

PRECURSOR DESCRIPTION AND DATA

NSIC Accession Number: 142462

Date: December 11, 1978

Title: Loss of a Vital Instrument Bus Initiates a Reactor Trip at Salem 1

The failure sequence was:

1. While at 100% power, vital instrument bus 1B was lost due to the failure of an output transformer and two regulating resistors.
2. Loss of the vital bus caused a false low RCS loop flow signal, which caused a reactor trip.
3. AFW pump 12 failed to start due to the loss of vital bus 1B.
4. AFW pump 13 failed to start due to a misadjustment of the overspeed trip mechanism.
5. Decreasing T_{AVE} plus safety injection inputs caused by the loss of the 1B vital bus resulted in an inadvertent safety injection.

(See additional page)

Corrective action;

1. AFW pump 12 was manually started.
2. The vital bus was reenergized from its emergency source.
3. The failed inverter components were replaced.
4. The overspeed trip mechanism was re-adjusted.
5. The failed RHR pump breaker was replaced.

Design purpose of failed system or component:

1. The vital bus provides regulated, uninterruptible power for reactor plant instrumentation.
2. The auxiliary feedwater pumps provide feed water for steam generator/reactor cooling when the main feed system is unavailable.
3. The RHR pumps provide for reactor heat removal during cold shutdown and also function as low pressure injection pumps during LOCA mitigation.

Unavailability of system per WASH 1400:* Insufficient power on vital bus:
 $1.7 \times 10^{-5}/\text{hr}$

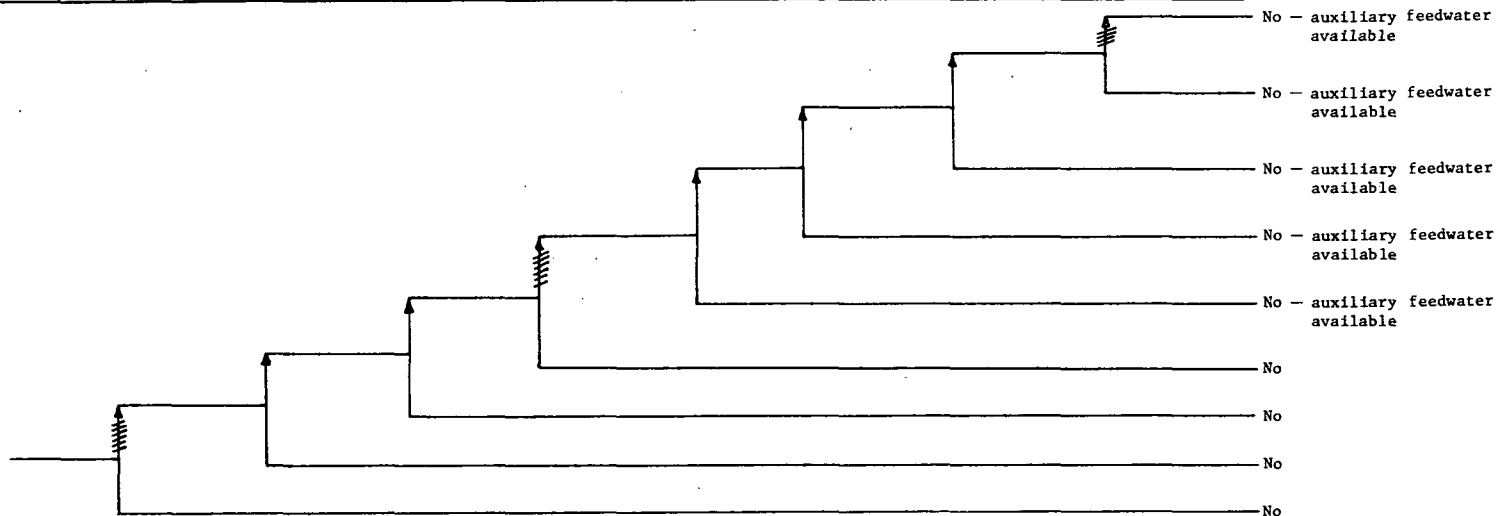
Unavailability of component per WASH 1400:* pump, failure to start: $10^{-3}/\text{D}$
breaker failure to operate: $10^{-3}/\text{D}$
transformers: $1 \times 10^{-6}/\text{hr}$

* Unavailabilities are in units of per demand D^{-1} . Failure rates are in units of per hour HR^{-1} .

