September 29, 2006

Mr. William R. Brian
Vice President, Operations (Acting)
Grand Gulf Nuclear Station
Entergy Operations, Inc.
P. O. Box 756
Port Gibson, MS 39150

SUBJECT: GRAND GULF NUCLEAR STATION, UNIT 1 - ISSUANCE OF AMENDMENT RE: PROPOSED RESOLUTION OF KAOWOOL ISSUES AT GRAND GULF (TAC NO. MC8180)

Dear Mr. Brian:

The U.S. Nuclear Regulatory Commission (NRC) has issued the enclosed Amendment No. 170 to Facility Operating License No. NPF-29 for the Grand Gulf Nuclear Station, Unit 1 (GGNS). This amendment consists of changes to the Operating License Condition (OLC) in response to your application dated August 17, 2005, as supplemented by letter dated May 19, 2006.

The amendment revises the OLC 2.C.(41) to reference an NRC Safety Evaluation (SE) that allows the application of certain risk-informed, performance-based fire protection methods and tools. Specifically, the SE evaluates the use of these risk-informed, performance-based fire protection methods and tools to resolve Kaowool issues. The use of this methodology would reduce the need for fire wraps in certain fire areas of the GGNS auxiliary building by eliminating reliance on Kaowool as a rated raceway fire barrier material and reducing the scope of 3M Interam wrap that must be installed to replace Kaowool.

In the application, as supplemented, you referred to your use of risk methods and fire modeling methods as being drawn from National Fire Protection Association (NFPA) 805. Please note, however, that the NRC staff reviewed the amendment application under the current risk-informed license amendment process pursuant to Regulatory Guide (RG) 1.174. Consequently, the NRC staff emphasizes that GGNS is not adopting NFPA 805 as its licensing basis pursuant to paragraph 10 CFR 50.48(c) of Title 10 of the *Code of Federal Regulations,* but is simply modifying its present licensing basis. Therefore, the NRC staff's approval of the methods and tools discussed in conjunction with this amendment is limited to the specific change requested in the application, as supplemented.

Consequently, the NRC staff notes that any future changes for the use of risk-informed, performance-based methods and tools, and RG 1.174 acceptance criteria to the licensee's fire protection program would require prior review and approval of the NRC staff, to the extent required by the GGNS fire protection license condition.

A copy of the SE for this amendment is also enclosed. The Notice of Issuance will be included in the Commission's next biweekly *Federal Register* notice.

Sincerely,

/RA/

Bhalchandra Vaidya, Project Manager
Plant Licensing Branch IV
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket No. 50-416

Enclosures: 1. Amendment No. 170 to NPF-29
2. Safety Evaluation

cc w/encls: See next page

A copy of the SE for this amendment is also enclosed. The Notice of Issuance will be included in the Commission's next biweekly *Federal Register* notice.

Sincerely,
/RA/
Bhalchandra Vaidya, Project Manager
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Division of Operating Reactor Licensing
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2. Safety Evaluation

cc w/encls: See next page

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ENTERGY OPERATIONS, INC.

SYSTEM ENERGY RESOURCES, INC.

SOUTH MISSISSIPPI ELECTRIC POWER ASSOCIATION

ENTERGY MISSISSIPPI, INC.

DOCKET NO. 50-416

GRAND GULF NUCLEAR STATION, UNIT 1

AMENDMENT TO FACILITY OPERATING LICENSE

Amendment No. 170
License No. NPF-29

1. The Nuclear Regulatory Commission (the Commission) has found that:

   A. The application for amendment by Entergy Operations, Inc. (the licensee) dated August 17, 2005, as supplemented by letter dated May 19, 2006, complies with the standards and requirements of the Atomic Energy Act of 1954, as amended (the Act), and the Commission's rules and regulations set forth in 10 CFR Chapter I;

   B. The facility will operate in conformity with the application, the provisions of the Act, and the rules and regulations of the Commission;

   C. There is reasonable assurance (i) that the activities authorized by this amendment can be conducted without endangering the health and safety of the public, and (ii) that such activities will be conducted in compliance with the Commission's regulations;

   D. The issuance of this amendment will not be inimical to the common defense and security or to the health and safety of the public; and

   E. The issuance of this amendment is in accordance with 10 CFR Part 51 of the Commission's regulations and all applicable requirements have been satisfied.

2. Accordingly, the license is hereby amended by changes to Operating License Condition, paragraph 2.C.(41) of Facility Operating License No. NPF-29, as follows:

(41) Fire Protection Program

Entergy Operations, Inc. shall implement and maintain in effect all provisions of the approved Fire Protection Program as described in Revision 5 to the Updated Final Safety Analysis Report and as approved in the Safety Evaluations dated August 23, 1991, and September 29, 2006, 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.

The page of the Facility Operating License, reflecting the above changes, is attached.

3. This license amendment is effective as of its date of issuance and shall be implemented within 90 days from the date of issuance.

FOR THE NUCLEAR REGULATORY COMMISSION

/RA/

David Terao, Chief
Plant Licensing Branch IV
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Attachment: Changes to Operating
License Condition Pargragh 2.C.(41) of
Facility Operating License NPF-29

Date of Issuance: September 29, 2006

ATTACHMENT TO LICENSE AMENDMENT NO. 170

FACILITY OPERATING LICENSE NO. NPF-29

DOCKET NO. 50-416

Replace the following page of Facility Operating License No. NPF-29 with the attached revised page. The revised page is identified by an amendment number and contains a marginal line indicating the area of change.

Remove	Insert
16	16

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELATED TO AMENDMENT NO. 170 TO

FACILITY OPERATING LICENSE NO. NPF-29

ENTERGY OPERATIONS, INC., ET AL.

GRAND GULF NUCLEAR STATION, UNIT 1

DOCKET NO. 50-416

1.0 INTRODUCTION

By application dated August 17, 2005 (Agencywide Documents and Access Management System (ADAMS) Accession Nos. ML052420637, ML052420641, and ML052420647), as supplemented by letter dated May 19, 2006 (ADAMS Accession No. ML061420521), Entergy Operations, Inc., et al. (the licensee), requested changes to the Operating License Condition (OLC) for Grand Gulf Nuclear Station, Unit 1 (GGNS). The supplement dated May 19, 2006, provided additional information that clarified the application, did not expand the scope of the application as originally noticed, and did not change the U.S. Nuclear Regulatory Commission (NRC) staff's original proposed no significant hazards consideration determination as published in the Federal Register on October 25, 2005 (70 FR 61658).

The proposed changes will revise the OLC 2.C.(41) to reference an NRC Safety Evaluation (SE) that allows the application of certain risk-informed, performance-based fire protection methods and tools. Specifically, the SE evaluates the use of these risk-informed, performance-based fire protection methods and tools to resolve Kaowool issues. The use of this methodology would reduce the need for fire wraps in certain fire areas of the GGNS auxiliary building by eliminating reliance on Kaowool as a rated raceway fire barrier material and reducing the scope of 3M Interam wrap that must be installed to replace Kaowool.

2.0 REGULATORY EVALUATION

The NRC staff's review of the licensee's application used the following regulatory requirements and guidance documents:

1. Title 10 of the *Code of Federal Regulations* (10 CFR) Part 50, Section 50.48, "Fire Protection," requires that each operating nuclear power plant have a fire protection plan that satisfies General Design Criterion (GDC) 3, "Fire protection," of Appendix A to 10 CFR Part 50.

2. The regulation in 10 CFR Part 50, Appendix R, “Fire Protection Program for Nuclear Power Facilities Operating Prior to January 1, 1979,” (Appendix R) establishes fire protection features required to satisfy GDC 3 with respect to certain generic issues for nuclear power plants licensed to operate prior to January 1, 1979. GGNS was licensed to operate on November 1, 1984, and thus, is not subject to Appendix R. However, GGNS committed to follow certain separation requirements, contained in Appendix R, for redundant trains in the same fire area to the extent incorporated into its licensing condition.

3. Regulatory Guide (RG) 1.174, “An Approach for Using Probabilistic Risk Assessment in Risk-Informed Decisions on Plant-Specific Changes to the Licensing Basis,” establishes guidance on the acceptance criteria for changes in risk that may result from a plant change. The guidance was used in assessing the nature and impact of licensing bases changes by considering engineering issues and applying risk insights.

GGNS was licensed to operate after January 1, 1979. By amendment No. 82, dated August 23, 1991, GGNS is licensed to operate under the license condition 2.C.(41), to implement and maintain in effect, all provisions of the approved Fire Protection Program as described in Revision 5 to the Updated Final Safety Analysis Report, and as approved in the Safety Evaluation dated August 23, 1991. This license condition permits GGNS to make changes to the approved Fire Protection Program only if the changes would not adversely affect the ability to achieve and maintain safe shutdown in the event of fire.

GGNS proposed to use risk-informed, performance-based analysis tools for evaluation of certain areas of the plant, and to use risk acceptance criteria in RG 1.174, which the NRC had previously issued, for resolution of its Kaowool issues in specific fire areas of the GGNS auxiliary building. GGNS used the guidance in RG 1.174 to make the determination of “No Adverse Effect,” as a part of the 10 CFR 50.90 portion of its application.

Since GGNS was licensed to operate after January 1, 1979, the NRC staff reviewed the licensee’s application for amendment only for the use of risk-informed, performance-based methodology and tools, and for the RG 1.174 acceptance criteria, to resolve Kaowool issues in GGNS auxiliary building. Therefore, the NRC staff approval of the methods and tools discussed in conjunction with this amendment is limited to the specific change requested in the application, as supplemented. Consequently, the NRC staff notes that any future changes for the use of risk-informed, performance-based methodology and tools, or the RG 1.174 acceptance criteria applicable to the licensee’s fire protection program, would require prior review and approval of the NRC staff to the extent required by the GGNS fire protection license condition.

The NRC staff determined that the proposed change would meet current regulations. The application indicated that the protection provided by the spacial separation provides an acceptable level of safety while maintaining defense-in-depth and safety margins. The NRC staff has reviewed this application and concluded that because the application is consistent with the principles of RG 1.174 (as discussed in subsequent sections of this SE), the application would satisfy GDC 3, pursuant to 50.48(a).

3.0 DESCRIPTION OF PROPOSED CHANGES

The licensee's proposed changes, described in the licensee's submission, as supplemented, with regard to replacement of Kaowool fire wrap in the GGNS auxiliary building, are summarized in this section.

The current licensing basis for GGNS is to ensure that one train of safe shutdown equipment is free of fire damage. The original commitments for these zones required Kaowool to be installed to provide 20 feet of separation between trains with no intervening combustibles (III.G.2.b separation) and in other locations for Kaowool to be used as a 1-hour fire barrier (III.G.2.c separation). The change being proposed for these areas is to eliminate the use of fire barriers to create a III.G.2.b separation, and to replace portions of the existing Kaowool wrap with 1-hour rated 3M Interam wrap on one division in the locations where the raceway would be subject to damage from a floor-based transient combustible fire. Kaowool that is not being replaced with 3M Interam wrap will be maintained as a non-fire rated, flame propagation retardant, or as required by other commitments.

