Form 1062.01A

NRC Form 366
(9-83)

U.S. Nuclear Regulatory Commission
Approved OMB No. 3150-0104
Expires: 8/31/85

LICENSEE EVENT REPORT (LER)

FACILITY NAME (1) Arkansas Nuclear One, Unit One

DOCKET NUMBER (2) 0 5 0 0 0 3 1 3 1 | PAGE (3) OF 0 3

TITLE (4) Personnel Error Results in an Inadequate Procedure Which Causes Calculated Reactor Shutdown Margins Less Conservative Than Assumed in the Plant's Design Basis.

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)
0 2	0 1	8 9	8 9	0 0 5	0 0	0 4	1 3	8 9		0 5 0 0 0
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OPERATING MODE (9)	N	THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check one or more of the following) (11)					
POWER LEVEL (10) 0 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
	__	20.405(a)(1)(iii)	__	50.73(a)(2)(i)	__	50.73(a)(2)(viii)(A)	Abstract below and
	__	20.405(a)(1)(iv)	X	50.73(a)(2)(ii)	__	50.73(a)(2)(viii)(B)	in Text, NRC Form
	__	20.405(a)(1)(v)	__	50.73(a)(2)(iii)	__	50.73(a)(2)(x)	366A)

LICENSEE CONTACT FOR THIS LER (12)

Name	Telephone Number Area Code
Larry Taylor, Nuclear Safety and Licensing Specialist	5 0 1 9 6 4 - 3 1 0 0

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

SUPPLEMENT REPORT EXPECTED (14)

__ Yes (If yes, complete Expected Submission Date) X No

EXPECTED SUBMISSION DATE (15): Month | Day | Year

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

On February 1, 1989, with the plant in cold shutdown, it was determined by Reactor Engineering personnel that the "Reactivity Balance Calculation" procedure was inadequate in that it did not consider the control rod of greatest worth being withdrawn from the core when calculating required shutdown boron concentrations for Reactor Coolant System (RCS) temperatures below 275 degrees. The ANO-1 Safety Analysis Report (SAR) states in the design basis assumptions for a control rod ejection (CRE) accident that when the reactor is subcritical, the RCS boron concentration is maintained at a level that ensures that the reactor is at least one percent subcritical with the control rod of greatest worth fully withdrawn from the core. The procedural inadequacy has existed since 1976 and using it to calculate shutdown boron concentrations had resulted in shutdown margins less conservative than assumed in the SAR. Additionally, for one cycle of operation, it could also not be assured that the reactor would have remained subcritical had a CRE accident occurred. The cause of this event was personnel error. The engineer responsible for the procedure revision in 1976 did not perform an adequate review of the basis for the CRE accident. The reactivity balance procedure has been revised to correct the deficiency. The significance of this event is reduced by the fact that the probability of a CRE accident is greatly reduced with the plant in cold shutdown at reduced RCS pressure.

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TEXT (If more space is required, use additional NRC Form 366A's) (17)

A. Plant Status

At the time of discovery of this condition on February 1, 1989, Arkansas Nuclear One, Unit 1 (ANO-1) was in the cold shutdown condition with the Reactor Coolant System (RCS) [AB] depressurized to atmospheric pressure.

B. Event Description

On February 1, 1989, while conducting a procedure review, it was determined by Reactor Engineering personnel that the "Reactivity Balance Calculation" procedure was inadequate in that it did not consider the control rod of greatest worth being withdrawn from the core when calculating required shutdown boron concentrations whenever RCS temperature was below 275 degrees.

The ANO-1 Safety Analysis Report (SAR) states as a design basis assumption for the control rod ejection (CRE) accident analysis that "when the reactor is subcritical, the boron concentration is maintained at a level that ensures that the reactor is at least one percent subcritical with the control rod of greatest worth fully withdrawn from the core." The "Reactivity Balance Calculation" procedure, however, contained a statement instructing the operators to not assume or account for the most reactive control rod being stuck out of the core with RCS temperature below 275 degrees. An investigation was conducted which revealed that this statement was added to the procedure by a revision implemented in August 1976. As a result, the boron concentrations maintained with the RCS below 275 degrees, for operating Cycle 4 through the present operating Cycle 9 may not have been sufficient to ensure the required shutdown margin for a CRE accident.

