October 21, 1988

Docket Nos. 50-259/260/296

Distribution

Docket File	GGears
NRC PDR	DMoran
Local PDR	JRutberg
Projects Rdg.	DCrutchfield
OSP Reading	BGrimes
JPartlow	EJordan
SRichardson	ACRS(10)
SBlack	GPA/PA
MSimms	GPA/CA
FMcCoy	BFN Rdg. File

Mr. S. A. White
Senior Vice President, Nuclear Power
Tennessee Valley Authority
6N 38A Lookout Place
1101 Market Street
Chattanooga, Tennessee 37402-2801

Dear Mr. White:

SUBJECT: APPENDIX R EXEMPTIONS FOR BROWNS FERRY NUCLEAR PLANT, UNITS 1, 2 AND 3 (TAC 61124, 61125 AND 61126)

In a letter dated January 31, 1986 as revised by letters dated November 21, 1986, May 26, 1987, September 14, 1987, and April 4, 1988, you requested certain exemptions from the technical requirements of Appendix R, Sections III.L and III.G to 10 CFR Part 50 for the Browns Ferry Nuclear Plant, Units 1, 2 and 3.

Based upon the evaluation of your submittals, we have concluded, for the exemptions requested, that Browns Ferry alternate fire protection configuration provided an equivalent level of safety to that achieved by conformance with Appendix R. Therefore, the Commission has granted your exemptions pursuant to 10 CFR Part 50.12.

A copy of the "Environmental Assessment and Finding of No Significant Impact" was sent to you by our letter dated October 11, 1988, and published in the Federal Register on October 19, 1988 (53 FR 40979).

A copy of the exemption is being filed with the Office of the Federal Register for publication.

Sincerely,

Original Signed by

Suzanne Black, Assistant Director
for Projects
TVA Projects Division
Office of Special Projects

Enclosures:
1. Exemption
2. Safety Evaluation
3. Technical Evaluation Report

cc w/enclosures:
See next page

8810270478 881021
PDR ADOCK 05000259
F PDC

DFO1
1/1

OFC	:OSP:TVA/LA	:OSP:TVA/PM	:TVA:AD/P	:OGC	:TVA:AD/TP	:TVA:D	:OSP:D
NAME	:MSimms MCS	:GGears:as	:SBlack	:	:BDLiaw	:SRichardson:	JPartlow
DATE	:10/11/88	:10/13/88	:10/11/88	:10/ /88	:10/12/88	:10/21/88	:10/ /88

OFFICIAL RECORD COPY

cc:
General Counsel
Tennessee Valley Authority
400 West Summit Hill Drive
E11 B33
Knoxville, Tennessee 37902

Mr. R. L. Gridley
Tennessee Valley Authority
5N 157B Lookout Place
Chattanooga, Tennessee 37402-2801

Mr. C. Mason
Tennessee Valley Authority
Browns Ferry Nuclear Plant
P.O. Box 2000
Decatur, Alabama 35602

Mr. P. Carier
Tennessee Valley Authority
Browns Ferry Nuclear Plant
P.O. Box 2000
Decatur, Alabama 35602

Mr. D. L. Williams
Tennessee Valley Authority
400 West Summit Hill Drive
W10 B85
Knoxville, Tennessee 37902

Chairman, Limestone County Commission
P.O. Box 188
Athens, Alabama 35611

Claude Earl Fox, M.D.
State Health Officer
State Department of Public Health
State Office Building
Montgomery, Alabama 36130

Regional Administrator, Region II
U.S. Nuclear Regulatory Commission
101 Marietta Street, N.W.
Atlanta, Georgia 30323

Resident Inspector/Browns Ferry NP
U.S. Nuclear Regulatory Commission
Route 12, Box 637
Athens, Alabama 35611

Dr. Henry Myers, Science Advisor
Committee on Interior
and Insular Affairs
U. S. House of Representatives
Washington, D.C. 20515

Tennessee Valley Authority
Rockville Office
11921 Rockville Pike
Suite 402
Rockville, Maryland 20852

UNITED STATES OF AMERICA

NUCLEAR REGULATORY COMMISSION

In the Matter of	)	
	)	
TENNESSEE VALLEY AUTHORITY	)	Docket Nos. 50-259, 50-260 and 50-296
	)	
(Browns Ferry Nuclear Plant, Units 1, 2 and 3)	)	

EXEMPTION

I.

The Tennessee Valley Authority (TVA or the licensee) is the holder of Operating License No. DPR-33 which authorizes operation of Browns Ferry Nuclear Plant (BFNP) Unit 1, Operating License No. DPR-52 which authorizes operation of Unit 2, and Operating License No. DPR-68 which authorizes operation of Unit 3. The licenses provide, among other things, that the plant is subject to all rules, regulations, and Orders of the Commission now or hereafter in effect.

The plant is comprised of three boiling water reactors (BWRs) at the licensee's site located near Decatur, Alabama.

II.

On November 19, 1980, the Commission published a revised Section 50.48 and a new Appendix R to 10 CFR Part 50 regarding fire protection features of nuclear power plants (45 FR 76602). The revised Section 50.48 and Appendix R became effective on February 17, 1981. Section III of Appendix R contains 15 subsections, lettered A through O, each of which specified requirements for

a particular aspect of the fire protection features at a nuclear power plant. Two of these subsections, III.L and III.G, are the subject of the licensee's exemption request.

Subsection III.L.1 of Appendix R requires that the alternative shutdown capability be able to maintain the reactor coolant system process variables within those predicted for a loss of normal ac power, and Section III.L.2.b of Appendix R requires that the reactor coolant makeup function maintain the coolant level above the top of the core for BWRs.

Subsection III.G.2 of Appendix R requires that one train of cables and equipment necessary to achieve and maintain safe shutdown be maintained free of fire damage by one of the following means:

a. Separation of cables and equipment and associated non-safety circuits of redundant trains by a fire barrier with a 3-hour rating. Structural steel forming a part of or supporting such fire barrier shall be protected to provide fire resistance equivalent to that required of the barrier.

b. Separation of cables and equipment and associated non-safety circuits of redundant trains by a horizontal distance of more than 20 feet free of intervening combustibles or fire hazards. In addition, fire detectors and an automatic fire suppression system shall be installed in the fire area.

c. Enclosure of cable and equipment and associated non-safety circuits of one redundant train in a fire barrier with a 1-hour rating. In addition, fire detectors and an automatic fire suppression system shall be installed in the fire area.

Subsection III.G.3 of Appendix R requires that where Subsection III.G.2 cannot be met, alternative or dedicated shutdown capability shall be provided. For areas where alternative and dedicated shutdown is provided, fire detection and a fixed suppression system shall also be installed in the areas, room, or zone under consideration.

III.

By letter dated January 31, 1986, the licensee requested exemptions from specific requirements of Appendix R. By letters dated November 21, 1986, May 26, 1987, September 14, 1987 and April 4, 1988, the licensee provided additional information to support and to modify certain exemption requests identified in the January 31, 1986 submittal. A description of the exemptions requested and the acceptability of these exemptions are addressed below. The Commission staff's detailed Safety Evaluation is concurrently being issued.

