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

December 27, 1995
3F1295-22

Public Document Room
U.S. Nuclear Regulatory Commission
101 Marietta Street, Suite 2900
Atlanta, GA 30303

Reference: NRC Inspection No. 50-302/95-22

Dear Sir:

The subject inspection at Crystal River Unit 3 (CR-3) included the review of the unauthorized Make-Up Tank evolutions of September 4 and 5, 1994, and verified other Make-Up Tank information that had recently been given to Florida Power Corporation (FPC).

In order to understand this recent information and put it in perspective, FPC has conducted an extensive evaluation of the information. The results of this evaluation are summarized in the attachment to this letter.

Please do not hesitate to contact me or my staff should you desire any further discussion on this recent information or any other Make-Up Tank related subject.

Sincerely,

P. M. Beard, Jr.
Senior Vice President
Nuclear Operations

PMB/RMB/lf
Attachment
xc: Region II Administrator
Region II Project Manager
Resident Inspector

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ATTACHMENT

Evaluation of Information in Document "Analysis of the Control of MUT Pressure at Crystal River Unit #3, 6/1/94 to 9/7/94"

On December 7, 1995, FPC received a document entitled "Analysis of the Control of MUT Pressure at Crystal River Unit #3, 6/1/94 to 9/7/94." The document contained computer data for the pressure and level parameters of the Make-Up Tank (MUT) and determined when the parameters would have exceeded a computer-generated annunciator alarm. The document then attempted to give explanations for each alarm condition and draw parallels to the unauthorized evolutions of September 4 and 5, 1994.

This evaluation provides FPC's review of this data, the reasons for and responses to the alarm conditions, and the differences with the unauthorized evolutions of September 4 and 5, 1994.

The computer data for the MUT pressure and level between June 1 and September 30, 1994 was reviewed by FPC in detail. Data beyond the dates in the subject document was included in the evaluation to determine if any alarm conditions occurred after the unauthorized evolutions of September 4 and 5, 1994. Some occurrences of computer parameters indicating the computer-generated annunciator to be in alarm were confirmed as noted in the subject document.

FPC identified a total of 669 MUT manipulations in the June 1 to September 30, 1994 time frame. These manipulations were 610 level reductions (bleeds) and/or level increases (feeds); 49 pressure increases by hydrogen addition (H2 adds); and 10 pressure reductions (vents).

In all these manipulations, only twenty-one (or 3.1%) resulted in the computer-generated annunciator being in the alarm condition at some point during the manipulation. These twenty-one manipulations are described below:

1. Ten of the 669 manipulations (or 1.5%) resulted in MUT operation less than one-half pound per square inch gauge (psig) above the computer-generated alarm limit and MUT operation with the computer-generated annunciator in alarm for less than one-half hour. These were manipulations that were slightly over the alarm curve and operator action was effective in quickly clearing the alarm condition.

2. Eleven of the 669 manipulations (or 1.6%) resulted in MUT operation greater than one-half psig over the alarm limit at some point in the manipulation and MUT

operation with the computer-generated annunciator in alarm for more than one-half hour.

a. Two of these eleven manipulations were the unauthorized evolutions of September 4 and 5, 1994 which were performed in order to challenge the accuracy of the operating curve (Curve 8 of operating procedure [OP] -103B, "Plant Operating Curves").

b. The other nine manipulations were for operational reasons. This is a small fraction of the total MUT manipulations and shows that this annunciator alarm was not regularly challenged by the control room operators and shift management. During the subject inspection, FPC provided to the NRC inspection team with a compilation of relevant data for these nine occurrences. This compilation included the computer parameters for each occurrence; plots of the parameters with time histories to show graphically how each manipulation was performed; and relevant plant information on reactor coolant system (RCS) hydrogen concentration and purity.

A review of these nine authorized manipulations shows that when the computer generated annunciator was in alarm, the operators in each case had initiated a course of action to lower the MUT pressure and clear the annunciator alarm. This action was to either vent the MUT, feed the MUT, or allow H2 to go into solution. These methods are described below:

1. The fastest technique to clear the alarm is to vent the MUT gas space. This is accomplished by selecting a Waste Gas Decay Tank (WGDT), performing a valve alignment (2 valves), starting the Waste Gas Compressors, opening another valve, monitoring the pressure decrease, stopping the Waste Gas Compressors, restoring the valve alignment (3 valves), purging the Waste Gas lines of H2 with the Waste Gas Compressors, removing the selected WGDT from service, and placing another WGDT in service. (All H2 was directed to a specified WGDT for industrial safety reasons.) Besides generating radioactive waste gas, this method generally lowered the H2 concentration in the RCS.

