

July 12, 2010

Mr. Ashok S. Bhatnagar  
Senior Vice President  
Nuclear Generation Development and Construction  
Tennessee Valley Authority  
1101 Market Street  
Chattanooga, TN 37402-2801

SUBJECT: NRC INSPECTION REPORT NOS. 05200014/2010-201 AND  
05200015/2010-201 AND NOTICE OF VIOLATION

Dear Mr. Bhatnagar:

From May 17, 2010, through May 21, 2010, the U.S. Nuclear Regulatory Commission (NRC) conducted an inspection at the Tennessee Valley Authority (TVA) office in Chattanooga, TN. The enclosed report presents the results of this inspection.

The purpose of the NRC inspection was to verify that quality assurance (QA) processes and procedures applied to activities related to the combined license application (COLA) for Bellefonte (BLN) Units 3 and 4 were effectively implemented. The inspection focused on assessing compliance with the provisions of Title 10 of the *Code of Federal Regulations* (10 CFR) Part 21, "Reporting of Defects and Noncompliance," and selected portions of Appendix B, "Quality Assurance Program Criteria for Nuclear Power Plants and Fuel Processing Plants," to 10 CFR Part 50, "Domestic Licensing of Production and Utilization Facilities." This NRC inspection report does not constitute NRC endorsement of your overall QA or 10 CFR Part 21 programs. In addition, the NRC inspection reviewed corrective actions associated with three violations issued during a February 2008 NRC inspection, documented in NRC inspection reports 05200014/2008-201 and 05200015/2008-201, which sought to verify that QA processes and procedures were effectively implemented with regards to the Simulated Open Channel Hydraulics (SOCH) code for the BLN Units 3 and 4 COLA.

Based on the results of this inspection, the NRC has determined that two Severity Level IV violations of NRC requirements occurred. The NRC evaluated these violations in accordance with the agency's Enforcement Policy, which is available on the NRC's Web site at [http://www.nrc.gov/about\\_nrc/regulatory/enforcement/enforce\\_pol.html](http://www.nrc.gov/about_nrc/regulatory/enforcement/enforce_pol.html).

The enclosed Notice of Violation (Notice) cites the violations, and the subject inspection report describes in detail the circumstances surrounding it. The violations are being cited because a review of the TVA Nuclear Quality Assurance Program, as it pertains to activities related to the COLA for BLN Units 3 and 4, found that certain program policies and implementation procedures were not in compliance with the applicable requirements of Appendix B to 10 CFR Part 50.

TVA is required to respond to this letter and should follow the instructions specified in the enclosed Notice when preparing its response. The NRC will use this response, in part, to 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," the NRC will make a copy of this letter, its enclosures, and the TVA response available electronically for public inspection in the NRC Public Document Room or from the NRC's Agencywide Documents Access and Management System (ADAMS), which is accessible from the NRC Web site at <http://www.nrc.gov/reading-rm/adams.html>. To the extent possible, the response 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 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/*

Juan Peralta, Chief  
Quality and Vendor Branch 1  
Division of Construction Inspection  
& Operational Programs  
Office of New Reactors

Docket Nos.: 05200014 and 05200015

Enclosures:

1. Notice of Violation
2. Inspection Report Nos. 05200014/2010-201 and 05200015/2010-201 and Attachments

In accordance with 10 CFR 2.390, "Public Inspections, Exemptions, Requests for Withholding," of the NRC's "Rules of Practice," the NRC will make a copy of this letter, its enclosures, and the TVA response available electronically for public inspection in the NRC Public Document Room or from the NRC's Agencywide Documents Access and Management System (ADAMS), which is accessible from the NRC Web site at <http://www.nrc.gov/reading-rm/adams.html>. To the extent possible, the response 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 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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Name	KKavanagh		TFrye ( <i>JBeardsley for</i> )		J.Peralta	
DATE	07/07/10		07/08/10		07/12/10	

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## NOTICE OF VIOLATION

Tennessee Valley Authority  
Bellefonte, Units 3 and 4  
Chattanooga, TN 37402

Docket Nos.: 05200014 and 05200015  
Report No.: 2010-201

During an U.S. Nuclear Regulatory Commission (NRC) inspection conducted at the Tennessee Valley Authority (TVA) office in Chattanooga, TN, on May 17–21, 2010, two violations of NRC requirements were identified. In accordance with the NRC Enforcement Policy, the violations are described below:

- A. Criterion IV, "Procurement Document Control," of Appendix B, "Quality Assurance Criteria for Nuclear Power Plants and Fuel Reprocessing Plants," to 10 CFR Part 50, states, in part, that measures shall be established to assure that applicable regulatory requirements, design bases, and other requirements which are necessary to assure adequate quality are suitably included or referenced in the documents for procurement of material, equipment, and services, whether purchased by the applicant or by its contractors or subcontractors.

TVA Procedure SPP-4.1, "Procurement of Material, Labor and Services," defines the procurement functions with respect to nuclear quality and safety-related structures, systems, and components (items) and services for nuclear power plants. Specifically, Step 4.1.1.C of SPP-4.1 states, in part, that the organization requesting the contract shall maintain the documentation that evidences the independent review and ensure that all technical and quality requirements are otherwise prepared, reviewed and released. Additionally, Step A.4 in Appendix B to SPP-4.1 states, in part, that when requesting labor and services, the requester shall include/address the following procurement provisions in Steps C.1 and C.2 (i.e. "9 Points").

Contrary to the above, as of May 21, 2010, TVA failed to implement its procurement process consistent with TVA Procedure SPP-4.1. Specifically, Procurement Requests NGD-13, Revision 0, and NGC-32, Revision 0, did not have a documented independent review, and NGD-10, Revision 0, did not include the listed procurement provisions in Steps C.1 and C.2 of Appendix B to SPP-4.1.

This issue has been identified as Violations 05200014/2010-201-01 and 05200015/2010-201-01.

This is a Severity Level IV violation (Supplement II).

- B. Criterion XVIII, "Audits" of Appendix B to 10 CFR Part 50 requires that a comprehensive system of planned and periodic audits shall be carried out to verify compliance with all aspects of the quality assurance program and to determine the effectiveness of the program. The audits shall be performed in accordance with the written procedures or check lists by appropriately trained personnel not having direct responsibilities in the areas being audited.

TVA-NQA-PLN89-A "Tennessee Valley Authority Nuclear Quality Assurance Plan," (NQAP), section 12, "Auditing," establishes requirements for internal audits to assess the adequacy and effectiveness of the QA Program. The NQAP commits to Regulatory Guide (RG) 1.28, Revision 3, dated August 1985 which states, in part, the applicable elements of an organization's quality assurance program should be audited at least once each year or at least once during the life of the activity, whichever is shorter.

ENCLOSURE 1

Contrary to the above, TVA failed to conduct an internal audit on the Bellefonte Units 3 and 4 COLA project within one year of becoming an applicant on October 30, 2007.

This issue has been identified as Violations 05200014/2010-201-02 and 05200015/2010-201-02.

This is a Severity Level IV violation (Supplement II).

Pursuant to the provisions of 10 CFR 2.201, "Notice of Violation," TVA is hereby required to submit a written statement or explanation to the U.S. Nuclear Regulatory Commission, ATTN: Document Control Desk, Washington, DC 20555-0001, with a copy to the Chief, Quality and Vendor Branch 1, Division of Construction Inspection & Operational Programs, Office of New Reactors, within 30 days of the date of the letter transmitting this Notice of Violation. This reply should be clearly marked as a "Reply to a Notice of Violation" and should include (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 to avoid further violations; 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, United States Nuclear Regulatory Commission, Washington, DC 20555-0001.

