



ENTERGY

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June 13, 1997

2CAN069703

U. S. Nuclear Regulatory Commission  
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Washington, DC 20555

Subject: Arkansas Nuclear One - Unit 2  
Docket No. 50-368  
License No. NPF-6  
Licensee Event Report 50-368/97-003-00

Gentlemen:

In accordance with 10CFR50.73(a)(2)(ii)(B), enclosed is the subject report concerning the potential for premature initiation of the Recirculation Actuation Signal.

Very truly yours,

Dwight C. Mims  
Director, Nuclear Safety

DCM/tfs

enclosure

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U. S. NRC

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cc: Mr. Ellis W. Merschoff  
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## LICENSEE EVENT REPORT (LER)

ESTIMATED BURDEN PER RESPONSE TO COMPLY WITH THIS INFORMATION COLLECTION REQUEST: 50.0 HRS. FORWARD COMMENTS REGARDING BURDEN ESTIMATE TO THE INFORMATION AND RECORDS MANAGEMENT BRANCH (MNBB 7714), U.S. NUCLEAR REGULATORY COMMISSION, WASHINGTON, DC 20555-0001, AND TO THE PAPERWORK REDUCTION PROJECT (3150-0104), OFFICE OF MANAGEMENT AND BUDGET, WASHINGTON, DC 20503.

FACILITY NAME (1)

Arkansas Nuclear One - Unit 2

DOCKET NUMBER (2)

05000368

PAGE (3)

1 OF 4

TITLE (4) Technical Specifications Allowing Operation With One Channel Of Refueling Water Tank Level Tripped Established The Potential For Premature Initiation Of Recirculation Actuation Signal During A Loss Of Coolant Accident Placing The Plant Outside Its 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 NAME                 | DOCKET NUMBER |
| 05                 | 14  | 97   | 97  | 003               | 00                | 06              | 13                   | 97   | FACILITY NAME                 | DOCKET NUMBER |
| OPERATING MODE (9) |     | 5    | THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR: (Check one or more) (11) |                   |                   |                 |                      |      |                               |               |
| POWER LEVEL (10)   |     | 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                         |               |
|                    |     |      | 20.405(a)(1)(iii)   |                   | 50.73(a)(2)(i)    |                 | 50.73(a)(2)(viii)(A) |      | Specify in                    |               |
|                    |     |      | 20.405(a)(1)(iv)  |                   | X 50.73(a)(2)(ii) |                 | 50.73(a)(2)(viii)(B) |      | Abstract Below                |               |
|                    |     |      | 20.405(a)(1)(v)   |                   | 50.73(a)(2)(iii)  |                 | 50.73(a)(2)(x)       |      | and in Text                   |               |

## LICENSEE CONTACT FOR THIS LER (12)

NAME

Thomas F. Scott, Nuclear Safety and Licensing Specialist

TELEPHONE NUMBER (Include Area Code)

501-858-4623

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

| CAUSE | SYSTEM | COMPONENT | MANUFACTURER | REPORTABLE TO NPDs | CAUSE | SYSTEM | COMPONENT | MANUFACTURER | REPORTABLE TO NPDs |
|-------|--------|-----------|--------------|--------------------|-------|--------|-----------|--------------|--------------------|
|       |        |           |              |                    |       |        |           |              |                    |
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## SUPPLEMENTAL REPORT EXPECTED (14)

| YES   |  | NO |  | EXPECTED SUBMISSION DATE (15) | MONTH | DAY | YEAR |
|---|--|----|--|-------------------------------|-------|-----|------|
| (If yes, complete EXPECTED SUBMISSION DATE) |  | X  |  |                               |       |     |      |

