



UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

September 1, 2011

Mr. R. M. Krich
Vice President, Nuclear Licensing
Tennessee Valley Authority
3R Lookout Place
1101 Market Street
Chattanooga, TN 37402-2801

SUBJECT: WATTS BAR NUCLEAR PLANT, UNIT 1 - ISSUANCE OF AMENDMENT
REGARDING TOTAL FLOODING AUTOMATIC CARBON DIOXIDE FIRE
SUPPRESSION SYSTEM INSTALLED IN THE AUXILIARY INSTRUMENT
ROOM (TAC NO. ME2532)

Dear Mr. Krich:

The U.S. Nuclear Regulatory Commission has issued the enclosed Amendment No. 88 to Facility Operating License No. NPF-90 for Watts Bar Nuclear Plant, Unit 1. This amendment consists of changes to the license in response to your application dated October 30, 2009 (Agencywide Documents Access and Management System Accession No. ML093080377), as supplemented May 24, 2011 (ML11147A024).

The amendment revises License Condition 2.F regarding fire protection.

A copy of the related Safety Evaluation is also enclosed. The Notice of Issuance will be included in the Commission's biweekly *Federal Register* notice.

Sincerely,

A handwritten signature in black ink, appearing to read "John G. Lamb", is written over a printed name and title.

John G. Lamb, Senior Project Manager
Watts Bar Special Projects Branch
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket No. 50-390

Enclosures:

1. Amendment No. 88 to NPF-90
2. Safety Evaluation

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UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

TENNESSEE VALLEY AUTHORITY

DOCKET NO. 50-390

WATTS BAR NUCLEAR PLANT, UNIT 1

AMENDMENT TO FACILITY OPERATING LICENSE

Amendment No. 88
License No. NPF-90

1. The Nuclear Regulatory Commission (the Commission) has found that:
 - A. The application for amendment by the Tennessee Valley Authority (the licensee) dated October 30, 2009, as supplemented May 24, 2011, complies with the standards and requirements of the Atomic Energy Act of 1954, as amended (the Act), and the Commission's rules and regulations set forth in Title 10 *Code of Federal Regulations* (10 CFR) Chapter I;
 - B. The facility will operate in conformity with the application, the provisions of the Act, and the rules and regulations of the Commission;
 - C. There is reasonable assurance (i) that the activities authorized by this amendment can be conducted without endangering the health and safety of the public, and (ii) that such activities will be conducted in compliance with the Commission's regulations;
 - D. The issuance of this amendment will not be inimical to the common defense and security or to the health and safety of the public; and
 - E. The issuance of this amendment is in accordance with 10 CFR Part 51 of the Commission's regulations and all applicable requirements have been satisfied.

2. Accordingly, the Operating License NPF-90 is amended as indicated in the attachment to this license amendment, and paragraphs 2.C.(2) and 2.F of Facility Operating License No. NPF-90 is hereby amended to read as follows:

(2) Technical Specifications and Environmental Protection Plan

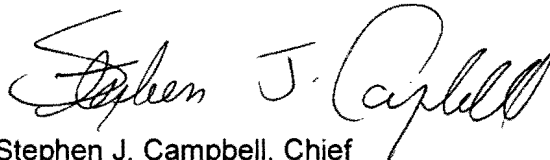
The Technical Specifications contained in Appendices A and B, as revised through Amendment No. 88, and the Environmental Protection Plan contained in Appendix B, both of which are attached hereto, are hereby incorporated into this license. TVA shall operate the facility in accordance with the Technical Specifications and the Environmental Protection Plan.

- F. TVA shall implement and maintain in effect all provisions of the approved fire protection program as described in the Fire Protection Report for the facility, as approved in Supplement 18 (except page 80 of Appendix FF), revised page 80 of Appendix FF of Supplement 18 (as revised by Amendment No. 88, and Supplement 19 of the SER (NUREG-0847) subject to the following provision:

TVA may make changes to the approved fire protection program without prior approval of the Commission only if those changes would not adversely affect the ability to achieve and maintain safe shutdown in the event of a fire.

