

UNITED STATES
NUCLEAR REGULATORY COMMISSION
OFFICE OF NUCLEAR REACTOR REGULATION
WASHINGTON, D.C. 20555

Jim McKnight
05F22

February 3, 1995

NRC INFORMATION NOTICE 95-10: POTENTIAL FOR LOSS OF AUTOMATIC ENGINEERED SAFETY FEATURES ACTUATION

Addressees

All holders of operating licenses or construction permits for nuclear power reactors.

Purpose

The U.S. Nuclear Regulatory Commission (NRC) is issuing this information notice to alert addressees to the potential for loss of the automatic actuation function of engineered safety features (ESF) as a result of electrical faults in some non-class 1E input signals. It is expected that recipients will review the information for applicability to their facilities and consider actions, as appropriate, to avoid similar problems. However, suggestions contained in this information notice are not NRC requirements; therefore, no specific action or written response is required.

Description of Circumstances

On February 2, 1995, the licensee for the Diablo Canyon facility reported to the NRC a condition that could result in the failure of one train of their solid state protection system (SSPS) during a main steamline break in the turbine building (10 CFR 50.72 report number 28318). The licensee postulated a break of a main steamline at the turbine stop valve in the turbine building. If the steamline breaks completely, it is free to rotate approximately 10 degrees. The 10-degree rotation of the steamline could result in the steam jet from the faulted steamline striking an electrical junction box. The junction box contains terminations for non-safety input signals to the SSPS, turbine stop valve position indication (four circuits, two circuits for each train).

The force of the steam jet impinging on the junction box is postulated to destroy the box and result in electrical faults in the affected non-safety inputs to the SSPS. The high current resulting from the electrical faults would cause 15-ampere fuses to open, interrupting 120-V ac power supply to the faulted circuits. Since dc power supplies for SSPS logic and ESF train actuation relays are supplied by the same 15-ampere fuses, opening of the fuses would also interrupt power to the SSPS logic channels and possibly one ESF train actuation relay bank. This would render one SSPS train inoperable. If a single failure of the other SSPS train is considered, as is required in

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the high energy line break analysis methodology, both trains of the SSPS would be rendered inoperable and no ESF actuations would be automatically available to mitigate the consequences of the steamline break. The reactor trip circuitry would be de-energized resulting in a reactor trip. Manual action could be initiated to operate individual pieces of equipment.

NRC inspectors determined that other non-class 1E circuits that provide input to the SSPS were not properly isolated. These circuits include turbine auto stop oil (three circuits), seismic trip (constructed to class 1E standard), 12-kV undervoltage, 12-kV underfrequency, and reactor coolant pump breaker position indication. An electrical fault in any of these circuits could cause loss of power to SSPS logic circuit in the same way described above.

Although a single main steamline break would likely render only one SSPS train inoperable, either train could be rendered inoperable depending upon the location of the steamline break. The licensee declared the ESF portion of the solid state protection system inoperable and entered Technical Specification 3.3.2 for inoperable ESF instrumentation and then Technical Specification 3.0.3 limiting condition for operation to start shutdown of both units within 1 hour.

On February 1, 1995, the licensee for the Salem facility notified the NRC that it had been determined that the design of the SSPS at its facility was similar to that at the Diablo Canyon facility (10 CFR 50.72 report number 28321). The Salem licensee concluded that a main steamline break could have the same effect on non-class 1E circuits as that postulated at the Diablo Canyon facility. In addition, the licensee concluded that a seismic event could challenge both trains of SSPS since both junction boxes associated with both trains of SSPS are located in the turbine building (the Diablo Canyon licensee is continuing to evaluate seismic and other vulnerabilities of these non-class 1E circuits). The circuits that are potentially affected at Salem include turbine stop valve position indication, auto-stop oil pressure switches, and reactor coolant pump breaker position indication. The circuit faults initiated by the steamline break or seismic event could result in loss of power to SSPS logic circuitry similar to that postulated by the Diablo Canyon licensee. The resulting impact would be either a partial or total loss of the automatic actuation function of the SSPS. The reactor trip circuitry would be de-energized, resulting in a reactor trip. Manual action would be required to mitigate the consequences of a main steamline break event. The licensee declared the SSPS inoperable and began a shutdown of Unit 1 as required by Technical Specifications. (Unit 2 was already shut down.)

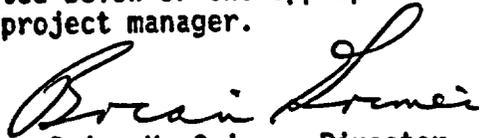
Discussion

The licensees are undertaking similar corrective actions. The electrical supply to the SSPS dc power supplies will be taken from a point electrically upstream of the 15-ampere fuse referred to above. This modification will ensure that opening of the fuse, because of faults in the non-class 1E circuits, does not cause a loss of power to the class 1E dc power supplies. Figure 1 is a one-line diagram illustrating the as-found condition of a single channel of the SSPS at Diablo Canyon. Two out of four channels are

potentially affected in SSPS Train A and two out of four channels are potentially affected in SSPS Train B.

