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June 15, 1990

Nuclear Regulatory Commission Document Control Desk Washington, DC 20555

DOCKET 50-255 - LICENSE DPR-20 - PALISADES PLANT -LICENSEE EVENT REPORT 90-009 - AUTOMATIC ACTUATION OF AUXILIARY FEEDWATER SYSTEM FOLLOWING UNEXPECTED OPERATION OF ATMOSPHERIC DUMP VALVES CAUSED BY INSTRUMENT SIGNAL NOISE.

Licensee Event Report (LER) 90-009 is attached. This event is reportable to the NRC per 10CFR50.73(a)(2)(iv).

4. Naniel Eddy

J Daniel Eddy Plant Licensing Engineer

CC Administrator, Region III, USNRC NRC Resident Inspector - Palisades

Attachment



OC0690-0361-NL02

NRC Fer (9-83)	U.S. MUCLEAR REGULATORY COMMENT APPROVED ONE NO. 3180-0104 LICENSEE EVENT REPORT (LER) EXPIRES: 8/31/86										4 185 10N 04								
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ABSTRACT

On May 16, 1990, the Plant was in Hot Standby, with the Primary Coolant System at 536 degrees F and 2060 psia. Feedwater supply to the steam generators was provided by the Auxiliary Feedwater (AFW) System, the turbine bypass valve was 25% open, and reactivity control elements were positioned to maintain criticality. While preparing for power operation, the atmospheric steam dump valves (ADVs) unexpectedly opened at 1512 hours, 1721 hours, 1807 hours, and 1917 hours. The ADV operations which occurred at 1721 hours and 1917 hours resulted in automatic Auxiliary Feedwater Actuation Signal (AFAS) initiations. AFAS initiations are considered to be reportable as Engineered Safety Feature actuations.

The condition described in this report was caused by electrical noise that was induced in the T input signal to the atmospheric steam dump and turbine bypass control circuit by adjacent electric power cables. As corrective action, a temporary modification was installed to suppress the noise on the input signal. Additionally, the response time of bistables in the ADV Т control circuit was increased in order to reduce the possibility of inadvertent ADV operations due to momentary noise spikes on the T____ input signal. Both of these modifications were implemented prior to Plant restart. The condition described in this report did not involve failure of a component or system.

NRC Form SEER 0690-0361-NL02

U.S. NUCLEAR REGULATORY COMMISSION APPROVED OMB NO. 3150-0104

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EVENT DESCRIPTION

NRC Form 366A

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On May 16, 1990, the Plant was in Hot Standby, with the Primary Coolant System (PCS) at 536 degrees F and 2060 psia. Feedwater supply to the steam generators [BLR] was provided by the Auxiliary Feedwater (AFW) System [AB], the turbine bypass valve [RV;J1] was approximately 25% open, and reactivity control elements were positioned to maintain criticality. While preparing for power operation, automatic operation of the atmospheric steam dump valves (ADVs) [RV;J1] occurred unexpectedly at 1512 hours, 1721 hours, 1807 hours, and 1917 hours. Each ADV operation event involved opening of all ADVs in the quick-open mode, and had a duration of less than ten seconds. The ADV operation events which occurred at 1721 hours and 1917 hours were also accompanied by unanticipated, automatic Auxiliary Feedwater Actuation Signal (AFAS) initiations, which are considered to be reportable as an Engineered Safety Feature actuations [JE].

Actions to shutdown the reactor were initiated immediately following the ADV operation and AFAS actuation event which occurred at 1917 hours, and shutdown was completed at 2036 hours. An investigation was subsequently initiated to determine the cause of the unexpected ADV operations and AFAS initiations. As part of this investigation, strip chart recorders [ER] were temporarily installed to monitor the output signal from the atmospheric steam dump and turbine bypass control circuit [J1] to the ADVs, and also the T output signal from the reactor regulating system [JD] to the atmospheric steam dump and turbine bypass control circuit. During subsequent testing of the reactor regulating system, these strip chart recorders documented the existence of noise spikes on the T signal. This spiking is believed to have been induced by electric power cables which are in close proximity to the T avg

Investigation into the circumstances surrounding the two AFAS initiations responded to the following observations made during the AFAS initiation events:

- 1. Steam generator levels were well above the low level AFAS initiation setpoint during both AFAS initiation events; however, an AFAS signal was initiated by two or more steam generator level transmitters during both AFAS initiation events.
- 2. There have been previous events involving ADV operations that did not result in AFAS initiation even though steam generator levels were lower at the start of these other events.
- 3. The reactor protection system [JC] pre-trip setpoint for steam generator level is the same as the AFAS initiation setpoint; however, the pre-trips were not received during either AFAS event.
- 4. The ADV operation event at 1807 hours tripped the minimum number of steam generator sensor channel bistables required to initiate an AFAS. However, an AFAS was not initiated because the low levels were not sensed coincidently.