Exemption Requested

The licensee requested an exemption from the requirements of Appendix R to 10 CFR Part 50, Section III.L, Items III.L.1.b and III.L.2.b. These items require that the reactor coolant make-up function associated with the alternative/dedicated shutdown system provided for a specific fire area be capable of maintaining the reactor coolant level above the top of the core for BWRs (III.L.2.b) and, thus, assure that the system has the capability to maintain the reactor coolant inventory (III.L.1.b). Contrary to this, temporary uncovering of the core may be experienced as provided in the licensee's submittal.

The licensee has determined and the staff concurs that the duration of core uncovery is not long enough to result in damage to the core. Also, maximum suppression pool temperatures attained still allow for operation of

the residual heat removal (RHR) system [i.e., net positive suction head (NPSH) requirements can be met].

The special circumstances of 10 CFR 50.12 apply since application of the regulation in the particular circumstances is not necessary to achieve the underlying purpose of the rule. Although momentary uncovering of the core may occur, licensee has performed detailed heat transfer analysis confirming lack of fuel clad damage in the core. Subsection III.L. requires that where alternative or dedicated safe shutdown capability is provided for a specific fire area that it be able to effect safe shutdown of the plant. The perfomance goals specified in Subsection III.L.2.b for the shutdown functions state that the reactor coolant level be maintained above the top of the fuel for BWRs. The underlying purpose of this performance goal is to prevent fuel clad damage and thus core damage. The licensee has demonstrated, notwithstanding a momentary coolant level drop below the top of the active core, that there will be no damage to fuel cladding and, therefore, to the core. Therefore, the underlying purpose of the rule is satisfied because the licensee has demonstrated that the plant can be safely shut down without fuel cladding damage.

Exemption Requested

An exemption was requested from the specific requirements of Section III.G.3 to the extent that a fixed fire suppression system is not provided in an area (Fire Area 16) for which an alternative shutdown capability is provided.

The licensee has provided an independent alternative shutdown capability for the main control rooms in Fire Area 16. The control rooms have automatic

fire detection systems installed and they are continuously manned. There are fire extinguishers and a hose station available for manual fire fighting. A postulated fire in this area is not expected to threaten other safe shutdown areas adjacent to it because of the existence of fire rated barriers and other fire protection features. Therefore, a fixed fire suppression system installation would not significantly upgrade the level of fire protection.

The special circumstances of 10 CFR 50.12 apply since application of the regulation in the particular circumstances is not necessary to achieve the underlying purpose of the rule. The underlying purpose of Subsection III.G.3 is achieved by having the control room continously manned and fire mitigation equipment located in the rooms. Thus, the underlying purpose of the rule would be satisfied without installing a fixed fire suppression system in the control room.

Exemption Requested

An exemption was requested from the specific requirements of Subsection III.G.2.b to the extent that areas containing redundant trains of RHR pumps and heat exchangers are not provided with an automatic fire suppression system (RHR Pumps - Fire Zones 1-1, 1-2, 2-1, 2-2, 3-1, and 3-2; Heat Exchanger Rooms - Fire Zones 1-3, 2-4, and 3-3).

Fire Zones 1-1, 1-2, 1-3, 2-1, 2-2, 2-4, 3-1, 3-2, and 3-3 are in the RHR pump and heat exchanger rooms. The fire loads in these zones is low to negligible. The licensee has provided fire detection systems and has installed water curtains and draft stops. These features provide reasonable assurance that a fire would remain small, be easily extinguished by the fire brigade, and not threaten adjacent plant areas or redundant RHR

equipment/cables which have a separation of more than 70 feet. Therefore, the installation of an automatic fire suppression system is not required.

The special circumstances of 10 CFR 50.12 apply since application of the regulation in the particular circumstances is not necessary to achieve the underlying purpose of the rule. As discussed above, the underlying purpose of Subsection III.G.2 is achieved by spatial separation in excess of the requirements (70 feet versus 20 feet), existing and proposed fire protection features and a low combustible load. Therefore, the underlying purpose of the rule would be satisfied without installation of automatic fire suppression system in the above Fire Zones.

Exemption Requested

An exemption was requested from the specific requirements of Subsection III.G.2.b to the extent that it requires no intervening combustibles within a 20-foot separation space provided between redundant safe shutdown system components. This exemption covers each Reactor Building for all three units.

With respect to each Reactor Building, it is found that the fire severity based on the existing combustible loading is substantially less than the fire rating of the existing fire barriers. Certain vertical penetrations such as equipment hatches are adequately protected by either heavy metal covers or water curtains. Area wide fire detection and sprinkler systems coupled with local supplemental sprinkler coverage and manual extinguishers and hose stations are provided in the Reactor Buildings. Should a fire occur in a Reactor Building, it is expected to develop slowly, be detected early, and be extinguished by either an automatic fire suppression system or by the

fire brigade. Therefore, it is concluded that the fire protection features in the reactor buildings provide a level of fire protection equivalent to the requirements of Subsection III.G.2.b.

The special circumstances of 10 CFR 50.12 apply since application of the regulation in the particular circumstances is not necessary to achieve the underlying purpose of the rule. As discussed above, the underlying purpose of Subsection III.G.2 is achieved by means of sprinkler system coverage, area wide detection and spatial separation of cables. Therefore, the underlying purpose of the rule would be satisfied without removal of intervening combustibles.

Exemption Requested

Exemptions were requested from the specific requirements of Subsection III.G.3 of Appendix R to the extent that fixed fire detection and suppression systems were not provided in areas for which alternative shutdown capability has been provided (Control Building - Fire Area 16).

The principal concern is that fire in this fire area could spread to a critical area and cause a loss of normal shutdown capability. The Control Building has fire rated barriers that exceed the expected fire severity based on the fire load within or near the affected areas. There are fire extinguishers and hose stations available for manual fire fighting. Therefore, there is reasonable assurance that a fire in this area could be readily extinguished by the fire brigade. The licensee has not provided a fire detection system for all locations in this fire area, however, there is reasonable assurance that a fire in this fire area would not propagate beyond the specific area origin. Should a fire occur and damage redundant normal safe

shutdown components within the aforementioned fire area, the alternative safe shutdown would be available to maintain safe shutdown.

The special circumstances of 10 CFR 50.12 apply since application of the regulation in the particular circumstances is not necessary to achieve the underlying purpose of the rule. With the provided fire protection features discussed above and a limited quantity of combustible materials, the staff concludes that the underlying purpose of Section III.G.3 is achieved. Thus, area-wide fixed suppression and detection system in Control Building is not necessary to provide reasonable assurance that a fire would be detected and suppressed and post-fire capability maintained free of fire damage.

IV.

Accordingly, the Commission has determined, pursuant to 10 CFR 50.12(a), that (1) these exemptions described in Section III are authorized by law and will not present an undue risk to the public health and safety and are consistent with common defense and security, and (2) special circumstances are present for the exemptions in that application of the regulation in these particular circumstances is not necessary to achieve the underlying purposes of Appendix R to 10 CFR Part 50. Therefore, the Commission hereby grants the exemptions from the requirements of Sections III.L and III.G of Appendix R to 10 CFR Part 50 as follows:

1. Core Uncovery to the extent that alternative shutdown capability is not able to maintain reactor coolant inventory above the core in a BWR as required by Section III.L of Appendix R.

