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Safety Evaluation Report for the
Special Nuclear Material License Application
Watts Bar Nuclear Plant, Unit 2
Spring City, Tennessee

Docket No. 70-7018
Tennessee Valley Authority

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Division of Fuel Cycle Safety and Safeguards
Office of Nuclear Material Safety and Safeguards
U.S. Nuclear Regulatory Commission
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Enclosure 2

ABSTRACT

The report documents the U.S. Nuclear Regulatory Commission (NRC) staff's safety and safeguards evaluation of the Tennessee Valley Authority (TVA) application for a license to receive, possess, inspect, and store an initial core of special nuclear material (SNM) in the form of fresh fuel assemblies at the Watts Bar Nuclear Plant, Unit 2 (WBN-2) located in Spring City, Tennessee. TVA previously had a license (License No. SNM-1873) for a proposed Unit 2, which was issued on February 17, 1981. Upon request from TVA, License No. SNM-1873 was terminated on January 27, 1998. TVA submitted its application for an SNM license on November 12, 2009, in accordance with the requirements in Title 10 of the *Code of Federal Regulations*, Sections 70.5, 70.21, and 70.22. The application was supplemented with additional submittals dated July 30, 2010, September 17, 2010, September 21, 2010, January 25, 2011 and April 29, 2011.

The objective of this review is to evaluate the potential impacts of the receipt, possession, inspection, and storage of fresh fuel assemblies at WBN-2 to the worker and public health and safety, under both normal and accident conditions. The NRC's review also considers physical protection of SNM; material control and accounting of SNM; and management organization, administrative programs, and financial qualifications provided to ensure the safe and secure receipt, possession, inspection, and storage of SNM in the form of fresh fuel assemblies.

The NRC staff concludes, in this Safety Evaluation Report, that TVA's descriptions, specifications, and analyses provide an adequate basis for the safety and safeguards of the proposed storage and handling of SNM at WBN-2; and that continued receipt, possession, inspection, and storage of the licensed material does not pose an undue risk to the worker or public health and safety.

The license application was noted on the NRC's public Web site on January 21, 2010. No requests for a hearing were received. A notice of availability of an Environmental Assessment and Finding of No Significant Impact was published in the *Federal Register* on June 13, 2011.

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EXECUTIVE SUMMARY

On November 12, 2009, Tennessee Valley Authority (TVA) submitted to the U.S. Nuclear Regulatory Commission (NRC) an application to obtain a license under Title 10 of the *Code of Federal Regulations* (10 CFR) Part 70 to receive, possess, inspect, and store an initial core of special nuclear material (SNM) in the form of fresh fuel assemblies in support of TVA's operations of the proposed Watts Bar Nuclear Plant, Unit 2 (WBN-2) facility in Spring City, Tennessee. TVA has requested that its SNM license remain effective until June 30, 2013. TVA supplemented its application with additional submittals, dated July 30, 2010, September 17, 2010, September 21, 2010, January 25, 2011 and April 29, 2011. TVA is requesting approval of the SNM license application.

The license application was noted on the NRC's public Web site on January 21, 2010. No requests for a hearing were received. A notice of availability of an Environmental Assessment and Finding of No Significant Impact was published in the *Federal Register* on June 13, 2011.

The NRC staff conducted its safety and safeguards review in accordance with 10 CFR Part 20, "Standards for Protection Against Radiation;" 10 CFR Part 70, "Domestic Licensing of Special Nuclear Material;" 10 CFR Part 73, "Physical Protection of Plants and Materials;" 10 CFR Part 74, "Material Control and Accounting of Special Nuclear Material," and other applicable regulations. The NRC staff used guidance in NUREG-1520, "Standard Review Plan for the Review of a License Application for a Fuel Cycle Facility," (NRC, 2002) (NUREG-1520) and other applicable guidance documents to conduct its review. The NRC staff's safeguards review included reviews of TVA's Materials Control and Accounting Program and Physical Security Plan. The NRC staff also reviewed TVA's Emergency Management Plan. Where TVA's safety programs should be supplemented, the NRC staff identified license conditions to provide assurance of safe receipt, possession, inspection, and storage of the fresh fuel assemblies.

A summary of the NRC's review and findings in each of the review areas is provided below and is limited to those activities discussed in the Part 70 license application:

General Information

TVA provided an adequate description of the WBN-2 facility and the proposed activities so that the staff has an overall understanding of the relationships of the facility features and the functions of each feature. Financial qualifications were adequately explained in the license application. The site description included pertinent information regarding regional hydrology, geology, meteorology, the nearby population, and potential effects of natural phenomena that could occur at the facility.

Organization and Administration

TVA adequately described the responsibilities and associated resources for the receipt, possession, inspection, and storage of the SNM in the form of fresh fuel assemblies. The plans and commitments described in the license application, and supplemental information, provided reasonable assurance that an acceptable organization; administrative policies; and sufficient, competent resources have been established or committed to ensure the safety of activities involving the fresh fuel assemblies. Therefore, the information provided meets the requirements in 10 CFR 70.22(a)(6) and 70.23(a)(2).

Integrated Safety Analysis and Integrated Safety Analysis Summary

TVA was not required to provide an Integrated Safety Analysis (ISA) Summary in support of the SNM license application for WBN-2. The requirements of a formal ISA in 10 CFR Part 70, Subpart H, “*Additional Requirements for Certain Licensees Authorized to Possess a Critical Mass of Special Nuclear Material*,” do not apply to SNM storage licenses (see 64 FR 41339-41340) and no fuel fabrication is being authorized.

Radiation Protection

TVA adequately described its radiation protection program for the proposed activities in the Part 70 license application for WBN-2, including: (1) radiation protection program implementation, (2) organization and personnel qualification, (3) written procedures, (4) the program for ensuring that worker and public doses are as low as is reasonably achievable, (5) the necessary training for all personnel who have access to radiologically restricted areas, (6) ventilation and respiratory protection program, and (7) radiation survey and monitoring. The information is adequate to demonstrate compliance with the requirements in 10 CFR Parts 19.12, Part 20, Subparts F,C, H, L and M; and 10 CFR 70.22(a)(8).

Nuclear Criticality Safety

TVA adequately described its nuclear criticality safety program, which includes the use of area radiation monitors in lieu of criticality accident alarms. The NRC staff found that TVA's proposed use of Watts Bar Nuclear Plant, Unit 1 (WBN-1) areas to store fresh fuel assemblies for later potential use in a WBN-2 reactor will provide for an adequate nuclear criticality safety margin. Since the activities of receipt, inspection and storage will take place in areas shared with WBN-1, TVA will comply with the requirements of paragraph (b) of 10 CFR 50.68 satisfying the requirements in 70.24. Compliance with 10 CFR 50.68 is stated in license condition S-2.

Chemical Process Safety

The proposed activities described in the Part 70 license application do not involve the receipt, storage, use, handling, or production of chemicals associated with the SNM that could result in credible accident scenarios.

Fire Safety

TVA adequately described its fire safety program in the license application for WBN-2. The proposed program is adequate to provide reasonable assurance of adequate safety against fire hazards associated with the proposed activities and meets the requirements in 10 CFR 70.22(a)(7) and 70.23(a)(3)-(a)(4).

Emergency Management

TVA's Part 70 license application incorporates by reference the previously approved Radiological Emergency Plan (REP) that is already in place for WBN-1, under the requirements of 10 CFR 50.34(b)(6)(v); 10 CFR 50.47; and 10 CFR Part 50, Appendix E. The REP consists of two portions: (1) a site-independent Nuclear Power Radiological Emergency Plan (NP-REP) that is applicable to all TVA-licensed nuclear power reactors, and (2) a series of site-specific appendices for each of the TVA nuclear sites (Appendix C covers the Watts Bar site). The TVA REP, including the WBN-specific Appendix C, comprises the “emergency plans” for the Watts

Bar Nuclear Plant (WBN). The NRC staff concludes that the existing REP is adequate to ensure the safety of the workers and the public regarding the proposed activities under the 10 CFR Part 70 license for WBN-2.

Environmental Protection

TVA adequately described its environmental protection program in the Part 70 license application for WBN-2. The program includes an adequate organization, procedures, and controls that ensure that the environment is protected during the conduct of the proposed activities (i.e., receipt, possession, inspection, and storage of SNM). Therefore, the proposed program meets the requirements in 10 CFR Part 20, Subparts B, D, F, L, and M; and 10 CFR 70.22(a)(7)-(a)(8) and 70.23(a)(3)-(a)(4).

Decommissioning

The proposed activities involve the receipt, possession, inspection and storage of fresh fuel assemblies in the form of sealed SNM. The Part 70 license being issued is thus not of the type for which a decommissioning funding plan is required under the requirements in 10 CFR 70.22 (a)(9) and 70.25.

Management Measures

TVA is not required to describe management measures in its Part 70 license application for WBN-2. Such measures are part of the requirements in 10 CFR Part 70, Subpart H, "*Additional Requirements for Certain Licensees Authorized to Possess a Critical Mass of Special Nuclear Material*," which are not applicable here. The proposed activities in the license application do not involve enriched uranium processing, fabrication of uranium fuel or fuel assemblies, uranium enrichment, enriched uranium hexafluoride conversion, plutonium processing, fabrication of mixed-oxide fuel or fuel assemblies, and scrap recovery of SNM. Therefore, consistent with 10 CFR 70.60, TVA is not required to meet the requirements in Subpart H (which includes management measures) in support of the license application for the WBN-2 facility.

Material Control and Accountability

TVA adequately described the procedures and protocols used for material control and accounting of the SNM for WBN-2. The NRC staff reviewed the information in the license application and supporting information and concludes that the material control and accounting program is acceptable and meets the requirements in 10 CFR 74.11, 74.13, 74.15, and 74.19(a)-(c).

Physical Security and Physical Protection

TVA is proposing to use the site-wide physical protection plan previously approved, pursuant to 10 CFR 73.55, for WBN-1 to ensure the security of the SNM for WBN-2. The NRC staff reviewed this Plan and concludes that it will adequately ensure that the SNM TVA will hold under its Part 70 license will be protected against theft, sabotage, or other malevolent event after it arrives onsite. Therefore, the NRC staff concludes that the Plan meets the requirements in 10 CFR 73.55(a)-(r).

Exemptions and Special Authorizations

TVA did not request any special exemptions or authorizations in support of the proposed activities.

LIST OF ACRONYMS AND ABBREVIATIONS

10 CFR	Title 10 of the <i>Code of Federal Regulations</i>
ALARA	As Low as is Reasonably Achievable
ANSI	American National Standards Institute
CAS	Central Alarm Station
CDE	Committed Dose Equivalent
CECC	Central Emergency Control Center
CEDE	Committed Effective Dose Equivalent
CFR	<i>Code of Federal Regulations</i>
DAC-hr	Derived Air Concentration-hour
DDE	Deep Dose Equivalent
EA	Environmental Assessment
EAL	Emergency Action Level
EPIP	Emergency Plan Implementing Procedures
FHA	Fire Hazards Analysis
FONSI	Finding of No Significant Impact
FPR	Fire Protection Report
FSAR	Final Safety Analysis Report
NEI	Nuclear Energy Institute
NP-REP	Nuclear Power Radiological Emergency Plan
NPDES	National Pollutant Discharge Elimination System
NPG	Nuclear Power Group
NRC	U.S. Nuclear Regulatory Commission
NVLAP	National Voluntary Laboratory Accreditation Program
ODS	Operations Duty Specialists
OSC	Operational Support Center
PA	Protected Area
PORC	Plant Onsite Review Committee
PSP	Physical Security Plan
RADCON	Radiation Control
RCA	Radiological Controlled Areas
REP	Radiological Emergency Plan
RP	Radiation Protection
RWP	Radiation Work Permit
SAS	Secondary Alarm Station
SCP	Safeguards Contingency Plan
SEC	Securities Exchange Commission
SED	Site Emergency Director
SM	Shift Manager
SNM	Special Nuclear Material
T&QP	Training and Qualification Plan
TEDE	Total Effective Dose Equivalent
TODE	Total Organ Dose Equivalent
TSC	Technical Support Center
TVA	Tennessee Valley Authority
WBN	Watts Bar Nuclear Plant

1.0 GENERAL INFORMATION

1.1 FACILITY AND PROCESS DESCRIPTION

1.1.1 REGULATORY REQUIREMENTS

The regulatory basis for the review of Tennessee Valley Authority's (TVA) facility and process description is contained in Title 10 of the *Code of Federal Regulations* (10 CFR) 70.22, "Contents of Applications."

1.1.2 REGULATORY ACCEPTANCE CRITERIA

The acceptance criteria applicable to the U.S. Nuclear Regulatory Commission's (NRC's) review of the facility and process description contained in the license application are contained in Section 1.1.4.3 of NUREG-1520 (NRC, 2002).

1.1.3 STAFF REVIEW AND ANALYSIS

In its license application, TVA provided a description of the Watts Bar Nuclear Plant, Unit 2 (WBN-2) facility. It is located in Rhea County, Tennessee, and covers an area of approximately 1770 acres. The major structures at the site include: 1) the reactor buildings, 2) the Turbine Building, 3) the Auxiliary Building, 4) the Control Building, 5) the Service and Office Building, 6) diesel generator buildings, 7) an intake pumping station, and 8) two natural draft cooling towers. The special nuclear material (SNM) that will be authorized by the license will be stored and inspected inside the Auxiliary Building of the WBN-2 facility. In support of the license application, TVA provided a copy of the Final Safety Analysis Report (FSAR)—which is incorporated into the license application by reference. The FSAR provided a description of the facility as well as the layout of the buildings and structures at the site. Figure 9.1-1 of the FSAR and the license application describes the new fuel array. The fuel handling areas are shown in Figures 1.2-3, 1.2-4, and 1.2-8 of the FSAR. The license application described the storage and inspection of the SNM in the form of fresh fuel assemblies in sufficient detail to obtain a general understanding of the regulated activity. The NRC staff reviewed the relevant information in Sections 1.2 and 9.1 of the FSAR against the license application, and confirmed that there is consistency in these documents with respect to the facility and process descriptions.

The NRC staff reviewed the information provided in the WBN-2's license application and the facility's FSAR, and concludes that the descriptions provided in these documents are appropriate for general familiarization and understanding of the proposed facility and processes.

1.1.4 EVALUATION FINDINGS

The NRC staff reviewed the general facility description for WBN-2, according to Section 1.1 of the Standard Review Plan. TVA adequately described: (1) the facility and its processes so that the staff has an overall understanding of the relationships of the facility features, and (2) the function of each feature. TVA cross-referenced its general description with the more-detailed descriptions in the facility's FSAR. Therefore, the NRC staff concludes that TVA complied with the general requirements of 10 CFR 70.22, "Contents of Applications," as applicable to this section for WBN-2.

1.2 INSTITUTIONAL INFORMATION

1.2.1 REGULATORY REQUIREMENTS

The regulatory basis for the review of TVA's institutional information is contained in 10 CFR 70.22, "Contents of Applications," and 10 CFR 70.23, "Requirements for the Approval of Applications."

1.2.2 REGULATORY ACCEPTANCE CRITERIA

The acceptance criteria applicable to the NRC's review of the institutional information section of the license application are contained in Section 1.2.4.3 of NUREG-1520 (NRC, 2002).

1.2.3 STAFF REVIEW AND ANALYSIS

In the license application, TVA described its corporate identity. TVA is wholly owned and controlled by the U.S. Government. Therefore, there is no foreign control, ownership, or influence over TVA by an alien organization or government. The license application also described TVA's full name and address, as well as the composition of the Board membership. The NRC staff reviewed this information and concludes that the information is adequate to understand the corporate identity of TVA.

TVA referenced a copy of their 2008 10-K report to the Securities and Exchange Commission (SEC) to show incorporation; however, a more recent filing of the financial statements filed with the SEC, which also shows incorporation, can be found at http://www.sec.gov/Archives/edgar/data/1376986/000137698609000113/tva_10-k2009.htm. The NRC staff did not identify anything in TVA's financial statements, submitted or otherwise, that warranted further inquiry. Therefore, the NRC staff concludes that these references demonstrate that TVA is financially qualified to engage in the proposed activities, related to the 10 CFR Part 70 at the WBN-2 site.

