Nuclear Power Plants and Fuel Reprocessing Plants," to Title 10 of the *Code of Federal Regulations* (10 CFR) Part 50, "Domestic Licensing of Production and Utilization Facilities." The primary focus of the inspection was the evaluation of the (1) use of RELAP5/MOD2-B&W and GOTHIC Methodology large break loss-of-coolant accident (LBLOCA) analysis and small break loss-of-coolant accident (SBLOCA) analysis and application of the results to the containment analysis, (2) application of design control process for LBLOCA and SBLOCA analyses and application of the results to the containment analysis, (3) application of software control process to the RELAP5/MOD2-B&W and Gothic Methodology, for the LBLOCA, SBLOCA and containment analyses, (4) the nonconformance process and the corrective action process related to the EPR project in the areas of design control, software control, RELAP5/MOD2-B&W and Gothic Methodology, LBLOCA analysis, SBLOCA analysis and containment analysis, and (5) internal audits for design and software control. The NRC previously inspected AREVA at its facilities in Lynchburg, VA in 2010, which is documented in NRC Inspection report 05200020/2010-202.

Based on interviews of AREVA personnel and the sample of documents reviewed, the inspectors determined that, with the exception of the violation described below, AREVA is effectively implementing its QA programs as it pertains to the use RELAP5/MOD2-B&W and GOTHIC Methodology for LBLOCA and SBLOCA analyses, and application of the results to the containment analysis, in support of the AREVA U.S. EPR Design Certification application that is currently under NRC review. The information below summarizes the results of this inspection.

Corrective Actions and 10 CFR Part 21 Evaluations

Based on interviews of AREVA personnel and on the limited sample of documents reviewed, the inspectors identified two examples where AREVA failed to adequately implement measures to assure that conditions adverse to quality are promptly identified and corrected, consistent with regulatory requirements in Criterion XVI, "Corrective Action," of Appendix B to 10 CFR Part 50. In the first example, AREVA failed to evaluate the extent of condition for the input errors in the RELAP5/MOD2-B&W input decks developed for loss-of-coolant accident analysis. In the

second example, AREVA failed to evaluate the extent of condition for the programmatic issue of open design change reviews (DCRs) that were suspended when work was delayed in 2010 and not identified as needing to be reviewed to support restart of Design Certification application. Therefore, the inspectors issued Violation 05200020/2013-203-01 for failure to promptly identify and correct conditions adverse to quality.

Design Control

Based on interviews of AREVA personnel and on the limited sample of RELAP5/MOD2-B&W and GOTHIC software documents reviewed, the inspectors concluded that the implementation of AREVA's programs for the design control of the RELAP5/MOD2-B&W and GOTHIC software were consistent with the regulatory requirements in Criterion III, "Design Control," of Appendix B to 10 CFR Part 50. No findings of significance were identified.

Audits

Based on interviews of AREVA personnel and on the limited samples of internal audits reviewed, the inspectors concluded that AREVA is implementing its audit program consistent with the regulatory requirements in Criterion XVIII, "Audits," of Appendix B to 10 CFR Part 50. No findings of significance were identified.

REPORT DETAILS

1. Corrective Actions and 10 CFR Part 21 Evaluations

a. Inspection Scope

The inspectors reviewed AREVA's nonconformance and corrective actions policies and procedures to verify compliance with Title 10 of the *Code of Federal Regulations* (10 CFR) Part 50, Appendix B, Criterion XV, "Nonconforming Materials, Parts, or Components," and Criterion XVI, "Corrective Action." The inspectors verified that procedures had been established and implemented for correcting conditions adverse to quality and nonconformances were properly identified and corrected. With regard to significant conditions adverse to quality (SCAQ), the inspectors confirmed that AREVA had established and implemented procedures to ensure (1) proper identification of the causes, (2) documentation of the corrective actions to prevent recurrence, and (3) reporting of the SQACs and actions taken to the appropriate levels of management. In addition, the inspectors confirmed that the Corrective Action Program (CAP) provides a connection to evaluate for 10 CFR Part 21 requirements. The inspectors also reviewed AREVA policies and implementing procedures that govern its program under 10 CFR Part 21, "Reporting of Defects and Noncompliance," to verify compliance with the regulatory requirements.