2. The Main Control Room to the extent that a fixed suppression system is not provided throughout the area as required by Section III.G of Appendix R.

3. RHR Pump Rooms and Heat Exchanger Rooms to the extent that an automatic fire suppression system is not provided as required by Section III.G of Appendix R.

4. The Reactor Buildings to the extent that Section III.G of Appendix R requires that there be no intervening combustibles within a 20 foot separation space between redundant safe shutdown system components.

5. The Control Building to the extent that Section III.G.3 requires installation of fire detection and fixed fire suppression in the fire areas for which an alternative shutdown capability has been provided.

Pursuant to 10 CFR 51.32, the Commission has determined that the granting of these exemptions will have no significant impact of the environment

October 19, 1988 (53 FR 40979)

A copy of the licensee's requests for exemptions dated January 31, 1986 and subsequent documents as well as the Safety Evaluation dated , 1988, related to this action is available for public inspection at the Commission's Public Document Room, 2120 L Street, N.W., Washington, D.C. and at the local public document room located at Athens Public Library, South Street, Athens, Alabama 35611. A copy may be obtained upon written request addressed to the U.S. Nuclear Regulatory Commission, Washington, D.C. 20555, Attention: Director, Office of Special Projects.

This Exemption is effective upon issuance.

Dated at Rockville, Maryland this 21st day of October 1988.

FOR THE NUCLEAR REGULATORY COMMISSION

James G. Partlow, Director
Office of Special Projects

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

SAFETY EVALUATION BY THE OFFICE OF SPECIAL PROJECTS

RELATIVE TO APPENDIX R EXEMPTIONS REQUESTED

TENNESSEE VALLEY AUTHORITY

FOR BROWNS FERRY NUCLEAR PLANT UNITS 1, 2, AND 3

DOCKET NOS. 50-259/260/296

1.0 INTRODUCTION

By letter dated January 31, 1986, the Tennessee Valley Authority (TVA or the licensee) submitted a revised plan for compliance with 10 CFR 50, Appendix R for the Browns Ferry Nuclear Plant (BFNP) Units 1, 2, and 3. This revised plan was the result of a complete reevaluation of the Licensee's Appendix R program which sought to bring the plant in conformance with the NRC staff positions and Appendix R requirements. This submittal identified several exemptions from the Appendix R requirements. By letters dated June 2, and November 21, 1986, May 26, 1987, September 14, 1987, and April 4, 1988 the Licensee supplemented their revised plan and modified some exemption requests. The final exemption request consists of one request for exemption to Section III.L of Appendix R and four exemptions from Section III.G of Appendix R.

This Safety Evaluation (SE) is based in part on the attached Technical Evaluation Report (TER) generated by a NRR contractor, Franklin Research Center (FRC). This SE covers only the requested exemptions and the engineering evaluations submitted in accordance with Generic Letter 86-10. Staff approval of other parts of the Browns Ferry Fire Protection Program is not intended by this SE.

Section III.L.1 of Appendix R requires that the alternative shutdown capability be able to maintain the reactor coolant system process variables within those predicted for a loss of normal ac power during the postfire shutdown. Section III.L.2.b. of Appendix R requires that the alternative shutdown capability be capable of maintaining the reactor coolant level above the top of the core for BWRs. The licensee requested an exemption from Section III.L of Appendix R to the extent that some core uncovery may be experienced as noted in the licensee's analyses of fire events and some process variables may exceed those predicted for a loss of ac power event.

Section III.G.1 of Appendix R requires fire protection features to be provided for structures, systems, and components important to safe shutdown and capable of limiting fire damage so that:

a. One train of systems necessary to achieve and maintain hot shutdown conditions from either the control room or emergency control station(s) is free of fire damage; and

b. Systems necessary to achieve and maintain cold shutdown from either the control room or emergency control station(s) can be repaired within 72 hours.

Section III.G.2 of Appendix R requires that one train of cables and equipment necessary to achieve and maintain safe shutdown be maintained free of fire damage by one of the following means:

a. Separation of cables and equipment and associated non-safety circuits of redundant trains by a fire barrier having a 3-hour rating. Structural steel forming a part of or supporting such fire barriers shall be protected to provide fire resistance equivalent to that required of the barrier.

b. Separation of cables and equipment and associated non-safety circuits of redundant trains by a horizontal distance of more than 20 feet with no intervening combustibles or fire hazards. In addition, fire detectors and an automatic fire suppression system shall be installed in the fire area.

c. Enclosure of cable and equipment and associated non-safety circuits of one redundant train in a fire barrier having a 1-hour rating. In addition, fire detectors and an automatic fire suppression system shall be installed in the fire area.

If the above conditions are not met, Section III.G.3 requires an alternative shutdown capability that is independent of the area, room, or zone of concern. It also requires that fire detection and a fixed suppression system be installed in the areas, room, or zone of concern. These alternative requirements are not deemed to be equivalent; however, they provide an acceptable level of fire protection for those configurations in which they are approved by the staff.

Because it is not possible to predict the specific conditions under which fires may occur and propagate, the design basis protective features rather than the design basis fire are specified in the rule. Plant-specific features may require protection different from the measures specified in Section III.G. In such a case, the licensee must demonstrate by means of a detailed fire hazards analysis that existing protection or existing protection in conjunction with proposed modifications will provide a level of safety equivalent to the technical requirements of Section III.G of Appendix R.

In summary, Section III.G is related to fire protection features to ensure that systems and associated circuits used to achieve and maintain safe shutdown are free of fire damage. Either the fire protection configurations must meet the specific requirements of Section III.G or an alternative fire protection configuration must be justified by a fire hazards analysis. Generally, the staff will accept an alternative fire protection configuration if:

- The alternative ensures that one train of equipment necessary to achieve hot shutdown from either the control room or emergency control systems is free of fire damage.
- The alternative ensures that fire damage to at least one train of equipment necessary to achieve cold shutdown is limited so that it can be repaired within a reasonable time (minor repairs using components stored on the site).
- Fire-retardant coatings are not used as fire barriers.
- Modifications required to meet Section III.G would not enhance fire protection safety levels above those provided by either existing or proposed alternatives.
- Modifications required to meet Section III.G would be detrimental to overall facility safety.

Generic Letter 86-10 (April 24, 1986), Attachment, "Interpretations of Appendix R," allows for fire area boundaries which are not completely sealed floor-to-ceiling, wall-to-wall 3-hour fire rated boundaries to be accepted without formal exemption from Section III.G of Appendix R. The Generic Letter requires that licensees perform an evaluation to assess the adequacy of fire boundaries in their plants to determine if the boundaries will withstand the hazards associated with the area. This analysis or engineering evaluation must be performed by at least a fire protection engineer and, if required, a systems engineer. Licensees may submit their evaluations for staff review and concurrence, although this is not required. The licensee must retain the analyses for subsequent NRC audits whether or not the analyses are submitted.

Altogether eight exemptions from Section III.G were requested:

Exemption from fixed suppression in the main control rooms;
Exemption for RHR pump rooms;
Exemption for fire doors;
Exemption for intervening combustibles;
Exemption for reactor building and refuel floor;
Exemption for fixed suppression and detection;
Exemption for lack of fire dampers in HVAC ducts in 3-hour fire barriers; and
Exemption for use of water curtains in reactor buildings.