The license application described the types, quantities, and forms of licensed material requested for the proposed activities. TVA is requesting authorization to receive, possess, inspect, and store an initial core of 193 fuel assemblies. The allowance for additional material at the site will be 2600 kg of U-235. The license application also described the average enrichment level in the fuel assemblies and their average uranium mass content. The NRC staff reviewed the information and concludes that TVA provided an adequate, narrative description pertaining to the licensed material and its authorized uses. The proposed use of the SNM in the form of fresh fuel assemblies is consistent with the Atomic Energy Act of 1954, as amended.

In the license application, TVA did not request special exemptions or authorizations in support of the proposed activities. Since the proposed activities do not involve National Security Information or Restricted Data, the requirements of 10 CFR Part 95 do not apply to this license application.

1.2.4 EVALUATION FINDINGS

The NRC staff reviewed the institutional information provided by TVA for WBN-2 according to Section 1.2 of the Standard Review Plan. On the basis of the review, the NRC staff determined that TVA adequately described and documented the corporate structure and financial information for the facility, and is in compliance with those parts of 10 CFR 70.22 related to other institutional information. In addition, in accordance with 10 CFR 70.22(a)(2) and (4), TVA

adequately described the types, forms, quantities, and proposed authorized uses of licensed materials to be permitted at this facility as follows:

MATERIAL	FORM	QUANTITY	AUTHORIZED USE
Uranium enriched in the isotope U-235 up to 5.00 % by weight	Physical: Solid Chemical: UO ₂	91,800 kg, including up to 2,600 kg of U-235	Receive, possess, inspect, and store an initial core of 193 fresh fuel assemblies for the WBN-2 reactor

1.3 SITE DESCRIPTION

1.3.1 REGULATORY REQUIREMENTS

The regulatory basis for the review of the place where TVA's proposed activities will be performed is contained in 10 CFR 70.22(a)(2). Using the guidance in NUREG-1520 (NRC, 2002), the NRC staff reviewed information in the license application pertaining to the WBN-2's site description.

1.3.2 REGULATORY ACCEPTANCE CRITERIA

The acceptance criteria for the NRC's review of WBN-2's site description section of the license application are contained in Section 1.3.4 of NUREG-1520 (NRC, 2002).

1.3.3 STAFF REVIEW AND ANALYSIS

In its license application, TVA provided a description of the WBN-2 site. The facility is located in Rhea County on the west bank of the Tennessee River, at a mean sea level of 700 feet. The facility is located in an area of 1770 acres that is completely owned by the U.S. Government. There are no residential areas in the immediate vicinity of the site; only one industrial facility called the Watts Bar Steam Plant, which is not currently operating. The Sequoyah Nuclear Plant is located about 31 miles from the WBN-2 site. State Route 68 is the major highway located nearby.

Regarding the site geography, TVA provided an adequate discussion of this subject in the license application and in Section 2.1 of the FSAR. The NRC staff reviewed Figure 2.1-3 of the FSAR and concludes that this figure clearly illustrates the topographic features of the site where the licensed material will be received, possessed, stored, and inspected.

Regarding the site demographics, TVA provided population distribution information between 2000-2060 in Tables 2.1-8 through 2.1-14 of the FSAR. The NRC staff reviewed this information and concludes that it is acceptable to understand the population distribution as a function of the distance from the facility.

Regarding meteorology, TVA provided short-term and historical data for the WBN-2 site and surrounding areas. The NRC staff reviewed the information in the license application and in Section 2.3 of the FSAR, and concludes that the information is consistent in both documents. In addition, the NRC staff concludes that the information provided by TVA is adequate to have a general understanding of the meteorological characteristics of the area where the facility is located.

Regarding hydrology and geology, TVA provided an adequate, narrative discussion on the hydrological and geological characteristics of the site in Sections 1.3.4 and 1.3.5 of the license application. In addition, the NRC staff reviewed Section 2.5 of the FSAR as it relates to the geology of the site, and concludes that the information adequately complements the discussion in the license application and is consistent.

1.3.4 EVALUATION FINDINGS

The NRC staff reviewed the site description submitted by TVA for WBN-2 in accordance with Section 1.3 of the Standard Review Plan. TVA adequately described and summarized general information pertaining to: (1) the site geography, including its location relative to prominent natural and manmade features such as mountains, rivers, airports, population centers, schools, and commercial and manufacturing facilities; (2) population information using the most current available census data; (3) meteorology, hydrology, and geology for the site; and (4) applicable design-basis events. The review verified that the site description is consistent with the information provided in the FSAR for Unit 1.

1.4 REFERENCES

(NRC, 2002) U.S. Nuclear Regulatory Commission, NUREG-1520, "Standard Review Plan for the Review of a License Application for a Fuel Cycle Facility," March 2002.

(TVA, 2008) September 23, 2008, letter from M. K. Brandon to the U.S. NRC, "Watts Bar Nuclear Plant (WBN) Unit 1 - Updated Final Safety Analysis Report (UFSAR), Amendment 7," (ADAMS Accession Number ML082950191).

(TVA, 2009a) "Organization Topical Report, TVA-NPOD 89-A," September 14, 2009, (ADAMS Accession Number ML092600185).

(TVA, 2009b) "Application for a Special Nuclear Material License For Watts Bar Nuclear Plant, Unit 2 in Accordance with 10 CFR 70, *Domestic Licensing of Special Nuclear Material*," November 12, 2009 (ADAMS Accession Number ML100120487).

(TVA, 2009c) "Supplement to Application for a Special Nuclear Material License for Watts Bar Nuclear Plant, Unit 2 in Accordance with 10 CFR 70, *Domestic Licensing of Special Nuclear Material*," November 30, 2009 (ADAMS Accession Number ML093370136).

2.0 ORGANIZATION AND ADMINISTRATION

2.1 REGULATORY REQUIREMENTS

The regulatory basis for the review of Tennessee Valley Authority's (TVA) organization and administration is contained in Title 10 of the *Code of Federal Regulations* (10 CFR) 70.22, "Contents of Applications," and 10 CFR 70.23, "Requirements for the Approval of Applications."

2.2 REGULATORY ACCEPTANCE CRITERIA

The acceptance criteria for the U.S. Nuclear Regulatory Commission's (NRC's) review of the organization and administration section of the license application are contained in Section 2.4.3 of NUREG-1520 (NRC, 2002).

2.3 STAFF REVIEW AND ANALYSIS

In the license application, TVA identified and functionally described the specific organizational groups that are responsible for managing the operations associated with the licensed material at the Watts Bar Nuclear Plant, Unit 2 (WBN-2) site. TVA is wholly owned by the U.S. Government, and its Board of Directors consists of nine individuals appointed by the U.S. President and confirmed by the U.S. Senate. The corporate organization of TVA is described in Figure 1-1 of Topical Report TVA-NPOD89-A. Section 2.2 of the license application described the roles and responsibilities of these leadership positions. The NRC staff reviewed this information and concludes that it is adequate to have a general understanding of the roles and responsibilities of the corporate leadership that supports the operations of the facility.

TVA described the operating organization in Section 2.2.1 of the license application. This information was further supplemented by TVA's Topical Report TVA-NPOD89-A. The NRC staff reviewed Figures 1-2 through 1-7, 1-12, and 1-13 in the Topical Report and concludes that the organizational charts in these figures clearly illustrate the reporting relationships in TVA that are needed to support the proposed activities. The NRC staff also concludes that the license application defines effective lines of communication and authority among the organizational units involved in the engineering, environmental, safety, and operations functions of the facility.

In the license application, TVA states that the site personnel, as well as members of the Plant Onsite Review Committee (PORC), meet the qualification and training guidance in Regulatory Guide 1.8, "Qualification and Training of Personnel for Nuclear Power Plants," Revision 2. Alternatives to this document are outlined in TVA's Nuclear Quality Assurance Plan, TVA-NQA-PLN89-A. Committing to Regulatory Guide 1.8 is an acceptable method for demonstrating that the PORC and WBN-2 staff are adequately qualified and trained for the proposed activities. The NRC staff also reviewed TVA-NQA-PLN89-A, Revision 23, and Section 13.1.3 of the Final Safety Analysis Report (FSAR) and notes that these documents reinforce TVA's use of Regulatory Guide 1.8. Therefore, the NRC staff concludes that the license application adequately describes the training and experience of key management positions in support of the proposed activities at the site.

The proposed activities described in the license application do not involve enriched uranium processing, fabrication of uranium fuel or fuel assemblies, uranium enrichment, enriched uranium hexafluoride conversion, plutonium processing, fabrication of mixed-oxide fuel or fuel assemblies, and scrap recovery of SNM. Therefore, consistent with 10 CFR 70.60, TVA is not

required to meet the requirements in Subpart H (which includes management measures) in support of the license application for the WBN-2 facility. However, a probabilistic risk assessment will be needed to authorize the operation of the WBN-2 reactor. Such analysis will be evaluated with respect to the requirements in 10 CFR Part 50, and is not part of the scope of this evaluation.

In the license application and Section 13.5 of the FSAR, TVA describes the different procedures in place to conduct the proposed operations—including administrative procedures, system operating instructions, etc. The NRC staff notes that these procedures are evaluated by an independent reviewer, the PORC (when required) and the cognizant manager before they are implemented in the field. This independent evaluation and approval process provides reasonable assurance that procedures that affect the safety of the workers and the plant have been found acceptable before they are put into effect.

In the license application, TVA described written agreements in place with offsite organizations, including government agencies and emergency response entities, to respond to an emergency. The NRC staff also reviewed similar information in Section 13.3 of the FSAR and confirmed that these statements are consistent with the more detailed discussions in the areas of fire safety and emergency preparedness.

2.4 EVALUATION FINDINGS

The NRC staff reviewed the organization and administration of TVA to support the proposed activities at WBN-2 according to Chapter 2 of the Standard Review Plan. TVA described its organization and management policies for providing adequate safety management for the proposed activities. The NRC reviewed information concerning: 1) the organizational structure of TVA; 2) the roles and responsibilities of its management, both at the plant and corporate level; and 3) the qualifications of key personnel responsible for the safety of the activities at WBN-2. Based on the information provided in the license application, the NRC staff concluded that TVA has an acceptable organization; administrative policies; and sufficient, qualified resources to assure the safety of the proposed activities under both normal and abnormal conditions. Therefore, the information provided meets the requirements in 10 CFR 70.22(a)(6) and 70.23(a)(2) and is acceptable.

2.5 REFERENCES

(NRC, 2002) U.S. Nuclear Regulatory Commission, NUREG-1520, "Standard Review Plan for the Review of a License Application for a Fuel Cycle Facility," March 2002.

(TVA, 2008) September 23, 2008, letter from M. K. Brandon to the U.S. NRC, "Watts Bar Nuclear Plant (WBN), Unit 1 - Updated Final Safety Analysis Report (UFSAR) Amendment 7," (ADAMS Accession Number ML082950191).

(TVA, 2009a) "Organization Topical Report, TVA-NPOD 89-A," September 14, 2009, (ADAMS Accession Number ML092600185).

(TVA, 2009b) "Application for a Special Nuclear Material License For Watts Bar Nuclear Plant, Unit 2 in Accordance with 10 CFR 70, *Domestic Licensing of Special Nuclear Material*," November 12, 2009 (ADAMS Accession Number ML100120487).

(TVA, 2009c) "Supplement to Application for a Special Nuclear Material License for Watts Bar Nuclear Plant, Unit 2 in Accordance with 10 CFR 70, *Domestic Licensing of Special Nuclear Material*," November 30, 2009 (ADAMS Accession Number ML093370136).

(TVA, 2010) "Nuclear Quality Assurance Program, TVA-NQA-PLN89-A," January 15, 2010, (ADAMS Accession Number ML100210972).

3.0 RADIATION PROTECTION

The purpose of this review is to determine whether Tennessee Valley Authority's (TVA) Radiation Protection (RP) Program is adequate to protect the radiological health and safety of workers at the Watts Bar Nuclear Plant, Unit 2 (WBN-2) site, and complies with the applicable regulatory requirements in Title 10 of the *Code of Federal Regulations* (10 CFR) Parts 19, 20, and 70 at the site.

3.1 REGULATORY REQUIREMENTS

3.1.1 RADIATION PROTECTION PROGRAM IMPLEMENTATION

Regulations applicable to the establishment of an RP program are presented in 10 CFR Part 20, Subpart B, "Radiation Protection Programs."

3.1.2 AS LOW AS IS REASONABLY ACHIEVABLE PROGRAM

Regulations applicable to the program to maintain doses as low as is reasonably achievable (ALARA) are presented in 10 CFR 20.1101, "Radiation Protection Programs."

3.1.3 ORGANIZATION AND PERSONNEL QUALIFICATIONS

The regulation applicable to the organization and qualifications of the radiological protection staff are presented in 10 CFR 70.22, "Contents of Applications."

3.1.4 WRITTEN PROCEDURES

The regulation applicable to RP procedures and radiation work permits (RWPs) are presented in 10 CFR 70.22, "Contents of Applications."

3.1.5 TRAINING

The following regulations apply to the Radiation Safety Training Program:

1. 10 CFR 19.12, "Instructions to workers"
2. 10 CFR 20.2110, "Form of records"

3.1.6 VENTILATION AND RESPIRATORY PROTECTION PROGRAMS

Regulations applicable to the ventilation and respiratory protection programs are presented in 10 CFR Part 20, Subpart H, "Respiratory protection and controls to restrict internal exposure in restricted areas."

3.1.7 RADIATION SURVEY AND MONITORING PROGRAMS

The following NRC regulations in 10 CFR Part 20 are applicable to radiation surveys and monitoring programs:

1. Subpart C, "Occupational Dose Limits"
2. Subpart F, "Surveys and Monitoring"

3. Subpart L, "Records"
4. Subpart M, "Reports"

3.1.8 ADDITIONAL PROGRAM REQUIREMENTS

Additional program requirements applicable to this application include 10 CFR 70.74, "Additional reporting requirements."

3.2 REGULATORY ACCEPTANCE CRITERIA

The acceptance criteria for U.S. Nuclear Regulatory Commission's (NRC's) review of a fuel cycle facility's RP program are outlined in Sections 4.4.1.3, 4.4.2.3, 4.4.3.3, 4.4.4.3, 4.4.5.3, 4.4.6.3, 4.4.7.3, and 4.4.8.3 of NUREG-1520 (NRC, 2002). It is recognized that the proposed license for storage of fresh fuel at the WBN-2 site does not encompass the range of fuel cycle processes that were anticipated by this guidance. Because the application addressed each RP subject area identified in the guidance, the review also addressed each subject area.

3.3 STAFF REVIEW AND ANALYSIS

As part of the WBN-2's special nuclear material (SNM) license application, Chapter 4 of the Final Safety Analysis Report describes the RP program for the facility. The chapter addresses each major section of NUREG-1520 (NRC, 2002). This chapter is organized to conform to the major sections of the license application and NUREG-1520 (NRC, 2002).

3.3.1 RADIATION PROTECTION PROGRAM IMPLEMENTATION

The TVA Nuclear Power Group's (NPG) RP program would implement the requirements of 10 CFR 19 and 20, and would be applicable to the site. The RP program consists of four elements that would be directed toward essential support to the WBN plant:

1. radiological impact assessments;
2. radiation protection planning and radiological safety evaluation, including preliminary safety analysis reports, final safety analysis reports, and radiological emergency plans;
3. radiological environmental monitoring; and
4. radiological control activities.

The Radiation Control (RADCON) Section would be under the supervision of the Plant Manager. The RADCON Section would be responsible for the radiological control activities at the plant. It would apply radiation standards and procedures, review proposed methods of plant operation, participate in development of plant documents, and assist in the plant's training program, and provide specialized training in RP. It would provide coverage for all operations involving radiation or radioactive materials, including maintenance, fuel handling, waste disposal, and decontamination. It would be responsible for personnel and in-plant radiation monitoring; and maintain continuing records of personnel exposures, plant radiation, and contamination levels.

The NRC staff reviewed WBN-2's RP program implementation and finds it sufficient to meet the requirements in 10 CFR Part 20 and is, therefore, acceptable.