For the purposes of the licensee's evaluation, no fire resistance was credited for the Kaowool wrap system. The Kaowool fire wrap systems in the areas considered were classified as one of the following:

- Installed for reasons other than those addressed in this evaluation, namely to meet the separation requirements of Regulatory Guide (RG) 1.75, "Physical Independence of Electrical Systems." No credit is taken for this wrap in this evaluation.

- Unrated, but maintained as-is. This type of fire wrap system is only credited for preventing flaming combustion and heat from being released into the general area by the protected cables.

- Unrated and abandoned in place (or removed at plant discretion). This Kaowool fire wrap system is ignored altogether in the evaluation. Although present, the analysis assumes there is no Kaowool fire wrap system.

All 3M Interam wrap installed will be 1-hour American Society of Testing Material (ASTM) E119 fire resistance rated and tested in accordance with ASTM E119-00A (ASTM, 2000).

Specifically, the changes being proposed are as follows:

3.1 Elevation 93' and 103'

1. Provide 3M Interam wrap on vertical cable tray ATWT02 from the lowest elevation to the ceiling. Provide 3M Interam wrap on various intervening and heat transfer items, including cable trays and conduits, as necessary to achieve a 1-hour fire rating for the cable tray.

2. Provide 3M Interam wrap on Division 1 horizontal cable tray ATWG from the north wall southward to a point 19.1 feet south of penetration AJ-29A, where the Division 2 residual heat removal (RHR) B minimum flow transmitter sensing lines enter the west wall of the east corridor of the GGNS auxiliary building. Provide 3M Interam wrap on

various intervening and heat transfer items, including cable trays and conduits, as necessary to achieve a 1-hour fire rating for the cable tray.

3. Provide 3M Interam wrap on Division 1 horizontal cable tray ATMG from a point 7 feet south of the north wall southward to a point 19.1 feet south of penetration AJ-29A, where the Division 2 RHR-B pump minimum flow transmitter tubing enters the RHR-B Pump Room. Provide 3M Interam wrap on various intervening and heat transfer items, including cable trays and conduits, as necessary to achieve a 1-hour fire rating for the cable tray.

4. Abandon in place the Kaowool wrap protecting Division 1 and Division 2 cable trays in the northeast corner of this elevation, with the exception of Kaowool wrap that is required for RG 1.75 separation requirements.

5. Provide a combustible exclusion zone that, as a minimum, is bounded by the north wall of the GGNS auxiliary building and extends 10 feet west, 10 feet east, and 10 feet south of all cable trays protected with 3M Interam wrap. In addition to the area cited, provide a combustible exclusion zone from the Division 2 RHR B pump minimum flow transmitter to a point 50 feet south of the transmitter. Relocate any security lockers that may be located within the combustible exclusion zone to be outside of the exclusion zone, and prohibit combustible storage areas on these elevations.

3.2 Elevation 119'

1. Provide 3M Interam wrap on vertical cable trays BTOT52, BTOT53, and BTOT54 from the floor of this elevation to a point at least 15 feet above the floor, the height necessary to prevent damage from a floor-based fire. Provide 3M Interam wrap on various intervening and heat transfer items, including cable trays and conduits, as necessary to achieve a 1-hour fire rating for the cable tray. This includes the portion of cable tray BMTH48 within the plane of the vertical trays BTOT52, BTOT53, and BTOT54.

2. Maintain unrated Kaowool wrap as-is on horizontal cable tray ATWH from the north wall southward, down to and including the horizontal cable tray elbow where the tray changes direction from north-south to east-west.

3. Maintain unrated Kaowool wrap as-is on horizontal cable tray BTMH48 from the north wall southward, down to and including the horizontal cable tray tee where the tray changes direction from north-south to east-west, excluding the portion covered with 3M Interam wrap.

4. Maintain unrated Kaowool wrap as-is on vertical cable trays ATWT02, ATWT03, and ATWT04 from the floor to a point 15 feet above the floor, which exceeds the height necessary for a floor-based source fire to ignite cables in this array.

5. Maintain unrated Kaowool wraps as-is on horizontal Division 1 cable trays 1AATMT01 and 1AATNT15 (that portion located west of vertical tray 1AATNT17)

and on cable drops to penetration sleeves No. 1BAAOT01 through 08 and 1BAAXT01.

6. Abandon in place the remainder of the Kaowool wrap protecting Division 1 and Division 2 cable trays in the northeast corner of this elevation, with the exception of Kaowool wrap that is required for RG 1.75 separation requirements.

7. Provide a combustible exclusion zone that, as a minimum, is bounded on the north by the GGNS auxiliary building wall and extends 10 feet west, 10 feet east, and 10 feet south of all cable tray segments that are either protected with 3M Interam wrap or are protected with Kaowool wrap that is not abandoned in place (not including that required for RG 1.75). This requires relocation of any security lockers that may be located within the combustible exclusion zone.

8. Limit the size of combustible storage areas on this elevation, such that the maximum floor area covered by any one combustible storage area is 462 square feet or less, based on the analysis below. If multiple storage areas are used, then they should be separated by a minimum 30 feet, unless their collective area is 462 square feet or less. Maintain a minimum 75 feet separation between combustible storage areas and the combustible exclusion zone located in Area 8.

3.3 Elevation 139'

1. Provide 3M Interam wrap on vertical cable trays BTOT54, BTOT55, BTOT56, and BTOT57 from the floor of this elevation to a point at least 15 feet above the floor, the height necessary to prevent damage from a floor-based fire. Provide 3M Interam wrap on conduit BRM155 from the unscheduled termination box to a point at least 15 feet above the floor, the height necessary to prevent damage from a floor-based fire. Provide 3M Interam wrap on various intervening and heat transfer items, including cable trays and conduits, as necessary to achieve a 1-hour fire rating for the cable tray. This also includes cable runs from the vertical cable trays BTOT54, BTOT55, BTOT56, and BTOT57 to penetration sleeves BAOT22, BAOT23, BAOT24, BAOT25, BAOT26, BAOT 27, BAOT28, and BAOT31, and portions of cable tray raceways BAOT32 and BRMI55 that are located within 15 feet of the floor.

2. Maintain unrated Kaowool wrap as-is on horizontal cable trays ATPI59 and ATWI59 from the north wall southward, down to and including the horizontal cable tray elbows where the trays change direction from north-south to east-west.

3. Maintain unrated Kaowool wrap as-is on horizontal cable tray BTMI28 from the north wall southward, down to and including the horizontal cable tray elbow where the tray changes direction from north-south to east-west.

4. Maintain unrated Kaowool wrap as-is on vertical cable trays ATWTO4, ATWTO5, ATWT06, and ATWT07 from the floor to a point 15 feet above the floor, which exceeds the height necessary for a floor-based source fire to ignite cables in this array.

5. Abandon in place the remainder of the Kaowool wrap protecting Division 1 and Division 2 cable trays and conduits in the northeast corner of this elevation, with the exception of Kaowool wrap that is required for RG 1.75 separation requirements.

6. Abandon in place (or remove at the plant's discretion) the Thermo-Lag wrap installed on Division 2 conduit XRW203.

7. Provide a combustible exclusion zone that, as a minimum, is bounded by the north wall of the GGNS auxiliary building and extends 10 feet west, 10 feet east, and 10 feet south of all cable tray segments that are either protected with 3M Interam wrap or are protected with Kaowool wrap that is not abandoned in place (not including that required for RG 1.75).

8. Limit the size of combustible storage areas on this elevation such that the maximum floor area covered by any one combustible storage area is 440 square feet or less, based on the analysis below. If multiple storage areas are used, then they should be separated by a minimum of 29 feet, unless their collective area is 440 square feet or less. Maintain a minimum of 75 feet of separation between combustible storage areas and the combustible exclusion zone located in Area 8. This requires relocation of the combustible storage area that is adjacent to the combustible exclusion zone located in Area 8.

3.4 Elevation 166'

1. Provide 3M Interam wrap on vertical cable trays BTOT57, BTOT58, and BTOT59 from the floor of this elevation to the end of the vertical tray section 59. Provide 3M Interam wrap on various intervening and heat transfer items, including cable trays and conduits, as necessary to achieve a 1-hour fire rating for the cable tray. This includes the portion of BTMJ27 within the plane of the vertical trays BTOT57, BTOT58, and BTOT59.

2. Maintain unrated Kaowool wrap as-is on horizontal cable trays ATPJ01 and ATNJ33 from the north wall southward, down to and including the horizontal cable tray elbows where the trays change direction from north-south to east-west.

3. Maintain unrated Kaowool wrap as-is on horizontal cable tray BTMJ27 from the north wall southward, down to and including the horizontal cable tray elbow where the tray changes direction from north-south to east-west, excluding the portion covered with 3M Interam wrap.

4. Maintain unrated Kaowool wrap as-is on vertical cable trays ATWT07, ATWT08, ATWT09, and ATOT09 from the floor to a point 15 feet above the floor, which exceeds the height necessary for a floor-based source fire to ignite cables in this array.

5. Abandon in place the remainder of the Kaowool wrap protecting Division 1 and Division 2 cable trays and conduits in the northeast corner of this elevation, with the exception of Kaowool wrap that is required for RG 1.75 separation requirements.

6. Provide a combustible exclusion zone that, as a minimum, is bounded by the north wall of the GGNS auxiliary building and extends 10 feet west, 10 feet east, and 10 feet south of all cable tray segments that are either protected with 3M Interam wrap or are protected with Kaowool wrap that is not abandoned in place (not including that required for RG 1.75).

7. Limit the size of combustible storage areas on this elevation such that the maximum floor area covered by any one combustible storage area is 322 square feet or less, based on the analysis below. If multiple storage areas are used, then they should be separated by a minimum of 25 feet, unless their collective area is 322 square feet or less. Maintain a minimum 75 feet of separation between the combustible storage areas and the combustible exclusion zone located in Area 8.

4.0 TECHNICAL EVALUATION

4.1 Background

The NRC Staff review of Kaowool fire barriers at the Joseph M. Farley Nuclear Plants, Units 1 and 2 (FNP), is documented in SECY 99-204. That review found that the fire rating of the Kaowool design is less than the 1-hour needed to meet the Appendix R requirements. Subsequently, Entergy determined that the GGNS raceway fire barrier system was similar to the FNP Kaowool system in the GGNS auxiliary building; the deficient Kaowool fire wrap system was used as a 1-hour fire rated wrap system in these buildings to meet Appendix R, Section III.G.2.b, and c separation requirements. Entergy initiated hourly fire watch rounds for these areas in accordance with Technical Requirements Manual (TRM/Updated Final Safety Analysis Report (UFSAR)), Section 6.2.8.

