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CHAPTER 17 QUALITY ASSURANCE

17.5 QUALITY ASSURANCE PROGRAM DESCRIPTION

17.5.1 Introduction

The Quality Assurance Program implemented during the development of this Early Site Permit Application (ESPA) for safety-related activities is described in the TVA "Nuclear Quality Assurance Plan (Quality Assurance Program Description)," TVA-NQA-PLN89-A (NQAP). The NQAP and associated procedures provide for control of TVA activities that have the potential to affect the quality of safety-related structures, systems, and components (SSC) of the proposed small modular reactors at the Clinch River Nuclear (CRN) Site. The NQAP is a separately controlled document and is included in Part 8 of the ESPA.

17.5.2 Summary

The NQAP is the top-level document that defines the quality policy and assigns major functional responsibilities. The NQAP applies to TVA personnel, organizations, and contractors performing activities within the scope of the NQAP that could affect the quality of safety-related structures, systems, and components at TVA's nuclear plants. It applies to design, construction, testing, operation, maintenance, repair, replacement, and modification of TVA nuclear facilities. The NQAP also addresses the site-related activities associated with the preparation of the CRN Site ESPA.

The NQAP applies to site suitability quality assurance (QA) activities associated with the CRN Site ESPA, including (but not limited to) designing, procuring, handling, testing, siting, inspecting, storing, training, and shipping. The NQAP is based on the applicable portions 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," Regulatory Guide (RG) 1.28, Revision 4, "Quality Assurance Program Criteria (Design and Construction)," and the applicable portions of ANSI 18.7-1976/ANS-3.2, "Administrative Controls and Quality Assurance for the Operational Phase of Nuclear Power Plants."

17.5.3 Regulatory Basis

The technical information requirements for ESPAs are in 10 CFR 52.17, "Contents of Applications; Technical Information." 10 CFR 52.17(a)(1)(xi) requires that an ESPA provide a description of the QA program applied to site-related activities for the future design, fabrication, construction, and testing of the SSC of a facility or facilities that may be constructed on the site.

17.5.4 Evaluation

10 CFR 52.17(a)(1)(xii) requires an evaluation of the site against applicable sections of the Standard Review Plan (SRP) revision in effect six months before the docket date of the application. SRP (NUREG-0800), Chapter 17, "Quality Assurance," Section 17.5, "Quality Assurance Program Description - Design Certification, Early Site Permit and New License Applicants," Revision 1, is based on 10 CFR Part 50, Appendix B, and reflects alignment with the American Society of Mechanical Engineers (ASME) Nuclear Quality Assurance (NQA) Standard NQA-1-2008 and the NQA-1a-2009 Addenda, "Quality Assurance Program Requirements for Nuclear Facility Applications," which the NRC staff found acceptable for meeting the requirement of Appendix B, and allows acceptable alternatives to the SRP.

The NQAP reflects alignment with an earlier set of standards considered by the NRC to be acceptable methods for complying with the provisions of 10 CFR 50, Appendix B. The NQAP is approved by the NRC to govern operations at multiple TVA operating nuclear plants. Activities conducted by TVA under the NQAP are of a manner consistent with those associated with site-related activities performed in support of the CRN Site ESPA. RG 1.28, Revision 4, describes a method acceptable to the NRC staff for complying with the provisions of 10 CFR 50, Appendix B, with regard to establishing and implementing the requisite quality assurance program for the design and construction of nuclear power plants.

TVA commits to implementing equivalents or alternatives to the implementing documents endorsed in RG 1.28, Revision 4, for the NQAP, as it applies to the CRN Site ESPA. NQAP, Appendix M, contains the NQA-1 equivalent or alternatives used for the CRN Site ESPA QA Program.

Accordingly, the NQAP is sufficient for use in support of the CRN Site ESPA. To demonstrate this conclusion, the NQAP has been evaluated in relationship to SRP Section 17.5, with the results provided below.

17.5.4.1 Organization

The NQAP conforms to the applicable guidance of SRP Section 17.5, Paragraph II.A for ESP applicant QA programs, and provides an organizational description that includes an organizational structure, functional responsibilities, levels of authority, and interfaces to establish, execute, and verify NQAP implementation. In addition, the NQAP allows management to size the QA organization according to the duties and responsibilities assigned.

