



UNITED STATES
NUCLEAR REGULATORY COMMISSION

WASHINGTON, D.C. 20555-0001

October 18, 2000

LICENSEE: Entergy Operations, Inc.
FACILITY: Grand Gulf Nuclear Station, Unit 1
SUBJECT: SUMMARY OF SEPTEMBER 21, 2000, MEETING TO DISCUSS
PROPOSED TESTING OF KAOWOOL FIRE BARRIER MATERIAL FOR
THE GRAND GULF NUCLEAR STATION, UNIT 1 (TAC NO. MA6031)

BACKGROUND

A public meeting was held at the Nuclear Regulatory Commission (NRC) headquarters in Rockville, Maryland on Thursday, September 21, 2000, between the NRC staff and Entergy Operations, Inc. (EOI, or the licensee), the licensee for Grand Gulf Nuclear Station (GGNS). The meeting was held at the request of the licensee to discuss the proposed testing of Kaowool fire barrier material used at the GGNS facility to meet regulatory requirements for protection of post-fire safe shutdown equipment. Enclosure 1 is a list of meeting attendees and Enclosure 2 is the presentation material provided by the licensee.

This meeting was prompted by the discussions held during a previous meeting on December 8, 1999, with the four licensees, including EOI, that operate nuclear power plants which use Kaowool material as 1-hour fire rated barriers. The staff, in its presentation at the December 8, 1999, meeting, stated that the length of time that Kaowool fire barriers could provide protection from fire damage for safety related components is indeterminate. Licensees using Kaowool were invited to discuss the resolution of the issues associated with the adequacy of these fire barriers through a voluntary industry initiative.

DISCUSSION

EOI's plan for resolution of the Kaowool issue includes a proposed testing program designed to determine the actual fire resistance rating of the Kaowool fire barrier configurations specifically used at the GGNS facility. EOI requested this meeting to provide the opportunity for discussion of their test plan with the staff, and to gain the staff's input and general agreement with the testing protocol and objectives of the effort. GGNS personnel provided a general description of the proposed testing plan, including criteria for selection of bounding test configurations, factors determining test duration, data evaluation methodology, and exceptions to testing criteria specified in Generic Letter (GL) 86-10, Supplement 1.

EOI acknowledged that they anticipate that not all the Kaowool fire barrier test configurations representing specific applications at GGNS will meet the 1-hour fire barrier requirement of Appendix R. However, based on the anticipated rating established by comparison of the full scale fire test results to the calculated fire loadings existing at GGNS, EOI expressed confidence in demonstrating the acceptability of the specific Kaowool configurations used at GGNS, provided that the staff could accept, with sufficient justification, a less than 1-hour rating for a Kaowool fire barrier installation.

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The staff, referencing the discussion of this issue in SECY-99-204, indicated that, given sufficient justification for specific as-installed fire barrier configurations, exemptions from the technical requirements of Appendix R may be needed. The staff emphasized that, in order to establish an adequate level of fire protection for an as-installed fire barrier with less than a 1-hour rating, its expectation is that a sufficient safety factor could be demonstrated when comparing fire rating established by test and fire loading established by analytical methods. The staff stated that a detailed Fire Hazard Analysis (FHA) needs to be performed for each area that contains a Kaowool fire barrier which does not achieve the required 1-hour rating. The FHA needs to include detailed fire severity approximations, similar to those performed in the Fire Induced Vulnerability Evaluation method (FIVE method of GL 88-24, Supplement 4), in addition to fire loading established by simplified Btu/compartments area calculations. The staff stated their belief that a safety factor only slightly greater than 1.0 does not provide a sufficient margin to generate confidence that potential unknowns in either the fire test configurations or the fire dynamics/loading calculation methodology had been accounted for.

The GGNS presentation on test protocol included some proposed exceptions to GL 86-10, Supplement 1, including:

- (a) No meggering of test cables during the actual fire test.
- (b) Megger the hottest cables immediately after the fire test, and complete the meggering within 45 minutes (or sooner) after termination of the fire test.
- (c) Conduct hose stream test after initial meggering.
- (d) After hose stream test, megger remaining test cables that experienced temperatures >250 °F above ambient.

The staff indicated that these proposed exceptions appear to be reasonable.

During discussion of other test details, GGNS said that one comprehensive fire test is planned, unless the establishment of bounding configurations for as-installed Kaowool geometries proves to be impractical for the single full scale test. Then, multiple tests may be necessary to properly represent all Kaowool installations used for fire barriers at GGNS. Additional engineering evaluation is ongoing to develop the appropriate test geometry. The staff expressed interest in reviewing the final test geometries and test plan prior to the actual fire tests.

