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Florida Power
CORPORATION

August 8, 1988
3F0888-06

U. S. Nuclear Regulatory Commission
101 Marietta Street N.W.
Suite 2900
Atlanta, GA 30323

Attention: Dr. J. Nelson Grace

Subject: Crystal River Unit 3
Docket No. 50-302
Operating License No. DPR-72
Environmental Qualification of Feedwater Isolation Valves

Dear Sir:

This letter is submitted as a follow up to the report made on August 5, 1988 per 10 CFR 50.72 and the subsequent discussion with your staff on August 8, 1988. It expands upon and clarifies the Justification for Continued Operation attached to the Non-conforming Operations Report (NCOR) which has been provided to the staff (Attachment 1).

While reconciling differences between the Equipment Qualification (EQ) List and Safety Listing for Crystal River 3 (CR-3) as part of an overall Master List verification effort, it was discovered that two valves in the Main Feedwater System (and their associated local control stations and terminal boxes), the start-up feedwater block valves, were listed on the Safety Listing as requiring environmental qualification but these valves were not listed on the Equipment Qualification List. An investigation revealed that during the development of the Equipment Qualification List and the design of the Emergency Feedwater Initiation and Control (EFIC) System, it was believed that the accident mitigating function of these valves would be preempted by EFIC. For this reason, these valves were deleted from the EQ list. Later finalization of the EFIC design resulted in the accident mitigating function of these valves <u>not</u> being preempted by EFIC. The valves were, however, not returned to the EQ list.

An evaluation of the high energy line break (HELB) caused harsh environment which the valves would be subjected to, revealed a short duration high temperature spike. The temperature curve is included as Attachment 2. While an explicit thermal lag calculation was not performed, based on good engineering judgement, there is a high

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probability the valve and associated components would be unaffected by the harsh environment during this short period. The valve would be signaled to close by the EFIC System as soon as the high energy line break was detected.

Additional insight in the safety significance of the situation can be gained by an evaluation of the effects of a failure of the valves to close to mitigate a HELB. If all other components perform as designed there would be no change in the accident scenario as it is described in the FSAR. This is because the FSAR analysis assumed the failure of one of three valves in the feedwater lines to the affected steam generator. The EFIC System closes the main feedwater pump suction valves in addition to tripping the main feedwater pumps when a feedwater or steam line rupture is detected. This results in a single failure proof design which can tolerate the failure of the valves in question. The main feedwater pumps and suction valves are located in another area of the plant and are not subjected to the same harsh environment.

Even if the feedwater pump suction valve in the train supplying the steam generator with the line break were to fail to close, the consequences are not severe. Once the pressure in the steam generator decreases below the discharge pressure of the feedwater booster pump, some amount of feedwater will be injected into the generator. This will not be a large amount of water, however, since the discharge pressure of the feedwater booster pumps is not as high as the main feedwater pumps and the startup feedwater line is only six inches in diameter. No explicit analysis has been performed, however, it would result in a moderate increase in the amount of steam released as a result of the steam line rupture and operator action would be required to secure the feedwater booster pumps or otherwise terminate the flow. This would result in a transient which is beyond the design basis, but would not likely cause radioactivity releases of the magnitude described in 10 CFR 100.

In those instances where qualified replacement materials are available on-site, Florida Power Corporation (FPC) will replace the unqualified materials as soon as is prudently possible. For the remainder of the components, FPC is actively pursuing the materials to replace the unqualified components. It is anticipated that all of this work can be done while the plant is in operation. More detailed corrective action will be provided in the requisite LER.

