Florida
Power
CORPORATION
Crystal River Unit 3
Docket No. 50-302

December 22, 1994
3F1294-22

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

Subject: Licensee Event Report (LER) 94-006-01

Dear Sir:

Attached is Licensee Event Report (LER) 94-006-01 which is submitted in accordance with 10 CFR 50.73.

This supplement provides additional information which was previously unavailable.

Sincerely,

E J Stokke for

G. L. Boldt
Vice President
Nuclear Production

GLB/JAF:ff

Attachment

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

IE22
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NRC FORM 366 (5-92) U.S. NUCLEAR REGULATORY COMMISSION

APPROVED OMB NO. 3150-0104

EXPIRES 5/31/95

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.

LICENSEE EVENT REPORT (LER)

FACILITY NAME (1)	DOCKET NUMBER (2)	PAGE (3)
CRYSTAL RIVER UNIT 3 (CR-3)	0 5 0 0 0 3 0 2	1 OF 0 7

TITLE (4)

Deficiency in Understanding of Technical Requirements Leads to Nonconservative RPS and EFIC Setpoints and Potential Violation of Technical Specifications

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)
									N/A	0 5 0 0 0
1 1	2 2	9 4	9 4	0 0 6	0 1	1 2	2 2	9 4	N/A	0 5 0 0 0

OPERATING MODE (9)	1	THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (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)	73.71(b)
		20.405(a)(1)(i)	50.36(c)(1)	50.73(a)(2)(v)	73.71(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 366A)
		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	TELEPHONE NUMBER
	AREA CODE
J. A. Frijouf, Nuclear Regulatory Specialist	9 0 4 5 6 3 - 4 7 5 4

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

CAUSE	SYSTEM	COMPONENT	MANUFAC-TURER	REPORTABLE TO NPRDS		CAUSE	SYSTEM	COMPONENT	MANUFAC-TURER	REPORTABLE TO NPRDS	

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

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

On October 6, 1994, Florida Power Corporation's (FPC) Crystal River Unit 3 (CR-3) was in MODE ONE (POWER OPERATION), operating at 100% power, generating 880 megawatts. It was determined that the potential existed for CR-3 to have operated outside plant Technical Specifications (TS) relative to the Reactor Protection System (RPS) setpoints. FPC engineering personnel were reviewing a newly revised calculation when it was discovered that setpoints may not be sufficiently conservative relative to TS. A change in the calculation caused the calculated instrument string error to increase in the new revision. It was determined that the Variable Low Pressure Trip (VLPT) setpoint was set at the TS limit without provision for instrument error. The Shutdown Bypass trip setpoint was also found to be adjusted at its TS limit. This condition is reportable in accordance with 10CFR50.73(a)(2)(i)(B). The remainder of the RPS trip setpoints were determined to be in compliance with TS requirements. A subsequent evaluation determined that the Once Through Steam Generator Differential High Pressure set point was also potentially nonconservative relative to TS. The cause of these events was personnel error by FPC engineering personnel. Corrective actions include: recalibration, procedure changes, and an evaluation to determine the need/benefit of reviewing setpoint calculations for other systems.

EVENT DESCRIPTION

On October 6, 1994, Florida Power Corporation's (FPC) Crystal River Unit 3 (CR-3) was in MODE ONE (POWER OPERATION), operating at 100% reactor power and generating 880 megawatts. At that time it was determined that the potential existed for CR-3 to have operated outside plant Technical Specifications (TS) relative to the Reactor Protection System (RPS) setpoints.

The RPS is designed to assure that specified acceptable fuel design limits are not exceeded during conditions of normal operation and anticipated transients. The RPS initiates a reactor trip signal whenever preset RPS setpoints are exceeded.

The RPS consists of the following eleven separate trip functions:

1. Nuclear Overpower;
2. RCS High Outlet Temperature;
3. RCS High Pressure;
4. RCS Low Pressure;
5. RCS Variable Low Pressure;
6. Reactor Building High Pressure;
7. Reactor Coolant Pump Power Monitor;
8. Nuclear Overpower RCS Flow And Measured Axial Power Imbalance;
9. Main Turbine Trip;
10. Loss Of Main Feedwater Pumps; and
11. Shutdown Bypass RCS High Pressure.

Figure 1 illustrates the reactor protection trips which define the normal operating envelope. Also included is a portion of the TS Safety Limit Curve for Reactor Coolant System Departure From Nucleate Boiling (TS Figure 2.1.1-1), and the Shutdown Bypass Pressure Trip setpoint. The plant typically operates within the "normal operating box", however, operation anywhere within the confines of the trip envelope is permitted. Any change in parameters which results in an excursion outside the trip envelope will result in a reactor trip. The trip envelope comprises the area bounded by the low pressure limit of 1800 pounds per square inch-gauge (psig.), the high pressure limit of 2355 psig., the high temperature limit of 618 degrees Fahrenheit, and the Variable Low Pressure Trip (VLPT) setpoint boundary (lower right corner of trip envelope) determined by the equation [11.59 (Loop T_{hot}) - 5037.8] psig. The Shutdown Bypass trip setpoint is provided for periods of plant heatup, cooldown, or testing when it is desirable to maintain some control rods withdrawn with the reactor subcritical. This provides plant operators with a ready means to add negative reactivity to the core should shutdown margin be reduced inadvertently. In order to achieve this operational condition, the reactor trip functions associated with low RCS pressure or flow must be bypassed. The Shutdown Bypass feature of the RPS is used for this purpose as permitted by TS.