## ABSTRACT (Limit to 1400 spaces, i.e., approximately 15 single-spaced typewritten lines) (16)

Design Engineering personnel discovered a deficiency in the ANO-2 technical specifications that provided a potential for premature actuation of the Recirculation Actuation Signal (RAS) during a Loss Of Coolant Accident (LOCA). The technical specifications allow indefinite operation with one channel of Refueling Water Tank (RWT) level in a tripped condition. If a LOCA were to occur in this condition, the failure of another RWT level channel low could cause premature RAS actuation before sufficient water was available in the containment sump to provide the Emergency Core Cooling System (ECCS) design functions. Only two instances (1981 and 1985) of ANO-2 actually having operated with an RWT level channel tripped have been identified, and those were of short duration. The potential for a single failure preventing ECCS functions from a normal, allowable operating configuration placed the plant outside its design basis. The root cause has been identified as a deficiency in the original technical specifications. Administrative controls have been established to prevent placing an RWT level channel in a tripped state. A technical specification amendment request is being prepared.

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| NRC FORM 366A<br>(5-92)  |  | U.S. NUCLEAR REGULATORY COMMISSION |  | APPROVED BY OMB NO. 3150-0104<br>EXPIRES 5/31/95   |                   |
| <b>LICENSEE EVENT REPORT (LER)</b><br><b>TEXT CONTINUATION</b> |  |                                    |  | ESTIMATED BURDEN PER RESPONSE TO COMPLY WITH THIS INFORMATION COLLECTION REQUEST: 50.0 HRS. FORWARD COMMENTS REGARDING BURDEN ESTIMATE TO THE INFORMATION AND RECORDS MANAGEMENT BRANCH (MNBB 7714), U.S. NUCLEAR REGULATORY COMMISSION, WASHINGTON, DC 20555-0001, AND TO THE PAPERWORK REDUCTION PROJECT (3150-0104), OFFICE OF MANAGEMENT AND BUDGET, WASHINGTON, DC 20503. |                   |
| FACILITY NAME (1)  |  | DOCKET NUMBER (2)                  |  | LER NUMBER (6)   |                   |
| Arkansas Nuclear One - Unit 2                                  |  | 005000368                          |  | YEAR   | SEQUENTIAL NUMBER |
|  |  |                                    |  | 97   | 003               |
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TEXT (If more space is required, use additional copies of NRC Form 366A) (17)

#### A. Plant Status

At the time this condition was discovered, Arkansas Nuclear One Unit 2 (ANO-2) was in cold shutdown (Mode 5) conditions in the early stages of a scheduled refueling outage.

#### B. Event Description

On May 14, 1997, while assessing potential design changes for the Plant Protective System (PPS) [JC] to address the condition described in Licensee Event Report 50-368/96-004-01 (ANO letter 2CAN019701 dated January 30, 1997), Design Engineering personnel discovered that technical specifications allow a normal operating configuration that, with a single failure during a Loss Of Coolant Accident (LOCA), could have resulted in premature initiation of the Recirculation Actuation Signal (RAS) [JE]. This created the potential for the plant having been outside its design basis by being unable to provide some functions of the Emergency Core Cooling System (ECCS).

In the event of a LOCA, the ANO-2 design provides for borated water from the Refueling Water Tank (RWT) to be injected into the Reactor Coolant System (RCS) [AB] by the High Pressure Safety Injection (HPSI) [BJ] System and Low Pressure Safety Injection (LPSI) [BP] System and to be sprayed into containment [NH] by the Containment Spray System (CSS) [BE] for core and containment cooling, maintenance of adequate core shutdown margin, and containment pressure control. Four transmitters sense water level in the RWT. When two of these transmitters reach a low level setpoint, the RAS automatically opens suction valves from the containment sump, closes minimum recirculation valves for CSS, HPSI, and LPSI pumps, stops the LPSI pumps, opens Service Water (SW) [BI] valves to the Shutdown Cooling (SDC) [BP] System heat exchangers, and closes the outlet valves from the RWT.

