

May 23, 1995

Mr. Stewart Ebnetter
Regional Administrator, Region II
U. S. Nuclear Regulatory Commission
101 Marietta Street, N.W., Suite 2900
Atlanta, GA 30323

Reference: A. FPC to NRC letter, 3F0595-13, dated May 5, 1995
B. Manager, Operations 'Journal' to Operations
May 19, 1994

Subject: Unresolved Item 94-22-01, Makeup Tank Operation

Dear Mr. Ebnetter:

The purpose of this letter is to provide my perspective of events and proposals presented to you in FPC to NRC letter, dated May 5, 1995 (Reference A). My name is David A. Fields and I was the Nuclear Shift Supervisor on duty September 5, 1994 when an evolution was performed and data taken on the makeup tank operating characteristics. This information was presented in Problem Report 94-0267, MUT Pressure Limit Curve Inadequate. I believe my input into the discussion is important. These are my comments, they should have no negative effect upon the individuals who worked for me on shift.

I strongly disagree with the tone and content of FPC's letter of May 5. I do, however, believe that Dr. P. M. Beard is sincere in his desire to limit or avoid NRC individual enforcement actions against the operators who actually performed the evolution. Let me provide you with a very short summary of why I felt authorized to perform the evolution and why I continue to believe that the evolution was not a 'test'. This is not an effort to say that 'mistakes' were not made. I personally made judgmental errors which have made this situation more damaging to FPC and to the people who worked for me and are now under scrutiny. I will discuss these errors and I will take full responsibility for them.

Hydrogen over pressure in the MUT was first identified as a concern in IE Notice 88-23. FPC's response was slow and not without controversy partly due to the fact that calculations were being performed by Gilbert Associates and comments back and forth between site, St. Petersburg engineering, and GAI in Reading, PA. were time consuming and there was no clear project manager. At that time, the MUT was administratively limited, by OP103B, Curve 8, to 12psig. In April 1993 a new Curve 8 was introduced, a variable curve based upon level in the MUT. The increased over pressure was desired to maximize dissolved hydrogen in the reactor coolant system. The nuclear operator on my shift had concerns at this time about the ability to emergency borate and

system response in the event of a fire. The concerns were not adequately addressed to his satisfaction. During Refuel 9, my shift performed SP-630, HPI Full Flow Test, and serious problems were encountered. The primary cause was determined to be incomplete venting of the pump's suction piping. A secondary concern identified and included in the Problem Report (PR94-149) was the MUT pressure response during drawdown and the fact that it appeared to be converging and would cross Curve 8. Nearly all of the issues and resolutions concerning PR94-149 were routed through my nuclear operator. He had many conversations, letters, and meetings over the various issues with engineering and management. He kept me up to date and informed, but I did not play an active role in the issue and resolution. At this same time, following restart from RF 9, there was increased attention to RCS hydrogen concentration. Management demanded that operating shifts operate high in pressure and on the curve (Curves). On September 2, Engineering sent a letter to the Director, Plant Operations saying that PR94-149 issues had been resolved and Curve 8 was conservative. The draft of this letter was brought to me by operations management and I was asked if there was anything my shift wanted to do or respond to because the issue was going to be closed.

Our response was to perform the MUT drawdown evolution on September 5, 1994. We had Calculation I90-0024 Rev 5, which we could see had several incorrect assumptions. The calculation assumed that the hydrogen over pressure was an 'ideal' gas. The calculation used pump suction pressures based upon an assumption that MUT to BWST swapever would occur at an RB level instead of a BWST level. We could also see that the calculation concluded that with two HPI pumps operating off of a single suction header, that a column of water 2.27 feet above the pump suction would result if a worst case LOCA break size occurred. We as a shift asked ourselves if we could legally perform the evolution. We reviewed OP-402 and concluded that we had approved guidance for lowering the MUT from 86" to 55". One member of the shift questioned whether we should drain below 55" and the ANSS said no, that to go outside the procedure would be a 'test'. No procedure Limits or Precautions would be violated. We reviewed the Annunciator Alarm procedure and determined that at the conclusion of the evolution, we would take actions to restore the tank and clear the alarm. Since we understood that the curve was a concern in the event of a large break LOCA and with an equipment malfunction which resulted in two HPI pumps operating off of a single suction header, we decided to station the Auxiliary Building Operators in a position to be able to immediately vent the pressure from the MUT. All of this was discussed at a pre-job briefing. We fully expected to get the MUT Pressure High Alarm. We fully expected to draw a system response that was above Curve 8. A third licensed operator was stationed in the control room to plot MUT level and pressure on Curve 8 so we would know exactly where we were at all times and could abort the evolution if something unexpected happened.

OP-103B, Curve 8, is a system response curve. We did not violate this curve, we placed the MUT at 86" with hydrogen over pressure exactly on the curve. Using an approved, routine procedure we lowered the level to 55". Actual system response, the data we took, drew the real and correct Curve 8. We did not violate Curve 8, we proved that the engineering assumptions used to derive the published curve were incorrect. The smooth curve that we included in Problem Report 94-0267 was in fact the real Curve 8. The published curve was incorrect because it was based upon poor engineering assumptions.

The data we collected showed an error of 1.7 psig at 55". This number is significant in that the 2.27 foot column assured in the calculation was inadequate, and hydrogen entrainment of HPI pumps was truly a concern. Lost in this entire issue is the fact that we were right. We had a safety concern which was not addressed by Management or Engineering and we proved that it was valid. On September 9 operation was administratively restricted to 2.0 psig below Curve 8 and this was increased to 2.5 psig on September 14. Engineering reluctantly agreed that OP-103B, Curve 8 was not correct.