2. Another method was to raise level, recognizing the tank level / pressure moved from left to right in a slightly less sloped manner than the computer-generated alarm. This would be less precise, less timely, and with more judgement involved due to the variables discussed below with the deviation between the computer point and the indicator-recorder. This method was often chosen due to creating less radioactive waste gas and not monopolizing the primary plant operator for a significant period of time.

3. The H2 was being put in the MUT to raise or maintain the concentration of H2 in the RCS. As the H2 went into solution, the pressure dropped. This, coupled with 2. above, was the most common method to clear the alarm.

Further review of the main control board MUT indicator-recorder chart for the relevant time period shows that the MUT parameters were in the acceptable operating region of the MUT operating pressure-level curve for all but one of the nine authorized manipulations. (Instrument error for the indicator-recorder was included in the calculation of the MUT operating curve so using the indicator-recorder for MUT parameters was acceptable.) It was normal for the operators to verify the computer-generated alarm with the indicator-recorder. While engineering considered the computer-generated parameters to be more accurate, operations generally used the MUT indicator-recorder on the main control board to follow MUT manipulations.

However, it is not acceptable to operate with one indication in alarm and one indication showing the MUT parameters in the acceptable region of Curve 8. Operators are trained to react to the more conservative indication. Thus, for each manipulation, the operators reacted to the more conservative indication and moved the MUT toward and into the acceptable region of MUT operation as defined by the computer-generated annunciator alarm. However as noted below, operator actions in these nine evolutions did not result in a prompt return to the acceptable region.

The nine authorized manipulations are summarized as follows:

	Date	Maximum psig Above Alarm	Reason for Manipulation and Resulting Actions
(1)	07/23/94	1.08	Operators raised pressure of hydrogen (H2) to bring H2 in RCS to higher equilibrium. The alarm occurred due to overshoot in H2 addition. (Overshoot is a phenomenon where the H2 added increases in pressure as it reaches equilibrium with the MUT temperature.) At worst point, the MUT operating curve was exceeded by the indicator-recorder readout but this was not noted by the operators. Level increase (feed) method was used to clear the alarm but was not effective. Alarm condition existed for 122 minutes. Operators should have recognized sooner that the feed method was not being effective and shifted to the vent method to clear the alarm more quickly.

(2)	07/25/94	0.68	Operators lowered MUT level and H2 added to bring H2 in RCS to higher equilibrium. H2 add caused MUT pressure to overshoot to alarm condition. Feed method used to clear alarm but alarm condition existed for 48 minutes. Indicator-recorder read below the MUT operating curve. Even though the pressure-level relationship was going in the right direction, more timely action should have been taken to clear the alarm.
(3)	07/27/94	0.68	Operators raised pressure of hydrogen (H2) to bring H2 in RCS to higher equilibrium. H2 add caused MUT pressure to overshoot to the alarm condition. The operators attempted to clear it with the feed method but alarm condition existed for 78 minutes. Indicator-recorder read below the MUT operating curve. Again, operators should have taken more timely action to clear the alarm.
(4)	07/28/94	2.1	Operators raised pressure of hydrogen (H2) to bring H2 in RCS to higher equilibrium. H2 add caused MUT pressure to overshoot to the alarm condition. The operators attempted to clear it with the feed method but alarm condition existed for 184 minutes. Indicator-recorder read on the MUT operating curve. (MU demineralizer changes may have caused a temperature change, thus affecting the pressure.) Again, operators should have taken more timely action to clear the alarm.
(5)	07/30/94	0.73	Operators raised pressure of hydrogen (H2) to bring H2 in RCS to higher equilibrium. H2 add caused MUT pressure to overshoot to the alarm condition. The operators attempted to clear it with the feed method but alarm condition existed for 190 minutes. Plotting the indicator-recorder shows it on or below the MUT operating curve. Again, operators should have taken more timely action to clear the alarm.
(6)	08/06/94	0.82	Operators raised pressure of hydrogen (H2) to bring H2 in RCS to higher equilibrium. H2 add caused MUT pressure to overshoot to the alarm condition. H2 purity was low so fresh H2 was required. Operators tried to let H2 dissolve in water to clear alarm but alarm condition existed for 141

