

Florida Power

CORPORATION

Crystal River Unit 3
Docket No. 50-302

February 27, 1996
3F0296-19

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

Subject: Licensee Event Report (LER) 95-013-01

Reference: FPC to NRC letter, 3F0196-16, dated January 31, 1996.

Dear Sir:

Please find the enclosed Licensee Event Report (LER) 95-013-01. This supplement is submitted by Florida Power Corporation in accordance with 10 CFR 50.73. It provides a revision to the previous corrective action plan and reconciles it with that provided in our Notice of Violation response.

Sincerely,

B. J. Hickle, Director
Nuclear Plant Operations

JAF/lf

Attachment

xc: Regional Administrator, Region II
Project Manager, NRR
Senior Resident Inspector

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EXPIRES 5/31/96

LICENSEE EVENT REPORT (LER)

ESTIMATED BURDEN PER RESPONSE TO COMPLY WITH THIS INFORMATION COLLECTION REQUEST: 50.0 HOURS. FORWARD COMMENTS REGARDING BURDEN ESTIMATE TO THE RECORDS AND REPORTS 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)

CRYSTAL RIVER UNIT 3 (CR-3)

DOCKET NUMBER (2)

0 5 0 0 0 3 0 2 1 OF 0 7

PAGE (3)

TITLE (4)

Design Deficiency May Cause Makeup Tank Vortexing Resulting in Failure to Meet Appendix R Requirements

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(8)								
									N/A	0 5 0 0 0								
0	7	0	7	9	5	0	1	3	0	1	0	2	2	7	9	6	N/A	0 5 0 0 0

OPERATING MODE (9)

THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR 5: (CHECK ONE OR MORE OF THE FOLLOWING) (11)

POWER LEVEL (10)

1 0 0

20.402(b)

20.405(c)

50.73(a)(2)(iv)

79.71(b)

20.405(a)(1)(i)

50.36(c)(1)

50.73(a)(2)(v)

79.71(c)

20.405(a)(1)(ii)

50.36(c)(2)

50.73(a)(2)(vii)

OTHER (Specify in Abstract below and in Text, NRC Form 386A)

20.405(a)(1)(iii)

50.73(a)(2)(i)

50.73(a)(2)(viii)(A)

20.405(a)(1)(iv)

X

50.73(a)(2)(ii)

50.73(a)(2)(viii)(B)

20.405(a)(1)(v)

50.73(a)(2)(iii)

50.73(a)(2)(x)

LICENSEE CONTACT FOR THIS LER (12)

NAME

J. A. Frijouf, Nuclear Regulatory Specialist

TELEPHONE NUMBER

AREA CODE

3 5 2 5 6 3 - 4 7 5 4

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

CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NRPDS	CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NRPDS

SUPPLEMENTAL REPORT EXPECTED (14)

EXPECTED SUBMISSION

MONTH

DAY

YEAR

YES (If yes, complete EXPECTED SUBMISSION DATE)

X NO

DATE (15)

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

On July 7, 1995, Florida Power Corporation's (FPC) Crystal River Unit 3 (CR-3) was in MODE ONE (POWER OPERATION), operating at 100% reactor power and generating 870 megawatts. At that time it was determined that CR-3 had operated outside it's licensing basis in that two Appendix R fire scenarios were identified which would provide operators less than eight hours to take action to isolate the Makeup Tank. A formal operability evaluation of these events was conducted, which determined that the makeup system would remain operable if manual isolation valve MUV-493 would be maintained closed, administratively controlled and opened by a "dedicated operator" only during hydrogen addition. The evaluation further concluded that CR-3 had deviated from it's licensing basis in that under certain accident scenarios, makeup tank vortexing may induce hydrogen binding of the running makeup pump conceivably causing it's subsequent failure. The event was reported at 1710 on July 7, 1995 to the NRC via the Emergency Notification System as a 1 hour non-emergency report and was assigned the Event number 29036. This report is submitted in accordance with 10 CFR 50.73(a)(2)(ii)(B) for operation outside the plant design basis. The cause of this event was design error. Corrective actions include maintaining the isolation valve in a normally closed position, procedure changes and a design change.

