

LICENSEE EVENT REPORT (LER)

FACILITY NAME (1) CRYSTAL RIVER UNIT 3	DOCKET NUMBER (2) 05000302	PAGE (3) 1 OF 07
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TITLE (4)
Incorrect Design Input and Misapplication of Qualification Requirements Cause Failure to Environmentally Qualify Equipment, Resulting in a Condition Outside Plant 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 NAMES		DOCKET NUMBER(S)
08	05	88	88	015	01	09	19	88	N/A		050000
									N/A		050000

OPERATING MODE (9) **1**

POWER LEVEL (10) **100**

THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR § (Check one or more of the following) (11)

<input type="checkbox"/> 20.402(b)	<input type="checkbox"/> 20.406(c)	<input type="checkbox"/> 80.73(a)(2)(iv)	<input type="checkbox"/> 73.71(a)
<input type="checkbox"/> 20.406(a)(1)(i)	<input type="checkbox"/> 80.36(a)(1)	<input type="checkbox"/> 80.73(a)(2)(v)	<input type="checkbox"/> 73.71(a)
<input type="checkbox"/> 20.406(a)(1)(ii)	<input type="checkbox"/> 80.36(a)(2)	<input type="checkbox"/> 80.73(a)(2)(vi)	<input type="checkbox"/> OTHER (Specify in Abstract below and in Text, NRC Form 306A)
<input type="checkbox"/> 20.406(a)(1)(iii)	<input type="checkbox"/> 80.73(a)(2)(i)	<input type="checkbox"/> 80.73(a)(2)(vii)(A)	
<input type="checkbox"/> 20.406(a)(1)(iv)	<input checked="" type="checkbox"/> 80.73(a)(2)(ii)	<input type="checkbox"/> 80.73(a)(2)(vii)(B)	
<input type="checkbox"/> 20.406(a)(1)(v)	<input type="checkbox"/> 80.73(a)(2)(iii)	<input type="checkbox"/> 80.73(a)(2)(ix)	

LICENSEE CONTACT FOR THIS LER (12)

NAME L. W. MOFFATT, NUCLEAR SAFETY SUPERVISOR	TELEPHONE NUMBER
	AREA CODE 904 NUMBER 795-6486

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

CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NPROS	CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NPROS

SUPPLEMENTAL REPORT EXPECTED (14)

YES (If yes, complete EXPECTED SUBMISSION DATE)

NO

EXPECTED SUBMISSION DATE (15)

MONTH	DAY	YEAR
01	31	89

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

Crystal River Unit 3 was operating at 100% full power on August 5, 1988. At 2145 the Shift Supervisor was notified that components associated with the Main Feedwater Startup Block Valves were not environmentally qualified (EQ). On August 19, 1988 at 1640 with the plant operating at 100% full power, utility personnel determined that terminal blocks associated with Reactor Coolant System (RCS) Vent and Post Accident Sampling System (PASS) Isolation Valves were not EQ. Lack of EQ constituted conditions outside the plant design basis.

When the initial list of EQ equipment was developed, incorrect design input led engineers to conclude modifications to the Emergency Feedwater System would eliminate the need to EQ the Startup Block Valves. When the RCS Vent and PASS Isolation Valves were qualified, engineers did not apply EQ criteria to their terminal blocks causing failure to qualify the blocks. Following each discovery of lack of EQ, continued operation was justified.

Since the initial development of the EQ program, better guidance has been developed to aid engineers in EQ determinations. This guidance is provided in engineering procedures, the Environmental and Seismic Qualification Program Manual, and training programs.

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TEXT (If more space is required, use additional NRC Form 3054's) (17)

EVENT DESCRIPTION

Crystal River Unit 3 (CR-3) was operating at 100% of full power on August 5, 1988. At 2145, the Shift Supervisor was notified by utility engineers that components associated with the Main Feedwater Startup Block Valves (tag numbers FWV-33 and FWV-36) [SJ,SHV] were not environmentally qualified. The components of concern were the motor operators [SJ,MO], motor starters [SJ,MSTR], valve control stations [SJ,XC], and terminal boxes [SJ,CON]. On August 19, 1988 at 1640, with the plant operating at 100% of full power, utility personnel determined that terminal blocks [BLK] associated with the Reactor Coolant System (RCS) [AB] Vent Valves [AB, VIV] and eight of the Post Accident Sampling System (PASS) [IP] Reactor Containment Building Isolation Valves [IP, ISV] were not environmentally qualified. In both cases, lack of environmental qualification constituted a condition outside the plant design basis.