Since your response will be made available electronically for public inspection in the NRC Public Document Room or through the NRC Agencywide Documents Access and Management System (ADAMS), to the extent possible, the response should not include any personal privacy, proprietary, or safeguards information so that it can be made available to the public without redaction. ADAMS is accessible from the NRC Web site at <http://www.nrc.gov/reading-rm/adams.html>. 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 withholding of such material, you must specifically identify the portions of your response that you seek to have withheld and provide in detail the bases 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."

Dated at Rockville, Maryland, this 12<sup>th</sup> day of July 2010.

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

Docket Nos.: 05200014 and 05200015

Report Nos.: 05200014/2010-201 and 05200015/2010-201

Applicant: Tennessee Valley Authority  
1101 Market Street  
Chattanooga, TN 37402

Applicant Contact: Thomas Spink  
Tennessee Valley Authority  
423-751-7062  
[tespink@tva.gov](mailto:tespink@tva.gov)

Background: Tennessee Valley Authority is pursuing a combined license for two new AP1000 units at the Bellefonte site in Jackson County, AL.

Inspection Dates: May 17–21, 2010

Inspectors: Kerri Kavanagh, NRO/DCIP/CQVA, Team Leader  
Milton Concepcion, RES/DE/DICB  
Paul Coco, NRO/DCIP/CQVA  
Garrett Newman, NRO/DCIP/CQVB  
Kenneth See, NRO/DSEB/RHEB  
Juan Uribe, NRR/DE/EMCB

Approved by: Juan D. Peralta, Chief  
Quality and Vendor Branch 1  
Division of Construction Inspection  
and Operational Programs  
Office of New Reactors

## EXECUTIVE SUMMARY

Tennessee Valley Authority  
Report Nos. 05200014/2010-201 and 05200015/2010-201

The U.S. Nuclear Regulatory Commission (NRC) inspection focused on quality assurance (QA) policies and procedures implemented to support the combined license (COL) application for Bellefonte (BLN), Units 3 and 4, as described in NRC Inspection Manual Chapter 2502, "Construction Inspection Program: Pre-Combined License (Pre-COL) Phase." The purpose of this inspection was to verify that Tennessee Valley Authority (TVA) Nuclear Generation Development and Construction (NGDC) had implemented an adequate QA program that complies with 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 inspection also verified that TVA NGDC had implemented a program under 10 CFR Part 21, "Reporting of Defects and Noncompliance," that meets NRC regulatory requirements.

The NRC based its inspection on the following:

- 10 CFR Part 21
- Appendix B to 10 CFR Part 50

During this inspection, the NRC inspection team implemented Inspection Procedure 35017, "Quality Assurance Implementation Inspection," dated July 29, 2008, and Inspection Procedure 36100, "Inspection of 10 CFR Parts 21 and 50.55(e) Programs for Reporting Defects and Noncompliance," dated October 3, 2007.

In addition, the inspection followed up on three violations issued during the February 2008 inspection, as documented in NRC inspection reports 05200014/2008-201 and 05200015/2008-201, which sought to verify QA processes and procedures were effectively implemented with regards to the Simulated Open Channel Hydraulics (SOCH) code for the BLN Units 3 and 4 combined license application (COLA). A summary of each Notice of Violation (NOV) is included below:

- NOVs 05200014/2008-001-01 and 05200015/ 2008-001-01 were issued because TVA did not implement the design control process as required by the TVA nuclear quality assurance plan.
- NOVs 05200014/2008-001-02 and 05200015/ 2008-001-02 were issued because TVA's 1998 Flood Reassessment for the Effects of Dam Safety Modifications calculation package did not contain a hard copy/microfiche of the input files as required by TVA procedures.
- NOVs 05200014/2008-001-03 and 05200015/ 2008-001-03 were issued because TVA did not implement procedure SPP-2.6 for the 1998 Flood Reassessment for the Effects of Dam Safety Modifications calculation package.

## 10 CFR Part 21 Program

The NRC inspection team concluded that the implementation of the TVA NGDC 10 CFR Part 21 program is consistent with the regulatory requirements of 10 CFR Part 21. Based on its review, the NRC inspection team also determined that TVA NGDC is effectively implementing its policies and associated procedures to support the COLA for BLN Units 3 and 4. No findings of significance were identified.

## Training and Qualification of Personnel

The NRC inspection team concluded the TVA NGDC training and qualification requirements of personnel are consistent with the regulatory requirements of Criterion II, "Quality Assurance Program," of Appendix B to 10 CFR Part 50. Based on the samples reviewed, the NRC inspection team also determined that TVA NGDC is effectively implementing its policies and associated procedures to support the COLA for BLN Units 3 and 4. No findings of significance were identified.

## Design Control

The NRC inspection team concluded that the implementation of the TVA NGDC design control process is consistent with the regulatory requirements of Criterion III, "Design Control," of Appendix B to 10 CFR Part 50. Based on the sample reviewed, the NRC inspection team also determined that TVA NGDC is effectively implementing its policies and associated procedures to support the COLA for BLN Units 3 and 4. No findings of significance were identified.

## Procurement Control

The NRC inspection team identified one violation associated with TVA NGDC's failure to implement the requirements of Criterion IV, "Procurement Document Control," of Appendix B to 10 CFR Part 50. Violations 05200014/2010-201-01 and 05200015/2010-201-01 identify TVA NGDC's failure to implement procurement consistent with TVA Procedure SPP-4.1, "Procurement of Material, Labor and Services." With the exception of these issues, the NRC inspection team concluded that TVA NGDC's procurement control process is consistent with the regulatory requirements of Criterion IV, "Procurement Document Control," and Criterion VII, "Control of Purchased Material, Equipment, and Services," of Appendix B to 10 CFR Part 50 and has been implemented in accordance with the applicable TVA NGDC policies and procedures.

## Corrective Action

The NRC inspection team concluded that the implementation of the TVA NGDC corrective action program is consistent with the regulatory requirements of Criterion XVI, "Corrective Action," of Appendix B to 10 CFR Part 50. Based on the sample reviewed, the NRC inspection team also determined that TVA NGDC is effectively implementing its policies and associated procedures to support the COLA for BLN Units 3 and 4. No findings of significance were identified.

## Internal and External Audits

The NRC inspection team concluded that the implementation of the TVA NGDC external and internal audits is consistent with the regulatory requirements of Criterion VII, "Control of Purchased Material, Equipment, and Services," and Criterion XVIII, "Audits," of Appendix B to 10 CFR Part 50. Based on the sample reviewed, the NRC inspection team also determined that TVA NGDC is effectively implementing its policies and procedures to support the COLA for BLN



Units 3 and 4. The NRC inspection team identified one violation associated with TVA NGDC's failure to implement the requirements of Criterion XVIII. Violations 05200014/2010-201-02 and 05200015/2010-201-02 identify TVA NGDC's failure to conduct an internal audit on the COLA for BLN Units 3 and 4 project within one year of becoming an applicant.