By letter dated June 1, 2000, GGNS submitted a compliance strategy to address the deficient fire wrap. GGNS intended to re-qualify the fire resistance rating and determine the overall acceptability of the Kaowool fire wrap system. Subsequent field walk downs and destructive examinations of representative samples of the Kaowool configuration identified additional installation deficiencies. After review of these additional deficiencies, it became apparent that the Kaowool wrap would have to be completely reworked.

By letter dated March 8, 2001, GGNS submitted a revised strategy and established an initial completion date of December 31, 2004, to resolve the deficiency. The strategy was to replace the Kaowool with a fire wrap system that provided the fire resistance rating required by the regulations. By letter dated July 22, 2004, due to a significant increase in the estimated man-hours required to complete the scope of work, GGNS submitted an extension for completion of the modifications from December 31, 2004, to December 31, 2005.

In December 2004, Entergy informed the NRC in a site meeting that GGNS had re-evaluated the remaining work scope and was considering an alternate strategy involving the use of risk-informed, performance-based methods recently approved by the NRC. Subsequently, by letter dated August 17, 2005, the licensee applied for the amendment to resolve the Kaowool issues.

4.2 Staff's Approach for the Review of the Proposed Changes

This technical evaluation considers the principles of implementing risk-informed decisionmaking, as described in RG 1.174. Some of these principles are described in terms typically used in traditional engineering decisions (for example, defense-in-depth). These principles are:

1. The proposed change meets the current regulations unless it is explicitly related to a requested exemption or rule change, i.e., a "specific exemption" under 10 CFR 50.12 or a "petition for rulemaking" under 10 CFR 2.802.

2. The proposed change is consistent with the defense-in-depth philosophy.

3. The proposed change maintains sufficient safety margins.

4. When proposed changes result in an increase in core damage frequency or risk, the increases should be small and consistent with the intent of the Commission's Safety Goal Policy Statement.

5. The impact of the proposed change should be monitored using performance measurement strategies.

After consideration of these principles, the NRC staff's review must determine whether: (1) there is reasonable assurance that the health and safety of the public will not be endangered by operation in the proposed manner, (2) such activities will be conducted in compliance with the Commission's regulations, and (3) the issuance of the amendment will not be inimical to the common defense and security or to the health and safety of the public.

4.2.1 Overview of Approach Used by the Licensee

Entergy's evaluations of the areas were performed using risk-informed, performance-based analysis tools and used RG 1.174, which the NRC had previously issued, for the risk acceptance criteria for resolution of its Kaowool issues in specific fire areas of the GGNS auxiliary building, as discussed below:

1) In general, the licensee conducted a risk-informed, performance-based review of the specified fire areas. The licensee concluded that the review and analysis showed that part of the planned modification to the Kaowool barrier system was unnecessary to ensure safety. The review and analysis conducted by the licensee reflected a combination of planned modifications to GGNS, deterministic re-analyses, and combined risk-informed and fire modeling analyses.

2) Based on the results of a risk-informed, performance-based evaluation of the following fire zones in the auxiliary building, Entergy proposed to eliminate reliance on Kaowool as a rated raceway fire barrier material and to reduce the scope of 3M Interam wrap that must be installed to replace Kaowool in specific portions of:

   - Fire Zone 1A101 - Passage: Elevations 93' and 103'
   - Fire Zone 1A117 - Miscellaneous Equipment Area: Elevations 93' and 103'

- Fire Zone 1A211 - Miscellaneous Equipment Area: Elevation 119'
- Fire Zone 1A316 - Motor Control Center: Elevation 139'
- Fire Zone 1A417 - Miscellaneous Equipment Area: Elevation 166'

4.2.2 Licensee's Change Analysis for the Resolution of Kaowool Issues

The licensee's change analysis submitted in its application, as supplemented, is summarized in this section as follows:

4.2.2.1 Auxiliary Building Area Description

The GGNS auxiliary building is a concrete and steel structure that surrounds the Containment Structure at GGNS. It adjoins the turbine building, diesel generator building, and control building. Details about the auxiliary building's structure, cables, and equipment are provided in this section.

Floor levels are referred to by absolute elevation. The floor elevations of the GGNS auxiliary building of interest are:

- Elevation 93'/103'
- Elevation 119'
- Elevation 139'
- Elevation 166'

Each floor of the auxiliary building is sub-divided into four Areas. This evaluation is concerned with fire zones in the northeast corner of the auxiliary building, which is designated as Area 8. These fire zones of interest are: 1A101, 1A117, 1A211, 1A316, and 1A417.

4.2.2.1.1 Elevation 93' And 103'

There are two fire zones of interest on this elevation: 1A101 and 1A117.

1) Fire Zone 1A101 – Passage: This fire zone is located east of column line G.4, and contains both Division 1 and Division 2 safe shutdown components. The minimum separation distance between Division 1 and Division 2 safe shutdown components that are not enclosed within noncombustible material is 35 feet. The intervening combustibles within this distance consist of one ventilated cable tray containing non-safety related IEEE-383 cable installed in accordance with the provisions of RG 1.75.

2) Fire Zone 1A117 - Miscellaneous Equipment Area: This fire zone is located west of column line G.4, and contains both Division 1 and Division 2 safe shutdown components. All Division 1 safe shutdown components in this zone were provided with Kaowool Wrap.

4.2.2.1.2 Elevation 119'

Fire Zone 1A211 - Miscellaneous Equipment Area:

This fire zone is located west of column line G.4, and contains both Division 1 and 2 safe shutdown components. Both Division 1 and 2 safe shutdown components are located in a 26 foot space west of column line G.4 and are provided with Kaowool wrap. There are no Division 1 safe shutdown components located west of this 26 foot space, and there are no Division 2 safe shutdown components located to the east of this 26 foot space. The intervening combustibles located within this separation distance consist of cable trays containing IEEE 383 cable installed in accordance with the provisions of RG 1.75.

4.2.2.1.3 Elevation 139'

Fire Zone 1A316 - Motor Control Center:

This fire zone is located west of column line G.4, and contains both Division 1 and 2 safe shutdown components. All Division 1 safe shutdown components and all Division 2 safe shutdown components in the 25 foot space where they interact were provided with Kaowool wrap. The minimum separation distance between unprotected Division 1 and Division 2 safe shutdown components is 25 feet. The intervening combustibles consist of two non-safety-related open cable trays and three cable tray risers containing IEEE 383 cable to a non-safety-related motor control center (MCC), which is located along the south wall of the zone. These trays are located 9 feet from unprotected Division 1 safe shutdown components and are totally enclosed in the vicinity of unprotected Division 2 safe shutdown components to satisfy the provisions of RG 1.75.

4.2.2.1.4 Elevation 166'

Fire Zone 1A417 - Miscellaneous Equipment Area:

This fire zone is located west of column line G.4, and contains both Division 1 and Division 2 safe shutdown components. Twenty feet separate Division 1 safe shutdown components located in adjacent fire zone 1A401 from Division 2 safe shutdown components in fire zone 1A417 that are not wrapped with Kaowool. This separation distance does not contain intervening combustibles. All Division 1 and Division 2 safe shutdown cables and raceways located in fire zone 1A417 are wrapped for the 23 feet where they interact, with the exception of two conduits. One conduit contains Division 1 circuits and another conduit contains Division 2 circuits. All other safe shutdown circuits in fire zone 1A417 that are located within 20 feet of these conduits were provided with Kaowool wrap, with the exception of two other Division 1 conduits.

4.2.2.1.5 Interaction Areas

As defined by the licensee, an interaction area is a location where Division 1 and Division 2 redundant safe shutdown cables, raceways, equipment, or components are horizontally separated by less than 20 feet, or where both divisions may be adversely affected by a single-fire scenario. The licensee identified six interaction areas in the analysis. These interaction areas are:

- Interaction Area 1: [Fire zone 1A117] This interaction area involves the interaction of the unprotected Division 2 north-south horizontal cable tray segment BTMG near the north wall with the Division 1 north-south horizontal segment ATMG east of the Division 2 segment and the vertical cable tray ATNT02 adjacent to the north wall. The Division 1 segments are covered with unrated Kaowool wrap.

- Interaction Area 2: [Fire zones 1A101 and 1A117] This area involves the interaction of the unprotected Division 2 conduit BRW310 with the Division 1 north-south horizontal cable tray segment ATMG east of the Division 2 conduit. The Division 1 segment is covered with unrated Kaowool wrap. There is approximately 19 feet of separation between the conduit and the portion of horizontal cable tray ATMG that is not protected with 3M Interam wrap.

- Interaction Area 3: [Fire zone 1A101] This interaction area involves the interaction of the unprotected Division 2 RHR B pump minimum flow transmitter and its associated sensing lines with the unprotected portions of the north-south Division 1 raceway array, located 19.1 feet south of Penetration AJ–29A or about 29 feet south of the transmitter.

- Interaction Area 4: [Fire zone 1A211] This interaction area involves the interaction of the Division 2 north-south horizontal cable tray segment BTMH48 near the north wall with the Division 1 north-south horizontal segment ATWH east of the Division 2 segment and the vertical cable trays ATWT02, ATWT03, and ATWT04 adjacent to the north wall. Interaction Area 4 also involves the interaction of the portions of vertical Division 2 cable tray BTOT54 that are covered with unrated Kaowool with the vertical Division 1 cable trays ATWT02, ATWT03, ATWT04. Except for the vertical Division 2 cable tray portions protected with 3M Interam wrap, all trays cited above are covered with unrated Kaowool wrap.

- Interaction Area 5: [Fire zone 1A316] This area involves the interaction of the Division 2 north-south horizontal cable tray segment BTMI28 near the north wall with the Division 1 north-south horizontal cable tray segments ATPI59 and ATWI59 east of the Division 2 segment and the vertical cable trays ATWT04, ATWT05, ATWT06, and ATWT07 adjacent to the north wall. Interaction Area 5 also involves the interaction of the portion of vertical Division 2 cable trays BTOT54, BTOT55, BTOT56, and BTOT57 that are covered with unrated Kaowool wrap with the vertical Division 1 cable trays ATWT04, ATWT05, ATWT06, and ATWT07, and with the horizontal cable tray segments ATPI59 and ATWI59. Except for the vertical Division 2 cable tray portions protected with 3M Interam wrap, all trays cited above are covered with unrated Kaowool wrap.

- Interaction Area 6: [Fire zone 1A417] This area involves the interaction of the Division 2 north-south horizontal cable tray segment BTMJ27 near the north wall with the Division 1 north-south horizontal cable tray segments ATPJ01 and ATNJ33 east of the Division 2 segment and with the vertical cable trays ATOT09, ATWT07, ATWT08, and ATWT09 adjacent to the north wall. Except for the vertical Division 2 cable tray protected with 3M Interam wrap, all trays cited above are covered with unrated Kaowool wrap.