3. This license amendment is effective as of the date of its issuance, and shall be implemented no later than 30 days from the date of its issuance.

FOR THE NUCLEAR REGULATORY COMMISSION



Stephen J. Campbell, Chief
Watts Bar Special Projects Branch
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Attachment:
Changes to the Operating License
and Page 80 in Appendix FF
of NUREG-0847, Supplement 18

Date of Issuance: September 1, 2011

ATTACHMENT TO LICENSE AMENDMENT NO. 88

FACILITY OPERATING LICENSE NO. NPF-90

DOCKET NO. 50-390

Replace the following pages of Operating License No. NPF-90 with the attached pages.

REMOVE

3
5a

INSERT

3
5a

Replace the following page of Appendix FF in NUREG-0847, Supplement 18 with the attached revised page. The revised page is identified by amendment number and contains a marginal line indicating the area of change.

REMOVE

80

INSERT

80

- (4) TVA, pursuant to the Act and 10 CFR Parts 30, 40 and 70, to receive, possess, and use in amounts as required, any byproduct, source or special nuclear material without restriction to chemical or physical form, for sample analysis, instrument calibration, or other activity associated with radioactive apparatus or components; and
 - (5) TVA, pursuant to the Act and 10 CFR Parts 30, 40 and 70, to possess, but not separate, such byproduct and special nuclear materials as may be produced by the operation of the facility.
- C. This license shall be deemed to contain and is subject to the conditions specified in the Commission's regulations set forth in 10 CFR Chapter I and is subject to all applicable provisions of the Act and to the rules, regulations, and orders of the Commission now or hereafter in effect, and is subject to the additional conditions specified or incorporated below.
- (1) Maximum Power Level

TVA is authorized to operate the facility at reactor core power levels not in excess of 3459 megawatts thermal.
 - (2) Technical Specifications and Environmental Protection Plan

The Technical Specifications contained in Appendix A as revised through Amendment No. 88 and the Environmental Protection Plan contained in Appendix B, both of which are attached hereto, are hereby incorporated into this license. TVA shall operate the facility in accordance with the Technical Specifications and the Environmental Protection Plan.
 - (3) Safety Parameter Display System (SPDS) (Section 18.2 of SER Supplements 5 and 15)

Prior to startup following the first refueling outage, TVA shall accomplish the necessary activities, provide acceptable responses, and implement all proposed corrective actions related to having the Watts Bar Unit 1 SPDS operational.
 - (4) Vehicle Bomb Control Program (Section 13.6.9 of SSER 20)

During the period of the exemption granted in paragraph 2.D.(3) of this license, in implementing the power ascension phase of the approved initial test program, TVA shall not exceed 50% power until the requirements of 10 CFR 73.55(c)(7) and (8) are fully implemented. TVA shall submit a letter under oath or affirmation when the requirements of 73.55(c)(7) and (8) have been fully implemented.

- F. TVA shall implement and maintain in effect all provisions of the approved fire protection program as described in the Fire Protection Report for the facility, as approved in Supplement 18 (except page 80 of Appendix FF), revised page 80 of Appendix FF of Supplement 18 (as revised by Amendment No. 88, and Supplement 19 of the SER (NUREG-0847) subject to the following provision:

TVA may make changes to the approved fire protection program without prior approval of the Commission only if those changes would not adversely affect the ability to achieve and maintain safe shutdown in the event of a fire.

- G. Except as otherwise provided in the Technical Specifications (Appendix A to this license) or Environmental Protection Plan (Appendix B to this license), TVA shall report any violations of the requirements contained in Section 2.C of this license in the following manner: initial notification shall be made within twenty-four (24) hours to the NRC Operations Center via the Emergency Notification System with written follow-up within 30 days in accordance with the procedures described in 10 CFR 50.73 (b), (c), and (e).
- H. The licensee shall have and maintain financial protection of such types and in such amounts as the Commission shall require in accordance with Section 170 of the Atomic Energy Act of 1954, as amended, to cover public liability claims.