Major work activities (such as subsurface investigation and engineering activities) may be delegated to contractors with a QA program that meets 10 CFR 50, Appendix B. However, TVA maintains responsibility for the program's effectiveness. TVA will provide oversight of these work activities to ensure implementation of the contractor's QA program including qualified individuals, organization elements, and effective lines of communication exist for QA activities.

17.5.4.2 Quality Assurance Program

The NQAP conforms to the applicable guidance of SRP Section 17.5, Paragraph II.B, in describing all aspects of work that are important to safety. The NQAP comprises those planned and systematic actions necessary to provide confidence that SSC will perform their intended safety function, as described in the Site Safety Analysis Report. The NQAP provides measures to assess its adequacy and to ensure effective implementation in accordance with NRC Regulations for the ESPA phase. The NQAP also conforms to the guidance of SRP Section 17.5, Paragraph II.S (with proposed alternative to Criterion S.4) and Paragraph II.T, in establishing and maintaining training programs for personnel who perform, verify, or maintain activities within the scope of the NQAP. The NQAP provides the minimum training requirements for managers responsible for its implementation.

17.5.4.3 Design Control and Verification

The NQAP conforms to the applicable guidance of SRP Section 17.5, Paragraph II.C, for controlling the design of SSC that are subject to the provisions of the NQAP for ESPA, including design changes. The NQAP design process includes provisions to control design inputs, outputs, changes, interfaces, records, and organizational interfaces with TVA and its suppliers. These provisions ensure that the design inputs (e.g., design bases and the performance, regulatory, quality, and quality verification requirements) are correctly translated into design outputs (e.g., analyses, specifications, drawings, procedures, and instructions).

17.5.4.4 Procurement Document Control

The NQAP conforms to the guidance of SRP Section 17.5, Paragraph II.D for ensuring that procurement documents for ESPA include or reference applicable regulatory, technical, and QA program requirements. These requirements (such as specifications, codes, standards, tests, inspections, special processes, and 10 CFR Part 21, “Reporting of Defects and Noncompliance”) are invoked for procurement of items and services.

17.5.4.5 Instructions, Procedures and Drawings

The NQAP conforms to the guidance of SRP Section 17.5, Paragraph II.E, to establish the necessary measures and governing procedures for the CRN ESPA to ensure that activities affecting quality are prescribed by and performed in accordance with documented instructions, procedures, and drawings.

17.5.4.6 Document Control

The NQAP conforms to the guidance of SRP Section 17.5, Paragraph II.F, to control the preparation, review, approval, issuance, and changes of documents that specify quality requirements or prescribe measures for controlling activities that affect quality, including organizational interfaces. The NQAP provides measures to ensure that the same organization that performed the original review and approval also reviews and approves changes, unless other organizations are specifically designated. A listing of all controlled documents that identify the current approved revision or date is maintained so personnel can readily determine the appropriate document for use.

17.5.4.7 Control of Purchased Material, Equipment, and Services

The NQAP conforms to the guidance of SRP Section 17.5, Paragraph II.G, to control the procurement of items and services to comply with requirements. The program provides measures for evaluating prospective suppliers and selecting only those that are qualified. In addition, the program provides guidelines for auditing and evaluating suppliers to ensure that qualified suppliers continue to provide acceptable products and services. The program provides for acceptance actions (e.g., source verification, receipt inspection, pre- and post-installation tests) and review of documentation (e.g., conformance certificates) to ensure that the procurement, inspection, and test requirements have been satisfied before relying on the item to perform its intended safety function. TVA’s program provides for the procurement of domestic calibration services from laboratories accredited by National Voluntary Laboratory Accreditation Program or American Association for Laboratory Accreditation, in lieu of performing a commercial grade survey as part of the commercial grade dedication process, subject to the conditions identified in SRP 17.5, Paragraph II.G.12.

