# LICENSEE EVENT REPORT (LER)

| FACILITY NAME (1) | DOCKET NUMBER (2) | PAGE (3) |
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TITLE (4)
Turbine Trip/Reactor Trip on Moisture Separator Reheater High Level

| EVENT DATE (5) | | | LER NUMBER (6) | | | REPORT DATE (7) | | | OTHER FACILITIES INVOLVED (8) | |
|---|---|---|---|---|---|---|---|---|---|---|
| MONTH | DAY | YEAR | YEAR | SEQUENTIAL NUMBER | REVISION NUMBER | MONTH | DAY | YEAR | FACILITY NAMES | DOCKET NUMBER(S) |
| | | | | | | | | | N/A | 0 5 0 0 0 |
| 0 1 | 3 0 | 9 3 | 9 3 | – 0 0 1 | – 0 0 | 0 2 | 2 4 | 9 3 | N/A | 0 5 0 0 0 |

OPERATING MODE (9): 1

POWER LEVEL (10): 0 9 6

THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check one or more of the following) (11)

| | | | |
|---|---|---|---|
| [ ] 20.402(b) | [ ] 20.405(c) | [X] 50.73(a)(2)(iv) | [ ] 73.71(b) |
| [ ] 20.405(a)(1)(i) | [ ] 50.36(c)(1) | [ ] 50.73(a)(2)(v) | [ ] 73.71(c) |
| [ ] 20.405(a)(1)(ii) | [ ] 50.36(c)(2) | [ ] 50.73(a)(2)(vii) | [ ] OTHER (Specify in Abstract below and in Text, NRC Form 366A) |
| [ ] 20.405(a)(1)(iii) | [ ] 50.73(a)(2)(i) | [ ] 50.73(a)(2)(viii)(A) | |
| [ ] 20.405(a)(1)(iv) | [ ] 50.73(a)(2)(ii) | [ ] 50.73(a)(2)(viii)(B) | |
| [ ] 20.405(a)(1)(v) | [ ] 50.73(a)(2)(iii) | [ ] 50.73(a)(2)(x) | |

LICENSEE CONTACT FOR THIS LER (12)

| NAME | TELEPHONE NUMBER | |
|---|---|---|
| | AREA CODE | |
| Thomas R. Bradish, Nuclear Regulatory Affairs Manager | 6 0 2 | 3 9 3 – 5 4 2 1 |

COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT (13)

| CAUSE | SYSTEM | COMPONENT | MANUFAC-TURER | REPORTABLE TO NPRDS | CAUSE | SYSTEM | COMPONENT | MANUFAC-TURER | REPORTABLE TO NPRDS |
|---|---|---|---|---|---|---|---|---|---|
| X | S N | L C | M 0 4 0 | N | | | | | |
| | | | | | | | | | |

| SUPPLEMENTAL REPORT EXPECTED (14) | | EXPECTED SUBMISSION DATE (15) | MONTH | DAY | YEAR |
|---|---|---|---|---|---|
| [ ] YES (If yes, complete EXPECTED SUBMISSION DATE) | [X] NO | | | | |

ABSTRACT (Limit to 1400 spaces, i.e., approximately fifteen single-space typewritten lines) (16)


At approximately 0603 MST on January 30, 1993, Palo Verde Unit 1 was in Mode 1 (POWER OPERATION) operating at approximately 96 percent power when a Unit 1 Main Turbine trip occurred. Control Room operators initiated a manual reactor trip after receiving high pressurizer pressure pretrip alarms in anticipation of the Reactor Protection System high pressurizer pressure trip.

At approximately 0615 MST on January 30, 1993, Control Room operators stabilized the plant in Mode 3 (HOT STANDBY). The Shift Supervisor classified the event as an uncomplicated reactor trip in accordance with Emergency Plan Implementing Procedures. No other safety system responses occurred and none were required.

APS Maintenance personnel have determined that the cause of the Main Turbine trip was due to the failure of Moisture Separator Reheater D Drain Tank high level controller. This resulted in a high level condition in Moisture Separator Reheater D which actuated the Main Turbine's electrical trip system.

No previous similar events have been reported pursuant to 10CFR50.73.

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TEXT

I. DESCRIPTION OF WHAT OCCURRED:

A. Initial Conditions:

At 0603 MST on January 30, 1993, Palo Verde Nuclear Generating Station (PVNGS) Unit 1 was in Mode 1 (POWER OPERATION) at approximately 96 percent power.

B. Reportable Event Description (Including Dates and Approximate Times of Major Occurrences):

Event Classification: An event that resulted in a manual actuation of the Reactor Protection System (RPS)(JC).

At approximately 0603 MST on January 30, 1993, a PVNGS Unit 1 Main Turbine (TA) trip occurred. Control Room operators (utility, licensed) initiated a manual reactor (RCT)(AC) trip after receiving the high pressurizer pressure pretrips on RPS channels A, B, and C in anticipation of a RPS high pressurizer (AB) pressure reactor trip. The manual trip functioned as designed by generating a trip signal that opened the Reactor Trip Switchgear Breakers (RTSGB)(AA) causing the Control Element Assemblies (CEA)(AA) to drop.