Actuation of these systems causes selected fire dampers and doors to the protected area to close and the HVAC fans to the area to shut down ensuring that the minimum concentration of CO₂ is maintained.

The design basis for the areas protected by automatic CO₂ are as follows: (1) auxiliary instrument rooms - the primary fire hazard is cables and is considered a deep-seated fire source; therefore, the system must have a 50-percent flooding factor per NFPA 12, 1973 Edition to maintain carbon dioxide concentration for a substantial period of time to assure complete extinguishment. In addition, the leakage from the room must be limited. (2) computer room (CO₂ system is provided for property protection) - the system must achieve a 30-percent concentration within 2 minutes and 50-percent concentration within 7 minutes after system discharge; (3) diesel generator engine rooms - the primary fire hazard is a surface fire (diesel fuel); therefore, the system must achieve a 34-percent concentration within 1 minute and maintain at least a 34 percent concentration for 20 minutes; (4) diesel generator electrical board rooms (CO₂ systems are provided for property protection) - the system must achieve a 30-percent concentration within 2 minutes and 50-percent concentration within 7 minutes after system discharge; and (5) lube oil storage and fuel oil transfer rooms (CO₂ system is provided for property protection) - the system must achieve a 34-percent concentration within 1 minute.

The applicant's CO₂ storage tank for supplying CO₂ to the diesel generator system is located in the diesel generator building. The diesel generators are protected from the effects of a postulated failure of this tank by an 18-inch-thick reinforced concrete wall. The vent path for the tank room for the storage tank compartment is through a set of double doors which lead into the stairwell and, if needed, through another set of double doors which open to the atmosphere from the stairwell.

The CO₂ for the balance of the plant is supplied from a storage tank in an underground vault in the yard. The failure of the tank cannot pose a threat to any safety-related areas or structures.

The staff finds that the applicant's design criteria and bases for the automatic CO₂ fire suppression systems did not take any exceptions to Position C.5 of Appendix A to BTP (APCSB) 9.5-1 and, therefore, are acceptable.

4.2.2 Manual Suppression Capability

4.2.2.1 Hose Stations

Manual hose stations are located throughout the plant to ensure that an effective hose stream can be directed to any safety-related area in the plant. The system is designed according to the requirements of NFPA-14 (1974), "Standpipe and Hose System for Sizing, Spacing, and Pipe Support Requirements," except for those hose stations in certain areas of the plant in which the applicant has requested a deviation to exceed the 100-foot hose spacing limitation. These deviations are discussed in Section 6.9.4, "Deviation - Manual Hose Stations."

In addition, the applicant performed a code compliance review and identified several areas in which the manual fire-fighting hose stations and standpipe system deviated from the code. Some of the more important NFPA-14 code



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SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION
RELATED TO AMENDMENT NO. 88 TO FACILITY OPERATING LICENSE NO. NPF-90
TENNESSEE VALLEY AUTHORITY
WATTS BAR NUCLEAR PLANT, UNIT 1
DOCKET NO. 50-390

1.0 INTRODUCTION

By application dated October 30, 2009 (Agencywide Documents Management Systems (ADAMS) Accession No. ML093080377), as supplemented May 24, 2011 (ADAMS Accession No. ML11147A024), Tennessee Valley Authority (TVA) requested an amendment to Facility Operating License No. NPF-90 Watts Bar Nuclear Plant (WBN), Unit 1, concerning a change to the fire protection program requirements related to the design basis of the total flooding automatic carbon dioxide (CO₂) fire suppression system in the Auxiliary Instrument Room. Specifically, this involves changing the design basis of the total flooding automatic CO₂ fire suppression system in the Auxiliary Instrument Room from a 50-percent CO₂ concentration to a 45-percent concentration.