The inspectors sampled 32 condition reports (CRs) related to large break loss-of-coolant accident (LBLOCA), small break loss-of-coolant accident (SBLOCA), containment analysis, design control, software control, and calculations. The inspectors observed a CR Screening Meeting to evaluate AREVA compliance with their procedures and regulatory requirements, and the sensitivity of the screening personnel to nuclear safety and repetitive issues. The inspectors interviewed various personnel on their knowledge of the CAP and CR processes, and their ability to use the processes. The inspectors reviewed 3 different trend reports that utilized trending of CRs from the CAP and determined that AREVA was performing trending of CRs and identifying adverse trends.

The inspectors found that AREVA utilized AP 1717-01, "Implementation of 10 CFR 21," Revision 40, effective July 18, 2012 to implement the requirements of performing evaluations of Part 21 and reporting defects and noncompliance.

The attachment to this inspection report lists the documents reviewed by the inspectors.

b. Observations and Findings

The inspectors found that AREVA utilized AP 171-06, "Corrective Action Program," Revision 007, effective October 17, 2012, to implement the requirements of its quality program for promptly identifying, investigating, reporting, tracking and correcting SCAQs, conditions adverse to quality, areas for improvement identified by company employees, and other events or conditions as directed by management within the CAP. Issues entered in AREVA's electronic CAP (WebCAP) were categorized into one of four significance levels (based on SCAQs, conditions adverse to quality, CRs, nonconformances, recommendations, etc.).

The inspectors noted that CR 2013-5239 documented that an approved final calculation for the LBLOCA analysis which provides part of the design bases for the containment

peak pressure and temperature documented in the Final Safety Analyst Report (FSAR), contained four computer code input errors in the RELAP5/MOD2-B&W input decks developed for a LBLOCA analysis which had not been identified by the originator, reviewer, or approver. The errors were: 1) the last digit (6) of oxide thickness of 3.283E-06 was truncated due to a limit of 80-column input for the outer oxide thickness for fuel rod; 2) control rod worth was incorrectly entered which resulted in the control rod forced to artificially increase by a factor of 2.5 (since reactor was expected to scram with insertion of control rod); 3) the time for main feedwater flow coastdown to zero was incorrectly input as 40 seconds in lieu of the correct value of 15 seconds; and 4) the Low-Low level feedwater control remained in action after loss of offsite power when control should be lost after loss offsite power. These errors did not result in a significant change in the calculation's final results for a LBLOCA, and therefore AREVA determined this was not a significant condition adverse to quality so they did not evaluate if these errors existed in other calculations. The inspectors determined that this could be a potentially significant issue in that input errors were not detected during normal review and approval. Since the code does not automatically alert the preparer or reviewer that the error (exceeding the 80 allowed characters) has occurred, the computer program will truncate values without anyone's knowledge that it had occurred. The preparer and the reviewer must rely on their training in the proper application of this code to prevent or identify this error. The inspectors considered this a potentially significant condition adverse to quality because the truncation could result in a non-conservative input condition that could challenge the margin of safety. AREVA had not evaluated if this error existed in other calculations or if the same programmer or reviewer had done other similar work. The NRC inspection team identified this issue as the first example of violation 05200020/2013-203-01, for AREVA's failure to promptly identify and correct conditions adverse to quality. AREVA reviewed previous CRs to determine if a truncation error had previously occurred in the calculation. AREVA found no other truncation errors, but they had been notified (CR 2011-4236) by the vendor for a different software code, that the code had similar input restrictions. AREVA initiated CR 2013-7048 to determine if code restrictions based on allowed column width for code input existed for other software and to evaluate ways to minimize potential errors.

The inspectors noted that CR 2013-2204 documented a programmatic issue of open design change reviews (DCRs) that were suspended when work was delayed in 2010 and not identified as needing to be completed to support restart of the project. These open DCRs were for support of the Design Certificate submittal to the NRC. AREVA closed CR 2013-2204 based on one issue being resolved, but did not address the programmatic aspect or extent of condition. AREVA initiated CR 2013-7051 to address the extent of condition to ensure that all DCRs and CRs that needed to be completed are tracked appropriately. The NRC inspection team identified this issue as a second example of violation 05200020/2013-203-01, for AREVA's failure to promptly identify and correct conditions adverse to quality.