The Diablo Canyon licensee plan for repairs includes drafting a formal modification procedure, curtailing work near the vulnerable junction boxes, deferring train-related maintenance and surveillance during the modification period, maintaining constant power level, testing the procedure on a mock-up, de-energizing one channel at a time while modifying that channel (the reactor trip bypass breaker will be closed during the modification), training operators on safety considerations during the repairs, and postmodification testing. The licensee estimated that the increase in core damage frequency during the repair period would be less than $2E-7$. (The Salem licensee repair plan was not available when this information notice was prepared.)

This information notice requires no specific action or written response. If you have any questions about the information in this notice, please contact one of the technical contacts listed below or the appropriate Office of Nuclear Reactor Regulation (NRR) project manager.



Brian K. Grimes, Director
Division of Project Support
Office of Nuclear Reactor Regulation

Technical contacts: E. Nick Fields, NRR
(301) 415-1173

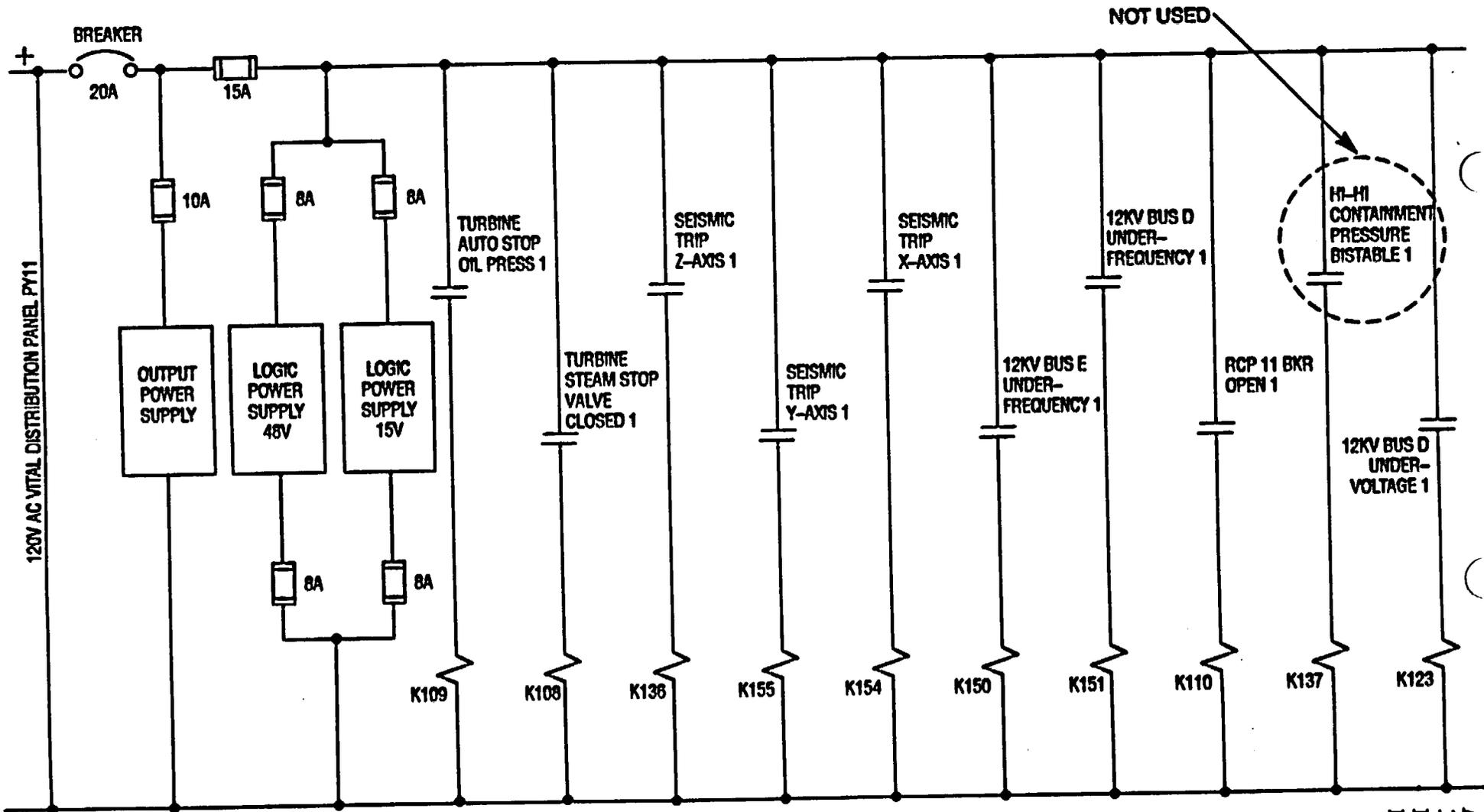
Cliff Douth, NRR
(301) 415-2847

Attachments:

1. Figure 1
2. List of Recently Issued NRC Information Notices

Attachments filed
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Figure 1 SOLID STATE PROTECTION SYSTEM, TRAIN A, CHANNEL 1, SIMPLIFIED SCHEMATIC.
BEFORE DESIGN CHANGE.



