# CATEGORY 1

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ACCESSION NBR:9705020011 DOC.DATE: 97/04/25 NOTARIZED: NO DOCKET #
FACIL:50-251 Turkey Point Plant, Unit 4, Florida Power and Light C 05000251
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RECIP.NAME RECIPIENT AFFILIATION

SUBJECT: LER 97-001-00:on 970327,ECCS recirculation loop leakage found to be in condition outside design basis due to gasket movement during installation during spring 1966 reassembly. Gasket replaced & pump tested.W/970425 ltr.

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TITLE: 50.73/50.9 Licensee Event Report (LER), Incident Rpt, etc.

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CATEGORY 1 DOCUMENT

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FPL

APR 25 1997

L-97-104
10 CFR §50.73

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

Re: Turkey Point Unit 4
Docket No. 50-251
Reportable Event: 97-001-00
Emergency Core Cooling System Recirculation Loop Leakage Found to be in a Condition Outside the Design Basis

The attached Licensee Event Report, 251/97-001-00, is being provided in accordance with 10 CFR 50.73(a)(2)(ii).

If there are any questions, please contact us.

Very truly yours,

R. J. Hovey
Vice President
Turkey Point Plant

JEK

attachment

cc: Luis A. Reyes, Regional Administrator, Region II, USNRC
Thomas P. Johnson, Senior Resident Inspector, USNRC, Turkey Point Plant

# LICENSEE EVENT REPORT (LER)

| FACILITY NAME (1) | DOCKET NUMBER (2) | PAGE (3) |
|---|---|---|
| TURKEY POINT UNIT 4 | 05000251 | 1 OF 6 |

TITLE Emergency Core Cooling System Recirculation Loop Leakage Found to be in a Condition Outside the Design Basis

| EVENT DATE (5) | | | LER NUMBER(6) | | | RPT DATE (7) | | | OTHER FACILITIES INV. (8) | |
|---|---|---|---|---|---|---|---|---|---|---|
| MON | DAY | YR | YR | SEQ # | R# | MON | DAY | YR | FACILITY NAMES | DOCKET # (S) |
| 3 | 27 | 97 | 97 | 001 | 00 | 4 | 25 | 97 | | |

| | |
|---|---|
| OPERATING MODE (9) | 1 |
| POWER LEVEL (10) | 100% |

10 CFR 50.73(a)(2)(ii)

LICENSEE CONTACT FOR THIS LER (12)

| | TELEPHONE NUMBER |
|---|---|
| J. E. Knorr, Regulation and Compliance Specialist | 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)

On March 27, 1997, Florida Power & Light Company's Turkey Point Unit 4 was operating in Mode 1 at 100% power. At 1440 hours eastern standard time an engineering evaluation found leakage on the 4A high head safety injection pump casing joint to be outside the design basis for recirculation loop leakage. The cause was believed to be a leaking gasket.

While torquing the casing bolts at the leak location, the leak increased significantly to a level determined to be outside allowable limits. With the static head of the refueling water storage tank, the estimated leakage was 38 liters per hour. The limit used was that which could cause exceeding the dose criteria of General Design Criterion 19 dose levels. The leak was repaired using injection sealant, and the pump was returned to operable status.

On April 3, 1997, at 2030 hours, the 4A safety injection pump was discovered leaking at about 3.4 liters per hour while the pump was running. The pump casing gasket was replaced to return the pump to operability.

The NRC operations center was notified after each event in accordance with 10 CFR §50.72(b)(1)(ii)(B), "condition that is outside the design basis of the plant." The April 3 event was retracted.

I. DESCRIPTION OF THE EVENT

On March 27, 1997, Florida Power & Light Company's (FPL) Turkey Point Unit 4 was operating in Mode 1 at 100% power. A few days earlier a small leak on the 4A high head safety injection pump [BQ:P] had been noticed traveling through the inner portion of the casing joint gasket, up through a stud which passes through the casing, and out the underside of the casing cap nuts at two locations. While adjusting the casing bolts' torque in an attempt to stop the leakage, the leak rate at one location increased significantly. The leakage was quantified and found to exceed the FSAR allowable limits for an accident. As a result, the 4A safety injection pump was declared inoperable. Unit 4 entered a Technical Specification action statement which required the safety injection pump to be returned to "OPERABLE status within 72 hours or be at least in HOT STANDBY within the next 6 hours and in HOT SHUTDOWN within the following 6 hours."

A hydraulically injected polymer based leak sealing compound was used to temporarily repair the safety injection pump casing joint leak. The leakage was stopped by the polymer injection. The 4A safety injection pump was returned to service on March 28.

The temporary repair was successful; the pump was operated several times with no observed leakage. On April 3, 1997, at 2030 hours, the 4A safety injection pump was being used to add water to an accumulator when the casing joint was discovered leaking at about 3.4 liters per hour at approximately the shut off head pressure. The pump was isolated and the casing gasket replaced.

The NRC operations center was notified after each event in accordance with 10 CFR §50.72(b)(1)(ii)(B), "condition that is outside the design basis of the plant." The April 3 event was retracted when the calculated dose due to the leak was calculated to be less than that allowed by 10 CFR 50 Appendix A General Design Criteria 19 (GDC 19).

II. CAUSE OF THE EVENT

Root Cause Discussion

Immediately after the April 3 event, the pump casing was disassembled and the condition of the gasket examined. The gasket was found to be damaged between the inside of the casing and the penetration through the gasket for the casing bolt. This

damage appears to have occurred during the spring 1996 reassembly of the pump due to gasket movement during installation, although the pump had passed post-maintenance testing at that time. The temporary leak sealant method employed did not withstand repeated pressure cycling of the pump during safeguards testing and accumulator filling operations. This appears to have been a direct result of the conservative injection procedure implementation due to the potential for injection material entering the safety injection system. This was confirmed during disassembly when inspection showed that the bolt annulus area was not completely filled. If more routine injection practices had been observed, greater margin against leakage due to cycling would have resulted without any significant increase in potential foreign material introduction.