Crystal River 3 design incorporates two Main Feedwater trains. Each train contains three parallel block valves sized for different flow capacities. (Please refer to Figure 1.) The Startup Block Valves supply feedwater during operations below 15% of full power. Block valves are normally opened and closed by the Integrated Control System [JA] during power increases and decreases. Block valves also receive commands to close from the Emergency Feedwater Initiation and Control (EFIC) system [BA] when it becomes necessary to isolate a Steam Generator (SG) [AB,BLR]. In order to isolate Main Feedwater, the EFIC system also trips the Main Feedwater Pump (MFWP) [SJ,P], and closes the crosstie and MFWP suction valves.

The RCS vent valves are used to vent noncondensable gases from the RCS to enhance core [AC] cooling during certain accident scenarios. The PASS Isolation Valves in question are part of lines used to sample the RCS and Reactor Containment Building (RB) [NH] Sump following a Loss of Coolant Accident (LOCA). The terminal blocks in question are used for solenoid and limit switch wiring for the valves.

Initial compilation of the list of equipment requiring environmental qualification was completed in 1983 in response to NRC I&E Bulletin 79-01B. Many equipment modifications were made during the 1985 refueling outage in order to environmentally qualify plant equipment. Following the outage, a consultant reviewed the list of environmentally qualified and safety related equipment. The review also included equipment which was initially considered for environmental qualification, but had been determined to not require such qualification. This study was deemed necessary by the utility, in order to assure that all plant equipment was properly classified with regard to environmental qualification requirements. The consultant submitted results of the study in 1986. The report contained several questions that the consultant was unable to resolve concerning the qualification requirements for certain equipment.

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		88	015	01	03	OF	07

TEXT (if more space is required, use additional NRC Form 356A) (17)

The original CR-3 Architect/Engineer (AE) reviewed the 1986 report in order to resolve the consultant's questions. The AE presented results of the review in 1987. Florida Power Corporation (FPC) engineers at the corporate office examined these results in March and April of 1988. Their examination raised questions concerning certain items of equipment. The Startup Feedwater Block Valves and the terminal blocks for the RCS Vent Valves and PASS Isolation Valves were among these items. A list of the questionable items was submitted to the AE in May of 1988. The AE's response received in June of 1988, stated the need to environmentally qualify the Startup Block Valves and the terminal blocks associated with the RCS Vent and PASS Isolation Valves. However, utility engineers felt that more detailed information was required before making final determination of the qualification requirements for these items, as well as several other items in the report. FPC requested that the AE provide the necessary additional information and initiated plans to correct environmental qualification problems.

Preliminary investigation of information in the AE's report regarding the Startup Block Valves, RCS Vent Valves, and PASS Isolation Valves indicated that the qualification problems did not compromise operability of the subject equipment. At this time, the lack of environmental qualification was not identified as a condition outside the plant design basis.

Utility engineers also evaluated actions required by NRC Generic Letter 88-07 (Modified Enforcement Policy Relating to 10CFR50.49). The Generic Letter provided guidance regarding actions to be taken if equipment was determined to be inoperable due to lack of environmental qualification. For equipment not declared inoperable, the letter directed licensees to evaluate the reportability of the lack of environmental qualification. The Startup Block Valves, RCS Vent Valves, and PASS Isolation Valves were not declared inoperable. Therefore, utility engineers did not initially identify that lack of environmental qualification for FWV-33 and 36 or the terminal blocks constituted a potentially reportable condition. The engineers proceeded with their corrective action plans.

On August 4, 1988, additional questions were raised concerning the necessity of the work planned for FWV-33 and FWV-36. Discussions between the AE and utility engineers confirmed that the Startup Block Valves must be environmentally qualified, and determined that the lack of environmental qualification constituted a condition outside the plant design basis. Utility engineers then promptly notified plant personnel of the condition. Reports required by 10CFR50.72 were made at that time.

When utility engineers received additional information confirming the need to environmentally qualify the RCS Vent and PASS Isolation Valves' terminal blocks, they notified personnel at the plant site.

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TEXT (If more space is required, use Additional NRC Form 264a) (17)

CAUSE

The initial list of environmentally qualified equipment was developed in response to NRC I&E Bulletin 79-01B and included FWV-33 and FWV-36. When the list was later refined, engineers had received information indicating that the EFIC system would perform functions that would eliminate the need to environmentally qualify the Startup Block Valves. Based on this input, the valves were removed from the environmental qualification list. This input was later found to be incorrect.

Modification packages for installation of the RCS Vent Valves and PASS were planned in 1983. At that time, it was concluded that the equipment would not be required to operate until sufficient time had passed for the harsh environment to have mitigated. Because the valves are maintained deenergized and are not required to operate immediately following an accident, engineers reasoned that the valves would not require environmental qualification.

