

July 18, 2005

Mr. Karl W. Singer  
Chief Nuclear Officer and  
Executive Vice President  
Tennessee Valley Authority  
6A Lookout Place  
1101 Market Street  
Chattanooga, TN 37402-2801

SUBJECT: BROWNS FERRY NUCLEAR PLANT, UNIT 1 - ISSUANCE OF AN  
AMENDMENT REGARDING THE COMPLETION TIME FOR CONTAINMENT  
ATMOSPHERE DILUTION (CAD) SUBSYSTEM INOPERABILITY (TAC NO.  
MC3960) (TS 435)

Dear Mr. Singer:

The Commission has issued the enclosed Amendment No. 255 to Facility Operating License No. DPR-33 for the Browns Ferry Nuclear Plant, Unit 1. This amendment is in response to your application dated August 2, 2004, regarding the completion time for containment atmosphere dilution subsystem inoperability. The change to the Technical Specification provides 7 days of continued operation when two trains of the Containment Atmosphere Dilution subsystem are inoperable.

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

Sincerely,

**/RA/**

Margaret H. Chernoff, Project Manager, Section 2  
Project Directorate II  
Division of Licensing Project Management

Docket No. 50-259

Enclosures: 1. Amendment No. 255 to  
License No. DPR-33  
2. Safety Evaluation

cc w/enclosures: See next page

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Distribution: See next page

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TS No.: ML052020182

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DATE	6/22/05	6/21/05	4/18/05	7/7/05	7/18/05

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SUBJECT: BROWNS FERRY NUCLEAR PLANT, UNIT 1 - ISSUANCE OF AN AMENDMENT REGARDING THE COMPLETION TIME FOR CONTAINMENT ATMOSPHERE DILUTION (CAD) SUBSYSTEM INOPERABILITY (TAC NO. MC3960) (TS 435)

Date: July 18, 2005

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TENNESSEE VALLEY AUTHORITY

DOCKET NO. 50-259

BROWNS FERRY NUCLEAR PLANT UNIT 1

AMENDMENT TO FACILITY OPERATING LICENSE

Amendment No. 255  
License No. DPR-33

1. The Nuclear Regulatory Commission (the Commission) has found that:
  - A. The application for amendment by Tennessee Valley Authority (the licensee) dated August 2, 2004, 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 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 license is amended by changes to the Technical Specifications as indicated in the attachment to this license amendment and paragraph 2.C.(2) of Facility Operating License No. DPR-33 is hereby amended to read as follows:

(2) Technical Specifications

The Technical Specifications contained in Appendices A and B, as revised through Amendment No. 255, are hereby incorporated in the license. The licensee shall operate the facility in accordance with the Technical Specifications.

3. This license amendment is effective as of its date of issuance and shall be implemented within 60 days from the date of issuance.

FOR THE NUCLEAR REGULATORY COMMISSION

*/RA/*

Michael L. Marshall, Jr., Chief, Section 2  
Project Directorate II  
Division of Licensing Project Management  
Office of Nuclear Reactor Regulation

Attachment: Change to the Technical Specifications

Date of Issuance: July 18, 2005

ATTACHMENT TO LICENSE AMENDMENT NO. 255

FACILITY OPERATING LICENSE NO. DPR-33

DOCKET NO. 50-259

Revise the Appendix A Technical Specifications by removing the page identified below and inserting the attached page. The revised page is identified by the captioned amendment number and contains a marginal line indicating the area of change.

REMOVE

INSERT

3.6-40

3.6-40

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION  
RELATED TO AMENDMENT NO. 255 TO FACILITY OPERATING LICENSE NO. DPR-33

TENNESSEE VALLEY AUTHORITY

BROWNS FERRY NUCLEAR PLANT, UNIT 1

DOCKET NO. 50-259

1.0 INTRODUCTION

By letter dated August 2, 2004 (ADAMS Accession No. ML042190431), the Tennessee Valley Authority (the licensee) submitted a request for a change to the Browns Ferry Nuclear Plant (BFN), Unit 1, Technical Specifications (TSs). The requested change would provide seven days of continued operation when both Containment Atmosphere Dilution (CAD) subsystems are inoperable.

This change was approved for BFN Units 2 and 3 (ADAMS Accession No. ML003718705) on May 24, 2000.