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It has been determined that the low steam generator levels that initiated the AFAS events were only a sensed condition and can be attributed to a thermodynamic phenomena in the steam generators which exists during low power operations. If the ADVs receive a quick-open signal during low power operations, pressure in the steam generators decreases rapidly due to the low steam generation rate. During this depressurization a low steam generator level condition may be sensed by level transmitters in the downcomer region of the steam generators even though an actual low level condition does not exist in the bulk region of the steam generators.

Previous ADV operations did not result in AFAS initiation because they involved operation of the ADVs in the modulating mode, and not the quick-open mode. As a result, these previous events did not involve the rapid steam generator depressurization associated with quck-opening of the ADVs during low power operation. The quick-open mode of operation for the ADVs is designed to operate when relatively large T deviations exist, such as those that can be expected following a main turbine trip. Smaller T deviations are typically handled by modulating ADV position. Although T deviations of sufficient magnitude to initiate ADV operation in the quick-open mode are not expected during Plant startup, the T noise spikes which initiated the recent ACV operation events were of sufficient magnitude that a quick-open signal was initiated.

Reactor Protection System pre-trips were not received concurrent with the AFAS initiation events due to the longer response time associated with the Reactor Protection System trip bistables. As demonstrated by testing, response of the AFAS logic is significantly faster than response of the Reactor Protection System logic. As a result, a low steam generator level signal of short duration, such as the ones received following the recent ADV operation events, can result in AFAS initiation without resulting in coincident Reactor Protection System pre-trips. The low steam generator level signals which were sensed during the ADV event which occurred at 1807 hours resulted in two AFAS bistable trips. However, these bistable trips did not result in AFAS initiation because the signals that initiated the trips only existed briefly and did not occur concurrently. The AFAS bistables do not have a seal-in feature.

Cause of Event

The unexpected ADV operations, and resultant AFAS actuations, were caused by electrical noise that was induced in the T input signal to the atmospheric steam dump and turbine bypass control circuit by adjacent electric power cables. The events and conditions described in this report did not involve personnel error, inadequacy of a procedure, an activity that was not included in a procedure, or an action that was not in accordance with an approved procedure; nor did they involve an unusual condition of the workplace, a component or system that was inoperable prior to the start of the event, or failure of a component, structure, or system.

NRC Form 366A (9-83) LICENSEE	LICENSEE EVENT REPORT (LER) TEXT CONTINU					U.S. NUCLEAR REGULATORY COMMISSION APPROVED OMB NO. 3150-0104 EXPIRES: 8/31/85				
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Corrective Action

As corrective action, a temporary modification to the atmospheric steam dump and turbine bypass control circuit was installed to suppress noise spiking on the T input signal from the reactor regulating system. Additionally, the response time of bistables in the ADV control circuitry was increased in order to reduce the possibility of further unanticipated ADV operation events due to short duration noise spikes on the T input signal. Both of these modifications were installed prior to Plant restart.

Analysis of Event

The T_____ signal spikes that initiated the unexpected ADV operations and that subsequently resulted in AFAS initiations were caused by electrical noise on the reactor regulating system input to the atmospheric steam dump and turbine bypass control circuit, and did not reflect an actual high T condition for the PCS. Additionally, although the AFAS actuations were initiated on low steam generator level, this was only a sensed condition, and did not reflect a true low level condition or decreased steam generator inventory. As a result, the protective features associated with the atmospheric steam dumps and AFW system were not required during the events described in this report.

Further, the condition described in this report did not have an adverse effect on the safety of the Plant during previous operations. The permissive for automatic ADV and turbine bypass valve operation is only active when the main turbine is tripped. As a result, PCS cooling due to inadvertent ADV operation is not a credible event during normal power operations. However, even if the ADVs did open, they can be closed from the control room, or isolated by manual valves located upstream of each ADV.

The ADVs are not required for protection of the Nuclear Steam Supply System (NSSS) [AB]. Their design function is to provide an available method for dissipating excess stored energy and sensible heat from the NSSS following a turbine trip without challenging the main steam safety valves, which are an engineered safety feature. The condition and events described in this report did not adversely affect the ability of either the ADVs or the main steam safety valves to perform their design functions. As a result, the events and conditions described in this report did not adversely impact the operational safety of the plant, or the safety of plant personnel or the general public.

Additional Information

There have been no previous events reported which involved an unexpected AFAS actuation following an instrument signal noise initiated operation of the atmospheric dump valves.