17.5.4.8 Identification and Control of Materials, Parts, and Components

The NQAP conforms to the guidance of SRP Section 17.5, Paragraph II.H, for establishing the necessary measures for the identification and control of items such as materials, including consumables and items with limited shelf life, parts, components, and partially fabricated subassemblies. The identification of items is maintained throughout fabrication, erection, installation, and use so that the item can be traced to its documentation.

17.5.4.9 Control of Special Processes

The NQAP addresses this element, but the guidance in SRP Section 17.5, Paragraph II.I, states that it is not applicable to ESP applicants.

17.5.4.10 Inspection

The NQAP conforms to the guidance of SRP Section 17.5, Paragraph II.J, to ensure that items, services, and activities that affect safety meet requirements and conform to specifications, instructions, procedures, and design documents. The inspection program establishes requirements for planning inspections, determining applicable acceptance criteria, setting the frequency of inspection, and identifying special tools needed to perform the inspection. Inspectors are properly qualified personnel who are independent of those who performed or directly supervised the work.

17.5.4.11 Test Control

The NQAP conforms to the guidance of SRP Section 17.5, Paragraph II.K, to demonstrate that items subject to the provisions of the NQAP will perform satisfactorily in service, that the plant can be operated safely as designed, and that the operation of the plant as a whole is satisfactory.

17.5.4.12 Control of Measuring and Test Equipment

The NQAP conforms to the guidance of SRP Section 17.5, Paragraph II.L, for controlling the calibration, maintenance, and use of measuring and test equipment used in activities affecting the quality of safety-related SSC.

17.5.4.13 Handling, Storage, and Shipping

The NQAP conforms to the guidance of SRP Section 17.5, Paragraph II.M, for controlling the handling, storage, packaging, shipping, cleaning, and preserving items to prevent inadvertent damage or loss and to minimize deterioration.

17.5.4.14 Inspection, Test, and Operating Status

The NQAP addresses this element, but the guidance in SRP Section 17.5, Paragraph II.N, states that it is not applicable to ESP applicants.

17.5.4.15 Nonconforming Materials, Parts, or Components

The NQAP conforms to the guidance of SRP Section 17.5, Paragraph II.O, to control items, including services that do not conform to specified requirements to prevent inadvertent installation or use. Instances of nonconformance are evaluated for their impact on operability of quality SSC to ensure that the final condition does not adversely affect safety, operation, or maintenance of the item or service. Results of evaluations of conditions adverse to quality are analyzed to identify quality trends. The results are then documented, notification made to affected organizations, and reported to upper management.

In addition, the NQAP provides for establishing the necessary measures to implement a reporting program to identify, evaluate, and report defects and non-compliances in accordance with the requirements of 10 CFR 50.55(e) and/or 10 CFR Part 21, as applicable.

17.5.4.16 Corrective Action

The NQAP conforms to the guidance of SRP Section 17.5, Paragraph II.P, to promptly identify, control, document, classify, and correct conditions adverse to quality. The NQAP requires personnel to identify conditions adverse to quality and find trends. Significant conditions adverse to quality are documented and reported to responsible management. In the case of contractor

activities that could affect quality-related SSC, TVA may delegate specific responsibility for the corrective action program, but maintains responsibility for the program's effectiveness.

In addition, the NQAP provides for establishing the necessary measures to implement a program to identify, evaluate, and report defects and non-compliances in accordance with the requirements of 10 CFR 50.55(e) and/or 10 CFR Part 21, as applicable.

17.5.4.17 Quality Assurance Records

The NQAP conforms to SRP Section 17.5, Paragraph II.Q, to ensure that records of items and activities affecting quality are generated, identified, retained, maintained, and retrievable.

For QA records in electronic media, the program includes provisions for the generation, distribution, use, maintenance, storage, and disposition of electronic records and meet applicable regulatory requirements (Generic Letter [GL] 88-18 and Regulatory Information Summary [RIS] 2000-18).

The typical records for the CRN Site ESPA include, but are not limited to: geotechnical data, topographic and geological maps, plot plans showing locations of major structures and explorations, boring logs and logs of explanatory trenches and excavations, geologic profiles showing excavation limits of structures, geophysical data, photographs of soil samples and rock cores, field and final logs of all borings, program or design plan, qualified investigation procedures, procurement control records, personnel qualification records, measuring and test equipment control and calibration records, test records, and procedures.

