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FACIL:50-250 Turkey Point Plant, Unit 3, Florida Power and Light C 05000250
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RECIP.NAME RECIPIENT AFFILIATION

SUBJECT: LER 96-005-00:on 960326,certain safety injection accumulator filled evolutions.Caused by cross-tie configuration.C/A:a night order written & operations procedure 3/4-op-064 revised.W/960423 ltr.

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CATEGORY 1 DOCUMENT

FPL

APR 23 1996

L-96-97
10 CFR §50.73

U. S. Nuclear Regulatory Commission
Attn: Document Control Desk
Washington, D. C. 20555

Gentlemen:

Re: Turkey Point Unit 3
Docket No. 50-250
Reportable Event: 96-005-00
Cross-Tie Of Accumulators, Resulting in a Condition Which Could Have Prevented the Fulfillment of a Safety Function

The attached Licensee Event Report, 250/96-005-00, is being provided in accordance with 10 CFR 50.73(a)(2)(v)(D).

If there are any questions, please contact us.

Very truly yours,

R. J. Hovey
Vice President
Turkey Point Plant

JEK

attachment

cc: Stewart D. Ebneter, Regional Administrator, Region II, USNRC
Thomas P. Johnson, Senior Resident Inspector, USNRC, Turkey Point Plant

IE22
1/1

LICENSEE EVENT REPORT (LER)

FACILITY NAME (1)	DOCKET NUMBER (2)	PAGE (3)
TURKEY POINT UNITS 3 AND 4	05000250	1 OF 6

TITLE (4)
CROSS-TIE OF ACCUMULATORS RESULTING IN A CONDITION WHICH COULD HAVE PREVENTED THE FULFILLMENT OF A SAFETY FUNCTION

EVENT DATE (5)			LER NUMBER(6)			RPT DATE (7)			OTHER FACILITIES INV. (8)	
MON	DAY	YR	YR	SEQ #	Rs	MON	DAY	YR	FACILITY NAMES	DOCKET # (S)
03	26	96	96	005	00	04	23	96		

OPERATING MODE (9)	1/NA	10 CFR 50.73(a)(2)(v)(D)
POWER LEVEL (10)	100/0	

LICENSEE CONTACT FOR THIS LER (12)

James E. Knorr, Licensing Engineer	Telephone Number: (305) 246-6757

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

CAUSE	SYSTEM	COMPONENT	MANUFACTURER	NPRDS?	CAUSE	SYSTEM	COMPONENT	MANUFACTURER	NPRDS?

SUPPLEMENTAL REPORT EXPECTED (14) NO ☒ YES ☐	EXPECTED SUBMISSION DATE (15)	MONTH	DAY	YEAR
(If yes, complete EXPECTED SUBMISSION DATE)				

ABSTRACT (16)

Based upon a review of a recent 10 CFR 50.72 notification made by another licensee, Florida Power & Light Company (FPL) found that certain safety injection accumulator fill evolutions resulted in a cross-tied configuration. FPL has determined that under these cross-tied conditions the plant may be in a condition that will prevent the accumulators from fulfilling their safety function.

Plant procedures permitted the cross connection of the nitrogen fill lines and the liquid fill lines for the accumulators. In the unlikely event of a loss of coolant accident, the injection of water from the accumulators may be required to mitigate the consequences of the accident. If cross-tied, especially through the nitrogen fill line, pressure in the accumulators not attached to the broken reactor coolant system leg could lose pressure through the break prior to injecting water into the intact legs. This loss of pressure could affect the core reflood capabilities of the accumulators in the early stages of a response to a loss of coolant accident.

Operating procedures have been changed to allow the fill of only one accumulator at a time with liquid or nitrogen, if pressure in the reactor coolant system is greater than 1000 psig.

This event was reported to the NRC Operations Center in accordance with 10 CFR 50.72(b)(2)(iii)(D).

I. DESCRIPTION OF THE EVENT

On March 13, 1996, another licensee reported that their plant operating procedures allowed the transfer of nitrogen or water into or out of safety injection accumulators through common fill lines. This condition could allow the cross-tie of safety injection accumulator [BP:ACC] gas or liquid fill lines. In the unlikely event of a loss of coolant accident, the injection of water from the accumulators may be required to mitigate the consequences of the accident. If cross-tied, pressure in the accumulators not attached to the broken reactor coolant system [AB:PSF] leg could be lost via the cross-tied lines through the break. This loss of pressure could affect the core reflood capabilities of the accumulators in the early stages of response to a loss of coolant accident. The remaining accumulators would be expected to inject water into the remaining intact reactor coolant system legs.

