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(4)

M. Virgilio (PF)

OCT 20 1983

MEMORANDUM FOR: Thomas M. Novak, Assistant Director for Licensing
 Division of Licensing

FROM: R. Wayne Houston, Assistant Director for Reactor Safety
 Division of Systems Integration

SUBJECT: CHAPTER 7 INSTRUMENTATION AND CONTROL
 GRAND GULF NUCLEAR STATION

Plant Name: Grand Gulf, Units 1 and 2
 Docket Nos.: 50-416/417
 Licensing Status: OI
 Project Manager: Dean Houston
 Review Branch: ICSB
 Review Status: Incomplete

Enclosed we are providing the Instrumentation and Control Systems Branch (ICSB) input to Supplement No. 5 of the Safety Evaluation Report related to the operation of Grand Gulf Nuclear Station.

As a result of our review we have resolved concerns related to the technical specifications that specify the reactor protection system instrument operability requirements and surveillance requirements. This completes the ICSB portion of TACS 52370 and 52524. The enclosed SER input includes one confirmatory item related to instrument setpoint methodology. We anticipate that this item will be resolved in the first quarter of 1984. The enclosed SER input includes one open item related to the Agastat type relays in the reactor protection system. By letter dated October 13, 1983, from A. Schwencer (NRC) to J. McCaughy (MPSL) we requested additional information from the licensee concerning the Agastat type relays. Resolution of this open item is pending receipt of additional information from the licensee.

Any questions concerning this SSER input should be directed to M. Virgilio of the ICSB.

Original Signed By
 R. Wayne Houston

R. Wayne Houston, Assistant Director
 for Reactor Safety
 Division of Systems Integration

Enclosure:
 As noted

cc: R. Mattson
 D. Houston
 R. Capra
 D. Hoffman

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OFFICE	ICSB/DSI	ICSB/DSI	ICSB/DSI	ADRS/DSI
URNAME	MVirgilio:vp	CERoss	FRosa	RWHouston
DATE	10/27/83	10/28/83	10/28/83	10/28/83

OCT 28 1983

7.0 Instrumentation and Control

7.8 Response to Inspection and Enforcement Bulletins and Other Safety Concerns

J. Reactor Protection System Instrumentation Technical Specifications

From a comparison of the instrumentation operability requirements contained in the Grand Gulf - Unit 1 Technical Specifications to the instrumentation specification tables included in the FSAR the NRC staff found that in some cases the Technical Specifications include only one-half the total number of channels provided. By letter dated September 12, 1983, from A. Schwencer (NRC) to J. McGaughy (MP&L) the NRC staff requested the licensee to confirm that the single failure criterion can be satisfied for each case where the minimum number of operable channel requirements of the technical specifications is less than the total number of channels provided for each reactor protection system trip function.

By letters dated October 11, 1983, from J. McGaughy (MP&L) to H. Denton (NRC) and October 14, 1983, from L. F. Dale (MP&L) to H. Denton the licensee provided the results of their review of this item. The licensee reviewed the Grand Gulf - Unit 1 Technical Specification requirements for the reactor trip, isolation actuation, emergency core cooling actuation and reactor core isolation cooling (RCIC) actuation instrumentation. From the

results of this review the licensee found that in most cases the FSAR incorrectly states the number of instrument channels provided and proposed to submit corrections in the annual FSAR update scheduled for June 1984. For the RCIC actuation instrumentation the licensee proposed a Technical Specification change to increase the number of instrument channels required to be operable from two to four, thus enhancing RCIC reliability and plant safety.

Based on the results of its review the licensee has confirmed that the single failure criterion is satisfied for the reactor trip, isolation actuation, emergency core cooling actuation, and RCIC actuation instrumentation when the Technical Specification requirements are met. With the additional information provided and incorporation of the proposed Technical Specification changes the NRC staff considers this issue resolved.

Certain Grand Gulf - Unit 1 Technical Specification action statements permit continued plant operation with less than the minimum channels operable requirement satisfied provided the inoperable instrument channels are placed in the tripped condition. From discussions with the licensee's representatives the NRC staff found that in some cases placing a channel in the tripped condition includes lifting leads and the use of temporary jumpers.

By letter dated September 12, 1983, from A. Schwencer to J. McGaughy the NRC staff requested the licensee to confirm that the licensing criteria (e.g., physical separation, qualification) are not compromised where leads are lifted or jumpers are installed.

By letter dated October 14, 1983, from L. F. Dale to H. Denton the licensee stated that they do not normally use lifted leads or temporary jumpers to place safety-related systems' actuation instrumentation channels in the tripped condition. However, if jumpers or lifted leads are utilized, the modification is considered a temporary alteration and will be accomplished using administrative procedures such as an engineering work order. To resolve the NRC staff concern the licensee has proposed to revise the facilities administrative procedures to ensure that seismic, environmental and separation criteria are considered when making such temporary alterations under an engineering work order. Plant procedures will be revised as necessary by November 30, 1983, to accomplish this commitment. Based on the licensee's commitment the NRC staff considers this issue resolved.