LIST OF RECENTLY ISSUED
NRC INFORMATION NOTICES

| Information Notice No. | Subject | Date of Issuance | Issued to |
|------------------------|--|------------------|---|
| 95-09 | Use of Inappropriate Guidelines and Criteria for Nuclear Piping and Pipe Support Evaluation and Design | 01/31/95 | All holders of OLs or CPs for nuclear power reactors. |
| 95-08 | Inaccurate Data Obtained with Clamp-On Ultrasonic Flow Measurement Instruments | 01/30/95 | All holders of OLs or CPs for nuclear power reactors. |
| 95-07 | Radiopharmaceutical Vial Breakage during Preparation | 01/27/95 | All USNRC medical licensees authorized to use byproduct material for diagnostic procedures. |
| 95-06 | Potential Blockage of Safety-Related Strainers by Material Brought Inside Containment | 01/25/95 | All holders of OLs or CPs for nuclear power reactors. |
| 95-05 | Undervoltage Protection Relay Settings Out of Tolerance Due to Test Equipment Harmonics | 01/20/95 | All holders of Construction Permits for nuclear power reactors. |
| 95-04 | Excessive Cooldown and Depressurization of the Reactor Coolant System Following a Loss of Offsite Power | 01/19/95 | All holders of OLs or CPs for nuclear power reactors. |
| 95-03 | Loss of Reactor Coolant Inventory and Potential Loss of Emergency Mitigation Functions While in a Shutdown Condition | 01/18/95 | All holders of OLs or CPs for nuclear power reactors. |

OL = Operating License
CP = Construction Permit

potentially affected in SSPS Train A and two out of four channels are potentially affected in SSPS Train B.

The Diablo Canyon licensee plan for repairs includes drafting a formal modification procedure, curtailing work near the vulnerable junction boxes, deferring train-related maintenance and surveillance during the modification period, maintaining constant power level, testing the procedure on a mock-up, de-energizing one channel at a time while modifying that channel (the reactor trip bypass breaker will be closed during the modification), training operators on safety considerations during the repairs, and postmodification testing. The licensee estimated that the increase in core damage frequency during the repair period would be less than 2E-7. (The Salem licensee repair plan was not available when this information notice was prepared.)

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Attachments:

1. Figure 1
2. List of Recently Issued NRC Information Notices

DOCUMENT NAME: 95-10.IN
 *See previous concurrence

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|------|-----------|--------------|----------|-------------|
| OFC | OECB:DOPS | SC/OECB:DOPS | PUB:ADM | C/OECB:DOPS |
| NAME | NFields* | EGoodwin* | Tech Ed* | AChaffee* |
| DATE | 02/03/95 | 02/03/95 | 02/03/95 | 02/03/95 |
| OFC | HICB:DRCH | C/HICB:DRCH | D/DRCH | D/DOPS |
| NAME | CDouth* | JWermiel* | BBoger* | BGrimes |
| DATE | 02/03/95 | 02/03/95 | 02/03/95 | 02/3/95 |

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potentially affected in SSPS Train A and two out of four channels are potentially affected in SSPS Train B.

The Diablo Canyon licensee plan for repairs includes drafting a formal modification procedure, curtailing work near the vulnerable junction boxes, deferring train-related maintenance and surveillance during the modification period, maintaining constant power level, testing the procedure on a mock-up, de-energizing one channel at a time while modifying that channel (the reactor trip bypass breaker will be closed during the modification), training operators on safety considerations during the repairs, and postmodification testing. The licensee estimated that the increase in core damage frequency during the repair period would be less than 2E-7. (The Salem licensee repair plan was not available when this information notice was prepared.)

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Attachment:

1. Figure 1
2. Figure 2
3. List of Recently Issued NRC Information Notices

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*See previous concurrence

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| DATE | 1 / 95 | 1 / 95 | 02/03/95 | 1 / 95 |
| OFC | HICB:DRCH | C/HICB:DRCH | D/DRCH | D/DOPS |
| NAME | CDoutt <i>CD</i> | <i>JW</i> | BBoger <i>B</i> | BGrimes |
| DATE | 2/3 / 95 | 2/3 / 95 | 2/3 / 95 | 1 / 95 |

potentially affected in SSPS Train A and two out of four channels are potentially affected in SSPS Train B. Figure 2 illustrates the proposed design change, including replacing the 15-ampere fuse with an 8-ampere fuse to ensure proper coordination of circuit protective devices. (The Salem design change employs a different fuse size)

The Diablo Canyon licensee's plans for repairs include drafting a formal modification procedure, curtailing work near the vulnerable panels, deferring train-related maintenance and surveillance during the modification period, maintaining constant power level, testing the procedure on a mock-up, de-energizing one channel at a time while modifying that channel (the reactor trip bypass breaker will be closed during the modification), training of operators on safety considerations during the repairs, and post-modification testing. The licensee estimated that the increase in core damage frequency during the period of repair would be less than 2E-7. (The Salem licensee's repair plans were not available when this information notice was prepared).

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