At approximately 0615 MST, on January 30, 1993, Control Room operators stabilized the plant in Mode 3 (HOT STANDBY). The Shift Supervisor (utility, licensed) classified the event as an uncomplicated reactor trip in accordance with Emergency Plan Implementing Procedures. No other safety system responses were required and none occurred.

Prior to the event, the 6A High Pressure Feedwater Heater (HPFWH)(HX)(SJ) level bridle (JB) was being modified in accordance with an approved Design Change Notice (DCN). This modification was made to permit the control of the water level on the shell side of the heat exchanger at a higher level. To support the modification, Operations personnel (utility, nonlicensed) isolated the extraction steam and feedwater to the A HPFWH train. Part of the isolation procedure required the Moisture Separator Reheater (MSR)(SA) Drain Tank levels to be controlled by their respective high level controllers.

The MSR Drain Tanks are connected to the MSRs and have two level controllers (normal and high). The normal level controller routes the condensate from the MSR Drain Tank, through the Heater Drain Tank and pump, and eventually to the suction of the Main Feedwater (SJ) pump. This flow path supplies a portion of the feedwater flow required at 100 percent power. The MSR Drain Tank high level

controller routes the condensate from the MSR Drain Tank directly to the Main Condenser (COND)(SG) on a high level. The MSR Drain Tank high level controller prevents the MSR reheating steam tube bundles from becoming covered with condensate. Covering these bundles reduces the MSR's efficiency and could cause an unacceptable amount of moisture to "carry-over" in the reheated steam to the Main Turbine. This "carry-over" could damage the turbine blades. Each MSR drain system has level sensors that actuate the Main Turbine's electrical trip system to prevent any "carry-over." This signal is set at 3 inches below the bottom of the MSR.

To isolate the MSR Drain Tank from the HPFWH train, the high level controller setpoint is lowered below the normal level controller setpoint such that the control valve to the HPFWH train is closed and the dump valve to the Main Condenser is open. After completion of the modification to the 6A HPFWH, an Auxiliary Operator (utility, nonlicensed) was transferring the level control for the D MSR Drain Tank back to normal. While raising the setpoint on the high level controller, a high level condition in MSR D occurred. The normal level controller responded to the increasing level, but the normal level control valve did not open. Also, the high level controller did not respond fast enough to the resulting high level and open the dump valve to the Main Condenser. This caused the level in the D MSR Drain Tank to increase above the Main Turbine trip setpoint for high MSR level, actuating a Main Turbine trip. This caused an increase in the primary plant pressure and the reactor was manually tripped by the Control Room operators.

At approximately 0615 MST, on January 30, 1993, Control Room operators stabilized the plant in Mode 3 (HOT STANDBY). The Shift Supervisor (utility, licensed) classified the event as an uncomplicated reactor trip in accordance with Emergency Plan Implementing Procedures. No other safety system responses were required and none occurred.

C. Status of structures, systems, or components that were inoperable at the start of the event that contributed to the event:

Other than the isolated D MSR Drain Tank normal level control valve identified in Section I.I., no other structures, systems, or components were inoperable at the start of the event that contributed to the event.

D. Cause of each component or system failure, if known:

During troubleshooting, the D MSR Drain Tank high level dump valve controller was determined to be defective. The controller did not operate smoothly and did not control the dump valve properly above

TEXT

40 percent open. The apparent cause of the failure was determined to be binding of the position carriage or the alignment of internal controller components. APS Engineering personnel are conducting an equipment root cause of failure analysis for the D MSR Drain Tank high level controller as identified in Sections I.I and III.B.

E. Failure mode, mechanism, and effect of each failed component, if known:

As described in Section I.B, failure of the D MSR Drain Tank high level controller resulted in a high level in the D MSR. This resulted in actuation of the Main Turbine's electrical trip system on high MSR level resulting in a trip of the Unit 1 Main Turbine.

F. For failures of components with multiple functions, list of systems or secondary functions that were also affected:

Not applicable - no failures of components with multiple functions were involved.

G. For a failure that rendered a train of a safety system inoperable, estimated time elapsed from the discovery of the failure until the train was returned to service:

Not applicable - no failures that rendered a train of a safety system inoperable were involved.

H. Method of discovery of each component or system failure or procedural error:

The failure of the D MSR Drain Tank high level control valve high level controller was discovered during troubleshooting. Procedural errors were not identified.

I. Cause of Event:

APS Maintenance personnel (utility, nonlicensed) have determined that the cause of the Main Turbine trip was the failure of the D MSR Drain Tank high level controller. This resulted in a high level condition in D MSR and actuation of the Main Turbine's electrical trip system resulting in a Main Turbine trip.

An investigation of this event was conducted in accordance with the APS Incident Investigation Program. An action plan was developed to determine why the D MSR Drain Tank high level control valve did not prevent a high level in the D MSR. A functional test of the valve, performed by PVNGS Maintenance personnel, identified that the controller was defective. The initial testing determined that the

controller did not control the dump valve smoothly above 40 percent open and evidence that pliers or vice grips may have been used to turn the setpoint adjustment on the controller because of a loose adjustment knob was found. The faulty controller was replaced (SALP Cause Code E: Component Failure).