The Grand Gulf - Unit 1 Technical Specification surveillance requirements include provisions for frequently

calibrating certain reactor protection system instrumentation channel components. The Rosemount trip units in the reactor trip and emergency core cooling system actuation instrumentation systems are required to be calibrated monthly. From a review of the Grand Gulf - Unit 1 Technical Specifications and discussions with the licensee's representatives the NRC staff found that the Rosemount trip units and the temperature switches associated with the isolation actuation instrumentation system were only required to be calibrated at 18 month intervals. By letter dated September 12, 1983, from A. Schwencer to J. McGaughy the NRC staff requested that the licensee confirm that the method and frequency for calibrating and functionally testing the reactor protection system instrumentation is consistent with the assumption of the instrument channel setpoint methodology.

By letter dated October 14, 1983, from L. F. Dale to H. Denton the licensee stated that presently all of the Rosemount trip units in the isolation actuation system are being calibrated monthly and temperature switches in the isolation actuation instrumentation system are being calibrated annually. The licensee stated that changes would be proposed to revise the Grand Gulf - Unit 1 Technical Specifications to require a monthly calibration of the Rosemount trip units and a yearly calibration of

the temperature switches, consistent with the manufacturer's recommendations and current practice at Grand Gulf. The NRC staff finds this acceptable. Addressing the overall issue of setpoint methodology the licensee stated that they are participating with the other BWR owners and General Electric Company to develop a setpoint methodology position statement.

The NRC staff will confirm the acceptability of the setpoint methodology and confirm that the surveillance currently required supports the assumptions of the licensee's methodology position statement.

k. Agastat Relay Failures

During recent surveillance testing at Grand Gulf twelve inoperable Agastat type relays were found. These relay failures precluded the automatic operation of three standby service water system valves, one low pressure coolant injection system valve, and components in the control room HVAC system, combustible gas control system, reactor core isolation cooling system, containment spray system, and the fire protection system.

By letter dated October 13, 1983, from A. Schwencer (NRC) to J. McGaughy (MP&L) the NRC staff requested additional information about the testing of Agastat type relays.

By letter dated October 17, 1983, from J. McGaughy to J. O'Reilly (NRC) the licensee submitted a report under the guidelines of 10 CFR Part 21 noting that deficiencies in the Agastat type relays could potentially create a substantial safety hazard. In its report the licensee stated that the normally energized Agastat type relays have an estimated service life of 4.5 years. The licensee expects to replace these relays in the Spring of 1984. To verify the adequacy of the surveillance program at Grand Gulf to detect failures of these relays we will require the licensee to provide the additional information requested in our October 13, 1983 letter.

(5)

M. Virgilio

DEC 27 1983

MEMORANDUM FOR: Darrell G. Eisenhut, Director
 Division of Licensing

FROM: Roger J. Mattson, Director
 Division of Systems Integration

SUBJECT: PROPOSED IE INFORMATION NOTICE - UNANTICIPATED
 SHORT SERVICE LIFE OF AGASTAT GP SERIES RELAYS

In July and August 1983 during the performance of periodic surveillance tests at Grand Gulf Nuclear Station 12 inoperable Agastat GP series relays were identified. These relay failures precluded the automatic operation of three standby service water system valves, one low pressure coolant injection valve, and components in the control room ventilation system, combustible gas control system, reactor core isolation cooling system, residual heat removal system, containment drywell instrumentation, high pressure core spray system and fire protection system.

By letter dated October 17, 1983 from J. P. McGaughy of Mississippi Power and Light Company (the licensee for Grand Gulf) to J. P. O'Reilly, Regional Administrator NRC Region II, the licensee provided the results of an evaluation of the Agastat GP series relay failures under the reporting guidelines of 10 CFR Part 21. From its evaluation the licensee determined that the relay failures were end-of-service-life failures that could have created a substantial safety hazard. We agree with these findings.

The relay failures at Grand Gulf were determined to be end-of-service-life failures only after extensive testing by the manufacturer. Although no qualified service life had previously been specified for the Agastat GP series relays it is apparent that such a short service life had not been anticipated.

Each nuclear facility should have a systematic preventative maintenance and component replacement program. We believe that this information regarding Agastat relay service life should be input to that program where applicable to preclude possible common cause failures. Accordingly, we have prepared the enclosed IE Information Notice.

Failures of Agastat GP series relays at Limerick, Susquehanna and Waterford are currently being evaluated to obtain additional information with regard to this concern. To date the results of this evaluation

Contact:
 M. Virgilio, ICSB
 X29454

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the findings on the failures identified at Grand Gulf. Although our re-
view effort is ongoing, we believe that at this point in time it would be
prudent to disseminate the information we have collected.