Sincerely,

Ken Wilson

K. R. Wilson
Manager, Nuclear Licensing

AEF/KRW:
Attachments

xc: Senior Resident Inspector
Document Control Desk

Attachment 1

FLORIDA POWER CORPORATION
Crystal River Unit 3

Zone Environmental Data

ZONE # 17

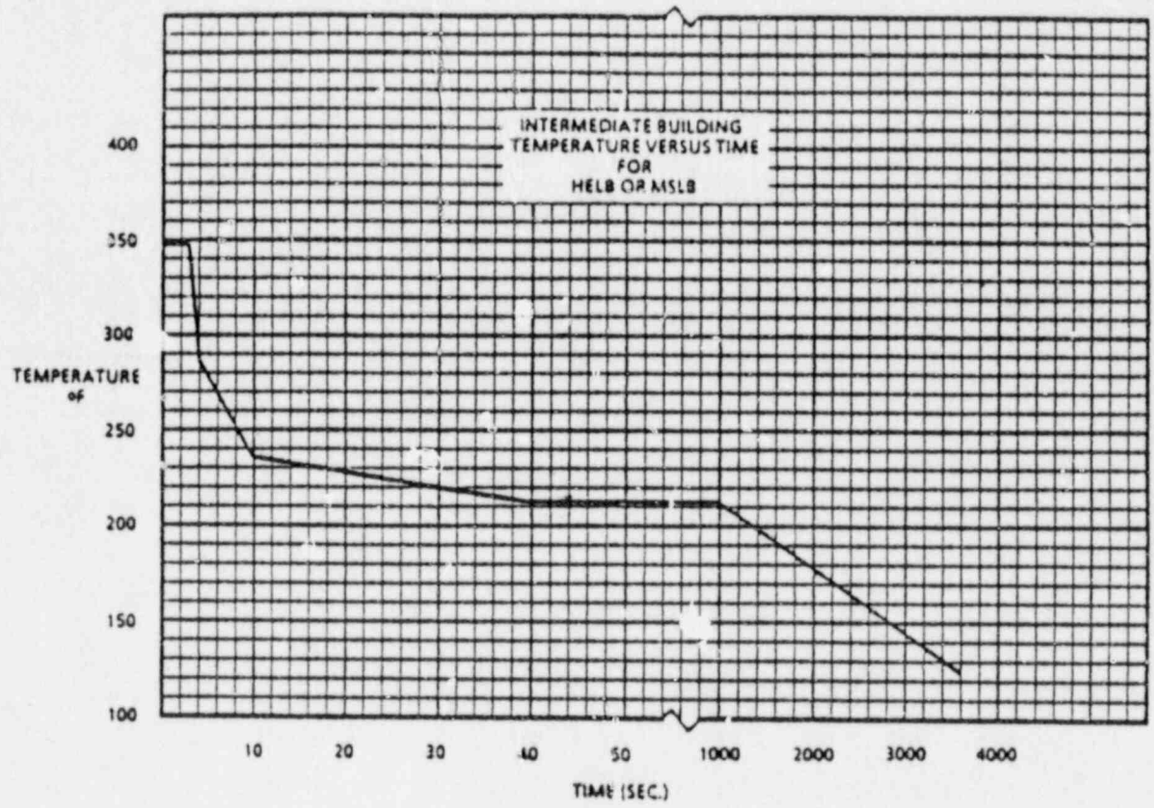
Revision 4

Date 8/86

DESCRIPTION: Elev. 119' - Intermediate Building, Pressurizer Cabinet Area, To Column 308

Parameters	Normal Environment		Environment For Loss Of Coolant Accident		Environment for High Energy Line Break (Inside A8 & 18)	
Temperature (°F)	Hours/Year	Temp.	Time	Temp.	Time	Temp.
	3723	100 to 140	N/A		0-2	Sec 345
	3368	95 to 99			2-4	Sec 345-287
	1521	85 to 94			4-10	Sec 287-240
	148	70 to 84			10-40	Sec 240-212
					40-1000	Sec 212
					1000-3600	Sec 212-Amb
					1 Hr-6 Mo	Ambient
Pressure (PSIG)	Atmospheric		Time	Press.	Time	Press.
			N/A		0-2	Sec 2.85
					2-40	Sec 2.85-0.5
					40-1000	Sec 0.5
					1000-3600	Se[illegible]-0
					1 Hr-6 Mo	
Relative Humidity(%)	20 to 90		N/A		Time	%
					0-1 Hr	100
					1-2 Hr	100-90
					2 Hr-6 Mo	90
Chemical Spray (pH)	N/A		N/A		N/A	
Radiation (Rads)	40 Year Dose		Time Pr[illegible] Accident	Dose		
	$< 1.0 \times 10^3$		1 Hr	1.7×10^3	N/A	
			1 Day	5.7×10^3		
			5 Days	9.9×10^3		
			30 Days	2.0×10^4		
			6 Months	4.2×10^4		
			40 Yr. Total + 6 Mo. = 4.3×10^4 Total			
Submergence (Flood Level)	N/A		N/A		N/A	