The WBN Unit 1, Auxiliary Instrument Room CO₂ fire suppression system was designed in accordance with the National Fire Protection Association (NFPA) Standard 12, "Standard on Carbon Dioxide Extinguishing Systems" 1973 Edition, which is the code of record (COR) for WBN Unit 1. WBN Unit 1 Fire Protection Report (FPR), Revision 4, September 28, 1995 (ADAMS Accession No. ML073231085) (i.e., the approved fire protection program), documents a point-by-point code comparison with NFPA 12, 1973 Edition. NUREG-0847, "Supplemental Safety Evaluation Report (SSER) No. 18," dated October 1995, documents the U.S. Nuclear Regulatory Commission (NRC) staff review of the FPR, Revision 4, submitted by TVA. The SSER No. 18,¹ and FPR, Revision 4, are cited in WBN, Unit 1, Operating License Condition 2.F.

TVA's supplementary submittal dated May 24, 2011, provided clarifying information that did not change the scope of the proposed amendment as described in the original notice of proposed action published in the *Federal Register* on December 15, 2009 (74 FR 66385) and did not change the initial proposed no significant hazards determination.

¹ SSER No. 18 provided the relevant information regarding CO₂ fire suppression system. There was an additional submittal of FPR, Revision 5, which SSER 19 approved, but these documents do not have information material to this review.

2.0 REGULATORY EVALUATION

The primary objectives of fire protection programs at U.S. nuclear power plants are to minimize both the probability of occurrence and the consequences of fire. To meet these objectives, the fire protection programs for operating nuclear power plants are designed to provide reasonable assurance, through defense-in-depth, that a fire will not prevent the necessary safe-shutdown functions from being performed and that radioactive releases to the environment in the event of a fire will be minimized.

To meet this objective, Title 10 of the *Code of Federal Regulations* (10 CFR), Section 50.48, "Fire protection," requires each operating nuclear power plant to have the means to limit fire damage to structures, systems, or components important to safety so that the capability to shut down the plant safely is ensured.

The objective of the plant safe-shutdown strategy is to assure that at least one means of achieving and maintaining safe-shutdown capability is available during and after any postulated fire.

The TVA letter, dated October 30, 2009, stated that the NRC SSER No. 18, dated October 1995, on page 80, incorrectly documented 50-percent concentration for 15 minutes as the total flooding automatic CO₂ fire suppression system design in the WBN Unit 1 Auxiliary Instrument Room (TVA letter, dated May 26, 1995, ADAMS Accession No. ML073230886).

In Revision 4 of the FPR, Part X, Section 4.0, "NFPA Code Conformance Summary Compliance List," a point-by-point comparison table with the 1973 Edition of NFPA 12, as reviewed by NRC staff, TVA states that a concentration of 45-percent for 15 minutes (page X-21) constitutes compliance with the code via Sections 2232 and 241 (WBN, Unit 1 FPR, Revision 4, dated September 28, 1995 for TVA's justification of 45-percent CO₂ design concentration, ADAMS Accession No. ML083110647). Also, in Part X, Section 4.0, of FPR Revision 4, as reviewed by NRC staff, TVA states that they comply with the code Section 2421 (page X-22), "Flooding factors for specific hazards (50-percent for deep seated fire locations such as board rooms, instrument rooms, etc.)." Based on the incoming from TVA in Revision 4 of the FPR, both a 45-percent concentration and a 50-percent concentration is referred to as being needed to suppress a deep-seated fire.

Cable fires may involve a combination of surface fire and burning within a mass of material. Surface burning is quickly suppressed when a sufficient quantity of CO₂ is rapidly discharged into the protected enclosure. However, to extinguish a deep-seated fire (the burning within the mass of material), a sufficiently high concentration must be maintained for an appropriate time period to allow any smoldering to be suppressed and to allow the material to cool to a temperature at which it will not reignite when the CO₂ dissipates. Deep-seated fires can occur in cable concentrations, such as exist in the WBN Unit 1 Auxiliary Instrument Room.

TVA is using a 10 CFR 50.90, "Application for amendment of license, construction permit, or early site permit," submittal to resolve the two statements in Revision 4 of the FPR and SSER No. 18 for the CO₂ concentration in the WBN Unit 1 Auxiliary Instrument Room. The correct regulatory process for making such a change to the approved fire protection program is 10 CFR 50.90.