3.3.2 AS LOW AS IS REASONABLY ACHIEVABLE PROGRAM

TVA would have an overall commitment to keep occupational radiation exposures ALARA and would have specific plans and procedures that would be followed by operating and maintenance staff to assure that ALARA goals are achieved. Operational policy and procedures would be formulated at the corporate level at TVA's NPG, and would be implemented at the WBN-2 plant through the issuance of division procedures and plant instructions for the purpose of maintaining the Total Effective Dose Equivalent (TEDE) ALARA. These procedures and instructions would be consistent with the intent of Section C.1 of Regulatory Guide 8.8, "Information Relevant to Ensuring that Occupational Radiation Exposures at Nuclear Power Stations Will Be as Low as Is Reasonably Achievable," (NRC, 1978) and Regulatory Guide 8.10, "Operating Philosophy for Maintaining Occupational Radiation Exposures as Low as Is Reasonably Achievable," (NRC, 1977). Included in these operating procedures and plant instructions would be the provision that employee radiation exposure trends get reviewed periodically by management staff at WBN-2 and in the NPG's central office. Summary reports would be prepared that describe: 1) major problem areas where high radiation exposures are encountered, 2) which worker group is accumulating the highest exposures, and 3) recommendations for changes in operating, maintenance, and inspection procedures or modifications to the plant as appropriate to reduce exposures.

An ALARA committee, composed primarily of supervisory personnel, would be established to periodically review the effectiveness of implementation of the ALARA program. Reviews would include the site performance against ALARA goals, employee suggestions to implement ALARA, ALARA planning documents, and trends (i.e., exposures, contamination, etc.). The Plant Manager or Assistant Plant Manager would normally serve as chairman of the site's ALARA committee.

The NRC staff reviewed the ALARA commitment and procedures for the WBN-2 site and finds them sufficient to meet the NRC requirements in 10 CFR Part 20 and are, therefore, acceptable.

3.3.3 ORGANIZATION AND PERSONNEL QUALIFICATIONS

NPG personnel at the WBN-2 plant would meet the qualification and training requirements of NRC Regulatory Guide 1.8, "Qualification and Training of Personnel for Nuclear Power Plants," Revisions 1 and 2 (NRC, 1975/1987) with the alternatives as outlined in the Nuclear Quality Assurance Plan, TVA-NQA-PLN89-A (TVA, 1989). Specifically, the site RP Manager would have the education and experience as described in Regulatory Guide 1.8, Revisions 1 and 2, and the endorsed ANSI N18.1-1971 (ANSI, 1971) and ANSI/ANS-3.1-1981 (ANSI 1981). The RP Manager would have to meet the more restrictive of the composite qualifications and training of both documents.

The RP Manager would have a bachelor's degree in a science or engineering subject, including formal training in RP. The responsible individual should have five years of experience in applied RP. At least three of the five years would be professional-level experience in applied RP work in a nuclear facility dealing with radiological problems similar to those encountered in nuclear power plants, preferably in a nuclear power plant. The WBN plant would have a Plant Onsite Review Committee (PORC) that advises the Plant Manager in matters related to nuclear safety. The PORC would be used to conduct, as minimum, reviews of the various document and programs.

The NRC staff reviewed WBN-2's personnel qualifications for the radiation safety organization and finds them sufficient to meet the requirements in 10 CFR 70.22(a)(6) and are, therefore, acceptable.

3.3.4 WRITTEN PROCEDURES

Radiation control instructions would be maintained and made available to all site personnel. These instructions would be written to implement the requirements of 10 CFR 20, applicable codes and standards, and commitments to outside agencies (American Nuclear Insurers, Institute of Nuclear Plant Operations, etc.).

RP procedures would be prepared, reviewed and approved to carry out activities related to the RP Program. Procedures would be used to control RP activities to ensure that the activities are carried out in a safe and effective manner. RP procedures would be reviewed and revised, as needed, to incorporate facility or operational changes.

A RWP system would be established to document radiological conditions and prescribe appropriate protective requirements for work in radiologically controlled areas. RWPs would normally be required for all work in radiologically controlled areas.

The NRC staff finds TVA's commitments to use written procedures at the WBN-2 site sufficient to meet the requirements in 10 CFR 70.22(a)(8) and are, therefore, acceptable.

3.3.5 TRAINING

An RP training program would be developed, documented, and administered—consistent with expectations as outlined in the Nuclear Energy Institute (NEI) Guidance NEI 03-04, "Guideline for General Access Training" (NEI, 2003). This program would be implemented in General Employee Training for TVA's NPG power plant facilities, including the WBN-2 plant. All individuals who in the course of employment would be likely to receive an occupational exposure to radiation from licensed and unlicensed radiation sources under the control of TVA in excess of 100 mrem in a year would receive RP training commensurate with their duties and responsibilities (10 CFR 19.12) and instructions on U.S. NRC Regulatory Guides 8.13 (NRC, 1999a) and 8.29 (NRC, 1996).

A training program for RP personnel would be developed by the Nuclear Training group within TVA. This group would issue procedures detailing the program. The Program Manager of Radiological Services would concur with the initial issuance and any change to procedures for the training of RP personnel. The National Voluntary Laboratory Accreditation Program's (NVLAP) Technical Director would concur with the training requirements and procedures involving NVLAP accredited activities.

The NRC staff finds that TVA's commitments to train employees in RP at the WBN-2 site are sufficient to meet the requirements in 10 CFR 70.22(a)(6) and are, therefore, acceptable.

3.3.6 VENTILATION AND RESPIRATORY PROTECTION PROGRAMS

Internal occupational dose would be controlled through facility design, engineering controls, confinement and reduction of contaminated areas, limiting access to radiological-controlled areas, and the use of respiratory protective equipment. Confirmatory monitoring would be performed for individuals through the assessment and tracking of derived airborne concentration

hours (DAC-hr). Bioassays (in vitro and in vivo measurement and analysis) would be employed to confirm and/or evaluate probable intake.

A respiratory protection program would be established and maintained in accordance with 10 CFR 20. Workers would have respiratory protection training before wearing respiratory protection equipment. TVA notes that intakes of radioactive material would be permissible if evaluations predict that the use of respiratory protection equipment would result in higher exposures but a lower TEDE that is ALARA. Unintended consequences of wearing respiratory protection equipment could include limited visibility, more time needed to perform the assigned work, etc. This trade-off is consistent with the guidance in Section 2.1 of Regulatory Guide 8.15, "Acceptable Programs for Respiratory Protection," Revision 1 (NRC, 1999). Other factors could also be considered in the evaluation for maintaining TEDE ALARA. These factors could include, but are not limited to, environmental conditions, safety conditions, accessibility conditions, worker comfort, wear times, and the type of respiratory equipment specified or available. All TEDE ALARA evaluations would be documented and retained as a facility-based Radiological Control Program record. Dose calculations/investigations would be reviewed and approved by RP supervision. The specific elements of the program are described in Section 4.6.1 of the license application.

The fuel handling area ventilation system would be designed to: 1) maintain acceptable environmental conditions for personnel access, operation, inspection, maintenance, and testing; 2) protect mechanical and electrical equipment and controls; and 3) control airborne activity during normal operation. To control airborne activity, ventilation air would be supplied to clean areas first and later routed to areas of progressively greater contamination potential.

The NRC staff finds that TVA established adequate ventilation and respiratory protection programs for the WBN-2 site in accordance with the regulatory requirements of 10 CFR Part 20, Subpart H and are acceptable.

3.3.7 RADIATION SURVEY AND MONITORING PROGRAMS

Prospective monitoring determinations for internal and external dose monitoring would be performed for individuals or group of individuals entering the restricted area. Personnel monitoring, for dose from sources external to the body, would be conducted using appropriate dosimeters as required by 10 CFR 20. TVA would maintain facilities with accreditation as a processing laboratory for dosimeters, as described in American Standards Institute (ANSI) N13.11-1983, "Personnel Dosimeter - Criteria for Performance" (ANSI, 1983). This accreditation is under the NVLAP conducted by the National Institute of Standards and Technology. Dosimeters could be processed onsite by WBN-2 personnel, an accredited sub-facility, or by another processing laboratory within the scope of TVA's accreditation. Dose information for whole body, external exposure of the skin, lens of the eye, and extremities would be recorded in a dose tracking system and retained in a permanent historical database for generating required reports. Real time control would be generally implemented using information from direct reading dosimeters. Official doses of record would be taken from dosimeters. However, doses could be calculated when dosimeter results are either not available or do not accurately represent actual dose received.

Personnel monitoring and confirmatory monitoring for dose from intakes of radioactive material would be conducted using DAC-hr tracking and bioassays, including whole body counting. Monitoring would be performed for each person required to be monitored by 10 CFR 20. The whole body counter would be calibrated with standard radioisotopes in configurations that

approximate the human body. It would be able to detect expected gamma emitting radionuclides per ANSI-N13.30, 1996, Table-C.3, "Direct Radiobioassay Minimum Detectable Quantities" (ANSI, 1996).

Routine radiological surveys to detect radiation, radioactive contamination, and airborne radioactivity would be performed throughout the plant on periodic schedules. Survey frequencies would be determined by the RADCON Superintendent based upon the actual or potential radiological conditions. Schedules for completion of routine surveys would be issued to the technicians. As plant conditions change, the schedule would be updated. Radiological surveys may be performed whenever personnel enter potential or actual radiological areas and there is any doubt as to the existing conditions. Retention of survey records would follow the requirements of 10 CFR 20.2103 and the TVA's Quality Assurance Plan.

Radiation and contamination surveys would be made on the new fuel shipments by RADCON personnel. The purpose of the survey would be to protect personnel from unnecessary exposure to radiation and/or contamination. Smears would be counted for alpha and beta-gamma radiation.

The designated areas to receive fuel would be posted according to 10 CFR 20. When the fuel arrives onsite, radiation and contamination surveys would be taken on the transport vehicle. Dose rate at contact and 2 meters from the vehicle would be taken, contact dose rates, dose rates at 1 meter, and smears would be taken on the external surfaces of the shipping containers. After the shipping containers are opened, smears would be taken of the fuel assembly covering and the inside of the container. The dose rate of each fuel assembly would be obtained, and the fuel assembly would be smeared when the polyethylene covering has been removed for inspection. When all fuel containers are removed from the truck, radiation and smear surveys would be taken on the truck before allowing it to leave.

Periodic surveys would be performed within the storage/handling area. Upon detection of contamination, a personnel monitoring station would be established and the area controlled to prevent the spread of the contamination. The work controlling document would describe the protective clothing, dosimetry, and methods to be followed to prevent unnecessary exposure to personnel. The contaminated area or item would be cleaned and/or disposed of appropriately.

Portable survey instruments would be calibrated and checked periodically with standard radioactive sources in accordance with instrument-specific calibration and maintenance procedures. Accurate records on the performance of each instrument during each calibration would be maintained. Each laboratory counting system would be checked at regular intervals with standard radioactive sources for proper counting efficiencies, background count rates, and operating parameters.

Controls would be established for entry into and exit from radiological controlled areas (RCA). Prior to entry, workers would be provided training, radiation monitoring devices (thermoluminescent dosimeter and electronic dosimetry) and would be required to have an RWP applicable to the assigned work activity. Upon exiting an RCA, workers would be expected to proceed to the nearest frisker station and perform a self-survey of their hands and feet as a minimum. Once frisking is completed, workers would exit the RCA via a personal contamination monitor. Prior to leaving the protected area, workers would exit through a portal monitor that again measures the individual for contamination.

Each RCA would be posted by yellow and magenta signs bearing the standard radiation warning symbol and the words "Caution - Radiologically Controlled Area." The posting would also state that a monitoring device is required (unless it was determined that monitoring is not required).

Contamination areas would have conspicuous boundaries consisting of such items as rad-ribbon, rad-rope, rad-tape, and step-off pads; and be posted by yellow and magenta signs bearing the standard radiation warning symbol and the words "Caution-Contaminated Area" or "Caution-Contamination Area." Where, due to physical space limitations, it would be impractical to post a contaminated area as described above, the area may be noted with radiation tape and/or radiation hazard tags. Physical space limitation would be intended to apply to such areas as floor drains, electrical panels, sample sinks, etc. Radiological postings would be displayed with yellow and magenta colors in accordance with 10 CFR 20.1901.

The NRC staff reviewed WBN's monitoring and contamination control program and finds it sufficient to meet the requirements in 10 CFR Part 20, Subpart F and is, therefore, acceptable.

3.3.8 ADDITIONAL PROGRAM REQUIREMENTS

WBN-2 would establish a tracking system that would track radiation exposure for purposes of trend analysis and work planning, and provide data for management evaluations of the ALARA program. An exposure control system would be implemented that would:

1. keep up-to-date exposure data from dosimeters, calculated doses, and DAC-hr;
2. compare individual dose data with TVA's Administrative Dose Limits and regulatory limits;
3. keep the supervisor informed of workers' exposure; and
4. keep employees informed of their own exposure.

A dose record system would be implemented by the RADCON group for purposes of maintaining historical dose records for all persons for whom personnel monitoring or dose calculations are performed. The information would be calculated, maintained, and reported to the NRC and individuals according to NRC's Regulatory Guides 8.7 (NRC, 2005) and 8.34 (NRC, 1992), and 10 CFR 19.

Those individuals who receive occupational exposure and require monitoring per 10 CFR 20.1502 would have their doses reported annually to the NRC.

All plant abnormal occurrences would be investigated in accordance the WBN's Corrective Action Program. The specific protocols that will be used to report abnormal events or occurrences are discussed in Section 4.8.2 of the license application. TVA also acknowledges reporting requirements contained in 10 CFR Part 20 for events involving licensed byproduct, source, or SNM; 10 CFR 30.50 which contains reporting requirements for events involving licensed byproduct material; 10 CFR 40.60 which contains reporting requirements for events involving licensed source material; and 10 CFR Part 70 which contains reporting requirements for events and conditions involving licensed SNM.

The staff reviewed TVA's exposure tracking and reporting program for the WBN-2 site and finds it sufficient to meet the requirements of 10 CFR Parts 10, 20, and 70 and are, therefore, acceptable.

3.4 EVALUATION FINDINGS

TVA and WBN-2 have established and will maintain an acceptable RP program that includes:

1. an effective documented program to ensure that occupational radiological exposures are ALARA;
2. an organization with adequate qualification requirements for RP personnel;
3. approved, written RP procedures and RWPs for RP activities;
4. RP training for all personnel who have access to restricted areas;
5. a program to control airborne concentrations of radioactive material with engineering controls and respiratory protection;
6. a radiation survey and monitoring program that includes requirements for controlling radiological contamination within the facility and monitoring of external and internal radiation exposures; and
7. other programs to maintain records, report to the NRC in accordance with 10 CFR Parts 20 and 70, and correct for upsets at the facility.

The NRC staff concluded that WBN-2 RP program for the receipt, possession, inspection and storage of SNM, as described in the license application, meets the regulatory requirements of 10 CFR Parts 19.12, Part 20, Subparts F,C, H, L and M; and 10 CFR 70.22(a)(6) and (a)(8). Therefore, it is acceptable.

3.5 REFERENCES

(ANSI, 1971) American National Standards Institute, ANSI N18.1-1971, "Selection and Training of Nuclear Power Plant Personnel," March 1971.

(ANSI, 1981) American National Standards Institute, ANSI/ANS-3.1-1981, "Selection, Qualification, and Training of Personnel for Nuclear Power Plants," 1981.

(ANSI, 1983) American National Standards Institute, ANSI-N13.11-1983, "Personnel Dosimeter - Criteria for Performance," September 1982.

(ANSI, 1996) American National Standards Institute, HPS N13.30, "Performance Criteria for Radiobioassay," May 1996.

(NEI, 2003) Nuclear Energy Institute, NEI 03-04, "Guideline for General Access Training," 2003.

(NRC, 1975/1987) U.S. Nuclear Regulatory Commission, Regulatory Guide 1.8, "Qualification and Training of Personnel for Nuclear Power Plants," Revisions 1 and 2, September 1975/ April 1987.

(NRC, 1977) U.S. Nuclear Regulatory Commission, Regulatory Guide 8.10, "Operating Philosophy for Maintaining Occupational Radiation Exposures as Low as Is Reasonably Achievable," May 1977.

(NRC, 1978) U.S. Nuclear Regulatory Commission, Regulatory Guide 8.8, "Information Relevant to Ensuring that Occupational Radiation Exposures at Nuclear Power Stations Will Be as Low as Is Reasonably Achievable," June 1978.

(NRC, 1980) U.S. Nuclear Regulatory Commission, NUREG-0737, "Clarification of TMI Action Plan Requirements," November 1980.

(NRC, 1982a) U.S. Nuclear Regulatory Commission, Generic Letter 82-33, "Supplement I to NUREG-0737 - Requirements for Emergency Response Capability," December 1982.