The staff provided references to two documents which specify test standards and methodology directly applicable to the type of testing proposed by GGNS. These test standards, listed below, in addition to the staff guidance in GL 86-10, Supplement 1, are representative of the staff's expectations for conducting a fire test program for fire barrier materials intended for the protection of electrical system components:

- American Society for Testing and Materials (ASTM) E1725-95, "Standard Test Methods for Fire Tests of Fire-Resistive Barrier Systems for Electrical System Components."
- Underwriters Laboratory (UL) Subject 1724, "Outline of Investigation for Fire Tests for Electrical Circuit Protective Systems," Issue No. 2, August 1991.

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CONCLUSION

Based on the technical discussion of the proposed test details and on questions raised by the staff, GGNS proposed a follow-up meeting prior to conducting the Kaowool full scale fire test. GGNS will continue to develop the Kaowool project plan to address specific issues such as details of bounding test configurations, and calculation of specific fire dynamics/loadings for qualification of fire barrier configurations which may not meet the 1-hour fire barrier requirements of Appendix R.

GGNS emphasized that compensatory measures, consisting of hourly fire watches, as required by the GGNS Fire Protection Program for inoperable fire barriers, have been established and will remain in effect until the Kaowool fire barrier issue has been resolved.

The licensee completed its presentation at about 11:30 A.M. and the meeting was closed.

/RA/

S. Patrick Sekerak, Project Manager, Section 1
Project Directorate IV & Decommissioning
Division of Licensing Project Management
Office of Nuclear Reactor Regulation

Docket No. 50-416

- Enclosures: 1. List of Meeting Attendees
- 2. Licensee's Presentation Material

cc w/encl: See next page

| | | | |
|--------|----------------------|---------------------|-------------------|
| OFFICE | PDIV-1/PM | PDIV-1/LA | PDIV-1/SC |
| NAME | P.Sekerak <i>SPS</i> | D.Johnson <i>dj</i> | R.Gramm <i>RG</i> |
| DATE | 10/18/00 | 10/18/00 | 10/18/00 |

DOCUMENT NAME: G:\PDIV-1\GrandGulf\MtsKaowool-092100.wpd
OFFICIAL RECORD COPY

Grand Gulf Nuclear Station

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DISTRIBUTION FOR MEETING SUMMARY FOR SEPTEMBER 21, 2000, MEETING
BETWEEN EOI AND NRC

DATED: October 18, 2000

PUBLIC

PD#IV-1 Reading

RidsOgcRp

RidsAcrcAcnwMailRoom

RidsNrrDlpm (JZwolinski/SBlack)

RidsNrrDlpmLpdiv (SRichards)

RidsNrrDlpmLpdiv1 (RGramm)

RidsNrrPMPSekerak

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M. Salley

D. Frumkin

E. Weiss

D. Lange

J. Tapia

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T. McMurtray, EDO

RidsRgn4MailCenter (KBrockman)

Meeting with Entergy Operations, Inc.

Kaowool Fire Barriers

September 21, 2000

List of Attendees

| <u>NAME</u> | <u>ORGANIZATION</u> |
|--------------------|-------------------------------|
| Jerry C. Roberts | EOI/GGNS |
| Mike Renfro | EOI/GGNS |
| Michael R. Cumbest | EOI/GGNS |
| William T. White | EOI/GGNS |
| Charles E. Brooks | EOI/GGNS |
| Ron Rispoli | EOI |
| Les Bailey | Southern Nuclear |
| Andy Robosky | South Carolina Electric & Gas |
| Daniel Frumkin | NRR/SPLB |
| Mark H. Salley | NRR/SPLB |
| Leonard N. Olshan | NRR/DLPM |
| Bill Reckley | NRR/DLPM |
| S. Patrick Sekerak | NRR/DLPM |

EOI = Entergy Operations, Inc.
GGNS = Grand Gulf Nuclear Station

NRR = Office of Nuclear Reactor Regulation
SPLB = Plant Systems Branch
DLPM = Division of Licensing Project Management

GGNS KAOWOOL PROJECT

NRC MEETING

9/21/2000

GOAL

Present & Gain NRC Buy-In For The
Philosophies & Methodologies To Be Used
By GGNS To Qualify The KAOWOOL Fire
Wrap System Used To Provide Separation Per
App. R, Section III.G.2.c

OBJECTIVES

- Identify Test Protocol
- Identify/Discuss Deviations
- Criteria For Selection Of Test Configurations
- Discuss Specific Test Details
- Discuss Data Evaluation
- Present Qualification Strategy

USE OF KAOWOOL AT GGNS APPENDIX R SEPARATION

- Seven Fire Zones Affected
 - Auxiliary Building - 1,160 Feet
 - Control Building - 330 Feet
- TOTAL Footage - 1,490 Feet
 - Cable Trays - 820 Feet
 - Conduits - 670 Feet

