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

December 20, 1989

Docket No 50-416

LICENSEE: System Energy Resources, Inc. (SERI)

FACILITY: Grand Gulf Nuclear Station, Unit 1 (GGNS-1)

SUBJECT: SUMMARY OF DECEMBER 6, 1989 MEETING REGARDING FIRE PROTECTION.

The NRC staff met with the licensee at the NRC office in Rockville, Maryland to discuss the staff's draft safety evaluations of the revised GGNS Fire Hazards Analysis and the implementation of Generic Letter 88-12, "Removal of Fire Protection Requirements from Technical Specifications". Enclosure 1 is a list of participants in the meeting. Enclosure 2 is the agenda prepared by SERI. Enclosure 3 is a copy of slides prepared by SERI. Enclosure 4 is a list of documents proposed by staff to be included in the "fire protection program" as used in the recommended license condition in GL 88-12. Enclosure 5 is the staff's draft Safety Evaluation (SE) concerning deviations from Section III G of to 10 CFR Part 50, Appendix R. Enclosure 6 is the staff's draft SE concerning deviations from Section III L of 10 CFR Part 50, Appendix R.

The history of the fire protection review for GGNS-1 is tabulated on pages 1-3 of Enclosure 3. In 1984, the licensee reviewed Appendix R compliance in light of NRC's clarification of requirements. In 1985, the staff inspected GGNS-1 for compliance with the Fire Protection Program in the FSAR and the intent of Appendix R (License Condition 2 C.(23)). As a result of the licensee's review and the staff's inspection, several exceptions to the requirements of Appendix R were taken and submitted to the staff for review (Pages 4 and 5 of Enclosure 3). The staff has evaluated these exceptions and prepared draft SEs (Enclosures 5 and 6) which were discussed in the meeting. Revisions to the Fire Hazards Analysis have been submitted annually as described on pages 6 and 7 of Enclosure 3.

SERI submitted a proposed license condition change pursuant to Generic Letter 86-10, "Implementation of Fire Protection Requirements". The submittal was held in abeyance by NRC until clarifications were issued in GL 88-12 (Page 8 of Enclosure 3). The revised submittal which is to be made pursuant to GL 88-12 was discussed in the meeting. Key features of the revised submittal, as proposed by the licensee, are given on page 9 of Enclosure 3.

The following summarizes the results of the meeting:

- The Technical Specifications (TS) regarding fire protection will be transferred verbatim to the Updated Final Safety Analysis Report (UFSAR). TS Section 1.0, "Definitions," and TS 3/4.0, "Applicability," will apply to the transferred TS.

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- The revised application for amendment will describe the administrative procedures for fire protection evaluations and associated 10 CFR 50.59 safety evaluations when making changes to the Fire Protection Program.

- UFSAR Appendix 9A will be revised to explicitly state that the Fire Hazards Analysis, which is referenced therein, is a part of the UFSAR.

- The proposed license condition will specify the revision of the UFSAR which contains the approved Fire Protection Program and the revised application will identify the sections of the UFSAR and other documents, if any, which contain the approved program. In this regard, the staff said the alternate shutdown cooling descriptions in UFSAR Sections 7.4.1.4 and 7.4.1.5 should be a part of the Fire Protection Program (See Enclosure 4). The licensee will consider this recommendation.

- The staff said the new license condition for fire protection should remain subject to License Condition 2.F., which requires reporting of any violations of a license condition. The licensee had proposed removing the new fire protection license condition from this requirement on the basis that it may conflict with 10 CFR 50.72 reporting requirements. The licensee will consider staff's recommendation.

- The licensee will review the staff's draft SEs (Enclosures 5 and 6) which will be included by reference in the new license condition. Comments on the SEs to identify any factual or updating changes believed to be needed will be provided by letter.

Original Signed By:

L. L. Kintner, Senior Project Manager
Project Directorate II-1
Division of Reactor Projects I/II

Enclosures:
As stated

cc w/enclosures:
See next page

OFC	:LA:PD21:DRPR	PM:PD21:DRPR	D:PD21:DRPR	:	:	:	:
NAME	:PAndersen	LKintner:dt	EAdensam	:	:	:	:
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Mr. W. T. Cottle
System Energy Resources, Inc.

Grand Gulf Nuclear Station (GGNS)

cc:
Mr. T. H. Cloninger
Vice President, Nuclear Engineering
& Support
System Energy Resources, Inc.
P. O. Box 31995
Jackson, Mississippi 39286

Robert B. McGehee, Esquire
Wise, Carter, Child, and
Caraway
P. O. Box 651
Jackson, Mississippi 39205

Nicholas S. Reynolds, Esquire
Bishop, Cook, Purcell
and Reynolds
1400 L Street, N.W. - 12th Floor
Washington, D.C. 20005-3502

Mr. Ralph T. Lally
Manager of Quality Assurance
Entergy Services, Inc.
P. O. Box 31995
Jackson, Mississippi 39286

Mr. Jack McMillan, Director
Division of Solid Waste Management
Mississippi Department of Natural
Resources
P. O. Box 10385
Jackson, Mississippi 39209

Mr. John G. Cesare
Director, Nuclear Licensing
System Energy Resources, Inc.
P. O. Box 469
Port Gibson, Mississippi 39150

Mr. C. B. Hogg, Project Manager
Bechtel Power Corporation
P. O. Box 2166
Houston, Texas 77252-2166

Mr. H. O. Christensen
Senior Resident Inspector
U.S. Nuclear Regulatory Commission
Route 2, Box 399
Port Gibson, Mississippi 39150

Mr. C. R. Hutchinson
GGNS General Manager
System Energy Resources, Inc.
P. O. Box 756
Port Gibson, Mississippi 39150

The Honorable William J. Guste, Jr.
Attorney General
Department of Justice
State of Louisiana
P. O. Box 94005
Baton Rouge, LA 70804-9005

Alton B. Cobb, M.D.
State Health Officer
State Board of Health
P. O. Box 1700
Jackson, Mississippi 39205

Office of the Governor
State of Mississippi
Jackson, Mississippi 39201

President,
Claiborne County Board of Supervisors
Port Gibson, Mississippi 39150

Regional Administrator, Region II
U.S. Nuclear Regulatory Commission
101 Marietta St., Suite 2900
Atlanta, Georgia 30323

Mike Moore, Attorney General
Frank Spencer, Assist. Attorney General
State of Mississippi
Post Office Box 22947
Jackson, Mississippi 39225

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ENCLOSURE 1

December 6, 1989 NRC-SERI Meeting

Name	Affiliation
L. L. Kintner	NRC Project Manager
D. Notley	NRC
D. Kubicki	NRC
Emmett G. Roun	SERI
Dennis P. Wiles	SERI
Thomas E. Barnett, Jr.	SERI
John Fowler	SERI

NRC/SERI MEETING ON FIRE PROTECTION
9:00 AM
DECEMBER 6, 1989
NRC WHITE FLINT FACILITY
ROCKVILLE, MARYLAND

I. GGNS FIRE PROTECTION HISTORY
- Key Dates and Events
- Discussion of SERs and their impact on the Fire Protection Program
- Appendix R Exceptions
- Revised Safe Shutdown Analysis

II. GGNS FIRE HAZARDS ANALYSIS
- Summary of Revisions through Rev. 2
- Summary of Revision 3 Changes

III. SERI PROPOSAL FOR GENERIC LETTER 86-10/88-12
- Overview of SERI Proposal
- Proposed Operating License Condition
- Description of Controlled Fire Protection Program
- Control of Relocated Tech Specs
- Changes to the Approved Fire Protection Program and use of 10CFR50.59

IV. STAFF'S APPENDIX R SER
- Review for Consistency with GGNS Fire Protection Features and SERI Submittals

V. CONCLUSION

I. GGNS FIRE PROTECTION HISTORY

Enclosure 3

HISTORY AND SIGNIFICANT EVENTS

2/81 APPENDIX R RULE EFFECTIVE NOT APPLICABLE TO GGNS

9/81 SER ISSUED

- o BACKFIT APPENDIX R SECTIONS III.G,J,O
- o MUST MEET "INTENT" OF APPENDIX R

6/82 LOW POWER OPERATING LICENSE ISSUED

- o OL CONDITIONED TO MEET "INTENT" OF APPENDIX R
- o INSTALL RMS DIV I ISOLATION SWITCH DURING FIRST OUTAGE

10/83 GENERIC LETTER 83-33 ISSUED

2/84 IE NOTICE 84-09 ISSUED

5/84 NRC REGION II, APPENDIX R WORKSHOP

5/84 SERI APPENDIX R REVIEW PROJECT COMMENCED

8/84 FULL POWER OPERATING LICENSE

- o FIRE PROTECTION LICENSE CONDITION UNCHANGED

SERs AND THEIR IMPACT ON THE FIRE PROTECTION PROGRAM

- o SER DATED SEPTEMBER, 1981
  - DOCUMENTED STAFFS REVIEW AGAINST APPENDIX A TO BTP 9.5-1
  - GGNS FIRE PROTECTION PROGRAM MEETS BOTH GUIDELINES OF BTP AND INTENT OF APPENDIX R
- o SSER SUPPLEMENT 1 DATED DECEMBER, 1981
  - DOCUMENTED STAFF'S REVIEW AND ACCEPTANCE OF GGNS DESIGN APPENDIX R SECTIONS III.G (SAFE SHUTDOWN) AND III.L (ALTERNATE/REMOTE SHUTDOWN)
  - ACCEPTANCE ON III.L WAS IN PART BASED ON SERIs COMMITMENT TO INSTALL RMS ELECTRICAL ISOLATION
- o SSER SUPPLEMENT 2 DATED JUNE, 1982
  - REITERATES SERI COMMITMENT TO INSTALL ELECTRICAL ISOLATION
  - STATES STAFFS INTENT OF CONDITION THE OL TO REQUIRE DESIGN SUBMITTAL PRIOR TO FIRST OUTAGE