(NRC, 1982b) U.S. Nuclear Regulatory Commission, NUREG-073, Supplement 1, "Clarification of TMI Action Plan Requirements: Requirements for Emergency Response Capability," December 1982.

(NRC, 1992) U.S. Nuclear Regulatory Commission, Regulatory Guide 8.34, "Monitoring Criteria and Methods To Calculate Occupational Radiation Doses," July 1992.

(NRC, 1996) U.S. Nuclear Regulatory Commission, Regulatory Guide 8.29, "Instruction Concerning Risks from Occupational Radiation Exposure," February 1996.

(NRC, 1999a) U.S. Nuclear Regulatory Commission, Regulatory Guide 8.13, "Instruction Concerning Prenatal Radiation Exposure," June 1999.

(NRC, 1999b) U.S. Nuclear Regulatory Commission, Regulatory Guide 8.15, "Acceptable Programs for Respiratory Protection," October 1999.

(NRC, 2002) U.S. Nuclear Regulatory Commission, NUREG-1520, "Standard Review Plan for the Review of a License Application for a Fuel Cycle Facility," March 2002.

(NRC, 2005) U.S. Nuclear Regulatory Commission, Regulatory Guide 8.7, "Instructions for Recording and Reporting Occupational Radiation Exposure Data," November 2005.

(TVA, 2009) Tennessee Valley Authority, "Watts Bar Nuclear Plant, Unit 2 10 CFR 70 Safety Analysis Report," November 2009.

(TVA, 2010) July 30, 2010 letter from R. M. Krich to the U.S. NRC, "Response to Request for Additional Information Regarding the Safety Evaluation Report for 10 CFR 70 License Application for Watts Bar Nuclear Plant, Unit 2 (TAC No. L32918)," (ADAMS Accession Number ML103570133).

4.0 NUCLEAR CRITICALITY SAFETY

4.1 REGULATORY REQUIREMENTS

The regulatory basis for the review of (TVA's) nuclear criticality safety (NCS) is contained in Title 10 of the *Code of Federal Regulations* (10 CFR) 70.22, "Contents of Applications;" 10 CFR 70.23, "Requirements for the Approval of Applications;" 10 CFR 70.24, "Criticality Accident Requirements;" and 10 CFR 70.52, "Reports of Accidental Criticality."

4.2 REGULATORY ACCEPTANCE CRITERIA

The acceptance criteria for the U.S. Nuclear Regulatory Commission's (NRC's) review of TVA's NCS program for the Watts Bar Nuclear Plant, Unit 2 (WBN-2) site are outlined in Section 5.4 of NUREG-1520 (NRC, 2002).

4.3 STAFF REVIEW AND ANALYSIS

Fuel Storage

The application requests a license to receive, possess, inspect, and store special nuclear material (SNM) in the form of 193 fresh fuel assemblies. The material to be licensed includes up to 2,600 kilograms of U-235, enriched to a maximum of 5 percent by weight (wt%). Storage locations will include the new fuel storage vault and the spent fuel pool. Fresh fuel assemblies will be stored in their shipping containers until they can be offloaded to the new fuel storage vault and/or into the spent fuel pool. In the license application, TVA stated that they will use shared systems, structures, and components currently in place for Watts Bar Nuclear Plant, Unit 1 (WBN-1) to support the proposed activities for WBN-2.

As Documented in the WBN-2 New Fuel Receipt Response to Request for Additional Information (TVA, 2011), TVA plans to store the fuel for the initial Unit 2 core load in either the new fuel vault and the spent fuel pool, or completely in the spent fuel pool. Section 5.1.2 of the license application discusses the control methods for prevention of criticality associated with the SNM in the form of fresh fuel assemblies and describes safety controls established in both storage locations.

As described in the WBN-1 Final Safety Analysis Report, Amendment 7 (TVA, 2008), the new storage vault design has a maximum capacity of 130 available storage cell locations. Their analysis demonstrated that nominal enrichments up to 5.0 wt% U-235 do not result in criticality concerns provided that only 120 specific storage cells of the 130 available locations are utilized. When fresh fuel is stored in the vault, 10 restricting devices such as insert plates will be placed in the proper locations to provide additional assurance, over procedural controls, that the fuel will only be stored in the 120 analyzed positions. The remaining fuel assemblies may be stored inside the spent fuel storage pool. Also, the analysis of the spent fuel racks confirmed that the fuel assemblies can be stored safely with TVA controls in place, to assure safe configuration inside the pool. Fuel assemblies less than a maximum of 5.0 wt% enriched may be stored in one of four arrangements with the storage conditions below:

- Fuel assemblies may be stored in the racks without further restrictions provided the burn-up of each assembly is in the acceptable domain.

- New and spent fuel assemblies may be stored in a checkerboard arrangement of two new and two spent assemblies, provided the accumulated burn-up of each spent assembly is in the acceptable domain identified in Figure 4.3-47, depending on the specified initial enrichment.
- New fuel assemblies may be stored in 4-cell arrays with 1 of the 4 cells remaining empty of fuel (containing only water or water with up to 75% by volume of nonfuel bearing material).
- New fuel assemblies with a minimum of 32 integral fuel burnable absorber (IFBA) rods may be stored in the racks without further restrictions provided the loading of ZrB₂ in the coating of each IFBA rod is a minimum of 1.25x (1.9625 mg/in).

As documented in Section 2.10 of the Safety Evaluation Report Related to Amendment 40 to the Operating License of Watts Bar Nuclear Plant, Unit 1 (NRC, 2002), the NRC staff concluded that TVA's evaluation of the four different configurations of fresh and spent fuel assemblies meets NRC requirements and the criticality analysis of the spent fuel pool configuration assures that the maximum K_{eff} will be less than or equal to 0.95 with fuel up to 4.95 ± 0.5 wt% U-235 enrichment. The Part 70 license application for WBN-2 does not present any new or revised information on these configurations since TVA will use the same structures, systems, and components currently in place and licensed for WBN-1 to store the fresh fuel for WBN-2. Therefore, the NRC staff concludes that TVA's evaluation is still applicable and meets the regulatory requirements in 10 CFR 70.22(a)(7) and (a)(8) for the proposed storage of fresh fuel assemblies for WBN-2.

Fuel Handling

Conservative and independent calculations performed by the NRC staff during the licensing of WBN-1(NRC, 1979) have shown that two or more of these fuel assemblies are required to attain criticality. TVA established controls to assure that no more than one fuel assembly may be out of approved shipping containers or storage locations at any one time as specified below:

- One un-irradiated fuel assembly shall be allowed within the fuel handling area. The fuel handling area includes all areas of the refueling floor where un-irradiated fuel assemblies are handled outside of metal shipping containers. The fuel handling area also includes the new fuel storage vault and the truck bay where metal shipping containers are unloaded.
- One fuel assembly shall be allowed within the spent fuel storage pool boundary (excluding the inspection, reconstitution, or cleaning locations with appropriate evaluation for each configuration that must be performed prior to implementation). The spent fuel storage pool boundary includes the cask loading area, fuel transfer canal (excluding the transfer cart), and spent fuel pool.
- Three fuel assemblies shall be allowed within the refueling canal. The refueling canal includes the fuel transfer tube boundary (including the transfer cart) and the rod cluster control changing fixture. This allows for two fuel assemblies to be in the rod cluster control changing fixture while the third fuel assembly is being transferred through the fuel transfer tube, is in the upender, or is in transit to or from the reactor cavity.

- One fuel assembly shall be allowed within the reactor cavity.
- Loose fuel rods or pellets must be evaluated for criticality before removal from a fuel assembly or storage at the site.

The NRC staff evaluated whether TVA needed criticality accident alarms pursuant to 10 CFR 70.24. In Supplement 5 of NUREG-0847, "Safety Evaluation Report Related to the Operation of Watts Bar Nuclear Plant, Units 1 and 2," the NRC staff granted TVA an exemption from the requirements of 10 CFR 70.24. On February 27, 2004, TVA updated its Final Safety Analysis Report to include a commitment to follow 10 CFR 50.68 in lieu of the exemption from the requirements in 10 CFR 70.24. A 10 CFR 50.59 evaluation was completed by TVA to reflect these changes. In a letter dated July 30, 2010, TVA indicated that the receipt, handling, and storage of SNM for WBN-2 will be in compliance with the requirements of 10 CFR 50.68(b), since these activities will take place in areas shared with WBN-1. This commitment has been incorporated into the license as a license condition, S-2.

To provide for detection of inadvertent releases of radiation due to fuel damage or a nuclear criticality, TVA states in its license application that radiation monitors are provided in the storage and associated handling areas when fuel is present. These radiation monitors are also used as part of the safety strategy to handle fuel for WBN-1. The NRC staff evaluated the adequacy of these monitors during the licensing of WBN-1 and found that these radiation monitors are adequate to detect excessive radiation levels and allow appropriate safety actions to be taken in accordance with plant procedures. Therefore, the NRC staff concludes that these monitors are also adequate to safely handle the fuel for WBN-2.

Reporting Requirements

In Section 5.4 of the license application, TVA commits to submit nuclear criticality safety reports pursuant to the requirements in 10 CFR 50.72 and 50.73 instead of 10 CFR 70.52. The NRC staff reviewed the reporting requirements in 10 CFR 50.72 and 50.73 and concludes that the requirements in 10 CFR 70.52 are bounded by those in 10 CFR 50.72 and 50.73. Therefore, the NRC staff has reasonable assurance that, should a criticality event occur involving the receipt, possession, inspection, and storage of fresh fuel assemblies at WBN-2, TVA will report such events in a timely manner and consistent with the intent of 10 CFR 70.52.

4.4 EVALUATION FINDINGS

The staff has reviewed the NCS program and requirements for criticality safety for WBN-2 and has reasonable assurance of the following:

Pursuant to 10 CFR 70.24(d)(1), "the requirements in paragraphs (a) through (c) of this section do not apply to a holder of a construction permit or operating license for a nuclear power reactor issued under part 50 of this chapter or a combined license issued under Part 52 of this chapter, if the holder complies with the requirements of paragraph (b) of 10 CFR 50.68." Therefore, by complying with 10 CFR 50.68(b), the NRC staff concludes that WBN-2 is in compliance with 10 CFR 70.24.

The NRC staff concludes that the NCS program and safety controls, as described in the license application, provides reasonable assurance that the proposed receipt, possession, inspection, and storage of the SNM in the form of fresh fuel assemblies at WBN-2 will be conducted safely and in a manner that does not result in a criticality accident.

4.5 REFERENCES

(NRC, 1979) U.S. Nuclear Regulatory Commission, "Safety Evaluation Report, TVA Application and Supplement for a License for Fuel for the Watts Bar Nuclear Power Plant, Unit 1," (ADAMS Accession Number ML082110091).

(NRC, 1990) U.S. Nuclear Regulatory Commission, NUREG-0847, "Safety Evaluation Report Related to the Operation of Watts Bar Nuclear Plant, Units 1 and 2," Supplement 5, November 1990.

(NRC, 2002) U.S. Nuclear Regulatory Commission, NUREG-1520, "Standard Review Plan for the Review of a License Application for a Fuel Cycle Facility," March 2002.

(NRC, 2002) U.S. Nuclear Regulatory Commission, Amendment No.40 Safety Evaluation, "Amendment No. 40 to Facility Operating License No. NPF-90 for Watts Bar Nuclear Plant, Unit 1," September 2002.

(TVA, 2004) Safety Analysis Report Change Request Performed by Tennessee Valley Authority pursuant to 10 CFR 50.59, "Changes, Test, and Experiments," (ADAMS Accession Number ML110840608).

(TVA, 2008) September 23, 2008, letter from M. K. Brandon to the U.S. NRC, "Watts Bar Nuclear Plant (WBN), Unit 1 - Updated Final Safety Analysis Report (UFSAR) Amendment 7," (ADAMS Accession Number ML082950191).

(TVA, 2009b) "Application for a Special Nuclear Material License For Watts Bar Nuclear Plant, Unit 2 in Accordance with 10 CFR 70, *Domestic Licensing of Special Nuclear Material*," November 12, 2009 (ADAMS Accession Number ML100120487).

(TVA, 2010) July 30, 2010 letter from R. M. Krich to the U.S. NRC, "Response to Request for Additional Information Regarding the Safety Evaluation Report for 10 CFR 70 License Application for Watts Bar Nuclear Plant, Unit 2 (TAC No. L32918)," (ADAMS Accession Number ML103570133).

(NRC, 2011) U.S. Nuclear Regulatory Commission, NUREG-0847, "Safety Evaluation Report Related to the Operation of Watts Bar Nuclear Plant, Units 1 and 2," Supplement 22, February 2011.

(TVA, 2011) April 29, 2011 letter from D. Stinson to the U.S. NRC, "New Fuel Receipt, Response to Request for Additional Information Regarding the Safety Evaluation Report for 10 CFR 70 License Application for Watts Bar Nuclear Plant, Unit 2," (ADAMS Accession Number ML11136A117).

5.0 FIRE SAFETY

The purpose of this review is to determine, with reasonable assurance, that Tennessee Valley Authority (TVA) has: (1) designed a facility that provides adequate protection against fires and explosions that could affect the safety of licensed materials and thus present an increased radiological risk; (2) considered the radiological consequences of fires; and (3) instituted suitable safety controls to protect workers, the public, and the environment during the proposed activities at Watts Bar Nuclear Plant, Unit 2 (WBN-2).

5.1 REGULATORY REQUIREMENTS

The regulatory basis for the fire safety review includes the general and additional contents of the application, as required by Title 10 of the *Code of Federal Regulations* (10 CFR) 70.22. In addition, the fire safety review must provide reasonable assurance of compliance with 10 CFR 70.23(a)(3) and 10 CFR 70.23(a)(4).

5.2 REGULATORY ACCEPTANCE CRITERIA

The acceptance criteria that the U.S. Nuclear Regulatory Commission (NRC) uses for reviews of fire safety are outlined in Sections 7.4.3.1 through 7.4.3.5 of NUREG-1520 (NRC, 2002).

5.3 STAFF REVIEW AND ANALYSIS

The information to support this review was obtained from the license application and "Watts Bar Nuclear Plant Fire Protection Report, Rev. 10," (FPR) dated January 27, 1998.

The fire protection review was performed relative to the guidance provided in NUREG-1520 (NRC, 2002) and is limited to the fuel handling areas shown in Figures 1.2-3, 1.2-4, and 1.2-8 of the Final Safety Analysis Report. The NRC's Office of Nuclear Reactor Regulation documented their evaluation of WBN-2 in regards to the applicable fire protection regulations and guidance for the safe operation of nuclear power reactors in NUREG-0847, "Safety Evaluation Report Related to the Operation of Watts Bar Nuclear Plant, Unit 2, Docket 50-391."

5.3.1 BUILDING CONSTRUCTION AND FACILITY DESIGN

The facility and its original fire protection systems were designed and constructed to industrial standards that were in effect at the time of construction. TVA commits to meeting the prevailing codes whenever facilities are expanded or modified. Facilities are generally noncombustible masonry or metal construction. Lightning protection is incorporated into the facility design. Facility exit routes are posted throughout and are unimpeded by physical security requirements. In addition, WBN-2 workers are trained in evacuation procedures, and periodic drills are conducted to verify the adequacy of egress.

5.3.2 PROCESS FIRE SAFETY

Within the Auxiliary Building, which is a Seismic Category I structure, new fuel bundles are unloaded in the Cask Unloading Area and are transferred for storage on racks within the New Fuel Storage Area. A Seismic Category I structure is designed and built to withstand the maximum potential earthquake stresses for the particular region where a nuclear plant is sited. The process itself utilizes methods and materials that have no fire safety concerns.

5.3.3 FIRE PROTECTION AND EMERGENCY RESPONSE

The fire protection equipment in the fuel handling area of the Auxiliary Building is common to both Units 1 and 2.

Firefighting equipment available during fuel receipt and movement for the fuel cask receipt area (Auxiliary Building, elevation 729) consists of the following:

1. A minimum of five 10-pound dry chemical fire extinguishers located in the cask receiving area and adjacent nitrogen storage area.
2. Two 1 1/2-inch hose stations equipped with 100 feet of hose and fog nozzles (ABC rated). One hose station is located in the cask fuel receipt area and the other is located in the adjacent nitrogen storage area. A fire pump, with a flow path to the referenced hose stations, is available.