GGNS KAOWOOL CONFIGURATION

- Two One Inch Blankets
- Butt Joints Used
- Used On Conduits & Cable Trays
- Aluminized ZETEX Fabric Outer Layer
- ZETEX - Flame Spread Rating Of 0

DETECTION IN AREAS REQUIRING APPENDIX R SEPARATION

- Early Warning Detection
 - Ionization Detectors - All Areas
 - Heat Detectors - Switchgear Rooms Only
- Control Room Annunciation

SUPPRESSION IN AREAS REQUIRING APPENDIX R SEPARATION

- Wet Pipe Sprinkler System
 - Auxiliary Building Corridors (Five Areas)
 - 165 °F Sprinklers
 - 0.3 GPM/Ft² (Based On Most Remote 3,000 Ft² Floor Area)
 - Extra Hazard Design

SUPPRESSION IN AREAS REQUIRING APPENDIX R SEPARATION

- Total Flood CO₂ System
 - Control Building Switchgear Rooms (2 Areas)
 - 50% Initial Concentration
 - 30% Concentration For 20 Minutes
 - Supply Adequate For Two Discharges
 - Activated By Heat Detectors

COMPENSATORY MEASURES

- GGNS Conservatively Chose To Establish Hourly Fire Watches As Required By The GGNS Fire Protection Program For Inoperable Fire Barriers Until The KAOWOOL Issue Has Been Resolved

PROJECT PLAN

- Acknowledge The Positions In SECY-99-204 To Establish Ground Rules
- Revisit Safe Shutdown Analysis
- Evaluate GGNS Configurations
- Establish Bounding Configurations
- Conduct Full Scale Fire Test
- Qualify Configurations Based On Combustible Loading
- Implement Modifications As Required

TEST PROTOCOL

- GL 86-10, Supplement 1 Criteria
- Exceptions To Supplement 1 Criteria
 - Megger Test
 - Hose Stream Test

EXCEPTIONS

- No Meggering During Test
- Megger Hottest Cables As Soon As Test Is Terminated
 - Complete Within 45 Minutes
- Hose Stream Test After Initial Meggering
- After Hose Stream Test Remaining Cables That Experienced Temperatures > 250 °F Above Ambient Will Be Meggered

TEST DURATION

- Maximize Data By Terminating Test Prior To Cable Failure
 - Test Duration May Be Less Than 1 Hour
 - Duration Based On Performance Of Majority Of Configurations
 - Test Terminated When Temperature Of Majority Of Cables Exceed 550 °F

TEST DETAILS

- Cable Fill Based On Bounding As-Installed Configurations
- Establishment Of Bounding Configurations
 - Based On Applicable Performance Parameters As Specified In NEI Application Guide For Evaluation Of Thermo-Lag 330-1 Fire Barriers, Revision 1

TEST DETAILS

- Test Bounding Configurations
- Modified/Enhanced Wrap Configurations Will Be Tested
 - Air Drops
 - Wall Interfaces

QUALIFICATION STRATEGY

- Determine Acceptability Of Existing Fire Wrap System Based On A Generic Rating, As Established By Full Scale Fire Test, Considering Actual Hazards And Combustible Loading In Individual Areas

EVALUATION METHODOLOGY

- Assumptions
 - Wrapped Raceways Do Not Contribute To Combustible Loading In Associated Area
 - Rating Less Than One Hour Acceptable If Have Margin (i.e. Rating versus Loading)
 - Approved Deviations Valid Provided Adequate Margin Exists

EVALUATION METHODOLOGY

- Existing Deviations
 - Raceways Not Protected Wall To Wall In All Areas
 - Sprinkler Coverage Not Provided For Entire Area
 - Approved Deviations Valid Provided Adequate Margin Exists

EVALUATION METHODOLOGY

- Document Area Loading
 - Combustible Hazards In Close Proximity To Wrapped Raceways/Conduits
 - Average Loading In Zone Where Wrap Exists
 - Average Loading In Fire Area With Wrap
- Consider Fire Modeling Results For Associated Area/Zone

EVALUATION METHODOLOGY

- Identify Safe Shutdown Circuits In Areas Impacted
- Define Minimum Acceptable Margin Based On Combustible Loading And Rating
- Establish Generic Rating
 - Based On Limiting Configuration
 - Applied To All Configurations

CABLE AMPACITY

- Long Term Cable Life Issue
- Dependent On Installed Wrap Configuration
- Ampacity Will Be Addressed For Modified Configurations
 - Based On Final Qualified Configuration
 - Use Approach Similar To Method Used To Resolve The Ampacity Issue With Thermo-Lag

EVALUATION METHODOLOGY

- Submit Detailed Evaluation Documenting The Basis For The Acceptability Of The KAOWOOL Wrap System In Each Of The Areas Where It Is Installed
- No Submittals Are Planned For Areas Where One Hour Barriers Are Provided