EVENT ANALYSIS

Valves FWV-33 and FWV-36 are located in the CR-3 Intermediate Building. This building also houses the Emergency Feedwater Pumps [SA,P], and portions of the Main Steam Lines [SB] and Main Feedwater lines. A High Energy Line Break (HELB) (rupture of a main steam line, feedwater line, or steam supply line to the turbine driven Emergency Feedwater Pump [BA,P]) would cause a harsh environment, as defined in 10CFR50.49, "Environmental Qualification of Electrical Equipment," to exist in the Intermediate Building. A HELB would also cause the EFIC system to isolate the Steam Generator affected by the failure.

Two factors mitigate the effect of a harsh environment on the Startup Block Valves. First, the only function of the block valves following a HELB is to close. The valves are required to close within 34 seconds of receiving a command to close, and have exhibited closure times less than 25 seconds during surveillance testing. Second, the harsh environment in the Intermediate Building would exist for only a few minutes. The mass of metal components of each valve operator is large enough to prevent rapid heatup. Therefore, it is not likely that a HELB would prevent the Startup Block Valves from closing within the required time.

Even if the harsh environment prevented closure of the Startup Block Valve associated with the affected Steam Generator, feedwater isolation would be accomplished by closing the MFWP Suction Valve and tripping the MFWP. However, if the associated MFWP suction valve failed to close, the Feedwater Booster Pump (FWBP) [SJ,P] could continue to feed the affected Steam Generator. Additional feedwater flow would worsen the consequences of a HELB.

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

Several factors reduce the risk associated with this scenario. Such a scenario is a low probability event, requiring multiple equipment failures, as well as failures of operators to take appropriate actions. Following a HELB, the FWBP's would not be able to feed the affected Steam Generator until SG pressure decreased to approximately 250 psig or less. Therefore, operators would be able to take actions to trip the FWBP's and terminate feeding of the affected Steam Generator before significant addition of feedwater occurred.

The RCS Vent and PASS Isolation Valves' terminal blocks are located in areas that would be subjected to a harsh environment following LOCA or HELB. Test data indicates that the terminal blocks would not maintain the required electrical resistance values when exposed to the harsh environment. The circuit breakers [72] which supply electrical power to the RCS Vent Valves and seven of the eight subject PASS Isolation Valves are normally open. Administrative controls are used to ensure that the breakers remain open. Therefore, the lowered resistance of the terminal blocks would not affect operation or cause inadvertent opening of these valves. However, it was determined that lowered terminal block resistance could lead to a short circuit that could cause the eighth PASS valve to inadvertently open. If this occurred, containment integrity would be maintained by redundant containment isolation valves.

CORRECTIVE ACTIONS

Following discovery of the lack of environmental qualification for the Startup Block Valves, FPC engineers performed an investigation of the components of concern. Engineers were able to gather sufficient data to qualify components by analysis. Although qualification by analysis was not sufficient to satisfy the requirements of 10CFR50.49, such qualification did support the justification for continued operation.

Following discovery of lack of environmental qualification for the RCS Vent and PASS Isolation Valves' terminal blocks, engineers developed additional justification for continued operation. Justification was based on analysis of the effects of failure of the subject terminal blocks in a post-LOCA or HELB environment. Following notification that this lack of environmental qualification, constituted a condition outside the design basis, plant operators opened the feeder breaker for the eighth PASS Isolation Valves and implemented administrative controls to ensure the breaker remains open.

All nonqualified components associated with the Startup Block Valves will be replaced with environmentally qualified parts. Due to availability difficulties with replacement parts, a schedule for the replacement can not be determined at this time. A schedule will be provided in a supplement to this report by January 31, 1989.

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TEXT (if more space is required, use additional NRC Form 366A (1/77))

The replacement of the RCS Vent and PASS Isolation Valves' terminal blocks with environmentally qualified components will be completed prior to restart from the October 1988 outage.

The Startup Block Valves were not environmentally qualified due to incorrect design input data. The terminal blocks associated with the RCS Vent Valves and PASS Isolation Valves were not environmentally qualified due to interpretation of environmental qualification requirements. These errors were made during the developmental phase of the environmental qualification program. Since the time the errors were made, better guidance has been developed to aid engineers in determination of environmental qualification requirements. Such guidance is provided in engineering procedures, the Environmental and Seismic Qualification Program Manual, and in environmental qualification training programs for utility engineers. Also, FPC has recently developed procedural guidelines for evaluating conditions which may affect the plant design basis.

PREVIOUS SIMILAR EVENTS

These are the first instances of a condition outside of the plant design basis due to lack of environmental qualification.

