

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

March 19, 1991

NRC INFORMATION NOTICE NO. 91-22: FOUR PLANT OUTAGE EVENTS INVOLVING LOSS
OF AC POWER OR COOLANT SPILLS

Addressees:

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

Purpose:

This information notice is intended to alert addressees to the potential for equipment failures resulting from loss of power or loss of coolant inventory that could affect the adequacy of decay heat removal during plant outages. 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 do not constitute NRC requirements; therefore, no specific action or written response is required.

Description of Circumstances:

During plant outages, non-routine plant configurations may result from refueling and maintenance/surveillance activities going on at the same time. As permitted by plant technical specifications, equipment may be taken out of service that would otherwise be required to be operable during power operation. The following four events occurred during a one-week period in March 1991. Two events involve losses of ac power sources with redundant trains out of service. The other two events involve reactor coolant spills from improper valve manipulations. The four events demonstrate the importance of careful planning to ensure the coordination of planned outages of equipment, tests of systems and components, and plant conditions.

DIABLO CANYON UNIT 1--MARCH 7, 1991

Diablo Canyon Unit 1 suffered a loss of offsite power when, while the unit was shut down for refueling with 35 feet of water above the core, the boom of a mobile crane came too close to the 500 kV transformer lead, shorting it and tripping the transformer.

Electrical power for Unit 1 operations was being back-fed through the main transformer to the unit auxiliary transformers. The main generator had been disconnected from the main transformer, so that the backfeed was possible. The

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Unit 1 standby startup transformer, the normal source of power during a shutdown, had been taken out of service for maintenance.

When the main transformer tripped and no longer supplied power, the unit's three emergency diesel generators started automatically and picked up emergency loads as designed. Offsite power was restored to the Unit 1 auxiliary buses five hours after the initiating event by cross-tying the Unit 2 standby startup transformer into the Unit 1 startup bus.

The mobile crane was improperly brought to within 2 or 3 feet from the power lines, permitting arc-over. The licensee's Accident Prevention Rules indicate that 27 feet is the minimum required clearance between mobile cranes and 500 kV transmission lines.

OCONEE 3--MARCH 8, 1991

Oconee Unit 3 was 24 days into its refueling outage with the reactor coolant system (RCS) in a reduced inventory condition when shutdown cooling was lost for about 18 minutes. Shutdown cooling was lost when the operating low-pressure injection (LPI) pump cavitated following a rapid loss of water from the RCS. Approximately 14,250 gallons of primary water drained into the sump during stroke testing of the reactor building emergency sump suction valve. Approximately 9,750 of that 14,250 gallons came from the reactor system; and about 4,500 came from the borated water storage tank (BWST). Apparently, the blind flange which should have been placed between the sump suction valve and the sump, was placed on the wrong line. Hence, when the sump suction valve was exercised, the water drained from that line into the sump. The water level in the reactor vessel dropped from the vicinity of the reactor vessel head flange to the bottom of the hot leg. The operators entered Abnormal Operating Procedures for "Loss of Low Pressure Injection System" which called for suction to be taken from the BWST. This action caused 4,500 gallons of BWST water to be dumped into the sump, and 5,250 gallons to flow to the reactor vessel restoring the level in the reactor vessel. Once the operators terminated the loss of reactor coolant, adequate net positive suction head was reestablished and the LPI pumps were vented and restarted.

OYSTER CREEK -- MARCH 9, 1991

Oyster Creek had been shut down for refueling since February 16, 1991. The reactor vessel head had been removed and the refueling cavity filled with water such that there were 60 feet of water above the core and 30 feet of water above the spent fuel rack. The main transformer had been taken out of service for maintenance so no back feed was available to the 4.16kV safety buses. Also, the licensee was performing refueling outage maintenance on its "C" 4.16 kV emergency safety bus and on the EDG that powers the "C" bus. The available 4.16 kV emergency safety bus, the "D" bus, was being energized from off site through the startup transformer. These conditions had put the plant in a Technical Specifications ACTION statement that required weekly testing of the standby EDG for the "D" bus.

During a weekly surveillance on March 9, 1991, the standby EDG for the "D" bus failed its test and was declared inoperable. Water was leaking into one cylinder. This put the plant in a condition in which there were no operable EDGs, and only one startup transformer was available. This condition existed until offsite power to the "C" bus was restored in approximately 33 hours. During that time period offsite power to the startup transformer provided the only ac power source.

