LICENSEE EVENT REPORT (LER)

FACILITY NAME (1)	DOCKET NUMBER (2)	PAGE (3)
Palo Verde Unit 1	0 5 0 0 0 5 2 8	1 OF 0 7

TITLE (4)

Analyses Failed to Consider as an Initial Condition the One Percent Shutdown Margin for ARI

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 NUMBERS
									Palo Verde Unit 2	0 5 0 0 0 5 2 9
0 3	0 3	9 5	9 5	- 0 0 2	- 0 1	0 8	2 5	9 5	Palo Verde Unit 3	0 5 0 0 0 5 3 0

OPERATING MODE (9)	1	THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check one or more of the following) (11)									
POWER LEVEL(10)	1 0 0		20.402(b)		20.405(c)		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		
			20.405(a)(1)(iii)		50.73(a)(2)(i)		50.73(a)(2)(viii)(A)		below and in Text, NRC Form		
			20.405(a)(1)(iv)	X	50.73(a)(2)(ii)		50.73(a)(2)(viii)(B)		366A)		
			20.405(a)(1)(v)		50.73(a)(2)(iii)		50.73(a)(2)(x)				

LICENSEE CONTACT FOR THIS LER (12)

NAME	TELEPHONE NUMBER
Burton A. Grabo, Section Leader, Nuclear Regulatory Affairs	AREA CODE 6 0 2 3 9 3 - 6 4 9 2

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

CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NPRDS		CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NPRDS	

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 1335 MST on March 3, 1995, Palo Verde Units 1 and 3 were in Mode 1 (POWER OPERATION) and Unit 2 was in Mode 6 (REFUELING) when it was identified by APS Nuclear Fuel Managem ent personnel that Technical Specifications (TS) Limiting Conditions for Operation (LCO) 3.5.2 and 3.3.2 are inconsistent with the assumptions used in the Steam Line Break (SLB) analysis for validation of the Temperature Dependent Shutdown Margin (TDSDM) while in Mode 3 (HOT STANDBY) above 500 degrees Fahrenheit (F).

Additionally, a concern was identified that the SLB analysis only addressed the shutdown margin (SDM) TS LCO 3.1.1.2 that applies with any rod withdrawn. This TS LCO provides a minimum allowed SDM that varies between 4 percent and 6.5 percent as a function of Reactor Coolant System (RCS) temperature. However, TS LCO 3.1.1.1 is applicable with all rods in (ARI)and requires only 1 percent SDM. The SLB analysis did not consider the more restrictive 1 percent SDM TS LCO. It has been determined that the 1 percent SDM TS LCO 3.1.1.1 does not provide adequate SDM for the limiting license basis SLB event in Mode 3.

As an immediate corrective action, administrative controls were established to apply TS LCO 3.5.2 during any operation above 500 degrees F, ensuring pressurizer pressure is maintained at 1700 psia or greater any time in Mode 3 with Tcold above 500 degrees F and apply TS LCO 3.1.1.2 for any Unit in Mode 3.

Previously similar events have been reported pursuant to 10CFR50.73 in LER 528/94-002-02, dated October 28, 1994.

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1. REPORTING REQUIREMENT:

This LER 528/529/530/95-002 is being written to report events that resulted in the power plant being in an unanalyzed condition that significantly compromised plant safety as specified in 10CFR50.73(a)(2)(ii)(A).

Specifically, at approximately 1335 MST on March 3, 1995, Palo Verde Units 1 and 3 were in Mode 1 (POWER OPERATION), operating at approximately 100 and 86 percent power respectively, and Unit 2 was in Mode 6 (REFUELING, at approximately atmospheric pressure and 104 degrees Fahrenheit) when APS Nuclear Fuel Management (NFM) personnel (utility, non-licensed) identified that Technical Specifications Limiting Conditions for Operation (TS LCO) 3.5.2 and 3.3.2 are inconsistent with assumptions used in the Steam Line Break (SLB) analysis for validation of the Temperature Dependent Shutdown Margin (TDSDM) while in Mode 3 (HOT STANDBY) above 500 degrees Fahrenheit (F).

TS LCO 3.5.2 requires that one Emergency Core Cooling System (ECCS) subsystems (BP, BQ, SA) shall be OPERABLE in Modes 3 with pressurizer pressure less than 1837 pounds per square inch absolute (psia).