Based upon a review of a recent 10 CFR 50.72 notification made by another licensee and review of Turkey Point Operating Procedures, Florida Power & Light Company (FPL) found that certain safety injection accumulator fill evolutions could have resulted in a cross-tied configuration. FPL has determined that during these cross-tied conditions the plant may be in a condition that will prevent the accumulators from fulfilling their safety function.

Plant procedures did not prevent the cross connection of the nitrogen fill lines and the liquid fill lines for the accumulators.

II. CAUSE OF THE EVENT

First, Operating Procedure 3/4-OP-064, Safety Injection Accumulators, has allowed the opening of more than one nitrogen fill valve or more than one water fill valve in the past. This procedure allowed the cross-tie of the safety injection accumulators during either the operation of increasing the nitrogen pressure or the adding of water to the accumulators.

Second, the effect of the cross tie on accident response of the system was not clearly understood. The cross tie was used to efficiently achieve both the liquid fill and nitrogen pressure adjustment in more than one accumulator at a time.

III. ANALYSIS OF THE EVENT

Design and Licensing Bases

The Turkey Point Updated Final Safety Analysis Report states that the accumulators are part of the engineered safety features and are designed to meet the requirements of General Design Criteria (GDC) 41:

"Engineered safety features, such as the emergency core cooling system and the containment heat removal system, shall provide sufficient performance capability to accommodate the failure of any single active component without resulting in undue risk to the health and safety of the public. (GDC 41)"

As such, the accumulators provide sufficient performance capability to accommodate any single failure of an active component and still function in a manner to avoid undue risk to the health and safety of the public.

The accumulators, which are passive components, discharge into the cold legs of the reactor coolant piping when pressure decreases to approximately 660 psig, thus rapidly assuring core cooling for large breaks. They are located inside the containment, and are protected against possible missiles.

The accumulators are pressure vessels filled with borated water and pressurized with nitrogen gas. Connections for remotely draining or filling the fluid space, during normal operation, are provided. The level of borated water in each accumulator tank is adjusted remotely as required during normal operation. Borated water is added using a safety injection pump. Water level is reduced by draining to the reactor coolant drain tank. Samples of the solution in the tanks are taken at the sampling station to confirm boron concentration.

Nitrogen pressure adjustment in the accumulators is accomplished periodically by connection of a high pressure nitrogen source to the nitrogen supply line of the accumulator needing pressure adjustment. The pressure adjustment is accomplished remotely as required during normal operation.

Redundant level and pressure indicators for the accumulators are provided with read outs in the control room. Each indicator is equipped with high and low level alarms.

During normal operation each accumulator is isolated from the Reactor Coolant System by two check valves in series. Should the Reactor Coolant System pressure fall below the accumulator pressure, the check valves open and borated water is forced into the Reactor Coolant System. Mechanical operation of the swing-disc check valves is the only action required to open the injection path from the accumulators to the core via the cold legs.

The accumulators are passive engineered safety features because nitrogen gas forces injection; no external source of power or signal

transmission is needed to obtain a fast-acting, high-flow capability when the need arises. To provide protection for large area ruptures in the Reactor Coolant System the Safety Injection System must respond to rapidly reflood the core following the depressurization and core voiding that is characteristic of large area ruptures.

The accumulators act to begin the rapid reflooding function with no dependence on the normal or emergency power sources, and also with no dependence on the receipt of an actuation signal. One accumulator is attached to each of the cold legs of the Reactor Coolant System. The design capacity of the accumulators is based on the assumption that flow from one accumulator spills onto the containment floor through the ruptured loop, and the flow from the remaining two accumulators provides sufficient water to fill the volume outside of the core barrel below the nozzles, the bottom plenum, and penetrate the core.

Analysis of Cross-Connected Accumulators During Accident Conditions

Interviews of operators has indicated that in the past, accumulators were routinely filled on a once or twice per shift frequency. During the fill evolutions, the accumulators met the requirements for water level and nitrogen pressure, and therefore were within their design bases. However, the accumulator cross-tie fill alignment could have prevented the accumulators from fulfilling their associated safety function of core reflood during loss of coolant accident (LOCA) conditions.