- SSER SUPPLEMENT 3 DATE JULY, 1982
  - DISCUSSED EXCEPTIONS THAT SERI TOOK TO THE SER DESCRIPTIONS OF (3) FIRE ZONES
  - REQUIRED INSTALLATION OF SPRINKLERS IN (1) FIRE ZONE
- REQUIRED INSTALLATION OF SPRINKLERS IN (1) FIRE ZONE
  - RECOGNIZED SERI'S SUBMITTAL OF RMS ELECTRICAL ISOLATION DESIGN AND COMPLETION OF OL CONDITION 2.C.(30)

APPENDIX R EXCEPTIONS

- Fire Area 1: Intervening combustibles (cable) in fire zones 1A101, 1A114, and 1A117 (AECM 85/0129)

  No modification were required to support this exception

- Fire Area 2: Redundant trains of safe shutdown cable are not separated by a continuous three hour rated fire barrier (AECM 85/0129)

  No modifications were required to support this exception

- Fire Area 6: Intervening combustibles (cable) in fire zone 1A211 (AECM 85/0129 & AECM 86/209)

  No modifications were required to support this exception

- Fire Area 11: Intervening combustibles (cable) in fire zone 1A316, and intervening combustibles (lube oil) in fire zone 1A322 (AECM 85/0129)

  DCP 85/3082 provided for Isolation of intervening Combustables (cabling) in fire zone 1A322. DCP 84/3228 provided 1 hr fire wraps in fire zone 1A316.

- Fire Area 19: Intervening combustibles (cable) and automatic suppression not provided in fire zone 1A428. (AECM 85/0129)

  No Modifications were required to support this exception, however DCP 83/0003 was implemented to add additional sprinkler coverage.

- Fire Area 25: Redundant trains of safe shutdown equipment in the drywell (Fire Zone 1A112) are separated by less than 20 feet horizontally, and no automatic suppression nor radiant energy shields have been provided (AECM 86/0190)

  DCP 85/3075 was implemented to provide radiant energy shields for certain safe shutdown circuits in Fire Area 25.

- o Fire Area 42: Redundant trains of safe shutdown cable and equipment are not separated by a 3 hour rated fire barrier in fire zones OC302 and OC303. (AECM 85/0129)

  DCP 84/3221, DCP 85/3132 & DCP 84/3224 provided Fire Wraps to support this exception.

- o Fire Area 50: Automatic suppression not provided in the Control Room, fire zone OC503 (AECM 85/0129)

  DCP 81/5003 and DCP 85/3098 provided Alternate Shutdown capability for a Fire in Fire Area ~~25~~ 50

- o Fire Area 59: Redundant trains of safe shutdown cable located in Manhole MH01 are not separated by 3 hour barriers. (AECM 85/0129)

  No modifications were required to support this exception.

- o Various Areas: Unprotected supports for raceways provided with 1 hour fire wrap. (AECM 85/0191) (AECM 85/0192)

  MNCR 0267-85 provided additional fire wraps for one Raceway support.

II. GGNS FIRE HAZARDS ANALYSIS

KEY REVISIONS FROM 1985 THROUGH 1989

The Fire Hazard Analysis (FHA) was submitted on May 7, 1985 reflecting and evaluation which compared the Grand Gulf Fire Protection Program with the positions of Appendix R. This FHA bore Bechtel Specification nubmer 15026-m-500.0, Rev.1.

A revised FHA was submitted May 7, 1986 bearing MP&L Specification Number M-500.0, Rev.0. This revision of the FHA reflected the following changes:

- Preparation under the controls of NPE Adminstrative Procedures in lieu of Bechtel Procedures
- Revisions to the Combustible Heat Load Calculations
- Updated information due to completion of the Fire Area 25 analysis.

SUMMARY OF REVISION 1 CHANGES

Revision 1 of the FHA was submitted on April 7, 1987. The following changes were incorporated:

- Alternate Shutdown System completed.
- Three hour Fire barriers are not provided on safe shutdown raceway in Fire Zone OC504 due to implementation of alternate shutdown.
- Automatic sprinkler protection was provided in Fire Zones 1A417, 1A424, and 1A428.
- Various Fire Zones not provided with detection where identified to include safety-related piping and valves.
- Power supply for the RPS sensors, trip unit Neutron Monitoring System, Nuclear Steam Supply Shut-off System, Leak Detection System, and Process Radiation Monitoring System was changed from RPS BUS to Class IE UPS.
- Fire Zone 1A603 was revised to reflect the presence of a nonrated hatchway.
- Revisions to the Combustible Heat Load Calculation.

SUMMARY OF REVISION 2 CHANGES

Revision 2 of the FHA was submitted May 11, 1988 and incorporated the following changes:

- Deletion of the 2-hour rating for various walls within Fire Area 26; the north, south, and east walls of Fire Zone OC305; and the wall separating Fire Zones OC603 and OC614.

SUMMARY OF REVISION 3 CHANGES

Currently, the FHA is at Rev. 3 which was submitted on May 5, 1989. The following changes were incorporated:

- Smoke detection added in Fire Zone 1A430.
- The wall separating the Unit 1 and 2 Control Room Spaces was relocated.
- Deleted the 2-hour fire rating for the walls of Fire Zone OC110.
- Fire Area 59 (Yard) was revised to reflect the presence of the newly constructed Modification and Engineering Facility.

III. SERI PROPOSAL FOR GENERIC LETTER 86-10/88-12

PROPOSED OPERATING LICENSE CONDITION

SERI shall implement and maintain in effect all provisions of the approved Fire Protection Program as described in the Updated Final Safety Analysis Report and as approved in the Safety Evaluation Report dated (Date of SER approving revisions to the Approved Fire Protection Program), subject to the following provisions:

> The licensee 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.

REVISED SAFE SHUTDOWN ANALYSIS

- BASED ON NRC GUIDANCE OF GL 83-33 AND IE NOTICE 84-09, SERI INITIATED AN EXTENSIVE REVIEW IN MAY, 1984
- GGNS APPENDIX R REVIEW RESULTED IN REVISED SAFE SHUTDOWN
- FHA REVISED TO REDEFINE FIRE ZONES
- RCIC REMOVED FROM SAFE SHUTDOWN LIST/REVISED SAFE SHUTDOWN ANALYSIS
- SERI REQUESTED EXCEPTIONS TO LITERAL REQUIREMENTS OF APPENDIX R FOR:
  - USE OF LOW PRESSURE MAKEUP
  - UNPROTECTED SUPPRESSION POOL LEVEL INSTRUMENTATION

INCORPORTATION OF THE FIRE PROTECTION PROGRAM INTO THE FINAL SAFETY ANALYSIS REPORT

- GGNS FIRE PROTECTION PROGRAM IS DESCRIBED IN THE FOLLOWING UFSAR SECTIONS:
  - SECTION 9.5.1, FP SYSTEMS
  - APPENDIX 9A, FIRE HAZARDS ANALYSIS
  - APPENDIX 9B, FP PROGRAM DESCRIPTION
  - APPENDIX 9C, SAFE SHUTDOWN ANALYSIS
  - TABLE 9.5-11, APPENDIX A COMMITMENTS
  - TABLE 9.5-12, APPENDIX R COMMITMENTS

PROPOSED TECH SPEC CHANGES

- CONSISTENT WITH GL 88-12
- REMOVE FIRE PROTECTION FEAUTRES
- RETAINS:
  - REMOTE SHUTDOWN SYSTEM INSTRUMENTATION
  - AUDITS
  - PROCEDURES AND PROGRAMS
- ADDS REQUIREMENT FOR PSRC REVIEW OF CHANGES TO THE FP PROGRAM

ENCLOSURE 4

Fire Protection Program

UFSAR

7.4.1.4	Remote Shutdown System
7.4.1.5	Alternate Shutdown System
Table 7.4.6	Controls for Alternate Shutdown Panels
9.5.1	Fire Protection System
Appendix 9A	References Fire Hazards Analysis Report
Appendix 9B	Fire Protection Program
Appendix 9C	Analysis of Safe Shutdown
Table 9.5-11	Comparison with NRC Branch Technical Position APCSB 9.5-1, Appendix A
Table 9.5-12	Comparison with Appendix R to 10 CFR Part 50
Table 9.5-16	LCOs and Surveillance Requirements removed from TS

Figures 9.5-1 to 9.5-8e, inclusive.
Fire Protection System

Separate Documents

Fire Hazards Analysis (Revision 3, May 5, 1989)*
Fire Protection Plan (includes instrumentation from TS)

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*Previous Submittals May 7, 1985 (AECM 85/0129); May 7 1986 (AECM 86/0123); April 7, 1987 (AECM 87/0078); May 11, 1988 (AECM 88/0082)

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Enclosure 5

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION RELATIVE TO APPENDIX R DEVIATIONS REQUESTED FOR SYSTEM ENERGY RESOURCES, INC. GRAND GULF NUCLEAR STATION UNIT 1 DOCKET NO. 50-416

1.0 INTRODUCTION

By letter dated May 7, 1985, the Licensee submitted an updated fire hazards analysis and a 10 CFR 50 Appendix R Fire Protection Review Summary Report. These documents were submitted as a result of an updated comparison of the Licensee's fire protection program based on recent NRC regional workshops and new Appendix R clarifications contained in the Generic Letters. On June 17 and 18, 1986, a site visit was conducted for the purpose of seeking clarification of the Licensee's submittals and to gather plant-specific information. A total of nine deviations from Appendix R were identified in the May 7, 1985, summary report and an additional deviation was presented during the site meeting. By letters dated July 24 and July 31, 1986, the Licensee supplemented their earlier submittals and docketed the tenth deviation. The information presented in the Licensee's submittal, the supplements, and the information collected during the site visit are the bases for the deviation request evaluations in this report.