On September 14, 1994 FPC engineering personnel were reviewing a newly revised calculation for RPS string errors. The calculation (produced by the Nuclear Steam Supply System (NSSS) vendor) titled " Calculation for Statistical Errors - Crystal River 3 RPS" was a revision to a previous calculation. Factored into the revised calculation were the effects of increased ambient temperatures resulting from Loss-Of-Coolant-Accident (LOCA) conditions. This enhancement was necessary to determine if the RPS instrument strings setpoints were adequate under these conditions. The Summary of Results for the revised calculation stated that increased errors in the high temperature trip, VLPT temperature loops, and an increased pressure trip time response were established. These errors were evaluated with respect to TS setpoints and accident analyses, and were found to be acceptable. The TS limits were unaffected and the RPS setpoints remained substantially the same between the old and new revisions, however the instrument string error had increased in the new revision for those setpoints noted above. Figure 2A illustrates the relationship and effects of the calibration setpoint, TS limits, and instrument string error tolerance. Figure 2B specifically illustrates the situation in which an instrument string could be within calibration specifications, yet be outside the TS limits.

During the review it was determined that the RCS VLPT setpoint was established at the TS limit. No calculated instrument error was used to offset the setpoint in a conservative direction. Therefore, the potential existed to exceed the TS RCS VLPT setpoint due to previous "as-left" tolerance and/or instrument drift. An action plan was developed to evaluate the RPS VLPT calibration setpoint, and further, to similarly evaluate all other RPS setpoints.

An analysis of the "as-left" data from the most recent RPS calibration (March 15, 1994) and the "as-found" data for the VLPT, recorded via the September 30, 1994 work instructions, was conducted. The analysis determined that the VLPT setpoint for RPS channels B & D were found to be slightly outside the TS curve in both the "as-left" condition from the performance of the RPS calibration on March 15, 1994 and the "as-found" data from work instructions performed on September 30, 1994. Based on this analysis, the two RPS VLPT channels would have tripped slightly outside TS limits. Additionally, the Shutdown Bypass trip setpoint was found to be adjusted at its TS setpoint. With no calculated error conservatively offsetting the RPS calibration setpoint from the TS setpoint, the Shutdown Bypass trip setpoint may have permitted operation outside TS limits. The remainder of the RPS trip setpoints were determined to be in compliance with TS requirements.

During a subsequent evaluation of the Emergency Feedwater Initiation and Control (EFIC) system, it was determined that the Emergency Feedwater (EFW) vector valve control, Once Through Steam Generator (OTSG) Differential High Pressure setpoint was potentially nonconservative relative to the TS allowable value. As part of the Feed Only Good Generator (FOGG) subsystem of EFIC, the OTSG Differential High

Pressure setpoint provides automatic EFW isolation to a depressurized OTSG for the range of steam line or feedwater line breaks that require rapid actuation early in the event.

The allowable TS value for this setpoint is 125 pounds per square inch differential (psid) and EFIC procedure, EFIC Monthly Functional Test (SP-146A), calibrates the setpoint to 126 psid with an as-left tolerance of approximately +/- 6 psig. The procedure's setpoint should have been less than 125 psid to include instrument error such that the TS value of 125 psid would not be exceeded.

This condition for potential operation or condition outside plant TS is reportable in accordance with 10CFR50.73(a)(2)(i)(B).

EVENT EVALUATION

By initiating a reactor trip when required, the RPS will limit the severity of the transient for each analyzed accident. The RPS consists of four identical channels. The system logic requires at least two of the four channels to trip before initiating a reactor trip. Although two of the four RPS VLPT channels had drifted slightly nonconservative relative to the TS setpoint, the remaining two channels were set to trip the reactor prior to reaching the TS limit. In the event of a failure of one or both of the conservatively calibrated channels the two nonconservatively calibrated channels would trip the reactor just outside the TS limit. In that case the conservatism between the TS setpoint and the safety limit curve would ensure that the reactor would trip prior to exceeding the safety limit. Additionally, none of the FSAR Chapter 14 Design Bases Accidents credit the VLPT for accident mitigation.

The Shutdown Bypass trip setpoint is not applicable for MODE 1 plant operations, but becomes an operational consideration at RCS pressures less than 1720 psig. The bases for this setpoint have been traced to a NSSS specification which established the setpoint to be "as high as possible to allow the maximum pressure range during physics testing", and "low enough below the Low Pressure trip setpoint such that pressure measurement errors could not prevent a trip from occurring".