The licensee stated in the analysis that other interactions on these elevations are bounded by the selected interaction areas. The licensee demonstrated this by showing that the other interactions involve larger separations between trains or greater distances from the source fire to the targets.

4.2.2.1.6 Structural Fire Protection Features

The structural fire barriers in the areas under consideration are as follows:

- Interfaces with Stair 1A10 and Elevator No.3 are 2-hour rated barriers.

- Elevation 93'/103': [Fire zone 1A101] The ceiling, north, east, and west walls are 3-hour rated fire barriers. The floor and south wall are below-grade, non-rated, exterior barriers. Portions of the west boundary are open to fire zones 1A114 and 1A117.

- Elevation 93'/103': [Fire zone 1A117] The ceiling, south, and east boundaries, and that portion of the north wall bordering on the Control Building are 3-hour rated fire barriers. The remaining portion of the north wall, as well as the floor and west wall, are below-grade, non-rated exterior boundaries. Portions of the south and east boundaries are open to fire zones 1A120 and 1A101, respectively.

- Elevation 119': [Fire zone 1A211] The ceiling, floor, south wall, and that portion of the north wall that is physically adjacent to the control building are 3-hour rated barriers. The remainder of the north wall is a below grade, non-rated exterior barrier. The east and west boundaries are open to fire zones 1A201 and 1A222, respectively.

- Elevation 139': [Fire zone 1A316] The floor, ceiling, and walls are 3-hour rated fire barriers. A portion of the north wall is a 2-hour rated exterior fire barrier. Portions of the east and west boundaries are open to fire zones 1A301 and 1A321, respectively.

- Elevation 166': [Fire zone 1A417] The floor, part of the north wall (column lines G.4 to K), and all of the south wall in this zone are 3-hour fire rated barriers, while the ceiling is the base of the roof slab. The remaining portion of the north wall is an exterior 2-hour rated fire barrier. The east and west zone boundaries are open to fire zones 1A401 and 1A424, respectively.

4.2.2.1.7 Fire Protection Equipment

The auxiliary building is equiped with an ionization smoke detection system located in each beam pocket throughout the areas under consideration. Automatic smoke detection is present but is not credited in this analysis.

The GGNS auxiliary building is also protected by partial coverage wet pipe sprinkler systems. These sprinkler systems provide coverage in the northeast corner of the auxiliary building as follows:

- Elevation 93'/103': Coverage north of column line 10.5 and east of column line J.5. [Fire zones 1A101 and 1A117]

- Elevation 119': Coverage north of column line 13.0 and east of column line J.5. [Fire zones 1A201 and 1A211]

- Elevation 139': Coverage north of column line 13.0 and east of column line J.5. [Fire zones 1A301 and 1A316]

- Elevation 166': Coverage north of column line 11.0 and east of column line L.0 except for the area west of the MCC room approximately bounded by column lines J.5, H.7, 12.5, and 13.8. [Fire zones 1A401 and 1A417]

Each of the interaction areas is fully covered by the appropriate sprinkler system. Additionally, except for the 93'/103' elevation, the combustible exclusion zones are fully protected. On the 93'/103' elevation, the southern boundary of the combustible exclusion zone extends about 20 feet beyond the coverage boundary. Neither suppression nor cooling effects of the sprinkler system actuations is credited in this analysis.

Manual fire fighting equipment consisting of the hose stations and portable fire extinguishers is available inside the auxiliary building. Manual fire fighting activities are not credited in this analysis.

Operability and surveillance requirements for fire protection systems, including those provided for the auxiliary building, are provided by the GGNS Updated Final Safety Analysis Report (UFSAR). Procedures are in place to maintain the fire protection systems and to ensure that the UFSAR requirements are met.

4.2.2.1.8 Combustible Controls

Processes and procedures are in place at GGNS to address housekeeping and control of combustible loading throughout the plant. This includes housekeeping and combustible loading control in the auxiliary building. The procedures provide controls for bringing combustibles into a fire zone for any plant activity.

The plant procedures also mandate combustible storage areas and combustible exclusion zones. The combustible storage areas are designated locations where Class A transient combustible materials may be stored or staged. Storage area contents are controlled by fuel load, location, and storage height. Outside of the storage areas, these transient combustibles may only be stored in sealed metal drums. Combustible exclusion zones are areas where transient combustible material storage and staging are prohibited.

Entergy will establish combustible exclusion zones around the interaction areas as indicated by its analysis. Additionally, some combustible storage areas will be relocated and have their storage capacities reduced.

These changes will provide additional assurance that the conditions of the risk-informed, performance-based evaluation are met and that defense-in-depth is maintained in these areas.

4.2.2.2 Deterministic Re-Analysis

Entergy performed a deterministic re-analysis of the Division 2 motor operated valve (MOV) Q1P41F068B and the associated conduit on the 93'/103' elevation. Entergy determined that cables 1BB63142B and 1BB631421 are in conduit BRMG20 in the area of interest, and that cable 1BB631421 is the power cable to the MOV Q1P41F068B and cable 1BB63142B is one of the valve's control cables. Entergy stated the following with respect to the valve and the cables:

a) The failure of concern for the valve is spurious closing.

b) A three-phase hot short is the only failure that will cause the valve to spuriously close.

c) Per the GGNS safe shutdown analysis, this valve is not a high-low pressure interface valve, and the spurious operation of a valve due to a three-phase hot short does not require evaluation in accordance with the guidance in Generic Letter 86-10, Section 5.3.1.

d) A short to ground or an open circuit would result in a loss of control of the valve, but would not cause spurious closure of the valve.

e) The conductor 31R in the control cable is in the closed circuit; however, it is located electrically above the control switch for the valve and already has power with the valve in the open position. Therefore, a hot short would not cause spurious closing.

f) The remaining conductors are in the space heater circuit, opening circuit, and indicating light circuit.

g) Based on (e) and (f) above, an open circuit on all conductors or a short circuit on any one conductor of the control cable (a hot short, short to ground, or open circuit on the cables), would cause a complete loss of control and indication for the operators, but would not cause spurious closure.

Therefore, Entergy determined that Division 2 valve Q1P41F068B and the associated conduit on the 93'/103' elevation is not a component that requires separation and protection from Division 1 cables and conduits on the same elevation.

4.2.2.3 Fire Modeling

The licensee's evaluation uses state-of-the-art fire modeling methods. The analysis method uses two concepts: the maximum expected fire scenario (MEFS) and limiting fire scenario (LFS). The MEFS is evaluated for each fire scenario. The MEFS, or worst case credible scenario, is identified by considering the fire types that have a reasonable likelihood of occurrence. For the bounding fire scenarios for each interaction area, as determined by the safety margin of the least affected train in the MEFS evaluation, the LFS is evaluated. The LFS is developed by altering one or more input parameters to the MEFS to determine the threshold at which a target would exceed the critical temperature or radiant heat flux. The purpose of determining an LFS is to perform a sensitivity analysis and demonstrate adequate margin between parameters when determining MEFS and LFS.

Three types of fire scenarios were evaluated by the licensee: direct fire exposures, indirect fire exposures, and combination direct/indirect fire exposures.

For the direct fire exposure scenarios, the LFS was determined by doubling and tripling the heat release rate for the fire used for the MEFS to see if a failure condition was attained. This produced a result of either “greater than two” or “greater than three” as a conservative value for the LFS. For the combustible storage area scenarios, the fire heat release rate of the fire used for the MEFS was increased until the failure criterion was obtained, producing a specific value as a result.

4.2.2.3.1 Fuel Packages

The fire scenarios are selected based on the location and on the potential of various fuel. Given a fuel package, an ignition source is assumed. In the licensee’s evaluation, fixed fuel packages include an MCC on the 139’ elevation and various unprotected cable trays that may be ignited by a floor-based source fire. Self-propagating cable tray fires are not postulated in the absence of an exposure fire; thus, cable tray fires are generally combined with floor-based source fires when they are predicted to occur. The licensee estimated the fire size for the MCC to be 1195 kW, based on test data. This is greater than the 95th percentile heat release rate electrical equipment of 650 kW used in the NRC’s Significance Determination Process (SDP), “Inspection Manual,” Chapter 0609, Appendix F. For the unprotected cable trays, a heat release rate of 400 kW/m² is assumed, based on cable test data.

Transient fuel packages vary with the requirements for a given floor area. According to procedure, combustible exclusion zones have no transients staged or stored. However, the licensee assumes in its evaluation that these requirements are not met and that a single trash bag may be located anywhere within the exclusion zone. A large trash bag may be placed upright or on its side; thus, two configurations are considered. Based on the licensee’s field measurements, the plan area of an upright trash bag is 4 square feet and the plan area of a trash bag on its side is 6 square feet. The fire size associated with a single trash bag fire is 350 kW, based on the largest published heat release rate obtained from a full scale trash bag.

Transient fuel packages in other areas may vary considerably and are limited by the combustible control program. The large transient fuel package in non-combustible exclusion zones on the 119’, 139’, and 166’ elevations is assumed to be a trash collection bin, used to transport and collect trash bags throughout the area. Based on field observations, the transportation bins have a capacity to hold ten trash bags and have a plan area of about 24 square feet and a base elevation of about 1 foot. The licensee stated that a fire involving this fuel package would represent a bounding transient fire scenario in areas beyond a combustible exclusion zone. The assumed heat release rate from this fuel package is 3500 kW.

On the 93’/103’ elevation, a different large transient fuel package is assumed. Based on the location and arrangement of this elevation, the trash bins used on the other elevations are not expected to be present. The size of the elevator doors on this elevation, coupled with the fact that there are no access ways from any other area that do not involve climbing stairs, precludes the introduction of one of the above types of carts. The licensee further stated that this area also does not support the kind of foot traffic that the other areas support, since it does not serve as an access way for carts/trash removal to any other area outside of this elevation. The largest transient fuel package on this elevation is the equivalent of 3.5 trash bags with a heat release rate of 1230 kW.

Transient fuel packages in combustible storage areas are limited by the GGNS Heat Load Calculation and vary from area to area. Combustible storage areas are remotely located from the interaction areas and thus represent an indirect fire exposure hazard only. On each floor level, the largest combustible storage area is evaluated to determine the most severe indirect fire exposure hazard to the targets in the interaction area. Based on test data, the unit heat release rate for miscellaneous Class A fuel packages located in combustible storage areas is assumed to be 400 kW/m². Each combustible storage area is assumed to be uniformly filled with the combustibles, and the transient fire growth period is also ignored.