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 nonsafety 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 nonsafety 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 nonsafety 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 that there be an alternative shutdown capability independent of the area, 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. 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.

2.0 AUXILIARY BUILDING PERIMETER PASSAGEWAYS, FIRE AREA 1 (FIRE ZONES 1A101, 1A114, 1A117 and 1A120)

2.1 Deviation Requested

A deviation was requested from Section III.G.2.b of Appendix R to the extent that it requires an area-wide fire suppression system and no intervening combustibles within the separation space that is greater than 20 feet between redundant safe shutdown system components.

2.2 Discussion

Fire Area 1 is within the auxiliary building and consists of Fire Zones 1A101, 1A107, 1A108 1A111, 1A114, 1A117 1A120, 1A127, 1A130, and 1A131. However, only Fire Zones 1A101, 1A114, and 1A117 contain safe shutdown components. These three fire zones and Fire Zone 1A120 are completely open to each other and form a perimeter passageway around the auxiliary building. The ceiling, floor, and all walls are complete 3-hour fire rated barriers, except for the interfaces with stairs and elevators, which are 2-hour fire rated. These fire zones encompass elevations 93 and 103 feet. The average fire load in Fire Area 1 is equivalent to a 15 minute fire severity with a maximum of a 30 minute fire severity for one fire zone. Fire detection is provided through the area and partial automatic sprinkler system coverage exists in zones containing Division 1 and Division 2 safe shutdown cables. Fire hose stations and fire extinguishers are available throughout the area.

2.2.1 Fire Zone 1A101

Fire Zone 1A101 forms part of a perimeter corridor within the auxiliary building. At one end of this fire zone there is a fire rated barrier, whereas, the other end is open into adjacent Fire Zone 1A117.

For Fire Zone 1A101, a minimum separation distance of 35 feet exists between unwrapped redundant divisions. The intervening combustibles consist of one ventilated cable tray containing nonsafety-related IEEE Std 383 qualified cables. Division 1 safe shutdown components, located north of column line 11.0, are protected with a 1-hour fire rated barrier (cable wrap). A partial area sprinkler system exists in Fire Zone 1A101, north of column line 10.5 where the redundant cables are located. The fire load in Fire Zone 1A101 is low and equates to a fire severity of 15 minutes.

2.2.2 Fire Zone 1A117

Fire Zone 1A117 is a continuation of open space from Fire Zone 1A101. Division 1 and 2 safe shutdown cables are located herein. The average fire load in this fire zone is equivalent to a 15 minute fire severity. Fire detection is provided throughout the zone and partial area sprinkler protection is provided west of Column Line 5.5.

2.2.3 Fire Zone 1A120

Fire Zone 1A120 is positioned next to Fire Zone 1A117 and separates it from Fire Zone 1A114. Fire Zone 1A120 contains no safe shutdown cables and offers a 90 foot separation space between redundant cables located in Fire Zones 1A117 and 1A114. The average fire load is low (15 minute fire severity) and consists of five cable trays. Fire detection is provided.

2.2.4 Fire Zone 1A114

Fire Zone 1A114 is adjacent to Fire Zone 1A120 and is a continuation of the corridor perimeter. It contains Division 1 safe shutdown cables and fire detection is provided. The fire load is equivalent to a 45 minute fire severity. The separation distance to the redundant division in Fire Zone 1A117 is about 106 feet, which includes the space in Fire Zone 1A120. Fire Detection is provided.

2.3 Evaluation

The fire protection in Fire Area 1 does not comply with the technical requirements of Section III.G.2.b of Appendix R because 20 feet of spatial separation free of intervening combustibles and an area-wide automatic fire suppression system have not been provided between redundant safe shutdown system components.

The concern regarding the level of fire protection in Fire Area 1 was that because of the lack of an area-wide fire suppression system and 20 foot spatial separations between redundant safe shutdown system components free of intervening combustibles, a fire of significant magnitude could develop and spread through the separation spaces (fire zones) between the redundant divisions. However, the fire load is low and consists of IEEE Std 383 qualified cable insulation. There is no 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. The presence of the partial sprinkler fire suppression system in Fire Zone 1A101 and 1A117 would prevent the fire from reaching significant proportions and spreading through the 35 foot separation distance. Also, the actuation of the fire detection system throughout Fire Area 1 would alarm and summon the fire brigade. Until the fire is extinguished, the low fire load, the spatial separation equal to or greater than 35 feet for Fire Zone 1A101 and 90 feet for Fire Zones 1A114 and 1A117, the high ceilings, and the partial sprinkler system coverage and 1-hour fire rated barrier (wrap) in Fire Zone 1A101 would provide reasonable assurance that a fire would not simultaneously threaten redundant safe shutdown system components. It is expected that the fire would remain small and would be easily extinguished by the fire brigade.

2.4 Conclusion

Based on the above evaluation, the staff concludes that the existing fire protection features in and around the three fire zones having redundant safe shutdown system components separated by a space from 35 to 90 feet with a minimal amount of intervening combustibles provide a level of fire protection equivalent to the technical requirements of Section III.G.2.b of Appendix R. Therefore, this deviation should be granted.

3.0 AUXILIARY AND ENCLOSURE BUILDINGS, FIRE AREA 2

3.1 Deviation Requested

A deviation was requested for Fire Area 2 from Section III.G.2.a of Appendix R to the extent that it requires complete 3-hour fire rated barriers separating redundant divisions of safe shutdown system components.

3.2 Discussion

Fire Area 2 is in the auxiliary building, includes the roof, and contains 30 fire zones that are located at each elevation of the auxiliary and enclosure buildings (roof area). The floor at elevation 93 feet of the auxiliary building is reinforced concrete slab on grade. The walls of Fire Area 2 are 3-hour fire rated, but the roof is unrated. The enclosure building is on the auxiliary building roof and its walls and roof are unrated. Finally, the auxiliary building walls on elevations 185 and 228 feet are 3-hour fire rated since they are also the containment wall.

Of the 30 fire zones in Fire Area 2, only 14 have safe shutdown equipment or cables. Fire Area 2 can be simplified by dividing it into four groups of fire zones (A, B, C, and D). Three groups are in the auxiliary building and one is in the enclosure building (roof area). The three groups of fire zones in the auxiliary building are separated from each other by complete 3-hour fire rated walls. The only exception is the pressure relief (blowout) panels that open into blowout shafts. These panels are 1-3/4-inch thick steel and are kept in a closed position.

Division 2 safe shutdown system components are located in group A, and Division 1 in group B. Group C currently contains both Division 1 and 2 safe shutdown system components in Fire Zone 1A305. Fire Zone 1A204 is the only other fire zone in group C to have a Division 1 safe shutdown train. Group D contains fire zones that have no safe shutdown system components. All Division 2 cables in Fire Zone 1A305 are provided with 3-hour fire rated barriers (wrapping). However, by letter dated July 31, 1986, the Licensee indicated that the Division 2 cabling would be eliminated from Fire Zone 1A305 and therefore, this fire zone would be in compliance with Appendix R.

The highest fire severity in Fire Area 2 is 65 minutes as represented by the ASTM E-119 fire test curve. However, this is skewed on the high side because of the area geometry (a small floor area). Since Fire Area 2 is separated from all other fire areas by 3-hour fire rated barriers, a fire will not spread into other fire areas.

Fire protection in Fire Area 2 includes fire hose stations and fire extinguishers throughout the area. Smoke detection systems are provided in all fire zones containing safe shutdown equipment cables.

3.3 Evaluation

The fire protection in Fire Area 2 does not comply with the technical requirements of Section III.G.2.a of Appendix R because a complete 3-hour fire rated barrier has not been provided between redundant divisions of safe shutdown system components.