AREVA initiated CR 2013-7251 to address both examples of violation 05200020/2013-203-01.

c. Conclusion

Based on interviews of AREVA personnel and on the limited sample of documents reviewed, the inspectors concluded that AREVA failed to adequately implement measures to assure that conditions adverse to quality are promptly identified and

corrected, consistent with the regulatory requirements in Criterion XVI, "Corrective Action," of Appendix B to 10 CFR Part 50. Specifically, AREVA failed to look at the extent of condition for the input errors in the RELAP5/MOD2-B&W input decks developed for a LBLOCA analysis and the programmatic issue of open DCRs that were suspending when work was delayed in 2010 and not identified as needing to be completed to support restart of Design Certification application. Therefore, the inspectors issued Violation 05200020/2013-203-01 for failure to promptly identify and correct conditions adverse to quality.

2. Design Control

a. Inspection Scope

The inspectors reviewed AREVA's policies and procedures that govern design control activities (including computer and software control) to verify compliance with the requirements of Criterion III, "Design Control," of Appendix B to 10 CFR Part 50. As part of this review, the inspectors interviewed AREVA personnel and reviewed source documentation to verify implementation of the design control program as it pertains to control and use of RELAP5/MOD2-B&W and GOTHIC software.

The inspectors evaluated AREVA's software certification process to ensure that validation and verification of changes in revisions of software were adequately controlled. The inspectors verified the inputs to RELAP5/MOD2-B&W and GOTHIC software were appropriate for the case of LBLOCA analysis.

The inspectors reviewed how AREVA followed their procedures for changes in software versions. The inspectors evaluated a sample of version updates to ensure AREVA's process of using vendor supplied test files and correct documentation of work station operating systems was implemented properly. For software certification, the inspectors found that AREVA would utilize an older pre-certified version as a baseline to compare test cases with the newer software version.

The inspectors also reviewed a sample of DCRs to ensure that changes that were rejected through the DCR process because they were classified as administrative changes, had the applicable changes appropriately tracked and completed through the FSAR change process.

The inspectors reviewed calculation 32-700770-000, "U.S. EPR SBLOCA Containment Analysis – Multi-node GOTHIC Model," dated December 17, 2009, and noted that the methodology of determining mass and energy release for a SBLOCA was based on the NRC approved topical report BAW 43-10168P, "RSG LOCA – B&W LOCA Evaluation Model for recirculating SG Plants, Rev. 2," dated October 1982, while the GOTHIC containment analysis methodology was based on another NRC approved topical report BAW 43-10252P, "Analysis of Containment Response to Postulated Pipe Ruptures Using GOTHIC," dated July 2004. The inspectors also noted that this calculation clearly distinguished a difference between LBLOCA and SBLOCA analysis methods. In the LBLOCA RELAP5 models used for containment analysis, the reactor coolant system (RCS) pressure oscillations were observed in the cold legs during the RELAP run of the post-reflood phase. The pressure oscillations will periodically open and close RCS loop seals. Based on this, the LBLOCA RELAP5 runs were only used in a short-term mass and energy release calculations. In other words, the RELAP5 LBLOCA will normally be

terminated at the time that a loop seal is formed. To continue calculating the mass and energy release from the reactor vessel to the containment, a boiling pot was added to the GOTHIC model to simulate the reactor pressure vessel and steam generators in which a certain conservative amount of safety injection water is assumed to absorb the decay heat and sensible heat, convert into steam and the effluent released into containment through the break. However, this phenomenon (pressure oscillations) was not observed in SBLOCA RELAP runs and is not predicted to occur in the SBLOCA RELAP5 models. Consequently, the entire SBLOCA mass and energy release used in the containment analysis is generated using RELAP5/MOD2-B&W model. The inspectors noted the subtle difference between LBLOCA and SBLOCA analysis.

The inspectors also noted a SBLOCA case in which the containment pressure and temperature does not “turn around” so that the pressure and temperature continuously go up at the end of the 24-hour analysis. This occurred for the case of a 3-inch break in cold leg pump discharge (CLPD) location. The AREVA preparer attributed this phenomenon to the inadequate simulation of a partial cooldown with the main steam relief system. The inspectors reviewed this explanation with AREVA’s staff. AREVA explained that they used the 6-inch break case results and S-RELAP’s 40-cm (~16 inch) break case results to infer the possible containment pressure and temperature peaks for the 3-inch break S-RELAP modeled required manual partial cooldown after the termination of 30 minute automatic partial cooldown.