## REPORT DETAILS

### 1. 10 CFR Part 21 Program

#### a. Inspection Scope

The NRC inspection team reviewed the implementation of TVA NGDC 10 CFR Part 21 program in support of the BLN Units 3 and 4 COLA. Specifically, the NRC inspection team reviewed the policies and procedures governing the implementation of TVA NGDC Part 21 process to verify compliance with regulatory requirements of 10 CFR Part 21. The NRC inspection team also discussed this process with members of the TVA NGDC management and technical staff.

The NRC inspection team reviewed the following documents for this inspection area:

- NGDC-BLN3/4-3-04, "10 CFR Part 21 Evaluating and Reporting of Defects and Noncompliance," Revision 1, dated May 14, 2010
- NGDC-BLN3/4-1-01, "NRC Correspondence," Revision 3, dated May 17, 2010
- SSP-3.4, "Corrective Action Program," Revision 16, dated February 10, 2010
- BLN Quality Assurance audit of NGDC, report number BLA1002, dated May 6, 2010.
- Problem Evaluation Request (PER) Number 230219 dated May 18, 2010

#### b. 10 CFR Part 21 Procedures and Implementation

NGDC-BLN3/4-3-04 provides instructions to TVA NGDC personnel to ensure that specific requirements for reporting to the NRC as directed by 10 CFR Part 21. It also identifies the organizational groups responsible for preparation, review, and submittal of the reports. The procedure also provides instructions on for evaluating a PER for reportability under 10 CFR Part 21.

The NRC inspection team reviewed the implementation of the TVA NGDC 10 CFR Part 21 program as described in NGDC-BLN3/4-3-04. The NRC inspection team learned that TVA NGDC had not performed any 10 CFR Part 21 evaluations and had not identified any potential 10 CFR Part 21 deviations or failures to comply requiring evaluation.

The NRC inspection team also reviewed SSP-3.4, which documents the TVA NGDC corrective action process. The NRC inspection team observed that SSP-3.4 did not contain a direct connection to NGDC-BLN3/4-3-04 for evaluating PERs for 10 CFR Part 21 reportability. This issue was also identified by an internal audit conducted by TVA BLN Quality Assurance of NGDC on April 12-16, 2010 and documented under Audit Report No BLA1002. The TVA BLN audit determined that SSP-3.4 was only applicable to BLN Units 1 and 2 and not BLN Units 3 and 4. The NGDC staff completed the required corrective action which includes revising SSP-3.4 to address the audit findings prior to the completion of the NRC inspection.

The NRC inspection team observed that all posting requirements of 10 CFR 21.6 were met to include Section 206 of the Energy Reorganization Act of 1974, the current version of 10 CFR Part 21, and TVA's procedures that implement this regulation.

The NRC inspection team also met with representatives of TVA NGDC to discuss the reportability evaluation under its corrective action program database, called Maximo. This program allows for human interface in the determination reportability under 10 CFR Part 21. No issues were identified.

c. Conclusions

The NRC inspection team concluded that the implementation of the TVA NGDC 10 CFR Part 21 program is consistent with the regulatory requirements of 10 CFR Part 21. Based on its review, the NRC inspection team also determined that TVA NGDC is effectively implementing its policies and associated procedures to support the COLA for BLN Units 3 and 4. No findings of significance were identified.

2. Training and Qualification of Personnel

a. Inspection Scope

The NRC inspection team reviewed the implementation of TVA NGDC policies and procedures for the indoctrination and training of personnel performing quality activities for the support of the BLN Units 3 and 4 COLA. Specifically, the NRC inspection team reviewed the policies and procedures governing the implementation of TVA NGDC training process to verify compliance with Criterion II, "Quality Assurance Program," of Appendix B to 10 CFR Part 50. In addition, the NRC inspection team discussed the training and qualification process with members of the TVA NGDC management and technical staff.

The NRC inspection team reviewed the following documents for this inspection area:

- TVA-NQA-PLN89-A, "Nuclear Quality Assurance Program," Revision 23, dated December 14, 2009
- NGDC-BLN3/4-27-01, "Advanced Reactor Licensing Implementation Procedure Reference Document," Revision 2, dated May 17, 2010
- NGDC-BLN3/4-17-01, "Training Procedure," Revision 1, dated May 14, 2010
- QAPD-7, "Quality Assurance Training Program Description," Revision 0, dated April 2, 2010
- QA-CH-09-006, "Corporate Quality Assurance-Assessment of the Response to NRC Violations associated with the Bellefonte Hydrology Study," dated October 27, 2009
- training records for selected TVA QA personnel.
- PER 203950

b. Observations and Findings

The NRC inspection team reviewed procedure NGDC-BLN3/4-17-01, which provides training and qualification program requirements for personnel assigned to the BLN Units 3 and 4 COLA project during the pre-COLA project phase. This procedure provides guidance for the training of personnel authorized to work on the COLA for BLN Units 3 and 4, including TVA employees, contractors, and subcontractors selected by TVA performing work under the TVA Nuclear Quality Assurance Program (NQAP).

NGDC-BLN3/4-17-01 requires that the manager of BLN AP1000 licensing determine training methods for project personnel. Training methods used are at the discretion of the manager of BLN AP1000 licensing, and include oral evaluation or self-study/required reading. Documentation of all training activities is required to establish a record of training attendance and task qualifications, which is entered into the Automated Training Information System (ATIS).

The NRC inspection team also reviewed QAPD-7, which describes the TVA QA Training and Qualification program for QA and contract personnel who perform audits, assessments, supplier evaluations, and inspections of quality-related structures, systems, and components. The scope of QA training includes in-processing, basic orientation, technical fundamentals, and discipline- and function-specific training.

The NRC inspection team reviewed a sample of training and qualification records for selected TVA QA personnel. The records included training record attachment forms and attendance sheets. Training was documented on appropriate training record forms in accordance with QAPD-7 and NGDC-BLN3/4-17-01.

Additionally, the NRC inspection team reviewed training and qualification records for the project licensing manager and two lead auditors. The NRC inspection team confirmed that qualification records were complete and had been reviewed and approved by a supervisor or manager in accordance with TVA procedures. No issues were identified.

The NRC inspection team noted that assessment report QA-CH-09-006 required all personnel in NGDC that are designated as Technical Contract Managers (TCM) to undergo training upgrades as a corrective action described in PER 203950. PER 203950 was created due to inadequate training for TCM's describing the interface between procurement procedures and other procedures that implement the TVA NQAP with respect to quality management. All training was completed by designated personnel and the PER was closed.

### c. Conclusions

The NRC inspection team concluded that the requirements of the TVA NGDC training and qualification are consistent with the regulatory requirements of Criterion II of Appendix B to 10 CFR Part 50. Based on the samples reviewed, the NRC inspection team also determined that TVA NGDC is effectively implementing its policies and associated procedures to support the COLA for BLN Units 3 and 4. No findings of significance were identified.

## 3. Design Control

### a. Inspection Scope

The NRC inspection team reviewed the implementation of TVA NGDC design control process in support of the COLA for BLN Units 3 and 4. Specifically, the NRC inspection team reviewed the policies and procedures governing the implementation of TVA NGDC design control process to verify compliance with the regulatory requirements of Criterion III, "Design Control," of Appendix B to 10 CFR Part 50.