The staff's principal concern with the level of fire protection in Fire Area 2 was that because of the the lack of complete 3-hour fire rated barriers between redundant trains of safe shutdown system components, a fire of significant magnitude could develop and damage redundant divisions of safe shutdown system components. However, there are no large fire hazards located in the fire zones of concern and the available fire load/severity is significantly less than the barrier(s) fire rating of 3 hours. The four groups of fire zones in Fire Area 2 are separated from each other by 3-hour fire rated barriers, except for the steel blowout panels. These steel panels are 1-3/4-inch-thick and are kept closed. Hence, a substantial noncombustibel physical barrier exists between the four groups of fire zones.

The fire zones within group A are separated by nonrated barriers. Since the fire zones in group A contain only Division 2 safe shutdown components, a postulated fire originating in any fire zone within this group will not affect more than one train of safe shutdown systems.

The fire zones constituting group B are also separated by nonrated barriers. Since the fire zones in group B contain only Division 1 Safe showdown components, a postulated fire originating in any fire zone within this group will not affect more than one train of safe shutdown systems.

The fire zones within group C are separated by nonrated barriers and contain both Division 1 and 2 safe shutdown components. All of the Division 2 safe shutdown components in group C are located in Fire Zone 1A305 and these cables will, by a design change, be eliminated from this Fire Zone (1A305). Therefore, a postulated fire originating in any zone with group C will not affect more than one train of safe shutdown components since Division 1 is the only exposure.

The fire zones within group D are not separated by barriers. Since the fire zones in group D do not contain any safe shutdown components, a postulated fire originating in any fire zone within this group will not affect either train of safe shutdown systems.

Division 2 in group A and Division 1 in group C are not separated by complete 3-hour fire barriers. The nonrated steel pressure relief panels located in the north and south walls and the floor of Fire Zone 1A125 (blowout shaft) are the only means of communication between group A and C fire zones. The closet Division 1 and 2 safe shutdown components are located in Zones 1A204 and 1A105. These components are separated horizontally by more than 30 feet for any of the communication paths between Fire Zones 1A105 and 1A204. Also, the communication path would have to involve two separated blowout pressure relief panels in an open position. The blowout panels are kept in a closed position. There are no intervening combustibles located within the horizontal separation distance.

If a fire were to occur in any of the four groups of fire zones, the staff anticipates that it would develop slowly with initial low heat release and slow rise in area temperature. The floors, walls, ceilings, and penetrations between the four groups of fire zones are essentially complete 3-hour fire rated barriers. However, the incompleteness of the fire barriers is due only to the 1-3/4-inch steel blowout panels, which are unrated, but offer substantial passive resistance to the spread of fire. Because of the presence of fire detection systems in the fire zones containing safe shutdown system components, the fire would be detected in a timely manner and the fire brigade would be summoned. Until the fire was extinguished, the 3-hour fire rated barriers with their steel blowout panels would provide reasonable passive protection to ensure that one division would remain free of fire damage. In the specific case of group C fire zones, which is the only group to contain redundant divisions, all Division 2 cables will be rerouted out of this fire zone, therefore, the concern for redundant divisions in this area to be damaged is mitigated.

The staff finds that the provision of 3-hour fire rated blowout panels to form complete 3-hour fire rated barriers would not significantly increase the level of fire protection in this fire area.

3.4 Conclusion

Based on the above evaluation, the staff concludes that the existing fire protection measures, separation distances, steel blowout panels, and 3-hour fire rated barriers and the rerouting of Division 2 cables out of Fire Zone 1A305, provide a level of fire protection equivalent to the technical requirements of Section III.G.2.a of Appendix R. Therefore, the deviation for Fire Area 2 should be granted.

4.0 AUXILIARY BUILDING, FIRE AREA 6 (FIRE ZONES 1A201, 1A211, 1A215, AND 1A222)

4.1 Deviation Requested

A deviation was requested from Section III.G.2.b of Appendix R to the extent that it requires an automatic fire suppression system throughout the area and a separation distance of more than 20 feet with no intervening combustibles.

4.2 Discussion

Fire Area 6 is within the auxiliary building on elevation 119 feet and consists of four fire zones: 1A201,1A211, 1A215, and 1A222. The four zones in this fire area are open to each other and form the perimeter corridor in the auxiliary building. The floor, ceiling, and walls are 3-hour fire rated barriers, except for the below grade areas and the nonrated exterior barriers. However, these barriers are of reinforced concrete and would qualify as 3-hour fire rated barriers. Barriers separating stairs and elevators are 2-hour fire rated.

All four zones contain safe shutdown system components. Fire Zone 1A211 contains Division 1 and 2 cables, which are protected by a 1-hour fire rated barrier (wrap) within the 26 foot separation space between 4 ft. and 30 ft. west of Column Line G.4. The unprotected portions are separated by 26 feet of space with intervening combustibles in the form of IEEE Std 383 cables. Fire Zone 1A201 contains only Division 1 safe shutdown system components and is adjacent to Fire Zone 1A211. There is a separation distance of at least 26 feet between the Division 1 components and the unprotected Division 2 components in Fire Zone 1A211. Fire Zone 1A215 contains only Division 1 components and is located over 90 feet away from Fire Zone 1A211 and is separated from Fire Zone 1A211 by Fire Zone 1A201. Fire Zone 1A222 contains both Division 1 and 2 safe shutdown system components. Divisions 1 and 2 within Fire Zone 1A222 are separated from each other by 28 feet of space free of intervening combustibles. Fire Zone 1A222 separates Division 1 components located in Fire Zone 1A215, from the Division 2 components located in Fire Zone 1A211.

The average fire load in Fire Area 6 is a 40-minute fire severity and, in one Fire Zone (1A201), it is 60 minutes as represented by the ASTM E-119 fire test curve. (For purposes of determining combustible fuel loading in a Fire Zone, enclosed cable trays - i.e. trays with solid bottom and solid covers - are treated the same as conduits or totally enclosed raceways.) Fire protection for this fire area includes an area-wide fire detection system. Partial area sprinkler system coverage is also provided for both fire zones that contain redundant divisions of shutdown components and for Fire Zone 1A201. Fire extinguishers, fire hose station coverage and automatic fire detection capability are also available throughout the area.

4.3 Evaluation

The fire protection in Fire Area 6 does not comply with the technical requirements of Section III.G.2.b of Appendix R because 20 feet of

spatial separation free of intervening combustibles and an area-wide automatic fire suppression system have not been provided between redundant safe shutdown system components.

The principal concern with the level of fire protection in Fire Area 6 was that a fire of significant magnitude could develop and, by spreading through the separation spaces between redundant safe shutdown components, could damage redundant divisions. Adding to this concern was the lack of complete area-wide fire suppression system and the presence of intervening combustibles within the 26-foot separation space in Fire Zone 1A211. These intervening combustibles consist of IEEE Standard 383 qualified cables. There are no other fire hazards or fuel loading within the 26-foot separation space in Fire Zone 1A211.

Should a fire occur, it is expected to be small and develop slowly. The presence of a complete area-wide fire detection system would detect and summon the fire brigade in a timely manner. The partial sprinkler systems, being in the areas of primary concern, would keep the fire small or extinguish it. Until the fire was extinguished, the low fire load in the fire zones, the 1-hour fire barrier wraps on both divisions within Fire Zone 1A211, separation distances of more than 28 feet, and the IEEE Standard 383 qualified cable insulation provide reasonable assurance that the fire would not threaten redundant safe shutdown system components simultaneously. It is expected that the fire would remain small and be easily extinguished by the fire brigade if necessary.

4.4 Conclusion

Based on the above evaluation, the staff concludes that the existing fire protection features in the fire zones having redundant safe shutdown components separated by a space of more than 26 feet with a minimal amount of intervening combustibles in the form of IEEE 383 qualified cables provide a level of fire protection equivalent to the technical requirements of Section III.G.2.b of Appendix R. Therefore, this deviation should be granted.

5.0 AUXILIARY BUILDING, FIRE AREA 11

5.1 Deviation Requested

A deviation was requested from Section III.G.2.b of Appendix R to the extent that it requires an automatic fire suppression system throughout the area and a separation distance of more than 20 feet with no intervening combustibles.

5.2 Discussion

Fire Area 11 consists of nine fire zones. Fire Zones 1A301, 1A302, 1A314, 1A316, 1A321 and 1A322 are the only fire zones in Fire Area 11 that contain safe shutdown system components, and they comprise an open,

U-shaped passage around the perimeter of the auxiliary building on elevation 139 feet. Fire Zone 1A301 is separated from Fire Zone 1A302 by the main steam tunnel. Fire Zones 1A323, 1A324, and 1A326 communicate with Fire Zones 1A316, 1A321, 1A322, and with each other through open areas and nonrated barriers. The floors, ceiling, and walls of Fire Area 11 are 3-hour fire rated barriers, except for sections of the south and west walls, which are nonrated exterior walls. However, these wall sections are of reinforced concrete and would qualify as being 3-hour fire rated. A section of the north wall, the stairwells, and Elevator No. 3 enclosures are 2-hour rated.

Fire Zone 1A316 contains Division 1 and 2 safe shutdown system components and both are provided with a 1-hour fire rated wrap within the 25-foot separation space. A minimum separation distance of 25 feet between unprotected Division 1 and 2 components exists with intervening combustibles in the form of five cable trays loaded with IEEE Std 383 qualified cables. An automatic fire suppression system is installed within this zone to cover this space. Therefore, this deviation from Section III.G.2.b can be approved in Fire Zone 1A316.