The inspectors evaluated calculation 32-9054992-000, “U.S. EPR Small Break LOCA for Containment Analysis,” dated August 31, 2007, since it was referenced by calculation 32-700770-000. The inspectors found that the major difference was that the GOTHIC model in calculation (32-9054992-000) used one node to simulate the containment as compared to calculation (32-700770-000) which used multi-node containment. The inspectors found from this calculation that a partial cooldown of 180°F/hr had been modeled but only limited to the first 30 minutes into transient. It is consistent with the explanation provided for the 3-inch CLPD break results in the multi-node calculation.

AREVA indicated that they were in the process of evaluating other break sizes, as part of a corrective action plan associated with CR 2011-4417, to ensure that different SBLOCA sizes complied with design and regulatory requirements. This evaluation was in progress and not reviewed by inspectors.

During the review of the two above calculations, the inspectors noted that there was no identification to warn that the error exists in the RELAP5 model used in the calculations (e.g., four known RELAP5 input errors, which were verified to be insignificant for this application, identified in CR 2013-5239). AREVA noted that there was no requirement in AREVA procedures to correct insignificant errors, or notify the user/reader that those errors existed, and has issued CR 2013-7053 to address this as a generic issue.

The attachment to this inspection report list the documents reviewed by the inspectors.

b. Observations and Findings

No findings of significance were identified.

c. Conclusions

Based on the interviews of AREVA personnel and on the limited sample of RELAP5/MOD2-B&W and GOTHIC software documents reviewed, the inspectors concluded that the implementation of AREVA's programs for the design control of the RELAP5/MOD2-B&W and GOTHIC software were consistent with the regulatory requirements in Criterion III of Appendix B to 10 CFR Part 50. The inspectors also determine that, for the limited sample reviewed, AREVA is effectively implementing its QA policies and procedures regarding control and use of the RELAP5/MOD2-B&W and GOTHIC software. The inspectors identified no findings of significance.

3. **Audits**

a. Inspection Scope

The inspectors reviewed the portions of the AREVA Quality Assurance Program and Quality Assurance Plan that govern the audit program to verify compliance with the requirements of Criterion XVIII, "Audits," of Appendix B to 10 CFR Part 50. The inspectors reviewed the audit program implementing procedures that identify the process for conducting internal audits and specifying the qualification requirements of personnel designated as lead auditors. The inspectors reviewed the two most recent internal audits to verify that internal audits of QA program elements including design control, software control, nonconformance, and corrective actions were conducted to ensure compliance with approved policies and procedures. The internal audits were reviewed to verify that audit results were properly documented and reviewed by appropriate levels of management. The inspectors interviewed applicable quality assurance personnel to verify understanding of AREVA audit program procedures and regulatory requirements for audits. The inspectors also reviewed the lead auditor qualification package to ensure that audits were conducted by qualified personnel.

The attachment to this inspection report identifies personnel interviewed and lists the documents that the inspectors reviewed.

b. Observations and findings

No findings of significance were identified.

c. Conclusion

The NRC Inspection team concluded that AREVA is implementing its audit program in accordance with 10 CFR 50, Appendix B, Criterion XVIII, "Audits." Based on the limited sample of internal audits reviewed, the NRC inspection team also determined that AREVA is implementing its policies and procedures associated with the audit program adequately. No findings of significance were identified.

4. **Exit Meeting**

On September 12, 2013, the inspectors presented the inspection scope and findings during an exit meeting with Mr. Pedro Salas, Director Regulatory Affairs, and AREVA personnel.

