



Entergy Operations, Inc.
P. O. Box 756
Port Gibson, MS 39150
Tel 601 437 6409
Fax 601 437 2795

January 22, 2001

William A. Eaton
Vice President,
Operations
Grand Gulf Nuclear Station

U.S. Nuclear Regulatory Commission
Mail Station P1-37
Washington, D.C. 20555

Attention: Document Control Desk

Subject: Grand Gulf Nuclear Station
Docket No. 50-416
License No. NPF-29
LER 2000-002-00, Plant Outside Design Basis (Kaowool)
Reference: Letter J. C. Roberts to the USNRC, dated December 18, 2000
(GNRO-2000/00099)

GNRO-2001/00003

Ladies and Gentlemen:

Attached is Licensee Event Report (LER) 2000-002-00, which is a final report. Approval for extending the submittal date for this report was verbally approved by Region IV and confirmed in our referenced letter dated December 18, 2000.

Yours truly,

A handwritten signature in cursive script that reads "William A. Eaton".

WAE/CEB/ceb

attachments: 1. Licensee Identified Commitments
2. LER 2000-002-00

cc: (See Next Page)

January 22, 2001

GNRO-2001/00003

cc:

Hoeg	T. L.	GGNS Senior Resident)	(w/a)
Levanway	D. E.	(Wise Carter)	(w/a)
Reynolds	N. S.		(w/a)
Smith	L. J.	(Wise Carter)	(w/a)
Thomas	H. L.		(w/o)

Mr. E. W. Merschoff (w/2) Regional Administrator U.S. Nuclear Regulatory Commission Region IV 611 Ryan Plaza Drive, Suite 400 Arlington, TX 76011	
Mr. S. P. Sekerak, NRR/DLPM/PD IV-1 (w/2) ATTN: ADDRESSEE ONLY U.S. Nuclear Regulatory Commission One White Flint North, Mail Stop O7-D1 11555 Rockville Pike Rockville, MD 20852-2378	
U.S. Nuclear Regulatory Commission Attention: Document Control Desk Washington, D.C. 20555	

**ATTACHMENT 1 TO GNRO-2001/00003
LICENSEE-IDENTIFIED COMMITMENTS**

Letter #:	GNRO-2001/00003		
COMMITMENT	TYPE <small>(Check only one type)</small>		SCHEDULED COMPLETION DATE <small>(If Required)</small>
	ONE- TIME ACTION	CONTINUING COMPLIANCE	
None. The statement under Section "E", Sentence 1, was included in LER-2000-007-00 as a commitment.	YES	N/A	2/15/2001

NRC FORM 366 (1-2001)	U.S. NUCLEAR REGULATORY COMMISSION	APPROVED BY OMB NO. 3150-0104 EXPIRES 6-30-2001 Estimated burden per response to comply with this mandatory information collection request: 50 hours. Reported lessons learned are incorporated into the licensing process and fed back to industry. Send comments regarding burden estimate to the Records Management Branch (T-6 E6), U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001, or by internet e-mail to: bjs1@nrc.gov, and to the Desk Officer, Office of Information and Regulatory Affairs, NEOB-10202 (3150-0104), Office of Management and Budget, Washington, DC 20503. If a means used to impose information collection does not display a currently valid OMB control number, the NRC may not conduct or sponsor, and a person is not required to respond to, the information collection.
<h2 style="margin: 0;">LICENSEE EVENT REPORT (LER)</h2> <p style="font-size: small;">(See reverse for required number of digits/characters for each block)</p>		

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TITLE (4)
Plant Outside Design Basis (Kaowool)