Fire Zone 1A301 contains only Division 1 components and is separated from Fire Zone 1A316 Division 2 components by a 25-foot separation distance. Fire Zone 1A321 contains only Division 2 components and is also separated by a 25-foot distance from Fire Zone 1A316 Division 1 components. An automatic sprinkler system is provided for both Fire Zones 1A301 and 1A321.

Fire Zone 1A322 contains both Division 1 and 2 components and these redundant divisions are separated by 23 feet. The only combustibles in this separation space is lube oil contained within three plant-chilled water system chillers and two enclosed cable trays. Automatic sprinklers are also provided for this zone.

Fire Zones 1A314 and 1A302 are located east of Fire Zone 1A322 and contain Division 1 components. No fire suppression system coverage is provided for these two fire zones.

Fire Area 11 is provided with an area-wide detection system. Also, fire extinguishers and hose stations are available on an area-wide basis. Fire rated barriers in all fire zones exceed the zone fire severity based on existing fire loads. There is only a minimal fire load on the floors.

5.3 Evaluation

The fire protection in Fire Area 11 does not comply with the technical requirements of Section III.G.2.b of Appendix R because 20 feet of spatial separation free of intervening combustibles and an area-wide automatic fire suppression system have not been provided between redundant safe shutdown system components.

The principal concern with the level of fire protection in Fire Area 11 was that because of the lack of an area-wide fire suppression system and spatial separations between redundant safe shutdown system components

that are not free of intervening combustibles, a fire of significant magnitude could develop and spread through the spatial separations and, thus, jeopardize the safe shutdown capability. The primary fire load is composed of IEEE Std 383 qualified cables. The 25 gallons of lube oil in the chillers located in Fire Zone 1A322 is contained within metal casings. There is essentially no fire loading on the floor and no fire hazardous equipment located within the subject fire area. Should a fire occur, it is expected to be small and develop slowly. The presence of the area-wide fire detection system would detect the fire in a timely manner and summon the fire brigade. In fire zones 1A316 and 1A322 which contain redundant divisions, the 1-hour fire rated barriers (wraps) on both Division 1 and 2 cables and the sprinkler system coverage provide assurance that one division of safe shutdown system components will remain free of fire damage.

Until a fire is extinguished within any of the fire zones in Fire Area 11, the partial 1-hour fire rated barrier wraps, the partial area sprinkler systems, the high ceilings and open areas, the IEEE 383 qualified cable insulation, and the spatial separations of at least 23 feet between redundant components provide reasonable assurance that a fire would not threaten redundant safe shutdown system components simultaneously. It is expected that the fire would remain small, be easily extinguished, and not damage redundant divisions of safe shutdown components.

5.4 Conclusion

Based on the above evaluation, the staff concludes that the existing fire protection in the six fire zones in Fire Zone 11 having redundant divisions of safe shutdown components separated by a spatial distance of at least 23 feet with a minimal amount of combustibles, and protected by area wide fire detection capability and/or 1-hour fire rated barrier wraps and partial area coverage sprinkler systems, provides a level of fire protection equivalent to the technical requirements of Section III.G.2.b of Appendix R. Therefore, this deviation should be granted.

6.0 AUXILIARY BUILDING, FIRE AREA 19

6.1 Deviation Requested

A deviation was requested from Section III.G.2.b of Appendix R to the extent that it requires redundant safe shutdown components to be separated by either a 20-foot space with no intervening combustibles or a 1-hour fire rated barrier. In addition, both alternatives must have fire detection and automatic suppression systems installed throughout the area.

6.2 Discussion

Fire Area 19 contains 35 fire zones of which 29 do not contain safe shutdown system components. In the remaining six fire zones, only two contain both redundant safe shutdown components. Fire Area 19 is bounded by 3-hour fire rated barriers and nonrated exterior barriers. However, the exterior barriers are of reinforced concrete and would qualify as 3-hour fire rated barriers. The only exceptions to the 3-hour rating are the stairwells and Elevator No. 3 enclosures, which are 2-hour fire rated.

For ease of discussion, the fire zones in Fire Area 19 can be classified into three separate groups (1, 2, and 3). Group 1 consists of Fire Zones 1A401, 1A403, and 1A420, which contain only Division 1 safe shutdown components; Fire Zone 1A424, which contains only Division 2 safe shutdown components; and Fire Zones 1A417 and 1A428, which contain both Division 1 and 2 safe shutdown components. Group 2 consists of Fire Zones 1A427, 1A429, 1A430, 1A432, 1A433, 1A434, and 1A436 group 3 consists of Fire Zones 1A431, 1A437, 1A438, 1A444, 1A523, 1A524, 1A525, 1A527, 1A528, 1A529, 1A530, 1A531, 1A532, 1A533, 1A534, 1A536, 1A537, 1A602, 1A603, 1A604, and 1A606. None of the group 2 or group 3 fire zones contain any safe shutdown components.

Group 1 includes those fire zones that form a passageway around the perimeter of the auxiliary building on elevation 166 feet. Group 2 consists of the remaining zones on elevation 166 feet. Group 3 includes the fire zones on elevation 185 feet or those that are separated from groups 1 and 2 by 3-hour rated barriers. Group 1 communicates with group 2 through nonrated barriers and with group 3 through nonrated hatchways between the floors.

Fire Zone 1A417 contains both divisions of safe shutdown components. Between column line G.4 and 21 feet west of G.4, both divisions are protected with a 1-hour fire rated wrap. Unprotected portions have a 21-foot separation free of intervening combustibles. In addition, an automatic sprinkler system provides a partial area coverage for this fire zone.

Fire Zone 1A428 contains both Division 1 and 2 safe shutdown components. All Division 1 safe shutdown components are located south of column line 6.2 and east of column line N. All Division 2 safe shutdown components are located more than 21 feet north of column line 11.0. Therefore, Division 1 and 2 safe shutdown components in Fire Zone 1A428 are separated by more than 110 feet. The intervening combustibles within this separation space are low and consist of IEEE Std 383 qualified cables in ventilated trays.

The remaining fire zones that contain safe shutdown system components have only one division per zone. These zones are adjacent to each other and to Fire Zones 1A417 and 1A428. Based on the arrangements of these zones, Division 1 and 2 components are separated by at least 21 feet and the space enclosed by any one particular fire zone.

Fire Zones 1A523, 1A519, and 1A525 are located on elevation 185 feet and do not contain any safe shutdown components. These fire zones are separated from the fire zones located on elevation 166 feet by 3-hour rated fire barriers, except for two nonrated hatches in the floor at elevation 185 feet. These hatches interface with Fire Zone 1A427 and 1A428, which contain safe shutdown components. The hatches are separated by a horizontal distance of more than 115 feet. The intervening combustibles between these hatches consist of IEEE Std 383 qualified cables. The hatches are constructed of steel or concrete and steel and offer substantial physical barriers against the spread of fire and heat.

All fire zones that contain safe shutdown components have fire detection systems and a majority of the other zones also contain fire detection systems. In addition, fire hose stations and portable fire extinguishers are available throughout the area. In all fire zones, the fire severity is considerably less than the fire rating of the existing barriers and, in no case, is the fire severity more than 60 minutes as represented by the ASTM E-119 fire test curve.

6.3 Evaluation

The fire protection in Fire Area 19 does not comply with the technical requirements of Section III.G.2.b of Appendix R because redundant divisions have not been separated by 20 feet of space with no intervening combustibles or provided with a complete 1-hour fire rated barrier. Also fire detection and automatic fire suppression systems have not been provided on an area-wide basis.

The staff's principal concern with the level of fire protection in Fire Area 19 is that a fire of significant magnitude could develop and, by spreading through separation distances, damage redundant divisions of safe shutdown system components. This concern was heightened by the lack of complete area-wide fire detection and fire suppression systems and spatial separations containing intervening combustibles. However, there are no fire hazardous equipment or heavy fire loads on the floors of the fire zones. The primary fire loading is in the form of IEEE Std 383 qualified cables. Should a fire occur, it is expected to develop slowly and remain small. The fire detection systems within the various fire zones would detect the fire and summon the fire brigade in a timely manner. The presence of partial sprinkler systems in the fire zones that have both redundant divisions of cables would be expected to control any postulated fire so that it can be extinguished by the fire brigade.

Until the fire is extinguished, the spatial separations and high ceilings, the 2- and 3-hour fire rated barriers and 1-hour fire rated barrier wraps, the IEEE Standard 383 qualified cable insulation, the partial area sprinkler systems, and the absence of fire loading on the floors provide reasonable assurance that a fire would not threaten redundant safe shutdown system components simultaneously. It is expected that any fire would remain small and would be easily extinguished by the fire brigade.

6.4 Conclusion

Based on the above evaluation, the staff concludes that the existing fire detection and sprinkler systems in fire zones having redundant safe shutdown system components separated by a distance of 21 to 115 feet (with minimal intervening combustibles) provide a level of fire protection equivalent to the technical requirements of Appendix R, Section III.G.2.b. Therefore, this deviation should be granted.