Equipment available during fuel storage inside the new fuel storage vault and/or the spent-fuel storage pit (Auxiliary Building, elevation 757) consists of the following:

1. A minimum of four 10-pound dry chemical fire extinguishers located strategically on the refueling floor.
2. One 100-pound CO₂ or dry chemical wheeled extinguisher located in the area.
3. Two 1 1/2 inch hose connections equipped with 100 feet of hose and adjustable fog nozzles (ABC-rated). One hose station is located south of stairway No. 4, and the other is available from the 1 1/2 inch Siamese connection in the Unit 1 Reactor Building access room. A fire pump, with a flow path to the referenced hose stations, is available.

Site procedures for the maintenance and surveillance testing of the above-listed equipment, including fire pump, fire mains, standpipes, and hoses have been developed and will be performed as described in the FPR. In addition, the compensatory actions described in the FPR will be used should any of the listed fire equipment become unavailable.

Effective handling of fire emergencies is accomplished by trained and qualified emergency response personnel. The fire response organization is staffed and equipped for firefighting activities. The fire brigade is composed of a fire brigade leader and four fire brigade members. The fire brigade does not include the Shift Manager or other members of the minimum shift crew necessary for safe shutdown of the unit, nor any personnel required for other essential functions during a fire emergency. Additional support is available when needed through an agreement with a local fire department.

Training ensures that the fire brigades capability to combat fires is established and maintained. The training program consists of initial (classroom and practical) training and recurrent training, which includes periodic instruction, fire drills and annual fire brigade training.

Firefighting equipment is provided throughout the plant. Fire emergency procedures and pre-fire plans specify actions taken by the individual discovering the fire and by the emergency response organization. A specific pre-fire plan has been prepared for the fuel receipt and fuel storage areas. Discussion of this pre-fire plan is included in the periodic classroom instruction's training program provided for the emergency response team.

5.3.4 FIRE SAFETY MANAGEMENT

Combustibles are controlled to reduce the severity of a fire which might occur in a given area and to minimize the amount and type of material available for combustion. The use and application of combustible materials at WBN-2 are controlled utilizing the following methods:

1. Instructions/guidelines provided during general employee training/orientation programs.
2. The chemical traffic control program.
3. Periodic plant housekeeping inspections/tours by management and/or the plant fire protection organization.
4. Design/modification review and installation process.
5. Administrative procedures (e.g., Transient Combustible Control Program).

The use of ignition sources such as welding, flame cutting, thermite welding, brazing, grinding, arc gouging, torch applied roofing, and open flame soldering within safety-related areas are controlled through the approval and issuance of an ignition source permit. Permits are reviewed and approved by appropriate plant personnel. The ignition source permit is valid for one job. Job area inspections are performed and documented at the start of each shift where ignition source activities are being performed.

5.3.5 FIRE HAZARD ANALYSIS

As discussed above the Fire Hazards Analysis (FHA) is part of the FPR. The FHA results are documented on a fire area basis, broken down into separate discussions of classical fire protection features and safe shutdown analysis for each fire area. The FHA includes the following:

1. A summary of the evaluation performed to determine the adequacy of the fire protection features for each fire area.
2. A discussion of the ability to achieve safe shutdown in case of a fire in each fire area.

The fire hazards and safe shutdown evaluation were performed by qualified nuclear, mechanical, electrical, and fire protection engineers. The deviation requests and evaluations applicable to each fire area are also summarized.

Fire Hazards Analysis and Pre-Fire Plans conform to the applicable guidance provided in the National Fire Protection Association (NFPA) Standard 801, "Standard for Fire Protection for Facilities Handling Radioactive Materials," (NFPA, 2008).

5.4 EVALUATION FINDINGS

The NRC staff concluded that TVA's capabilities meet the acceptance criteria provided in Chapter 7 of NUREG-1520 (NRC, 2002). Given TVA's conformity with the NUREG-1520 (NRC, 2002) acceptance criteria on fire protection and their commitment to NFPA 801 (NFPA, 2008), the NRC staff determined that TVA's equipment, facilities, and procedures provide reasonable assurance that adequate fire protection for the proposed activities described in TVA's license

application, will be provided and maintained at WBN-2 to meet the safety requirements of 10 CFR 70.22 (a)(7) and 70.23 (a)(3)-(a)(4).

5.5 REFERENCES

(NFPA, 2008) National Fire Protection Association Standard 801, "Standard for Fire Protection for Facilities Handling Radioactive Materials," (NFPA, 2008).

(NRC, 1996) NUREG-0847, "Safety Evaluation Report Related to the Operation of Watts Bar Nuclear Plant, Units 1 and 2, Docket Nos. 50-390 and 50-391." (ADAMS Accession Number ML072060498).

(NRC, 2002) U.S. Nuclear Regulatory Commission, NUREG-1520, "Standard Review Plan for the Review of a License Application for a Fuel Cycle Facility," March 2002.

(TVA, 2009a) "Application for a Special Nuclear Material License For Watts Bar Nuclear Plant, Unit 2 in Accordance with 10 CFR 70, *Domestic Licensing of Special Nuclear Material*," November 12, 2009 (ADAMS Accession Number ML100120487).

(TVA, 2009b) "Supplement to Application for a Special Nuclear Material License for Watts Bar Nuclear Plant, Unit 2 in Accordance with 10 CFR 70, *Domestic Licensing of Special Nuclear Material*," November 30, 2009 (ADAMS Accession Number ML093370136).

6.0 EMERGENCY MANAGEMENT

Tennessee Valley Authority's (TVA's) Radiological Emergency Plan (REP) consists of two portions: (1) a site-independent Nuclear Power Radiological Emergency Plan (NP-REP) that is applicable to all TVA-licensed nuclear power reactors, and (2) a series of site-specific appendices for each of the TVA nuclear sites—Browns Ferry Nuclear Plant (BFN, Appendix A); Sequoyah Nuclear Plant (SQN, Appendix B); and Watts Bar (WBN, Appendix C). The TVA REP, including the WBN-specific, Appendix C (but omitting Appendices A, B and D), comprises the “emergency plans” for Watts Bar Nuclear Plant (WBN) as referred to in 10 CFR 50.34(b)(6)(v), 10 CFR 50.47(b), and 10 CFR Part 50, Appendix E. The generic NP-REP and the WBN-specific, Appendix C are collectively referred to in this Safety Evaluation Report as the “WBN REP.”

The purpose of reviewing the WBN REP is to determine if TVA has established adequate emergency management facilities and procedures to protect workers, the public and the environment related to the receipt, possession, inspection, and storage of special nuclear material (SNM) in the form of new fuel assemblies for the WBN-2 site. As part of the license application, TVA states that the proposed activities will utilize shared systems, structures, components and administrative controls currently in place supporting the operation of WBN-1. As a result, the majority of the emergency preparedness information contained or incorporated by reference in the license application has been previously submitted and reviewed by the U.S. Nuclear Regulatory Commission (NRC) in either the Final Safety Analysis Report (FSAR) or the REP. This information is included the TVA REP and its Appendices that provide emergency planning information specific to each of its three sites.

As part of the original licensing of the WBN site, NUREG-0847, “Safety Evaluation Report Related to the Operation of Watts Bar Nuclear Plant, Units 1 and 2,” Supplement 20, (ADAMS Accession No. ML072060498) concluded that the overall state of onsite and offsite emergency preparedness provides reasonable assurance that, pursuant to 10 CFR 50.47(a), adequate protective measures can and will be taken in the event of a radiological emergency at the WBN site.

6.1 REGULATORY REQUIREMENTS

The regulatory basis for the emergency management review is outlined in 10 CFR 70.22(i)(1)(ii) and 10 CFR 70.22(i)(3).

6.2 REGULATORY ACCEPTANCE CRITERIA

The acceptance criteria for the NRC's review of the Emergency Management Plan are outlined in Section 8.4.3 of NUREG-1520 (NRC, 2002).

6.3 STAFF REVIEW AND ANALYSIS

6.3.1 FACILITY DESCRIPTION

Sections 1 and 2 of the FSAR contain descriptions of the licensed activity, the facility and site, and the area near the site. The information provided includes:

1. a detailed description and arrangement of structures and components;

2. a detailed drawings of onsite and near offsite structures, roads, parking lots, site boundaries and water bodies located near the site;
3. a description of the area near the site, including industrial facilities and transportation; and
4. a general description of licensed activities conducted at the facility.

As stated above, TVA identified and provided a description of the facility. The information provided by TVA meets the guidance in Section 8.4.3.1.1 of NUREG-1520 (NRC, 2002) for new facilities as TVA identified and described the facility and site, the area near the site, and the licensed activities. Section 8.3.14 of this report further discusses that TVA will maintain compliance with the *Emergency Planning and Community Right-to-Know Act of 1986*, in accordance with 10 CFR 70.22(i)(3)(xiii). TVA's facility description is, therefore, acceptable.

6.3.2 ONSITE AND OFFSITE EMERGENCY FACILITIES

Sections 8.0 and C.6 of Appendix C to the WBN REP contains descriptive information regarding the emergency response equipment and facilities. A specific area (adjacent to the relay room) in the Control Building at elevation 755 feet is designated for use as the Technical Support Center (TSC). The room is provided with multiple, redundant communication capabilities to areas of the plant and external to the plant. This room is sufficiently shielded to ensure occupancy during an emergency and is designed to be continuously habitable during all radiological emergencies. All ventilating and air-conditioning facilities have redundant or backup systems. The emergency diesel generators will provide emergency power when there is a loss of normal AC power, and cooling water for the air-conditioning equipment is taken from the essential raw cooling water system.

The Operational Support Center (OSC) is located on Elevation 713 feet adjacent to the Radiation Protection Lab. The role of the OSC is to provide assembly areas for operations support personnel during an emergency situation which are under the supervision of the OSC Manager or a designated alternate. It contains emergency team briefing areas, and additional space provided in the adjacent hallway and adjoining rooms for staging, briefing and dispatching maintenance teams. The alternate OSC is located in the Outage Control Center, with additional space provided in the nearby Plant Assembly Room for staging, briefing and dispatching maintenance teams. The OSC is provided with telephone and radio communications. Respiratory protective devices, protective clothing, portable lighting, other protective equipment and tools are available, as needed.

The Central Emergency Control Center (CECC) is located in the TVA's Chattanooga Office Complex in Chattanooga, Tennessee. It is designed to house the CECC Director and his staff during an emergency situation. Included in the CECC are areas for the Plant Systems Assessment, Radiological Assessment, Information Staff and the TVA Operations Duty Specialist (ODS). The CECC is designed to serve as the central point for information collection, assessment and transfer during an emergency. The CECC is provided with direct communication links with State emergency response centers, other TVA emergency response organizations, the plant sites, the Joint Information Center, and offsite Federal and State organizations. The CECC performs the functions of an Emergency Operations Facility as described in NUREG-0737, Supplement 1, dated January 1983.

Section C.6.4 of Appendix C to the WBN REP discusses the monitoring systems used to initiate emergency measures as well as for continuing assessments, including onsite systems and equipment, and facilities and equipment for offsite monitoring.

Section 6.0 of the WBN REP describes the communications systems which include the emergency Telephone System, Paging System, Radio System and an offsite telephone communications network.

As stated above, TVA identified and provided a description of the onsite and offsite emergency facilities. The information provided by TVA meets the guidance in Section 8.4.3.1.2 of NUREG-1520 (NRC, 2002) for new facilities, as TVA identified and described the onsite and offsite facilities that could be relied on in an emergency. TVA's facility description of onsite and offsite emergency facilities is, therefore, acceptable.

6.3.3 TYPES OF ACCIDENTS

Section 15 of the WBN FSAR identifies a summary of postulated events that have potential radiological consequences. These events are divided into four categories of plant conditions in accordance with anticipated frequency of occurrence and potential radiological consequences to the public. The four categories are as follows:

- Condition I: Normal Operation and Operational Transients
- Condition II: Faults of Moderate Frequency
- Condition III: Infrequent Faults
- Condition IV: Limiting Faults

The basic principle applied in relating design requirements to each of the conditions is that the most probable occurrences should yield the least radiological risk to the public and those extreme situations having the potential for the greatest risk to the public shall be those least likely to occur.

As stated above, TVA identified and provided a description of the types of accidents identified in the FSAR for which protective actions may be needed. The information provided by TVA meets the guidance in Section 8.4.3.1.3 of NUREG-1520 (NRC, 2002) for new facilities, as TVA identified and described the types of accidents that may require protective actions. TVA's description of the types of accidents is, therefore, acceptable.

6.3.4 CLASSIFICATION OF ACCIDENTS

The WBN REP established Emergency Action Levels (EALs) corresponding with NUMARC/NESP-007, "Methodology for Development of Emergency Action Levels." Section 4.0 and Appendix C to the WBN REP explains the system used to classify an emergency consistent with Section IV.C of Appendix E to 10 CFR 50, and defines these types of incidents in Section 4.1 of the WBN REP. TVA established the criteria for recognizing, characterizing and declaring each emergency classification as applicable. Section 3.2 and 3.4 of the WBN REP provide classification analysis techniques for arriving at the appropriate classification level. TVA provides that planning is coordinated with State and local agencies to ensure that the classification system used is compatible with their systems. Sections C.2 and C.4 of Appendix C to the WBN REP provides examples of site-specific incidents and the emergency classification that will be declared for each event

As stated above, TVA identified and provided a description of the emergency plan classification system. The information provided by TVA meets the guidance in Section 8.4.3.1.4 of NUREG-1520 (NRC, 2002) for new facilities, as TVA identified and described the classification system, the classification that is expected for each accident identified in the emergency plan, the emergency action levels to address events occurring in the spent fuel pool area, and designates the personnel positions and alternates with responsibility for accident classifications. TVA's description of the classification of accidents is, therefore, acceptable.

6.3.5 DETECTION OF ACCIDENTS

Section C.6 of Appendix C to the WBN REP explains the methods and systems available to detect accidents at the facility, including:

1. Environmental Data System
2. Seismic Monitors
3. Radiological Monitors
4. Process Monitors (radiological and non-radiological)
5. Area Radiation Monitors
6. Fire Protection Systems
7. Environmental Monitors

A variety of methods must be used to identify emergency situations and to categorize them. Emergencies can be caused by natural disasters such as, tornadoes or floods; hazards such as, aircraft crashes, releases of toxic gases, or breaches of plant security; as well as by conditions involving plant systems directly. The initiating conditions used for recognizing and declaring the emergency classes are based on specific, measurable values or observable conditions defined as EALs. These can be combinations of specific instrument readings (including their rates of change), annunciator warnings, time periods certain conditions exist, etc. The instrument readings and parameters required for determination of these EALs are detailed in the site Emergency Plan Implementing Procedures (EPIPs). These EALs are used as thresholds for determining the emergency classifications.

As stated above, TVA identified and provided a description of the detection of accidents. The information provided by TVA meets the guidance in Section 8.4.3.1.5 of NUREG-1520 (NRC, 2002) for new facilities, as TVA identified and described the means for detecting an accident, the means of detecting any release of radioactive material or hazardous chemicals, the means of alerting the operating staff, and the anticipated response of the operating staff. TVA's description of the detection of accidents is, therefore, acceptable.

6.3.6 MITIGATION OF CONSEQUENCES

Sections 8.0 and C.5 of Appendix C to the WBN REP describe actions, facilities and equipment that will be used to mitigate the consequences of accidents at the facility. TVA provides that the on-shift staffing and augmenting personnel are capable of responding to a radiological emergency and support to the Control Room operations crew during an emergency. This has

been demonstrated with WBN-1 performance in actual emergency events, periodic emergency exercises, and in periodic NRC routine and supplemental inspections. The person primarily responsible for mitigation of an emergency is the Site Emergency Director (SED). Upon declaration of an emergency, the Shift Manager initially fills the position of SED and directs emergency response from the Control Room. This position is transferred to the TSC when that center is activated. Once the TSC is activated, the SED and the TSC can provide technical support to the Control Room as part of their overall response to the emergency. The OSC area(s) will be under the control of the SED in the Control Room until the TSC is staffed and will provide damage assessment, maintenance and repair services, and necessary technical services. Communications will be available to the TSC. The OSC will also establish and maintain appropriate communications with any teams that may enter the plant for assessment or repair.