When determining the LFS, the heat release rate of the fuel package is increased to two and then three times that of the MEFS. For direct fire exposures in the combustible exclusion zone, this is done by increasing either the plan dimensions such that the unit heat release rate remains constant or by increasing the unit heat release rate such that the plan dimension remains constant. The most severe exposure configuration is not obvious and may vary between the two methods; thus, each is assessed when determining the LFS for any given fire scenario involving transient combustible materials. Other types of fire exposures (combustible storage areas, a large transient located beyond the combustible exclusion zone, and cable trays) have their heat release rate increased, but their dimensions remain fixed. These fires are not expected to be sensitive to the dimension and/or the unit heat release rate, because either the dimensions are fixed or the heat release rate is the dominant parameter.

4.2.2.3.2 Direct Fire Exposures

Nineteen direct exposure fire scenarios were evaluated by the licensee. These particular scenarios were chosen since they were believed to be the most likely to affect multiple trains of systems. Empirical correlations for flame height, thermal plume temperature, thermal radiation, and heat flux were used to model the fires in these scenarios. The scenarios evaluated were:

a) Elevation 93'/113':

1. [Interaction area 1] A transient fuel package within the combustible exclusion zone positioned midway between unprotected horizontal Division 1 and Division 2 safe shutdown cable trays. The licensee stated that this scenario bounds all scenarios within the combustible exclusion zone that could expose both Division 1 and Division 2 safe shutdown cable trays that do not involve the ignition of cables in overhead cable trays. Based on the fire modeling results, Entergy concluded that none of the modeled targets would be adversely impacted by an MEFS.

   In scenario 1, the licensee calculated the LFS fire size to be greater than three times the MEFS fire size. The licensee concluded that the difference between MEFS and LFS is acceptable.

2. [Interaction area 1] A transient fuel package within the combustible exclusion zone positioned beneath the unprotected Division 2 cable tray nearest Division 1 and Division 2 cable trays. This tray is safe shutdown cable tray BTMG. The licensee states that this scenario bounds all scenarios within the combustible exclusion zone that could expose both Division 1 and Division 2 safe shutdown cable trays that involve the ignition of cables in unprotected overhead cable trays. Based on the fire modeling results, Entergy concluded that while some of the modeled Division 2

targets would be adversely impacted, none of the modeled targets in Division 1 would be adversely impacted by an MEFS.

Based on the results of the MEFS evaluation, the licensee concluded that this scenario is bounded by scenario 1, for LFS purposes.

3. A transient fuel package located just outside the combustible exclusion zone in fire zone 1A117, exposing horizontal Division 1 and Division 2 cable trays. This a large transient fuel package because it is located outside the combustible exclusion zone. Based on the fire modeling results, Entergy concluded that none of the modeled targets would be adversely impacted by an MEFS.

   In scenario 3, the licensee calculated the LFS fire size to be greater than three times the MEFS fire size. The licensee concluded that the difference between MEFS and LFS is acceptable.

4. [Interaction area 2] A transient fuel package positioned within the combustible exclusion zone between unprotected horizontal safe shutdown Division 1 cable tray ATMG and Division 2 safe shutdown conduit BRW310. The licensee states that this scenario bounds all scenarios within the combustible exclusion zone that could expose both the Division 1 cable tray and the conduit that powers the Division 2 RHR B minimum flow transmitter located in interaction area 3. Based on the fire modeling results, Entergy concluded that none of the modeled targets would be adversely impacted by an MEFS.

   In scenario 4, the licensee calculated the LFS fire size to be greater than three times the MEFS fire size. The licensee concluded that the difference between MEFS and LFS is acceptable.

5. [Interaction area 3] A transient fuel package positioned within the combustible exclusion zone between unprotected horizontal Division 1 cable tray ATMG and the Division 2 RHR B pump minimum flow transmitter. The licensee stated that this scenario bounds all scenarios within the combustible exclusion zone that could expose both the unprotected Division 1 cable trays north of the minimum flow transmitter and the transmitter itself. Based on the fire modeling results, Entergy concluded that while the Division 2 transmitter would be adversely impacted, none of the modeled targets in Division 1 would be adversely impacted by an MEFS.

   In scenario 5, the licensee calculated the LFS fire size to be greater than two times the MEFS fire size. The licensee concluded that the difference between MEFS and LFS is adequate due to the conservatism of the calculation.

6. [Interaction area 3] A transient fuel package positioned within the combustible exclusion zone between the unprotected portions of safe shutdown horizontal Division 1 cable trays ATMG and ATWG and the Division 2 RHR B pump minimum flow transmitter. The licensee stated that this scenario bounds all scenarios within the combustible exclusion zone that could expose both the unprotected Division 1 cable trays south of the minimum flow transmitter and the transmitter itself. Based on the fire modeling results, Entergy concluded that while the Division 2 transmitter

would be adversely impacted, none of the modeled targets in Division 1 would be adversely impacted by an MEFS.

Based on the results of the MEFS evaluation, the licensee concluded that this scenario is bounded by scenario 5, for LFS purposes.

7. A transient fuel package located just outside of the combustible exclusion zone in fire zone 1A101. The exclusion zone boundary is 50 feet south of the Division 2 RHR B pump minimum flow transmitter. This a large transient fuel package because it is located outside the combustible exclusion zone. Based on the fire modeling results, Entergy concluded that while the unprotected Division 1 cable trays would be adversely impacted, none of the modeled targets in Division 2 would be adversely impacted by an MEFS.

   In scenario 7, the licensee calculated the LFS fire size to be greater than three times the MEFS fire size. The licensee concluded that the difference between MEFS and LFS is acceptable.

On this elevation, based on the results of scenarios 3 and 7, the LFS for a direct exposure fire in the general floor area outside of the combustible exclusion zone is determined to be greater than three times the MEFS fire size. However, based on the results of the indirect exposure evaluation in Section 4.2.2.3.3 of this SE, the LFS fire size for these scenarios should be greater than two times the MEFS fire size.

b) Elevation 119':

8. [Interaction area 4] A transient fuel package positioned within the combustible exclusion zone between vertical Division 1 and Division 2 safe shutdown cable trays. The licensee stated that this scenario bounds all scenarios within the combustible exclusion zone that could expose both the vertical Division 1 and Division 2 cable trays. Based on the fire modeling results, Entergy concluded that while some of the modeled Division 1 targets would be adversely impacted, none of the modeled targets in Division 2 would be adversely impacted by an MEFS.

   In scenario 8, the licensee calculated the LFS fire size to be greater than three times the MEFS fire size. The licensee concluded that the difference between MEFS and LFS is acceptable.

9. [Interaction area 4] A transient fuel package within the combustible exclusion zone positioned midway between horizontal Division 1 and Division 2 safe shutdown cable trays. The licensee stated that this scenario bounds all scenarios within the combustible exclusion zone that could expose both Division 1 and Division 2 safe shutdown horizontal cable trays that do not involve the ignition of cables in overhead cable trays. Based on the fire modeling results, Entergy concluded that none of the modeled targets would be adversely impacted by an MEFS.

   In scenario 9, the licensee calculated the LFS fire size to be greater than three times the MEFS fire size. The licensee concluded that the difference between MEFS and LFS is acceptable.

10. [Interaction area 4] A transient fuel package within the combustible exclusion zone positioned beneath the unprotected Division 2 cable tray (non-safe shutdown) nearest Division 1 and Division 2 cable trays. This tray is located 3 feet west of Division 2 horizontal cable tray BTMH48. The licensee stated that this scenario bounds all scenarios within the combustible exclusion zone that could expose both Division 1 and Division 2 safe shutdown horizontal cable trays that involve the ignition of cables in unprotected overhead cable trays. Based on the fire modeling results, Entergy concluded that none of the modeled targets would be adversely impacted by an MEFS.

    Based on the results of the MEFS evaluation, the licensee concluded that this scenario is bounded by scenario 9, for LFS purposes.

11. A transient fuel package located just outside of the combustible exclusion zone in fire zone 1A211, exposing horizontal Division 1 and Division 2 cable trays. This a large transient fuel package because it is located outside the combustible exclusion zone. Based on the fire modeling results, Entergy concluded that while some of the modeled Division 2 targets would be adversely impacted, none of the modeled targets in Division 1 would be adversely impacted by an MEFS.

    In scenario 11, the licensee calculated the LFS fire size to be greater than three times the MEFS fire size. The licensee concluded that the difference between MEFS and LFS is acceptable.

c) Elevation 139':

12. [Interaction area 5] A transient fuel package positioned within the combustible exclusion zone between vertical Division 1 and Division 2 safe shutdown cable trays. The licensee stated that this scenario bounds all scenarios within the combustible exclusion zone that could expose both the vertical Division 1 and Division 2 cable trays. Based on the fire modeling results, Entergy concluded that while some of the modeled Division 1 targets would be adversely impacted, none of the modeled targets in Division 2 would be adversely impacted by an MEFS.

    In scenario 12, the licensee calculated the LFS fire size to be greater than three times the MEFS fire size. The licensee concluded that the difference between MEFS and LFS is acceptable.

13. [Interaction area 5] A transient fuel package within the combustible exclusion zone positioned midway between horizontal Division 1 and Division 2 safe shutdown cable trays on top of the hot pipe shield. The top of the hot pipe shield, and the base of the fire, are 3.5 feet above the floor. The licensee stated that this scenario bounds all scenarios within the combustible exclusion zone that could expose both Division 1 and Division 2 safe shutdown horizontal cable trays that do not involve the ignition of cables in overhead cable trays. Based on the fire modeling results, Entergy concluded that none of the modeled targets would be adversely impacted by an MEFS.

In scenario 13, the licensee calculated the LFS fire size to be greater than three times the MEFS fire size. The licensee concluded that the difference between MEFS and LFS is acceptable.

14. [Interaction area 5] A transient fuel package on top of the hot pipe concrete shield within the combustible exclusion zone, positioned beneath an unprotected cable tray (non-safe shutdown) nearest Division 1 and Division 2 cable trays. This tray is located 7 feet west of Division 2 horizontal cable tray BTMI28. The top of the hot pipe shield and the base of the fire, are 3.5 feet above the floor. The licensee stated that this scenario bounds all scenarios within the combustible exclusion zone that could expose both Division 1 and Division 2 safe shutdown horizontal cable trays that involve the ignition of cables in unprotected overhead cable trays. Based on the fire modeling results, Entergy concluded that none of the modeled targets would be adversely impacted by an MEFS.

    Based on the results of the MEFS evaluation, the licensee concluded that this scenario is bounded by scenario 13, for LFS purposes.

15. [Interaction area 5] An MCC fire. The MCC is a fixed combustible located about 6.4 feet south of the Division 1 cable trays ATPI59 and ATWI59 and 2 feet southeast of Division 2 cable tray BTMI28. The MCC is about 1.7 feet wide, 8.4 feet long, and 11.5 feet tall. Based on the fire modeling results, Entergy concluded that none of the modeled targets would be adversely impacted by an MEFS.