As a result of the NRC inspection documented in inspection reports 05200014/2008-201 and 05200015/2008-201, TVA NGDC set forth to properly verify and validate the Single Open Channel Hydraulic (SOCH) code and supporting models and reproduce design input

data. The NRC inspection team reviewed the verification and validation of the SOCH code and supporting models, the reproduced design input data, and the corrective actions associated with three violations cited in NRC inspection reports 05200014/2008-201 and 05200015/2008-201.

The NRC inspection team reviewed the following documents for this inspection area:

- NEDP-2, "Design Calculation Process Control," Revision 14, dated February 23, 2010
- SPP 2.6, "Computer Software Control," Revision 12, dated June 2, 2008
- Simulated Open Channel Hydraulics (SOCH) User's Manual, Revision 0, Version 1.0, dated May 28, 2009
- SOCH Software Design Description (SDD), Revision 0, Version 1.0, dated May 8, 2009
- SOCH Software Requirements Specification (SRS), Revision 0, Version 1.0, dated May 27, 2009
- SOCH Software Verification and Validation Report (SVVR), Revision 1, Version 1.0, dated December 23, 2009
- DBREACH User's Manual, Revision 0, Version 1.0, dated February 12, 2009
- DBREACH Software Design Description (SDD), Revision 1, Version 1.0, dated December 23, 2009
- DBREACH Software Requirements Specification (SRS), Revision 0, Version 1.0, dated December 17, 2008
- DBREACH Software Verification and Validation Report (SVVR), Revision 1, Version 1.0, dated December 23, 2009
- Weighted Width (WWIDTH) and Conveyance (CONVEY) User's Manual, Revision 0, Version 1.0, dated February 12, 2009
- WWIDTH and CONVEY Software Design Description (SDD), Revision 0, Version 1.0, dated December 19, 2008
- WWIDTH and CONVEY Software Requirements Specification (SRS), Revision 0, Version 1.0, dated December 17, 2008
- WWIDTH and CONVEY Software Verification and Validation Report (SVVR), Revision 1, Version 1.0, dated December 23, 2009
- UNITGRPH, FLDHYDRO, TRBROUTE, and CHANROUT User's Manual, Revision 1, Version 1.1, dated December 23, 2009
- UNITGRPH, FLDHYDRO, TRBROUTE, and CHANROUT Software Design Description (SDD), Revision 1, Version 1.1, dated December 23, 2009
- UNITGRPH, FLDHYDRO, TRBROUTE, and CHANROUT Software Requirements Specification (SRS), Revision 1, Version 1.1, dated December 23, 2009

- UNITGRPH, FLDHYDRO, TRBROUTE, and CHANROUT CONVEY Software Verification and Validation Report (SVVR), Revision 1, Version 1.1, dated December 23, 2009
- Bechtel Engineering Department Procedure 3DP-G04-00036, Revision 7, dated March 2006
- Bechtel Validation Manual for the Hydrologic Engineering Center River Analysis System (HEC-RAS), Revision 1, dated February 2006

b. Observations and Findings

b.1 Software Lifecycle Documentation

The NRC inspection team reviewed policies and procedures associated with safety-related analyses, including verification, validation, and changes to computer programs. Specifically, the NRC inspection team reviewed TVA's NQAP, NEDP-2, and SPP 2.6 in order to assess adequate implementation of the requirements for preparation, checking, verification and approval of design calculations.

TVA procedure NEDP-2 provides the requirements and instructions for the preparation, review, approval, issuance, and revision of calculations and the preparation, review, and approval of calculation data used for TVA nuclear power plants. NEDP-2 references SPP-2.6 for computer application software that is used to perform safety-related calculations. SPP-2.6 provides the controls for computer software used in support of design, operation, modification, and maintenance of TVA nuclear plants to ensure the integrity of computer analyses. In inspection reports 05200014/2008-201 and 05200015/2008-201, the NRC inspection team determined that TVA had not implemented NEDP-2 and SPP-2.6 in a manner consistent with the TVA QA program. The NRC inspection team noted that TVA revised SPP-2.6 after the February 2008 NRC inspection in order to establish a clear understanding of the criteria required for computer software controls.

TVA uses the SOCH code to calculate flooding levels for the probable maximum flood on streams and rivers and potential dam failures to support the BLN Units 3 and 4 Final Safety Analysis Report (FSAR), Sections 2.4.3, "Probable Maximum Flood of Streams and Rivers," and 2.4.4, "Potential Dam Failures," respectively. The SOCH code solves the Saint-Venant equations of continuity and momentum for one-dimensional, unsteady flow in open channels. The SOCH code implements an explicit finite-difference scheme in the solution of the Saint-Venant equations using the leapfrog method, which employs a staggered time-distance grid and centered differences in space and time to compute the spatial and temporal derivatives in the equations of continuity and momentum. The SOCH code requires input from seven different auxiliary codes to prepare the input data to SOCH. These codes are UNITGRPH, FLDHYDRO, TRBROUTE, CHANROUT, DBREACH, CONVEY, and WWIDTH. Specifically, the supplemental codes perform the following functions:

- UNITGRPH computes unit hydrographs from historical flood data.
- FLDHYDRO determines inflows from unit hydrographs and rainfall.
- TRBROUTE routes hydrographs from one point to another using different routing procedures (channel and reservoir).

- CHANROUT determines channel routing method coefficients.
- DBREACH determines the time of failure of an overtopped earth embankment based on soil type and time and depth of overtopping during a flood.
- CONVEY determines cross sectional area and composite conveyance for SOCH geometry.
- WWIDTH determines equivalent weighted width to account for reservoir volume in SOCH geometry.

The NRC inspection team reviewed the QA documentation supporting the SOCH suite of computer codes that provide input to the SOCH code. The NRC inspection team learned that TVA contracted Bechtel Power Corporation (Bechtel) to develop the life-cycle documentation for the SOCH suite of computer codes consistent with SPP-2.6. Specifically, Bechtel developed software design descriptions, software requirements specifications, software verification and validation reports, and user's manual documentation for each of the computer codes above. The NRC inspection team reviewed these documents to verify that the SOCH suite of computer codes was adequately controlled in accordance with SPP 2.6.

*Software Requirements Specification (SRS) Documentation for the SOCH Suite of Computer Codes*

The NRC inspection team reviewed the SRS documentation developed by Bechtel. The NRC inspection team noted that the SRSs reviewed provide a comprehensive description of the intended purpose and environment for the SOCH suite of computer codes. In addition, the SRSs reviewed fully describe what the software will do and how it will be expected to perform. The NRC inspection team noted that the SRSs were written consistent with the guidance contained in SPP-2.6, which requires an SRS for category A-D software.

*Software Design Description (SDD) Documentation for the SOCH Suite of Computer Codes*

The SDDs reviewed describe the software design in sufficient detail to adequately describe how the computer codes implement the requirements. The NRC inspection team noted that the information also includes the analysis or rationale for the design chosen. The SDDs reviewed also describe the internal function of the software; the main computer code and internal subroutines; and the integration of the operating system, design inputs and sources, and design constraints into the code.

*Software Verification and Validation (V&V) Report Documentation for the SOCH Suite of Computer Codes*

The V&V reports provide testing results for the SOCH code functionality testing. The NRC inspection team noted that the V&V reports provide a description of the test problems used in each case; describe the plan for testing each of the codes functionality; describe the results of the tests; provide a summary and conclusions of the functionality testing; and present references to the source of the data used for the validation of the codes.