TVA provides, in Section C.7 of Appendix C to the WBN REP, a list of emergency procedures that have direct application to the corrective actions or the scope of potential situations within each emergency classification. These procedures are designed to guide the actions of personnel to correct or mitigate the situation early and as close to the source of the problem. Specific corrective or mitigative actions within applicable emergency procedures may prevent or significantly reduce a potential release of radioactive material, provide for prompt fire control, and/or ensure timely damage control and recovery.

As stated above, TVA identified and provided a description of the mitigation of consequences. The information provided by TVA meets the guidance in Section 8.4.3.1.6 of NUREG-1520 (NRC, 2002) for new facilities, as TVA identified and described the measures and equipment to be used for safe shutdown, and mitigating the consequences to workers onsite and offsite, as well as the public offsite. TVA's description of the mitigation of consequences is, therefore, acceptable.

6.3.7 ASSESSMENT OF RELEASES

Sections 9.0 and C.6 of Appendix C to the WBN REP explains the systems and equipment available for assessing radiological conditions. In-plant accident assessment actions are carried out by the plant's emergency staff to properly characterize and classify the accident, determine the actual or potential radioactivity releases, and determine if there has been any effect on plant personnel or a threat to the public.

TVA provides that assessment methodology consists of actions carried out through plant operating procedures, as well as the EIPs. At the onset of an accident, plant operating procedures (normal, abnormal, and emergency) assist the plant operator and SED in identifying the cause of the accident; actions necessary to control the accident; radioactivity release rate, if any; and in-plant radiation levels. The EIPs assist the SED in: (1) identifying and reassessing accident classification, (2) determining the need for offsite protective actions, (3) determining the need for plant area evacuation, (4) initiating activation of onsite and offsite emergency organizations, (5) directing the utilization of needed medical and/or decontamination facilities, and (6) implementing predetermined security and access control plans. Each of the above-mentioned activities is described within the EIPs, as applicable, for a given situation. The distinct breakdown of assessment actions into operating procedures and implementing procedures is necessary since some assessment actions are necessarily carried out prior to identification or classification of an emergency. The procedures to ensure that accidents are properly evaluated, timely notifications are made, and assessment and protective actions are

performed are compiled in the EIPs. These procedures are summarized in the Appendix C. Systems and equipment used for assessment have been discussed previously in Section 8.3.5 of this evaluation.

As stated above, TVA identified and provided a description of the assessment of releases. The information provided by TVA meets the guidance in Section 8.4.3.1.7 of NUREG-1520 (NRC, 2002) for new facilities, as TVA identified and described the procedures to be used to assess the release of radioactive material incident to the processing of licensed material. TVA's description of the assessment of releases is, therefore, acceptable.

6.3.8 RESPONSIBILITIES

Sections 3.0 and C.5 of Appendix C to the WBN REP describes the emergency response organization and administration.

The onsite organization is comprised of the SED and technical staff located in the TSC, a Control Room staff of operations personnel, and additional support personnel located in the OSC. The organization is responsible for the onsite response to an emergency condition. All activities onsite will be directed by the SED and will include such functions as Control Room operations, technical assessment, accident mitigation analysis, onsite radiation surveys and dose tracking for site personnel. Under normal conditions, the Site Vice President is in charge of all activities at the site; and the Plant Manager is responsible for the safe, efficient operation of the plant. The person primarily responsible for mitigation of an emergency is the SED. Upon declaration of an emergency, the SM initially fills the position of SED and directs emergency response from the Control Room. This position is transferred to the TSC when that center is activated. Once the TSC is activated, the SED and the TSC can provide technical support to the Control Room as part of their overall response to the emergency.

The SED is responsible for directing onsite accident mitigation activities; consulting with the CECC Director and Site Vice President on significant events and their related impacts; protective actions; coordinating accident mitigation actions with the NRC; makes final decision on personnel entrance to radiologically hazardous areas when the Radiation Protection Superintendent recommends against the entry; and initiating long-term, 24-hour-per-day accident mitigation operations.

The SED makes recommendations for protective actions (if necessary) to the State and local agencies through the ODS prior to the CECC being staffed (this responsibility can be transferred only to the CECC Director). The SED is also responsible for determining the emergency classification as well as the approval of emergency dose authorizations for personnel under his direction and control (these responsibilities cannot be delegated).

The offsite emergency organization is designated as the CECC Staff. The CECC staff is comprised of a CECC Director, a supporting group of technical assistants and representatives of other TVA organizations. The CECC Director and supporting technical assistants report to the CECC during an emergency as required. Other TVA organizations will send representatives to the CECC as requested by the CECC Director. The CECC is responsible for directing and coordinating the overall TVA response to an emergency condition. Functions such as offsite radiological monitoring and dose assessment, public information, State and local government coordination, and additional plant assessment are handled by the CECC—relieving the onsite organization of the many peripheral duties necessary for the successful emergency response.

Implementing procedures have been developed for the CECC to ensure that accidents are properly evaluated, timely notifications are made, and assessment and protective actions are performed. These procedures are compiled in the Section 9.2.

Section 16.5 and Appendix E to the WBN REP provides the local offsite assistance to the facility for fire, emergency medical services and local law enforcement. Letters of Agreement have been established with the local response organizations, and State and local authorities are maintained in Appendix E to the WBN REP.

As stated above, TVA identified and provided a description of responsibilities. The information provided by TVA meets the guidance in Section 8.4.3.1.8 of NUREG-1520 (NRC, 2002) for new facilities, as TVA identified and described the emergency response organization and administration that ensure effective planning, implementation, and control of emergency preparedness activities. TVA's description of responsibilities is, therefore, acceptable.

6.3.9 NOTIFICATION AND COORDINATION

Sections 7.0, 8.5, 10.2, 16.5 and C.6 of Appendix C to the WBN REP provide information related to the notification of State and local agencies, and the public.

Section 7.0 discusses that the emergency public information and education is to ensure timely distribution of accurate information during an emergency. The program also provides education to the public located within the 10-mile Emergency Planning Zone on emergency plans. The program also provides for TVA to coordinate emergency information with non-TVA agencies that have a primary response role prior to its release to the public or news media.

Section 8.5 provides that the alert and notification system networks consist of fixed sirens and tone-alert radios which are under the control of the State or local Emergency Management Agencies. The systems are designed to provide warning within 15 minutes to the population within 10 miles of the plants.

Section 10.2 provides that should an event be initially classified as a General Emergency, the SED has the responsibility to determine an initial protective action for recommendation to State and local government authorities. A logic diagram is provided in the EPIPs as a decisional aid to facilitate this recommendation. After the CECC is staffed, the responsibility to recommend protective action is transferred to the CECC Director. The CECC Plant Assessment Manager will provide an assessment of actual and/or projected plant conditions. The Radiological Assessment Manager will provide an assessment of actual and/or projected radiological conditions offsite. The Radiological Assessment Manager will provide a recommendation for a specific protective action. The CECC Director will evaluate the recommendation from his staff and make a recommendation to the State authorities. Although TVA may recommend protective actions to these agencies, the State and local authorities are responsible for deciding if any actions are needed, and what they should be.

Sections 16.5, C.6 of Appendix C, and Appendix E to the WBN REP, respectively, provides a listing of agreements or contracts maintained for services by outside organizations during an emergency.

As stated above, TVA identified and provided a description of notification and coordination. The information provided by TVA meets the guidance in Section 8.4.3.1.9 of NUREG-1520 (NRC, 2002) for new facilities, as TVA identified and described the emergency notification

procedures that enable the organization to correctly classify emergencies, notify emergency response personnel, and initiate or recommend appropriate actions in a timely manner. TVA's description of notification and coordination is, therefore, acceptable.

6.3.10 INFORMATION TO BE COMMUNICATED

Sections 5.0 and 7.0 of the WBN REP provide an adequate description of the type of information to be given to offsite response organizations during an emergency. These sections describe the type of information to be provided and the timeframes for updates, as appropriate.

TVA provides that hourly, or more often as necessary, the State agencies are updated—through the CECC—on appropriate plant status and environmental conditions as follows:

1. Class of emergency
2. Type of actual or projected release (airborne, waterborne, surface spill) and estimated duration/impact times
3. Estimate of quantity of radioactive material released or being released and the height of release
4. Chemical and physical form of released material, including estimates of the relative quantities and concentration of noble gases, iodines, and particulates
5. Prevailing weather (wind velocity, direction, temperature, atmospheric stability data, form of precipitation, if any)
6. Actual or projected doses at site boundary
7. Projected dose rates and integrated dose at about 2, 5, and 10 miles, including sector(s) affected
8. Estimate of any surface spill radioactive contamination
9. Emergency response actions underway
10. Request for any needed onsite support by offsite organizations
11. Prognosis for worsening or termination of event based on plant information

As stated above, TVA identified and provided a description of information to be communicated. The information provided by TVA meets the guidance in Section 8.4.3.1.10 of NUREG-1520 (NRC, 2002) for new facilities, as TVA identified and described the use of a standard reporting checklist, the types of information to be provided, a description of preplanned protective action recommendations, the offsite officials to be notified, and the recommended actions to be implemented by offsite organizations for each accident treated in the emergency plan. TVA's description of the information to be communicated is, therefore, acceptable.

6.3.11 TRAINING

Section 15.0 of the WBN REP provides a description of the training TVA will provide to workers on how to respond to an emergency. Site organizations will provide training in emergency procedures to all permanent plant personnel and applicable non-plant personnel, in accordance with plant training procedures. For personnel with specific duties involving the WBN REP, this training will consist of initial training classes and annual retraining to maintain familiarity with the features of the REP. The site emergency preparedness group provides training to key site responders in the TSC, OSC, and the SED. The Safety and Emergency Response Training Academy provides emergency medical care training to medical personnel, and selected nuclear power personnel stationed at the sites. Successful completion of training, commensurate with their duties, allows personnel to fulfill the role of medical care provider on the station Medical Emergency Response Team.

Training and annual retraining is provided to local plant support agencies (security, fire, ambulance, and hospital personnel), who may be involved with direct support of the site during an emergency.

As stated above, TVA identified and provided a description of notification and coordination. The information provided by the applicant meets the guidance in Section 8.4.3.1.11 of NUREG-1520 (NRC, 2002) for new facilities, as TVA identified and described the topics and general content of the training programs, the administration of the training programs, the training provided for the use of protective equipment, the training program for onsite personnel who are not members of the emergency response organizations, and special instructions and orientation tours provided for offsite organizations. TVA's description of training is, therefore, acceptable.

6.3.12 SAFE SHUTDOWN (RECOVERY AND FACILITY RESTORATION)

Section 13.0 of the WBN REP describes the general plan and guidelines for recovery operations related to operations of the Part 50 nuclear power plant. There are no processes associated with the receipt, possession, inspection, and storage of SNM in the form of fresh fuel assemblies requested in the Part 70 license application that would require safe shutdown. Therefore, Section 8.4.3.1.12 of NUREG-1520 (NRC, 2002) and 10 CFR 70.22 (i)(3)(xi) are not applicable for the proposed activities.

6.3.13 EXERCISES AND DRILLS

Section 14.0 of the WBN REP provides adequate provisions for drills, exercises, and biennial exercises that are used to test the timing and effectiveness of procedures; to test emergency equipment; and to ensure that all emergency response personnel are familiar and proficient with their duties. Areas evaluated include the appropriateness of the plan; the emergency procedures, equipment, facilities, personnel training; and overall response effectiveness.

TVA will ensure that adequate emergency response capabilities are maintained during the interval between biennial exercises by conducting drills, including at least one drill involving a combination of some of the principal functional areas of the onsite emergency response capabilities. The principal functional areas of emergency response include activities such as management and coordination of emergency response, accident assessment, protective action decisionmaking, and plant system repair and corrective actions.

As stated above, TVA identified and provided a description of exercises and drills. The information provided by the applicant meets the guidance in Section 8.4.3.1.13 of NUREG-1520 (NRC, 2002) for new facilities, as TVA identified and described the conduct of drills and exercises in a manner that demonstrates the capability of the organization to plan and perform an effective response to an emergency. TVA's description of training is, therefore, acceptable.

6.3.14 EMERGENCY PLANNING AND COMMUNITY RIGHT-TO-KNOW ACT OF 1986

TVA will maintain compliance with the *Emergency Planning and Community Right-to-Know Act of 1986*, in accordance with 10 CFR 70.22(i)(3)(xiii). This is accomplished by providing chemical inventory reports, providing notifications when new chemicals are brought onsite in certain quantities, and reporting releases of these substances to the appropriate agencies.

This meets the requirements of 10 CFR 70.22(i)(3)(i).

6.4 EVALUATION FINDINGS

The NRC staff evaluated the WBN REP for the facility. TVA has an established REP for responding to the radiological hazards resulting from a release of radioactive material relating to the receipt, possession and storage of SNM in the form of new fuel assemblies for the WBN- 2 in accordance with 10 CFR 70.22(i)(1)(ii). The NRC staff reviewed the WBN REP with respect to 10 CFR 70.22(i)(1)(ii), 70.22(i)(3), and the guidance in Section 8.4.3 of NUREG-1520 (NRC, 2002). The NRC staff concluded that the WBN REP is adequate to demonstrate compliance with the regulatory requirements, in that: (1) the facility is properly configured to limit releases of radioactive materials in case of an accident; (2) a capability exists for measuring and assessing the significance of accidental releases of radioactive materials; (3) appropriate emergency equipment and procedures are provided on-site to protect workers against radiological hazards that might be encountered after an accident; (4) a system has been established to notify Federal, State and local government agencies, and to recommend appropriate protective actions to protect members of the public; and (5) necessary recovery actions are established to return the facility to a safe condition after an accident.

6.5 REFERENCES

(NRC, 1983) U.S. Nuclear Regulatory Commission, NUREG-0737, Supplement 1, "Clarification of TMI Action Plan Requirements."

(NRC, 1996) NUREG-0847, "Safety Evaluation Report Related to the Operation of Watts Bar Nuclear Plant, Units 1 and 2," Supplement 20 (ADAMS Accession Number ML072060498).

(NRC, 1992) U.S. Nuclear Regulatory Commission, Regulatory Guide 3.67, "Standard Format and Content for Emergency Plans for Fuel Cycle and Materials Facilities."

(NRC, 2002) U.S. Nuclear Regulatory Commission, NUREG-1520, "Standard Review Plan for the Review of a License Application for a Fuel Cycle Facility," March 2002.

(TVA, 2009) November 12, 2009 letter from R. M. Krich to the U.S. NRC, "Application for a Special Nuclear Material License for Watts Bar Nuclear Plant, Unit 2 in Accordance with 10 CFR 70, 'Domestic Licensing of Special Nuclear Material'."

(TVA, 2010) September 17, 2010 letter from M. Bajestari to the U.S. NRC, "Watts Bar Nuclear Plant (WBN) Unit 2 – Response to NRC Question Regarding WBN, Unit 2 Emergency Plan (TAC No. ME0853)" (ADAMS Accession Number ML102600474).

7.0 ENVIRONMENTAL PROTECTION

7.1 REGULATORY REQUIREMENTS

To be considered acceptable, Tennessee Valley Authority (TVA) must satisfy the following regulatory requirements regarding environmental protection:

1. 10 CFR Part 20 specifies the effluent control and treatment measures necessary to meet the dose limits and dose constraints for members of the public specified in Subparts B, D, and F; the survey requirements of Subpart F; the waste disposal requirements of Subpart K; the records requirements of Subpart L; and the reporting requirements of Subpart M.
2. 10 CFR 70.22(a)(7) states that the application shall contain a description of the equipment and facilities that will be used by TVA to protect health and minimize danger to life or property.
3. 10 CFR 70.22(a)(8) states that the application shall contain procedures to protect health and minimize danger to life or property (such as procedures for personnel monitoring and waste disposal, etc.)
4. 10 CFR 70.23(a)(3) and (a)(4) specify, in part, that an application for the possession and use of SNM will be granted provided that, among other things, the applicant's equipment and facilities are adequate to protect health and minimize danger to life or property, and that the applicant's proposed procedures to protect health and minimize danger to life or property are adequate.

7.2 REGULATORY ACCEPTANCE CRITERIA

The acceptance criteria for the NRC's review of TVA's Environmental Protection Program are outlined in Section 9.4.3.2 of NUREG-1520 (NRC, 2002).