    Based on the results of the MEFS evaluation, the licensee concluded that this scenario is bounded by scenario 13, for LFS purposes.

16. A transient fuel package located just outside of the combustible exclusion zone in fire zone 1A316, exposing horizontal Division 1 and Division 2 cable trays. This a large transient fuel package because it is located outside the combustible exclusion zone. Based on the fire modeling results, Entergy concluded that none of the modeled targets would be adversely impacted by an MEFS.

    In scenario 16, the licensee calculated the LFS fire size to be greater than three times the MEFS fire size. The licensee concluded that the difference between MEFS and LFS is acceptable.

d) Elevation 166':

17. [Interaction area 6] A transient fuel package within the combustible exclusion zone positioned midway between horizontal Division 1 and Division 2 safe shutdown cable trays. The licensee states that this scenario bounds all scenarios within the combustible exclusion zone that could expose both Division 1 and Division 2 safe shutdown horizontal cable trays that do not involve the ignition of cables in overhead cable trays. Based on the fire modeling results, Entergy concluded that none of the modeled targets would be adversely impacted by an MEFS.

In scenario 17, the licensee calculated the LFS fire size to be greater than three times the MEFS fire size. The licensee concluded that the difference between MEFS and LFS is acceptable.

18. [Interaction area 6] A transient fuel package within the combustible exclusion zone, positioned beneath the unprotected Division 2 cable tray (non-safe shutdown) nearest Division 1 and Division 2 cable trays. This tray is located 3 feet west of Division 2 horizontal cable tray BTMJ27. The licensee stated that this scenario bounds all scenarios within the combustible exclusion zone that could expose both Division 1 and Division 2 safe shutdown horizontal cable trays that involve the ignition of cables in unprotected overhead cable trays. Based on the fire modeling results, Entergy concluded that none of the modeled targets would be adversely impacted by an MEFS.

    Based on the results of the MEFS evaluation, the licensee concluded that this scenario is bounded by scenario 17, for LFS purposes.

19. [Interaction area 6] A transient fuel package outside the combustible exclusion zone. This a large transient fuel package because it is located outside the combustible exclusion zone. Based on the fire modeling results, Entergy concluded that none of the modeled targets would be adversely impacted by an MEFS.

    In scenario 19, the licensee calculated the LFS fire size to be greater than three times the MEFS fire size. The licensee concluded that the difference between MEFS and LFS is acceptable.

The licensee also calculated the direct fire exposures for MEFSs in the combustible storage areas. Based on the fire modeling results, Entergy concluded that the maximum possible heat flux generated by such a fire was far below any damage threshold.

4.2.2.3.3 Indirect Fire Exposures

The licensee evaluated indirect exposure fires on each elevation. These particular scenarios were chosen based on the largest combustible storage area on each elevation. The Consolidated Model of Fire Growth and Smoke Transport (CFAST), Version 5.1.1 (Jones et al., 2000) was used to model the fires. The hot gas layer temperature is determined for each scenario based on a steady-state fire and for various ventilation conditions.

On the 93'/103' elevation, the acceptance criterion is the critical temperature for the minimum flow transmitters, which is much lower than that of the safe shutdown cable. On this elevation, the licensee evaluated the effect of this elevation's large transient fire, since there are no combustible storage areas on this elevation.

On the other three elevations, the acceptance criterion was the critical temperature for safe shutdown cables. On these elevations, the licensee evaluated the effects of both a large transient fire, and a fire in the largest combustible storage area on the particular elevation. The licensee determined that on these elevations, the large transient fires were dwarfed by, and thus bounded by, the combustible storage area fires.

On the 93'/113' elevation, the licensee determined that a 2600 kW fire was required to reach the failure criterion, and it set this as the LFS. The MEFS is the 1230 kW large transient fire. The LFS fire size is thus greater than two times the MEFS fire size. The licensee concluded that the difference between MEFS and LFS is adequate due to the conservatism of the calculation. The licensee also concluded that combustible storage areas should continue to be banned from this elevation.

On the 119' elevation, the licensee determined that a 34,500 kW fire was required to reach the failure criterion, and it set this as the LFS. However, the fire modeling results showed that this scenario rapidly becomes ventilation limited, preventing the smoke layer temperature from reaching the failure criteria. The largest current combustible storage area on this elevation produces a fire of 5600 kW. The LFS corresponds to a storage area of about 928 square feet. The licensee concluded that to maintain an MEFS to LFS safety margin of two, combustible storage areas on this elevation should be limited to about 462 square feet. The licensee states that this is acceptable due to the conservative nature of the calculation and the ventilation limited nature of large fires on this elevation. The licensee also determined that 30 feet of separation shall be maintained between combustible storage areas to prevent multiple combustible storage area scenarios.

On the 139' elevation, the licensee determined that a 32,500 kW fire was required to reach the failure criterion, and it set this as the LFS. However, the fire modeling results showed that this scenario rapidly becomes ventilation limited, preventing the smoke layer temperature from reaching the failure criteria. The largest current combustible storage area on this elevation produces a fire of 5600 kW. The LFS corresponds to a storage area of about 874 square feet. The licensee concluded that to maintain an MEFS to LFS safety margin of two, combustible storage areas on this elevation should be limited to about 440 square feet. The licensee stated that this is acceptable due to the conservative nature of the calculation and the ventilation limited nature of large fires on this elevation. The licensee also determined that 29 feet of separation shall be maintained between combustible storage areas to prevent multiple combustible storage area scenarios.

On the 166' elevation, the licensee determined that a 24,000 kW fire was required to reach the failure criterion, and set this as the LFS. However, the fire modeling results showed that this scenario rapidly becomes ventilation limited, preventing the smoke layer temperature from reaching the failure criteria. The largest combustible storage area on this elevation produces a fire of 12,000 kW. The LFS corresponds to a storage area of about 644 square feet, and the MEFS corresponds to about 322 square feet. The licensee concluded that the MEFS to LFS safety margin of two is acceptable due to the conservative nature of the calculation and the ventilation-limited nature of large fires on this elevation. The licensee also determined that 25 feet of separation shall be maintained between combustible storage areas to prevent multiple combustible storage area scenarios.

4.2.2.3.4 Direct/Indirect Fire Exposures

Based on preliminary calculations, the licensee determined that there is sufficient volume in the auxiliary building such that the formation of a hot smoke layer in combination with a localized fire exposure is not expected, given the type of fires postulated in the direct-exposure-scenarios; that is, in the combustible-exclusion-zones. The licensee then used the Fire Dynamics Simulator (FDS), Version 4.02 (McGrattan et al., 2004) to confirm the validity of this

assumption. Based on these fire modeling results, combination direct/indirect fire exposures were not considered in the licensee's evaluation of combustible exclusion zone or combustible storage area scenarios.

The only cases in which direct/indirect fire exposures are of concern are for the LFSs of the large transient fuel packages at the boundary of the combustible exclusion zones. On the 93'/113' elevation there are two of these scenarios: 3 and 7. Note that based on the indirect fire evaluation, the LFS for these scenarios is already two. For scenario 3, there is no direct fire exposure to the target transmitter, due to the transmitter's location, thus, preventing a combined exposure scenario. In scenario 7, there is a large margin present when the LFS is equal to twice the MEFS. Although a hot smoke layer is expected to develop, mitigating effects, such as the absorption of thermal radiation by the smoke layer and obstruction of intervening objects, are expected to compensate, and prevent a change in results from an LFS equal to twice the MEFS. On the other elevations, the margins are as large, or larger, and the LFSs of triple the MEFS are all less than half the size of the indirect LFSs. Based on these conditions, the results of these scenarios are not expected to change.

4.2.2.3.5 Conservative Aspects of the Analysis

The licensee's submission, as supplemented, stated that there are a number of conservative aspects to the licensee's calculations inherent in the approach or the assumptions, although the licensee did not quantitatively compute them. The following aspects would indicate a margin of safety:

- Heat release rates are selected based on the most conservative data available and exceed the recommended values in the NRC SDP by a factor of nearly two or more.
- Mitigating effects from automatic fire suppression are not credited.
- Manual fire fighting activities are not credited.
- The transient response of the targets is not credited. Damage is assumed upon exposure to the failure criteria. Short duration fire scenarios may not burn long enough to heat a target to critical temperature.
- Fuel packages are positioned in the most adverse location relative to the targets.
- Exposure conditions are assumed uniform over a target's surface. They are determined from peak heat flux and temperature values.
- Thermal losses from the target to the environment are not credited.
- Emissive power is assumed constant over the entire flame surface.
- The flame is assumed to be a cylinder, instead of a cone. This produces conservative radiative view factors.
- Shadowing effects are not credited.

- The target's surface is assumed to be normal to the incident radiation.

- Smoke layer absorption of thermal radiation is not credited.

- The heat flux acceptance criteria for the transmitter is very conservative, since it assumes that: the fire is a perfect emitter and the target is a perfect absorber; there are no thermal losses from the target; and that there is a radiative view factor of 1.0.

These aspects clarify the degree of conservatism inherent in the calculations and the margin between the MEFS and LFS for the scenarios. Based on the degree of conservatism, the licensee concluded that a safety margin of two between the MEFS and LFS fire sizes is adequate.

Based on its independent review, the NRC staff concluded, because the licensee's administrative controls on combustibles, such as combustible exclusion areas and limitation on the size of combustible storage areas are appropriate; because the area configuration is satisfactory (in particular, because it lacks intervening combustibles); and because other features involved, such as automatic fire suppression installed in most areas, provide additional assurance of safety, that a safety margin of two between the MEFS and LFS fire sizes is adequate.

4.2.2.4 Risk Assessment

As described in the licensee's letter dated August 17, 2005, Attachment 3, in the "Risk Analysis" Section, the licensee adopted the following approach for its risk analysis:

- Regulatory Guide 1.174 specifies that the risk associated with a plant change is determined by considering the change in core damage frequency (CDF) and large early release frequency (LERF) that result from the plant change. These changes in CDF and LERF are calculated by comparing the CDF and LERF values for the entire fire area before and after the change to ensure that all contributors to risk are included. The fire risk analysis focused only on elements that had been or were proposed to be changed from the current licensing basis. These elements were associated with transient combustible fires previously described.

- The process of determining the risk impact of the proposed change is complicated by the fact that plant fire risk information for GGNS is limited to the Fire IPEEE that was submitted in response to Generic Letter 88-20, Supplement 4. A comprehensive updating and upgrading of the GGNS Fire Risk assessment was not performed as part of this project effort. Instead, a qualitative change assessment was first performed to identify specific fire sequences that would be contributors to the risk associated with the changed configuration. The purpose of this initial qualitative assessment was to eliminate those sequences that would be applicable for both baseline and changed configuration. It is the quantification and summation of this reduced set of sequences that was conservatively used to estimate the change in plant fire risk that is attributable to the proposed change.

