UNITED STATES
NUCLEAR REGULATORY COMMISSION
REGION II
101 MARIETTA STREET, N.W.
ATLANTA, GEORGIA 30323

Report No.: 50-416/91-16

Licensee: Entergy Operations, Inc.
Jackson, MS 39205

Docket No.: 50-416 License No.: NPF-29

Facility Name: Grand Gulf Nuclear Station

Inspection Conducted: July 27 through August 31, 1991

Inspectors: For R. W. Wright 9/26/91
J. L. Mathis, Senior Resident Inspector Date Signed

For R. W. Wright 9/26/91
C. A. Hughey, Resident Inspector Date Signed

Approved by: [signature] 9/26/91
F. S. Cantrell, Section Chief Date Signed
Division of Reactor Projects

SUMMARY

Scope:

The resident inspectors conducted routine inspections in the following areas: operational safety verification; maintenance observation; surveillance observation; and reportable occurrences. The inspectors conducted backshift inspections on August 2, 15, 17 and 28, 1991.

Results:

During this inspection period violations were not identified; however, we are concerned about your protective tagging program as indicated by your operation of Intermediate Range Monitor "C" on July 28, 1991, paragraph 3. The plant scrammed twice from 100 percent power and received two RPS actuations while at zero percent power during this inspection period. The scrams were the result of equipment problems, personnel problems and design/installation problems. The scrams did not appear to be programmatic in nature.

The task force that was assembled to investigate the low reactor water level condition when placing shutdown cooling in service was thorough and effective.

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A Temporary waiver of compliance from TS 4.8.3.1.2.a was granted by the NRC on August 15, 1991, until August 31, 1991. The TS required successful operation of the Auto-Test system which is a subsystem of the load shedding and sequencing (LSS) system. The licensee's request was technically sound and thorough (paragraph 3).

REPORT DETAILS

1. Persons Contacted

Licensee Employees

W. T. Cottle, Vice President, Nuclear Operations
D. G. Cupstid, Manager, Plant Projects
*L. F. Daughtery, Compliance Supervisor
M. A. Dietrich, Director, Quality Programs
J. P. Dimmette, Manager, Plant Maintenance
*C. W. Ellsaesser, Operations Superintendent
C. R. Hutchinson, GGNS General Manager
F. K. Mangan, Director, Plant Projects and Support
M. J. Meisner, Director, Nuclear Licensing
D. L. Pace, Director, Nuclear Plant Engineering
*J. V. Parrish, Manager, Plant Operations
*J. C. Roberts, Manager, Plant & System Engineering
J. E. Reaves, Manager, Quality Services
G. W. Vining, Manager, Plant Modification and Constructio
G. Zinke, Superintendent, Plant Licensing

Other licensee employees contacted included superintendents, supervisors, technicians, operators, security force members, and administrative personnel.

*Attended exit interview

On August 9, 1991, Congressman P. Kostmayer (Pennsylvania), Chairman of the Interior Subcommittee on Energy and the Environment; J. O'Donnell, Technical Assistant; J. Milhoan, Deputy Regional Administrator, Region II; D. M. Verrelli, Branch Chief, Division of Reactor Projects; H. O. Christensen, Section Chief, Division of Reactor Projects; and Linda Portner, Congressional Affairs; met with the licensee and toured the plant.

F. S. Cantrell, Section Chief, DRP, Region II was on site to review site activities and meet with the Resident Inspector on August 14-16, 1991.

2. Plant Status

During the inspection period the plant scramed twice from 100 percent power and received two RPS actuations from zero percent power. The first scram occurred on July 28, 1991, as a result of work being performed on the Division II LSS panel power supply. Following the scram on July 28, 1991, a RPS actuation occurred from zero percent power when an operator withdrew IRM C from the core. The plant was proceeding to cold shutdown for investigation and repair of problems associated with the Division II LSS panel when another RPS actuation occurred while placing RHR A in shutdown cooling. On August 10, 1991, the plant scramed from 100 percent

power due to induced voltage spikes as a result of a lightning strike. The plant resumed power operation, Mode 1, on August 11, 1991, and remained at power through the end of the inspection period.

3. Operational Safety, (71707 and 93702)

Daily discussions were held with plant management and various members of the plant operating staff. The inspectors made frequent visits to the control room. Observations included: the verification of instrument readings, setpoints and recordings; the review of operating systems status and the tagging of equipment; verification of annunciator alarms, limiting conditions for operation, and temporary alterations; and review of daily journals, data sheet entries, control room manning, and access controls.

Weekly selected ESF systems were confirmed operable. The inspectors verified that accessible valve flow path alignment was correct, power supply breaker and fuse status was correct and instrumentation was operational. The inspectors that verified the following systems were operable: SSW C, HPCS, LPCS, and ADS.