EVENT DATE (5)			LER NUMBER (6)			REPORT DATE (7)			OTHER FACILITIES INVOLVED (8)			
MO	DAY	YEAR	YEAR	SEQUENTIAL NUMBER	REV NO	MO	DAY	YEAR	FACILITY NAME	DOCKET NUMBER		
12	09	2000	2000	002	00	01	22	2001	FACILITY NAME	DOCKET NUMBER		
										05000		
									FACILITY NAME	DOCKET NUMBER		
										05000		
OPERATING MODE (9)		THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check all that apply) (11)										
1		20.2201(b)			20.2203(a)(3)(ii)			X		50.73(a)(2)(ii)(B)		50.73(a)(2)(ix)(A)
POWER LEVEL (10)		20.2201(d)			20.2203(a)(4)					50.73(a)(2)(iii)		50.73(a)(2)(x)
100		20.2203(a)(1)			50.36(c)(1)(i)(A)					50.73(a)(2)(iv)(A)		73.71(a)(4)
		20.2203(a)(2)(i)			50.36(c)(1)(ii)(A)					50.73(a)(2)(v)(A)		73.71(a)(5)
		20.2203(a)(2)(ii)			50.36(c)(2)					50.73(a)(2)(v)(B)		OTHER
		20.2203(a)(2)(iii)			50.46(a)(3)(ii)					50.73(a)(2)(v)(C)		Specify in Abstract below or in NRC Form 366A
		20.2203(a)(2)(iv)			50.73(a)(2)(i)(A)					50.73(a)(2)(v)(D)		
		20.2203(a)(2)(v)			50.73(a)(2)(i)(B)					50.73(a)(2)(vii)		
		20.2203(a)(2)(vi)			50.73(a)(2)(i)(C)					50.73(a)(2)(viii)(A)		
		20.2203(a)(3)(i)			50.73(a)(2)(ii)(A)					50.73(a)(2)(viii)(B)		

LICENSEE CONTACT FOR THIS LER (12)

NAME Charles E. Brooks	TELEPHONE NUMBER (Include Area Code) 601-437-6555
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COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT (13)

CAUSE	SYSTEM	COMPONENT	MANU-FACTURER	REPORTABLE TO EPIX	CAUSE	SYSTEM	COMPONENT	MANU-FACTURER	REPORTABLE TO EPIX

SUPPLEMENTAL REPORT EXPECTED (14)				EXPECTED SUBMISSION DATE (15)					
YES (If yes, complete EXPECTED SUBMISSION DATE).				X	NO		MONTH	DAY	YEAR

ABSTRACT (Limit to 1400 spaces, i.e., approximately 15 single-spaced typewritten lines) (16)

GGNS uses Kaowool to satisfy commitments for meeting 10CFR50, Appendix R, Section III.G.2 safe shutdown separation requirements, as a nominal 1-hour fire barrier and as a radiant energy shield inside containment. GGNS also uses Kaowool to satisfy Regulatory Guide 1.75 electrical separation requirements. During resolution of concerns promulgated in SECY 99-204, GGNS developed a re-qualification plan to establish the fire resistive rating and overall acceptability of Kaowool. Limited installation instructions and documentation necessitated the need to destructively examine representative samples of GGNS Kaowool raceways. The examinations revealed deficiencies that compromised the ability of Kaowool to perform as designed. Based on the nature of the deficiencies identified, the results of the examinations were generically applied to all Kaowool installations. Subsequent evaluations concluded that the only area where redundant safe shutdown capability may have been compromised during a postulated fire was the Division II ESF Switchgear Room. The fire barrier in this area is augmented with early warning smoke detection, heat detection, and automatic suppression capability. This area is being monitored by an hourly fire patrol. Regulatory Guide 1.75 electrical separation requirements are unimpaired by these deficiencies.

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NARRATIVE (If more space is required, use additional copies of NRC Form 366A) (17)

A. Reportable Occurrence

The Kaowool Fire Wrap System is used at GGNS to satisfy commitments for meeting 10CFR50, Appendix R, Section III.G.2 as a nominal 1-hour fire barrier and as a radiant energy shield inside containment. GGNS also uses Kaowool to satisfy Regulatory Guide 1.75 electrical separation requirements. While performing destructive examinations of representative samples of Kaowool protected raceways as part of GGNS's effort to establish a qualification basis for Kaowool, deficiencies were identified with the Kaowool Fire Wrap System that compromise its ability to perform as a nominal 1-hour fire barrier. On December 9, 2000, the initial engineering assessment of all areas where Kaowool is relied upon to protect safe shutdown capability, concluded that a fire in Fire Zone 0C215 is the only plant area where redundant safe shutdown circuits may have been damaged in the event of a postulated fire.