TS LCO 3.3.2 requires that the low pressurizer pressure setpoint for Safety Injection Actuation Signal (SIAS)(SA, JE) be set at 1837 psia pressurizer pressure. TS LCO 3.3.2 also requires, "In Modes 3 and 4, the pressurizer pressure may be decreased manually, to a minimum of 100 psia, as pressurizer pressure is reduced, provided the margin between the pressurizer pressure and this value is maintained at less than or equal to 400 psi; the setpoint shall be increased automatically as pressurizer pressure is increased until the trip setpoint is reached."

The SLB analysis indicates that at Tcold greater than 500 degrees F, credit for boron injection via a SIAS is necessary to ensure acceptable results. In Mode 3, at pressurizer pressure less than 1837 psia, TS LCO 3.5.2 only requires 1 HPSI pump to be operable. Two HPSI pumps, however, must be operable in order to meet the single failure criteria for a SLB event.

TS LCO 3.3.2 allows the setpoint to be adjusted 400 psia below pressurizer pressure. Should a SLB occur under these conditions, a void formation in the RVUH could delay or prevent RCS pressure from dropping below the SIAS setpoint, such that SI may not occur in time to prevent a return to criticality.

Additionally, a concern was identified that the SLB analysis only addressed the shutdown margin (SDM) TS LCO 3.1.1.2 that applies with any rod withdrawn. This TS LCO provides a minimum allowed SDM that varies between 4 percent and 6.5 percent as a function of Reactor Coolant System (RCS)(AB) temperature. However, TS LCO 3.1.1.1 is applicable with all rods in (ARI)and requires only 1 percent SDM in Modes 3 through 5. The SLB analysis did not consider the more restrictive 1 percent SDM TS LCO. It has been determined for the current cycles that the 1 percent SDM TS LCO does not provide adequate SDM for the SLB event in Mode 3 due to a decrease in rod worth from low leakage core designs.

TEXT

2. EVENT DESCRIPTION:

On February 22, 1995, APS NFM personnel identified that TS LCO 3.5.2 and 3.3.2 are inconsistent with assumptions used in the SLB analysis for validation of the TDSDM while in Mode 3 above 500 degrees F.

Additionally, a concern was identified that the SLB analysis only addressed the SDM TS LCO 3.1.1.2 that applies with any rod withdrawn.

Prior to the event, on October 28, 1994, LER 528/529/530/ 94-002-02 was submitted to report conditions regarding TS LCOs that would not ensure plant operation was maintained within the assumptions of the safety analysis as required by 10CFR50.36 (See Section 7).

One of the actions to prevent recurrence was to develop a long term action plan to review the safety analysis assumptions and groundrules document.

As part of the action plan, on February 22, 1995, while reviewing the SLB analysis (as part of a long term project to capture safety analysis assumptions) it was discovered that the conditions assumed in the SLB analysis were inconsistent with TS. The analysis evaluates TDSDM requirements for a SLB event in Modes 3 and 4.

The analysis indicates that at Tcold greater than 500 degrees F, credit for boron injection via a SIAS is necessary to ensure acceptable results. In Mode 3, at pressurizer pressure less than 1837 psia, TS LCO 3.5.2 only requires 1 HPSI pump to be operable. Two HPSI pumps, however, must be operable in order to meet the single failure criteria for a SLB event. Secondly, TS LCO 3.3.2 allows the SIAS setpoint to be reduced in Mode 3 as required to maintain the setpoint within 400 psi of pressurizer pressure during a controlled depressurization/cooldown. Should a SLB occur under these conditions, the formation of a void in the reactor vessel upper head (RVUH)(AB) could delay or prevent reactor coolant system (RCS) pressure from dropping below SIAS setpoint, such that SI may not occur in time to prevent a return to criticality. A condition report/disposition request (CRDR) document was written to initiate an investigation of this condition.

The initial results of the investigation identified that this discrepancy had been first identified during development of the Safety Analysis Basis Document (SABD) in 1994 and was documented as an action item requiring additional follow-up. A cursory review was performed to identify if there were any additional discrepancies similar to the one identified. This review determined that there was one other SABD action item similar to the above condition. On February 28, 1995, a CRDR was written to investigate a concern that the wrong shutdown margin had been assumed for the startup of an inactive reactor cooling pump (RCP)(AB) analysis.

On March 3, 1995, the investigation determined that there was adequate negative reactivity in the core to ensure that during the startup of an inactive RCP, the core would not return to criticality. Therefore, this condition was determined to have no safety significance because the condition is bounded by the analysis.