For 35 minutes on September 5, my shift operated in a region that later turned out to be outside of the HPI System Design Basis. That is 35 minutes with extra people stationed and briefed for actions to take in case of an emergency. 'All' other times that the MUT was operated 'on' Curve 8, CR-3 was outside of the same design basis. The plant operated outside of design basis for months in Cycle 9 and following restart from Refuel 9. Our efforts have had a direct positive affect upon the safe operation of the plant. Engineering is conducting a complete evaluation of this complex issue. Two additional one hour design basis reports have been made and a twenty six item MUT Action Plan has been developed to validate system assumptions and calculations and EOP procedure guidance.

We initiated PR94-267 on September 7. Within days, the subject of 'design basis' and 'unauthorized test' was raised. Neither I nor anyone on my crew knew that Curve 8 was a design basis limit. No one in Management knew it was a design basis or they would not have insisted, demanded that we operate on the curve. Why would Engineering provide us with a curve and an annunciator alarm that indicated a one hour NRC report was due, if they understood that it was a design basis curve? In fact, Engineering could not definitively decide that a design basis had been violated until November 16 when the one hour report was made. It is also not totally clear, in my opinion, whether a 'test' was actually performed. There is no clear policy or guidelines in CR-3 Administrative Procedures of what constitutes a test. I use as a 'rule of thumb' that if an evolution is covered by an approved procedure, then a test procedure is not required. If I thought that the evolution that we performed on the MUT was a 'test', I would not have authorized it's performance.

Dr. Beard's letter of May 5 presents Management's view that my shift performed an unauthorized test and violated the HPI system design basis. He is asking you, the NRC, to not take individual enforcement action against me and my assistant for our actions. I agree with his conclusion that neither of us willfully or knowingly violated any NRC requirement. I do not agree with his assessment that management has fully understood this issue and has taken appropriate disciplinary action against us. Their actions appear to me to be a reaction to what they 'think' the NRC will do or what they 'think' the NRC expects management to do. Following the Management Review Committee investigation of my shift's actions concerning the MUT evolution, my supervisor, the Manager Nuclear Plant Operations, presented his view of the MUT evolution and lessons learned in his e-mail Journal to all Operations Department personnel (Reference B, attached). This was the most balanced and insightful discussion of the issue that I have seen. It is clear to me that management expectations had not been established prior to this event, but were being stated in his journal.

Additional disciplinary actions were not taken against me or my assistant, until after the Office of Investigation announced its arrival on site to perform an investigation. I was working the mid-night shift and was called at home and told not to come into work, that I was 'off shift'. The Assistant Shift Supervisor was already off shift because he had been asked, prior to September 5, to come off shift and be the Emergency Operating Procedure (EOP) Coordinator. Dr. Beard's letter also states that the company has no intention of restoring either of us to Licensed duties. He has told me that I will never go back on shift. His letter was the first time, however, that my assistant has ever been notified that he was administratively removed from Licensed activities. After the Management Review Committee completed its investigation, there were no restrictions, and no disciplinary actions taken against us. Dr. Beard assured both of us personally that FPC had looked at the issue and felt that appropriate action had been taken and the issue was closed. Why has FPC changed their position? No new information has surfaced. Region II and O&I interest and involvement seems to be the only reason these additional actions were taken.

I do not understand the purpose of Dr. Beard's letter. The 'politics' between FPC and the NRC is completely foreign to me. Every licensed person on my shift answered all O&I questions truthfully. I believe that their report will contain no information or allegation of any willful wrong doing. Any actions which the Office of Enforcement might take against me seem to pale in comparison to the actions which my company has already taken. My career and reputation have been ruined over this issue. It now appears that my assistant's career is also being harmed by these unilateral actions.

After Dr. Beard showed me his letter and I expressed my disappointment, he accused me of not being willing to accept any responsibility. I am responsible for every thing that happens on my shift. I authorized the MUT evolution and take all responsibility for any errors which were made. No individuals reporting to me, including my assistant, should be considered for any individual enforcement. I was their supervisor and I made the decisions...period.

The following discussion is my perspective of areas where I could have made better decisions.

1. The Nuclear Operator on my shift took the lead on the MUT and the concerns the operations department had with operating with elevated pressures. Following SP-630, he worked tirelessly with engineering to help resolve the problems identified. I know that the O&I report will show his dedication and frustration with the issue. I should have gotten more personally involved and helped him with his concerns and got his questions raised to the appropriate levels. I let him down. If I had been a more aggressive, effective supervisor, this entire issue could have been avoided.
2. I am the one person on shift who should have recognized that Curve 8 was more than an operating curve. We had the calculation, and we could see that the curve provided was the assumed system response to a MUT drawdown. This information should have alerted me that no conservatism was included. I am a degreed engineer, I spent five years as an officer in the US Navy nuclear program, I worked as an engineer for Duke Power for three years, and I worked for FPC as an engineer for seven years prior to becoming a shift supervisor eight years ago. I am the only person on shift who could have been expected to recognize Curve 8 as a design basis. If I had made that distinction, then I would not have performed the evolution.
3. I did not notify or consult with the STA/Shift Manager prior to taking data on the MUT. That was a serious mistake in judgement. I mistakenly did not place the proper importance on the evolution we were going to perform. I do not think the STA would have voiced any objections; however, that is an opinion and does not excuse my action.