3.0 TECHNICAL EVALUATION

The NRC staff performed two specific analyses in evaluating this change. The first analysis addresses defense-in-depth in the WBN Unit 1 Auxiliary Instrument Room. The second analysis is a discussion of the requirements of the 1973 Edition of NFPA 12, as they relate to the CO₂ concentration for deep-seated fires in that area.

The WBN Unit 1 Auxiliary Instrument Room contains the Reactor Protection System for WBN Unit 1. The Auxiliary Instrument Room is located in the Control Building at Elevation 708.0 feet (ft). The alternative safe-shutdown strategy was selected by TVA for the Auxiliary Instrument Room and a total flooding automatic CO₂ fire suppression system was installed to meet the requirements of 10 CFR Part 50, Appendix R, Section III.G.3.

3.1 Fire Protection Defense-In-Depth

3.1.1 Area Description

The Auxiliary Instrument Room is located in Fire Area 48, "Control Building." The room measures approximately 86 ft by 42 ft with a ceiling height of approximately 19.5 ft. By letter dated May 24, 2011, TVA calculated the volume of the room to be 71,900 cubic ft (ft³). By letter dated October 30, 2009, TVA stated all area boundaries are 3-hour-rated fire barriers, with the exception of the east walls, which are 2-hour-rated fire barriers.

The primary, in situ combustible in the Auxiliary Instrument Room is cable in the cable trays. Other combustibles consist of plastics associated with the electrical instrument panels. A fire severity of greater than 180 minutes (3 hours) was assigned based on the combustible material present in the Auxiliary Instrument Room (WBN Unit 1, FPR, Revision 10, ADAMS Accession No. ML073510528). The Auxiliary Instrument Room houses cables and equipment required for safe-shutdown. Some, but not all, of this cable meets the requirements of Institute of Electrical and Electronics Engineers (IEEE)-383 (i.e., both IEEE-383 qualified and IEEE-383 nonqualified cables are present in the Auxiliary Instrument Room in trays).

3.1.2 Fire Hazard and Ignition Sources

According to the TVA letter dated October 30, 2009, the floor based ignition sources in the Auxiliary Instrument Room consist of two air handling units. In addition, Revision 10 of the FPR states that "...The combustible materials consist of plastics associated with the electrical instrument panels and insulation on cables in trays" Therefore, electrical instrument panels are also considered ignition sources for the area. According to the TVA letter dated October 30, 2009, the WBN Unit 1 procedures mandate transient combustible controls and ignition source work control in the Auxiliary Instrument Room.

3.1.3 Fire Detection System

An automatic fire detection system, consisting of ionization smoke detectors and rate compensation/fixed temperature heat detectors, is used to actuate the Auxiliary Instrument Room CO₂ fire suppression system. The smoke detectors and heat detectors are cross zoned to minimize the chance for an inadvertent discharge. The suppression system needs one smoke and one heat detector to detect fire in order to actuate the automatic CO₂ fire suppression system. The fixed temperature element of the heat detector is rated at 135 °F. Each detection zone provides an independent alarm of a fire (or detector trouble) to the Main Control Room.

3.1.4 Fire Suppression System

The installed fire suppression system is a total flooding CO₂ system. The system is designed in accordance with the 1973 Edition of NFPA 12. Most fires in the area, such as transient fires, oil fires associated with the lubricating oil in the ventilation equipment, and even cable fires (before they have an opportunity to become deep seated), are likely to be surface fires. The system is designed sufficiently to address surface fires. See discussion regarding deep-seated fires in Section 3.2.