Original signed by *R. Eisenhut*
✓ Roger J. Mattson

Roger J. Mattson, Director
Division of Systems Integration
Office of Nuclear Reactor Regulation

Enclosure:
As stated

cc: H. Denton
E. Case
E. Rossi

DISTRIBUTION:
Central File
ICSB R/F
M. Virgilio (PF)(2)
J. Calvo
F. Rosa
AD/RS Rdg.
T. Dunning

OFFICE	ICSB/DSI	ICSB/DSI	ICSB/DSI	ADRS/DSI	D/DSI	
SURNAME	MVirgilio; JCalvo	JCalvo	FRosa	RWHouston	RJMattson	
DATE	12/27/83	12/27/83	12/27/83	12/27/83	12/27/83	

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UNITED STATES
NUCLEAR REGULATORY COMMISSION
OFFICE OF INSPECTION AND ENFORCEMENT
WASHINGTON, D.C. 20555

IE INFORMATION NOTICE NO. 83- UNANTICIPATED SHORT SERVICE LIFE OF
AGASTAT GP SERIES RELAYS

ADDRESSEES:

All holders of a nuclear power reactor operating license (OL) or construction permit (CP).

PURPOSE:

This information notice is provided as notification of a potentially significant problem pertaining to Agastat GP series relays. Recipients should review the information for applicability to their facilities and take appropriate actions. No action or response to this notice is required at this time.

DESCRIPTION OF CIRCUMSTANCES:

Agastat GP series relays manufactured by Amerace Corporation are used in the reactor protection system and other safety-related systems for logic actuation in instrumentation and control circuits. Earlier than anticipated end-of-service-life failures of Agastat GP series relays were reported by Mississippi Power and Light Company on October 17, 1983 under the provisions of 10 CFR Part 21 for the Grand Gulf Unit 1 Nuclear Station. It has been determined that the relay failures could create a substantial safety hazard.

During the performance of 18 month surveillance tests at Grand Gulf Unit 1 12 (out of approximately 1700) inoperable Agastat GP series relays were identified. These relay failures affected the automatic operation of three standby service water system valves, and one low pressure injection valve. The other failed relays affected the operation of the control room ventilation system, combustible gas control system, reactor core isolation cooling system, residual heat removal system, containment drywell instrumentation, high pressure core spray system and fire protection system.

On September 2, 1983 Mississippi Power and Light Company, General Electric and Amerace Corporation began a combined effort to determine the failure mechanism. Through examination, the failure of the relays to operate properly was determined to be a result of the nylon movable contact arms coming in contact with the barrier strips on the melamine phenol plastic relay bases. This mechanical interference consequently prevented one of the four sets of contacts in the relay from changing state. Through testing and analysis it was determined that the failures were end-of-service-life failures due to accelerated service aging of energized relays in a mild environment in combination with the mechanical configuration and close tolerances of the internal parts.

There appear to be two predominant factors influencing the service life of the energized relay, one is base shrinkage and the other is nylon component aging. Amerace Corporation is reported to be looking at additional testing which would substantiate an energized relay service life beyond the present value.

The calculated service life, based on test data, for the Agastat GP series relays operated in the energized state is now reported to be 4.5 years. The calculated service life for Agastat GP series relays operated in the de-energized state is reported to be 40 years. The NRC has neither reviewed the specific details of the service life evaluation program nor conducted its own independent evaluation program to determine the service life of Agastat GP series relays.

Other problems attributed to the close tolerances of the internal parts had previously been identified by the relay manufacturer. Agastat GP series relays manufactured between 1975 and 1977 exhibited casing shrinkage following assembly as the melamine phenol plastic base cured. This phenomenon was called post-mold plastic shrinkage. The post-mold plastic shrinkage caused a reduction in clearances and in some assemblies mechanical interference between the moving relay contact arm and the stationary base of the relay case. It was believed that mechanical interference resulting from post-mold shrinkage would either cause relay failure within the first year after assembly as the curing process completed or would not occur at all. It is now believed that although failure may not have occurred in the first year after manufacture a reduction in clearances resulting from post-mold plastic shrinkage may have shortened the service life of the relays. In August 1977, Amerace Corporation introduced a design change modifying the relay base by cutting a notch in the barrier strip to provide additional clearances which would preclude mechanical interference resulting from post-mold plastic shrinkage. Subsequent operational experience has shown that this design change precludes failures

related to post-mold shrinkage within the first year after manufacture, however, there is no evidence that the notched base design extends the service life of the energized relays beyond 4.5 years.

We advise all nuclear power plant licensees and permit holders to review their safety-related systems to ascertain whether Agastat GP series relays have been installed or are being held as spare parts. Preventative maintenance programs should recognize the application dependent (energized/de-energized) service life of these Agastat GP series relays.

If you have any questions regarding these matters please contact the Administrator of the appropriate Regional Office or this office.

E. L. Jordan, Director
Division of Engineering & Quality Assurance
Office of Inspection and Enforcement