We were not a group of frustrated operators bent on proving a point and taking inappropriate action to embarrass engineering or management. I honestly believed that I was taking appropriate actions as a shift supervisor to address the concerns of operators within my department. The data was taken on the mid-night shift only because we were on the mid-night shift. Our intent was only to take data we thought would keep a safety concern open.

I hope this letter has given you a different perspective on the MUT issue than the one provided by Dr. Beard. I believe the O&I report will come to the conclusion that there was no willful misconduct associated with any aspect of the event. I am disappointed that FPC has chosen to say our actions were taken because we had 'technical' concerns with Curve 8. I believe this wording trivializes a valid safety concern. I am disappointed that FPC has taken punitive actions against me and my assistant over an issue as important and sensitive as this. My assistant is the finest Assistant Shift Supervisor that I have ever worked with. His ability, integrity, and moral principles are outstanding. It is wrong and inappropriate that he should suffer because of my mistakes or the mistakes of our management. If nothing else comes of this discussion, I would like to see him removed from any threat of individual enforcement.

My position and FPC's position on this issue are clearly not in agreement. I would like to be included in any further discussion of this unresolved item. I welcome the opportunity to attend any Enforcement Conference. I consider my discussion of this event as a protected activity defined and governed by 10 CFR 50.7.

Sincerely,

David A. Fields

David A. Fields
Nuclear Shift Supervisor
Nuclear Operations

cc P. M. Beard
Office of Investigation
Chief, Branch 2, Region II
Senior Resident Inspector
NRR Project Manager

attachment

To: DFIELD
From: GHALNON
Subject: Journal 8/18
Date: 09-18-94 Time: 4:21p

attachment, Reference B

To: *JOURNAL

Bruce will be coming to discuss the events over the last week in reference to the MUT pressure curve. Everyone knows some details of what happened, so to dispell any rumors, here are some details. First, A- shift is not "in-trouble". We, as a department, were brought into the lime-light by an action to raise attention of a potential safety issue. The methods to raise this attention brought up a philisophical issue we must all be clear of the expectations. When I say "all", I am talking of all of CR-3 management and workers, not just operations. The philosophy is in how we deal with operating curves and limits. First, when given an operating curve, we will comply with it at all times. Second, we must give to operations curves we CAN comply with and when complied with assure the safety of the plant. Without both of these, we, as a plant, let ourselves down in attempting to comply with our Code of Ethics. The safety of the plant is utmost, unfortunately drastic measures are felt required to bring safety subjects to a head. Also unfortunately, in bringing the MUT issue to a head, we passed into an unknown region of compliance, into clearly unacceptable regions of a curve which was already thought to be non-conservative. The questioning attitude we ask you to exhibit was excellent. The thought processes and safety culture for this issue were excellent. The controls put on the evolution were excellent. The philosophy of not accepting an incomplete, unsatisfactory answer was excellent. The data obtained was excellent. The one place we felt we could have done better was to have a pre-approved procedure, one that without a shadow of a doubt, showed no unreviewed safety questions for crossing over the curve. I feel our management team could have done better if I more aggressively pursued the completion of the issue. Whether it be my background or that I thought I fully understood the issue, I do not know. I do know the three days I spent with the subject, almost non-stop, taught me a lot about the issue I did not know and should have. In closing, Bruce will discuss with each of us his expectations on operating conservatively. Please do not take offense by surmising that he thinks you are not. By clearly stating expectations, it will open up discussions where, once again, we will learn more about nuclear power. The end did not justify the means, even though in the big picture, it will bring the issue to closure. I encourage you to talk to Dave or Rob about the issue. They both handled the questions extremely well and professional. Bruce commented on this and felt their attitude contributed a lot to our learning process and brought the issue to the right people the quickest.



UNITED STATES
NUCLEAR REGULATORY COMMISSION
REGION II
101 MARNETTA STREET, N.W., SUITE 3000
ATLANTA, GEORGIA 30333-0100

July 7, 1995

EA 95-126

Mr. P. M. Beard Jr.
Senior Vice President, Nuclear Operations
ATTN: Manager, Nuclear Operations Licensing, NA2I
Florida Power Corporation
15760 West Power Line Street
Crystal River, FL 34428-6708

SUBJECT: NRC OFFICE OF INVESTIGATIONS REPORT 2-94-036
NRC INSPECTION REPORT NO. 50-302/95-13

Dear Mr. Beard:

This refers to an investigation by the Nuclear Regulatory Commission (NRC) Office of Investigations (OI) completed on May 24, 1995, and inspections conducted by Mr. Ross Butcher of this office between September 5, 1994 and July 5, 1995 and documented in NRC Inspection Report No 50-302/95-13. This special inspection report also summarizes related findings discussed in NRC Inspection Reports 50-302/94-22, 95-02, 95-07, 95-08 and 95-09. During these reviews, the NRC examined the facts and circumstances surrounding a September 5, 1994 event involving pressure control of the reactor coolant system makeup tank; and reviewed the adequacy of design control and corrective actions that affected operability of emergency core cooling system pumps. The subject inspection report and the synopsis of the OI investigation are enclosed. At the conclusion of the inspection, the findings were discussed with those members of your staff identified in the enclosed report.

Based on the results of our inspections and the OI investigation, four apparent violations have been identified and are being considered for escalated enforcement action in accordance with the "General Statement of Policy and Procedure for NRC Enforcement Actions" (Enforcement Policy), 10 CFR Part 2, Appendix C. In addition, enforcement action is being considered against the licensed operators involved in the September 5, 1994 event.