## *User's Manuals Developed for the SOCH Suite of Computer Codes*

The NRC inspection team reviewed the user's manuals developed by Bechtel. The user's manuals provide a theoretical basis for each code, including mathematical formulations; restrictions or limitations on the use of the codes; definitions, structure, and format of input files and variables required to run the codes; step-by-step instructions on how to run the codes; outputs produced by the codes; references used; copies of the source codes; typical problems and their associated output files; and maintenance and user support contacts for problems identified with the software.

The NRC inspection team determined that TVA provided sufficient life-cycle documentation to establish adequate control of the SOCH suite of computer codes, consistent with QA requirements.

Based on the review of documentation supporting the SOCH code described above, the NRC inspection team confirmed that TVA adequately addressed and corrected the violations documented in NOVs 05200014/2008-001-01 and 05200015/2008-001-01. The NRC inspection team closed NOVs 05200014/2008-001-01 and 05200015/2008-001-01.

### b.2 Verification and Validation of the SOCH Suite of Computer Codes

The NRC inspection team requested documentation to verify that the SOCH suite of computer codes was adequately validated and controlled in accordance with SPP 2.6. In addition, the NRC inspection team verified whether TVA adequately controlled such documentation as QA records, consistent with QA requirements.

Under contract with TVA, Bechtel developed test cases and performed validation testing of the SOCH suite of computer codes in accordance with Bechtel procedure 3DP-G04-00036. The NRC inspection team discussed the V&V records associated with the SOCH suite of computer codes and the methodology used to verify the accuracy of the results produced by the SOCH model with TVA and Bechtel. The NRC inspection team learned that Bechtel assigned a technical specialist that proposed a set of relevant problems to be used during the SOCH V&V testing; verified the theoretical basis and the accuracy of results for the intended use of the program; ensured adequacy and completeness of testing, verification, documentation, operational validation test problems, and incorporation of self-testing features, as appropriate; and defined the program capabilities and limitations, as documented in the User's Manuals.

The NRC inspection team also learned that Bechtel utilized the HEC-RAS computer program to verify the adequacy of the results produced by the SOCH model. The HEC-RAS computer program was designed by the Army Corps of Engineers to perform one-dimensional hydraulic calculations for a network of natural and constructed channels. The HEC-RAS system contains three one-dimensional hydraulic analysis components for: (1) steady flow water surface profile computations; (2) unsteady flow simulation, and (3) movable boundary sediment transport computations. During the V&V testing of the SOCH code, the test cases selected for verification were run in both SOCH and HEC-RAS. The SOCH code was then verified by comparing the results of the test cases against the results produced by the HEC-RAS computer program. The NRC inspection team requested TVA and Bechtel to provide evidence of V&V reports associated with the HEC-RAS computer program to verify that the comparison performed during the validation of the SOCH suite of computer codes was adequate. To this end, the NRC inspection team reviewed the Validation Manual for HEC-RAS River Analysis System. Bechtel developed this document to validate the HEC-RAS computer program against hand calculations. The NRC inspection team noted that the validation manual included a discussion of HEC-RAS program theory,



assumptions, and limitations identified with the steady flow program. The NRC inspection team noted that Bechtel validated the HEC-RAS computer program through a series of steps. First, a problem in the HEC-RAS application guide manual was run and the output was compared with that given in the program, with the goal of verifying that the computer used in the validation process performed the computations as expected. Additionally, hand computations were performed for several specific steady state problems to verify that the HEC-RAS computer program performed as its formulations dictated. Lastly, Bechtel developed documentation to validate the dam break option, part of the unsteady flow simulation. The NRC inspection team reviewed the validation activities performed by Bechtel on the HEC-RAS computer program, including hand calculation sheets used to validate HEC-RAS, and determined that Bechtel adequately performed validation of HEC-RAS in accordance with established procedures.

Based on the review described above, the NRC inspection team confirmed that TVA adequately addressed and corrected the violations documented in NOVs 05200014/2008-001-03 and 05200015/2008-001-03. The NRC inspection team closed NOVs 05200014/2008-001-03 and 05200015/2008-001-03.

### b.3 Review of Calculation Packages

The NRC inspection team reviewed a sample of calculation packages generated by TVA to verify the effective implementation of TVA design control requirements. In addition, the NRC inspection team reviewed documentation to demonstrate the accuracy and validity of input data used in the SOCH model.

During several discussions with TVA personnel, the NRC inspectors learned that the original 1998 TVA Flood Reassessment for the Effects of Dam Safety Modifications calculation package is still in effect until TVA supersedes it with an updated calculation package and the related PERs are closed. The NRC inspection team also learned that this will be a long term effort that is tentatively scheduled for completion by the end of 2010. These calculations were performed after the SOCH suite of computer codes was validated. The NRC inspection team reviewed a sample of the calculations that were prepared after the SOCH code was validated.

Through the review of these calculation packages, the NRC inspection team confirmed that TVA maintained documentation and records to demonstrate the accuracy and validity of design basis input data (e.g., river cross-sections, topographic datasets, modifications to dams in the region, etc.). In addition, the NRC inspection team confirmed that design inputs to the SOCH code were independently verified and the data had been updated to reflect changes to the Tennessee River/watershed since initial development of the data sets in the 1960s and 1970s, consistent with the TVA QA program, NEDP-2 and SPP-2.6 provisions.

Based on the review described above, the NRC inspection team confirmed that TVA adequately addressed and corrected the violations documented in NOVs 05200014/2008-001-02 and 05200015/2008-001-02. The NRC inspection team closed NOVs 05200014/2008-001-02 and 05200015/2008-001-02.

c. Conclusions

The NRC inspection team concluded that the implementation of the TVA NGDC design control process is consistent with the regulatory requirements of Criterion III, "Design Control," of Appendix B to 10 CFR Part 50. Based on the sample reviewed, the NRC inspection team also determined that TVA NGDC is effectively implementing its policies and associated procedures to support the COLA for BLN Units 3 and 4. No findings of significance were identified.

4. Procurement Control

a. Inspection Scope

The NRC inspection team reviewed the implementation of TVA NGDC procurement document control process in support of the COLA for BLN Units 3 and 4. Specifically, the NRC inspection team reviewed the policies and procedures governing the implementation of TVA NGDC procurement control process to verify compliance with Criterion IV, "Procurement Document Control," and Criterion VII, "Control of Purchased Material, Equipment, and Services," of Appendix B to 10 CFR Part 50, and a representative sample of procurement records.

The NRC inspection team reviewed the following documents for this inspection area:

- TVA-NQA-PLN89-A, "Tennessee Valley Authority Nuclear Quality Assurance Program," Revision 23, dated December 14, 2009
- SP-4.1, "Procurement of Material, Labor and Services," Revision 24, dated March 13, 2010
- NEDP-8, "Technical Evaluation for Procurement of Materials and Services," Revision 14, dated July 22, 2009
- NEDP-2, "Design Calculation Process Control," Revision 14, dated February 19, 2010
- NGDC-BLN3/4-3-04, "10 CFR Part 21 Evaluation and Reporting of Defects and Noncompliance," Revision 1, dated May 14, 2010
- PR NGD-10, "Bechtel National, Inc.," Revision 0, April 2, 2008
- PR NGD-13, "Pro2Serve," Revision 0, September 19, 2008
- PR NGD-32, "Barge Waggoner Sumner and Cannon, Inc. (BWSC)," Revision 0, February 25, 2009
- Contract No. 69909, "TVA Hydrology Calculation Managed Task Services Contract [Bechtel]," dated May 7, 2008
- Contract No. 72510, "TVA Hydrology Calculations Managed Task Services Contract [Pro2Serve]," dated September 30, 2008
- Contract No. 75578, "Barge, Waggoner, Sumner and Cannon, Inc.," dated March 3, 2009, with supplements dated April 10 and November 6, 2009

- PERs 230465 and 230724
- Service Request (SR) 182077

b. Observations and Findings

b.1 Policies and Procedures

The NRC inspection team reviewed the TVA NGDC policies and procedures for implementation of procurement documents controls. Specifically, the NRC inspection team reviewed Section 8.1, "Procurement Document Control," of the TVA NQAP, which describes the controls applied to documents used to obtain materials, parts, components, spare and replacement parts, and services.