APS Engineering personnel are conducting an equipment root cause of failure analysis for the D MSR Drain Tank high level controller. If analysis results differ significantly from the apparent cause, a supplement to this report will be submitted.

The Investigation Team also evaluated the failure of the D MSR Drain Tank normal level control valve to respond and control level. Following the event, a walkdown of the system identified a closed unnumbered instrument air valve between the D MSR Drain Tank normal level controller and the associated control valve. This closed air valve prevented the normal level control valve from functioning correctly.

The procedures used to remove and restore the normal level controller and valve were reviewed. No reference to the unnumbered instrument air valve was found. No clearances were found that operated or used this unnumbered instrument air valve as a boundary for work or equipment isolation. Also, no work documents were found that would have operated this unnumbered instrument air valve. The Investigation Team is continuing to review the procedures governing these level controllers to determine procedural adequacy and expectations of operator performance. These issues will be addressed within the Incident Investigation program.

If a procedural or personnel error is identified that would significantly change the readers perception of the cause of the event, a supplement to this LER will be submitted.

J. Safety System Response:

The reactor trip in this event was a manual action in anticipation of a RPS high pressurizer pressure trip following the Main Turbine trip. No other safety system responses occurred and none were necessary.

K. Failed Component Information:

MAGNETROL Modulevel Pneumatic Proportional Level Controller
Model 6450-P-6560BSW

II. ASSESSMENT OF THE SAFETY CONSEQUENCES AND IMPLICATIONS OF THIS EVENT:

Nuclear Fuel Management (NFM) performed an assessment of the event and determined that the equipment and systems assumed in the Updated Final Safety Analysis Report (UFSAR) Chapter 15 were functional and performed as required. Abnormal transients were not identified following the reactor trip. The scenarios defined in UFSAR Chapter 6 concerning the Loss of Coolant Accident (LOCA) were not challenged during this event.

A turbine trip, characterized as a decrease in heat removal, is normally evaluated for peak pressures. The Reactor Coolant System (RCS) peak pressure of 2369 pounds per square inch absolute (psia) in this event is less than the 2742 psia peak RCS pressure for a Loss of Condenser Vacuum (LOCV) event. This is the UFSAR Chapter 15 limiting event in this category. The assessment concluded that this event did not result in a transient more severe than those already analyzed. The event did not cause any violation of Specified Acceptable Fuel Design Limits (SAFDL). Safety system actuations did not occur and were not required.

The event did not result in any challenges to the fission product barriers or result in any releases of radioactive materials. Therefore, there were no adverse safety consequences or implications as a result of this event. This trip did not adversely affect the safe operation of the plant or the health and safety of the public.

III. CORRECTIVE ACTION:

A. Immediate:

The failed high level controller was replaced and the new controller was tested and placed in service. The new controller functioned as designed.

Unit 1 Maintenance and Operations personnel functionally tested all of the normal and high level controllers for the High Pressure Feedwater Heaters (SJ), Low Pressure Feedwater Heaters (SJ), MSR Drain Tanks (SN), and First and Second Stage MSR Drain Tanks (SN). This consisted of manually raising and lowering the carriages on the controllers, watching the control valves stroke, and visually inspecting each pneumatic controller in the system. Only minor problems such as broken and sticking gauges, air regulator settings, air leaks, and worn gaskets were noted. These minor problems were corrected upon discovery.

A complete valve line-up for the Unit 1 Train A High Pressure Feedwater Heater and Extraction Steam was conducted and no other valves were found mispositioned.

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TEXT

A Night Order was issued to all three units discussing the event and reminding Operations personnel of the need to maintain positive control of plant equipment.

B. Action to Prevent Recurrence:

As discussed in Section I.I, APS Engineering personnel are conducting an equipment root cause of failure analysis to determine the failure mechanism of the high level controller. If the analysis results differ significantly from the apparent cause, a supplement to this report will be submitted to describe the final root cause of failure. This analysis is expected to be completed by May 28, 1993.

Training personnel will evaluate this event in accordance with approved procedures for inclusion into Industry Events Training for Operations, Maintenance, and Work Control personnel. This evaluation is expected to be completed by July 30, 1993.

IV. PREVIOUS SIMILAR EVENTS:

There are no previous similar events reported pursuant to 10CFR50.73 where a Main Turbine trip, caused by MSR high level, resulted in a manual reactor trip.

V. ADDITIONAL INFORMATION:

The Plant Review Board, the Management Response Team, and the Plant Manager reviewed the Incident Investigation report and authorized a Unit restart according to approved procedures. Unit 1 entered Mode 2 (STARTUP) at approximately 1220 MST on January 31, 1993 and Mode 1 (POWER OPERATION) at approximately 1602 MST on January 31, 1993. Unit 1 was synchronized to the grid at approximately 0157 MST on February 1, 1993.