3.1.5 Safe Shutdown Capability

The Auxiliary Instrument Room is in Fire Area 48, which consists of the entire control building. The control building relies on alternative shutdown in the event of a fire in this area. Specifically, the Auxiliary Instrument Room is in Room 708.0-C1. There are no electrical raceway fire barriers in the Auxiliary Instrument Room. For a damaging fire in the WBN Unit 1 Auxiliary Instrument Room, the WBN Unit 1 staff would rely on the Auxiliary Control Room complex (ACR). The ACR has been designed to provide sufficient indication and equipment that is independent of the control building in order to achieve safe shutdown.

3.1.6 Summary of Defense-in-Depth

The WBN Unit 1 Auxiliary Instrument Room, as described, is stated to meet Appendix R, Section III.G.3, "Alternative or dedicated shutdown capability (III.G.3)." The area is designed with detection and fixed suppression. The suppression system is automatic, which exceeds the requirements of III.G.3 and is designed sufficiently to extinguish surface fires. Alternative shutdown is provided by way of the ACR that has safe shutdown equipment independent of the Auxiliary Instrument Room. The treatment of deep-seated fires is discussed in Section 3.2 below.

3.2 NFPA 12 Code Evaluation for Deep-Seated Fires

3.2.1 Flooding Factors

Suppressing deep-seated fires requires higher concentration of fire suppressant (CO₂) and longer soak times than surface fires. The NRC staff's acceptance of the WBN Unit 1, CO₂ fire suppression system to extinguish deep-seated fires was based on TVA's adherence to

requirements of NFPA 12, 1973 Edition. Since the volume factors in Table 5 of the 1973 Edition of NFPA 12 are all less than those required for deep-seated fires, NFPA 12, 1973 code relied upon a Flooding Factor to establish sufficient concentration. The reason for providing Flooding Factors, rather than requiring full discharge testing and concentration measurement is provided in the Code:

...For combustible materials capable of producing deep seated fires, the required carbon dioxide concentration cannot be determine with the same accuracy possible with surface materials. The extinguishing concentration will vary with the mass of material present because of the thermal insulating effects. Flooding Factors have, therefore, been determined on the basis of practical test conditions....

The basis quantity of CO₂ needed for deep-seated hazards is calculated using Flooding Factors in Table 6 of the NFPA 12, 1973 Edition. A series of specific Flooding Factors has been established for deep-seated fire hazards in the following table that was reproduced from the 1973 Edition of NFPA 12.

NFPA 12, 1973 Edition Table 6. Flooding Factors for Specific Hazards

<u>Design</u> <u>Concentration</u>	<u>Flooding Factor</u>		<u>Specific Hazard</u>
	(Cu. Ft./Lb. CO ₂)	(Lb. CO ₂ /Cu. Ft.)	
50	12	0.083	Dry electrical, wiring insulation hazards in general.
50	10	0.100	Small elec. machines, wire enclosures, under 2000 cu. ft.
65	8	0.125	Record (bulk paper storage, ducts, and mechanically ventilated covered trenches.
75	6	0.166	Fur storage vaults, dust collectors.

The above table specifies for dry electrical, wiring insulation hazards, such as those found in the WBN Unit 1 Auxiliary Instrument Room, a Flooding Factor of 12 ft³ per pound (ft³/lb) CO₂ or 0.083 lb CO₂/ft³. Note that the above Flooding Factor criterion exists in the 2011 Edition of NFPA 12 code.

To verify that the system design met the requirements of NFPA 12, 1973 Edition, Section 2421, the following confirmatory calculations are based on the CO₂ Flooding Factor requirements for deep-seated fires.

The minimum amount of CO₂ required = m_{CO2} = (Volume of Space in ft³) x (Flooding Factor)

$$\text{Volume of Space (V}_{\text{space}}) = 71900 \text{ ft}^3$$

Flooding Factor – Dry Electrical Hazard – 0.083 lb CO₂/ft³ to achieve 50% design concentration. (Table 6, NFPA 12, 1973 Edition)

Therefore, the minimum amount of CO₂ required = $m_{CO_2} = (71,900 \text{ ft}^3) (0.083 \text{ lb CO}_2/\text{ft}^3) = 5968 \text{ lb CO}_2$.