The inspectors conducted plant tours weekly. Portions of the control building, turbine building, auxiliary building and outside areas were visited. The observations included safety related tagout verifications, shift turnovers, sampling programs, housekeeping and general plant conditions. Additionally, the inspectors observed the status of fire protection equipment, the control of activities in progress, the problem identification systems, and the readiness of the onsite emergency response facilities.

The inspectors observed health physics managements' involvement and awareness of significant plant activities, and observed plant radiation controls. Periodically the inspectors verified the adequacy of physical security control. Additionally, senior plant management was observed making routine tours of the plant.

The inspectors reviewed safety related tagouts, 911388 (TBCW C heat exchanger) and 911464 (RWST pump A P11C002A) to ensure that the tagouts were properly prepared and performed. Additionally, the inspectors verified that the tagged components were in the required position.

The inspectors reviewed the activities associated with the events listed below:

On July 28, 1991, during troubleshooting of the Division II LSS panel due to failures which occurred earlier, a BOP load shed occurred. The reactor scram followed at 0131 was due to fast closure of the main turbine control valves. During the cooldown, the reactor vessel exceeded the TS limit (<less than 100°F/hr) due to the reactor recirculation pumps tripping when BOP busses 11HD and 12HE were lost. The increased CRD flow with no forced circulation resulted in exceeding the cool down rate in the bottom head. Engineering

performed an evaluation of the thermal transient experienced by the bottom head drain and concluded that there were no structural integrity concerns related to continued operation.

Prior to the scram, on July 27, 1991, the control room had received a trouble alarm on the P870 panel in the control room. Investigation at the LSS panel revealed a total internal power failure. All lights and indications except the incoming power available lights were out. Output of the 15 and 24 volt power supplies were confirmed to be 0 volts dc during troubleshooting. After lifting the output leads for both power supplies, the licensee reenergized the panel. The 15 volt power supply energized as expected, but the 24 volt supply did not. The licensee replaced the 24 volt power supply. The 15 volts supply leads were relanded and the panel was energized. A BOP load shed occurred immediately.

Subsequent investigation by the licensee revealed a "sneak circuit" involving the 15 volt converter with a loss of power output from the 24 volt converter that will allow a BOP load shed, a system response that does not meet design specifications. As a result, Division I and II LSS panels were modified to correct this design deficiency through the implementation of MCP 91/1071. MCP 91/1071 powered the optical isolators from the respective panel's 24 volt converters. The optical isolators separated the BOP load shed portion of the panel from class 1E circuits. This modification should preclude BOP load shed actuation due to loss of the LSS panel 24 volt converter.

Again, on August 15, 1991, at approximately 1126 an annunciator alarm was received that indicated that the auto-test feature of the Division II LSS system was in a fault condition. The auto-test feature is designed to continuously perform a self-test on the panel's logic. This auto-test feature performs a check of the panel's electronics approximately once every 1.5 seconds. If a fault is detected, the logic interrupts the auto-test and actuates a control room annunciator. Operations reset the auto-test feature as suggested by the vendor manual. When the system was reset, the auto-test indicated a different fault condition. When the system was reset the second time, the auto-test feature again locked up, this time indicating a general failure of the auto-test feature. The LSS system was subsequently declared inoperable at 1151 and Technical Specification LCO 3.8.3 was entered. Technical Specification 3/4.3.3 specifies operability requirements for the Division I and II LSS system. TS 4.8.3.2.a requires that the LSS panel be demonstrated operable at least once per 12 hours by determining that the auto-test system is operating and not indicating a faulted condition.

During a telephone conference on August 15, 1991, the licensee requested and received a Temporary Waiver of Compliance from the NRC for surveillance requirement 4.8.3.1.2.a until such time as the Division II auto-test system could be returned to operable status, but no later than August 31, 1991. Investigation into the LSS panel

auto-test system anomaly revealed the defect was associated with a solder bridge which was shorting two pins on an integrated circuit chip. The cards were confirmed to have caused the fault when the licensee replaced the faulty cards on a spare Unit 2 LSS panel and obtained the duplicate faults. The two cards were replaced and the system was manually tested with operations surveillance procedure, 06-OP-1R21-M-0002, every 12 hours under the TS Temporary Waiver of Compliance.

The licensee's corrective action appeared to be appropriate following each event event though they were not effective in precluding the August 19, 1991 event. Vendor representatives were involved in investigation of both events, but the solution did not develop until these cards were inserted in Unit 2's mockup panel.

On July 28, 1991, following the scram, operations personnel inserted the IRMs in accordance with the ONEP. The control room operator was aware that there was a tracking LCO on the 'C' IRM, but due to the drive button not being red tagged, he selected and drove the IRM into the core as directed by the scram ONEP. Following the insertion of IRM C and stabilization of the plant, maintenance was scheduled to investigate the abnormal behavior of the IRM C. RPS 'B' was already in a trip condition (half-scram) due to IRM D being out of service and bypassed. When IRM C was withdrawn in preparation for maintenance, an upscale spike occurred causing a trip of the 'A' RPS which resulted in a full RPS actuation signal. The scram was reset and the operator bypassed IRM C following the scram.