2.0 BACKGROUND INFORMATION

2.1 Hydrogen Control Systems

The BFN CAD system consists of two redundant subsystems each of which contains an external liquid nitrogen storage tank and the piping, valves, instrumentation, and controls necessary to inject nitrogen gas to the primary containment of any of the BFN units. Each subsystem of the CAD system is capable of keeping the concentration of oxygen in the containment atmosphere below 5 percent. In the event that postaccident monitoring instrumentation indicated that hydrogen and oxygen generation rates were substantially below those specified in the Safety Guide, the CAD system could be operated as necessary to maintain either the hydrogen concentration below 4 percent or the oxygen concentration below 5 percent. The time required to produce significant amounts of oxygen through radiolysis is lengthy and in the loss-of-coolant accident (LOCA) analysis CAD operation is not required until hours after a LOCA.

The CAD system can also be used to provide a nonsafety grade, backup pneumatic supply to the drywell pneumatic system, primarily for the purpose of increasing the availability of long-term main steam relief valve (MSRV) operation for beyond design basis events such as those associated with Appendix R fire protection. This backup system capability is not addressed in the TSs and the Fire Protection Program allows the use of alternate methods

and/or compensatory measures, such as nitrogen bottles, in instances where normal drywell pneumatic supply is not available. Selective MSRVs are equipped with safety grade accumulators, which are designed to ensure each MSRV can be opened five times, as discussed in Updated Final Safety Analysis Report (UFSAR) Section 4.4.5 in the Automatic Depressurization System description.

The CAD subsystem A provides a backup pneumatic source for operation of the hardened wetwell vent valves and the torus vacuum breaker isolation valves. The current TS allows for a single CAD subsystem to be inoperable for 30 days. The requested TS change, allowing both CAD subsystems to be inoperable for 7 days, does not extend the period that this backup function may be unavailable.

BFN units are provided with a normal containment inerting system which is separate from the CAD system. The normal containment inerting system provides an alternate means of injecting nitrogen into the containment. The normal containment inerting system is used during the initial purging of the primary containment to establish an inerted containment, and it also provides a supply of make-up nitrogen during reactor operation. The licensee indicated that the BFN emergency operating instructions (EOIs) preferentially direct the use of the normal primary containment inerting system for purging and venting during emergency conditions.

## 2.2 Boiling-Water Reactor (BWR) Owners Group Evaluation of Combustible Gas Control

The BWR Mark 1 Owners Group undertook a substantial study in response to the addition of the provisions in Title 10, *Code of Federal Regulations* (10 CFR), Section 50.44(c)(3) requiring recombiner capability for those light water reactors relying upon purge/repressurization systems as the primary means of hydrogen control. The study was published as NEDO-22155, Generation and Mitigation of Combustible Mixtures in Inerted BWR Mark 1 Containment, June 1982. This NEDO concluded the generation rates assumed in Safety Guide 7 (subsequently Regulatory Guide 1.7) were overly conservative and maintaining containment inerted during operation was sufficient to provide combustible gas control.

Following review of this study, the U.S. Nuclear Regulatory Commission (NRC) issued Generic Letter 84-09, which states that the BWR Mark 1 plants affected by the recombiner rule (including BFN) did not need to rely on the use of a safety grade purge/repressurization system (CAD) specified by 10 CFR 50.44 as a primary means of hydrogen control provided that three technical criteria were met. These criteria are (1) the plant has TS limiting conditions for operation requiring containment atmosphere oxygen concentration to be maintained less than 4 percent by volume (including a margin of 1 percent by volume), (2) the plant has only nitrogen or recycled containment atmosphere for use in all pneumatic control systems within containment, and (3) there are no potential sources of oxygen in containment other than radiolysis of the reactor coolant. The licensee indicated that BFN is designed and operated in accordance with these criteria.

## 3.0 REGULATORY EVALUATION

The regulations in 10 CFR 50.44, and 10 CFR 50 Appendix B, General Design Criterion 41, require that reactor facilities be provided with a means for post-accident control of combustible gases in the containment. To meet these requirements, the BFN facilities are provided with a

shared, redundant (i.e., two trains or “subsystems”), safety-grade CAD system as described in Section 5.2.6 of the UFSAR.

The CAD system is classified as an engineered safety feature. During a postulated design basis LOCA, hydrogen, a combustible gas, would be generated by metal-water reaction, radiolysis, and corrosion. If hydrogen and oxygen are present in the containment in sufficient concentration, the containment barrier and equipment within the containment are threatened by the possibility of excessive temperature and pressure due to hydrogen combustion. The CAD system is designed to provide the capability to prevent a combustible hydrogen/oxygen mixture from forming during a design basis LOCA. Assuming the hydrogen and oxygen generation rates as specified in Regulatory Guide 1.7 “Control of Combustible Gas Concentrations in Containment Following a Loss-of-Coolant Accident,” the concentration of combustible gases in containment following a LOCA can be controlled by the CAD system. This is accomplished by maintaining an inert containment during normal operation, and, in the event of an accident, using the CAD system to inject nitrogen gas into the containment to dilute any oxygen generated by the LOCA, and venting the containment atmosphere as necessary, for pressure control, through the standby gas treatment system.