TEXT

On March 1, 1995, while reviewing the SLB analysis, the investigation identified that the analysis failed to consider that the SDM initial condition could be as low as 1 percent with ARI conditions.

On March 3, 1995, the investigation determined that TS LCO 3.1.1.1 does not preserve adequate SDM to limit the consequences of a SLB in Mode 3 with ARI conditions. A non-emergency notification was made via the ENS per 10CFR50.72(b)(1)(ii)(A).

3. ASSESSMENT OF THE SAFETY CONSEQUENCES AND IMPLICATION OF THIS EVENT:

A Mode 3 SLB accident has not occurred at PVNGS; therefore, this event did not result in any challenges to the fission product barriers or result in any releases of radioactive materials, and there were no adverse safety consequences or implications as a result of this event. This event did not adversely affect the safe operation of the plant or the health and safety of the public.

A Probabilistic Risk Assessment (PRA) was performed for both one and two trains of HPSI being available to mitigate the event with a conservative assumption of a Loss of Offsite Power event occurring in parallel. The frequency for a return to power (RTP) event resulting from a steam line break in Mode 3 with one or two HPSI trains available is 1 E-10/yr and 9 E -12/yr respectively. The low frequency is based primarily on (1) low probability of a stuck rod (3.04 E-05) which is required for a RTP event to occur and (2) the unit spends a minimal amount of time in Mode 3 (than 5 percent).

Based on the low frequency for occurrence of a RTP event, from a probabilistic perspective, there is a negligible safety risk associated with the potential omissions in Technical Specification 3/4.5.2 (ECCS Subsystems) and 3/4.3.2 (ESF Instrumentation).

4. CAUSE OF THE EVENT:

An evaluation for each event was performed in accordance with the APS Corrective Action Program. The root cause analyses for the above events were performed by ABB Combustion Engineering (ABB-CE, contractor personnel) and reviewed by APS.

The root cause analyses for TS 3.1.1.1 (ARI SDM) and 3.1.1.2 (TDSDM) concluded that:

1) The conclusion that TS 3.1.1.1 (ARI SDM) was less limiting than 3.1.1.2 was not supported in the analysis documentation.; and

2) Lack of coordination and the unclear division of responsibilities between the Systems and Fuels groups at ABB-CE.

APS concurs with these root causes (SALP Cause Code B: Design, Manufacturing, Construction/Installation and SALP Cause Code A: Personnel Error, respectively). The ABB-CE personnel errors were determined to be cognitive errors.

TEXT

A statement was made in the Cycle 1 ABB-CE analysis about 3.1.1.1 being less limiting than 3.1.1.2, however, the bases of the statement was not included in the Cycle 1 document. There was a failure to recognize the impact of changing the worth of the worst stuck rod. The concept of TDSDM was, itself, new to the analysis groups at this time. Methodologies and procedures for performing this work were not fully developed, nor was the licensing basis fully established. No unusual characteristics of the work location (e.g., noise, heat, or poor lighting) directly contributed to this event.

5. STRUCTURES, SYSTEMS, OR COMPONENTS INFORMATION:

No structures, systems, or components were inoperable at the start of the event which contributed to this event. There were no component or system failures involved; therefore, no safety systems were rendered inoperable. No components with multiple functions were involved. There were no safety system actuations and none were required.

6. CORRECTIVE ACTIONS TO PREVENT RECURRENCE:

On February 22, 1995, a night order was issued to administratively apply TS LCO 3.5.2 during any Mode 3 operation and to ensure that pressurizer pressure is maintained at 1700 psia or greater any time in Mode 3 with Tcold above 500 degrees Fahrenheit.

On March 1 and 2, 1995, procedures 40OP-9ZZ10 Hot Standby to Cold Shutdown Mode 3 to Mode 5 and 40OP-9ZZ01 Cold Shutdown to Hot Standby Mode 5 to Mode 3 (respectively) were revised instructing operators not to exceed a RCS temperature of 500 degrees F with RCS pressure less than 1700 psia (procedure 40OP-9ZZ01) and not to make either HPSI pump inoperable with RCS temperature greater than 500 degrees F (procedure 40OP-9ZZ10). Associated actions were also included if the above conditions were not met.

On March 3, 1995, a night order was issued to administratively apply TS 3.1.1.2 to ensure that the TDSDM is maintained in Mode 3.