Of these eight exemption requests, the provisions of Generic Letter 86-10 to do an engineering evaluation were found to be applicable to four of them. These four were:

Exemption for fire doors;
Exemption for reactor building refuel floor;
Exemption for lack of fire dampers in HVAC ducts; and
Exemption for use of water curtains in reactor buildings.

Each of the exemptions requested by the licensee is evaluated below. The four exemption requests to be reviewed as engineering evaluations under Generic Letter 86-10 are discussed in Section 3.0 of this SE following discussions of the other exemptions.

2.0 EXEMPTIONS

2.1.0 Core Uncovery

2.1.1 Exemption Requested

By a November 21, 1986 submittal (R. Gridley to D. Muller) TVA requested an exemption from "no core uncovery," i.e., Section III.L.1 of Appendix R requires that the alternative shutdown capability be able to maintain the reactor coolant system process variables within those predicted for a loss of normal ac power. Section III.L.2.b of Appendix R requires that the alternative shutdown capability be able to maintain reactor coolant inventory above the core for a BWR. Contrary to this, some core uncovery may be experienced as noted in the analysis for the evaluation fire event.

TVA summarized their justification for the exemption essentially as follows: When the alternate shutdown capability is used in response to a fire, the process variables would exceed those predicted for a loss of normal ac power. Although some momentary core uncovery can be expected for the systems used for BFN, the core uncovery will not result in any fuel damage, which satisfies the requirement specified in Section III.L.1 of Appendix R. Sections 3 and 6 of NEDC-31119 are referenced as presenting the development of the design requirements for the BFN safe shutdown system and the safe shutdown analysis.

2.1.2 Discussion

As described in NEDC-31119, the alternate shutdown systems to satisfy Appendix R were selected to include those which may be used when offsite power is available and those which may be used when offsite power is not available. The systems were further reduced to a set of minimum systems including the auxiliary support systems. A safe shutdown analysis was performed for each fire area to confirm that at least one train was available to provide minimum safe shutdown functions. The reactor coolant system response was evaluated by the SAFE code. Core heat-up response was determined by the CHASTE code. Suppression pool response was determined from heat and mass balance calculations.

2.1.3 Evaluation

Considering only the reactor core variables, Appendix R, Section III.L requires, in essence, a dedicated system or systems which may be used to bring the plant to hot or cold shutdown without fuel damage regardless of where the fire may occur.

In the analysis of each event, if it can be confirmed that there will be no core uncovery, or that the process variables will be maintained within those predicted for a loss of normal ac power, or if an acceptable detailed heat transfer analysis of the core confirms the absence of fuel clad damage, the NRC will accept that the alternate or dedicated shutdown capability is adequate.

The minimum safe shutdown systems for a BFN fire affected unit includes only the manual control of the main steam relief valves (MSRVs), residual heat removal system (RHR) in the low pressure coolant injection system (LPCI) mode, and the residual heat removal service water (RHRSW) systems. When the reactor pressure is reduced to allow low pressure injection, the froth level surrounding the core momentarily drops below the top of the core (resulting in core uncovery and exceeding process variables associated with loss of offsite power event). GE has analyzed those events relying upon minimum systems using codes found acceptable to the NRC. The analyses have confirmed that no core damage would occur.

In the November 21, 1986 submittal, RHR/LPCI injection was assumed at 20 minutes after manual scram. The RHRSW was assumed to provide cooling after two hours rather than three hours as in the January 1986 submittal. The staff has been advised that RHRSW system actuation within two hours has been incorporated in the operating procedures. This has alleviated the staff's concerns about inadequate net pump suction head (NPSH) for RHR pumps late in the event.

2.1.4 Conclusion

Based upon the above evaluation the staff recommends that the requested exemptions to Section III.L of Appendix R to 10 CFR 50 be granted. The staff will audit the Appendix R abnormal occurrence operating procedures to assure that RHRSW system actuation is initiated within two hours.

2.2.0 Main Control Rooms Fire Area 16

2.2.1 Exemption Requested

An exemption was requested from Section III.G.3 of Appendix R to the extent that it requires installation of a fixed fire suppression system in a fire area (Fire Area 16) for which an alternative shutdown capability is provided.

2.2.2 Discussion

The main control rooms for all three units are located in the control building (Fire Area 16) which is a shared, reinforced concrete structure. The main control rooms are a central location for manual and automatic controls for all plant systems.

The most severe postulated fire would affect all three units. Therefore, an independent alternative safe shutdown system is required for the control rooms. The current alternative shutdown system at BFNP includes backup control stations and other manual controls. The backup control stations are located in the 4-KV shutdown board rooms A, C, and E for Units 1, 2, and 3, respectively. The backup control stations have manual controls for reactor core isolation cooling system (RCIC), main steamline isolation valves (MSIVs), MSRVs and associated instrumentation. The manual trip capability for the MSIVs and MSRVs provides additional assurance that spuriously opened valves can be closed. The manual control of the MSRVs with automatic depressurization system (ADS) function assures that the MSRV requirements for minimum safe shutdown systems are satisfied. The licensee has committed to re-route certain cables to assure instrumentation availability at the backup control stations. In summary, the alternative safe shutdown system is physically and electrically independent of the control building for all three units.

2.2.3 Evaluation

The fire protection in this fire area (main control rooms) does not comply with the technical requirements of Section III.G.3 of Appendix R because a fixed fire suppression system is not installed in a fire area for which alternative shutdown capability is provided.

The primary concern for this fire area was that a fire in the main control rooms could cause the loss of normal shutdown capability. However, should a fire occur within the main control rooms, it is expected to be promptly detected by the automatic fire detection system, the station personnel, or the fire brigade. Should fire damage be extensive, necessitating the control rooms' evacuation, then the alternative safe shutdown system can be utilized to safely shut down the plant. Except for the battery and battery board rooms, the control building has 3-hour fire rated adjacent barriers. The battery and battery board rooms which have a combustible loading of less than 30 minutes, have 1-1/2 hour rated barriers and fixed detection and suppression. Therefore, it is expected that a fire starting anywhere in the control building would not spread to adjacent fire areas. The staff finds that the installation of a fixed suppression system would not significantly increase the level of fire protection in the main control rooms.

2.2.4 Conclusion

Based on the above evaluation, the staff concludes that the existing fire protection features combined with the alternative shutdown capability in the aforementioned fire area provide a level of protection equivalent to the technical requirements of Section III.G.3 of Appendix R. Therefore, the exemption from fixed fire suppression in the main control rooms should be granted.

2.3.0 RHR Pump Rooms (Fire Zones 1-1, 1-2, 2-1, 2-2, 3-1, and 3-2) and Exchanger Rooms (Fire Zones 1-3, 2-4, and 3-3)

2.3.1 Exemption Requested

An exemption was requested from Section III.G.2.b of Appendix R to the extent that it requires that cable, equipment, and associated circuits of redundant trains be separated by a horizontal distance of 20 ft. or more and installation of an automatic fire suppression system in the RHR pump/heat exchanger rooms.