ANO-2 Technical Specification Table 3.3-3, Engineered Safety Feature Actuation System (ESFAS) [JE] Instrumentation, Item number 6.b requires a minimum of three of the four RWT low level channels to be operable and specifies that two of the four are required for a RAS trip. Actions 10 and 11 of the table are referenced. Action 10 states, in part, "With the number of channels one less than the Total Number of Channels, STARTUP and/or POWER OPERATION may continue provided the inoperable channel is placed in the bypassed or tripped condition within 1 hour." If a LOCA were to have occurred with one of the RWT level channels in a tripped condition, a single failure of another RWT level channel could have initiated a premature RAS causing LPSI pumps to stop and the suction for HPSI and CSS pumps to shift to the containment sump before sufficient water was in the sump to provide adequate net positive suction head for the pumps.

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| Arkansas Nuclear One - Unit 2                           | 005000368         | YEAR                               | SEQUENTIAL NUMBER | REVISION NUMBER  | 3 OF 4 |
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### C. Root Cause

The original ANO-2 technical specifications required restoration of an inoperable RWT level channel to an operable status within 48 hours or placing it in a tripped condition. The allowance for leaving an inoperable channel in bypass occurred during a later amendment. The root cause of this condition is attributed to a deficiency in the technical specifications. The source of this deficiency could not be determined but is believed to have been influenced by the concept that a safe state for a protective function is the tripped state. For reactor protective systems, placing a failed channel in a tripped state changes logic such that the safe state, a reactor trip, results from a failure of the operable channels. This concept appears to have been applied to the design of ESFAS functions; however, for RAS, failure to the actuated state is not necessarily the safest condition.

### D. Corrective Actions

On May 15, 1997, interim administrative controls were established via Operations Night Orders that prevent a failed RWT level channel from remaining in a tripped condition.

A technical specification change is being prepared. It is estimated that this proposed amendment will be submitted to the NRC by July 31, 1997.

The potential generic implications of this condition to other ESFAS functions are being assessed. This evaluation is expected to be complete by July 1, 1997.

### E. Safety Significance

The potential for premature initiation of a RAS would have been established only when an RWT level channel was in a tripped status but not when a channel was bypassed. The technical specifications allow either action; however, ANO has been able to determine only two instances (in 1981 and 1985) when one of the level channels was actually in a tripped state. These conditions involved freezing of the level transmitters causing indicated tank level to fail high, and both resulted in the channels being tripped for short durations. The potential for RWT level transmitters freezing was significantly minimized during the mid-1980s by a plant modification. During small break LOCA scenarios, sufficient time should have been available for operators to restore injection and spray flow in response to alarms and indications associated with a premature RAS. For large break LOCAs, the low probability of having one RWT level channel tripped at the time of initiation combined with the low probability of having another channel fail low



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during the approximately 36 minutes from initiation to the expected shift of the HPSI and CSS pump suction source to the containment sump serve to minimize the safety significance of this condition.

#### F. Basis for Reportability

The ANO-2 technical specifications allowing operation for extended periods with one RWT level channel in a tripped status could have resulted in being unable to provide safety functions associated with HPSI and CSS for some LOCA scenarios with an additional failure of another RWT level channel during the early stages of the accident. This caused the plant to have been outside its design basis and is being reported in accordance with 10CFR50.73(a)(2)(ii)(B). A report was made to the NRC Operations Center at 1630 on May 14, 1997, in accordance with 10CFR50.72(b)(2)(i).

#### G. Additional Information

The condition described in the "Event Description" above was identified at Fort Calhoun Station in NRC Inspection Report 50-285/93-11. Related correspondence subsequent to the inspection report indicated that the issue was under generic review for CE plants and appeared to be generically applicable to Westinghouse plants. ANO has been unable to locate any generic communication of this concern prior to its being identified on May 14, 1997.

The Nuclear Steam Supply System and ECCS vendor, ABB-CE (Mfg. Code C490) issued Infobulletin No. 97-02 dated May 23, 1997, "Spurious Recirculation Actuation Signal," to alert other plants to the potential for this condition. This document stated, "For other plants as well as ANO-2, this condition may exist as a deficiency in the prescribed actions of the plant's Technical Specifications and is not a deficiency in the ECCS or actuation system design."

There have been no similar conditions reported by ANO as Licensee Event Reports.

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