LEGEND: N/A = Not Applicable, N/C = Not Calculated
NOTES:


INTERMEDIATE BUILDING
TEMPERATURE VERSUS TIME
FOR
HELB OR MSLB
TEMPERATURE
°F
400
350
300
250
200
150
100
10
20
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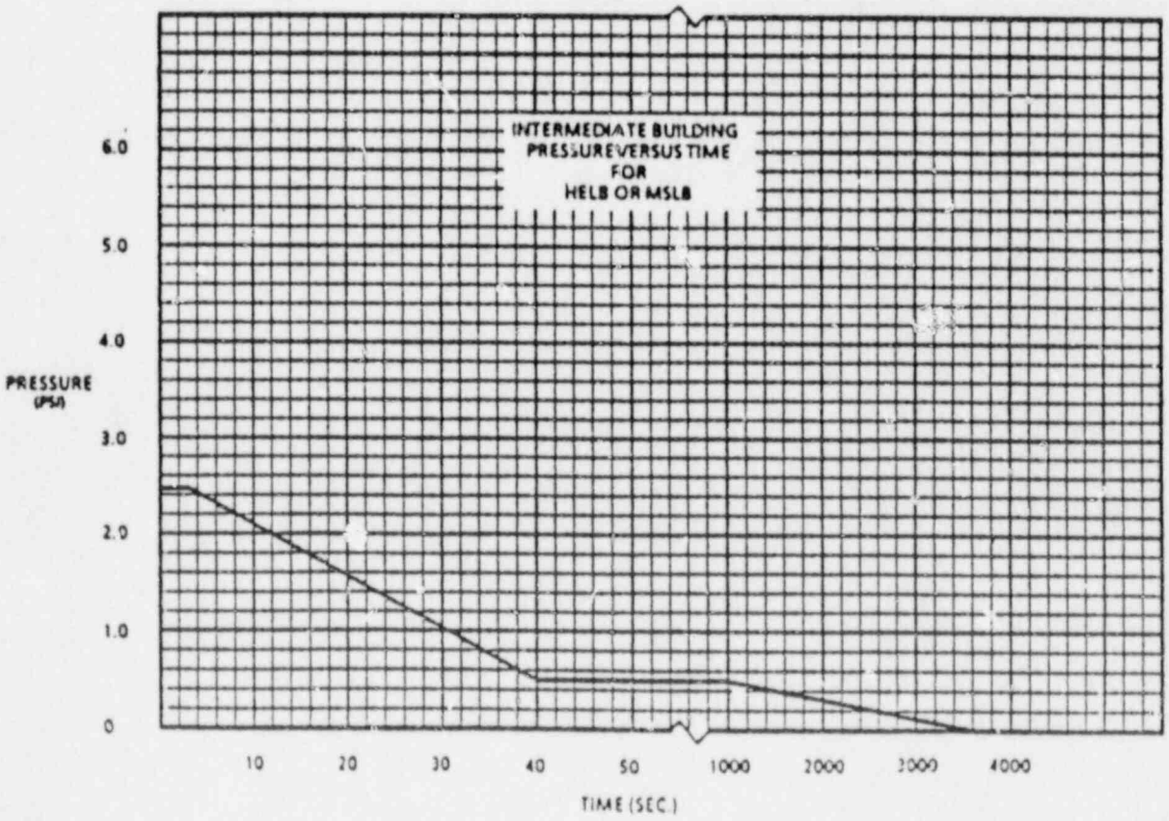
40
50
1000
2000
3000
4000
TIME (SEC.)