17.5.4.18 Quality Assurance Audits

The NQAP conforms to the guidance of SRP Section 17.5, Paragraph II.R, to audit activities covered by the NQAP. The NQAP provides for TVA to conduct periodic internal and external audits. Internal audits determine the adequacy and effectiveness of the TVA QA Program. Internal audits are performed with a frequency commensurate with safety significance. At a minimum, an audit of all QA program elements and functional areas applicable to the CRN Site ESPA are conducted on an annual basis. External audits are performed on frequency to not exceed 36 months. External audits determine the adequacy and effectiveness of a supplier's or contractor's QA program. Audit results are documented and reviewed. Management responds to all audit findings and initiates corrective action. In addition, where corrective actions are indicated, documented follow-up of identified findings through inspections, review, re-audits, or other means is conducted to verify corrective action.

17.5.4.19 Nonsafety-Related SSC Quality Controls

The NQAP establishes QA program controls for nonsafety-related SSC that are significant contributors to plant safety, but the guidance for establishing such controls in SRP Section 17.5, Paragraph II.U, is not applicable to ESP applicants.

17.5.4.20 Quality Assurance Program Commitments

17.5.4.20.1 Regulatory Commitments

To supplement and support the TVA QA Progam, the NQAP conforms to the guidance of SRP Section 17.5, Paragraph II.V, to establish QA program commitments to specific NRC RGs and GLs as described below.

- RG 1.26, “Quality Group Classification and Standards for Water-, Steam-, and Radioactive-Waste-Containing Components of Nuclear Power Plants,” Revision 4, defines classification of systems and components. TVA commits to the applicable regulatory position guidance provided in this RG for the CRN Site ESPA QA program.

- RG 1.29, “Seismic Design Classification for Nuclear Power Plants,” Revision 5, defines systems required to withstand a safe shutdown earthquake. TVA commits to the applicable regulatory position guidance provided in this RG for the CRN Site ESPA QA program.

- RG 1.37, “Quality Assurance Requirements for Cleaning of Fluid Systems and Asssociated Components of Water-Cooled Nuclear Power Plants,” Revision 1, provides guidance on specifying water quality and precautions related to the use of alkaline cleaning solutions and chelating agents. TVA currently conforms to RG 1.37, Revision 0. In addition, TVA commits to the applicable regulatory position guidance in RG 1.37, Revision 1, for the CRN Site ESPA, with the following alternatives:

  Regulatory Position (RP) C.1. TVA commits to ANSI N45.2.1. Acceptable Codes and Standards are identified in ANSI N45.2.1, Sections 3 and 12. This position is an equivalent to RG 1.37, Revision 1, RP C.1.

  Regulatory Position C.2. TVA commits to ANSI N45.2.1, Section 3.4, with the following clarification, “The water quality for final flushes of fluid systems and associated components should be at least equivalent to the quality of the operating system water.” This position is an equivalent to RG 1.37, Revision 1, RP C.2.

  Regulatory Position C.3. In lieu of the commitments identified in this position, TVA commits to ANSI N45.2.1 and ANSI N45.2.15. These standards are equivalent to the NQA-1-1994 parts that are referenced. In addition, the following clarification is added, “A suitable chloride stress-cracking inhibitor should be added to the fresh water used to flush systems containing austenitic stainless steels.” This position is an equivalent to RG 1.37, Revision 1, RP C.3.

- GL 89-02, “Actions to Improve the Detection of Counterfeit and Fraudulently Marked Products,” and GL 91-05, “Licensee Commercial Grade-Dedication Programs.” TVA commits to implementing the actions and policies required by GL 89-02 and GL 91-05. Nuclear Power Group Procurement Engineering procedures for commercial grade dedication and receipt inspection activities are consistent with the GLs.

17.5.4.20.2 Quality Standards

To supplement and support the TVA QA Program, the NQAP conforms to the guidance of SRP Section 17.5, Paragraph II.V, to establish QA program commitments for CRN Site ESPA to specific quality standards as described below.