During LOCA scenarios, accumulator dump could start within 9.25 seconds, and the intact accumulators are empty at 52.2 seconds, with a total accumulator blowdown time of approximately 43 seconds. The previous fill procedures did not direct the operators to secure accumulator fill evolutions during accident conditions, and the short time duration of the transient would most likely preclude operator action to eliminate the cross tie condition. Westinghouse indicated that the accumulator on the faulted reactor coolant system (RCS) loop is empty when the RCS blowdown is complete, at 22.8 seconds. Therefore, during the initial 22.8 second blowdown, and for the next approximately 30 seconds, the intact accumulators will lose pressure via the cross-tie through the faulted RCS loop, and the required accumulator water volume may not be injected into the core during reflood.

The analysis assumes that the contents of two accumulators, or 1750 cubic feet of water, are utilized during core reflood. Westinghouse indicated that their preliminary assessment was that the reflood analysis has insufficient margin to accommodate the potential pressure loss in the accumulators attached to the intact reactor coolant system loops.

The practice of cross tying multiple accumulators during fill evolutions is considered reportable under 10 CFR 50.72(b)(2)(iii)(D), an event or condition that alone could have prevented the fulfillment of the safety function of the accumulators to mitigate the consequences of an accident.

Probabilistic Safety Significance

An analysis of the core damage frequency (CDF) increase due to the cross-tie of accumulators was made by FPL. A bounding time of 30 minutes per day was assumed in which all three accumulators were to be considered out of service (OOS) simultaneously. No other risk significant components were considered to be removed from service.

According to the Turkey Point Units 3 & 4 Probabilistic Risk Assessment Individual Plant Examination (June 25, 1991), the probability of a large loss of coolant accident (LOCA) occurrence is 1.00E-05/yr. The probability of a medium LOCA occurrence is 1.00E-04/yr. The probability that all three accumulators are out of service at the same time due to filling operations is calculated to be:

(0.5 hrs./day * 365 day/yr.)/8760 hrs./yr. = 2.1E-02.

The probability of core damage per year then would be the product of the combined probability of large and medium LOCAs, and the probability of all three accumulators being out of service (OOS) at the same time:

(P Large LOCA + P Medium LOCA)*(P 3 Accumulators OOS) =

(1.00E-05/yr. + 1.00E-04/yr.)*(2.1E-02) = 2.31E-06/yr.

This increase represents a 4.2% increase over the baseline CDF (6.03E-05/yr.) which is considered not significant based on EPRI guidelines (EPRI PSA Applications Guide, Final Report, August 1995) for a permanent plant change.

The following conservatisms are built into the above calculation:

Not all LOCA breaks (such as hot leg or intermediate leg breaks) would create the dynamic conditions whereby accumulator dump flow is caused to bypass the core.

The 30 minute per day estimate of time where all three accumulators were considered to be OOS simultaneously is considered to be conservative. The need for accumulator filling has varied and filling all three accumulators simultaneously, though not prohibited by procedure, may not have been the common practice as reflected in the 30 minute per day estimate.

Finally no consideration was given to account for possible operator recovery actions of securing accumulator fill operations upon advent of a LOCA.

This condition had no significant effect on the health and safety of the public because of the low probability of an intermediate break LOCA or Large Break LOCA occurring concurrent with the infrequent and short duration of cross-tying the safety injection accumulators.

IV. CORRECTIVE ACTIONS

1. A night order was written to instruct operators to not cross-tie accumulators during gas pressure or liquid level adjustments when the reactor coolant system pressure is above 1000 psig.

2. Operations Procedure 3/4-OP-064, Safety Injection Accumulators, has been revised to require that only one fill valve be open at a time whenever reactor coolant pressure is above 1000 psig. This will prevent the cross-tie that has resulted in the potential condition described in this Licensee Event Report.

3. The operations department has reviewed other applicable systems for cross-tie affects on the associated systems. No similar system cross-ties were found.

V. ADDITIONAL INFORMATION

A. Similar Events: None

B. Additional Information: None

EIIS Codes are shown in the format [EIIS SYSTEM: IEEE component function identifier, second component function identifier (if appropriate)].