INTERMEDIATE BUILDING
PRESSURE VERSUS TIME
FOR
HELB OR MSLB
PRESSURE
(PSI)
6.0
5.0
4.0
3.0
2.0
1.0
0
10
20
30
40
50
1000
2000
3000
4000
TIME (SEC.)

NONCONFORMING OPERATIONS REPORT (NCOR) ENCLOSURE 1 (PAGE 1 of 2)
YEAR - NO. -

PART 1: TITLE FWV 33 & 36 AND ASSOCIATED ELECTRICAL EQUIPMENT'S ENVIRONMENTAL QUALIFICATION

DOCUMENT NO. _____
TAG NO. _____
WR NO. _____

1. REQUIREMENT Compliance to Title 10 CFR 50.49.

NONCONFORMANCE/EVENT Equipment which should have been part of the Environmental Qualification Program has been excluded due to improper classification during the I&E Bulletin 79-01B response work.

2. DISCOVERY METHOD/CONDITION _____ DISCOVERY DATE/TIME 8/5/88 /

APPARENT CAUSE Improper classification of equipment during I&E Bulletin 79-01B response.

IMMEDIATE IMPACT Inability to verify compliance to requirements of 10 CFR 50.49.

INITIAL ACTIONS Engineering has implemented corrective actions per NRC Generic Letter 88-07.

SUPPORTING DOCUMENTATION: ATTACHED _____ N/A X

3. ORIGINATOR G W Lattberry 8/5/88 RESP SUPER D D Shook 8/5/88

PART 2: 1. PLANT CONDITIONS: MODE _____ RX PWR _____ MWe _____ OTHER _____

REDUNDANT EQUIP _____ SP/MAINT _____

2. TS AFFECTED _____ ACTION ENTRY DATE/TIME _____

ITEM TAG ATTACHED: YES _____ NA _____

ACTION STATEMENT SUMMARY _____

3. EVALUATION FOR IMMEDIATE NOTIFICATION (USE EM-202 IF EMERGENCY DECLARED)
EMERGENCY PLAN IMPLEMENTED: YES _____ NO _____ CLASSIFICATION _____

REFERENCE (USE ENCLOSURE 4, 8)	PHONE CALL REQD YES	PHONE CALL REQD NO	TIME LIMIT	ORGANIZATION
a. 10 CFR 50.72	___	___	1 HR OR 4 HR	NRC OPS CENTER
b. 10 CFR 20.205	___	___	IMMEDIATE	NRC REGION II
c. 10 CFR 20.402	___	___	IMMEDIATE	NRC OPS CENTER
d. 10 CFR 20.403	___	___	IMMEDIATE OR 24 HR	NRC OPS C./DHRS
e. 10 CFR 50.36	___	___	1 HR OR 24 HR	NRC OPS CENTER
f. 10 CFR 73.71	___	___	AS REQUIRED	NRC OPS CENTER
g. TS 6.7.1	___	___	24 HR	FPC VP/NGRC
h. EPP	___	___	24 HR	NRC REGION II
i. ANI/FPC RISK	___	___	IMMEDIATE	ANI/FPC RISK
j. 10 CFR 70.52(a)	___	___	IMMEDIATE	NRC OPS CENTER

4.

NOTIFICATION	NAME	TITLE	DATE/TIME
a. STATE			
b. NRC (ENS)			
c. NRC (REG II)			
d. FPC			
e. DHRS			
f. SOTA			
g. OTHER			

5. NUCLEAR SHIFT SUPERVISOR _____ DATE/TIME _____

JUSTIFICATION FOR CONTINUED OPERATION

During the course of verification of the scope of 10CFR50.49, it was determined that the following devices were identified as requiring qualification to 10CFR50.49:

FWV-33/36	Motor Operated Valve (DC)
FWV-33/36 (MS)	DC Motor Starter For MOV's FWV-33/36
FW-5/6	Control Stations For FWV-33/36
FW-3/4	Terminal Boxes For FWV-33/36

In accordance with the requirements of Generic Letter 88-07, an assessment of operability was performed on each of these components.