The NRC inspection team reviewed SPP-4.1 which defines the procurement functions with respect to nuclear quality-related services for BLN Units 3 and 4 COLA. The NRC inspection team discussed contract development, administration, and oversight with responsible TVA NGDC management.

b.2 Implementation of Procurement Control

The NRC inspection team reviewed the contract numbers 69909, 72510, and 75578 associated with the support of the BLN Units 3 and 4 COLA.

Hydrology Project

TVA set forth to properly document verification and validation of the SOCH code and supporting models and reproduce design input data, in response to the February 2008 inspection. TVA contracted with Bechtel, Pro2Serve, and Barge Waggoner Sumner and Cannon (BWSC) for engineering and consulting services in support of this project.

The scope of work assigned to Bechtel includes verification and documentation of data used for calculations for maximum flood levels under probable maximum precipitation; revision to GEN-CEB-CDQ0999-980001, "Reassessment for the Effects of Dam Safety Modifications," dated March 27, 1998; and the documentation and validation of SOCH and auxiliary codes used in GEN-CEB-CDQ0999-980001.

The scope of work assigned to Pro2Serve includes preparation of calculation packages for input and predecessor data sets used in the probable maximum flood analyses in accordance with NEPD-2 and augmenting the services provided by Bechtel.

The scope of work assigned to BWSC includes computation and analysis of probable maximum flood levels at new and existing TVA sites, review and input to BLN Units 3 and 4 FSAR and COLA, technical support for probable maximum precipitation site drainage issues, and dam and reservoir analyses.

The Bechtel, Pro2Serve, and BWSC contracts stipulate that the procured services and any subcontracts would be performed under the TVA NQAP. The NRC inspection team determined that the procurement documents for the three suppliers contained appropriate provisions for personnel qualification, access to the supplier's facilities and records and reporting of nonconformances. TVA NGDC remained responsible for 10 CFR Part 21 reporting as the engineering products were generated using TVA procedures and approved by TVA NGDC.

While reviewing procurement documents associated with the hydrology project, the NRC inspection team noted that the procurement requests PR NGD-13 and PR NGD-32, for Pro2Serve and BWSC respectively, did not have signatures indicating that an independent review had been completed. Appendix B, "Quality Requirements for Personal and Professional Services Contracts," to SPP 4.1, Step A.3 requires an independent review to assure incorporation of the necessary technical and quality requirements. Step A.4 requires that documentation that evidences this review be maintained. The NRC inspection team met with TVA representatives regarding the missing signatures and noted that TVA was unable to provide objective evidence that these steps had been completed. The failure to furnish documentation that the independent review was conducted in accordance with SPP-4.1 is an example of Violations 05200014/2010-201-01 and 05200015/2010-201-01. TVA initiated SR 182077 to address this issue.

The NRC inspection team also noted that procurement request PR NGD-10 did not include procurement specifications as required by SPP-4.1. Step 4.1.1.C requires the requester to include/address the procurement provisions in Steps 4.1.1.C.1 and 4.1.1.C.2. The failure to include the specified procurement provisions in accordance with SPP-4.1 is another example of Violations 05200014/2010-201-01 and 05200015/2010-201-01. TVA NGDC initiated PER 230724 to address this issue.

#### c. Conclusions

The NRC inspection team identified one violation associated with TVA NGDC's failure to implement the requirements of Criterion IV, "Procurement Document Control," of Appendix B to 10 CFR Part 50. Violations 05200014/2010-201-01 and 05200015/2010-201-01 identify TVA NGDC's failure to implement procurement consistent with TVA Procedure SPP-4.1, "Procurement of Material, Labor and Services." With the exception of these issues, the NRC inspection team concluded that TVA NGDC's procurement control process is consistent with the regulatory requirements of Criterion IV, "Procurement Document Control," and Criterion VII, "Control of Purchased Material, Equipment, and Services," of Appendix B to 10 CFR Part 50 and has been implemented in accordance with the applicable TVA NGDC policies and procedures.

### 5. Corrective Action Program

#### a. Inspection Scope

The NRC inspection team reviewed the implementation of TVA NGDC corrective action process in support of the BLN Units 3 and 4 COLA. Specifically, the NRC inspection team reviewed the policies and procedures governing the implementation of TVA NGDC corrective action process to verify compliance with Criterion XVI, "Corrective Action," of Appendix B to 10 CFR Part 50. In addition, the NRC inspection team discussed the corrective action program with members of the TVA Nuclear Power Group (NPG) and NGDC management and technical staff.

The NRC inspection team reviewed the following documents for this inspection area:

- TVA, "Nuclear Quality Assurance Program," TVA-NQA-PLN89-A, Revision 23, dated December 14, 2009
- TVA BLN Site Standard Practice, SSP-3.4, "Corrective Action Program," Revision 16, dated February 18, 2010

- TVA BLN Site Standard Practice, SSP-3.4, "Corrective Action Program," Revision 17, dated May 20, 2010
- NPG Standard Programs and Processes, SPP-3.1, "Corrective Action Program," Revision 19, dated March 30, 2010
- PERs: 203950, 163427, 171191, 171275, 173921, 230219, 230651, 226276, 226278, 226279, 226281, 226283, 226560, 226887, 226889, 225975, 230463, 230467, and 230639
- BLN-CAP-S-10-001, "Review of BLN PERs for Trends," dated November 17, 2009
- BLN-CAP-S-10-003, "Review of BLN PERs for Trends," dated March 16, 2010

b. Observations and Findings

The NRC inspection team reviewed the TVA NGDC policies and procedures for implementation of the corrective action program. More specifically, the NRC inspection team reviewed Section 10, "Adverse Conditions," of the TVA NQAP, which describes the controls and corrective measures prescribed to ensure that conditions adverse to quality are reported and that appropriate corrective actions are implemented in a timely manner. Section 10.2.2, "Corrective Action for Adverse Conditions," states that "[a]dverse conditions shall be dispositioned by organizations with defined responsibility and authority and shall be corrected in accordance with documented plans."

The NRC inspection team noted that TVA NGDC issued 69 PERs as a result of the on-going hydrology review of the TVA river basin. During discussions with the TVA NPG management and staff, the NRC inspection team learned that the PERs associated with the hydrology review were generated and controlled under the TVA corporate corrective action procedure, SPP-3.1. These PERs are managed through the NPG corporate PER screening committee and corrective action review board as described in SPP-3.1. The NRC inspection team reviewed six PERs, including both opened and closed PERs, related to the hydrology project. The NRC inspection team concluded that the hydrology project PERs were documented, tracked, and resolved, if applicable, consistent with SPP-3.1.