- In lieu of Subpart 2.2, “Quality Assurance Requirements for Packaging, Shipping, Receiving, Storage, and Handling of Items for Nuclear Power Plants,” ASME NQA-1-1994 Edition or ASME NQA-1-2008/2009a Edition identified in SRP 17.5, TVA commits to ANSI N45.2.2-1972, “Quality Assurance Requirements for Packaging, Shipping, Receiving, Storage, and Handling of Items for Nuclear Power Plant.”

- In lieu of Subpart 2.4, “Installation, Inspection, and Testing Requirements for Power, Instrumentation, and Control Equipment at Nuclear Facilities,” ASME NQA-1-1994 Edition or ASME NQA-1-2008/2009a Edition identified in SRP 17.5, TVA commits to ANSI N45.2.4-1972, “Installation, Inspection, and Testing Requirements for Instrumentation

and Electric Equipment During the Construction of Nuclear Power Generating Stations," with alternatives listed in the NQAP, Appendix B, "Regulatory Guide Conformance Status," Table 2.

- In lieu of Subpart 2.5, "Quality Assurance Requirements for Installation, Inspection, and Testing of Structural Concrete, Structural Steel, Soils, and Foundations for Nuclear Power Plants," ASME NQA-1-1994 Edition or ASME NQA-1-2008/2009a Edition identified in SRP 17.5, TVA commits to ANSI N45.2.5-1974, "Supplementary Quality Assurance Requirements for Installation, Inspection, and Testing of Structural Concrete, Structural Steel, Soils, and Foundations During the Construction Phase of Nuclear Power Plants."

- In lieu of Subpart 2.7, "Quality Assurance Requirements of Computer Software for Nuclear Facility Applications," ASME NQA-1-1994 Edition or ASME NQA-1-2008/2009a Edition identified in SRP 17.5, TVA commits to RG 1.152, "Criteria for Programmable Digital Computer System Software in Safety-Related Systems of Nuclear Power Plants," Revision 3.

- In lieu of Subpart 2.8, "Quality Assurance Requirements for Installation, Inspection, and Testing of Mechanical Equipment and Systems for Nuclear Power Plants," ASME NQA-1-1994 Edition or ASME NQA-1-2008/2009a Edition identified in SRP 17.5, TVA commits to ANSI N45.2.8-1975, "Supplementary Quality Assurance Requirements for Installation, Inspection and Testing of Mechanical Equipment and Systems for the Construction Phase of Nuclear Power Plants."

- In lieu of Subpart 2.14, "Quality Assurance Requirements for Commercial Grade Items and Services," ASME NQA-1-1994 Edition or ASME NQA-1-2008/2009a Edition identified in SRP 17.5, TVA commits to RG 1.123, "Quality Assurance Requirements for Control of Procurement of Items and Service for Nuclear Power Plants," Revision 1, with alternatives listed in NQAP, Appendix B, Table 2. In addition, TVA commits to GL 89-02 and GL 91-05.

- In lieu of Subpart 2.15, "Quality Assurance Requirements for Hoisting, Rigging, and Transporting Items for Nuclear Power Plants," ASME NQA-1-1994 Edition or ASME NQA-1-2008/2009a Edition identified in SRP 17.5, TVA commits to ANSI N45.2.2-1972, "Quality Assurance Requirements for Packaging, Shipping, Receiving, Storage, and Handling of Items for Nuclear Power Plant."

- In lieu of Subpart 2.20, "Quality Assurance Requirements for Subsurface Investigations for Nuclear Power Plants," ASME NQA-1-1994 Edition or ASME NQA-1-2008/2009a Edition identified in SRP 17.5, TVA commits to ANSI N45.2.20-1979, "Supplementary Quality Assurance Requirements for Subsurface Investigations for Nuclear Power Plants."

- SRP 17.5 identifies various Nuclear Information and Records Management Association (NIRMA) documents (Technical Guides [TG]-11-1998, 15-1998, 16-1998, and 21-1998) as acceptable quality standards for the establishment and controls of electronic records management and software controls. NQAP, Section 6.3.1 and Appendix B, Table 1, include the requirements of ANSI/ANS-3.2-2012, Section 3.17, which is consistent with the intent of RIS 2000-18 and the associated NIRMA TGs.