7.0 CONTAINMENT AND DRYWELL, FIRE AREA 25

7.1 Deviation Requested

A deviation was requested for Fire Area 25 from Section III.G.2. (d, e, or f) of Appendix R to the extent that it requires one of the following: separation of redundant safe shutdown components by a horizontal distance of more than 20 feet with no intervening combustibles; or the installation of fire detectors and an automatic fire suppression system; or separation of redundant components by a noncumbustible radiant energy heat shield.

7.2 Discussion

Fire Area 25 consists of 34 fire zones of which two are in the drywell and 32 are in the containment proper. The floors in the containment are made of steel grating with concrete pads to support specific pieces of equipment. There are no rated fire walls inside the containment. Therefore, a fire originating in any fire zone can spread to any other fire zone in the containment. The same is true for the two fire zones in the drywell. However, a fire originating in either the drywell or the containment cannot spread to the other because the drywell is separated from the containment by a 5-foot-thick concrete wall with a vault type door.

A separation analysis of Fire Area 25 was performed to determine compliance with Section III.G.2 of Appendix R. This analysis, which is contained in document AECM 86/0123 dated May 7, 1986, and supplemented by letter dated July 24, 1986, revealed that there are redundant trains that are separated by less than 20 feet with no suppression systems or radiant energy shields. The circuits and components of the redundant safe shutdown trains include:

- safe shutdown nuclear boiler system pressure switches/circuits, and
- suppression pool temperature monitoring circuits (system M71), and
- safety relief valves.

The deficiencies related to lack of 20-feet separation distance for each of these combinations of safe shutdown train components was corrected by the licensee.

1. Radiant energy shields in accordance with Section III.G.2.f were provided for safe shutdown nuclear boiler system (B21) pressure switches and raceways containing these circuits in Fire Zone 1A110D3, and raceway 1CARNP14 from Fire Zone 1A220D3 to azimuth 19° in Fire Zone 1A411.

2. Radiant energy shields in accordance with Section III.G.2.f were provided for all Division 2 safe shutdown suppression pool temperature monitoring circuits (system M71) in Fire Area 25 (Fire Zones 1A110C1, 1A313, 1A110C2, 1A311, and 1A110C3). These circuits are only redundant to the Division 1 M71 system circuitry. Therefore, at least one train of safe shutdown suppression pool temperature monitoring circuits are protected from the effects of a design basis fire in Fire Area 25.

3. With respect to the safety relief valves, the Licensee had originally selected six specific safety relief valves and associated cabling as being required for safe shutdown during a fire at the Grand Gulf plant. These six valves were in accordance with the Licensee's post-fire safe shutdown model approach. Each of these valves, by necessity, has redundant cables terminating at it, and some were in close proximity to each other. A total of 20 safety relief valves (SRVs) are available, and any six SRVs can be used for safe shutdown given a fire in Fire Area 25. These design features assure that at least six of the 20 SRVs will be available during or following any fire in Fire Area 25, thus preventing a fire from disabling the ability to depressurize the reactor vessel via ADS/safety relief valves. The Licensee stated during the June 18, 1986 meeting that the analysis of this fire area would be revised to reflect the availability of the 20 SRVs and, that these valves fail in a safe position. By letter dated July 24, 1986, the Licensee docketed the above information.

The fire severity based on the fire loading in Fire Area 25 ranges from 15 minutes to less than 60 minutes as represented by the ASTM E-119 fire test curve. Fire detection capability is in the form of smoke detectors within sections of the HVAC ductwork and redundant ambient air temperature monitors. In the drywell area, three dual thermocouples are provided to monitor ambient air and alarm if the temperatures exceed 145°F. Additional fire protection is in the form of fire extinguishers and fire hose stations.

7.3 Evaluation

The fire protection in Fire Area 25 did not comply with the technical requirements of Section III.G.2 of Appendix R because 20 feet of separation without intervening combustibles does not exist, fire detection and automatic fire suppression systems are not installed, and the provision of a radiant energy heat shield(s) had not been provided between redundant safe shutdown system components.

Within the containment and drywell areas, the main concern was that a fire could develop and damage redundant safe shutdown system components because of their close proximity and/or lack of radiant energy heat shields. However, for the three specific locations of concern identified by the Licensee, two were resolved by the Licensee's modifications. The third location of concern involved six SRVs and their associated cables.

The licensee's installation of radiant energy heat shields for the safe shutdown nuclear boiler system pressure switches and raceways and for all of Division 2 safe shutdown suppression pool temperature monitoring circuits complies with the technical provisions of Section III.G.2.f of Appendix R.

The availability of 20 SRVs, of which only six are required, mitigates the concern for fire damage to redundant SRVs because of the arrangement and spacing of all of the SRVs. Only two SRVs could be damaged by any one fire leaving 18 SRVs intact.

7.4 Conclusion

Based on the above evaluation, the staff concludes that the existing fire protection and the licensee's modifications result in Fire Area 25 being in compliance with Section III.G.2 of Appendix R. Therefore, this deviation is not required.

8.0 CONTROL BUILDING, FIRE AREA 42

8.1 Deviation Requested

A deviation was requested from Section III.G.2.a of Appendix R to the extent that it requires complete 3-hour fire rated barriers separating redundant divisions of safe shutdown system components in Fire Area 42.

8.2 Discussion

Fire Area 42 contains 21 fire zones located on elevations 133 feet through 177 feet. The floor, ceiling, and walls of Fire Area 42 are either 3- or 2-hour fire rated barriers, except for the nonrated exterior doors of Fire Zone 0C309.

Seventeen of the 21 fire zones in Fire Area 42 do not contain any safe shutdown components. The other four fire zones (0C302, 0C303, 0C308, and 0C402) contain both Division 1 and 2 safe shutdown system components.

Fire Zones 0C302, 0C303, and 0C308 are situated in the control building as a group, each containing both Division 1 and 2 safe shutdown equipment, cable, and raceway. All three fire zones are separated from each other by 2-hour rated fire barriers. Fire Zone 0C302 contains both Division 1 standby service water system (P41) and Division 2 residual heat removal (E12) safe shutdown cable and raceway. Division 1 P41 cable and raceway are provided with 3-hour rated fire barriers.

Fire Zones 0C302 and 0C303 contain Divisions 1 and 2 safeguard switchgear and battery room ventilation (Z77) safe shutdown components.

A section of both Division 1 and 2 safe shutdown (Z77) cable and raceway in Fire Zone 0C302 are provided with 3-hour rated fire barriers. The Z77 system, which consists of Units 1 and 2 (dedicated for Unit 1 Operation) equipment, is designed to operate with two supply air handling units (AHUs), two exhaust fans (EFs) and the corresponding ductwork, dampers etc. Four AHU/EF trains exist. A minimum of two trains are required for proper ventilation. There are two complete sets of equipment in Fire Zone 0C303. The Z77 ductwork does not cross Fire Zones 0C302/0C303 room boundary.

A fire in Fire Zone 0C302 could disable the Z77 equipment located there. However, the power supplies in Fire Zone 0C302 and the Z77 equipment in Fire Zone 0C303 would not be affected and would still be operational. Similarly, a fire in Fire Zone 0C303 could disable the Z77 equipment located there, however the power supplies in Fire Zone 0C303 and the Z77 equipment in Fire Zone 0C302 would not be affected and would be available. As previously indicated, a minimum of two trains of AHUs/EFs are required to provide proper ventilation for the safeguard switchgear and battery rooms. The logic associated with the Z77 system permits manually initiated operation using the undamaged equipment, cable, and raceway located in the other fire zone.

Fire Zone 0C308 contains both Division 1 and 2 safe shutdown cable and raceway. All of the Division 1 safe shutdown cable and raceway are provided with 3-hour fire barriers. Fire Zone 0C308 is separated from Fire Zones 0C302 and 0C303 by 2-hour fire barriers, and all three zones have a postulated combustible loading equal to less than a 15-minute fire severity.

Fire Zone 0C402 contains Division 1 and Division 2 safe shutdown equipment. One hour fire rated barriers are provided for the Division 1 safe shutdown cables and raceways in addition to fire detection capability, automatic total flooding CO_2 and automatic water sprinkler suppression systems throughout the zone. This assures that at least one train of safe shutdown equipment will be protected from effects of a fire within Fire Zone 0C402. From the above descriptions it is also clear that safe shutdown equipment in Fire Zone 0C402 is separated from redundant equipment located in Fire Zones 0C302, 0C303 and 0C308 by more than 50 feet of horizontal distance and 2-hour rated fire barriers.

Other fire protection features are in the form of smoke detection systems in all zones having safe shutdown systems components. Fire extinguishers and hose stations are also available throughout the area. The fire severity, based on zone fire loadings, ranges from 0 to 90 minutes as represented by the ASTM E-119 fire test curve. However, for Fire Zones 0C302, 0C303, and 0C308, the fire severity is only 15 minutes. In Fire Zone 0C402, the fire severity is 60 minutes, but this zone has two automatic fire suppression systems on an area-wide basis.

8.3 Evaluation

The fire protection in Fire Area 42 does not comply with the technical requirements of Section III.G.2. of Appendix R because a complete 3-hour fire rated barrier has not been provided between divisions of safe shutdown system components.

