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SEP 30 1983

MEMORANDUM FOR: Dean M. Houston, Project Manager, Licensing Branch #2
 Division of Licensing

THRU: Faust Rosa, Chief, Instrumentation & Control Systems Branch
 Division of Systems Integration

FROM: Marty Virgilio, Senior Reactor Engineer, Instrumentation &
 Control Systems Branch, Division of Systems Integration

SUBJECT: NRC REGION II MEETING WITH MISSISSIPPI POWER & LIGHT COMPANY
 TO DISCUSS AGASTAT RELAY FAILURES

Plant Name: Grand Gulf - Unit 1
 Docket No.: 50-416
 Licensing Status: OL (Limited to 5 Percent of Rated Thermal Power)
 Project Manager: D. Houston
 Review Branch: ICSB
 Review status: Open

On September 23, 1983 members of the NRC staff from IE Region II and NRR met with representatives from Mississippi Power & Light Company (the licensee) and representatives from General Electric to discuss reported Agastat relay failures at Grand Gulf - Unit 1. As Enclosure 1, I am providing a list of participants. As Enclosure 2, I am providing a summary of the meeting.

Please contact me if you have any questions or if the Instrumentation and Control Systems Branch can be of additional assistance.

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Docket File
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Enclosures:
 As stated

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DATE	9/28/83	9/29/83	9/30/83				

ENCLOSURE

LIST OF PARTICIPANTS
NRC - MP&L MEETING AT NRC REGION II OFFICES
ON SEPTEMBER 23, 1983

NRC REGION II

C. A. Julian
A. R. Wagner
L. J. Watson
M. D. Hunt
T. E. Conlon
A. R. Herot
J. A. Olshinski
J. P. O'Reilly
R. C. Lewis
D. M. Verrelli

MP&L

J. F. Groves
C. W. Angle
J. E. Pinto
J. P. McGaughy

NRC HEADQUARTERS

M. Virgilio

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A. R. Smith
C. A. Cameron
N. G. Lubin
E. C. Spencer

SUMMARY OF THE SEPTEMBER 23, 1983 NRC REGION II MEETING
WITH MISSISSIPPI POWER & LIGHT COMPANY TO DISCUSS AGASTAT
RELAY FAILURES

The Mississippi Power and Light Company (the licensee) representatives provided the following sequence of events. While performing surveillance tests during the months of July and August the licensee identified 12 inoperable Agastat type relays. The inoperable relays were Agastat GP series relays manufactured by the Amerace Corporation, Control Products Division, and supplied to Grand Gulf by the Bechtel Power Corporation in Gaithersburg, Maryland and by the General Electric Company, San Jose, California. Unable to determine the cause of the failures the licensee requested assistance from General Electric in evaluating the failures. On September 2, 1983 General Electric and Amerace Corporation began a combined effort to determine the failure mechanism. This evaluation included an examination and test of the 12 relays that failed at Grand Gulf. The visual examination of the relays found a discoloration of the outer case which was suspected to be a result of exposure to elevated temperatures. Of the 12 relays retested by General Electric and Amerace, one was found to have its contacts welded closed, three did not fail when retested, one failed to open contacts as designed, and seven failed to close contacts as designed. As elevated operating temperatures in the relay cabinets was a suspected cause of the failures, tests were performed at elevated temperatures (up to 130°F) and following a short (several hour) exposure to elevated temperatures (130°F). As part of this evaluation calibrated temperature monitoring equipment was installed in several relay cabinets at Grand Gulf and tests were performed in the San Jose laboratories by General Electric

exposing similar relays to ambient temperatures in the range of 130°F for extended periods of time. From the calibrated temperature monitoring equipment it was determined that temperatures in the cabinets at Grand Gulf were within the range specified for relay operation, between 70°F and 104°F. The licensee noted that this temperature range was probably not maintained during the construction phase. The General Electric tests that exposed similar relays to elevated temperatures for extended periods of time found that the relays exhibited case discoloration and failed after prolonged exposure. From the results of the examination and tests of the Grand Gulf relays, General Electric concluded that the failures were random, end of life failures, consistent with the manufacturers expected failure rates and consistent with the assumptions for relay failure rates contained in General Electric's risk assessment studies. The end of life failure mode for eight of the relays was mechanical interference due to the nylon movable contact arm coming in contact with the barrier strip on the relay base. The anticipated failure rate for these relays is 13 failures per 1000 relays each 18 months. The Grand Gulf safety-related systems contain approximately 1740 relays.

- The NRC staff questioned the licensee's representatives and the General Electric representatives as to whether the relay failures could have been a result of the post mold shrinking phenomenon observed in certain Agastat relays. The General Electric representatives stated that between 1975 and 1977 Amerace Corporation manufactured relays exhibited a casing shrinkage following assembly as the

plastic base cured. This shrinkage caused a reduction in clearances and in some assemblies mechanical interference between the relay arm and the barrier strip on the base of the plastic case. The mechanical interference resulting from the case shrinkage would, according to the General Electric representatives, either result in relay failure within the first year after manufacture as the curing process completed or would not occur at all. Sometime between 1975 and 1977 Amerace Corporation introduced a design change modifying the relay base by cutting a notch in the plastic to provide additional clearances which would preclude mechanical interference resulting from shrinkage. All relays supplied to General Electric during this period did not include this modification (notched base), such as most of those installed at Grand Gulf. During the construction phase all replacement relays for Grand Gulf safety-related systems have been of the modified (notched base) design. At this time there are approximately 1740 relays in safety-related systems at Grand Gulf, approximately 1500 relays were supplied by General Electric, approximately 300 have the modified (notched base) design. None of the failed relays were of the modified (notched base) design.

The licensee stated that the safety-related systems at Grand Gulf have been energized for the past 2 1/2 years. During this time period the areas containing the relays have not been maintained at constant temperatures as would be expected during the construction phase. The General Electric representatives stated that these conditions could have caused relay case discoloration noted during the inspection of the 12 relays and led to premature aging of the relays.

The General Electric representatives stated that they were in the process of developing a relay maintenance and replacement program for Grand Gulf. This program will specify the design life for the Agastat relays. At this time General Electric believes that the modified (notched base) design has a longer service life than the un-notched relays. The licensee's representatives stated that they would adopt the General Electric recommendations for relay maintenance and replacement. Further, the licensee's representatives stated that they would be replacing all un-notched relays with the modified (notched base) relays in the near future, however, no schedule was proposed. The licensee's representative stated that a summary of their relay maintenance and replacement program would be submitted to NRC Region II by October 15, 1983 for staff review.

The NRC staff questioned the licensee's representatives on the periodic at-power testing of these relays. The licensee's representatives stated that a significant number of relays were not periodically tested at-power and that some of the relay failures would be detected only during the system functional tests performed at 18 month intervals.

In summary the NRC staff stated that they would review the licensee's relay maintenance and replacement program in detail, and any additional relay failures at Grand Gulf. Further, the NRC staff stated that they intend to collect data from other plants, via the IE inspection program, to determine if other facilities are experiencing relay failure rates similar to Grand Gulf.