Relative to the EFIC OTSG Differential High Pressure setpoint, the Safety Analysis for Vector/FOGG Logic is 150 psid with an analyzed instrument string error of 12 psig. Postulating a worst case procedurally allowable (prior to November 22, 1994) as-left setpoint of 129 psid plus the 12 psig instrument error, the maximum OTSG differential pressure actuation would occur at 141 psid, 9 psid below the Safety Analysis value. Actual as-left data determined that the maximum as-left trip setpoint was 126.4 psid and the design basis was not exceeded.

Therefore, these setpoint discrepancies did not have a significant effect on the margin of safety provided to the general public.

CAUSE

The primary cause of these events was cognitive personnel error by FPC engineering personnel in that a deficiency existed in the understanding of the impact of the calculation on plant procedures and equipment prior to issuance of the calculation. The same equation described in TS was used to develop the calibration voltages, which established the potential to calibrate the RPS module within the procedural specifications yet fall outside the TS limits.

The exact scenario for the human error resulting in the SP-146A calibration value of 126 psid rather than the TS value of 125 psid is unknown.

CORRECTIVE ACTION

Corrective actions for this event include the following.

1. System Engineering personnel will be required to review these events in order to ensure that future actions addressing setpoints will include proper consideration of instrument error.

2. The incorrect VLPT RPS and EFIC OTSG Differential High Pressure setpoints have been recalibrated and the shutdown bypass setpoint has been moved to be conservative relative to the TS allowable value.

3. The applicable procedures and Calibration Data Sheets will be revised to reflect the new RPS and EFIC OTSG Differential High Pressure setpoints setpoints.

4. An evaluation is being conducted to determine the need/benefit to develop or revise analyses and calculations to provide new calibration setpoints for other systems. This includes the Engineered Safety Features Actuation System (ESFAS). Any setpoints determined to be nonconservative relative to TS limits will be reported via a supplement to this LER.

PREVIOUS SIMILAR EVENTS

There have been three previous reportable events involving RPS calibration.

ATTACHMENT

Figure 1 illustrates the reactor protection trip envelope, including a portion of the TS Reactor Coolant System Departure From Nucleate Boiling (DNB) Safety Limit curve, and the Shutdown Bypass low pressure limit level.

Figure 2A illustrates the relationship of the calibration setpoint, TS limits, and instrument string error tolerance.

Figure 2B illustrates the possible effects of calibration tolerance on TS limits when inadequate offset of RPS setpoint from TS setpoint is employed.

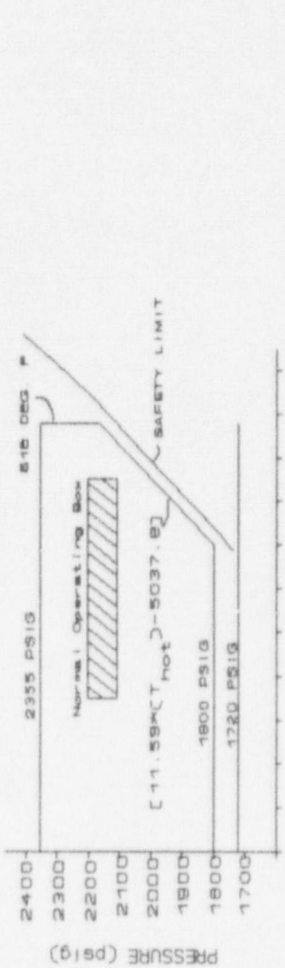

FIGURE 1 REACTOR PROTECTION TRIP ENVELOPE

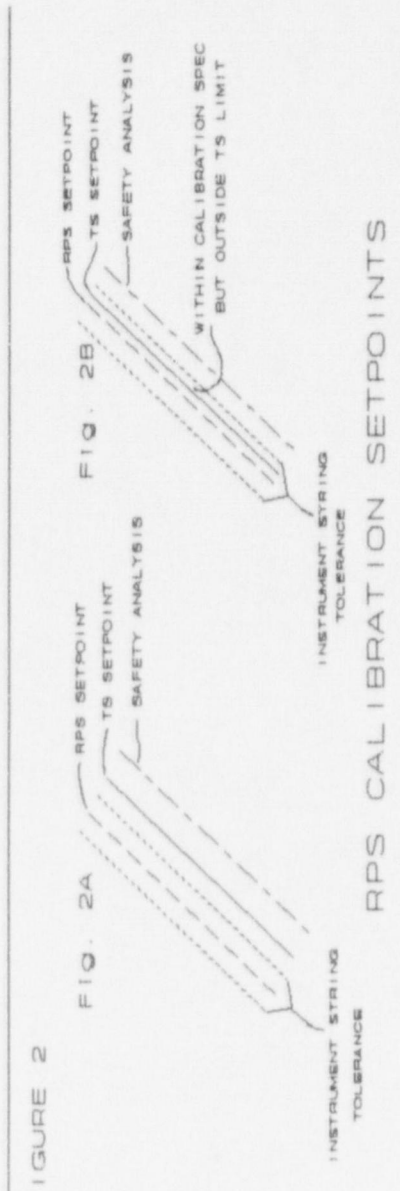

FIGURE 2 RPS CALIBRATION SETPOINTS

FIG. 2A FIG. 2B