ATTACHMENT

1. ENTRANCE/EXIT MEETING ATTENDEES AND INDIVIDUALS INTERVIEWED

Name	Title	Affiliation	Entrance	Exit	Interviewed
Kerri Kavanagh	Chief, Quality Assurance Branch, Division of Construction and Operational Programs (DCIP)	U.S. Nuclear Regulatory Commission (NRC)/Office of New Reactors		X	
Thomas Kendzia	Inspection Lead Team	NRC/NRO/DCIP	X	X	
Clinton Ashley	Inspector	NRC/NRO/Division of Safety Systems & Risk Assessment (DSRA)	X	X	
Eugene Huang	Inspector	NRC/NRO/DCIP	X	X	
Robert Mathis	Inspector	NRC/Region 2/Division of Construction Inspection			
Shie-Jeng Peng	Inspector	NRC/NRO/DSRA	X	X	
Jim Ransom	Project manager, U.S.	AREVA	X	X	
Len Gucwa	Licensing manager U.S. EPR DC	AREVA	X	X	X
Graydon Uyeda	Project Engineering Manager, U.S. EPR	AREVA	X	X	X
Bret Boman	Engineering Manager, Nuclear Analysis	AREVA	X	X	
Pedro Salas	Director Regulatory Affairs	AREVA	X		
Jennifer Musgrave	Manager, Product licensing	AREVA	X	X	X
David White	Manager, Product licensing	AREVA	X	X	X
Nathan Hottle	Manager, Product licensing	AREVA	X	X	X
Tom Ehrhorn	Quality Engineer	AREVA	X	X	X
Mike Saniuk	Quality Engineering oversight Manager	AREVA	X	X	X
Craig Chiodo	Manager Corrective Actions Program	AREVA	X	X	X
Tracy Rhodes	Software Configuration Administrator	AREVA	X	X	X
Matt Miller	Technical Integration Engineer	AREVA	X	X	X
Chris Molseed	Supervisor, PWR Containment Analysis	AREVA	X	X	X
John Klingenfus	Advisory Engineer, LOCA Analysis	AREVA	X	X	X
Gary Szabatura	Manager, Quality Programs	AREVA	X	X	X
Charles Tally	Manager, Engineering Integration	AREVA		X	X
Keith Higar	Engineering Manager I	AREVA	X	X	X
Gary Elliott	Manager, Center of Regulatory Excellence	AREVA		X	

Name	Title	Affiliation	Entrance	Exit	Interviewed
Nick Simile	Quality Manager, Engineering	AREVA	X		
Doug Brownson	Engineering Supervisor	AREVA			X
Jim Bartleman	Retired AREVA Corrective Action	AREVA		X	X

2. INSPECTION PROCEDURES USED

- a. Inspection Procedure (IP) 35017, "Quality Assurance Implementation Inspection," dated 29 July 2008.
- b. IP 36100, "Inspection of 10 CFR Part 21 and Programs for Reporting Defects and Noncompliance," dated February 13, 2012.

3. LIST OF ITEMS OPENED, CLOSED, AND DISCUSSED

Item Number	Status	Type	Description
05200020/2013-203-01	Opened	NOV	Criterion XVI

4. DOCUMENTS REVIEWED

a. Quality Management Procedures

- AREVA QA Topical Report (QATR) 43-10266-04, "AREVA QAP for the Design Certification of the U.S. EPRTM", ANP-10266, Revision 4, dated December 2012
- ANP-10266, "AREVA NP Inc. Quality Assurance Plan (QAP) for Design Certification of the U.S. EPR – Topical Report," Revision 4, dated December 2012
- AREVA QA Program, Document No. 56-9141754-001, dated April 16, 2012
- 0405-22, "Design review boards," Revision 024, December 14, 2012
- 0405-30, "Design verification testing," Revision 022, September 18, 2012
- 0414-12, "Preparation and Processing of licensing documents," Revision 21, September 29, 2006
- 0404-12, "Preparation of licensing documents and B&W owners group reports," Revision 16, January 7, 2000
- 0418-01-F03, "Design certification licensing document approval," Revision 9, May 8, 2013
- 0418-01, "Preparation, Control, and Revisions to Final Safety Analysis Report (FSAR)," Revision 007, October 5, 2012
- 0902-29, "Procurement of engineering applications software," Revision 006, May 3, 2013
- 0902-32, "Software development," Revision 000, June 8, 2012
- 0902-13, "Production software and hardware changes," Revision 006, December 7, 2011
- 0902-19, "Engineering software error reporting and evaluation," Revision 007, September 14, 2012