2.3.2 Discussion

The licensee stated that circuits and equipment of both divisions of the RHR located on elevation 519 are separated from each other by a cumulative horizontal distance of more than 20 feet; however, automatic suppression is not provided.

The RHR pump rooms and heat exchanger rooms are constructed of reinforced concrete and are located within the reactor buildings on elevation 519 feet. Open metal grating exists at elevations 541 and 565 feet of the RHR pump rooms. A portion of the heat exchanger room floor is metal grating which is the ceiling of the RHR pump room. The distance between the unprotected openings of the two RHR pump rooms for each unit is about 70 feet with no significant intervening combustibles. The height to the solid ceiling located below elevation 621 feet is 101 feet. The RHR pumps are located in two of the four corner rooms of each reactor building. Each core spray/RCIC corner room is in the same fire zone and on the same side of the RHR pump rooms, but on the opposite side of the building. A HPCI room adjoins one RHR corner room on each unit reactor building.

The fire load in the RHR pump rooms primarily consists of pump lube oil, plastics, and cables. The average RHR pump room fire load is 14,000 Btu per square foot, which translates into an equivalent fire severity of 11 minutes as represented by the ASTM E-119 fire test curve. The fire loading in the core spray/RCIC, and torus area is negligible. In the HPCI room the fire load is also low (15,500 Btu per square foot).

The safe shutdown system components located in the subject fire zones include both divisions of:

- RHR pumps
- RHR heat exchangers
- associated cables

Several circuits of RHR Division 1 pass across the ceiling of the Division II heat exchanger room, resulting in a separation of approximately 15 feet horizontally and 80 feet vertically between divisional cables. There are other interdivisional valves to RHR equipment with separations between 12 to 20 feet horizontally and 80 feet vertically.

Fire protection coverage for the RHR pump and heat exchanger rooms is in the form of hose stations and portable fire extinguishers. The licensee has

committed to provide cross-zoned fire detectors on the ceilings of the RHR pump rooms. The licensee has installed a water curtain and draft stop to separate the RHR heat exchanger rooms and the fire zone on elevation 593 feet. The general area at elevation 593 feet is protected by fire detection and automatic fire suppression systems. One of the RHR pump rooms for each unit is adjacent to a high pressure coolant injection system (HPCI) room. The HPCI room has automatic fire suppression and detection systems that protect the lube oil tank fire hazards located there.

2.3.3 Evaluation

The fire protection in the RHR pump and heat exchanger rooms does not comply with the technical requirements of Appendix R because an automatic fire suppression system has not been installed in the fire zones per Section III.G.2.b.

The principal concern with the level of fire protection in the RHR pump and heat exchanger rooms was that because of the absence of an automatic fire suppression system, a fire of significant magnitude could develop and damage redundant RHR system components. However, the fire load inside these fire zones and adjoining locations is low to negligible. If a fire were to occur, it would develop slowly with low heat release and slow room temperature rise. The water curtains and draft stops installed around the open grating between the RHR pump rooms and the RHR heat exchanger rooms will prevent spread of fire between these rooms. Also, the open grating will permit some heat to dissipate to the 621 foot elevation where the volume of space is large relative to the volume and fire load of the RHR pump rooms. Because of the early warning fire detection systems in the RHR pump and heat exchanger rooms' ceilings, the fire would be detected in its incipient stages and would summon the plant fire brigade. Until the fire was extinguished, the low fuel load, concrete barriers, and high ceilings would prevent the fire from damaging or spreading to redundant RHR system components located over 70 feet away. Should a fire occur in the HPCI room, torus area, or core spray/RCIC rooms, it is not expected to spread to the RHR pump and heat exchanger rooms because of the negligible intervening fire loads. The water spray system in the HPCI room would contain the lube oil fire hazard located therein.

The staff finds that the installation of an automatic fire suppression system would not significantly increase the level of fire protection in the RHR pump and heat exchanger rooms.

2.3.4 Conclusion

Based on the above evaluation, the staff concludes that the existing fire protection measures for the RHR pump and heat exchanger rooms provides a level of fire protection equivalent to the technical requirements for Section III.G.2.b of Appendix R. Therefore, the exemption request for the aforementioned zones should be granted.

2.4.0 Reactor Buildings

2.4.1 Exemption Requested

An exemption was requested from the specific requirements of Section III.G.2.b to the extent that it requires no intervening combustibles within a 20-foot separation space between redundant safe shutdown system components.

2.4.2 Discussion

Each reactor building has open ladder-type cable trays located between redundant safe shutdown system components separated by a distance equal to or greater than 20 feet. The intervening combustibles consist of the cable insulation in the cable trays.

The locations within the reactor buildings having the aforementioned concern have no other in-situ fire hazards or fire loads except for the cable insulation. The average fire load is equivalent to a fire severity of 30 minutes as represented by the ASTM E-119 fire test curve. The cables and trays have been liberally coated with flamastic compound, which is a fire retardant material. The licensee has further committed that any new cable additions to the trays will conform to the fire resistance properties of IEEE Std. 383.

The reactor buildings are constructed of reinforced concrete and the ceilings are 20 to 30 feet high. Area wide fire detection and sprinkler systems coupled with local supplemental sprinkler coverage and manual extinguishers and hose stations are provided to protect the intervening cables in the affected areas. Where sprinkler system coverage does not exist, the licensee has committed to provide additional sprinklers as necessary as delineated in the January 31, 1986 submittal and to provide additional sprinkler coverage to mitigate the effects of a floor level and transient exposure fire.

2.4.3 Evaluation

The fire protection in the reactor buildings does not comply with the technical requirements of Section III.G.2.b of Appendix R because there is not 20 feet of spatial separation free of intervening combustibles between redundant safe shutdown system components.

There was concern regarding the level of fire protection in the reactor building areas because of the presence of intervening combustibles. A fire of significant magnitude could develop and spread through the 20-foot space between the redundant safe shutdown divisions. The primary fire load of concern is cable insulation which has been coated with a fire retardant material. There is not significant fire loading on the floor except for the possibility of a transient exposure fire. Should a fire occur, it is expected to be small and develop slowly. Also, the actuation of the fire detection system(s) would alarm and summon the fire brigade. Until the fire was extinguished, the low fire load, the spatial separation equal to or greater than 20 feet, the high ceilings, the fire retardant coating on cable insulation, and the sprinkler system coverage above and below the cable trays

would provide reasonable assurance that the fire would not simultaneously threaten redundant safe shutdown system components. It is expected that the fire would remain small and be easily extinguished by the fire brigade.

2.4.4 Conclusion

Based on this evaluation, it is concluded that local supplemental sprinkler coverage on intervening combustible loads between redundant trains separated by a horizontal distance of 20 feet or more under the conditions as described by the licensee is equivalent to the separation requirements of Section III.G.2.b of Appendix R in regard to horizontal separation. However, the placement of a local supplemental sprinkler system does not exempt the licensee from the other requirements of Section III.G.2.b (installation of detection and suppression in the fire area). This supplemental sprinkler system should serve as an independent defense against fire spread and meet the intent of the defense in depth philosophy inherent in Section III.G.2.b. The criteria developed for supplemental sprinkler protection for Watts Bar and Sequoyah may also be used (as approved for Deviation 11 - Appendix R, SON, Youngblood to White letter of May 29, 1986). Applicability of this criterion will depend on the comparability of suppression capability at Browns Ferry to the plants for which the criterion was approved.

