



UNITED STATES
NUCLEAR REGULATORY COMMISSION
REGION V
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SUITE 202, WALNUT CREEK PLAZA
WALNUT CREEK, CALIFORNIA 94596

August 24, 1981

MEMORANDUM TO: ALL THOSE ON IE INFORMATION NOTICE DISTRIBUTION LIST

FROM: IE - REGION V

SUBJECT: IE INFORMATION NOTICE NO. 81-25 - OPEN EQUALIZING VALVE
OF DIFFERENTIAL PRESSURE TRANSMITTER CAUSES REACTOR SCRAM
AND LOSS OF REDUNDANT SAFETY SIGNALS.

The attached IE Information Notice No. 81-25 was issued this date to the following licensees:

1. Arizona Public Service Company (Palo Verde 1, 2 & 3, Docket Nos. 50-528, 50-529 & 50-530).
2. Pacific Gas & Electric Company (Humboldt Bay Unit 3, Diablo Canyon Units 1 & 2, Docket Nos. 50-133, 50-275 & 50-323).
3. Portland General Electric Company (Trojan, Docket No. 50-344)
4. Sacramento Municipal Utility District (Docket No. 50-312, Rancho Seco).
5. Southern California Edison Company (San Onofre Units 1, 2 & 3, Docket Nos. 50-206, 50-361 & 50-362).
6. Washington Public Power Supply System (WNP-1, WNP-2, WNP-3, WNP-4 & WNP-5, Docket Nos. 50-397, 50-460, 50-508, 50-509 & 50-513).

Enclosures:

1. Transmittal Letter
2. IE Information Notice No. 81-25



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SSINS No.: 6835
Accession No.:
8103300410
IN 81-25

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

August 24, 1981

IE INFORMATION NOTICE NO. 81-25: OPEN EQUALIZING VALVE OF DIFFERENTIAL PRESSURE TRANSMITTER CAUSES REACTOR SCRAM AND LOSS OF REDUNDANT SAFETY SIGNALS

Description of Circumstances:

On March 13, 1981, the Tennessee Valley Authority reported to the NRC that a scram occurred at the Browns Ferry Unit 2 facility as a result of an open equalizing valve used with the lower wide-range Yarway water level transmitter. Equalizing valves, which are closed during normal plant operation, are used to conduct instrument calibrations and to prevent over-ranging the transmitter during instrument isolation valve manipulations. With the plant operating at normal full recirculation flow conditions, there is no clear indication that this equalizing valve is open. However, once recirculation flow is decreased, the reference leg will drain, causing erroneous delta pressure (dp) input signals to other transmitters connected to the same reference water column. This affects a large number of safety and control systems that use water level as an input. A review of the event showed that under reduced flow conditions the false high water level signals led to loss of redundancy in the logic for initiating safety functions, as well as initiation of a turbine trip which caused the reactor to scram.

Safety system dp transmitters that could be affected by the drained reference leg provided water level input signals to the logic circuits for the following functions: primary containment isolation, low water level scram protection, automatic depressurization system confirmatory low water level, and high water level trip signal for high-pressure coolant injection and reactor core isolation cooling. In addition, a large number of control functions can be affected, either directly or indirectly, by the drained reference leg.

Under normal operating conditions with full recirculation flow, the operator would be unaware of the abnormal position of the equalizing valve because the lower wide-range Yarway transmitter, which was bypassed by the open equalizing valve and the affected safety system transmitters, would continue to provide signals to the control room instrumentation that appear normal. The lower wide-range Yarway transmitter is designed to provide accurate water level signals only for accident conditions when there is no jet pump flow. With full recirculation flow, this transmitter reads full scale (high water level) whether or not the equalizer valve is open because the variable leg is connected near the high-pressure outlet section of the jet pump. Under these conditions, the common reference leg for the safety system dp transmitters identified above will not drain. Therefore, even if the equalizing valve is open, these transmitters also provide normal signals when there is full recirculation flow.