4.2.2.4.1 Core Damage Frequency

As described in the licensee's letter dated May 19, 2006, Attachment 4, in the "Risk Analysis" Section, including Sub-Section "CDF," and the licensee's letter dated August 17, 2005, Attachment 3, Enclosure 2, the licensee's fire analysis determined that, at most, one safe shutdown train may be damaged due to a [credible transient] fire if the wrap as noted in the changes is installed. Therefore, the licensee concluded that, at most, the review of the CDF needs to determine the consequences if loss of one safe shutdown train was to occur. Ignition frequencies for transient combustibles were selected from IMC 0609, Appendix F (Fire Protection Significance Determination Process [FPSDP]) and weighted by the ratio of "critical" to "plausible" floor area as directed by the FPSDP. To ensure the results were bounding, the NRC staff asked the licensee to perform a sensitivity analysis using the more detailed process for assigning ignition frequencies for transient combustibles described by NUREG/CR-6850 (EPRI/NRC Fire PRA(1) Methodology for Nuclear Power Facilities), which is the basis for the simplifications of the FPSDP. The results verified that the values calculated using the FPSDP approach were bounding.

For additional conservatism, the licensee credited neither automatic nor manual suppression from preventing cable damage. The licensee's analysis also utilized calculated CDF as a surrogate for ΔCDF [change in CDF]. Using these assumptions, weighting factor, and ignition frequency calculated above, and the CCDP [Conditional Core Damage Probability] provided in the licensee's letter dated August 17, 2005, Attachment 3, Enclosure 2, the licensee determined that, the CDF for each zone and the cumulative CDF was 4.93E-8/yr. Therefore, the licensee concluded that the ΔCDF is well below the CDF Region III guidance threshold from RG 1.174. In addition, the licensee concluded that, the CDF can be expected to be much lower, based on the following conservative assumptions:

- The analysis does not credit either manual or automatic suppression.

- Where one raceway of safe shutdown equipment can be damaged in a zone, it is assumed that all equipment associated with that division in that zone is rendered unavailable, as opposed to just those cables installed in the raceway.

The licensee thus concluded that this change is acceptable for implementation, and it committed to tracking the cumulative effects of these changes in the Risk Analysis, pursuant to the performance monitoring principles in RG 1.174, at least on a qualitative basis.

The licensee calculated the CCDPs referenced above using the existing GGNS Fire PRA, which fails equipment, assumes a plant trip, and analyzes the resultant expected core damage frequency with the use of flag files. These files set the failed equipment to True, indicating failure. As a result, this analysis determines the total CDF as a surrogate for the ΔCDF. The licensee retained assumptions in the GGNS Fire PRA that did not generally credit the Kaowool (although some sensitivity cases are run) and assumed that all targets exposed to fire conditions in excess of their damage threshold were disabled. The results of the analysis showed CCDP, with no manual or automatic suppression credited, ranging from a low value of

(1) The terms "PRA" (Probabilistic Risk Assessment) and "PSA" (Probabilistic Safety Assessment) are used interchangeably and equivalently throughout the licensee's submissions.

2.76E-5 to a high value of 1.93E-3. The CCDP is the core damage probability conditional on the occurrence of a damaging fire (that is, it does not include fire ignition frequency or the probabilities of detection, growth, or suppression).

4.2.2.4.2 Large Early Release Frequency

As described in the licensee's letter dated May 19, 2006, Attachment 4, in the "Risk Analysis" Section, including Sub-Section "LERF," and the licensee's letter dated August 17, 2005, Attachment 3, Enclosure 2, the licensee's analysis for LERF paralleled that for CDF, utilizing the same assumptions and approach. The analysis again assumed that calculated LERF could serve as a surrogate for ΔLERF. The licensee stated that using these assumptions, the weighting factor and the ignition frequency calculated above, and the CLERP [Conditional Large Early Release Probability] provided in the licensee's letter dated August 17, 2005, Attachment 3, Enclosure 2, it determined the LERF for each zone and the cumulative LERF to be 3.30E-9/yr. Therefore, the licensee concluded that the ΔLERF is well below the LERF Region III guidance threshold from RG 1.174. In addition, the LERF is expected to be much lower, based on the following conservative assumptions:

- The analysis does not credit either manual or automatic suppression.
- Where one raceway of safe shutdown equipment can be damaged in a zone, it is assumed that all equipment associated with that division in that zone is rendered unavailable, as opposed to just those cables installed in the raceway.

The licensee thus concluded that this change is also acceptable for implementation, and it committed to tracking the cumulative effects of these changes in the Risk Analysis, pursuant to the performance monitoring principles in RG 1.174, at least on a qualitative basis.

The licensee calculated the CLERPs referenced above "using the existing GGNS Fire PRA, which fails equipment, assumes a plant trip, and analyzes the resultant expected core damage frequency with the use of flag files. These files set the failed equipment to "True," indicating failure. As a result, this analysis determines the total LERF as a surrogate for the ΔLERF. The licensee retained assumptions in the GGNS Fire PRA that did not generally credit the Kaowool (although some sensitivity cases are run) and assumed that all targets exposed to fire conditions in excess of their damage threshold were disabled. The results of the analysis showed CLERP, with no manual or automatic suppression credited, ranging from a low value of 1.99E-6 to a high value of 1.67E-4. The CLERP is the large early release probability conditional on the occurrence of a damaging fire (that is, it does not include fire ignition frequency or the probabilities of detection, growth, or suppression).

4.2.2.4.3 PSA Quality

As described in the licensee's letter dated August 17, 2005, Attachment 1, Section 4.0, and the licensee's letter dated May 19, 2006, Attachment 1, "Responses to Request for Additional Information (RAI)," the licensee stated that Revision 2 of the GGNS PSA addressed most of the important observations resulting from the peer review and updated various elements of the analysis. This internal events model was used, along with the detailed fire scenario and cable routing information from the GGNS Fire IPEEE analysis, to develop an updated Fire PSA model that was used in the risk calculations for this analysis. This implied to the NRC staff that, while

most of the important observations from the peer review had been addressed prior to using the updated internal events model for this analysis, some important observations still remained to be addressed. The NRC staff asked the licensee to provide a list of these remaining important observations and to discuss whether failure to have addressed them in any way affected the results of this analysis.

The licensee's response, dated May 19, 2006, Attachment 1, "Responses to Request for Additional Information (RAI)," included a list and discussion of the 17 peer review high-level (Category A and B) Facts and Observations (F&Os) still open or only partially addressed. With respect to these F&Os, the licensee stated the following:

> Nine of the open Category B F&Os are associated with the GGNS IPE Level 2 model which GGNS has chosen not to update. Instead, a LERF model based on the methodology described in NUREG/CR-6595, Rev. 1, "An Approach for Estimating the Frequencies of Various Containment Failure Modes and Bypass Events", was developed. As a result of this decision, the Level 2 F&Os are not directly applicable. Three of the open F&Os are documentation related and do not affect PRA results. Three of the remaining F&Os do not impact Fire PRA results since they deal with initiators other than fire. The impact of the remaining two items ... was assessed using sensitivity analyses. The results of the analyses indicate that these F&Os would not have a significant impact on the PRA results. Therefore, incorporation or completion of the open Category A & B F&Os is not expected to have any significant impact on the results of the analyses in the submittal.

The NRC staff asked for further clarification on this issue regarding "the unresolved deficiencies that are cited as not appearing in or affecting the fire PRA of a purely calculational nature such that (1) these initiators CANNOT be induced by fire or (2), even if they could be induced by fire, the calculational deficiency would not carry over into the resulting accident sequence (i.e., event/fault trees)." The NRC staff asked the licensee to provide assurance that, although the affected events cited in the F&Os are not fire initiators or fire-related failures, they CANNOT be induced or affected by fire-related failures that, on the surface, would appear to be totally unrelated but, under the surface, somehow could be connected. By letter dated May 19, 2006, Attachment 1, "Responses to Request for Additional Information (RAI)," the licensee responded that, while the initiators cited in the F&Os may be induced by a fire, the F&Os are not relevant to the fire PRA because they are concerned with the frequency of the specific non-fire-induced initiators or with the treatment of recovery associated with a specific non-fire-induced initiator.

4.2.2.4.4 Staff Conclusions - Risk Analysis

The NRC staff found that any increases in core damage frequency or risk would be small and consistent with the intent of the Commission's Safety Goal Policy Statement. The application indicated that the change in risk is small. Based on its independent review, the NRC staff agrees with the licensee's approach and conclusion because the approach applied is as realistic as practicable and is consistent with the performance monitoring and acceptance criteria principles of RG 1.174, because the licensee correctly applies the methods for applying risk insights and acceptance criteria described in RG 1.174. Furthermore, the NRC staff finds that the licensee's conclusions are consistent with the intent of the Commission's Safety Goal Policy Statement, because PRA methods and associated analyses methods used are state-of-

the-art, are as realistic as practicable, and the delta CDF has been calculated by the licensee to be small (a determination independently evaluated by staff).

The NRC staff also found that the impact of the proposed change would be monitored using performance measurement strategies, based on the applicant's commitment to tracking the cumulative effects of these changes in the risk analysis, pursuant to the performance monitoring principles in RG 1.174, at least on a qualitative basis.

4.2.2.5 Defense-in-Depth and Safety Margins

The licensee provided its evaluation of Defense-in-Depth and Safety Margins in its letter dated May 19, 2006, Attachment 4, in the "Defense-in-Depth and Safety Margins" Section. It is summarized below:

4.2.2.5.1 Defense-in-Depth

A comprehensive risk-informed, performance-based analysis requires consideration of defense-in-depth as part of an integrated evaluation of risk considerations. The defense-in-depth objectives are the following:

1. To prevent fires from starting;

2. To detect rapidly, control, and extinguish promptly those fires that do occur;

3. To provide protection for structures, systems, and components important to safety so that a fire that is not promptly extinguished by the fire suppression activities will not prevent the safe shutdown of the plant.

RG 1.174 also identifies factors to be considered when evaluating defense-in-depth for a risk-informed change.

The licensee's evaluation of defense-in-depth stated that fire prevention is strengthened by increasing the size of some of the combustible exclusion zones. In addition, the sizes of some of the combustible storage areas are being reduced. Security storage lockers will also be relocated outside of the new combustible exclusion areas.

Entergy proposes no changes to the existing fire detection systems, automatic fire suppression systems, or manual fire fighting procedures in the auxiliary building. Entergy will continue to control these systems and procedures to maintain defense-in-depth.

Protection for structures, systems, and components important to safety is weakened by the elimination of the reliance on the Kaowool fire barriers in the northeast corner of the auxiliary building. However, the elimination of the reliance on Kaowool has been evaluated by Entergy in accordance with RG 1.174, or by deterministic re-analysis. Protection for structures, systems, and components is strengthened by protecting one division of safe shutdown cable trays with 1-hour fire rated 3M Interam wrap where it would be subject to damage from a credible floor-based fire; by moving combustible storage areas away from interaction areas; and by maintaining the noncombustible, but unrated, Kaowool on certain cable trays to prevent cable

ignition from a floor-based fire. All of these changes will occur as indicated by the licensee's analysis.