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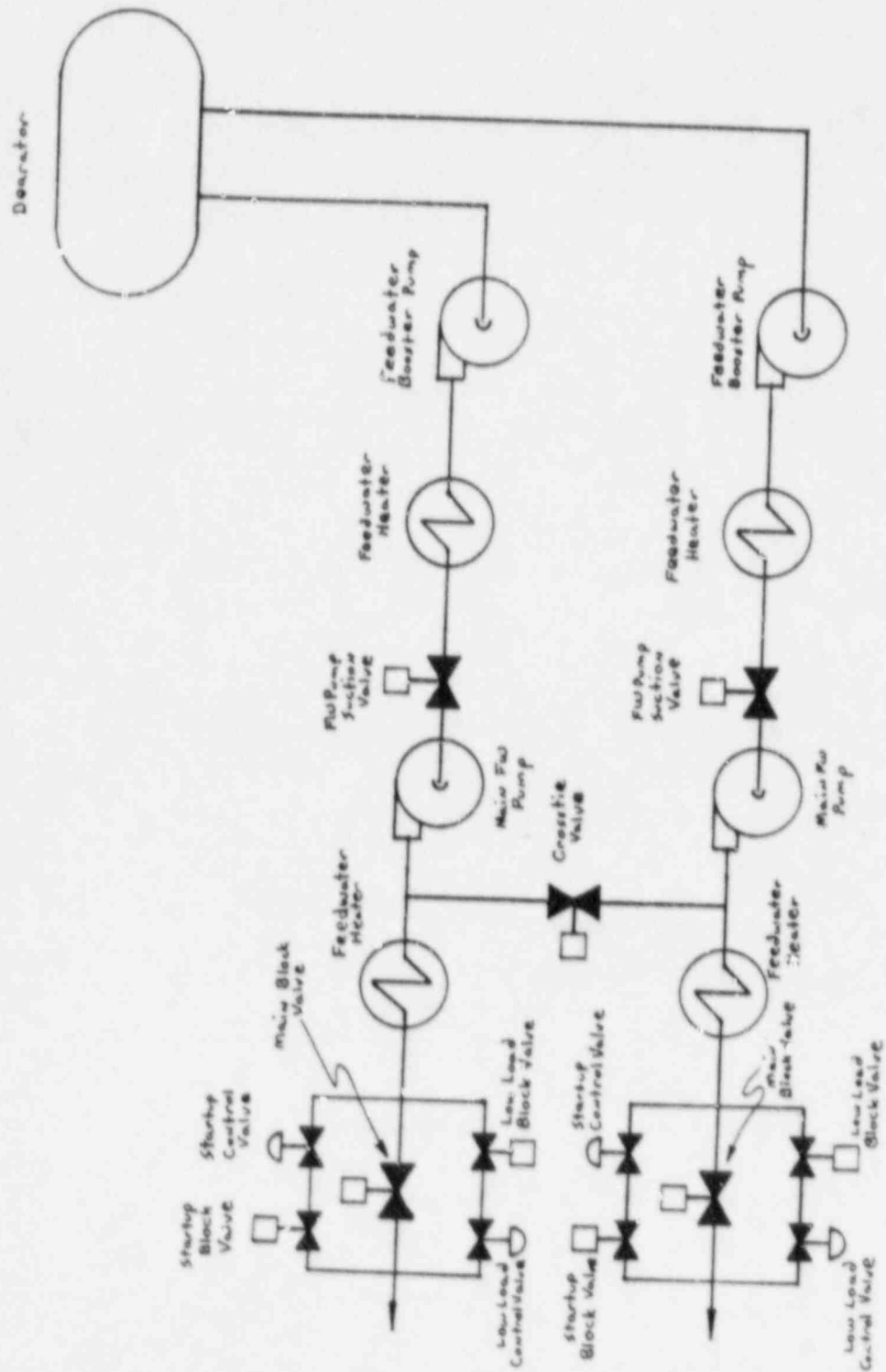
CRYSTAL RIVER UNIT 3

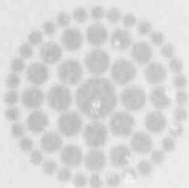
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TEXT (if more space is required, use additional NRC Form 305A's) (17)

Figure 1 - Simplified Feedwater System Diagram





**Florida
Power**
CORPORATION

September 19, 1988
3F0988-14

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

Subject: Crystal River Unit 3
Docket No. 88-302
Operating License No. DPR-72
Licensee Event Report No. 88-015-01

Dear Sir:

Enclosed is Licensee Event Report (LER) 88-015-01 which is submitted in accordance with 10 CFR 50.73.

Should there be any questions, please contact this office.

Very truly yours,

Rolf C. Widell
Director, Nuclear Operations Site Support

WLR:mag

Enclosure

xc: Regional Administrator, Region II
Senior Resident Inspector