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UNITED STATES
NUCLEAR REGULATORY COMMISSION
REGION V
1990 N. CALIFORNIA BOULEVARD
SUITE 202, WALNUT CREEK PLAZA
WALNUT CREEK, CALIFORNIA 94596

August 15,1980

Docket No. 50-312

Sacramento Municipal Utility District
P. O. Box 15830
Sacramento, California 95813

Attention: Mr. John J. Mattimoe
Assistant General Manager

Gentlemen:

SUBJECT: IE BULLETIN NO. 80-19, REVISION 1 - FAILURES OF MERCURY-WETTED MATRIX RELAYS IN REACTOR PROTECTIVE SYSTEMS OF OPERATING NUCLEAR POWER PLANTS DESIGNED BY COMBUSTION ENGINEERING

Enclosed is Revision 1 to IE Bulletin No. 80-19. The revision merely clarifies the areas of concern; therefore, the actions including dates of reports required by you with respect to your nuclear power facility are not changed.

In order to assist the NRC in evaluating the value/impact of each Bulletin on licensees, it would be helpful if you would provide an estimate of the manpower expended in conduct of the review and preparation of the report(s) required by the Bulletin. Please estimate separately the manpower associated with corrective actions necessary following identification of problems through the Bulletin.

Should you have any questions regarding the revised Bulletin or actions required by you, please contact this office.

Sincerely,

R. H. Engelken
Director

Enclosures:
1. IE Bulletin No. 80-19
   Revision 1
2. List of Recently Issued
   IE Bulletins

cc w/enclosures:
R. J. Rodriguez, SMUD
L. G. Schwieger, SMUD

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

DUPLICATE

August 15, 1980

IE Bulletin No. 80-19
Revision 1

FAILURES OF MERCURY-WETTED MATRIX RELAYS IN REACTOR PROTECTIVE SYSTEMS OF OPERATING NUCLEAR POWER PLANTS DESIGNED BY COMBUSTION ENGINEERING

BACKGROUND:

This bulletin addresses the failures of mercury-wetted relays used in the logic matrix of the reactor protective system (RPS) of nuclear power plants designed by Combustion Engineering (C-E). Except for Arkansas Nuclear One Unit 2 and Palisades, both of which use dry-contact matrix relays, the NRC understands that all other operating C-E plants use C.P. Clare Model HG2X-1011 mercury-wetted matrix relays in the RPS.

Mercury-wetted matrix relays manufactured by the Adams and Westlake Company were initially used in the Palisades plant; however, because of repeated failures of these relays, they were subsequently replaced with relays having dry-contacts. GTE, the manufacturer of these dry-contact relays, however, has since discontinued their production. Thus, although the dry-contact relays used at Palisades have performed without a failure since they were installed, they are not available for the other operating nuclear power plants designed by C-E.

OPERATING EXPERIENCES AND EVALUATION:

To date, operating nuclear power plants designed by C-E have reported thirty-one (31) failures of mercury-wetted relays used in the logic matrix of the RPS.

Most of the reported failures were "failed-closed" type (i.e., the type that could inhibit a reactor trip), and four of the reported events involved multiple failures (i.e., three relay failures were detected during two tests; two other failures were detected during two different tests). Because of the redundancy within the RPS, no reported event would have prevented a reactor trip; however, the build-up of coincident "failed-closed" failures of certain sets of relays could result in trip failures for off-normal events.

The number of single and multiple relay failures reported gives rise to two concerns: (1) the total number of failures yields a much higher random failure rate than that used in other relay failure estimates*, and (2) the number of

* Other relay failure estimates include (1) WASH-1400, "Reactor Safety Study", NRC, October 1975; (2) IEEE Std 500-1977,"IEEE Guide to the Collection and Presentation of Electrical, Electronic, and Sensing Component Reliability Data for Nuclear Power Generating Stations", IEEE, New York; and (3) NUREG/CR-0942, "Nuclear Plant Reliability Data System, 1978 Annual Reports of Cumulative System and Component Reliability", NRC.

multiple failures detected suggests the presence of a common-mode failure mechanism. Such a common-mode failure mechanism could result in the build-up of specific "failed-closed" failures which, in turn, could result in anticipated transients without scram (ATWS). Thus, the relatively high random failure rate and the suggested common-mode failure mechanism, indicate that plants using mercury-wetted matrix relays in the RPS are more susceptible to scram failures than predicted in other studies.