CALVERT CLIFFS UNIT 2-- MARCH 12, 1991

On March 12, 1991, Calvert Cliffs Unit 2 was in MODE 5, nearing the end of an extended outage when approximately 1900 gallons of borated reactor coolant was inadvertently discharged into the containment through the containment spray header.

Decay heat removal was being provided by a low-pressure safety injection (LPSI) pump and two shutdown cooling (SDC) heat exchangers. The licensee was lining up the valves to fill one of the safety injection tanks (SITs). This fill activity required that the discharge cross-connect valve for both of the SDC heat exchangers be shut and the discharge cross-connect isolation valve between the LPSI and the containment spray pumps be opened. Another step in this fill procedure was to verify that the containment spray header was isolated by independently verifying that the containment spray isolation valve was closed.

The reactor coolant discharged because operators deviated from the established SIT valve line up and verification procedure, allowing a flowpath to be established from the LPSI pump to the motor-operated isolation valve of the containment spray header. Flow was noted through the containment spray header when the inboard containment spray isolation valve was observed to be leaking grossly.

The NRC staff sent augmented inspection teams (AITs) to determine the facts associated with these events at Diablo Canyon, Oconee, and Oyster Creek. A special Region I inspection team was sent to Calvert Cliffs. The results of these inspections will be factored into the NRC staff's ongoing evaluation of safety risks during shutdown and low-power operation. This information notice will be supplemented, as necessary, as additional information becomes available. NRC Information Notice No. 90-55: "Recent Operating Experience of Loss of Reactor Coolant Inventory While in a Shutdown Condition" describes similar events that occurred at Catawba Unit 1, Maine Yankee and Braidwood Unit 2.

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 NRR project manager.

Charles E. Rossi
Charles E. Rossi, Director
Division of Operational Events Assessment
Office of Nuclear Reactor Regulation

Technical Contacts: Robert A. Benedict, NRR
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Angie Young, NRR
(301) 492-1167

Thomas A. Greene, NRR
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(301) 492-1171

Attachment: List of Recently Issued NRC Information Notices

LIST OF RECENTLY ISSUED
NRC INFORMATION NOTICES

Information Notice No.	Subject	Date of Issuance	Issued to
91-21	Inadequate Quality Assurance Program of Vendor Supplying Safety-Related Equipment	03/19/91	All holders of OLs or CPs for nuclear power reactors and all recipients of NUREG-0040, "Licensee Contractor and Vendor Inspection Status Report" (White Book).
91-20	Electrical Wire Insulation Degradation Caused Failure in A Safety-Related Motor Control Center	03/19/91	All holders of OLs or CPs for nuclear power reactors.
90-43, Supp. 1	Mechanical Interference with Thermal Trip Function in GE Molded-Case Circuit Breakers	03/13/91	All holders of OLs or CPs for nuclear power reactors.
91-19	Steam Generator Feedwater Distribution Piping Damage	03/12/91	All holders of OLs or CPs for pressurized water reactors (PWRs).
91-18	High-Energy Piping Failures Caused by Wall Thinning	03/12/91	All holders of OLs or CPs for nuclear power reactors.
90-25, Supp. 1	Loss of Vital AC Power with Subsequent Reactor Coolant System Heat-Up	03/11/91	All holders of OLs or CPs for nuclear power reactors.
91-17	Fire Safety of Temporary Installations or Services	03/11/91	All holders of OLs or CPs for nuclear power reactors.
91-16	Unmonitored Release Pathways from Slightly Contaminated Recycle and Recirculation Water Systems at A Fuel Facility	03/06/91	All fuel cycle facilities.
91-15	Incorrect Configuration of Breaker Operating Springs in General Electric AK-Series Metal-Clad Circuit Breakers	03/06/91	All holders of OLs or CPs for nuclear power reactors.

OL = Operating License
CP = Construction Permit

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Original Signed By
Charles E. Rossi

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*See previous concurrences.

EAB:NRR
RBenedict:ld
03/ /91

*EAB:NRR
TGreen
03/15/91

*EAB:NRR
AYoung
03/15/91

*TECH ED
RSanders
03/14/91

*SC:EAB:NRR
DFischer
03/14/91

*D:DST:NRR
ATHadani
03/18/91

*C:EAB:NRR
AChaffee
03/18/91

*D:OGCG:NRR
CBerlinger
03/18/91

D:DOEA:NRR
CRossi
03//8/91

DOCUMENT NAME: IN 91-22

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