In regard to the first apparent violation, on September 5, 1994, licensed operators planned and conducted an evolution that allowed the makeup tank pressure to exceed the acceptable operating region of OP-1038, Curve 8 for approximately 35 minutes. In addition, the operators delayed their response to the annunciator for the makeup tank overpressure condition while they continued to drain the makeup tank, causing the tank overpressure to diverge further into the unacceptable region of Curve 8. These apparent intentional acts resulted in a violation of Technical Specification 5.6.1.1 which requires implementation of procedures AI-500, Conduct of Operations; OP-402, Makeup and Purification System; OP-1038, Plant Operating Curves; and AR-403, PSA H Annunciator Response. Had an Engineered Safeguards actuation occurred while in this condition, cavitation and subsequent inoperability of one of the high pressure injection pumps could have resulted.

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The OI investigation concluded that the shift supervisor, assistant shift supervisor, and two chief operators deliberately violated Crystal River Nuclear Plant procedures. 10 CFR 50.5 (a), Deliberate Misconduct, in part, prohibits licensee employees from engaging in deliberate misconduct that causes a licensee to be in violation of a condition of any license issued by the Commission. Deliberate misconduct is defined by 10 CFR 50.5(c) as an intentional act or omission that the person knows constitutes a violation of a requirement, procedure, instruction or policy of a licensee.

The record in this case reflects that licensed operators planned and conducted an evolution that they fully expected would result in exceeding the makeup tank overpressure limits specified in procedures. The record also reflects that the licensed operators intentionally delayed implementation of the requirements of the annunciator response procedure in order to gather additional data on the overpressure condition. Apparently, the licensed operators involved were aware of the procedural requirements and intentionally violated the procedures. The NRC considers these apparent intentional acts to constitute an apparent violation of 10 CFR 50.5(a). We are also concerned that appropriate management oversight and control was not exercised to preclude intentional violation of plant procedures.

The remaining apparent violations involved failures to meet the requirements of 10 CFR 50, Appendix B, Criterion III, Design Control in that the design basis was not correctly translated into drawings, procedures, and instructions, for: (1) operation of the makeup tank; (2) operation of the manual swap over of the ECCS pumps' suction from the borated water storage tank to the reactor building sump; and (3) maintaining adequate inventory in the reactor building sump to provide adequate net positive suction head to one low pressure injection pump with the high pressure injection (HPI) pump suction cross-tie valve open and supplying two operating HPI pumps. Two of these violations also involved apparent violations of 10 CFR 50, Appendix B, Criterion XVI, Corrective Action, in that once the design deficiencies were identified they were not adequately corrected in a timely manner.

These apparent violations indicate significant weaknesses in management control of the review and resolution of significant conditions adverse to quality. Operator concerns about gas entrainment in the high pressure injection pumps, identified in problem reports and correspondence between operations and engineering, were not adequately resolved over a significant period of time. Subsequent to identification of the design deficiencies in makeup tank overpressure limits, engineering reviews of the design assumptions for the pressure/level operating curve of the makeup tank were not thorough. The curve issued by engineering contained errors and was non-conservative. The revised curves issued by engineering also contained errors and were non-conservative. The curves permitted the plant to be operated outside the design basis. Indications of deficiencies in the design assumptions for various tank levels in other safety related tanks also were not aggressively pursued.

No Notice of Violation is presently being issued for these inspection findings. The number and characterization of the apparent violations described in the enclosed inspection report may change as a result of further NRC review.

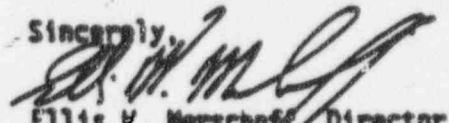
A closed predecisional enforcement conference to discuss these apparent violations has been scheduled for July 25, 1995 at 10:00 a.m. in the NRC's Region II office in Atlanta, Georgia. In addition, as discussed with you on July 5, 1995, we are also scheduling predecisional enforcement conferences with each of the licensed operators involved in the September 5, 1994 event. The decision to hold conferences with you and the licensed operators does not mean that the NRC has determined that the violations have occurred or that enforcement action will be taken. The purposes of these conferences are to discuss the apparent violations, their causes and safety significance; to provide you the opportunity to point out any errors in our inspection report; and to provide an opportunity for you to present your corrective actions. In your discussion, you should specifically address the concerns described above with regard to management oversight and control of licensed activities and include any mitigating considerations not previously identified. In addition, this is an opportunity for you to provide any information concerning your perspectives on 1) the severity of the violations, 2) the application of the factors that the NRC considers when it determines the amount of a civil penalty that may be assessed in accordance with Section VI.B.2 of the Enforcement Policy, and 3) any other application of the Enforcement Policy to this case, including the exercise of discretion in accordance with Section VII.

Please note that the NRC Enforcement Policy was revised and became effective with its publication in the *Federal Register* (60 FR 34381, June 30, 1995) (Enclosure 3). Because the apparent violations in this case were under review before the effective date of the revised Policy, the NRC will utilize whichever version of the Policy accrues to the benefit of the licensee. During the conference, you will be provided an opportunity to address any application of the revised Enforcement Policy to this case. You will be advised by separate correspondence of the results of our deliberations on this matter. No response regarding the apparent violations is required at this time.

