



UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

AEOD/E204

JAN 23 1982

MEMORANDUM FOR: R. Vollmer, Director
Division of Engineering, NRR

E. Jordan, Director
Division of Engineering and
Quality Assurance, IE

FROM: Carlyle Michelson, Director
Office for Analysis and Evaluation
of Operational Data

SUBJECT: EFFECTS OF FIRE PROTECTION SYSTEM ACTUATION
ON SAFETY-RELATED EQUIPMENT

At the Operating Reactor Event meeting held on January 7, 1982, the subject of recent fire protection system actuations at operating nuclear plants was discussed.^{1/} The events showed that safety-related equipment subjected to water spray from fire protection system could be rendered inoperable. The events also indicated that spurious actuation of fire protection system can be initiated by operator error, by steam, high humidity or maintenance activities in the vicinity of fire protection system detectors. Other events also exemplify that interactions of the fire protection system with other systems (e.g., ventilation and diesel fuel oil) have not been adequately considered. At the meeting, IE was assigned the responsibility to review the recent fire system actuations and consider development of an Information Notice and the Division of Engineering, NRR was to review the events and consider the need for modifications to requirements or review procedures for fire protection systems.

We have reviewed some of the recent operating reactor events involving fire protection system actuation. Brief descriptions of these events are enclosed. Based on a review of the events, the following information is provided for your consideration in the efforts that are underway.

We share your conclusion that the adequacy of design and qualifications of safety-related equipment and systems located in areas where fire protection is provided should be re-evaluated. Potential interactions between fire protection systems and other systems that affect the operation of safety-related systems need to be thoroughly understood. Safety-related equipment, not damaged by a fire itself, should be designed and qualified to perform its intended function during and following a fire protection system activation.

^{1/} Memorandum for D. Eisenhut from G. Lainas dated January 13, 1982 on "Summary of Operating Reactor Events Meeting on January 7, 1982."

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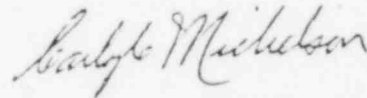
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These considerations should include all types of fire protection systems, e.g., water, halides, carbon dioxide and other chemicals. In addition, consideration could be given to incorporate diverse design considerations in the fire protection system to minimize inadvertent spray, e.g., smoke detectors and heat detectors. The diverse detectors should also minimize the likelihood of inadvertent fire protection activation during a seismic event which can induce smoke detector alarms due to airborne dust.

In summary, the NRC should have confidence that all safety-related and essential support equipment located in areas where fire protection spray systems are provided will perform the intended function during and following the activation of the fire protection system.

If you should desire additional information or assistance, the AEOD contact is Matthew Chiramal.



Carlyle Michelson, Director
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Enclosure:
As state

cc: H. Denton, NRR
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Events Related to Fire Protection System Actuation

<u>Plant</u>	<u>Date of Occurrence</u>	<u>Description of Event</u>
Surry-2	May 28, 1981	LER 81-033 - An open valve from the fire main to the fire protection foam system allowed approximately 4,000 gallons of water to enter the above ground fuel oil storage tank. Water was subsequently found in the underground and wall tanks for the emergency diesel generators. This occurrence represents a potential common mode failure for both trains of the onsite emergency power system. The fire protection sparger is located <u>inside</u> the fuel oil storage tank. The potential for water to leak from the fire protection system into the fuel oil had not been considered during the design or before installation of the fire protection system. Inadequate procedures and sampling techniques contributed to this event. (AEOD is performing an engineering evaluation of this event.)
Trojan	July 26, 1981	LER 81-16 - During steady state operation with the plant at 80% power, the control room operator noticed that the control power had been lost to the "B" train hydrogen recombiner... The loss of control power was due to inadvertent activation of the fire protection deluge system while welding in the electrical penetrating area. The spray caused a short circuit and loss of control power to the hydrogen recombiner...
Trojan	Sep. 10, 1981	LER 81-021 - During normal operations, high ambient temperatures in the room housing the "A" trains

Plant

Date of Occurrence

Description of Event

of the preferred instrument and control power buses for the ESF equipment exceeded the Technical Specifications. The occurrence resulted from the installation of a three-hour rated fire barrier between the two trains of equipment which lead to inadequate ventilation in the new room created by the wall. Inadequate interdisciplinary review resulted in an incomplete safety evaluation for the plant design change that created the fire barrier, i.e., cooling requirements for the installed heat loads versus the cooling capability of the installed ventilation system were not analyzed.

