

METROPOLITAN EDISON COMPANY Subsidiary of General Public Utilities Corporation

Subject TH1-2 REPORTABLE OCCURRENCE NO. 78-22/99X

Location TH1 Nuclear Station
Middletown, Pa.

To G. J. TROFFER

Date June 12, 1978

Attached, please find the Unit 2 PORC input for the Special Report required by Tech Spec 3.5.2 for the ECCS Actuation that occurred on March 29, 1978.

If you have any questions on this matter, please contact either myself or R. W. Bensei at TH1 Ext. 309.

J. L. Seelinger

J. L. Seelinger
Unit Superintendent/
Technical Support

JLS:RWB:pld

cc: W.E. Potts

~~Date~~ 184 For ID
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INTER-OFFICE MEMORANDUM

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TMI-2. ECCS ACTUATION OF MARCH 29, 1978

SYNOPSIS OF EVENT

At 14:38:51 on March 29, 1978 TMI Unit 2 experienced an automatic actuation of Safety Injection (the Emergency Core Cooling System, ECCS) due to rapid depressurization of the Reactor Coolant System (RCS). Immediately prior to the incident, the unit was operating in Mode 2 at a power level of 4×10^{-9} amps on the intermediate range of the nuclear instrumentation, and zero power physics testing was in progress.

The rapid depressurization of the RCS was initiated by the pressurizer electromagnetic relief valve (RC-R2) opening upon de-energization of Vital Bus 2-1V. (See LER 78-21/3L for details of the 2-1V failure). The pressure switch (bistable), RCS-PS8, that opens RC-R2 on high RCS pressure failed close upon loss of Vital Bus 2-1V. At the time of the trip the unit was running on three Reactor Coolant Pumps. The loss of Vital Bus 2-1V caused the Reactor Protection System to sense a 0/2 Reactor Coolant Pump combination and a reactor trip resulted.

The operators took the correct immediate action by closing MU-V376 (the RCS Tetdown isolation valve) and verified that required safety injection components started. Followup action was hampered by the loss of temperature compensated pressurizer level indication and reactor coolant system pressure indication powered from Vital Bus 2-1V. Without position indication on the control console for RC-R2, the cause of the depressurization was not obvious to the operators.

The depressurization was terminated after approximately four minutes by re-energizing Vital Bus 2-1V through its alternate source. With Vital Bus 2-1V energized, RC-R2 automatically closed, and all instrumentation was returned to service. The minimum reactor coolant system pressure reached was 1173 psig. (See attached curve for depressurization rate and pressure recovery).

After Safety Injection was initiated, the High Pressure Injection Pumps (2 Make Up pumps) took suction from two sources: the Borated Water Storage Tank (BWST), and the Sodium Hydroxide Tank. The injection of sodium hydroxide was terminated after approximately 5 minutes; however, the injection resulted in a peak sodium concentration of 430 ppm, and a peak chloride concentration of approximately 4.0 ppm in the Reactor Coolant System. The chloride concentration exceeded the transient chloride limit of Technical Specification 3.4.7 and required entry into the associated action statement. Results of the required engineering evaluation are attached.

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Sequence of Events

Initial Conditions

Time Zero 1437
Reactor Power 4×10^{-9} amps
Reactor Coolant Pumps running 1A, 1B, 2B
Tov 535°F
R.C.S. Pressure 2220 psig
Pressurizer Level 45"

All ICS Stations were in HAND except the turbine bypass valves and the Startup Feedwater Valves.

| | Mins | Sec. | |
|---|------|------|---|
| T | 0:00 | | Vital Bus 2-1V de-energized. |
| T | 0:01 | | Pressurizer Electromagnetic Relief Valve Open, initiating RCS de-pressurization. Reactor Trip. Trip initiated by 2 pumps in "A" RCS Loop tripped. RC-P-2A was off and loss of power to the power monitor for RC-P-1A signalled the RPS that RC-P-1A was also off. |
| T | 1:53 | | SFAS Actuation A and B for Safety Injection Initiated. HPI pumps taking suction from SWST and NaOH tank. |
| T | 2:23 | | Safety Injection Signal Bypassed. |
| T | 4:13 | | Vital Bus 2-1V re-energized, RC-R2 closed, Depressurization terminated. |
| T | 5:00 | | OH-V8A and B closed. |

Conclusions

Operator Action

1. Operator response to re-energize Vital Bus 2-1V by closing the Alternate Source Breaker, located one level above the control room within 5 minutes of the event was very good.
2. The operators did not know the cause of event until after it was terminated, due to lack of indication for RC-R2. If indication would have been available, the operator could have closed the associated block valve.
3. The operators experienced difficulty in determining which control room indication was correct since indicators were not labeled to indicate their power source.

Equipment Performance

1. All equipment required for Safety Injection performed their intended functions.
2. Opening the OH-V8's (NaOH Tank Outlet Valves) on a Safety Injection signal should be changed to prevent inadvertent sodium and chloride contamination of the RCS.
3. RC3-PS8 high pressure contact should be changed to fail open on loss of power to prevent inadvertent opening of RC-R2 if functioning at its high setpoint.
4. Position indication for RC-R2 should be provided in the control room.

Procedures

1. Procedures need to be developed to key the operator as to how components fail on loss of Vital Buses and what alternate instrumentations and controls are available.

Other

1. Control Room indicators should be labeled to indicate their power source.

Follow up Action

Equipment Changes

1. A design change has been incorporated to change. "The loss of power fail position" for RC3-PS8 High pressure contact from closed to open, when functioning at its high setpoint.

2. An indicating light for RC-R2 position (solenoid energized) has been provided in the control room.
3. A design change has been incorporated to change the actuation logic for DH-V8 and B. The valves' control logic was modified to open the valves on an RB, Isolation and Cooling Signal or a Safety Injection Signal concurrent with a decrease in SWST level.

Procedure changes

1. A loss of Vital Bus Abnormal Procedure is being prepared by the unit staff.

Others

1. Vital control room indicators are being labeled to indicate their power source.