Per 10CFR50.72(b)(1)(ii), a one-hour telephone notification was made to the NRC's Emergency Notification System on December 9, 2000 reporting the condition discovered in Fire Zone 0C215 - a condition that places the plant outside its design basis. This LER submits the follow-up report pursuant to 10CFR50.73(a)(2)(ii).

B. Initial Conditions

At the time of discovery of this condition, the plant was in OPERATIONAL MODE 1, with reactor power at approximately 100 percent and reactor coolant temperature at approximately 521 degrees Fahrenheit. There were no other structures, systems, or components inoperable at the time of discovery of this condition that contributed to the occurrence of this condition.

C. Description of Occurrence

The Kaowool Fire Wrap System is used at GGNS to satisfy commitments for meeting 10CFR50, Appendix R, Section III.G.2 as a nominal 1-hour fire barrier and as a radiant energy shield inside containment. GGNS also uses Kaowool to satisfy Regulatory Guide 1.75 electrical separation requirements. As a result of NRC concerns with the fire resistive rating of the Kaowool Fire Barrier system promulgated in SECY 99-204, GGNS developed a comprehensive re-qualification plan to establish the fire resistance rating and overall acceptability of the Kaowool Fire Wrap System used at GGNS. The re-qualification plan included a testing program designed to determine the actual fire resistive rating of GGNS Kaowool fire barrier configurations. In preparation for the testing, destructive examinations of representative samples of GGNS Kaowool configurations were performed to verify/validate the actual details of installation. Destructive examinations of representative samples of both cable tray and conduit configurations located in the Auxiliary Building [NF] were performed. The selected locations are considered to be representative of the Appendix R committed Kaowool fire wrap barriers located in the Control [NA], Auxiliary [NF] and Containment [NH] Buildings. Results from the destructive examinations revealed deficiencies with the Kaowool fire barrier system that compromise its ability to perform as designed.

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<p>NARRATIVE (If more space is required, use additional copies of NRC Form 366A) (17)</p> <p>C. Description of Occurrence (Continued)</p> <p>Deficiencies identified as a result of the destructive examinations can be categorized as follows resulting in portions of the raceways (conduits & cable trays) having through openings into the wrapped raceway:</p> <ol style="list-style-type: none"> 1) Installation method is not consistent between common raceway types. 2) Installation is not in accordance with details provided in the original installation document. 3) Physical damage (probably caused by individuals stepping/crawling on wrapped raceways) to the fibrous Kaowool material. <p>Based on the nature of the deficiencies identified during the examinations, the nonconformances were conservatively applied generically to all Kaowool configurations. Engineering evaluated each of the plant areas where the Kaowool fire wrap system is installed to satisfy Appendix R Safe Shutdown criteria, considering actual fire hazards, fire loading, ignition sources, proximity of associated redundant safe shutdown raceways, available detection and suppression capabilities and the results of the IPEEE evaluation. This review concluded that the only area where redundant safe shutdown capability could be lost during a fire was in the Control Building [NA] in the Division II ESF Switchgear Room (Fire Zone 0C215). The specific safe shutdown components which could be damaged from a fire in Fire Zone 0C215 are the redundant safe shutdown circuits for the Ultimate Heat Sink, which is the Standby Service Water System (SSW)[BS].</p> <p>Three previous condition reports (CR's) have recently been initiated involving this fire wrap system (CR-GGN-1999-1004, 2000-1481 and 2000-1516). As a result of the issuance of SECY 99-204 and the previous CRs, the areas containing this fire wrap system in the Control [NA], Auxiliary [NF] and Containment [NH] Buildings are currently being monitored by hourly fire watch patrols in accordance with GGNS Fire Protection Program requirements for inoperable fire barriers. In addition, the Kaowool fire wrap system has been re-installed where destructive examinations were conducted and the deficiencies noted above have been corrected. Licensee Event Report 2000-007-00 was submitted by letter dated November 22, 2000 for the deficiency documented in CR-GGN-2000-1481.</p> <p>Based on field walk downs, it was concluded that Division I conduits 1BARNR33, 1BARNR34, 1BARNR36, 1BARWQ31 and 1BARWQ38 are located directly above and in proximity to the Division II electrical switchgear cabinet containing breaker 152-1616 (SSW B Pump breaker), the 16AB bus feed to LCC 16BB5, as well as Division II panels 1Y95, 1Y95-1, 1Y88, 1Y88-1 and Distribution Boards 1Y84 and 1Y86. Review of the affected raceways and cabinets has concluded that redundant Division I and Division II circuits required to achieve safe shutdown conditions associated with both the Division I and II Standby Service Water System [BS] are impacted. A detailed review of the configuration of the conduits, switchgear cabinets, panels and distribution boards revealed that the only location where redundant circuits in Division I and Division II required to achieve safe shutdown conditions were impacted was at the Division II electrical switchgear cabinet containing breaker 152-1616 which is the 16AB bus feed to the SSW B Pump.</p>				