- 0902-30, "Management and use of engineering applications software," Revision 006, September 14, 2012
- 0902-28, "Development of engineering applications software," Revision 004, August 31, 2012
- 1707-01, "Implementation of 10 CR 21," Revision 040, July 18, 2012
- 1717-06, "Corrective Action Program – WebCAP," Revision 8, April 11, 2013
- 1719-21, "Quality Assurance of Internal Audits," Revision 28, March 4, 2013
- 1719-23, "Qualification of Quality Assurance Audit Personnel," Revision 23, September 15, 2011

Software Documents

- 32-9110782-000, "GOTHIC 7.2b validation and verification," June 9, 2009
- 32-5061628-00, "GOTHIC 7.2b validation and verification," March 17, 2005
- 32-9045683-000, "GOTHIC 7.2a validation and verification," April 23, 2007
- 32-9110782, "GOTHIC 7.2b validation and verification," June 9, 2009
- 2A4-RELAP5MOD2-27.0HP, "Certification file for RELAP5MOD2-B&W version 27.0HP," November 20, 2007
- 0902-06, "Software Certification," Revision 24, January 20, 2006
- BAW-10164P-A, "RELAP5MOD2-B&W an advanced computer program for light water reactor LOCA and Non-LOCA transient analysis," Revision 6, June 2007, Revision 4, November 26, 2002
- 0902-30-F04, "Software document cover sheet for ABSOLUTE6," Revision 0, April 5, 2013
- 20032-33, "Document release notice for 43-10164P-06," April 4, 2006
- 20032-24, "Document release notice for 43-10164P-04," August 17, 2000
- 0902-30-F04, "Software document cover sheet for BWSPAN," Revision 0, November 7, 2012
- 32-700770-000, "U.S. EPR SBLOCA Containment Analysis – Multi-node GOTHIC Model," December 17, 2009
- 32-9054992-000, "U.S. EPR Small Break LOCA for Containment Analysis," August 31, 2007
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WebCAP Condition Reports

- 2008-3157, 3190, 3445, 6358, 6755
- 2010-4120, 8862
- 2011-4236, 4417
- 2012-2815, 3366, 7715, 7766, 8489, 8956
- 2013-1433, 1750, 1967, 2153, 2204, 2215, 4213, 4361, 4576, 4883, 5149, 5239, 5432, 5708, 6811, 6867, 6868

WebCAP Condition Reports submitted during the NRC Inspection

- 2013-7046, 7048, 7051, 7053, 7077, 7140, 7251

Design Change Requests

- 113-7004724-000, "Documentation changes for containment penetrations IRT RAI-372, " May 13, 2010
- 113-7009758-000, "Addition of PS function for MFW isolation, "January 6, 2011
- 113-7012156-000, "Correct Safety Classifications, Quality Groups, and Codes and Standards for SSC classifications – CR 2012-2815/3366/7715," February 11, 2013
- 113-7014168-000, "Revisions to SSC Classifications in Response to CR 2013-2153," May 17, 2013

Other Documents

- EG-06, "Pre-Job Briefings, Engineering Task Plans and Post-Job Reviews," Revision 003, August 23, 2012
- ANP-10278P, "U.S. EPR realistic large break loss of coolant accident," Revision 1, January 2010
- ANP-10299P, "Applicability of AREVA NP containment response evaluation methodology to the U.S. EPR for large break analysis, "Revision 2, December 2009
- U.S. EPR final safety analysis report, Revision 5-interim
- U.S. EPR final safety analysis report, Revision 2-interim
- SRA-13-024, "E&P/IB-NB-EPR Internal Audit (13-06)," dated July 12, 2013
- U.S. Fuel Business Unit Quality Report (12-23), dated January 4, 2013
- Lead Auditor Qualification Package for Susan Andrews
- Calculation 32-700770-000 U. S. EPR SBLOCA Containment Analysis – Multi-node GOTHIC Model" prepared by Juan M Cajigas on December 1, 2009 and approved by Bob Salm on December 17, 2009
- Calculation 32-9054992-000, 'U.S. EPR Small break LOCA for containment for Containment Analysis prepared by Seifae Farrokh on August 31, 2007
- Quality Engineering Trend report, January 2013 – Jun 2013, dated July 31, 2013
- 2013 RS and EP Management Review Report, dated March 19, 2013
- 2013 IB-A Spring Outage Report, January 1 thru May 31, 2013, dated June 17, 2013