Further engineering evaluation of previous shutdown margin calculations for plant conditions that existed during plant shutdowns which occurred during the referenced time period were conducted. This evaluation, completed on March 29, 1989, verified that the failure to consider the highest worth rod fully withdrawn when calculating required shutdown boron concentrations had resulted in boron concentration and shutdown margins less conservative than assumed in the SAR for operating Cycles 4 through 9. In accordance with 10CFR50.72 the NRC was notified of these findings at 1705 on March 29, 1989.

C. Safety Significance

For operating Cycles 5 thru 9 this event was determined not to be safety significant. Although the required one percent subcritical shutdown margin could not have been maintained should a CRE accident actually occurred, the reactor would have remained subcritical by a shutdown margin of approximately one-half percent or more for each cycle.

For operating Cycle 4 this event is considered safety significant because it could not be assured that the reactor would have remained subcritical if a CRE accident were to occur under worst case conditions with the plant in cold shutdown. However, the significance of the event is reduced by the fact that the probability of a CRE accident is greatly reduced with the plant in cold shutdown at reduced RCS pressure.

D. Root Cause

The root cause of this event was determined to be personnel error. The engineer responsible for the revision which removed the requirement for considering the most reactive rod stuck out of the core from the "Reactivity Balance Calculation" procedure did not adequately review the basis of the CRE accident prior to implementing the procedure change. An assumption was apparently made that a CRE accident (caused by the physical failure of a pressure barrier component in the control rod drive assembly) was not credible any time that RCS pressure was less than 600 psig. The temperature of 275 degrees was chosen based on allowable RCS pressure-temperature combinations (i.e., RCS pressure should always be less than 600 psig if temperature is less than 275 degrees). However, there was no documentation generated to support this assumption. Such an assumption would not have been consistent with the SAR which requires the postulation of a "non-mechanistic" failure of the pressure barrier, leading to a CRE accident, unless prevented by some type positive means.

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TEXT (If more space is required, use additional NRC Form 366A's) (17)

E. Basis For Reportability

This event is reportable pursuant to 10CFR50.73(a)(2)(ii)(B) because a condition that was outside the design basis of the plant existed in that the plant had been in the cold shutdown condition with a calculated reactor shutdown margin less conservative than that assumed for a design basis CRE accident.

Although this event was discovered on February 1, 1989, it was believed that conservatisms built into the "Reactivity Balance Calculation" procedure for determination of shutdown boron concentrations would have maintained the required design bases shutdown margin even considering the failure to account for a worst case withdrawn control rod. However, subsequent evaluation by Reactor Engineering for the present and past operating cycles determined these built in conservatism were not sufficient to "off-set" the failure to account for the worst case withdrawn control rod and, as a result, the plant had operated in a condition outside the design bases. Upon discovery of this, the NRC was notified at 1705 on March 29, 1989, in accordance with the requirements of 10CFR50.72(b)(2)(i).

F. Corrective Actions

The "Reactivity Balance Calculation" procedure has been revised to require that the most reactive control rod be considered "stuck out" when calculating required shutdown boron concentrations.

Additionally, in 1987, Arkansas Power and Light Company implemented a comprehensive program to meet management objectives to improve the quality, depth and documentation of reviews conducted under 10CFR50.59 for plant design changes and procedure changes. This program and associated plant procedures require detailed documented reviews of licensing basis documents including the Safety Analysis Report when making changes to plant procedures. It is believed that these thorough reviews and in-depth evaluations performed for procedure changes would currently prevent the error which led to occurrence of this event.

G. Additional Information

There have been no previous similar reportable events identified.

Energy Industry Identification System (EIIS) codes are identified in the text as [XX].

ARKANSAS POWER & LIGHT COMPANY

April 13, 1989

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U. S. Nuclear Regulatory Commission
Document Control Desk
Mail Station P1-137
Washington, D. C. 20555

SUBJECT: Arkansas Nuclear One - Unit 1
Docket No. 50-313
License No. DPR-51
Licensee Event Report No. 50-313/89-005-00

Gentlemen:

In accordance with 10CFR50.73(a)(2)(ii), attached is the subject report concerning a personnel error resulting in an inadequate procedure which caused calculated reactor shutdown margins less conservative than assumed in the plant's design basis.

Very truly yours,

J. M. Levine
Executive Director,
Nuclear Operations

JML:RHS:sgw
attachments

cc: w/att: Regional Administrator
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