7.3 STAFF REVIEW AND ANALYSIS

Title 10 of the *Code of Federal Regulations* (10 CFR) 20 Subpart B requires each licensee to develop, document, and implement a Radiation Protection Program commensurate with the scope and extent of licensed activities and sufficient to ensure compliance with the provisions of Part 20. Subpart B also requires the licensee to use, to the extent practicable, procedures and engineering controls based upon sound radiation protection principles to achieve occupational doses and doses to members of the public that are as low as is reasonably achievable (ALARA).

TVA documented and implemented a Radiation Protection Program commensurate with the receipt, possession, inspection, and storage of Watts Bar Nuclear Plant, Unit 2 (WBN-2) fresh fuel; as demonstrated and implemented in their program for similar activities with Watts Bar Nuclear Plant, Unit 1 (WBN-1) fresh fuel.

An ALARA committee, composed primarily of supervisory personnel, would be established to periodically review the effectiveness of implementation of the ALARA program applied to effluent controls and monitoring. Reviews would include the site performance against ALARA goals, employee suggestions to implement ALARA, ALARA planning documents, and trends

(e.g., stack monitoring results, liquid effluent monitoring data, environmental monitoring data). The Plant Manager or Assistant Plant Manager would normally serve as chairman of the site ALARA committee.

The NRC staff reviewed the ALARA commitment and procedures for the WBN-2 site and finds them sufficient to meet the public dose limit requirements in 10 CFR Part 20 and are, therefore, acceptable.

Title 10 of the *Code of Federal Regulations* (10 CFR) 20 Subpart D requires licensees to conduct operations so that the total effective dose equivalent to individual members of the public from the licensed operations does not exceed 0.1 rem (1 millisievert) in a year and that the dose in any unrestricted area from external sources does not exceed 0.002 rem (0.02 millisievert) in any 1 hour. The licensee must make surveys in unrestricted areas and controlled areas and radioactive materials in effluents released to unrestricted and controlled areas to demonstrate compliance with the dose limits by one of two methods: (1) demonstrating that the Total Effective Dose Equivalent to the individual likely to receive the highest dose from the licensed operation does not exceed the dose limits or, (2) demonstrating that the annual average concentration of radioactive material released in gaseous and liquid effluents at the boundary of the restricted area do not exceed the values specified in Table 2 of Appendix B to Part 20, and that the dose from external sources to an individual continuously present in an unrestricted area would not exceed 0.002 rem (0.02 mSv) in an hour and 0.05 rem (0.5 mSv) in an hour.

TVA has chosen to use the first method to demonstrate compliance with the dose limits for the nuclear reactors. TVA's methodology is described in the Offsite Dose Calculation Manual (TVA 2010). TVA will also use it for offsite dose evaluation for WBN-2, including the activities described in the Part 70 license application. The NRC staff reviewed the Offsite Dose Calculation Manual and determined that the effluent controls and monitoring described in the Manual, and TVA's methodology for calculating doses to the public from operation of WBN-1, are adequate to protect the public and the environment from any potential releases from storage of the fresh fuel, in accordance with Subpart D of 10 CFR Part 20, Radiation Dose Limits for Individual Members of the Public. The fresh fuel is not irradiated and does not contain fission or activation products, and is sealed in cladding. The NRC staff evaluated the proposed activities in the Part 70 license application and concludes that receipt, possession, inspection, and storage of the fresh fuel assemblies do not result in any credible accident scenarios that could release radioactive material to the environment. Therefore releases are not likely to occur during normal handling.

Section 9.2.2 of the Part 70 license application incorporates by reference Section 11.4 of the Watts Bar Nuclear Plant Final Safety Analysis Report (FSAR) (TVA, 2009a). This FSAR section describes the Auxiliary Building process and effluent monitoring and sampling system. It includes spent fuel pool accident radiation monitors and auxiliary building vent monitor assembly. In Section 9.2 of the license application, TVA described the effluent and environmental controls and monitoring associated with the receipt, possession, inspection, and storage of the fresh fuel assemblies. These activities will not produce any gaseous effluents.

Environmental monitoring requirements for liquid effluents are included in the Watts Bar Nuclear Plant National Pollutant Discharge Elimination System (NPDES) permit. TVA provides an annual, non-radiological environmental operating report that contains a summary of the NPDES report and other non-routine and special biological monitoring reports. Receipt, possession, inspection and storage of the fresh fuel assemblies are not expected to produce any liquid effluents.

In Chapter 3 of the license application, TVA described the analyses of four accident scenarios. None of these accidents involving fresh fuel have the potential to produce environmental effluents. In the license application, TVA also committed to comply with 10 CFR 50.68, "Criticality Accident Requirements." In the rulemaking for 10 CFR 50.68 (62 FR 62835, direct final rule with opportunity to comment; and 63 FR 63127, final rule), the U.S. Nuclear Regulatory Commission (NRC) determined that a fuel-handling accidental criticality at a commercial nuclear power plant is extremely unlikely. Therefore, no additional effluent controls or monitoring beyond those current used for WBN-1 are necessary to mitigate consequences of a criticality accident involving the receipt, possession, inspection, and storage of the fresh fuel assemblies at WBN-2.

The NRC staff determined that the gaseous and liquid effluent controls provided in the Auxiliary Building are adequate to control any potential releases from the stored fresh fuel in accordance with the public dose limits in 10 CFR 20 Subpart D. The effluent monitoring and surveys that will be performed by TVA during receipt, possession, inspection, and storage of the fresh fuel assemblies are adequate to detect any such releases in time to provide reasonable assurance that the annual dose limits to the public and the environment will not be exceeded during normal operations.

7.4 EVALUATION FINDINGS

The NRC staff reviewed the process and effluent control, monitoring and sampling systems; the environmental monitoring actions; the ALARA provisions; and the methodology for calculating public doses, and determined that they are adequate to control, detect, and measure any potential effluents from the fresh fuel receipt, possession, inspection, and storage; and are acceptable. Therefore, the proposed activities meet the requirements in 10 CFR Part 20, Subparts B, D, F, K, L, and M; 10 CFR 70.22(a)(7) and (a)(8); and 10 CFR 70.23(a)(3) and (a)(4).

The NRC staff prepared an Environmental Assessment (EA) for the proposed license and reached a finding of no significant impact (FONSI). The draft EA was shared with the State of Tennessee; the State had no comments on the draft EA. The EA and FONSI were published in the *Federal Register* on June 13, 2011 (76 FR 34273).

7.5 REFERENCES

(NRC, 2002) U.S. Nuclear Regulatory Commission, NUREG-1520, "Standard Review Plan for the Review of a License Application for a Fuel Cycle Facility," March 2002.

(TVA, 2009a) November 12, 2009, letter from R. M. Krich to the U.S. NRC, "Application for a Special Nuclear Material License for Watts Bar Nuclear Plant, Unit 2 in Accordance with 10 CFR 70, 'Domestic Licensing of Special Nuclear Material'." (ADAMS Accession Number ML100120487).

(TVA, 2009b) April 30, 2009, letter from M. Bajestani to U.S. NRC, "Watts Bar Nuclear Plant (WBN) – Unit 2 - Final Safety Analysis Report (FSAR), Amendment 93" (ADAMS Accession Number ML091400067).

(TVA, 2010) April 29, 2010, letter from R. M. Krich to U.S. NRC, "Enclosure 1-Watts Bar Nuclear Plant, 2009 Annual Radioactive Effluent Release Report" and "Offsite Dose Calculation Manual, Revision 22" (ADAMS Accession Number ML102080384).

(NRC, 2011) U.S. Nuclear Regulatory Commission, "Environmental Assessment and Finding of No Significant Impact for Special Nuclear Material License Application from Tennessee Valley Authority for Watts Bar Nuclear Plant, Unit 2, Spring City, Tennessee," (ADAMS Accession Number ML103430326).

8.0 DECOMMISSIONING

The proposed activities involve the receipt, possession, inspection and storage of fresh fuel assemblies in the form of sealed SNM. The Part 70 license being issued is thus not of the type for which a decommissioning funding plan is required under the requirements in 10 CFR 70.25.

9.0 MATERIAL CONTROL AND ACCOUNTING

9.1 REGULATORY REQUIREMENTS

The U.S. Nuclear Regulatory Commission's (NRC's) staff reviewed Tennessee Valley Authority's (TVA) application for a license to receive, possess, inspect, and store special nuclear material (SNM) in the form of fresh fuel assemblies at its Watts Bar Nuclear Plant, Unit 2 (WBN-2) facility. Currently, TVA has a construction permit for WBN-2 pursuant to Title 10 Part 50, and WBN-2 is co-located with the operating WBN-1 reactor. In accordance with 10 CFR 74.31(a)-(b), licensees at sites on which a reactor is authorized to operate are not subject to the requirement to submit a Fundamental Nuclear Material Control Plan. TVA must still satisfy other 10 CFR Part 74 requirements regarding material control and accounting (MC&A).

9.2 REGULATORY ACCEPTANCE CRITERIA

TVA's MC&A program for its WBN-2 facility must meet the recordkeeping requirements specified in 10 CFR Part 74.19(a)-(c), which are summarized as follows:

1. maintain records showing the receipt, inventory (including location and unique identity), acquisition, transfer, and disposal of all SNM possessed;
2. establish, maintain, and follow written MC&A procedures sufficient to account for all SNM possessed under license; and
3. conduct physical inventories of all SNM possessed at least every 12 months.

TVA's MC&A program for its WBN-2 facility is also subject to the MC&A reporting requirements in 10 CFR 74.11, 74.13, and 74.15, which are summarized as follows:

1. 74.11: Notification to the NRC Operations Center within 1 hour of discovery of any loss or theft or other unlawful diversion of SNM;
2. 74.13: Within 60 calendar days of beginning the annual physical inventory, complete and submit in computer-readable format Material Balance Reports concerning all SNM in its possession; and
3. 74.15: Within 10 calendar days of receiving any SNM, complete in computer-readable format a Nuclear Material Transaction Report.

9.3 STAFF REVIEW AND ANALYSIS

The WBN-2 application for an SNM license was received on November 12, 2009, and included Enclosure 3: Special Nuclear Material Control Summary. By letter dated, May 10, 2010, the staff sent a request for additional information (RAI) to TVA; and by letter dated July 30, 2010, TVA responded to the RAIs. The NRC's staff reviewed the MC&A program procedures, provided by TVA on July 30 that will be used for SNM control, accounting and reporting.

Listed below are TVA's written procedures for the MC&A program as required in 10 CFR Part 74:

1. O-PI-RXE-1.0, "Annual Special Nuclear Material Inventory"
2. O-SI-79-1, "Verification of Fuel Storage Configurations"
3. FHI-1, "Receiving, Returning, Inspecting and Storing New Fuel and Inserts"
4. NFTP, "Nuclear Fuel Database Updates and Special Nuclear Material Reporting"
5. NFTP-113, "Spent Fuel Management"
6. SPP-3.5, "Regulatory Reporting Requirements"
7. SPP-5.8, "Special Nuclear Material Control"
8. TI-7.006, "Preparing Special Nuclear Material Transfer Forms"

TVA provided a List of Regulatory Commitments in the July 30, 2010, letter. In its letter, dated January 25, 2011, TVA indicated that procedure FHI-1, "Receiving, Returning, Inspecting, and Storing New Fuel and Inserts," was revised to include WBN-2. TVA clarified that there were no technical changes to the content of the procedure. In the same letter, TVA indicated that their computer system did not require any modifications to include the SNM that will be brought onsite for WBN-2.

9.4 EVALUATION FINDINGS

Based on the NRC staff's review of the license application and MC&A procedures, the NRC staff determined that TVA provided adequate information pertaining to the MC&A program to control and account for SNM at the WBN-2 facility in accordance with the requirements in 10 CFR 74.11, 74.13, 74.15, and 74.19 (a)-(c).

9.5 REFERENCES

(TVA, 2009a) "Application for a Special Nuclear Material License For Watts Bar Nuclear Plant, Unit 2 in Accordance with 10 CFR 70, *Domestic Licensing of Special Nuclear Material*," November 12, 2009 (ADAMS Accession Number ML100120487).

(TVA, 2009b) "Supplement to Application for a Special Nuclear Material License for Watts Bar Nuclear Plant, Unit 2 in Accordance with 10 CFR 70, *Domestic Licensing of Special Nuclear Material*," November 30, 2009 (ADAMS Accession Number ML093370136).

(TVA, 2010) July 30, 2010, letter from R. M. Krich to the U.S. NRC, "Response to Request for Additional Information Regarding the Safety Evaluation Report for 10 CFR 70 License Application for Watts Bar Nuclear Plant, Unit 2 (TAC No. L32918)" (ADAMS Accession Number ML103570133).

(TVA, 2011) January 25, 2011, letter from M. Bajestani to the U.S. NRC, "Watts Bar Nuclear Plant (WBN), Unit 2 - Submittal Concerning Procedures for Unit 2 Special Nuclear Material (TAC No. L32918)," (ADAMS Accession Number ML110280191).

10.0 PHYSICAL PROTECTION AND PHYSICAL SECURITY

10.1 REGULATORY REQUIREMENTS

TVA is proposing the use of the site-wide Physical Security Plan (PSP) previously approved for Unit 1 to ensure the security of the SNM for WBN-2 to be held under the Part 70 license. The PSP was evaluated with respect to the requirements in 10 CFR 73.55, "Requirements for Physical Protection of Licensed Activities in Nuclear Power Reactors Against Radiological Sabotage."

The provisions of 10 CFR 73.55 (a)(4) require applicants, for an operating license under 10 CFR Part 50, to implement the requirements of this section before the fuel is allowed onsite in the protected area (PA).

The provisions of 10 CFR 73.55(a)(5) state that WBN-2, holding a current construction permit under the provisions of 10 CFR Part 50, shall meet the requirements in 10 CFR 73.55 (a) through (r) as applicable to operating nuclear power reactor facilities.

10.2 REGULATORY ACCEPTANCE CRITERIA

Regulatory guidance documents, technical reports, accepted industry codes and standards that an applicant may apply to meet regulatory requirements include, but are not limited to the following:

- Regulatory Guide 5.7, "Entry/Exit Control for Protected Areas, Vital Areas, and Material Access Areas," Revision 1, May 1980.
- Regulatory Guide 5.12, "General Use of Locks in the Protection and Control of Facilities and Special Nuclear Materials," November 1973.
- Regulatory Guide 5.44, "Perimeter Intrusion Alarm Systems," Revision 3, October 1997.
- Regulatory Guide 5.59, "Standard Format and Content for a Licensee Physical Security Plan for the Protection of Special Nuclear Material of Moderate or Low Strategic Significance," Revision 1, February 1983.
- Regulatory Guide 5.62, "Reporting of Safeguards Events," Revision 1, November 1987.
- Regulatory Guide 5.65, "Vital Area Access Controls, Protection of Physical Protection System Equipment and Key and Lock Controls," September 1986.
- Regulatory Guide 5.66, "Access Authorization Programs For Nuclear Power Plant" Revision 1," Revision 1, July 2009.
- Regulatory Guide 5.68, "Protection Against Malevolent use of Vehicles at Nuclear Power Plants," August 1994.
- Regulatory Guide 5.75, "Training and Qualification of Security Personnel at Nuclear Power Reactor Facilities," June 2009.
- Regulatory Guide 5.77, "Insider Mitigation Program," March 2009.

- NUREG-0800, “Standard Review Plan,” Chapter 13, Section 13.6.1, Revision 1, June 15, 2010, “Physical Security – Combined License and Operating Reactors.”
- NUREG 0847, “Safety Evaluation Report related to the operation of WBN Nuclear Plant, Units 1 and 2,” June 1982 and Supplemental Safety Evaluation Reports (SSERs) (SSER 1 September 1982, SSER 2 September 1982, SSER 3 January 1984, SSER 4 March 1985, SSER 10 October 1992, SSER 15 January 1995, SSER 20 February 1996).
- NRO’s Office Instruction LIC 110, Revision 1, Watts Bar, Unit 2, License Application Review, September 28, 2009.
- SECY 07-0096, “Staff Requirements - Possible Reactivation of Construction and Licensing Activities for the Watts Bar Nuclear Plant, Unit 2,” dated July 25, 2007.