Therefore, the exemption should be granted with the condition that an evaluation of the existing and supplemental suppression coverage be available for NRC audit for each use of the exemption.

2.5.0 Control Building (Fire Area 16)

2.5.1 Exemption Requested

An exemption was requested from Section III.G.3 to the extent that it requires installation of fire detection and fixed fire suppression systems in the fire areas for which an alternative shutdown capability has been provided. This request for exemption originally included Shutdown Board Rooms inside the Reactor Buildings, consisting of fire areas 4 through 15; Shutdown Board Rooms inside the Unit 3 Diesel Generator Buildings consisting of fire areas 22 through 24; and the Turbine Building consisting of Fire Area 25. These areas were deleted from the requests for exemption by the licensee in its letter of November 21, 1986. Hence, this exemption request is for the Control Building only.

2.5.2 Discussion

The control building is a separate fire area enclosed by reinforced concrete barriers equivalent to a 3-hour fire rated barrier except for the battery and battery board rooms (Fire Areas 17, 18, and 19). Some of these walls are 1-1/2 hour fire rated. However, the battery and battery board rooms have fire detection and fire suppression systems as well as a combustible loading of less than 30 minutes. The lack of a fixed fire suppression system in the main control rooms is addressed in a separate exemption request evaluated in

2.2.0 of this report. All areas in the Control Building without detection and suppression are listed below:

Control Building Areas Without Fire Detection and Suppression

Room	Elevation
Corridor	593
Computer Services Room	593
Stairs	593
Stairs	606
Stairs	617
Corridor	617
Lunch Room	617

Control Building Areas Without Fire Suppression

Room	Elevation
Computer Maintenance Room	593
Electrical Rooms	593
Corridor	593
MG Set Room	593
Communication Room	593
Communication Battery Board Room	593
Communication Battery Room	593
Mechanical Equipment Room	593

Fire extinguishers and hose stations are available within Fire Area 16.

The control building has redundant safe shutdown system components, but alternative shutdown capability has been provided which is independent of Fire Area 16 (Control Building).

2.5.3 Evaluation

The fire protection in the Control Building does not comply with the technical requirements of Section III.G.3 of Appendix R because fire detection and fixed fire suppression systems have not been installed in the fire areas for which an alternative shutdown capability is provided.

The principal concern was that fire in one of these fire areas could spread to a critical area and cause a loss of normal shutdown capability. However, the low fire load and fire barriers provide reasonable assurance that a fire would not propagate beyond the specific area of fire origin. There is also reasonable assurance that a fire in these areas can be readily extinguished by the fire brigade. Fire detection systems are provided for the subject areas except as noted in the above table.

Should a fire damage redundant normal safe shutdown system components in the subject fire areas before the fire is extinguished, alternative shutdown capability is available to maintain safe shutdown. The staff finds that the installation of fixed fire suppression systems and area wide detectors would not significantly increase the level of fire protection for these areas.

2.5.4 Conclusion

Based on the above evaluation, the staff concludes that the existing fire rated barriers and fire protection features combined with the alternative shutdown capability in the Control Building provides a total level of protection equivalent to the technical requirements of Section III.G.3 of Appendix R. Therefore, this exemption should be granted as requested. With respect to withdrawing the exemption requests for the Shutdown Board Rooms inside the Reactor Buildings (Fire Areas 4 through 15), in the Unit 3 Diesel Generator Building (Fire Areas 22 through 24) and the Turbine Building (Fire Area 25), compliance with the requirements of Section III.G of Appendix R will be verified by the staff during the regular Appendix R audit prior to authorizing the licensee to return to power.

3.0 EXEMPTION REQUESTS IN REGARD TO FIRE AREA BOUNDARIES AS PER GENERIC LETTER 86-10

The following exemption requests were evaluated under the provisions of Generic Letter 86-10.

3.1.0 Fire Doors, Reactor Buildings Elevations 505, 541 and 519 Feet

3.1.1 Exemption Requested

An exemption was requested from the specific requirement of Section III.G.2.a to the extent that 3-hour rated fire doors are not provided for certain fire rated barriers.

3.1.2 Discussion

Fire rated barriers are required to have door openings equipped with a fire rated door assembly. The fire rating of the door assembly should equal that required of the fire rated barrier. Contrary to this requirement, the following unrated fire doors are used in 3-hour fire rated barriers:

(a) The door openings into the main steam and feedwater piping tunnels which separate the reactor buildings from the turbine building at elevation 565 feet. These doors are identified as door Nos. 220, 239, and 252 for Units 1, 2, and 3, respectively.

(b) The doors between the reactor buildings on elevations 519 and 541 feet. They are identified as door nos. 30, 31, 34, 35, 36, 37, 40, 41, 42, 43, 44, and 45.

(c) The personnel locks and the equipment access locks on the turbine building entrance to Units 2 and 3 reactor buildings at elevation 565 feet. These doors are identified as numbers 235 and 248 for the personnel locks and numbers 237 and 250 for the equipment access locks.

The affected unrated fire doors are identified by number, column line, and elevation in the following tabulation:

Door No	Column Line	Elevation
30	R7-n	519
31	R7-r	519
34	R8-r	519
35	R8-n	519
36	R14-n	519
37	R14-r	519
40	R15-r	519
41	R15-n	519
42	R7-r	541
43	R8-r	541
44	R-14-r	541
45	R15-r	541
220	R3-n	565
235	R8-n	565
237	R9-n	565
239	R10-n	565
248	R15-n	565
250	R16-n	565
252	R17-n	565

3.1.2.1 Fire Doors of the Main Steam and Feedwater Piping Tunnels, Door Nos. 220, 239, and 252

The main steam and feedwater piping tunnels have walls, floors, and ceilings with a fire rating in excess of 3 hours. The fire load is negligible. The main steam and feedwater piping tunnels are in between each reactor building and the turbine building. On the reactor building side the interface is a door opening and a blowout panel. On the turbine building side, (approximately 40 feet from the blowout panel) the piping tunnel opens into the moisture separator area. This area has several openings into the general area of the turbine building and the main condenser room. Portable fire extinguishers and hose stations are available to the area. No safe shutdown cables or equipment are located in these areas.

3.1.2.2 Fire Doors Between Reactor Buildings, Door Nos. 30, 31 34, 35, 36, 37, 40, 41, 42, 43, 44, and 45

The walls between the reactor buildings are equal to or greater than 3-foot-thick reinforced concrete. There is a door on each side of the opening through the wall on elevations 519 and 541 feet. Between Units 1 and 2, the

doors connect Unit 1 RHR pump room and core spray pump room to the Unit 2 RHR pump room and the core spray/RCIC pump room at the 519-foot elevation. At the 541-foot elevation, two doors connect Units 1 and 2 through the RHR pump rooms. The door connections between Units 2 and 3 are similar to those between Units 1 and 2. Each door is a heavy equipment bulkhead door of all metal construction (5/16-inch-thick plate). Labeled doors are not available for this type of application.

The fire load in the rooms on either side of the subject doors is low and is equivalent to a fire severity of about 12 minutes. The RHR pump rooms at the zone interface will be provided with water curtains actuated by cross-zoned fire detectors.