The main concern with the level of fire protection in Fire Area 42 was that because of the lack of complete 3-hour fire rated barriers between redundant divisions, a fire of significant magnitude could develop and damage redundant divisions of safe shutdown system components. However, in the fire zones containing safe shutdown divisions, the fire load is low and coverage of two fire suppression systems is available. In no instance within this fire area is the fire severity more than 90 minutes and, hence, less than the fire rating of the area/zone barriers throughout Fire Area 42.

In the fire zones containing redundant divisions, one division has either 3-hour fire rated wraps or 1-hour fire rated wraps coupled with fire detection and suppression systems, bringing it in compliance with Appendix R. The remaining issue, then, is the 2-hour fire rating of the walls separating redundant divisions.

If a fire were to occur in any of the four groups of fire zones, the staff expects that it would develop slowly and remain small with low heat release and slow rise in area temperature. The fire loads are such that the expected fire severity would not exceed the 2- or 3-hour fire rating of the walls. The smoke detection systems would actuate and summon the fire brigade. Until the fire was extinguished by either the fire brigade or existing fire suppression systems, there is reasonable assurance that the 1- and 3-hour fire rated wraps would adequately protect the redundant division components in the area or zone of concern. Likewise, the 2-hour fire rating of the walls is sufficient to protect adjoining zones that have safe shutdown components. The staff finds that the upgrading of the 2-hour fire rated barriers to a 3-hour fire rating would not significantly increase the level of fire protection.

8.4 Conclusion

Based on the above evaluation, the staff concludes that the existing fire protection measures including the 1- and 3-hour fire rated wraps and the 2-hour fire rated walls provide a level of fire protection equivalent to the technical requirements of Section III.G.2.a of Appendix R. Therefore, the deviation for Fire Area 42 should be granted.

9.0 CONTROL BUILDING, FIRE AREA 50

9.1 Deviation Requested

A deviation 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 for which an alternative shutdown capability is provided.

9.2 Discussion

Fire Area 50 is separated from other plant areas by 3-hour fire rated barriers, except for interfaces with stairwells and an elevator, which are 2-hour fire rated. The only fire zones in Fire Area 50 that contain safe shutdown system components are Fire Zones 0C503 and 0C504. Essentially, this is the control room area for Unit 1. Fire Zone 0C503 is the control room proper, whereas, Fire Zone 0C504 is in the space above the control room that is enclosed by a suspended ceiling. Fire Zone 0C504 contains redundant divisions; however, all Division 2 components are protected with a 3-hour rated barrier. The fire load in the room is low. Fire protection features in the control room include fire detectors, Halon fire suppression for the under floor sections of the PGCC panels, portable extinguishers, and constant manning of the area. Also, fire hose stations are available to this area.

Since the control room area contains safe shutdown system components for almost all plant systems, the most severe postulated fire would affect all divisions. However, the Licensee has provided an alternative safe shutdown system. The Licensee will provide isolation transfer switches for compliance with Sections III.G.3 and III.L of Appendix R. The alternative safe shutdown room will be independent of the control room area after the first refueling outage.

9.3 Evaluation

The fire protection in Fire Area 50 (main control room) 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 room could cause the loss of normal shutdown capability. However, should a fire occur within the main control room, it is expected that it would be promptly detected by the automatic fire detection system or by station personnel. Should fire damage be extensive, necessitating evacuation of the control room, the alternative safe shutdown system can be used to shutdown the plant safely. Because the control building has 3- and 2-hour fire rated barriers (see Section 8.0), it is expected that a fire would not spread to adjacent fire areas/zones. The staff finds that the installation of a fixed suppression system in the main control room would not significantly increase the level of fire protection.

9.4 Conclusion

Based on the above evaluation, the staff concludes that the existing fire protection features in conjunction with the proposed modifications by the first refueling outage and 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 deviation from fixed fire suppression in the main control room should be granted.

10.0 MANHOLES, FIRE AREA 59

10.1 Deviation Requested

A deviation was requested from Section III.G.2.a of Appendix R to the extent that it requires complete 3-hour fire rated barriers separating redundant divisions of safe shutdown system components.

10.2 Discussion

Fire Area 59 comprises manhole MH01, which has four compartments. This manhole is located underground and contains Division 1 and 2 safe shutdown cable and raceway. The raceway consists of reinforced concrete duct banks and manholes to facilitate cable pulling. All manholes are sealed with pressure-type water-, gas-, and steam-tight bolted lids. Rubber gaskets are proved to prevent the entry of liquids. Manhole MH01 is located about 275 feet west of the control building.

Two compartments of MH01 contain Division 1 cables and the other two contain Division 2 cables. Each compartment is separated from each other by a 12-inch-thick reinforced concrete wall. However, at the bottom of each manhole compartment, a 4-inch drain pipe allows drainage from one compartment to another. A sump pump is provided at the end of the drainage path. Since this area and structure are below grade and are isolated, there can be no exposure fire consideration on the manhole walls. The Unit 1 diesel oil storage tank is located about 35 feet away and 10 feet below grade.

The fire load within Fire Area 59 is low, consisting of IEEE Std 383 qualified cables. A fire hydrant is about 50 feet away from manhole MH01.

10.3 Evaluation

The fire protection in Fire Area 59 does not comply with the technical requirements of Section III.G.2.a of Appendix R because a complete 3-hour fire rated barrier has not been provided between redundant divisions of safe shutdown system components.

The principal concern with the level of fire protection in Fire Area 59 was that because of the lack of complete 3-hour fire rated barriers between redundant trains of safe shutdown system components, a fire of significant magnitude could develop and damage redundant divisions of

safe shutdown system components. However, fire hazards inside and outside of MH01 are low. This area is continuously sealed off and unmanned. The concrete barriers between each manhole compartment would qualify as a 3-hour fire rated barrier, except for the 4-inch-open drain line in the bottom of each manhole. If a fire were to develop in any of the manhole compartments, it is expected to be small because of the low fire load, small volume of space in the manhole, and the sealed covers, which prevent the entry of combustion air. The 4-inch-open drain pipe is at the bottom of the manhole and, therefore, not in a position to allow heat or flame to spread. Also, there are no combustibles located at the bottom of the manholes and no flammable liquids contained therein.

The staff finds that the provision of complete 3-hour fire rated barriers, which would necessitate the sealing of the open 4-inch drains, between each of the MH01 compartments would not significantly increase the level of fire protection in this fire area.

10.4 Conclusion

Based on the above evaluation, the staff concludes that the existing physical arrangement, low fire load, sealed environment, locations of the drain at the bottom, and the 12-inch reinforced concrete walls provide a level of fire protection equivalent to the technical requirements of Section III.G.2.a of Appendix R. Therefore, the deviation for Fire Area 59 should be granted.

11.0 UNPROTECTED CABLE TRAYS/CONDUITS STEEL SUPPORTS

11.1 Deviation Requested

A deviation was requested from Section III.G.2.a and III.G.2.c of Appendix R to the extent that it requires fire resistant materials for covering all structural supports for cable trays and conduits provided with a fire rated barrier or wrap in accordance with Appendix R.

11.2 Discussion

The issue of unprotected cable tray supports is applicable throughout the station, wherever a 1-hour fire rated barrier has been provided for either cable trays or conduits. In all cases these locations are provided with fire suppression systems. The sprinkler systems are designed to deliver 0.3 gpm per square foot, which is a conservative discharge density for cable tray fire hazards and other significant fire hazards. In addition, fire detection systems are provided in these areas. Finally, fire extinguishers and hose stations are available.

The Licensee has performed a detailed evaluation of unprotected steel supports using a computer program based on a fire model. The computer program, identified as FIREMPROG, evaluates the thermal response of structural steel to bulk fires. The assumptions and bulk fire analysis are similar to those used for the Limerick plant, which has been previously accepted by the NRC.

11.3 Evaluation

The fire protection for the 1-hour fire rated cable tray and conduit wraps does not comply with the technical requirements of Sections III.G.2.a and III.G.2.c of Appendix R because of the lack of a complete fire rated barrier to include the unprotected steel supports.

Because of the low fire loads and the fire detection and suppression systems in the areas that have 1- or 3-hour fire rated barrier wraps, cable trays, or conduits, there is reasonable assurance that after a fire in one of the subject areas, one train of safe shutdown systems will be free of fire damage (exclusive of the unprotected steel cable tray/conduit supports).

With respect to the specific issue of unprotected steel supports for cable trays and conduits, the following evaluation is offered.

1. The supports are designed for a seismic load and, hence, have a conservative strength factor. Because of this, the Licensee has concluded that the complete loss of a support's strength will not impair the integrity of an adjacent support.

2. The calculated deflection cuased by the loss of a support is minimal and the overlapping of wraps by 4 inches allows for this deflection without impairing barrier.

3. The fire analysis was performed with a conservative computer program similar to that accepted at the Limerick plant.

4. All affected areas have automatic fire suppression systems that would contain a fire so that the heat release would not fail structural steel.

5. The steel supports terminate into concrete building components. These connections allow heat to dissipate into concrete, which serves as a heat reservoir. This phenomenon is documented in the American Iron and Steel Institute (AISI) publication, Fire Protection Through Modern Building Codes, Fifth Edition.