The NRC inspection team reviewed an additional 13 PERs that were specific to BLN Units 3 and 4 and were generated and controlled through the Bellefonte site corrective action procedure, SPP-3.4. These PERs are managed through the BLN site management review committee as described in SPP-3.4. The BLN site includes Units 1 and 2 which are in a deferred plant status. The NRC inspection team concluded that the PERs specific to BLN Units 3 and 4 were documented, tracked, and resolved, if applicable, consistent with SPP-3.4.

The NRC inspection team also reviewed the trending analysis reports for the BLN site which provided trends of the PERs for August 1 through October 31, 2009 and November 1, 2009 through February 28, 2010. Corrective action program issues were the leading area of concern in both trend assessments, but for different reasons. The NRC inspection team interviewed TVA NGDC responsible staff and management as part of its evaluation of the TVA corrective action program. The NRC inspection team noted that TVA policies and implementing procedures provided the necessary guidance to adequately document, evaluate, correct, report, and verify resolution of conditions adverse to quality.

c. Conclusions

The NRC inspection team concluded that the implementation of the TVA NGDC corrective action program is consistent with the regulatory requirements of Criterion XVI, "Corrective Action," of Appendix B to 10 CFR Part 50. Based on the sample reviewed, the NRC inspection team also determined that TVA NGDC is effectively implementing its policies and associated procedures to support the COLA for BLN Units 3 and 4. No findings of significance were identified.

6. Internal and External Audits

a. Inspection Scope

The NRC inspection team reviewed the implementation of TVA NGDC external and internal audit processes in support of the COLA for BLN Units 3 and 4. Specifically, the NRC inspection team reviewed the policies and procedures governing the implementation of TVA NGDC processes to verify compliance with Criterion VII, "Control of Purchased Material, Equipment, and Services," and Criterion XVIII, "Audits," of Appendix B to 10 CFR Part 50, and a representative sample of audits.

The NRC inspection team reviewed the following documents for this inspection area:

- QAPD-3, "Supplier Audits, Surveys and Evaluations," Revision 1, dated March 12, 2010
- TVA-NQA-PLN89-A, "Nuclear Quality Assurance Program (NQAP)," Revision 23, dated December 14, 2009
- SSP-3.1, "Conduct of Quality Assurance," Revision 10, dated March 30, 2010
- QAPD-7, "Quality Assurance Training Program Description," Revision 0, dated April 2, 2010
- BLN Quality Assurance audit of NGDC, Report No BLA1002, dated May 6, 2010
- PER 230219 dated May 18, 2010
- BP-252, "Supplier Technical Quality for Non Safety-Related Procurements," Revision 3, dated October 29, 2007
- BP-259, "Oversight of Supplemental Personnel," Revision 8, dated February 19, 2010
- NEDP-2, "Design Calculation Process Control," Revision 14, dated February 19, 2010
- NADP-1, "Conduct of Nuclear Assurance Assessment," Revision 16, dated June 20, 2008
- TVA Audit No. 2009N-21, "Enercon Services, Inc.," dated March 6, 2009
- NUPIC Audit 20094, dated November 13, 2008
- WR 090831 815, "Supplier Evaluation Data Sheet, Enercon Svcs. Inc.," dated August 19, 2009

- WR 080924 805, "Supplier Evaluation Data Sheet, Enercon Svcs. Inc.," dated August 11, 2008
- WR 070828 818, "Supplier Evaluation Data Sheet, Enercon Svcs. Inc.," dated August 24, 2007
- CDQ00020080005, "Dam Rating Curves, Cherokee," Revision 2, dated December 28, 2009
- CDQ000200800018, "Dam Rating Curves," Revision 1, dated December 28, 2009
- CDQ00020080057, " Subbasin 49 (Sequatchie River) Unit Hydrograph Validation," Revision 2, dated December 23, 2009
- CDQ00020080065, "Watts Bar Dam Local Watershed (Subbasins 25, 33, 34, 36, and 37) Unit Hydrograph Validation," Revision 2, dated December 23, 2009
- CDQ00020080071, "Unit Hydrograph Validation for Subbasin 44A, the Lower Hiwassee River from Charleston (River Mile 18.9) to Apalachia and Ocoee No. 1 Dams," Revision 2, dated December 23, 2009
- CDQ00020080026, "SOCH Geometry Validation for Watts Bar Reservoir," Revision 1, dated December 23, 2009
- BWSC Letter, "QA Assessment Findings, Interim Measures and Corrective Actions Bellefonte Units 3 and 4 Hydrology Documentation," dated October 24, 2009
- PERs 203952, 203951, 203950, 204081, and 205253

b. Observations and Findings

The NRC inspection team reviewed the TVA NGDC policies and procedures for implementation of control of purchase materials, equipment, and services and audits. Specifically, the NRC inspection team reviewed Section 8.2, "Control of Purchased Material, Equipment, and Services," of the TVA NQAP which establishes requirements to ensure that procured items conform to the procurement documents including supplier evaluation and effectiveness assessment. Section 12, "Auditing," establishes requirements for internal audits and contractor/supplier audits to assess adequacy and effectiveness of the QA program.

QAPD-3 provides instructions for scheduling, preparation, planning, performance, and follow-up of surveys, audits, and annual evaluations. SPP-3.1 contains oversight and assessment requirements for quality-related work performed by suppliers of services working under the TVA NQAP.

The NRC inspection team reviewed SSP-3.1 which describes the QA functions that are implemented to meet NRC regulatory requirements of 10 CFR Part 50, and other applicable regulations, codes and standards addressed in NQAP. This procedure gives amplifying information of how TVA NGDC defines and conducts audits, assessments, and inspections.

The NRC inspection team reviewed a sample of external and internal audits conducted by TVA in support of the COLA for BLN Units 3 and 4. The NRC inspection team examined the

scope and depth of the audits and also reviewed the corrective actions associated with these audits.

#### b.1 External Audits

##### Nuclear Procurement Issues Committee Audit of Enercon Services, Inc.,

The NRC inspection team reviewed TVA Audit Report No. 2009N-21, which documents a Nuclear Procurement Issues Committee (NUPIC) audit performed by Duke Energy at Enercon Services, Inc., in Kennesaw, GA and Mt. Arlington, NJ. The NRC inspection team noted that TVA had documented the review of the NUPIC audit, determined that the Enercon status was acceptable, and determined that the NUPIC audit was applicable to TVA. TVA followed the audit findings through implementation of corrective actions by Enercon as reported by NUPIC and Duke Energy. TVA also added a restriction to its approved suppliers list to require a Project Planning Document for on-site work performed by Enercon as a result of its review of the audit. The NRC inspection team verified that this restriction has been placed in the Approved Suppliers List (ASL) for Enercon.

##### NuStart Joint Audit of Enercon Services, Inc.

The NRC inspection team reviewed TVA Audit Report No. 2006V-24, which documents a NuStart joint audit led by TVA at Enercon Services, Inc., in Mt. Arlington, NJ. The audit report identified four deviation reports in the areas of contract review, procurement, document control / adequacy, and training/certification. TVA followed Enercon's corrective actions for the audit findings through completion. The NRC inspection team also confirmed that TVA conducted annual evaluations of Enercon to maintain its status on the ASL.