3.1.2.3 Personnel Locks and the Equipment Access Locks, Doors Nos. 235, 237, 248 and 250

The walls between the reactor buildings and the turbine buildings are 2-foot-thick reinforced concrete. Personnel locks and equipment access locks are provided for access between the turbine building and the reactor buildings. These doors are at the following locations:

a. Personnel lock (door 235) on the turbine building entrance to Unit 2 reactor building at elevation 565 feet.

b. Equipment access lock (door 237) on the turbine building entrance to Unit 2 reactor building at elevation 565 feet.

c. Personnel lock (door 248) on the turbine building entrance to Unit 3 reactor building at elevation 565 feet.

d. Equipment access lock (door 250) on the turbine building entrance to Unit 3 reactor building at elevation 565 feet.

These doors are heavy equipment bulkhead type doors of all metal (1/4-inch-thick) construction. Labeled doors are not available for these types of applications. These doors are part of the enclosures that separate the reactor buildings and the turbine building to maintain the secondary containment boundary. For the personnel access locks, the enclosures are of reinforced concrete with a fire rating of three hours. The doors between the enclosures and the reactor building are heavy steel doors without a fire rating. The equipment lock enclosures have 7-5/8-inch hollow concrete block walls with seismic reinforcement. The ceilings are 4-inch reinforced concrete with a fire rating of one hour. The doors in these enclosures are the same as the personnel access doors and are not fire rated.

There are no fire loads within the enclosures separating the reactor and turbine buildings. For a fire to spread between these two buildings it would have to propagate through one of the enclosure doors and through a second metal door. The fire load and/or fire hazards on either side of these locks is not sufficient to permit fire to spread to the two buildings.

3.1.3 Evaluation

The fire protection in the affected plant areas does not comply with the technical requirements of Section III.G.2.a of Appendix R because fire rated door assemblies have not been installed in fire rated barriers between fire areas or zones.

The principal concern with the level of fire protection is that because of the absence of complete 3-hour fire rated barriers, a fire of significant magnitude could develop and damage redundant and/or multiple unit safe shutdown system components. However, there are not concentrated fire loads near the unrated fire door locations and the average fire load is negligible to low (less than a 12-minute fire severity). Should a fire occur, it is expected to develop slowly, remain small, and be easily extinguished by the fire brigade. The main steam and feedwater tunnels have walls, floors, and ceilings of 3-hour fire rated construction. There are not safe shutdown systems within the area. For the reactor building and personnel lock locations, each door is a heavy, all metal construction door and, based on our judgment, can withstand a 12-minute fire severity. The staff finds that the provision of 3-hour fire rated door assemblies for the affected plant locations would not significantly increase the level of fire protection.

3.1.4 Conclusion

Based on the above evaluation, it is concluded that the existing and proposed fire protection measures provide a level of fire protection equivalent to the technical requirements of Section III.G.2.a of Appendix R. Therefore, no exemption is necessary in accordance with the provisions of Generic Letter 86-10.

3.2.0 Reactor Building Refuel Floor, Units 1, 2, and 3

3.2.1 Exemption

An exemption was requested from Section III.G.2 of Appendix R to the extent that it requires installation of automatic fire detection and suppression systems in an area that does not have 3-hour fire rated barriers between redundant safe shutdown equipment and circuits.

3.2.2 Discussion

The refuel floor is a common area at elevation 664 feet of each unit's reactor building. The refuel floor is not separated from the three reactor building fire areas by complete 3-hour fire rated barriers. However, each lower elevation within the reactor building is separated from each other by a reinforced concrete floor slab. The licensee has made a commitment that stairways and equipment hatches will have water curtains installed around the openings through the floor slabs at elevations 593, 621, and 639 feet to maintain fire zone separations. Also, on these three elevations the HVAC ducts will have either a fire rated damper or a fire rated wrap. Other mechanical

penetrations on these elevations will be sealed with fire rated seals. The refuel floor (elevation 664 feet) is separated from the rest of the reactor building by a reinforced concrete floor with an equivalent 3-hour fire rating. The stairways and elevator shafts are enclosed by concrete block walls and doors with 1-hour fire ratings. The ceiling height from the refuel floor is 51 feet and the room volume is 2,745,000 cubic feet. The refuel floor is spatially separated by about 37 feet from the turbine building and the only interface is along the north wall where the ventilation towers from Units 1, 2, and 3 contain the main exhaust ducts from the refuel floor. The ventilation towers are constructed of metal panel walls.

During plant operation the fire load for the refuel floor area is negligible and there are no significant fire hazards. Portable fire extinguishers and hose stations are available to the area.

The refuel floor contains no safe shutdown system equipment or cables.

3.2.3 Evaluation

The fire protection concern for the refuel floor area is threefold and includes the following scenarios:

(a) A fire starts in the refuel floor area and spreads down to the lower reactor building elevations containing redundant safe shutdown system components.

(b) A fire starts within one reactor building, spreads up to the refuel floor, propagates across the refuel floor, then spreads down into lower elevations of an adjacent reactor building.

(c) A fire initiates in the turbine building, spreads to the refuel floor, then down through the reactor buildings.

All three scenarios rely on a common denominator that the refuel floor has to have sufficient fire loadings or fire hazards to allow a fire to start or support propagation. Because the refuel floor has a negligible fire load, there is reasonable assurance that a fire will not develop and propagate through the floor area. It is expected that since a fire on the refuel floor would be quite small, the high ceiling (51 feet) and large volume would safely dissipate the heat and smoke. This also provides reasonable assurance that a fire would not spread down through an open equipment hatch to the lower elevations. However, if it did, the redundant safe shutdown system components located within the reactor buildings on lower levels are in accordance with the provisions of Appendix R; therefore, the fire would not affect redundant safe shutdown trains.

The two hatches closest to each other are located within Units 1 and 2. They are separated by more than 20 feet of space free of intervening combustibles. Some piping penetrations of 1-inch annular space are separated by less than 20 feet. Since the general area in the refuel floor is free of intervening

combustibles, these small openings are not significant paths for fire propagation. Therefore, it would be unlikely for fire to propagate from one reactor building to an adjacent reactor building via the refuel floor, or for fire originating in the refuel floor to propagate down into more than one reactor building.

For a fire in the turbine building to propagate to the refuel floor area, it would have to destroy the main exhaust duct from the turbine building and pass through the metal panel walls of the ventilation tower. It is not expected that a fire would accomplish this, but if it did, no severe consequences would result because there are no combustibles within the refuel floor area and no safe shutdown system components located therein. The staff finds that the installation of complete 3-hour fire rated barriers or automatic fire detection and fire suppression systems would not significantly increase the level of fire protection in the refuel area.

Based on the above evaluation, the staff concludes that the existing fire protection and proposed modifications for the refuel floor area provide a level of fire protection equivalent to the technical requirements of Section III.G.2 of Appendix R. Therefore, no exemption is necessary in accordance with the provisions of Generic Letter 86-10. The staff will, however, review controls on transient combustibles on the refuel floor during the Appendix R audit.