EXPIRES 5/31/95

LICENSEE EVENT REPORT (LER)
TEXT CONTINUATION

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

EVENT DESCRIPTION

On July 7, 1995, Florida Power Corporation's (FPC) Crystal River Unit 3 (CR-3) was in MODE ONE (POWER OPERATION), operating at 100% reactor power and generating 870 megawatts. At that time it was determined that CR-3 may have operated outside its Licensing (Design) Basis. As a result of heightened awareness of vortexing issues, Analysis/Calculation M94-0053 Rev 2 noted that for hydrogen regulator settings above 17 pounds per square inch gauge (psig) there would be less than 8 hours for operators to take action in isolating the Makeup Tank [CB,TK](MUT-1) under two accident scenarios.

In the first scenario, a fire is postulated in fire area AB-119-6H (119 foot elevation of the auxiliary building), near Makeup Valve-143 [CB,FSV](MUV-143). A fire induced hot short occurs, causing the solenoid valve to open, providing a continuous supply of hydrogen to MUT-1. Due to normal reactor coolant system [AB](RCS) makeup flow, the level in MUT-1 decreases to a point and vortexing in MUT-1 may occur, at very low tank levels, allowing hydrogen to enter the running makeup pump [CB,P](MUP), subsequently challenging its operability. In this event, the remaining train would still be available to provide RCS makeup; therefore, Appendix R criteria would not be violated.

In the second scenario, the "A" train MUP is the running MUP aligned to MUT-1. A fire occurs in fire area AB-95-3B or AB-95-3G (95 foot elevation of the Auxiliary building). The fire damages the circuitry for the "B" train MUP thus making it unavailable. The fire also induces a hot short in the MUV-143 control circuit, causing the valve to open, providing a continuous supply of hydrogen to MUT-1. As the level in MUT-1 decreases, vortexing in MUT-1 may occur, allowing hydrogen to enter the "A" train MUP, inducing hydrogen binding and subsequent pump failure. Both trains of makeup flow would therefore be rendered inoperable. At the time of discovery, no operator guidance was available in the plant procedures to mitigate this event. Using design data, the shortest credible time frame for this event to proceed to the point of MUP damage is slightly more than 30 minutes.

A formal operability evaluation of these postulated events was conducted in accordance with NOD-14, "Evaluating Operability and Determining Safety Function Status". The evaluation determined that the makeup system would remain operable if manual isolation valve MUV-493 [CB,ISV] is maintained closed, administratively controlled and opened by a "dedicated operator" only during hydrogen addition (see figure 1, Makeup Tank Hydrogen Supply). The evaluation further concluded that CR-3 had deviated from its licensing basis in that under certain accident scenarios, makeup tank vortexing could induce hydrogen binding of the running makeup pump which could cause its subsequent failure.

The event was reported to the Nuclear Regulatory Commission at 1710 on July 7, 1995 via the Emergency Notification System as a 1 hour non-emergency report per the requirements of 10 CFR 50.72(b)(1)(ii)(B) and was assigned the Event number 29036.

EXPIRES 5/31/95

LICENSEE EVENT REPORT (LER)
TEXT CONTINUATION

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

This report is submitted in accordance with 10 CFR 50.73(a)(2)(ii)(B) for operation outside the design basis of the plant.

EVENT EVALUATION

A 1985 Appendix R fire analysis postulated a spurious opening of the hydrogen addition control valve MUV-143 due to a fire induced hot short. MUV-143 is a 3/4 inch solenoid control valve located in the hydrogen addition line. The analysis concluded that a fire in certain areas of the plant could cause MUV-143 to spuriously open. Spurious operations based on Appendix R concerns must be addressed by one of two ways. Actions to preclude the spurious operation must be taken, or compensatory actions must be specified to mitigate the effects of the spurious operation.