Pursuant to 10 CFR 2.790 of the NRC's "Rules of Practice", a copy of this letter and its enclosures will be placed in the NRC Public Document Room.

Should you have any questions concerning this letter, please contact us.

Sincerely,



Ellis W. Merschoff, Director
Division of Reactor Projects

Docket No. 50-302
License No. DPR-72
EA 95-126

Enclosures: 1. Synopsis of NRC Office Of
Investigations Report 2-94-036
2. NRC Inspection Report 50-302/95-13
3. Revised Enforcement Policy

cc w/encs: (See next page)

cc w/encs:

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SYNOPSIS

On November 29, 1994, the U.S. Nuclear Regulatory Commission, Region II, Office of Investigations initiated this investigation to determine if certain reactor operators at Florida Power Corporation's Crystal River Nuclear Plant (CRNP) deliberately violated CRNP procedures by conducting an unauthorized evolution involving the relationship between the water level versus pressure in the makeup tank.

The investigation disclosed that on September 5, 1994, the Operations midnight shift deliberately allowed the makeup tank water level to decrease, within allowable limits, without adjusting the makeup tank overpressure to prevent entering a prohibited area of overpressure. This prohibited area was described by a CRNP procedural document which displayed a plot (curve) of permissible tank level versus pressure response. The purpose for the conduct of this evolution by the operators was to obtain actual tank level versus pressure response data for comparison to the procedural curve. This curve described the permissible operating region.

When the overpressure entered into the unacceptable operating region, annunciators activated, and the operators knowingly continued to obtain data without taking any action to alleviate the overpressure and allowed the unacceptable overpressure condition to exist for 35 minutes. The data gathered by the operators confirmed that the procedural curve differed from the actual curve.

Based upon the evidence developed in this investigation, it is concluded that the shift supervisor, assistant shift supervisor, and two chief operators deliberately violated CRNP procedures by exceeding the allowable makeup tank overpressure, and delaying taking appropriate action to reduce makeup tank overpressure.



UNITED STATES
NUCLEAR REGULATORY COMMISSION
REGION II
101 MARIETTA STREET, N.W., SUITE 2020
ATLANTA, GEORGIA 30333-0189

Report No.: 50-302/95-13

Licensee: Florida Power Corporation
3201 34th Street, South
St. Petersburg, FL 33733

Docket No.: 50-302

License No.: DPR-72

Facility Name: Crystal River 3

Inspection Conducted: September 5, 1994 through July 5, 1995

Inspector: R. L. Butcher 7/7/95
R. Butcher, Senior Resident Inspector Date signed

Accompanying Inspectors:

T. Cooper, Resident Inspector
L. Mellen, Reactor Inspector, RII
R. Schin, Project Engineer, RII

Approved by: K. Landis 7/7/95
K. Landis, Section Chief Date signed
Division of Reactor Projects

SUMMARY

Scope:

This special inspection report documents inspections conducted by the NRC between September 5, 1994 and July 5, 1995 and summarizes the related findings of NRC Inspection Reports 50-302/94-22, 95-02, 95-07, 95-08 and 95-09. These inspections included reviews of:

- The unauthorized evolution by licensed operators regarding the operation of the makeup tank outside of procedural operating limits.
- Operation of the makeup tank per approved operating instructions that resulted in operation outside the design basis of the makeup and purification system.

ENCLOSURE 2

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- Emergency operating procedures that directed the manual swapover of the Emergency Core Cooling System (ECCS) pumps suction from the Borated Water Storage Tank (BWST) to the reactor building sump at a BWST water level that could have resulted in the loss of the ECCS pumps, and
- Emergency operating procedures that directed the alignment of one Low Pressure Injection (LPI) pump to supply two operating High Pressure Injection pumps that could have resulted in the loss of the only operable LPI pump.

Results:

Four apparent violations were identified:

Apparent violation 50-302/95-13-01: Deliberate operation of makeup tank outside the acceptable operating region. (paragraph 2)

Apparent violation 50-302/95-13-02, Examples 1, 2 and 3: Operating curves for makeup tank outside design basis and failures to take adequate corrective actions for significant conditions adverse to quality. (paragraphs 3 and 4)

Apparent violation 50-302/95-13-03, Examples 1, 2 and 3: Inadequate design assumptions for borated water storage tank swapover level; failure to take adequate corrective actions for significant conditions adverse to quality; and failure to adequately translate design basis requirements for available stored fire protection water into procedures. (paragraphs 5 and 6)

Apparent violation 50-302/95-13-04: Inadequate net positive suction head to an Engineered Safeguards pump during accident conditions. (paragraph 7)

These issues were previously being followed up as URI 50-302/94-22-01, Makeup tank operation outside the acceptable operating region, and URI 50-302/95-08-04, Discrepancies in the implementation of the fire service water tank level versus volume calculations. These unresolved items are closed.

REPORT DETAILS

1. Persons Contacted

Licensee Employees

- *P. Beard, Senior Vice President Nuclear Operations
- *G. Becker, Manager-In-Training, Site Nuclear Engineering Services
- *R. Davis, Manager, Nuclear Plant Maintenance
- *P. Fleming, Senior Nuclear Licensing Engineer
- *B. Gutherman, Nuclear Engineering Supervisor
- *G. Halnon, Manager, Nuclear Plant Operations
- *B. Hickie, Director, Nuclear Plant Operations
- *M. Jacobs, Corporate Communications
- *L. Kelly, Director, Nuclear Operations Site Support
- *J. Masada, Manager, Design Engineering
- *P. McKee, Director, Quality Programs
- *P. Tanguay, Director, Nuclear Engineering and Projects
- *G. Williams, Legal Council
- *K. Wilson, Manager, Nuclear Licensing

Other licensee employees contacted included office, operations, engineering, maintenance, chemistry/radiation, and corporate personnel.