3.3.0 Turbine and Reactor Building Interface Wall Fire Dampers

3.3.1 Exemption Requested

An exemption was requested from Section III.G.2 of Appendix R to the extent that 3-hour fire rated HVAC dampers are not installed in 3-hour fire rated barriers that separate the turbine building and each unit's reactor building and the reactor buildings from each other.

3.3.2 Discussion

There are two separate sets of unprotected HVAC ducts. One set is located in the main steam and feedwater piping tunnel. The second set is associated with the standby gas treatment system. These ducts are in fire rated walls between the reactor buildings.

The walls, floor, and ceiling of the main steam and feedwater piping tunnels have a 3-hour fire rating. This area has been previously discussed in Section 4.2.1 of this report. The walls that separate the reactor building from each other are 3-hour fire rated. The reactor building fire area has been previously discussed in Sections 4.2.2 and 5.0 of this report.

The standby gas treatment system (SBGT) has ducts of spiral-welded ASTM-A211 pipe, a black steel pipe with a wall thickness of 0.375 inches. During plant operation the SBGT is shut down. There are charcoal filters with a fire load/severity equivalent to 24 minutes within the SBGT buildings.

3.3.3 Evaluation

The fire protection in the affected plant areas does not comply with the technical requirements of Section III.G.2 of Appendix R because fire rated dampers have not been installed in HVAC ducts that penetrate 3-hour fire rated walls separating the turbine building from the reactor building and the reactor buildings from each other.

An evaluation of these areas has been performed in Sections 4.3, 5.3 and 7.3. It was found that a fire would develop slowly and remain small. A fire within the SBGT charcoal filters would safely ventilate through the system and not infiltrate the reactor buildings. A fire in the reactor buildings would not damage the SBGT duct and would only generate warm air within the idle ducts. The staff finds that the installation of 3-hour fire rated dampers would not significantly increase the level of fire protection.

3.3.4 Conclusion

Based on the above evaluation, the staff concludes that the existing fire protection features provide a level of protection equivalent to the technical requirements of Section III.G.2 of Appendix R. Therefore, no exemption is necessary in accordance with the provisions of Generic Letter 86-10.

3.4.0 Exemption for Use of Water Curtains in Reactor Buildings

3.4.1 Exemption Required

An exemption was requested from Section III.G.2 of Appendix R to the extent that redundant safe shutdown circuits are not separated by 3-hour fire rated barriers or 1-hour fire rated barriers with automatic fire detection and suppression provided.

3.4.2 Discussion

Each Reactor Building is a designated Fire Area and each is separated from other fire areas by barriers with minimum 3-hour fire rating. Each Reactor Building is further subdivided into fire zones by reinforced concrete floor slabs at the 593, 621 and 639 foot elevations. The floor slabs have a minimum 3-hour fire rating and all piping and electrical penetrations are or will be closed with slabs having minimum 1-hour fire rating. HVAC ducts will be provided where required with dampers having minimum 1-hour fire rating. However, unprotected openings through the reinforced concrete floor slabs exist in the form of open stairways, equipment hatches and RHR heat exchanger room openings. Equivalent 1-hour protection is required for some of these openings to satisfy separation requirements of Section III.G.2 of Appendix R. Since it is not practical to install 1-hour fire rated enclosures for these openings, the licensee has installed draft stops and close spaced automatic sprinklers to form a water curtain around each opening that is required to be protected. The purpose of the draft stop around the opening is to bank heat near the ceiling from any postulated fire and cause rapid operation of the

close spaced sprinklers around the opening. This will create a water curtain around the opening and cool the hot gases from the fire before they force through the opening to fire zones above. This arrangement of draft stops and close spaced automatic sprinklers is in accordance with Section 4-4.8.2.3 of NFPA-13, standard for the installation of sprinkler systems, 1985 Edition.

3.3.3 Evaluation

Fire protection features in the affected plant areas do not meet the specific requirements of Section III.G.2 of Appendix R for either 1-hour or 3-hour fire rated barriers separating redundant trains of safe-shutdown equipment in that reinforced concrete floor slabs have unprotected openings in the form of stairways, equipment hatches and RHR heat exchanger rooms openings. The licensee has, however, installed draft stops and close spaced automatic sprinklers to provide "water curtains" around these openings. The installation of the draft stops and close spaced sprinklers is in accordance with the provisions of Section 4-4.8.2.3 of NFPA-13, a standard for the installation of sprinkler systems, 1985 Edition, and is an acceptable method of protecting openings through floor-ceiling fire barriers. The staff finds that this method of protection for the floor openings is acceptable in conjunction with the fire protection features provided for safe shutdown components located in the areas of concern. Therefore, the installation of 1-hour or 3-hour fire rated enclosures around these openings would not significantly increase the level of fire protection in the Reactor Buildings.

3.4.4 Conclusion

Based on the above evaluation, the staff concludes that existing and proposed fire protection features will provide a level of fire protection that satisfies the technical requirements of Section III.G.2 of Appendix R. Therefore, no exemption is necessary in accordance with the provisions of Generic Letter 86-10.

4.0 SUMMARY

Based on this evaluation, it is found that the level of fire safety in the areas listed below is equivalent to that achieved by compliance with the technical requirements of Appendix R, and therefore, the request for exemptions in these areas should be granted:

1. Core Uncovery to the extent that alternative shutdown capability is not able to maintain reactor coolant inventory above the core in a BWR as required by Section III.L of Appendix R. See Section 2.1 for details.

2. The Main Control Room to the extent that a fixed suppression system is not provided throughout the area as required by Section III.G of Appendix R. See Section 2.2 for details.

3. RHR Pump Rooms and Heat Exchanger Rooms to the extent that an automatic fire suppression system is not provided as required by Section III.G of Appendix R. See Section 2.3 for details.

4. The Reactor Buildings to the extent that Section III.G of Appendix R requires that there be no intervening combustibles within a 20 foot separation space between redundant safe shutdown system components. See Section 2.4 for details.

5. The Control Building to the extent that Section III.G.3 requires installation of fire detection and fixed fire suppression in the fire areas for which an alternative shutdown capability has been provided. See Section 2.5 for details.

In addition to the above listed exemptions, the staff has also approved the licensee's analysis in regard to the fire area boundary deviations as per Generic Letter 86-10. These deviations are as follows:

1. Reactor Buildings on elevations 565, 541, and 519 feet to the extent that 3-hour fire rated doors are not provided for certain fire rated barriers. See Section 3.1 for details.

2. Reactor Building Refuel floors to the extent that 3-hour barriers are not provided between redundant safe shutdown equipment and circuits. See Section 3.2 for details.

3. Turbine and Reactor Building Interface Wall Fire dampers to the extent that 3-hour fire rated dampers are not provided for certain locations. See Section 3.3 for details.

4. Water Curtains in Reactor Buildings to the extent that redundant safe shutdown circuits are not separated by 3-hour fire rated barriers. See Section 3.4 for details.

5.0 PRINCIPAL CONTRIBUTORS

This Safety Evaluation was prepared by John Stang, Rex Wescott, and James Watt and was partly based on a technical evaluation report prepared by Franklin Research Center (FRC) under a contract with U.S. Nuclear Regulatory Commission (NRC).

Principal Contributors: R. Wescott and J. Watt

Dated: October 21, 1988