Additional Information on Generic Implications

Turkey Point has four high head safety injection pumps of the same design. Each pump has different gasket material or has used a different gasket installation technique. The success of the gasket material is sensitive to installation technique. The adhesive used for gasket installation enhances the success of the gasket installation. The other safety injection pumps do not display any appreciable pump casing joint leakage at this time and are monitored regularly by operators and the system engineer.

III. ANALYSIS OF THE EVENT

Post accident, the safety injection pumps may be used for recirculation of coolant which has spilled from a break into the containment sump. Those portions of the safety injection system located outside the containment which are designed to circulate radioactively contaminated coolant under post accident conditions, are required to meet loop leakage criteria. The Turkey Point Final Safety Analysis Report Table 6.2-12 assumes a total leakage outside containment from all sources during recirculation of 2.325 liters per hour. This leak rate is an assumed leak rate for analysis and does not constitute an absolute limit on Emergency Core Cooling System (ECCS) leakage. During the March 27 event, the leakage was estimated to be 35 to 38 liters per hour at a pressure equivalent to the static head of the refueling water storage tank.

For the limiting loss-of-coolant accident (LOCA), the control room doses calculated to support the recent thermal power uprating (WCAP-14276 Rev. 1) are:

| | Control room (0-30 day) | |
|---|---|---|
| Containment leakage | 14.9 | Rem thyroid |
| Containment purge | 0.073 | Rem thyroid |
| Total | 15 | Rem |

General Design criteria (GDC) 19 identifies the control room operator limit for thyroid as 30 Rem, using the guidance provided in NUREG-0800, sections 6.4 and 15.6.5. Accordingly, 15 Rem is available to accommodate dose contributions from ECCS leakage that may occur in the post-LOCA recirculation phase of an accident. The maximum calculated ECCS leakage outside containment which would not exceed this 15 Rem dose is 37.6 liters per hour as established by an FPL calculation using realistic flash fractions.

During a LOCA the potential existed for a short period of time for the 4A safety injection pump to be operating with a shut off head exceeding 1300 psig. Under these conditions, considering the location of the leak, the pump casing leakage could approach 340 liters per hour. Therefore, the potential existed for doses to be greater than that permitted by NUREG 0800 (30 Rem thyroid to the control room operator).

While this calculation shows that thyroid doses to a control room operator could exceed 100 Rem, the calculation is very conservative considering the actual situation. The calculation assumes a TID-14844 source term in the recirculation sump, which represents 50% of the core inventory of halogens (iodine) and 1% particulates based upon a complete core melt. ECCS design is such that no fuel melting would be expected. Additionally, analytical work resulting from the accident at Three Mile Island (TMI) has demonstrated that the predominant iodine form assumed in TID-14844 (elemental iodine) is not realistic, and that the normal form anticipated is particulate, probably as Cesium Iodide. Iodine as a particulate would be filtered out prior to reaching the control room, thus thyroid doses would be significantly reduced to within GDC-19 limits.

The ECCS system outside containment is subject to a Technical Specification required leak inspection program. This program is

implemented by Operations Surveillance Procedure 0-OSP-207.2, Visual Leak Inspection of Systems Outside Containment. The procedure provides the guidance necessary to inspect and reduce any leakage from piping systems outside containment that would or could contain highly radioactive fluids during a serious transient to as low as reasonably achievable. This program has been successful in maintaining the leak tight integrity of the ECCS system outside containment.

The risk associated with this event was very small. For the March 27 event to have been a concern would require a LOCA with subsequent core melt during the several hours that the safety injection pump had high leakage. The core damage frequency associated with all sizes of LOCAs is calculated to be 3.0 E-05/year. The conditional probability of this event occuring in a 24 hour period when this leak exceeded allowable levels was 1.0 E-07, which is not considered risk significant.

For the second case, 3.4 liters per hour of leakage from the safety injection pump was assumed, which would increase the thyroid dose to control room personnel by approximately 8 Rem for the 30 days assumed in the dose calculations in the Final Safety Analysis Report. This also assumes the conservative source term of TID-14844. This dose is less than the 15 Rem margin discussed above.

Potential doses at the exclusion boundary and the low population zone would be expected to have insignificant increases due to this additional leakage.

Based on the above, the health and safety of the public were not adversely affected.

IV. CORRECTIVE ACTIONS

1) The 4A high head safety injection pump casing gasket has been replaced and the pump tested. The test was successful with no leakage at the casing joint.

2) The technique for installation of the casing gasket has been changed to minimize the movement of the gasket during installation.

3) The 3A, 3B and 4B safety injection pump casing joints were inspected in detail for evidence of leakage with no appreciable indications found.

4) Each safety injection pump will continue to be inspected by the system engineer and operations personnel during their normally scheduled system walkdowns.

5) Turkey Point injects the minimum amount of sealant compound to stop each leak. The conservative injection amounts will be reviewed for each of the existing leak locations and evaluated for adequate sealant application.

6) Independent supervisory inspections of the gasket installations have been conducted. Quality Assurance has also evaluated the adequacy of the inspection process and concluded that a change in the inspection process is not required.

7) Currently, two safety related components have had injection of sealant compound. The type used in each of these cases was different than that used on the safety injection casing. The process heat in each of these cases ensures a high integrity repair.

V. ADDITIONAL INFORMATION

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