Nuclear Regulatory Commission

- *R. Butcher, Senior Resident Inspector
- *T. Cooper, Resident Inspector
- *C. Evans, Regional Council, RII
- *K. Landis, Chief, Reactor Projects Branch 2, Region II (RII)
- *E. Merschoff, Director, DRP, RII
- *T. Peebles, Chief, Operator Licensing Branch, RII
- *L. Raghaven, Licensing Project Manager, Office of Nuclear Reactor Regulation (NRR)
- *R. Schin, Project Engineer, RII
- *L. Watson, Senior Enforcement Specialist, RII
- *G. West, Engineering Psychologist, Human Factors Branch, NRR

*Attended exit interview

†Participated in exit interview via telephone

Acronyms and initialisms used throughout this report are listed in the last paragraph.

2. Followup of Apparent Operator Misconduct During September 5, 1994 Event (92901)

On September 7, 1994, a PR was issued regarding the adequacy of the MJT hydrogen overpressure curve in OP-103B, Plant Operating Curves. PR 94-0267, MJT Pressure Limit Curve Technical Basis Inadequate, listed operator concerns regarding the engineering calculation (190-0024, Revision 5) that the operating limits curve was derived from. The need to maintain H₂ overpressure as high as possible was to address RCS

chemistry control. The industry guideline for RCS H_2 concentration is ≈ 25 cc/Kg. At CR-3, the operators manually manipulate the MUT level to attain the maximum H_2 overpressure by lowering MUT level, increasing H_2 pressure to the maximum allowed value per the curve, and then raising the MUT level to increase H_2 pressure. RCS H_2 concentration will stabilize at ≈ 25 cc/Kg. Operators were instructed by management to maintain hydrogen overpressure as high as possible due to RCS hydrogen concentration concerns. The NSS/ANSS shift relief checklist dated July 21, 1994, under Comments/Special Instructions, directed the operators to keep MUT pressure as high as possible. OP-103B, Plant Operating Curves, Curve 8, Maximum Makeup Tank Overpressure, plots MUT allowable overpressure (psig) versus MUT indicated water level (in.). The purpose of OP-103B is to provide operational information for plant startup, shutdown, and other plant operations and evolutions. The operators are to use this curve to determine that the MUT is in an acceptable operating region.

Recently, the operators expressed concern that the engineering calculations regarding the acceptable H_2 overpressure on the MUT were non-conservative. Operators had observed the MUT pressure versus level variance from the curve during operation and were convinced that curve 8 was neither accurate nor conservative. This observation had been documented in PR 94-0149, MUV-60 Stuck Open, which resulted in an unexpected drop in the MUT level. On September 5, 1994 in order to verify actual MUT pressure versus level differed from that shown on curve 8, the operators adjusted MUT pressure to fall on the curve at a MUT level of 86 inches (MUT high level setpoint). The system was allowed to stabilize and then the MUT level was bled down to the low level setpoint of 55 inches. Operating procedure OP-402, Makeup and Purification System, paragraph 4.2.15 directs operators to maintain the MUT level between 55 and 86 inches. As noted earlier, curve 8 in OP-103B is then used to maintain the MUT allowable overpressure (in psig) versus indicated water level (in inches). When the operators allowed the MUT to bleed down, the MUT pressure entered the unacceptable region and the difference between the curve and actual pressure increased throughout the entire level decrease. At a MUT lower level of 55 inches, MUT pressure was approximately 1.7 psig above the curve. PR 94-0267 stated that the 1.7 psig equates to approximately 3.9 feet of water. Calculation 190-0024, Revision 5, only ensures a column of water in the MUT line 2.27 feet high and therefore the error in curve 8 is larger than the margin provided by the calculation.

TS 5.6.1.1 requires procedures be established, implemented, and maintained covering activities as recommended in Regulatory Guide 1.33, Rev. 2, Appendix A, February 1978. Regulatory Guide 1.33, Appendix A recommends procedures for startup, operation, and shutdown of the reactor coolant system. Procedure AI-500, Conduct of Operations, paragraph 4.3.1, Procedural Compliance, states it is the duty of every member of the Crystal River Plant work force to comply with procedures. Procedure OP-402, Makeup and Purification System, steps 4.19.8 and 4.19.9 required operators to refer to curve 8 of OP-103B for maximum MUT

overpressure. Procedure OP-103B, Plant Operating Curves, Curve 8, Maximum Makeup Tank Overpressure, defines the allowable makeup tank pressure versus level operating region during operation. AR-403, PSA H Annunciator Response, annunciator MUT PRESS HIGH/LOW, requires operators to take action to reduce MUT pressure to within the limits of OP-103B, curve 8, when a valid alarm is received.

However, on September 5, 1994, operators allowed the makeup tank pressure versus level to exceed the acceptable operating region of OP-103B, curve 8. The operators then delayed actions to comply with AR-403 when the makeup tank high pressure alarm annunciated. Exceeding the acceptable region of curve 8 of OP-103B and delaying the annunciator response is an apparent violation of the requirements of Technical Specification 5.6.1.1 which requires implementation of plant procedures AI-500, Conduct of Operations; OP-402, Makeup and Purification System; OP-103B, Plant Operating Curves; and, AR-403, PSA H Annunciator Response.