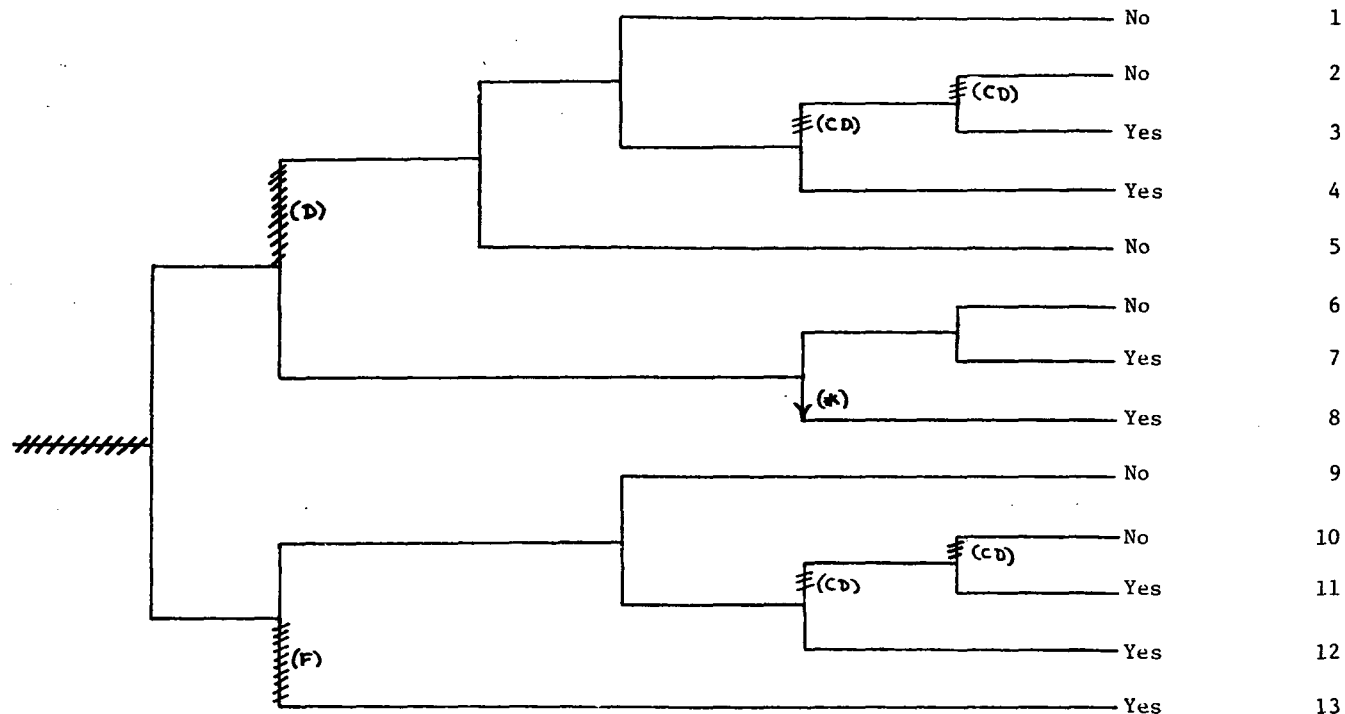
The failure sequence was: (Continued)

6. The 1B diesel generator, #11 charging pump, and #12 RHR pump failed to start due to the loss of the vital bus.
7. After initially securing the #11 RHR pump, it failed to start when a restart was attempted due to a breaker failure.

Reactor at 100% power	Loss of vital bus 1B due to output transformer and regulating resistor failures	Reactor trip due to false low RCS loop flow signals resulting from vital bus failure	AFW Pump 12 failure to start due to bus failure	AFW Pump 13 failure to start due to misadjustment of overspeed trip mechanism	Operator manually starts AFW Pump 12	Decreasing Tavg plus safety injection inputs due to loss of vital bus result in inadvertant safety injection	Failure of 1B diesel generator, #11 charging pump, and #12 RHR pump to start due to loss of vital bus	Failure of #11 RHR pump to start after being initially secured due to pump breaker failure	Potential Severe Core Damage
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Loss of Vital Bus 1B	Reactor Trip	Auxiliary Feedwater and Secondary Heat Removal	PORV Demanded	PORV or PORV Isola- tion Valve Closure	High Pressure Injection	Long Term Core Cooling	Potential Severe Core Damage	Sequence No.
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NSIC 142462 — Sequence of Interest for Loss of a Vital Instrument Bus Initiates a Reactor Trip at Salem 1

* Not included in mitigation procedures.

CATEGORIZATION OF ACCIDENT SEQUENCE PRECURSORS

NSIC ACCESSION NUMBER: 142462

DATE OF LER: December 11, 1978

DATE OF EVENT: November 27, 1978

SYSTEM INVOLVED: Vital power, auxiliary feedwater, low pressure injection

COMPONENT INVOLVED: Inverter, AFW pump, breaker

CAUSE: The inverter failed due to a failed output transformer and regulating resistors. The AFW pump failed because of a mis-adjusted overspeed trip, and the breaker failed to

SEQUENCE OF INTEREST: Loss of vital instrument bus close.

ACTUAL OCCURRENCE: Loss of vital instrument bus and consequent reactor trip and safety injection.

REACTOR NAME: Salem 1

DOCKET NUMBER: 50-272

REACTOR TYPE: PWR

DESIGN ELECTRICAL RATING: 1090 MWe

REACTOR AGE: 2.3 yr

VENDOR: Westinghouse

ARCHITECT-ENGINEERS: Utility

OPERATORS: Public Service Electric & Gas Co.

LOCATION: 20 miles south of Wilmington, DE

DURATION: N/A

PLANT OPERATING CONDITION: 100% power

SAFETY FEATURE TYPE OF FAILURE: (a) inadequate performance; (b) failed to start; (c) made inoperable; (d) _____

DISCOVERY METHOD: operational transient

COMMENT: -