The postulated spurious opening of MUV-143 by an Appendix R fire is not considered a significant probability. Probabilistic Safety Assessment (PSA) has determined that an ignition frequency of $4.8\text{E-}5$ per year can be expected for fire area AB-119-6H. This frequency is considered to be the lowest reported value for an ignition frequency and considers transient combustibles in or being moved through a location containing no credible ignition sources. Fire areas AB-95-3B and AB-95-3G have ignition frequencies of $1.77\text{E-}3$ and $5.82\text{E-}4$ per year, respectively. By comparison, a Small Break Loss Of Coolant Accident (SBLOCA) has an occurrence frequency of $2\text{E-}3$. Both of these fire areas contain fire detection equipment (alarms), automatic fire suppression equipment (sprinkler systems), manual firefighting equipment, and are currently traversed on an hourly basis by roving fire watch personnel.

The two scenarios described in this event did not pose any threat to core integrity, but only a challenge to place the plant in cold shutdown in less than 72 hours. Based on the probability of occurrence, availability of fire detection and suppression systems, and roving fire watch personnel, these postulated events would not substantially degrade the safety of CR-3, nor would they compromise the health and safety of the general public.

CAUSE

The cause of this event was a design analysis error in that the original Analysis/Calculation for hydrogen pressure in MUT-1 did not take into consideration vortexing at reduced inventory in the tank.

EXPIRES 5/31/96

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

IMMEDIATE CORRECTIVE ACTION

1. A formal operability evaluation was conducted in accordance with NOD-14, titled "Evaluating Operability and Determining Safety Function Status". This activity was completed on July 7, 1995 and found the makeup system to be operable based on the ability to isolate the hydrogen to MUT-1 with Makeup Valve (MUV) MUV-493, the hydrogen regulator manual isolation valve.
2. A Short Term Instruction (STI) and an Operations Study Book (OSB) entry were issued to operations personnel to specify requirements to administratively control MUV-492 and MUV-493. The STI and OSB entry were in effect until permanent procedural guidance controlling these evolutions was issued.

ADDITIONAL CORRECTIVE ACTION

1. There are two methods to add hydrogen to the MUT, opening MUV-493 to allow hydrogen through the regulator (MUV-491) or bypassing the regulator by opening the manual bypass valve (MUV-492). Hydrogen addition evolutions involving MUV-492 and MUV-493 have been proceduralized to ensure only one will be opened by a "dedicated operator" during hydrogen addition. The valve to be opened will depend on the method used.
2. FPC Nuclear Engineering Design management personnel reviewed this issue with Mechanical and Instruments & Controls (I&C) engineers to heighten awareness of this event. This activity was completed on September 15, 1995.

ACTION TO PREVENT RECURRENCE

After lengthy reviews of the assumptions used in calculating the available operator response time during different fire scenarios, the long term resolution to this issue was determined to be as follows:

1. Continue to leave the regulator (MUV-491) normally isolated and use the manual isolation valves to add hydrogen to the MUT as described above. It was also agreed that manually charging the MUT with hydrogen would not be considered an Operator Work Around and that long term, this method was preferred because it is fast and puts more focus on the evolution.
2. Generate a design change to lower the setpoint on MUV-491 to a value that would bring it into compliance with design assumptions, adding a level of defense when using the regulator to add hydrogen to the MUT. The design change will be issued and installed during the Refuel 10 outage scheduled for the Spring of 1996.

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PREVIOUS SIMILAR EVENTS

There have been two similar events involving vortexing. LER 86-003 addressed a Decay Heat Pump shaft failure which may have been induced by vortexing in the pump. LER 94-09 addressed Borated Water Storage Tank vortexing, and is closely related to the issue reported in the present LER.

ATTACHMENT

Attachment 1 - Abbreviations and Acronyms

Figure 1 - Makeup Tank Hydrogen Supply

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ATTACHMENT 1 - ABBREVIATIONS AND ACRONYMS

AB-95-3B Fire Area - Auxiliary Building Hallway 95 Foot Elevation

AB-95-3G Fire Area - Auxiliary Building Hallway 95 Foot Elevation

AB-119-6H Fire Area - Auxiliary Building Hallway 119 Foot Elevation

Appendix R Appendix R to 10 CFR 50 - Fire Protection Program for Nuclear Power Facilities Operating Prior to January 1, 1979