An investigation of the apparent deliberate failure to follow plant procedures was conducted by OI. The investigation was completed on May 24, 1995. The OI investigation concluded that the shift supervisor, assistant shift supervisor, and two chief operators deliberately violated Crystal River Nuclear Plant procedures by exceeding the allowable makeup tank overpressure, and delaying taking appropriate action to reduce makeup tank overpressure. 10 CFR 50.5, (Deliberate misconduct), paragraph (a), in part, prohibits licensee employees from engaging in deliberate misconduct that causes a licensee to be in violation of a condition of any license issued by the Commission. Deliberate misconduct is defined by 10 CFR 50.5(c) as an intentional act or omission that the person knows constitutes a violation of a requirement, procedure, instruction or policy of a licensee. The licensed operators involved apparently were aware of the procedural requirements and intentionally violated the procedures. The NRC considers these intentional acts to constitute an apparent violation of 10 CFR 50.5(a). Management oversight and control of control room operations is discussed in paragraph 8. The apparent violation of plant procedures and 10 CFR 50.5 is identified as apparent violation 50-302/95-13-01.

3. Review of Design Basis of MUT Operating Limits (92903)

FSAR Section 6.1, ECCS, states in part that upon a valid actuation signal, the Makeup and Purification System is automatically switched from its normal operating mode to the emergency operating mode (High Pressure Injection) to deliver water from the BWST into the reactor vessel. Unstated in the FSAR is the design feature which requires the hydrogen overpressure in the MUT be limited to prevent the MUT from being emptied which could allow hydrogen gas to enter the suction of the HPI pumps (which also function as the makeup pumps in the Makeup and Purification System) and result in damage to the pumps.

Based on the continuing operator concerns, licensee management initiated a comprehensive review of the MUT H₂ overpressure issue. An engineering evaluation was completed on November 16, 1994 that concluded that operation on or to the left of the OP-103B curve at the onset of a LBLOCA or core flood line LOCA would have resulted in HPI pump damage. This means that operation on curve B of OP-103B resulted in operation outside the design basis of the plant.

Subsequently, the licensee recognized that they normally operate with the two trains of HPI isolated from each other on the suction side of the HPIs. One train is aligned with its suction from the MUT (and also the BWST after an ES signal), while the other train suction is normally isolated from the first train and is aligned to the BWST after an ES signal through a separate pipe from the BWST. In this case, excess hydrogen pressure in the MUT during the onset of a LOCA could cause gas binding in one of the two ES selected HPI pumps. The other ES selected HPI pump would not be affected since its suction is aligned directly to the BWST.

However, one LOCA scenario, a postulated break in a core flood line in conjunction with the potential gas binding of high pressure injection pump due to a high overpressure in the makeup tank, could lead to the loss of the safety function as explained below. In this scenario, LPI cooling water enters into the reactor vessel through the core flood lines. Any cooling water from LPI in the train containing the break would not reach the vessel. A single failure in the other train, i.e., loss of the B emergency diesel generator, would result in loss of the other train of LPI and loss of one train of HPI. The remaining train of HPI cooling water would then be required to mitigate this event. The core flood line nozzles have inserts which limit the break size to 0.44 square feet which is considered an intermediate break size. The blowdown rate for this LOCA is rapid enough to prompt systems to respond as they would in a large break LOCA. Therefore, the MUT pressure limit curve constitutes a design basis limit for this event because a high overpressure in the makeup tank could result in emptying the makeup tank prior to switchover to the BWST resulting in gas binding of the remaining HPI pump and loss of the safety function. Consequently, a pipe break in the A core flood line concurrent with a LOOP, and a start failure of the B emergency diesel generator could result in a reactor coolant system blowdown and unavailability of both trains of LPI and one train of HPI, as well as loss of the second train of HPI due to hydrogen gas binding. It should be noted that with operator action the A LPI pump could be manually aligned to the BWST and used for injection of cooling water.

10 CFR 50, Appendix B, Criterion III, Design Control, requires that measures be established to assure that applicable regulatory requirements and the Design Basis, as defined in 10 CFR 50.2, Definitions, and as specified in the license application, are correctly translated into specifications, drawings, procedures, and instructions. The failure to translate the design basis to ensure proper operation of

the Makeup and Purification System such that the system is automatically switched from its normal operating mode to the emergency operating mode (High Pressure Injection) and is capable of delivering water from the BWST into the reactor vessel is an apparent violation of 10 CFR 50, Appendix B, Criterion III. This is identified as example 1 of apparent violation 50-302/95-13-02.

4. Review of Revised Operating Curves for MUT (92903)

On September 9, 1994, short term instruction (STI) 94-019 was issued requiring operators to maintain MUT pressure approximately 2 psig below the limit shown on OP-1038, curve 8. On September 14, 1994, STI 94-021 was issued stating that engineering had identified that the calculated error was greater than 2 psig and therefore, operators were directed to maintain MUT pressure approximately 2.5 psig below the limit shown on OP-1038, curve 8. The permanent revision, Revision 13 to OP-1038, was issued on January 30, 1995, and contained two new curves to replace the existing curve 8 titled, Maximum Makeup Tank Overpressure.