An investigation into the cause of the scram revealed inadequate procedural controls thus allowing the inoperable IRM 'C' to be inserted into the core following the scram. A tracking LCO was written on IRM 'C'; however, there was no protective tagging for the drive button for 'C' to prevent operation. The withdrawal of IRM C was not reviewed and approved by shift management. This is similar to an event involving protective tagging discussed in Inspection Report No. 50-416/90-15.

On July 29, 1991, while attempting to place shutdown cooling loop "A" in service, the plant experienced a rapid decrease in reactor vessel water level. Level dropped approximately 27 inches due to voids existing in the RHR piping. This level decrease resulted in a RPS actuation. The licensee determined that during the RHR "A" loop warmup, the heat exchanger "A" outlet valve F003A (18 inch valve) was throttled to control system heatup rate. During this period the discharge path (4 inch line) to the liquid radwaste system remained open for approximately 20 minutes. This resulted in the piping downstream of F003A being voided and vapor cavities being formed. When shutdown cooling was initiated, the RHR "A" pump became vapor bound. The pump was secured and the shutdown cooling return to feedwater valve (F053A) was closed. Approximately 80 seconds later, reactor water level began dropping due to void collapse. Operators

closed shutdown cooling suction valves F008, F009, and F006A to stop the inventory loss; however, before the valves were closed, vessel level decreased approximately 27 inches.

The licensee conducted a system walkdown to determine if the system had any water hammer damage and performed the quarterly functional test on the RHR A pump. No visual water hammer damage was observed and the pump passed its functional test. Additionally, the licensee revised the system operating instruction to prevent recurrence. The revised system warmup instruction was successfully demonstrated prior to plant restart. The licensee formed a special task force team to determine the root cause of the problem. This task force consisted of licensed operators, system engineers, nuclear plant engineers, an independent consultant, and a department manager. The investigation was detailed and the team appeared to ask the right type of questions. The procedure for establishing RHR operation indicated an inadequate review or poor judgement in selecting the lineup. The followup action appeared to be appropriate and prompt.

On August 7, 1991, at 0945 the operational hotline was taken out of service for corrective maintenance for approximately one hour and 45 minutes. On August 9, 1991, the operational hotline was down again due to loss of communication links with offsite agencies. At the time of the problem vendor personnel were working on the lines. The lines were returned to operational status shortly afterward.

On August 10, 1991, a severe thunder storm was in progress in the site vicinity. At 1906, during the storm, the reactor automatically scrammed due to a high neutron flux signal on the APRMs (channels C, G, D and H). Also two HPCS system low water level channels (C and R) tripped, but the trip signal duration was not long enough for the logic to seal-in and cause a HPCS initiation.

Following the scram, the reactor water level decreased to -19 inches, level was subsequently raised to approximately +49 inches by the feedwater system. The post trip analysis concluded that the cause of the instrumentation signal spikes was induced voltage and ground potential spikes caused by lightning activity at the site. Similar events were reported in LERs 88-012, 89-010 and 89-016. Commitments were made in the latter LER to install a lightning dissipation system for vulnerable structures. Design and installation of the lightning dissipation system was implemented in January 1990. A functional check of APRM indication was performed to confirm proper response. No adverse effects were observed. Furthermore, exterior plant areas were inspected for damage prior to restart. There was no evidence of damage due to lightning.

Investigation by the licensee and the vendor of the lightning dissipation system revealed that the lightning struck the unprotected static line associated with the 115 Kv line via the turbine building. The static line has been removed from the 115 Kv line, and the vendor

has been authorized to enhance the lightning dissipation system per his recommendation.

The corrective actions were prompt and appear to be appropriate.

4. Maintenance Observation (62703)

During the report period, the inspectors observed portions of the maintenance activities listed below. The observations included a review of the MWOs and other related documents for adequacy; adherence to procedure, proper tagouts, technical specifications, quality controls, and radiological controls; observation of work and/or retesting; and specified retest requirements.

MWO	DESCRIPTION
40821	Clean/inspect, change bearing oil to RHR C pump.
44999	Check coupling wear and align RHR C pump.
50377	Clean/inspect/megger RHR C motor.
50037	Troubleshoot Division II LSS panel.

No violations or deviations were identified. The observed activities were conducted in a satisfactory manner and the work was properly performed in accordance with approved maintenance work orders.

5. Surveillance Observation (61726)

The inspectors observed the performance of portions of the surveillances listed below. The observation included a review of the procedures for technical adequacy, conformance to technical specifications and LCOs; verification of test instrument calibration; observation of all or part of the actual surveillances; removal and return to service of the system or component; and review of the data for acceptability based upon the acceptance criteria.