6. A fire would not be expected to concentrate only on the steel supports but, rather, would dissipate much of its energy thoughout the area of involvement. The result would be that the steel supports would experience a lower heat flux exposure.

7. It is especially important to note that fire test information generally provided by the utilities have no indication of damage or failure of steel supports for cable trays or conduits subjected to the ASTM E-119 fire tests. Further, the staff has neither observed nor received information to the effect that steel cable tray or conduit supports have failed during the numerous ASTM E-119 1, 2, or 3-hour fire tests conducted over the years.

11.4 Conclusion

Based on the above evaluation, the staff concludes that the installation of complete fire wraps, barriers, or fire resistive materials on bare steel supports for fire protected steel conduits and cable trays would not significantly increase the level of fire protection in the affected areas. Therefore, the omission of complete fire resistive wraps, barriers, or materials on steel supports for fire protected conduits and cable trays is an acceptable deviation from Sections III.G.2.a and III.G.2.c of Appendix R for these areas and should be granted.

12.0 SUMMARY

Based on the above evaluations, the staff finds that the level of fire safety in the areas listed below is equivalent to that achieved by compliance with the technical requirements of Section III.G of Appendix R and, therefore, the Licensee's requests for deviation in the following areas should be granted.

1. Auxiliary Building (Fire Area 1) to the extent that there is no fire suppression system or separation space free of intervening combustibles provided pursuant to Section III.G.2.b. See Section 2.0 for more details.

2. Auxiliary Building (Fire Area 2) to the extent that complete 3-hour fire rated barriers are not provided pursuant to Section III.G.2.a. See Section 3.0 for more details.

3. Auxiliary Building (Fire Area 6) to the extent that there is no fire suppression system or separation space free of intervening combustibles provided pursuant to Section III.G.2.b. See Section 4.0 for more details.

4. Auxiliary Building (Fire Area 11) to the extent that there is no fire suppression system or separation space free of intervening combustible provided pursuant to Section III.G.2.b. See Section 5.0 for more details.

5. Auxiliary building (Fire Area 19) to the extent that there is no 1-hour fire rated barrier, or 20-foot separation space free of intervening combustibles, and fire detection and suppression systems provided pursuant to Section III.G.2.b. See Section 6.0 for more details.

6. Control Building (Fire Area 42) to the extent that pursuant to Section III.G.2.a there is not a complete 3-hour fire rated barrier provided between divisions of redundant safe shutdown system components. See Section 8.0 for more details.

7. Control Building (Fire Area 50) to the extent that pursuant to Section III.G.3 there is no fixed fire suppression system provided in an area for which an alternative safe shutdown system has been provided. See Section 9.0 for more details.

8. Manholes (Fire Area 59) to the extent that a complete 3-hour fire rated barrier is not provided between redundant divisions of safe shutdown system components pursuant to Section III.G.2.a. See Section 10.0 for more information.

9. Unprotected Cable Trays/Conduits Steel Supports to the extent that fire rated barriers are not provided for unprotected steel supports of cable trays/conduits pursuant to Sections III.G.2.a and III.G.2.c. See Section 11.0 for more information.

In addition to these nine requested deviations which the staff has approved, the licensee requested a deviation for protection of redundant safe shutdown components in the Containment and Drywell (Fire Area 25). Since the licensee provided radiant energy shields in accordance with Section III.G.2.f, the staff concluded that this requested deviation was not required. See Section 7.0 for more information.

13.0 PRINCIPAL CONTRIBUTORS

This safety evaluation was prepared by John Stang based on a Technical Evaluation Report prepared by Franklin Research Center (FRC) under a contract with the U.S. Nuclear Regulatory Commission (NRC), and revised by David Notley.

ENCLOSURE 6

DRAFT

SAFETY EVALUATION REPORT
REGARDING FIRE PROTECTION, SAFE SHUTDOWN CAPABILITY (APPENDIX R)
GRAND GULF NUCLEAR STATION

In Section 9.5.6 of Supplement No. 1 to the Grand Gulf Nuclear Station (GGNS) Units 1 and 2, Safety Evaluation Report (SSER No. 1, NUREG-0831) dated December 1981, the staff provided its evaluation of the station's compliance with Appendix R to 10 CFR 50, Sections III.G and III.L with respect to safe and alternate shutdown capability in the event of a fire.

In SSER No. 1, the staff concluded that for hot shutdown, at least one of the following shutdown systems would be available: (1) the reactor core isolation cooling (RCIC) system, (2) the high pressure core spray (HPCS) system, (3) a combination of the pressure relief system - automatic depressurization system (ADS), the low pressure core spray (LPCS) system, and residual heat removal (RHR) system. For cold shutdown, an appropriate portion of the RHR system would be available. The safe shutdown analysis in SSER No. 1 considered components, cabling and support equipment for the above safe shutdown systems. Also in SSER No. 1, the staff stated that for a control room fire, the RCIC system, safety/relief valves and one division of the RHR system would be controlled from the remote shutdown panel (alternate shutdown capability). This alternate shutdown capability was to include isolation switches at the remote shutdown panel for RCIC, one ADS valve and one division of RHR.

By letters dated May 18, May 30, and June 18, 1985, the licensee proposed to protect different safe shutdown systems in the event of a fire than those identified by the staff in SSER No. 1. The revised safe shutdown systems do not include the RCIC system or the HPCS system. In the staff's original evaluation it was assumed that for a fire disabling RCIC, the HPCS would be available. However, the availability of HPCS was not verified by the licensee. In lieu of showing the availability of either the RCIC or HPCS systems, the new safe shutdown method proposed by the licensee relies on the ADS valves for depressurization and the RHR system for makeup operating in the LPCI mode.

The licensee's revised safe shutdown systems identified in the above referenced letters included the use of three (3) ADS valves for depressurization and requested an exception to the requirements of Section III.L of Appendix R because the shutdown method resulted in a temporary uncovering of the core with no core damage. Although the licensee's analysis showed no core damage due to the core uncovery during depressurization, the staff requested the licensee to consider verifying the availability of six ADS valve for any fire in order to minimize the amount and time of fuel uncovery. The licensee indicated that their current plans already called for isolation capability for six ADS valves at the remote shutdown panel in the event of a control room fire. By letter dated July 19, 1985 the licensee also provided the results of a cable separation analysis that showed six ADS valves would be available in the event of a fire in any plant area. The July 19, 1985 submittal also included the results of a plant unique analysis of reactor water level assuming six ADS valves available for depressurization with makeup from one RHR pump in the LPCI mode. The results of the analysis showed only the upper portion of the core would be uncovered for a short period of time. This short term uncovery of the upper portion of the core in a BWR is an acceptable deviation from the Appendix R, Section III.L.2 requirement that reactor water level be maintained above the top of the core since even with the core uncovery, fuel cladding integrity is maintained. This same exemption has been granted for other BWR plants that rely on the ADS/LPCI method of shutdown in the event of a fire (Reference: NRR memorandum from L. Rubenstein, to R. Mattson dated December 3, 1982).

The safe shutdown systems now proposed by the licensee to be available for GGNS are:

1. ADS valves - a minimum of six valves will be available either in the control room or at the remote shutdown panel;
2. RHR system trains A and B - Suppression pool cooling, alternate shutdown cooling and LPCI modes;

3. Standby service water system trains A and B;
4. Standby diesel generators A and B;
5. Emergency core cooling system (ECCS) rooms ventilation (HVAC);
6. Standby service water pump house HVAC;
7. Diesel generator rooms HVAC;
8. Remote shutdown panel system; and
9. Electrical distribution systems for the above equipment.

For a control room fire, train A (Division I) components of the above listed systems will be used for alternate shutdown and will be appropriately isolated from the control room.

In SSER No. 1, the staff also identified certain instrumentation that would be available at the remote shutdown panel following a control room fire. This instrumentation included suppression pool water level and RCIC pump turbine speed. Because the RCIC is no longer relied on for alternate shutdown, the RCIC pump turbine speed instrument is not required to be operable following a control room fire. Additionally, by letter dated June 18, 1985, the licensee proposed to delete the suppression pool water level instrument from the instrumentation required for post-alternate safe shutdown. Justification for not providing suppression pool level instrumentation is based on the licensee's associated circuits analysis which eliminates any leakage pathways from the suppression pool and the new alternate shutdown cooling method using the ADS valves and RHR in the LPCI mode. When the plant is aligned for alternate shutdown cooling which relies on ADS for depressurization and RHR-LPCI to flood the vessel, a closed loop is established through the safety relief valves to the suppression pool. The licensee has performed analysis to show that the resulting decrease in suppression pool water level is less than two feet. We have reviewed the above justification, and conclude that the elimination of suppression pool water level instrumentation is an acceptable deviation from the staff position on required instrumentation for compliance with Section III.L of Appendix R.

Based on its review of the safe and alternate shutdown systems and supporting analyses for GGNS, the staff concludes that the systems are in conformance with Sections III.G and III.L of Appendix R with the approved exception and deviation regarding short-term uncovery of the upper portion of the core and absence of a suppression pool water level instrument for alternate shutdown. The staff, therefore, concludes that the proposed safe and alternate shutdown systems using six ADS valves and LPCI are acceptable in the event of a fire in any plant area.