Ginna

Nov. 14, 1981

Daily Report - During start-up testing of the new fire suppression system, failure to follow test procedures caused activation of several portions of the system... Various power cabinets and electrical equipment in the turbine and intermediate buildings were sprayed. A manual reactor trip was initiated at 10:26 am following indication of two dropped rods and numerous control room annunciator alarms. The dropped rods were attributed to a trip of the "A" RPS MG set which may have reduced voltage enough to drop two rods. All systems functioned properly following the trip and plant was maintained in "hot-shutdown" status while operability of equipment affected by the suppression system was assured...

<u>Plant</u>	<u>Date of Occurrence</u>	<u>Description of Event</u>
Dresden 1	Nov. 30, 1981	<p>LER 81-39/OIT-0 - Unit start-up was in progress when the control room received a HPCI Room Fire System Initiation alarm from the south ionization smoke detector. The HPCI system was declared inoperable and the HPCI steam line isolated. An Unusual Event was declared and a normal unit shutdown initiated. The health and safety of the general public was not endangered since all safety systems performed as designed and this was the first event of this type at Dresden Station.</p>

The cause of the fire system initiation is believed to have been a buildup of humidity/steam vapor in the HPCI room. The smoke detector operates on the ionization principle and is usually activated by the presence of combustion products. Discussions with the manufacturer of the smoke detector indicated that the detector may actuate if exposed to a high concentration of water vapor.

The HPCI room has had a history of high humidity/steam because of steam leaks and the leakoff/drain system which runs to the sump in the HPCI room. Temporary ventilation was not operating prior to the occurrence which would have reduced the water vapor concentration. The smoke detector continued to intermittently alarm until the ventilation was restored.

The station Fire Marshall will be reviewing the entire fire protection system for this HPCI room. In addition,

<u>Plant</u>	<u>Date of Occurrence</u>	<u>Description of Event</u>
		our Station Nuclear Engineering Department has been requested to review both the fire protection detectors and the ventilation system for possible modifications to improve reliability.
Dresden 2	Dec. 24, 1981	PNO-III-81-120A - The Unit 2 reactor was brought from full power to a cold shutdown condition on December 24, 1981, after a failure of both required high pressure ECCS systems; HPCI and ADS... The HPCI system was declared inoperable on December 23, 1981, following activation of the HPCI room fire protection water deluge system. The deluge system was activated by smoke from welding operations near a HPCI room smoke detector. The water spray caused water intrusion into the HPCI turbine oil system (which did not affect HPCI operability)...
Oyster Creek	Jan. 9, 1982	Daily Report - With the plant in cold shutdown at about 9:50 am, the auxiliary pump on the reactor water cleanup system seized. Its motor overhead. Smoke from the motor activated the fire suppression system on the south side of the reactor building at the 51-foot elevation... The fire suppression system was secured at 10:25 am. Water spray from the suppression system shorted out the position indication on one torus vent valve, damaged one reactor 10-10- water level sensor and one reactor high pressure sensor.
Trojan	Jan. 9, 1982	Daily Report - Shortly after 1:00 am the control room

Plant

Date of Occurrence

Description of Event

operators received signals indicating a fire in the turbine building and actuation of several deluge systems located in that area. Fire brigade personnel responding to the alarm reported that the turbine bldg was filled with steam. The control room operator there upon manually tripped the reactor and brought it to hot shutdown. Further investigation revealed that the source of the steam was a failure of a 90 degree elbow in a low pressure (150 psi) steam line from the high pressure turbine to the No. 5 feedwater heater. In addition, the heat from the steam is credited with tripping the fire alarms and deluge systems...

McGuire 1

Jan. 6, 1982

Daily Report - On January 6 licensee identified an interaction of non-safety related to safety-related equipment that could compromise Diesel Generator IA operation following a seismic event. During a check of equipment installation the licensee identified fire protection piping routed over one of the safety-related cable and an instrument panel used for HVAC inside the diesel generator room.