The NRC staff found that the proposed change would be consistent with the defense-in-depth philosophy. The application indicated that the proposed change maintains an adequate balance between defense-in-depth elements. Based on its independent review, the NRC staff agreed with this conclusion, because the three elements of defense-in-depth were adequately satisfied. The NRC staff determined that the licensee had addressed the element of fire prevention by increasing the size of combustible exclusion zones. The NRC staff also determined that the licensee had addressed the element of fire detection and suppression through having the areas under evaluation equipped with both detection and automatic suppression capability. Finally, the NRC staff determined that the licensee had addressed the element of protection of safe shutdown capability from fire and fire suppression efforts by using state-of-the-art risk analysis methods and the PRA as described elsewhere in this evaluation. Therefore, the NRC staff concluded that the proposed change would provide sufficient defense-in-depth.

4.2.2.5.2 Safety Margins

RG 1.174 provides acceptance guidelines to ensure that sufficient safety margins are maintained. It states that the proposed change should provide sufficient margin to account for analysis and data uncertainty.

The method that the licensee used to evaluate the safety margins in this evaluation was to calculate LFSs and compare them to the MEFSs. The licensee concluded that for each limiting fire scenario, a heat release rate of at least two times that modeled in the MEFS was needed to reach the LFS. This safety factor did not include the added benefits of the suppression and detection systems that are present, but that are not credited in the evaluation.

Entergy addressed uncertainty by considering the degree to which the fire models and calculations used bounded the uncertainty in the input parameters. The licensee stated that the analysis indicated that there was no single parameter for which the results were overly sensitive. Based on these results, Entergy concluded that the uncertainty associated with variations in the input parameters was less than the safety margin for the fire scenarios considered.

The licensee further addressed uncertainty by determining an LFS for each limiting fire scenario. For the direct fire exposure scenarios, the LFS was determined by doubling and tripling the heat release rate for the fire used for the MEFS to see if a failure condition was attained. This produced a result of either "greater than two" or "greater than three" as a conservative value for the LFS. For the indirect fire exposure scenarios, the licensee increased the fire heat release rate for the MEFS until a failure criteria was obtained, producing a specific value as a result. Where appropriate, the sizes of allowed combustible storage areas were then adjusted to maintain an LFS to MEFS safety margin of at least two.

The licensee also conducted a sensitivity analysis to determine that the conclusions would not be altered. In the case of the auxiliary building fire scenarios, the licensee conducted sensitivity analyses on a number of quantities: the fire size, the unit heat release rate and fuel package configuration or orientation, the compartment ventilation configuration, the compartment recirculation configuration, the fire location, the fire emissive power, the limiting oxygen index,

and the fire radiant fraction. Based on the results of the sensitivity study, Entergy developed the limitations on the combustible storage areas that appear in the change description. Entergy concluded that the other conclusions were not affected.

The NRC staff found that the proposed change would maintain sufficient safety margins. The application indicated that safety margins have been satisfied based on expected fire sizes. The NRC staff finds this conclusion acceptable because the licensee considered the fire sizes included in the fire protection significance determination process as well as plant specific values that were more conservative. Therefore, the NRC staff concluded that sufficient safety margins are preserved.

4.3 List of Regulatory Commitments

The following table identifies those actions committed to by Entergy in conjunction with this amendment request:

List of Regulatory Commitments

COMMITMENT	TYPE (Check one)		SCHEDULED COMPLETION DATE (If Required)
	ONE-TIME ACTION	CONTINUING COMPLIANCE	
The commitments made in the letter dated August 17, 2005:			
Entergy is making the following regulatory commitments: • Completion of 1 hour fire wrap installation on raceways that the analysis determines require it and maintenance of portions of the existing Kaowool wrap. • Revision of the combustible exclusion areas as determined by this assessment. • Revision of the combustible storage areas as determined by this assessment. • Relocation of security lockers to an area outside of combustible exclusion areas. • Upgrade to the existing fire protection program to ensure the plant is maintained in accordance with the bases for this analysis.		X	Within 90 days of amendment issuance
GGNS will continue to maintain the compensatory measures committed to in letter GNRO-2004/00042.		X	Until changes proposed by this OLC [operating license condition] amendment request are implemented

COMMITMENT	TYPE (Check one)		SCHEDULED COMPLETION DATE (If Required)
	ONE-TIME ACTION	CONTINUING COMPLIANCE	
The commitments made in the letter dated May 19, 2006:			
The cumulative effect of the changes in the risk analyses will be tracked and included in subsequent changes, [pursuant to the performance monitoring principles in RG 1.174,] at least on a qualitative basis.		X	[Within 90 days of amendment issuance]

The NRC staff finds that reasonable controls for the implementation and for subsequent evaluation of proposed changes pertaining to the above regulatory commitments are provided by the licensee's administrative processes, including its commitment management program. Should the licensee choose to incorporate a regulatory commitment into the emergency plan, UFSAR, or other documents with established regulatory controls, the associated regulations would define the appropriate change-control and reporting requirements. The NRC staff has determined that the commitments do not warrant the creation of regulatory requirements, which would require prior NRC approval of subsequent changes. The NRC staff has agreed that Nuclear Energy Institute 99-04, Revision 0, "Guidelines for Managing NRC Commitment Changes," provides reasonable guidance for the control of regulatory commitments made to the NRC staff (see Regulatory Issue Summary 2000-17, "Managing Regulatory Commitments Made by Power Reactor Licensees to the NRC Staff," dated September 21, 2000). The commitments should be controlled in accordance with industry guidance or comparable criteria employed by a specific licensee. The NRC staff may choose to verify the implementation and maintenance of these commitments in a future inspection or audit.

4.4 Summary - Staff's Evaluation

As discussed above, the NRC staff reviewed the licensee's application with reference to the following five risk-informed decision-making criteria described in RG 1.174:

1. As discussed in Section 2.0 of this SE, the NRC staff determined that the proposed change would meet current regulations. The application indicated that the protection provided by the spacial separation provides an acceptable level of safety while maintaining defense-in-depth and safety margins. The NRC staff has concluded that because the application is consistent with the principles of RG 1.174, the application would satisfy GDC 3, pursuant to 50.48(a).

2. As discussed in Section 4.2.2.5.1 of this SE, the NRC staff found that the proposed change would be consistent with the defense-in-depth philosophy. The application indicated that this change maintains an adequate balance between defense-in-depth elements. The NRC staff agreed, based on its independent review, with this conclusion because the three elements of defense-in-depth

(preventing fires, detecting and suppressing fire, and protecting safe shutdown capability from fire and fire suppression efforts) have been adequately considered. Therefore, the NRC staff concluded, that the proposed change would provide sufficient defense-in-depth.

3. As discussed in Section 4.2.2.5.2 of this SE, the NRC staff found that the proposed change would maintain sufficient safety margins. The application indicated that safety margins have been satisfied based on expected fire sizes. The NRC staff agreed, based on its independent review, with this conclusion because the licensee considered the fire sizes included in the fire protection significance determination process and plant specific values that were more conservative. Therefore, the NRC staff concluded, that sufficient safety margins are preserved.

4. As discussed in Section 4.2.2.4.4 of this SE, any increases in core damage frequency or risk would be small and consistent with the intent of the Commission's Safety Goal Policy Statement. The application indicated that the change in risk is small. Based on its independent review, the NRC staff agrees with the licensee's approach and conclusion because the approach applied is consistent with the principles of RG 1.174 and the conclusions are consistent with the intent of the Policy Statement.

5. As discussed in Sections 4.2.2.4.1 and 4.2.2.4.2 of this SE, the NRC staff also noted that the impact of the proposed change would be monitored using performance measurement strategies, based on the applicant's commitment to tracking the cumulative effects of these changes in the risk analysis, pursuant to the performance monitoring principles in RG 1.174, at least on a qualitative basis.

The license's submission presented the evaluation of the impact of the changes. Its evaluation was based on a combination of risk insights and deterministic methods to show that sufficient safety margins and defense-in-depth are maintained. The fire modeling in the licensee's submission demonstrated that it is unlikely that two redundant trains in the same fire area will be damaged by the same fire. Also, fire detection systems, manual fire fighting, and automatic fire suppression systems in the areas of interest provided defense-in-depth, but the licensee has not taken credit for these in its analysis. The results of the risk-informed portions of the analysis were consistent with the acceptance criteria described in RG 1.174.

The NRC staff reviewed the licensee's methodologies, assumptions, evaluations, analyses, and results in conjunction with the regulatory commitments made by the licensee. Based on the above discussion, the commitments made by the licensee, and the information provided in the licensee's submission, the NRC staff finds that the licensee's application as supplemented meets the regulations in 10 CFR 50.48, is consistent with the defense-in-depth philosophy, maintains sufficient safety margins, that any increase in core damage frequency or risk would be small and consistent with the intent of the Commission's Safety Goal Policy Statement, and the cumulative effect of the changes in the risk analyses will be tracked as described in RG 1.174, at least on a qualitative basis. Therefore, the NRC staff finds the licensee's proposed changes, with respect to replacement of the Kaowool fire wrap in the auxiliary building to resolve Kaowool issues, to be acceptable.

5.0 STATE CONSULTATION

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

6.0 ENVIRONMENTAL CONSIDERATION

The amendment changes a requirement with respect to installation or use of a facility component located within the restricted area as defined in 10 CFR Part 20. The NRC staff has determined that the amendment involves no significant increase in the amounts, and no significant change in the types, of any effluents that may be released offsite, and that there is no significant increase in individual or cumulative occupational radiation exposure. The Commission has previously issued a proposed finding that the amendments involve no significant hazards consideration, and there has been no public comment on such finding published on October 25, 2005 (70 FR 61658). Accordingly, the amendment meets the eligibility criteria for categorical exclusion set forth in 10 CFR 51.22(c)(9). Pursuant to 10 CFR 51.22(b) no environmental impact statement or environmental assessment need be prepared in connection with the issuance of the amendment.

7.0 CONCLUSION

Based on the discussion in Section 4.0 of the SE, the commitments made by the licensee, and the information provided in the licensee's submission, the NRC staff finds that the licensee's application, as supplemented, meets the purpose of the regulations in 10 CFR 50.48, uses state-of-the-art fire modeling methods, meets the criteria of RG 1.174, and maintains reasonable balance among the elements of defense-in-depth, ensuring maintenance of appropriate safety margins. Therefore, the NRC staff concludes that the licensee's proposed changes, with respect to replacement of the Kaowool fire wrap in the auxiliary building to resolve Kaowool issues, are acceptable.

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

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