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C. Description of Occurrence (Continued)

Destructive examinations were performed on the Kaowool fire wrap installed on the Division I Raceways above the stated switchgear cabinet to verify if the as-installed wrap configuration could be credited for some level of protection. Based on these examinations, it was concluded that the as-installed configuration of the Kaowool was deficient and provided very little protection to the wrapped raceways.

D. Apparent Causes

Although the specific deficiencies initially identified are only on fire wrap installed on electrical raceways located in the Auxiliary Building [NF], the deficiencies are considered generic to all 10CFR50, Appendix R, Section III.G.2 Kaowool wrapped raceways located in the Control [NA], Auxiliary [NF], and Containment [NH] Buildings. This was further substantiated to be applicable to all buildings based on examinations performed in the Division II ESF Switchgear Room (Fire Zone 0C215).

1. The root cause for this event was the lack of specific guidance or direction on how to address or handle configurations other than unsupported straight runs of cable tray and conduit during initial installation. Additionally, results of the destructive examinations revealed that the system was not initially installed in accordance with design documents on straight runs of conduits or cable trays.
2. A number of causes have been identified during the review of this issue. At the time the Kaowool wrap system was initially accepted, the test protocol for fire wrapped raceways was still under development. The use of the test protocol to bound existing field conditions was in its early stages of development as well. Therefore, the process of correlating acceptable test data to acceptable field configurations/conditions was not necessarily an exact science at that time. These conditions appear to have been present in GGNS's initial acceptance of the Kaowool wrap system during initial plant construction.
3. GGNS failed to adequately document Kaowool field configurations and failed to provide justification that the limited initial test results were bounding conditions for all GGNS configurations.

E. Corrective Actions (Corrective Action/Preclude Recurrence/Remedial):

As an immediate corrective action, the Kaowool fire wrap system has been re-installed where destructive examinations were conducted and the deficiencies have been corrected, including those in 0C215. As previously committed in LER 2000-007-00, dated November 22, 2000, the long-term resolution of all issues associated with the Kaowool fire wrap system will be addressed under CR-GGN-1999-1004. In the interim, actions consistent with the GGNS Fire Protection Program requirements for an inoperable fire barrier i. e., hourly fire patrols will continue until GGNS Kaowool fire barrier issues are resolved.

