UNITED STATES
NUCLEAR REGULATORY COMMISSION
REGION IV
611 RYAN PLAZA DRIVE, SUITE 1000
ARLINGTON, TEXAS 76012

SEP 2 1980

MEMORANDUM FOR: Those Listed Below

FROM: G. L. Madsen, Chief, Reactor Operations and Nuclear Support Branch, RIV

SUBJECT: IE BULLETIN NO. 80-19

Subject IE Bulletin has been sent to the following licensees. A copy is attached for your information.

Arkansas Power & Light Company
ANO-1 & 2 (50-313, 50-368)

Nebraska Public Power District
Cooper Nuclear Station (50-298)

Omaha Public Power District
Ft. Calhoun Nuclear Station (50-285)

Public Service Company of Colorado
Fort St. Vrain (50-267)

G. L. Madsen, Chief,
Reactor Operations and
Nuclear Support Branch

Attachment:
As stated

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

July 31, 1980

IE Bulletin No. 80-19

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 or not mercury-wetted relays are used in 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.

2. Licensees of operating nuclear power plants using mercury-wetted relays in 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. 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.)

3. Nuclear power facilities which are using or whose design includes the use of mercury-wetted matrix relays in 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 this bulletin.

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

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RECENTLY ISSUED IE BULLETINS

Bulletin No.	Subject	Date Issued	Issued To
80-14	Degradation of Scram Discharge Volume Capability	6/12/80	All BWRs with an Operating License (OL) or Construction Permit (CP)
80-15	Possible Loss of Emergency Notification System (ENS) with Loss of Offsite Power	6/18/80	All nuclear facilities holding Operating Licenses (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 Operating License (OL) or a Construction Permit (CP)
80-17	Failure of 76 of 185 Control Rods to Fully Insert During a Scram at a BWR	7/3/80	All BWR power reactor facilities holding Operating Licenses (OLs) or Construction Permit (CP)
Sup. 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 Operating Licenses (OLs) or Construction Permits (CPs)
Sup. 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 Operating Licenses (OLs) or Construction Permits (CPs)
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

Enclosure