The results follow:

1. <u>FWV-33/36 - DC Limitorque Motor Operator</u>

   Based on walkdown data obtained during IEB 79-01B evaluations, all the components of this operator, with exception of the motor, can be qualified by Limitorque Report Number B0058. The DC Motor is a Reliance Class B insulation DC Motor. A similar AC Motor with Class B insulation, however, is qualified for an outside containment environment at a lower temperature than required. This valve (FWV-33/36) must operate in less than a minute. Based on mass of the equipment and thermal lag consideration, it is Engineering's judgement that short term qualification is demonstrated. Also of concern is the DC Motor which contains brushes not tested in the AC Motor. Similar RH insulated DC Motors have been qualified for a steam environment demonstrating operability of the DC Motor Brush System.

   The motor leads for the operator are terminated by Raychem WCSF-N qualified splice configuration.

   Thus, there is adequate assurance of short term operability of the existing DC Limitorque operator until a complete EQ upgrade is implemented.

2. FWV-33/36 (MS) - Allen-Bradley DC Motor Starter

These local DC Motor Starters are the same design as the 480 VAC ES MCC. Similar Allen-Bradley DC Motor Starters for Emergency Feedwater valves were replaced with qualified DC Motor Starters supplied by Nutherm and fabricated from Siemens components. A preliminary component by component materials analysis was done indicating the similarity between the qualified Nutherm (Siemens) starter and the existing Allen-Bradley starter. Credit can also be taken for the NEMA 4 type enclosure to protect against direct impingement of the steam environment (100% RH) on the starter components. Based on this similarity and short term functional requirements (less than a minute for the valve), adequate assurance of operability exists for the DC Motor Starter.

3. FW-5/6 - Local Control Station

These field fabricated local control stations consist of CR2940 pushbuttons and indicating lights in a NEMA 4 type enclosure. Based on the wiring of the pushbuttons and indicating lights in the control circuit, their failure open or short will not affect the Main Steam Pressure Matrix closure signal to the MOV. A short to ground will not cause the control fuse to blow since the control voltage is an ungrounded 125V DC System. Also, the NEMA 4 type enclosure provides protection from the steam environment short term and the GE CR2940 switches and lights are rated for 95% RH. Thus, adequate assurance of short term operability exists for the control stations.

4. FW-3/4 (TB) - Terminal Boxes

The terminal boxes consist of a NEMA 4 type enclosure and States Type NT terminal blocks that are rated for 95% RH. Tests by Sandia National Laboratories for the NRC (NUREG/CR-4301) indicate that terminal blocks in a NEMA 4 type enclosure can adequately perform a control function in a steam environment in most cases. This provides adequate assurance of the short term function of these terminal blocks to allow closure of the MOV (less than a minute).

The safety function of FWV-33/36 for the HELB environment (MSLB or MFWLB) outside the Reactor Building is to provide a Start-up Feedwater Line Block (isolation) upon an initiation signal from the Main Steam Pressure Matrix. A similar safety function exists for the Low Load FW Block Valves (FWV-31/32) and the Main FW Block Valves (FWV-29/30).

The original design basis for CR-3 was non-safety related valves, and the closure signal was from the Main Steam Pressure Matrix, also non-safety related. The valves were upgraded with Class 1E power and closure signal from the new EFIC system. As a backup to these valves, an isolated safety related signal is provided to close the MFWP suction valves (FWV-14/15) which results in a trip of the Main Feedwater Pump (MFWP) Turbine. FWV-14/15 were also originally non-safety related and upgraded with Class 1E power. In addition, FWV-14/15 Limitorque operators are qualified for inside containment application. These diverse and redundant components, though not fully Class 1E, provide assurance of the ability to isolate Main Feedwater from the Main Steam or Feedwater Line Break. Also, because the FSAR steam line break analysis assumed the failure of one of these valves, the current plant situation is bounded by the safety analysis.

The interim assessment of operability summarized above and the availability of a redundant and diverse means of performing this function provides a justification for continued operation until qualified equipment can be installed.