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F. Safety Assessment

A detailed review of the configuration of the conduits, switchgear cabinets, panels and distribution boards revealed that the only location where redundant circuits in Division I and Division II required to achieve safe shutdown conditions were impacted was at the Division II electrical switchgear cabinet containing breaker 152-1616 which is the 16AB bus feed to LCC 16BB5 (i.e. SSW B Pump breaker). Engineering reviewed the detection and suppression in the Division II ESF Switchgear Room (0C215) and concluded that the Division I raceways could sustain significant damage (i.e. failure) from a fire originating in the Division II electrical panels before the automatic suppression system (i.e. total flood CO₂) would be expected to actuate. However, if the suppression system were manually initiated within approximately six (6) minutes of the initiation of the fire (i.e. resulting in control room indication of a bus fault in the cabinet), the Division I circuits would not be expected to fail and would therefore be available to perform their design function. Based on GGNS specific operator response time, it is expected that CO₂ would have been initiated within 6 minutes and the ability to achieve and maintain safe shutdown capability would be met. Research of plant records for the previous 3-year period prior to discovery of this condition revealed that at the start of this 3 year period for about 6 months, the CO₂ system for Fire Zone 0C215 was considered inoperable. The GGNS Fire Protection Program requires establishing a continuous fire watch in the area when this condition exists. Additionally, a fire fighting strategy to address the CO₂ issue had been developed had a fire occurred in Fire Zone 0C215. Because of the length of time that has elapsed since this condition existed, it was not considered in the following risk evaluation.

In order to evaluate the risk impact of degraded Kaowool fire wrap in the Division II Switchgear Room, a comparison was made to the Division II Switchgear Room results from the GGNS Fire IPEEE. The Fire IPEEE credits systems in addition to the safe shutdown systems for the prevention of core damage. This switchgear room contains Division II equipment and cables, Division I cables and High Pressure Core Spray (HPCS) [BG] cables. The original Fire IPEEE assumed that Kaowool wrap provided a nominal 1-hour protection for wrapped cables. A hot gas layer (HGL) is possible in this room if the exposure fire propagates to overhead trays. It is assumed that this will lead to damage of all unprotected and eventually, protected cables in the room if the condition continues to exist. If suppression is successful prior to the formation of a HGL, ignition and continued combustion of overhead cable is prevented or stopped and there is no damage to protected cable and targets that are not impacted directly by the exposure fire. The assumption is also made that all of Division II is failed with a fire in this room, as the fire ignition sources are all Division II components except for the transient fire initiator source. The GGNS Fire IPEEE developed four scenarios for the Division II Switchgear Room with a resulting core damage frequency of 4.06E-07/year. With degraded Kaowool, the assumption is made that there is no additional protection for the Division I wrapped cables. Therefore, any wrapped cables that are directly impacted by the exposure fire would be damaged from the fire plume. The room was walked down and it was determined that wrapped Division I cables in the room could be directly impacted by certain fire ignition sources. Therefore, additional fire scenarios were developed to address this potential. Only one electrical cabinet (or cubicle) has the potential to propagate to overhead cables, thereby resulting in a HGL, and also directly impact wrapped Division I cables (i.e., wrapped cables would be in the fire plume).

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F. Safety Assessment (Continued)

Based on the distance from the cabinet, the fire would have to be suppressed in approximately nine minutes to prevent damage to the Division I cables. Since automatic suppression initiation for the room is by rate of temperature rise, it was determined that auto-actuation would not occur soon enough to prevent damage to the wrapped cables. Manual actuation of the CO₂ system within approximately six minutes (to allow time for CO₂ to transport and achieve the required concentration) was required to prevent damage to the Division I cables in the fire plume. Based on this information the following new fire core damage scenarios were developed:

- Fire originating in a cabinet which directly impacts Division I cables with the potential for a HGL. Manual suppression efforts (including manual actuation of the CO₂ system) within six minutes fail but auto suppression is successful before a HGL forms. Division I cables are damaged due to direct impact but HPCS [BG] cables are protected.
- Fire originating in a cabinet which directly impacts Division I cables with the potential for a HGL. Manual suppression within six minutes fails, subsequent auto suppression fails, and subsequent manual suppression efforts prior to formation of a HGL fail. Division I cables are damaged because of direct impact and HPCS [BG] cables are damaged from the HGL.
- Fire originating in a cabinet which directly impacts Division I cables with the potential for a HGL. Manual suppression efforts within six minutes succeed and the Division I cables are protected. A HGL is not formed and HPCS [BG] cables are also protected.
- Fire originating in a cabinet which directly impacts Division I cables with the potential for a HGL. Manual suppression within six minutes fails, subsequent auto suppression fails but subsequent manual suppression efforts succeed prior to formation of a HGL. Division I cables are damaged due to direct impact of exposure fire but a HGL is prevented and HPCS [BG] cables are protected.
- Fire originating in cabinets which directly impacts Division I cables without the potential for a HGL. Exposure fire in these cabinets leads to damage of Division I wrapped cables but HPCS [BG] cables are not damaged since a HGL is not formed.
- The original fire scenarios were also modified as required to properly integrate with the above scenarios.

The evaluation of these scenarios results in a fire core damage frequency for the Division II switchgear room with no credit for the Kaowool fire wrap of 9.28E-07/yr. The increase in core damage frequency of 5.22E-07/year is not considered risk significant. These results are also considered to be conservative as all Division II equipment is assumed to fail with any fire in the room. Realistically, not all fires originating in Division II electrical components in the room will result in the loss of the entire Division.

Therefore, based on current system design, risk considerations and GGNS specific operator response time, the ability to shutdown the plant in event of the postulated fire in the Division II ESF Switchgear Room is maintained and there is no impact on public health and safety.

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<p>NARRATIVE (If more space is required, use additional copies of NRC Form 366A) (17)</p> <p>G. Additional Information</p> <p>Previous Occurrence Evaluation:</p> <p>A search of plant databases for similar occurrences dealing with the installation of Kaowool reveals that there have been three non-conformance documented in addition to CR-GGN-1999-1004, CR-GGN -2000-1481 and CR-GGN -2000-1516 generated to document deficiencies associated with the installation of the Kaowool Fire Wrap System on raceways, raceway supports and intervening items. The three Condition Reports are CR-GGN- 1985-0267, CR-GGN- 1999-0029 and CR-GGN-1999-0128. Each of these CRs will be addressed separately below.</p> <p>CR-GGN-1985-0267 was generated to document that a number of cases existed in the field where the Kaowool Fire Wrap System was installed on either side of, but not on, support steel that was in direct contact with the associated raceways. This configuration basically left an unprotected opening into the wrapped raceway. Based on the conditions documented in the CR, it should have been obvious that the level of detail provided in the original installation instructions/procedure was inadequate. The fact that no specific guidance or details were provided on how to rework the Kaowool on the supports identified in CR-GGN-1985-0267, even though it had been identified as a problem, resulted in the Kaowool being inconsistently installed on the supports. The fact that no action was taken/initiated to revise/update the Kaowool installation document to provide specific and detailed installation instructions for the Kaowool Fire Wrap System was identified as a contributing cause.</p> <p>CR-GGN-1999-0029 documents that Kaowool had not been installed at locations as directed by MCP 94-1062. This condition was discovered during field walk downs to support the disposition of CR-GGN-1998-1316 that dealt with internal conduit seals. Engineering was tasked with providing reportability input for CR-GGN-2000-0029. During walk downs to support the reportability input, engineering discovered additional locations where the Kaowool had not been installed as directed by MCP 94-1062. CR-GGN-1999-0178 was generated to document these additional locations.</p> <p>CR-GGN-1999-0178 was generated to document locations, in addition to those previously identified in CR 1999-0029, where the Kaowool Fire Wrap was not installed as required by MCP 94-1062. This condition had been previously documented in CR-GGN-1999-0029 and CR-GGN-1999-0178. During the development of the disposition for CR 1999-0178 Engineering identified that the level of detail provided in the installation document for the installation of Kaowool on raceways, raceway supports and intervening items was inadequate. Kaowool was installed on the areas that were identified in CR-GGN-1999-0029 and CR-GGN-1999-0178.</p>				