On March 8, 1995, the ARI core data book SDM curves were modified to reflect any rod withdrawn requirements corresponding to LCO 3.1.1.2.

On April 7, 1995, ABB-CE performed calculations to verify that the above administrative controls would ensure that plant operation is consistent with the operating space explicitly covered in the safety analysis. The analyses demonstrated, that a SLB initiated from plant operation in compliance with TS 3.1.1.2 and the administrative controls in place, would have consequences no more severe than by those already presented in the Safety Analysis Report (SAR).

On April 19, 1995, the ABB-CE root cause analysis concluded that the division of responsibilities which existed in the 1985 to 1988 time frame no longer exists. In 1994, the Project Director and Reload Engineering Project Manager positions were created to ensure that the necessary coordination takes place. The root cause analysis team recommended the following long term corrective actions:

TEXT

1) On June 1, 1995, ABB-CE Engineering Operations management modified the proposal development and project execution processes so that provision for the first time and cycle-by-cycle impact of all proposals and projects on FSAR, Reload Analysis Reports, TS, Administrative Procedures and the analyses that support these be included in both the proposal scope and project plan, as appropriate, and coordinated with the ABB-CE Reload Engineering Project Manager. and,

2) Propose a modified TS 3.1.1.1 to the NRC to insure that the consequences of SLB from Mode 3 and higher are acceptable and perform sufficient safety evaluation to verify the new TS. Update the Summary of Transients documents for Palo Verde Units 1 and 2 Cycle 6 and Unit 3 Cycles 5 and 6 so that all TS associated with TDSDM are screened, as appropriate, each fuel cycle.

A changes to TS 3.1.1.1, 3.3.2 and 3.5.2 to correct this condition are expected to be submitted to the NRC for review by no later than January 1996.

On June 12, 1995, APS NFM personnel identified that the guidance provided in procedures 40OP-9ZZ10 and 40OP-9ZZ01 did not include instrument uncertainties for RCS temperature and pressurizer pressure.

On June 14, 1995, preliminary calculations indicated that RCS indicated temperature would be 485 degrees F and that the SIAS setpoint should be at least 140 psi above the saturation pressure for the indicated temperature.

Based on these preliminary calculations and the PRA, it was determined that the current procedural guidance was adequate until the calculation was finalized.

On July 26, 1995, the instrument loop uncertainties were finalized and this information was incorporated into procedures 40OP-9ZZ10 and 40OP-9ZZ01.

Procedures 40OP-9ZZ10 and 40OP-9ZZ01 (effective 08/04/95) now require operators not to make either HPSI pump inoperable with the RCS temperature greater than or equal to 485 degrees F or a pressure of greater than or equal to 1837 psia. Also, the operators are instructed to ensure that the SIAS setpoint is greater than or equal to the saturation pressure plus 140 psi corresponding to indicated RCS Cold Leg temperature while RCS Cold Leg temperature is greater than or equal to 485 degrees F.

If the above conditions can not be maintained then the operators are instructed to:

1) Comply with TS LCO 3.5.2 action a, if either HPSI pump is inoperable with RCS temperature greater than or equal to 485 degrees F, or RCS pressure greater than or equal to 1837 psia. ,and

2) Restore the SIAS setpoint to at least 140 psi greater than saturation pressure or reduce RCS Cold Leg temperature to less than 485 degrees F within two hours, while RCS Cold Leg temperature is greater than or equal to 485 degrees F.

TEXT

The Summary of Transients documents for Palo Verde Units 1 and 2 Cycle 6 and Unit 3 Cycles 5 and 6 has been updated by ABB-CE so that all TS and safety analysis assumptions associated with TDSDM are capable of being screened, as appropriate, each fuel cycle. Also, analysis has been completed to justify a new TS for 3.1.1.1.

Actions required from the above investigations will be tracked by the Commitment Action Tracking System (CATS).

7. PREVIOUS SIMILAR EVENTS:

A similar event to this condition has been reported pursuant to 10CFR50.73 by LER 528/94-002-02, dated October 28, 1994. This LER reported conditions where TS LCOs would not ensure plant operation was maintained within the assumptions of the safety analysis as required by 10CFR50.36.

Additionally, the supplement identified a condition where the operating procedures for exercising Control Element Assemblies (CEA) in Modes 3, 4, and 5 could allow assumptions used in the subcritical CEA bank withdrawal analysis to be violated.

Corrective actions taken for the previous event would not have prevented this event.