By letter dated April 22, 2011 (ADAMS Accession No. ML111040272), the NRC staff issued a request for additional information regarding the CO₂ fire suppression system design flow calculation.

In a letter dated May 24, 2011, TVA confirmed that the CO₂ fire suppression system is designed to inject 5968 lb of CO₂ into the Auxiliary Instrument Room, which translates into the assumed Flooding Factor of 0.083 lb CO₂/ft³ based on a room volume of 71,900 ft³.

The above discussion of the Flooding Factor explains the apparent contradiction between the two licensee references. Although TVA used a 50-percent concentration Flooding Factor, TVA also did a test that resulted in a measured CO₂ concentration of 45-percent. TVA provided the correct Flooding Factor, based on the information in the 1973 Edition of NFPA 12 and the design is to provide 5968 lb of CO₂ plus 1128 additional lbs of CO₂ to account for leakage (see Section 3.2.2 of this SE, "Other Considerations" for discussion of leakage) for a total discharge of 7096 lbs of CO₂ into the WBN Unit 1 Auxiliary Instrument Room. Since the Flooding Factor was determined based on "practical test conditions," it is reasonable that concentration testing would not be an exact match for the test results.

TVA's design basis for the WBN Unit 1 Auxiliary Instrument Room CO₂ fire suppression system design concentration is for a 50-percent Flooding Factor based on TVA's commitment to meet Sections 242 and 2421 of the NFPA 12, 1973 Edition. Section 242 states that, "...For combustible materials capable of producing deep seated fires, the required carbon dioxide concentrations cannot be determined with the same accuracy possible with surface burning materials. The extinguishing concentration will vary with the mass of material present because of the thermal insulating effects. Flooding factors have, therefore, been determined on the basis of practical test conditions...."

Therefore, NUREG-0847, SSER No. 18, Appendix FF, page 80, should read the following: "...therefore, the system must have a 50-percent flooding factor per NFPA 12, 1973 Edition to maintain carbon dioxide concentration for a substantial period of time to assure complete extinguishment."

3.2.2 Other Considerations

Section 2441, of the 1973 Edition of NFPA 12, requires compensation for openings that cannot close. TVA has stated it complies with this requirement in the FPR. In its statement, TVA takes credit for the testing that resulted in a 45-percent concentration of CO₂ in the area as evidence that there is compensation for the openings. The difference between 45-percent measured concentration and the 50-percent Flooding Factor is not unexpected since the Flooding Factor is based on practical test conditions and may not match measured concentrations.

A consideration of a total flooding CO₂ system is to ensure there is sufficient pressure relief venting for tight enclosures, per Section 262 of the 1973 Edition of NFPA 12. Based on the test results, the WBN Unit 1 Auxiliary Instrument Room is considered a tight enclosure due to

concerns about room over pressurization. In Table 7, Section 2623 of the 1973 Edition of NFPA 12 for normal building construction, there is a provision for "venting sash designed to open freely." Therefore, TVA's installation of a pressure relief vent in this room is consistent with the COR.

Section 2441 of the 1973 Edition of NFPA 12 requires that any openings that cannot be closed at the time of extinguishment shall be compensated for by the addition of CO₂. Unless there are changes to the tightness of the room, there would be no specific need to exceed the Flooding Factor as described in NFPA 12. The licensing basis is not linked to full discharge test. By letter dated May 24, 2011, TVA confirmed that the WBN Unit 1 Auxiliary Instrument Room design includes an additional 1128 lb CO₂ to compensate for known leakage paths.

3.3 Summary

The NRC staff examined whether the design basis requirements for CO₂ concentration have been satisfied at the WBN Unit 1 Auxiliary Instrument Room. The summary of NRC's review is that the design basis for gaseous CO₂ concentration has been met and is consistent with the COR. Therefore, there is no contradiction in the licensing documents that the room has a 50-percent Flooding Factor that results in a concentration per full discharge testing of 45-percent at 15 minutes. The design basis for the WBN Unit 1 Auxiliary Instrument Room CO₂ fire suppression system at WBN Unit 1 is based on a 50-percent Flooding Factor and complies with the COR.