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During the event at Browns Ferry Unit 2 on March 13, 1981, the abnormal condition became apparent to the operator when the recirculation flow rate was being reduced as part of a planned reactor shutdown. Reactor power had been reduced from 100% to 54% over the previous 45 minutes. As the recirculation flow was reduced, the pressure across the jet pump diffuser changed so that at lower flow rates the driving force across the equalizing valve reversed, causing the reference leg to have a higher relative pressure. Higher pressure on the reference leg, coupled with an open equalizing valve, caused the water in the reference leg to drain into the variable leg water column. This caused all level transmitters connected to the affected reference leg to indicate higher-than-actual water level. The false indication of high water level caused the feedwater control valve to close and caused a turbine trip. The turbine trip caused the reactor to scram.

It is unknown when the lower wide-range transmitter equalizing valve was opened. However, thirty-six hours prior to the scram, a surveillance test was performed on the unit.

Similar problems have occurred previously and, in July 1980, the nuclear steam system supplier (NSSS) prepared an information letter that delineates similar safety concerns with respect to the control of differential pressure transmitter equalizing valves. This information letter provides recommendations to alleviate the chronic problem of open equalizing valves. An extract of the NSSS recommended actions is attached for information.

This information notice is provided as notification of a possible significant matter. It is expected that recipients will review the information for applicability to their facilities. No specific action or response to this information is required at this time. If you have questions regarding this matter, please contact the Director of the appropriate NRC Regional Office.

Attachments:

1. Extract from NSSS Information Letter
2. Recently issued IE Information Notices

EXTRACT FROM NSSS INFORMATION LETTER

The NSSS recommends that licensees consider for implementation the following various means for controlling critical dp sensor instrumentation equalizing valves:

1. Installed dp instrumentation equalizing valves may be removed and the low and high side pipe stubs capped (see note below). Such removal will prevent equalizing valving errors and also prevent sensor errors due to installed, leaky equalizing valves. This is, however, not feasible where valve block assemblies are in use.
2. Installed dp instrumentation equalizing valves may be closed in a positive manner by permanently locking the valves in the closed position or by closing the valves and removing the valve wheels and extended portions of the valve stems, etc.

NOTE: For Items 1 and 2 above any function of the equalizing valves can be performed by equalizing valves mounted on calibration systems or devices which are disconnected for normal operation.

3. Root, vent, drain and equalizing valve handles may be painted different colors, and the color included in calibration and line up verification checks.
4. After normal checklists are complete, an independent supervisory check may be performed and then valves may be wire and lead sealed in position.
5. Procedures may include a supervisory comparison of the dp instrument reading taken just prior to surveillance testing/calibration and just after signoff and channel restoration. The final reading should only differ from the initial reading due to calibration or a change in plant operating conditions.
6. A periodic check may be made of dp instrumentation to detect warm instrument lines (for instruments connected to systems at high temperatures). A warm instrument line would indicate significant leakage or an open equalizing valve.

Attachment
IN 81-25
August 24, 1981

RECENTLY ISSUED
IE INFORMATION NOTICES

Information Notice No.	Subject	Date of Issue	Issued to
81-24	Auxiliary Feed Pump Turbine Bearing Failures	8/5/81	All power reactor facilities with an OL or CP
81-23	Fuel Assembly Damaged due to Improper Positioning of Handling Equipment	8/4/81	All power reactor facilities with an OL or CP
81-22	Section 235 and 236 Amendments to the Atomic Energy Act of 1954	7/31/81	All power research reactor, fuel fabrication and reprocessing, and spent fuel storage licensees and applicants
81-21	Potential Loss of Direct Access to Ultimate Heat Sink	7/21/81	All power reactor facilities with an OL or CP
81-20	Test Failures of Electrical Penetration Assemblies	7/13/81	All power reactor facilities with an OL or CP
81-19	Lost Parts in Primary Coolant System	7/6/81	All power reactor facilities with an OL or CP
81-18	Excessive Radiation Exposures to the Fingers of Three Individuals Incurred During Cleaning and Wipe Testing of Radioactive Sealed Sources at a Sealed- Source Manufacturing Facility	6/23/81	Specified licensees holding byproduct licenses
81-16	Control Rod Drive System Malfunctions	4/23/81	All BWR facilities with an OL or CP

OL = Operating Licenses
CP = Construction Permits