06-IC-1B21-M-1001,	Safety Relief Valve High Pressure Trip.
06-IC-1B22-M-1001,	MSIV Leakage Control Functional Test.
06-IC-1E61-M-1004,	Containment and Drywell Hydrogen Analyzer A Calibration.
06-EL-1B21-M-0001,	ADS Timer Functional Timer.

06-EL-E30-M-0001-1,	Suppression Pool Makeup Timer Delay Calibration.
06-RE-1C51-0-0001,	LPRM Calibration, Channel D and E.
06-OP-1R21-M-0002,	Div. II LSS Panel Alternate 12 Hour Functional Test.

No violations or deviations were identified. The observed surveillance tests were performed in a satisfactory manner and met the requirements of Technical Specifications.

6. Reportable Occurrences (90712 & 92700)

The event reports listed below were reviewed to determine if the information provided met the NRC reporting requirements. The determination included adequacy of event description, the corrective actions taken or planned, the existence of potential generic problems and the relative safety significance of each event. The inspectors used the NRC enforcement guidance to determine if the event met the criterion for licensee identified violations.

On August 26, 1991, during a routine checkout of access to the effluent end of the A sediment basin, approximately 250-300 dead fish were found floating on top of the basin. Tests performed by the licensee for dissolved oxygen, chlorine, pH and temperature showed no abnormal conditions. Environmental Services believed that the fish kill was not plant related, but was a result of natural causes. The licensee is trying to determine the root cause.

(Closed) LER 91-007, Reactor Scram Upon Load Shed of Balance of Plant Equipment. Investigation by the licensee revealed that the LSS panels had a logic coupling in that energizing the 15 volt converter without power from the 24 volt converter would cause a BOP load shed. The Division I and II LSS panels were modified to preclude BOP load shed through the implementation of MCP 91/1071 which modified the system to power the optical isolators by the respective panel's 24 volt converter. This modification was to preclude a BOP load shed actuation due to loss of the LSS panel 24 volt converter. (Also see paragraph 3). This item is considered closed.

(Closed) LER 90-023, Shutdown Cooling Isolation Due to a Blown Fuse. The licensee revised time response procedure, 06-IC-1B21-R-0038, to tag out the circuit breakers for the RHR shutdown cooling suction valves during testing. In addition, procedures 04-1-01-R21-15 and 04-1-01-R21-16 were revised to require the opening of the breakers on divisional valves affected while jumpers were being installed or removed to prevent inadvertent valve closure. This item is considered closed.

No violations or deviations were identified.

7. Exit Interview (30703)

The inspection scope and findings were summarized on September 3, 1991, with those persons indicated in paragraph 1 above. The licensee did not identify as proprietary any of the materials provided to or reviewed by the inspectors during this inspection.

8. Acronyms and Initialisms

ADS - Automatic Depressurization System
APRM - Average Power Range Monitor
ATWS - Anticipated Transient Without Scram
BOP - Balance Of Plant
BWR - Boiling Water Reactor
CRD - Control Rod Drive
DCP - Design Change Package
DG - Diesel Generator
ECCS - Emergency Core Cooling System
EHC - Electro-Hydraulic Control
ESF - Engineering Safety Feature
FCV - Flow Control Valve
HPCS - High Pressure Core Spray
HPU - Hydraulic Power Unit
IC - Integrated Circuit
I&C - Instrumentation and Control
IFI - Inspector Followup Item
IRM - Intermediate Range Monitor
LCO - Limiting Condition for Operation
LER - Licensee Event Report
LLRT - Local Leak Rate Test
LPCI - Low Pressure Core Injection
LPCS - Low Pressure Core Spray
LPRM - Local Power Range Monitoring
LSS - Load Shedding and Sequencing
MCP - Minor Change Package
MG - Motor Generator
MNCR - Material Nonconformance Report
MSIV - Main Steam Isolation Valve
MWO - Maintenance Work Order
NPE - Nuclear Plant Engineering
NRC - Nuclear Regulatory Commission
ONEP - Off Normal Event Procedure
PDS - Pressure Differential Switch
P&ID - Piping and Instrument Diagram
PSW - Plant Service Water
QDR - Quality Deficiency Report
RCIC - Reactor Core Isolation Cooling
RHR - Residual Heat Removal
RPS - Reactor Protection System
RWCU - Reactor Water Cleanup

RWST - Refueling Water Storage Tank
RWP - Radiation Work Permit
SBLC - Standby Liquid Control
SOI - System Operating Instruction
SRV - Safety Relief Valve
SSW - Standby Service Water
TBCW - Turbine Building Cooling Water
TCN - Temporary Change Notice
TS - Technical Specification