CR-3 Crystal River Unit 3

FPC Florida Power Corporation

I&C Instruments & Controls

ER Licensee Event Report

MODE ONE Power Operation (Greater Than 5 Percent Rated Thermal Power)

MUP Makeup Pump

MUT-1 Makeup Tank

MUV Makeup Valve

NOD-14 Evaluating Operability and Determining Safety Function Status (procedure)

NRC Nuclear Regulatory Commission

OSB Operations Study Book

PSA Probabilistic Safety Assessment

PSIG Pounds Per Square Inch Gauge

RCS Reactor Coolant System

SBLOCA Small Break Loss of Coolant Accident

SSOD Shift Supervisor On Duty

STI Short Term Instruction

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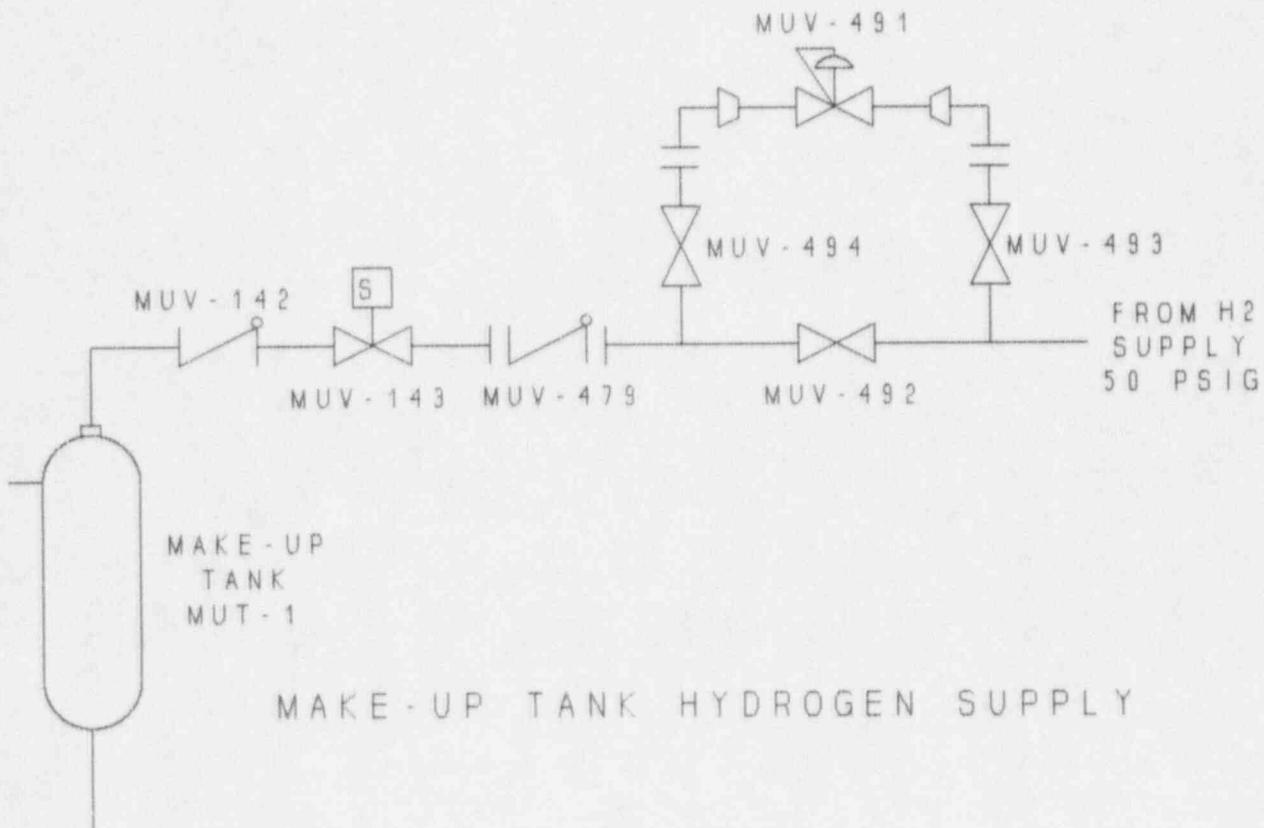


FIGURE 1