The staff has issued guidance for reviewers and utilities that will meet the requirements of 10 CFR 50.36 for TSs. The staff guidance applicable to BWRs with Mark 1 containments, such as BFN, is promulgated as NUREG-1433, “Standard Technical Specifications General Electric Plants, BWR/4.”

#### 4.0 TECHNICAL EVALUATION

The current BFN Unit 1 TSs require two CAD subsystems to be operable during operation in Modes 1 and 2. If one subsystem is inoperable (Condition A), a 30 day completion time is specified to restore operability. If this condition is not met (Condition B), the facility must be in Mode 3 within 12 hours. No required action is specified for the condition wherein both CAD subsystems are inoperable. Therefore, for that condition, TS 3.0.3 applies, requiring shutdown to commence within 1 hour.

The TS change requested by the licensee would revise Condition B. The new Condition B would state that with two CAD subsystems inoperable, the required action is “B.1 Verify by administrative means that the hydrogen control function is maintained with a completion time of 1 hour and once per 12 hours thereafter; and B.2 Restore one CAD subsystem to OPERABLE status with a completion time of 7 days.” The existing Condition B would then become Condition C.

Revision 3 of NUREG-1433, “Standard Technical Specifications General Electric Plants, BWR/4,” provides a 7-day continued operation allowance with two CAD systems inoperable if an alternate hydrogen control system is verified available. The licensee indicated that for BFN, the normal containment inerting system provides this hydrogen control function.

In the event of a LOCA, the core standby cooling systems are designed to prevent significant fuel damage and the generation of significant quantities of hydrogen. Should fuel damage be postulated, and hydrogen and oxygen be generated per Regulatory Guide 1.7 assumptions, the inerted primary containment atmosphere ensures that the oxygen concentration is too low to

react with this hydrogen gas. Hence, any oxygen which can react must be generated from radiolytic decomposition of water under post-LOCA conditions.

The primary containment inerting system can be used to provide nitrogen dilution in a manner analogous to the CAD system. The BFN EOs preferentially direct the use of the normal primary containment inerting system for purging and venting during emergency conditions. The EOI procedural policy, which is in accordance with industry emergency procedure guidelines, recognizes that the inerting system is well suited for use under emergency conditions since it is routinely used for purge and vent operations under normal operations. Under this procedural direction, the CAD system serves as the backup method rather than the primary means to mitigate any combustible mixture formation. Therefore, the proposed TS change is consistent with this EOI usage of the normal inerting system by requiring it to be functional as the alternate hydrogen control function during any period of reactor operation if both CAD subsystems are inoperable. This is consistent with STS provisions for CAD.

The NRC staff has reviewed the licensee's application. Based on its review, the staff concludes that the proposed TS amendment to provide 7 days of continued operation with two trains of the CAD subsystem inoperable is acceptable. The amendment is consistent with NUREG-1433, Revision 3, "Standard Technical Specifications General Electric Plants, BWR/4," consistent with the NRC approved study contained in NEDO-22155, "Generation and Mitigation of Combustible Mixtures in Inerted BWR Mark 1 Containment," and meets the criteria set forth in Generic Letter 84-09, "Recombiner Capability Requirements of 10 CFR 50.44(c)(3)(ii)." The staff concluded that the normal containment inerting system provides an alternate postaccident containment atmosphere dilution capability, and the reliability of other services supported by the CAD system (i.e., instrument/control air, hardened wetwell vent capability, vacuum breaker isolation valves) would not be adversely affected by this change. The proposed TS changes have been previously approved for BFN Units 2 and 3. Based on the above, the staff finds the proposed TS change for BFN, Unit 1 for the CAD system to be acceptable.

## 5.0 STATE CONSULTATION

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

## 6.0 ENVIRONMENTAL CONSIDERATION

The amendment changes a requirement with respect to installation or use of a facility component located within the restricted area as defined in 10 CFR Part 20. 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 (69 FR 64991). 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 amendment will not be inimical to the common defense and security or to the health and safety of the public.

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Date: July 18, 2005

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