Therefore, NUREG-0847, SSER No. 18, Appendix FF, page 80, should read the following: "...therefore, the system must have a 50-percent flooding factor per NFPA 12, 1973 Edition to maintain carbon dioxide concentration for a substantial period of time to assure complete extinguishment."

4.0 LICENSE CONDITION

The current License Condition 2.F states the following:

- F. TVA shall implement and maintain in effect all provisions of the approved fire protection program as described in the Fire Protection Report for the facility, as approved in Supplements 18 and 19 of the SER (NUREG-0847) subject to the following provision:

TVA may make changes to the approved fire protection program without prior approval of the Commission, only if those changes would not adversely affect the ability to achieve and maintain safe shutdown in the event of a fire.

The following will be included in Condition 2.F of Operating License NPF-90:

- F. TVA shall implement and maintain in effect all provisions of the approved fire protection program as described in the Fire Protection Report for the facility, as approved in Supplement 18 (except page 80 of Appendix FF), revised page 80 of

Appendix FF of Supplement 18 (as revised by Amendment No. 88, and Supplement 19 of the SER (NUREG-0847) subject to the following provision:

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5.0 STATE CONSULTATION

In accordance with the Commission's regulations, the Tennessee State official was notified of the proposed issuance of the amendments. The State official had no comments.

6.0 ENVIRONMENTAL CONSIDERATION

The NRC staff has determined that the amendment involves no significant increase in the amounts, and no significant change in the types, of any effluents that may be released offsite, and that there is no significant increase in individual or cumulative occupational radiation exposure. The Commission has previously issued a proposed finding that the amendment involves no significant hazards consideration, and there has been no public comment on such finding (74 FR 66385). Accordingly, the amendment meets the eligibility criteria for categorical exclusion set forth in 10 CFR 51.22(c)(9). Pursuant to 10 CFR 51.22(b) no environmental impact statement or environmental assessment need be prepared in connection with the issuance of the amendment.

7.0 CONCLUSION

The Commission has concluded, based on the considerations discussed above, that: (1) there is reasonable assurance that the health and safety of the public will not be endangered by operation in the proposed manner, (2) such activities will be conducted in compliance with the Commission's regulations, and (3) the issuance of the amendments will not be inimical to the common defense and security or to the health and safety of the public.

Principal Contributor: Naeem Iqbal

Date: September 1, 2011

September 1, 2011

Mr. R. M. Krich
Vice President, Nuclear Licensing
Tennessee Valley Authority
3R Lookout Place
1101 Market Street
Chattanooga, TN 37402-2801

SUBJECT: WATTS BAR NUCLEAR PLANT, UNIT 1 - ISSUANCE OF AMENDMENT
REGARDING TOTAL FLOODING AUTOMATIC CARBON DIOXIDE FIRE
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Dear Mr. Krich:

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The amendment revises License Condition 2.F regarding fire protection.

A copy of the related Safety Evaluation is also enclosed. The Notice of Issuance will be included in the Commission's biweekly *Federal Register* notice.

Sincerely,

/RA/

John G. Lamb, Senior Project Manager
Watts Bar Special Projects Branch
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket No. 50-390

Enclosures:

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2. Safety Evaluation

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ADAMS Accession No. ML11181A184

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NAME	JKLamb	BCLayton	AKlein	MSpencer	SCampbell
DATE	07/06/11	07/06/11	08/04/11	08/29/11	09/01/11

OFFICIAL AGENCY RECORD

Letter to R. M. Krich from John G. Lamb dated September 1, 2011

SUBJECT: WATTS BAR NUCLEAR PLANT, UNIT 1 - ISSUANCE OF AMENDMENT
REGARDING TOTAL FLOODING AUTOMATIC CARBON DIOXIDE FIRE
SUPPRESSION SYSTEM INSTALLED IN THE AUXILIARY INSTRUMENT
ROOM (TAC NO. ME2532)

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