The following documents contain security-related or safeguards information and are not publicly available:

- Regulatory Guide 5.69, “Guidance for the Application of Radiological Sabotage Design Basis Threat in the Design, Development, and Implementation of a Physical Security Protection Program that Meets 10 CFR 73.55 Requirements,” June 2006.
- Regulatory Guide 5.76, “Physical Protection Programs at Nuclear Power Reactors,” July 2009.
- Nuclear Energy Institute 03-12, Revision 6, “Template for the Security Plan, Training and Qualification Plan, Safeguards Contingency Plan, and Independent Spent Fuel Installation Security Program,” March 2009 (and endorsed by NRC on April 2009).
- NUREG/CR 6190, “NUREG/CR-6190 Material to Reflect Postulated Threat Requirements,” March 27, 2003.

10.3 STAFF REVIEW AND ANALYSIS

TVA stated in its Part 70 license application that “Receipt, handling, inspection and storage of new nuclear fuel for Watts Bar Nuclear Plant, Unit 2 will utilize shared systems, structures, components and administrative controls currently in place supporting the operation of WBN- 1. As a result, the majority of the information contained, or incorporated by reference, in this application has been previously submitted and approved by the U.S. Nuclear Regulatory Commission (NRC). This information includes, but is not limited to, the Final Safety Analysis Report; Final Environmental Impact Statement (NUREG-0498 and Supplement 1); TVA’s Final Supplemental Environmental Impact Statement for the Completion and Operation of Watts Bar Nuclear Plant, Unit 2; Radiological Emergency Plan; Physical Security Plan; and Safeguards Contingency Plan.” Enclosure 4 provides a summary of the Physical Security Plan/Contingency Plan.

Enclosure 4 of TVA’s Part 70 license application provides a summary of the PSP, Training and Qualification Plan (T&QP), and the Safeguards Contingency Plan (SCP), composed for WBN-1 and WBN-2. TVA incorporated—by reference—the previously-approved PSP, T&QP, and SCP based on the shared nature of the areas where the new fresh fuel will be received, handled, inspected, and stored.

TVA used NEI 03-12, Revision 6, dated March 2009, as guidance to write the PSP. By letter dated October 16, 2009, TVA submitted Revision 9 to its PSP. By letter dated March 31, 2010, TVA submitted Revision 10 to its PSP. By letter dated July 23, 2010, TVA submitted Revision 11 to its PSP. Since the Part 70 license application was submitted on November 12, 2009, TVA incorporated, by reference, the “current” version of the PSP, which was Revision 9 at the time of the submittal. Subsequent revisions to the PSP, after the Part 70 license application was filed, were also evaluated to assess whether TVA had an adequate program to protect the SNM in the form of fresh fuel assemblies from any malevolent attack.

The NRC staff initially reviewed the Watts Bar Nuclear Plant’s PSP, T&QP, and SCP, dated July 23, 2010, Revision 11, which is marked as safeguards information to be withheld under 10 CFR 73.21. Thus, the findings below are based in part on non-public information. As part of the review, the NRC staff also conducted two site visits (November 2009 and February 2010). TVA addressed the NRC staff’s requests for additional information related to the Watts Bar Nuclear Plant’s PSP in their letter response dated April 5, 2010, and submitted a revised PSP dated July 23, 2010, Revision 11, which was used to complete this review.

On November 3, 2009, and February 2-5, 2010, the NRC staff visited the site for the purpose of observing the security operation relating to vehicle and personnel access control, controlled access area intrusion detection measures, communication capabilities with local law enforcement, vehicle and personnel search procedures, and target set review.

The NRC staff compared the WBN-2’s PSP to the requirements in 10 CFR 73.55 (a) through (r). Based on the PSP review and site visit observation, it was determined that the security measures that the facility employs meet the requirements to provide high assurance that 10 CFR 73.55 (a) through (r) are being met.

Physical Security Plan

WBN-1’s PSP is already in effect and has been in effect since 1996. On October 16, 2009, TVA submitted the PSP, T&QP, and SCP to the NRC in accordance with the requirements of 10 CFR 50.34 (c)(2) and (d)(2). Chapter 13, Section 13.7 of the Final Safety Analysis Report references this information in describing the licensing basis for establishing a physical protection program, design of a physical protection system, and security organization which will have as its objective to provide high assurance that activities involving SNM are not inimical to the common defense and security and do not constitute an unreasonable risk to the public health and safety.

In addition, TVA submitted the PSP which contained a set of detailed maps of the entire site. The NRC staff reviewed the maps and found that they contain the required site-specific information; meets the requirements of 10 CFR 73.55(c); and is, therefore, acceptable.

The NRC staff conducted two site visits and tours of the PA, vital areas, and the vehicle barrier system. The NRC staff also observed the access authorization process and alarm station operations. Based on the PSP’s review and observation during the site visits, it was determined that the security measures that TVA employs at WBN-2 meet the requirements to provide high assurance that 10 CFR 73.55(c) and (d) are being met.

TVA requested a separate Part 70 license to authorize the receipt, possession, ownership, inspection, and storage within the PA in anticipation that the Part 70 license would be issued before the Part 50 license. The NRC staff determined that the requirements of 10 CFR 73.55 (a)(4) and (a)(5) apply, and the approved PSP for WBN-2 must be in place and

implemented before any receipt onsite of SNM (in the form of fresh fuel assemblies for use in the WBN-2 reactor) could occur.

Using the guidance in NUREG-0800, “Standard Review Plan for the Review of Safety Analysis Reports for Nuclear Power Plants: LWR Edition” (NRC, 2010), the NRC staff reviewed Section 1 of TVA’s PSP, which describes the implementation of the site-specific physical protection program in accordance with Commission regulations. Because TVA’s description in the PSP is consistent with the acceptance criteria in Section 13.6.1 of NUREG-0800 (NRC, 2010), the NRC staff finds that the description provided in the PSP meets the requirements of 10 CFR 73.55(c) and (d) and is, therefore, acceptable.

Physical Protection System

Based on the PSP’s review—which addresses security patrols, physical locking devices, fencing, and electronic measures—and site visits by the NRC staff, it was determined that the security measures that TVA employs for WBN-2 meet the requirements to provide high assurance that 10 CFR 73.55(b) is being met.

The NRC staff reviewed TVA’s description in Section 2 of the PSP and the approved exemption for the implementation of the site-specific physical protection program in accordance with Commission regulations and the guidance in NUREG-0800 (NRC, 2010). Because TVA’s description of the physical protection system in the PSP is consistent with the guidance in Section 13.6.1 of NUREG-0800 (NRC, 2010), the NRC staff finds that the description provided in the PSP meets the requirements of 10 CFR 73.55(b) and is, therefore, acceptable.

Response Force

Based on the review of WBN-1’s PSP, which addresses Response Requirements, TVA committed in its PSP to an onsite security force for WBN-2 that regulates access to the site in general and to specific buildings onsite. By means of patrols, access control, locking devices, and due to the size of the SNM housings, it would be difficult to remove SNM without detection.

The NRC staff reviewed TVA’s description in Section 18 of the PSP for the implementation of the site-specific physical protection program in accordance with the Commission regulations and the guidance in Section 13.6.1 of NUREG-0800 (NRC, 2010). The NRC staff finds that the description provided in the PSP meets the requirements of 10 CFR 73.55(k) and is, therefore, acceptable.

Store or Use the Material

The descriptions of the PA barrier are provided in Section 11.3 of the PSP. These descriptions meet the definitions of “physical barrier” and “protected area” contained in 10 CFR 73.2 and requirements of 10 CFR 73.55(e)(8).

Section 11.3 of the PSP describes the extent to which the PA barrier at the perimeter is separated from a vital area/island barrier. The Security Plan identifies where the PA barrier is not separated from a vital area barrier, consistent with 10 CFR 73.55(e)(8)(i)(c).

Section 11.3 of the PSP describes isolation zones. As required in 10 CFR 73.55(e)(7), the isolation zone is maintained in outdoor areas adjacent to the PA perimeter barrier and is designed to ensure the ability to observe and assess activities on either side of the PA perimeter.

Section 14.1 of the PSP states that the access authorization program implements regulatory requirements utilizing the provisions in RG 5.66, "Nuclear Power Plant Access Authorization Program", Revision 1 (NRC, 2009). The NRC staff finds that Regulatory Guide 5.66 is an acceptable method for meeting the requirements of 10 CFR 73.56.

Section 14.4 of the PSP provides an overview description of the search process for vehicle, personnel and materials. The search process is conducted using security personnel, specifically trained non-security personnel, and technology. Detailed discussions of actions to be taken in the event unauthorized materials are discovered are found in implementing procedures.

Section 14.4.6 of the PSP describes the process for control of visitors. The PSP affirms that procedures address the identification, processing and escorting of visitors and the maintenance of a visitor control register. Training for visitor escorts includes responsibilities, communications and escort ratios. All escorts are trained to perform escort duties in accordance with site requirements. All visitors wear a badge that clearly indicates that an escort is required.

Section 14.5 of the PSP describes vital areas and that TVA maintains vital areas that are locked and protected by an active intrusion alarm system. An access authorization system is established to limit unescorted access that is controlled by an access authorization list which is reassessed and reapproved at least once every 31 days. Additional access control measures are described in the facility procedures.

Section 15.1 of the PSP describes how all isolation zones and appropriate exterior areas within the PA have lighting capabilities that provide illumination sufficient for the initiation of an adequate response to an attempted intrusion of the isolation zone, a PA, or a vital area. A discussion of the implementation of technology using fixed and non-fixed, low-light level cameras or alternative technological means is provided.

The NRC staff reviewed TVA's description in Sections 11.3, 14 and 15.1 of the site-specific PSP in accordance with the Commission regulations and the guidance in Section 13.6.1 of NUREG-0800 (NRC, 2010). The NRC staff finds that the description provided by TVA in the PSP meets the requirements of 10 CFR 73.55(b) and is, therefore, acceptable.

Intrusion Alarm

Section 15.2 of the PSP describes that surveillance is accomplished by human observation and technology. Surveillance systems include a variety of cameras, video display, and annunciation systems designed to assist the security organization in observing, detecting, and assessing alarms or unauthorized activities. Certain systems provide real-time and recorded playback of recorded video images. The specifics of surveillance systems are described in facility implementing procedures.

The NRC staff reviewed TVA's description in Sections 15.2 of the PSP for the implementation of the site-specific physical protection program in accordance with the Commission regulations

and the guidance in Section 13.6.1 of NUREG-0800 (NRC, 2010). The NRC staff finds that the description provided in the PSP meets the requirements of 10 CFR 73.55(b) and (i) and are, therefore, acceptable.

Establishment of Security Organization

Section 4.1 of the PSP describes the organization's management structure. The PSP establishes that the security organization is a critical component of the physical protection program and is responsible for the effective application of engineered systems, technologies, programs, equipment, procedures, and personnel, necessary to detect, assess, interdict, and neutralize threats up to and including the design basis threat of radiological sabotage. The security organization may be proprietary (i.e., TVA personnel), contract, or other qualified personnel.

The PSP states that the organization will be staffed with appropriately trained and equipped personnel in a command structure with administrative controls and procedures to provide a comprehensive response. Section 4.1 of the PSP also describes the roles and responsibilities of the security organization. The PSP provides that at least one full time, dedicated nuclear security lieutenant that has the authority for command and control of all security operations, is onsite at all times.

Section 16.2 of the PSP describes the establishment and maintenance of the communications system. Detailed descriptions of security systems are included in facility procedures. The WBN has access to both wired and alternate communications systems. Site security personnel are assigned communications devices with which to maintain continuous communications with the Central Alarm Station (CAS) and Secondary Alarm Station (SAS). All personnel and vehicles are assigned communications resources with which to maintain continuous communications. Continuous communications protocols are available between CAS, SAS and the Control Room.

The NRC staff reviewed TVA's description in Sections 4.1, and 16.2 of the PSP for the implementation of the site-specific physical protection program in accordance with Commission regulations and the guidance in Section 13.6.1 of NUREG-0800 (NRC, 2010). Therefore, the NRC staff finds that the description provided in the PSP meets the requirements of 10 CFR 73.55(b) and (i) and are, therefore, acceptable.

Protective Strategy

Section 8 of the SCP describes the site protective strategy as outlined in 10 CFR Part 73, Appendix C, Section II.B.3.c.(v). The discussion provided in the subject section is of sufficient detail to understand the guidance to TVA's personnel in the event of a threat, theft, or radiological sabotage associated with the SNM or the WBN-2 facility.

The NRC staff reviewed TVA's description in Section 8 of the SCP for the implementation of the site-specific physical protection program in accordance with Commission regulations and the guidance in Section 13.6.1 of NUREG-0800 (NRC, 2010). Therefore, the NRC staff finds that the description provided in the SCP meets the requirements of 10 CFR Part 73, Appendix C, Section II.B.3.c.(v) and is, therefore, acceptable.

10.4 EVALUATION FINDINGS

The NRC staff's review of the WBN's PSP, T&QP and SCP focused on ensuring that the necessary programmatic elements are contained in these plans to provide high assurance that 10 CFR 73.55 (a) through (r) are being met; and that activities involving the receipt, possession, inspection and, storage of SNM at WBN-2, in the form of fresh fuel assemblies are not inimical to the common defense and security and do not constitute an unreasonable risk to the public health and safety.

The TVA's PSP information is withheld from public disclosure in accordance with the provisions of 10 CFR 73.21 "Requirements for Protection of Safeguards Information."

Based on the review of the PSP and its implementation, the NRC staff concluded that the Plan and security measures meet the applicable requirements in 10 CFR 73.55 (a) through (r). Accordingly, the protection provided will ensure that the health and safety of the public will not be endangered.

10.5 REFERENCES

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(TVA, 2009b) "Application for a Special Nuclear Material License For Watts Bar Nuclear Plant, Unit 2 in Accordance with 10 CFR 70, *Domestic Licensing of Special Nuclear Material*," November 12, 2009 (ADAMS Accession Number ML100120487).

(TVA, 2010) April 5, 2010, letter from M. Bajestani to U.S. NRC, "Response to U.S. Nuclear, Regulatory Commission Request for Additional Information Regarding Physical Security Plans." (ADAMS Accession Number ML100970072).

(TVA, 2010) May 13, 2010, letter from R. M. Krich to U.S. NRC, "Physical Security Plan, Training and Qualification Plan, Safeguards Contingency Plan and Independent Spent Fuel Storage Installation Security Program, Revision 10" (ADAMS Accession Number ML101380029).

(TVA, 2010) July 23, 2010, letter from R. M. Krich to U.S. NRC, "Physical Security Plan, Training and Qualification Plan, Safeguards Contingency Plan and Independent Spent Fuel Storage Installation Security Program, Revision 11" (ADAMS Accession Number ML102090059).

11.0 EXEMPTIONS AND SPECIAL AUTHORIZATIONS

11.1 SPECIAL AUTHORIZATIONS

Tennessee Valley Authority (TVA) did not request any special authorizations in support of the license application for the Watts Bar Nuclear Plant, Unit 2 (WBN-2) site.

11.2 EXEMPTIONS

TVA did not request any special authorizations in support of the license application for the WBN-2 site.

11.3 REFERENCES

(NRC, 2002) U.S. Nuclear Regulatory Commission, NUREG-1520, "Standard Review Plan for the Review of a License Application for a Fuel Cycle Facility," March 2002.

(TVA, 2008) September 23, 2008, letter from M. K. Brandon to the U.S. NRC, "Watts Bar Nuclear Plant (WBN), Unit 1 - Updated Final Safety Analysis Report (UFSAR) Amendment 7," (ADAMS Accession Number ML082950191).

(TVA, 2009a) "Organization Topical Report, TVA-NPOD 89-A," September 14, 2009, (ADAMS Accession Number ML092600185).

(TVA, 2009b) "Application for a Special Nuclear Material License For Watts Bar Nuclear Plant, Unit 2 in Accordance with 10 CFR 70, *Domestic Licensing of Special Nuclear Material*," November 12, 2009 (ADAMS Accession Number ML100120487).

(TVA, 2009c) "Supplement to Application for a Special Nuclear Material License for Watts Bar Nuclear Plant, Unit 2 in Accordance with 10 CFR 70, *Domestic Licensing of Special Nuclear Material*," November 30, 2009 (ADAMS Accession Number ML093370136).

12.0 LIST OF CONTRIBUTORS

- Mary Adams
- Gregory Chapman
- Chiquita Collins
- James Downs
- John Frost
- Craig Hrabal
- Michael Norris
- Rafael Rodriguez
- Aaron Szabo
- Marilyn Diaz