#### b.2 Internal Audits

##### Hydrology Project Assessment

The NRC inspection team reviewed TVA Corporate QA Assessment Report No. QA-CH-09-006, which documents an assessment of the work performed to date on the hydrology study. The assessment scope included activities performed in response to NRC violations, documented in IRs 05200014/2008-201 and 05200015/2008-201, training /qualification, computer software control, design and calculation control, contracts, corrective action, and QA records. TVA NGDC developed 12 PERs as a result of the assessment in the areas of training and qualifications, calculations, and corrective action. The NRC inspection team verified by sample that these PERs were accurately entered into the corrective action program and that the specified actions had been taken in a timely and effective manner.

##### Bellefonte Units 3 and 4 (COLA) Activities

The NRC inspection team reviewed Audit Report No BLA 1002, which was an internal audit in support of the COLA for BLN Units 3 and 4. The audit scope assessed the implementation of programs and procedures established to support activities affecting quality during the COLA process of BLN Units 3 and 4 to include organization, quality assurance program, design control, procurement document control, document control, control of purchased services, non-conformances/corrective action, quality assurance records, software quality assurance, and Part 21 reporting. The audit was conducted from April 12 through April 16, 2010. The audit report identified eight issues and two recommendations. The NRC inspection team verified that TVA NGDC placed the audit's issues and recommendations into their corrective action program.



At the time of the inspection, the NRC inspection team identified that the April 2010 internal audit as the only audit conducted for the BLN Units 3 and 4 COLA. The NRC inspection team noted that Section 17.1 of the BLN Units 3 and 4 FSAR, Revision 2, states that the following:

TVA maintains oversight under its existing 10 CFR Part 50, Appendix B program, as described in "Tennessee Valley Authority Nuclear Quality Assurance Plan," TVA-NQA-PLN89-A (Reference 204). TVA oversight is provided through its review and approval of the "NuStart Energy Project Instruction-Quality Assurance Plan" (Reference 202), by conducting QA audits and surveillances of NuStart activities and processes, and by direct participation in COL development activities, including providing site-specific applicant input and review of COL application content, signing the COL application as the applicant at submittal, and working directly with NuStart and contractors to respond to NRC requests for additional information.

The TVA Bellefonte Units 3 and 4 safety related design activities conducted under the program described in FSAR Section 17.1 are performed in conformance with Regulatory Guide 1.28, Revision 3.

The NRC inspection team noted that similar wording was in Revisions 0 and 1 of the BLN Units 3 and 4 FSAR. In addition, Regulatory Guide (RG) 1.28, "Quality Assurance Program Requirements (Design and Construction)," Revision 3, states that the "[a]pplicable elements of an organization's quality assurance program should be audited at least once each year or at least once during the life of the activity, whichever is shorter."

The NRC inspection team determined that TVA failed to conduct an internal audit on the Bellefonte Units 3 and 4 COLA project within one year of becoming an applicant on October 30, 2007. The failure to conduct an internal audit of the BLN Units 3 and 4 COLA project consistent with RG 1.28, Revision 3, is identified as Violations 05200014/2010-201-02 and 05200015/2010-201-02.

#### c. Conclusions

The NRC inspection team concluded that the implementation of the TVA NGDC external and internal audits is consistent with the regulatory requirements of Criterion VII, "Control of Purchased Material, Equipment, and Services," and Criterion XVIII, "Audits," of Appendix B to 10 CFR Part 50. Based on the sample reviewed, the NRC inspection team also determined that TVA NGDC is effectively implementing its policies and procedures to support the COLA for BLN Units 3 and 4. The NRC inspection team identified one violation associated with TVA NGDC's failure to implement the requirements of Criterion XVIII. Violations 05200014/2010-201-02 and 05200015/2010-201-02 identify TVA NGDC's failure to conduct an internal audit on the COLA for BLN Units 3 and 4 project within one year of becoming an applicant.

### 7. Entrance and Exit Meetings

On May 17, 2010, the NRC inspection team presented the inspection scope during an entrance meeting with Mr. Mark Hellstern, General Manager NGDC Oversight, and other TVA NGDC personnel. On May 21, 2010, the NRC inspection team presented the inspection results during an exit meeting with Mr. Jack Bailey, Vice President Nuclear Generation Development, NGDC; Mr. Gordon Arent, General Manager New Generation Licensing, Mr. Mark Hellstern, and other TVA NGDC personnel.

## ATTACHMENT 1

### 1. PERSONS CONTACTED

Thomas Spink	AP1000 Licensing Manager, TVA NGDC
Thomas Niessen	BLN Project QA Manager, TVA NGDC
Perry Maddux	Project Engineer / Project Manager, TVA
Gary Curtis	Sr. Project Manager, TVA
Tom Ryan	Project Manager, TVA NGDC
Kevin Rackley	Corrective Actions Manager, TVA NPG
Angelos Findikakis	Sr. Principal Engineer and Fellow, Bechtel

### 2. INSPECTION PROCEDURES USED

Inspection Procedure 35017, "Quality Assurance Implementation Inspection," dated July 29, 2008

Inspection Procedure 36100, "Inspection of 10 CFR Part 21 and 50.55(e) Programs for Reporting Defects and Noncompliance," dated October 3, 2007

### 3. LIST OF ITEMS OPENED, CLOSED, AND DISCUSSED

<u>Item Numbers</u>	<u>Status</u>	<u>Type</u>	<u>Description</u>
05200014/2008-001-01 and 05200015/ 2008-001-01	Closed	NOV	Criterion III
05200014/2008-001-02 and 05200015/ 2008-001-02	Closed	NOV	Criterion III
05200014/2008-001-03 and 05200015/ 2008-001-03	Closed	NOV	Criterion V
05200014/2010-201-01 and 05200015/ 2010-201-01	Opened	NOV	Criterion IV
05200014/2010-201-02 and 05200015/ 2010-201-02	Opened	NOV	Criterion XVIII

## ATTACHMENT 2

### Bellefonte Units 3 and 4, Quality Assurance Implementation Inspection Entrance and Exit Meeting Attendance

List of Attendees: (1) Entrance Meeting May 17, 2010, and (2) Exit Meeting on May 21, 2010

<u>(1)</u>	<u>(2)</u>		
X	X	Kerri Kavanagh	NRC Inspection Team, Leader
X	X	Milton Concepcion	NRC Inspection Team
X	X	Paul Coco	NRC Inspection Team
X	X	Garrett Newman	NRC Inspection Team
X	X	Kenneth See	NRC Hydrologist
X	X	Juan Uribe	NRC Engineer
X	X	Thomas Spink	TVA, NGDC
	X	Jack Bailey	TVA, NGDC
	X	Gordon Arent	TVA, NGDC
X	X	Tom Niessen	TVA, NGDC
X	X	Gary Curtis	TVA, NGDC
X	X	Perry Maddux	TVA, NGDC
X	X	Tom Ryan	TVA, NGDC
X	X	Zack Patterson	TVA, NGDC
X		Zackary Rad	TVA, NGDC
X	X	Mark Hellstern	TVA, NGDC
X		Penny Selman	TVA, NPG
	X	Gregory Mark Ray	TVA, NPG
X	X	Stu Henry	BWSC
X		Chris Triplett	BWSC
X		Fred Redwarz	Enercon
X		Eddie Grant	EXCEL

COL - Bellefonte Mailing List

(April 5, 2010)

cc:

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