			minutes. Operators then shifted to the feed method to clear alarm. Again, operators should have taken more timely action to clear the alarm. Indicator-recorder read below the MUT operating curve.
(7)	08/08/94	1.54	Operators raised pressure of hydrogen (H2) to bring H2 in RCS to higher equilibrium. H2 add caused MUT pressure to overshoot to the alarm condition. H2 purity was low but increasing, so fresh H2 was still required. Operators tried to let H2 dissolve in water to clear alarm but alarm condition existed for 67 minutes. Again, operators should have taken more timely action to clear the alarm. The maximum pressure plotted right on the MUT operating curve.
(8)	08/24/94	0.51	Operators raised pressure of hydrogen (H2) to bring H2 in RCS to higher equilibrium. H2 add caused MUT pressure to overshoot to the alarm condition. Operators tried to let H2 dissolve in water but alarm condition existed for 87 minutes. Again, operators should have taken more timely action to clear the alarm. (RCS average temperature [Tave] was swinging at this time, thus affecting the level in the MUT.] Indicator-recorder read below the MUT operating curve.
(9)	09/04/94	2.07	Operators raised pressure of hydrogen (H2) to bring H2 in RCS to higher equilibrium. H2 add caused MUT pressure to overshoot to the alarm condition. Operators tried to let H2 dissolve in water but alarm condition existed for 86 minutes. Operators then shifted to vented method to clear alarm. Again, operators should have taken more timely action to clear the alarm. Indicator-recorder read below the MUT operating curve.

In all but one of the above examples, the indicator-recorder did not indicate a condition in the unacceptable region of the MUT operating curve. Even so, operator actions were not prompt.

A second area of review was the difference between the evolutions on September 4 and 5, 1994 and the other nine authorized manipulations above. There are two main differences:

1. There were valid operational reasons for the nine authorized MUT manipulations (and all the other MUT manipulations) while there were no operational reasons for the September 4 and 5, 1994 unauthorized evolutions (they were designed solely to "challenge" Curve 8). There was clearly a difference of intent.

2. The nine authorized manipulations reflect documented operator actions in order to bring the MUT to an acceptable operational configuration after receiving the annunciator alarm (although not prompt in clearing alarms). In contrast, during the unauthorized evolutions of September 4 and 5, 1994 the "A" Shift entered the unacceptable operating region of the MUT by lowering level in order to "challenge" the MUT operating curve. The unauthorized evolution of September 4, 1994 actually began in the unacceptable operating region of the MUT. The unauthorized evolution of September 5, 1994 began on the MUT annunciator alarm curve after initially exceeding the curve.

The referenced document implies there was a strong safety concern among the shift that performed the unauthorized evolutions. It is true the events brought more attention to resolving the issue of the difference between the MUT operating curve (which is based on MUT response to a loss of coolant accident [LOCA]) and the normal day-to-day operation of the MUT. However, the "A" Shift's actions (on a midnight shift during a holiday weekend) reflected poor communication, non-conservative operation, and mis-use of procedures. It now appears that the primary motivation was to prove engineering wrong. Significantly, there was no urgent condition which required immediate action on September 4 and 5, 1994.

The "A" Shift had a number of avenues to further raise their concerns without conducting unauthorized evolutions. They could have:

1. consulted with the on-duty Shift Manager;

2. raised the issue with the Manager, Nuclear Plant Operations or his supervisor, the Director, Nuclear Plant Operations;

3. used the Employee Concern Program (which the shift supervisor had previously used to raise other issues);

4. contacted the Vice President, Nuclear Production or the Senior Vice President, Nuclear Operations.

Rather than use these other avenues, the "A" Shift chose to conduct an unauthorized evolution on two consecutive midnight shifts during the Labor Day Weekend.

FPC earlier investigations into reports of the other MUT manipulations focused on the indicator-recorder parameters and its relation to the MUT operating curve rather than on computer parameter points which fed the annunciator alarm. There were very few instances of alarm conditions evident and little reason to suspect that some instances may have exceeded thirty minutes.

With regard to management expectations and operator response to the MUT alarm conditions in the June to September 1994 time frame, our review has concluded the following:

1. Operators were expected to acknowledge alarms, verify them, and the take appropriate action to clear alarm conditions. There was no specific guidance regarding timeliness of clearing alarm (time frames) other than operators are trained to take prompt and prudent actions.

2. Management relied heavily on the judgement of licensed operators to diagnose, evaluate, and respond to alarm conditions. In these nine authorized manipulations, the judgement of the licensed operators was affected by the management expectation to keep the MUT as close to the alarm curve as possible in order to maintain a high H2 concentration in the RCS. Recognizing the MUT parameters from the indicator-recorder were on or below the MUT operating curve, the operators did not respond promptly in clearing the alarm conditions on a timely basis. However, it is doubtful that they recognized that they were in the unacceptable region of the MUT operating curve.

3. In discussing these nine manipulations with the operators involved, they acknowledge that they were more focused on maintaining H2 pressure as high as possible rather that promptly clearing the alarm condition. This is a result of their interpreting management expectations for maintaining H2 pressure as more important than promptly clearing the alarm.

4. Management should have been more specific on expectations to operators regarding timeliness of response to alarms and in providing operators with sufficient guidance on how to balance H2 pressure versus being in an alarm condition.