ACTIONS TO BE TAKEN BY HOLDERS OF CONSTRUCTION PERMITS OR OPERATING LICENSES FOR NUCLEAR POWER FACILITIES:

1. Review your facility to determine whether C.P. Clare Model HG2X-1011 mercury-wetted relays are used in the logic matrix of the RPS. If no such relays are used, you should submit a negative declaration to this effect and you need not respond to the remaining items in this bulletin. Your negative declaration shall be submitted to the appropriate NRC regional office within thirty (30) days of the date of this bulletin and a copy forwarded to the Director, Division of Reactor Operations Inspection, Office of Inspection and Enforcement, NRC, Washington, D. C. 20555. R1 R1

2. Licensees of operating facilities using the above relays in the logic matrix of the RPS should increase the frequency of their surveillance tests. Until further notice, or until the mercury-wetted relays have been replaced with qualified relays of a different design, surveillance testing of the relays shall be initiated within ten (10) days of the date of this bulletin and repeated at intervals not exceeding ten (10) days thereafter. The additional surveillance testing applies when operability of the RPS is required by the Technical Specification. Upon detecting a failed relay, the failed unit shall be replaced with a qualified dry-contact relay or a new mercury-wetted relay. (The removed relay shall not be reused in the RPS.) R1 R1 R1 R1

3. Nuclear power facilities which are using or whose design includes the use of the above relays in the logic matrix of the RPS shall submit either their plans and schedules for replacing the mercury-wetted relays with qualified relays of a different design, or justification for using the mercury-wetted relays. Responses to this item shall be submitted to the offices listed in Item 1, above, within ninety (90) days of the date of the original version of this bulletin, July 30, 1980. R1 R1

Approved by GAO, B180225 (R0072); clearance expires July 31, 1980. (Application for renewal pending before GAO.) Approval was given under a blanket clearance specifically for identified generic problems.

IE Bulletin No. 80-19, Revision 1
August 15, 1980

Enclosure

RECENTLY ISSUED
IE BULLETINS

Bulletin No.	Subject	Date Issued	Issued To
80-20	Failures of Westinghouse Type W-2 Spring Return to Neutral Control Switches	7/31/80	To each nuclear power facility in your region having an OL or a CP
80-19	Failures of Mercury-Wetted Matrix Relays in Reactor Protective Systems of Operating Nuclear Power Plants Designed by Combustion Engineering	7/31/80	All nuclear power facilities having either an OL or a CP
80-18	Maintenance of Adequate Minimum Flow Thru Centrifugal Charging Pumps Following Secondary Side High Energy Line Rupture	7/24/80	All PWR power reactor facilities holding OLs and to those PWRs nearing licensing
Supplement 2 to 80-17	Failures Revealed by Testing Subsequent to Failure of Control Rods to Insert During a Scram at a BWR	7/22/80	All BWR power reactor facilities holding OLs
Supplement 1 to 80-17	Failure of Control Rods to Insert During a Scram at a BWR	7/18/80	All BWR power reactor facilities holding OLs
80-17	Failure of Control Rods to Insert During a Scram at a BWR	7/3/80	All BWR power reactor facilities holding OLs
80-16	Potential Misapplication of Rosemount Inc., Models 1151 and 1152 Pressure Transmitters with Either "A" or "D" Output Codes	6/27/80	All Power Reactor Facilities with an OL or a CP
80-15	Possible Loss Of Hotline With Loss Of Off-Site Power	6/18/80	All nuclear facilities holding OLs
80-14	Degradation of Scram Discharge Volume Capability	6/12/80	All BWR's with an OL