On January 31, 1995, the licensee reported the operation outside their design basis to the NRC. The licensee determined that the short term instructions issued on September 9 and September 14, 1994, and the new pressure versus level operating curves for the MUT (curves 8A and 8B in OP-1038, Plant Operating Curves), issued on January 30, 1995, were non-conservative. The STIs and the new curves were based on design assumptions that did not correspond to current EOP requirements. Specifically, EOP-08, LOCA Cooldown, step 3.35 and 3.63, and EOP-07, Inadequate Core Cooling, step 3.9, require realigning ECCS pump suction to the RB sump and aligning for piggy back operation of the MUPs when the BWST reaches an indicated level of ≤ 5 feet. The calculation used to support the STIs and generate the new OP-1038 curves assumed the swap over to the RB sump and piggy back alignment was completed prior to reaching 5 feet in the BWST. The STIs issued on September 9 and September 14, 1994 and the curves issued on January 30, 1995 did not provide adequate margin to ensure that hydrogen entrainment in the high pressure makeup pumps was prevented during design basis events when the makeup tank was operated within the specified pressure and level limits; and, therefore, the interim curves allowed operation of the makeup tank outside of the design basis of the plant.

The licensee's immediate action was to issue a short term instruction with the following guidance to operations:

- (1) Due to inconsistencies between the design assumptions used to generate OP-1038, Rev. 13, Curves 8A and 8B, and EOP-8 LOCA Cooldown, maintain MUT pressure a minimum of 7 and a maximum of 11 psig less than the limit given in OP-1038, Rev. 13, Curves 8A and 8B.
- (2) When transferring LPI suction from the BWST to the RB sump and establishing HPI suction from LPI (EOP-8, steps 3.35 and 3.63 and EOP-7, Inadequate Core Cooling, steps 3.9 and 3.10) valve

alignments need to be performed in a timely manner. While performing the numbered detail steps in order, both A and B train valves listed within the step should be stroked simultaneously.

- (3) Due to the location of the transmitter, indicated BWST level will not decrease below 2.33 feet.
- (4) The STI was not to be altered or rescinded without DNPO approval.

10 CFR 50, Appendix B, Criterion III, Design Control, requires that measures be established to assure that applicable regulatory requirements and the Design Basis, as defined in 10 CFR 50.2, Definitions, and as specified in the license application, are correctly translated into specifications, drawings, procedures, and instructions.

FSAR Section 6.1, ECCS, states in part that the upon a valid actuation signal, the Makeup and Purification System is automatically switched from its normal operating mode to the emergency operating mode (High Pressure Injection) to deliver water from the borated water storage tank into the reactor vessel.

OP-103B, Plant Operating Curves, Curve 8, Maximum Makeup Tank Overpressure, defined operating limits for control of the reactor coolant system makeup tank pressure versus level. Operators were instructed by management to maintain the makeup tank pressure versus level close to the limit defined by Curve 8 to maximize hydrogen overpressure.

10 CFR 50, Appendix B, Criterion XVI, Corrective Action, states, in part, that measures shall be established to assure that conditions adverse to quality, such as nonconformances, are promptly identified and corrected. In the case of significant conditions adverse to quality, measures shall assure that the cause of the condition is determined and corrective action taken to preclude repetition.

As discussed above, the design basis for the ECCS was not correctly translated into drawings, procedures, and instructions for the emergency operating mode (High Pressure Injection) of the Makeup and Purification System. The STIs issued on September 9 and September 14, 1994 and Revision 13 to OP-103B, Plant Operating Curves, which replaced Curve 8, Maximum Makeup Tank Overpressure, with new Curves 8A and 8B, Maximum Makeup Tank Operating Pressure Versus Level on January 30, 1995 all allowed operation outside the plant design basis. An Engineered Safeguards actuation while operating on the new curves, could have resulted in cavitation and subsequent inoperability of at least one of the high pressure injection pumps and, for a given scenario as described in paragraph 3, without operator intervention, could have resulted in the loss of all HPI pumps. Therefore, the corrective actions for the previously identified problem with the curves were inadequate to prevent operation outside of the design basis. Failure to meet the requirements of 10 CFR 50, Appendix B, Criterion III and XVI for the interim curves

and the curves issued in Revision 13 to OP-1038 are identified as examples 2 and 3 of apparent violation 50-302/95-13-02.

5. Review of Design Assumptions for Borated Water Storage Tank Swapover Level (92903)

On February 2, 1995, the residents questioned the licensee regarding their design assumptions for the BWST level for swap over from the BWST to the RB sump. The inspectors identified the following additional concerns:

- The indicated BWST in the control room reads from 0 to 50 feet. The accuracy of the BWST level instrumentation contains more than 0.5 feet of uncertainty.
- The top of the 14 inch line from the BWST to the ES pumps is located at approximately the two feet level in the BWST.
- Vortexing of the borated water in the BWST was not accounted for. The BWST contains a vortex breaker, however, the licensee has been unable to locate any of the calculations for this device. The licensee's preliminary calculations indicate that even with the vortex breaker, vortexing would be likely to occur between 3.5 and 4 feet of BWST level.
- Operators could perform the BWST to RB sump transfer function in accordance with procedures at anytime the BWST level became less than 5 feet.
- At the maximum flow rates, the draw down of the BWST approaches one foot per minute.

On February 2, 1995 the licensee made a report to the NRC regarding their finding that manual swap over of the ES pumps from the BWST to the RB sump may not occur in time to prevent vortexing in the BWST. Preliminary calculations indicated that a minimum of 4 feet is required in the BWST to prevent vortexing and therefore ensure adequate NPSH.

Engineering calculation M95-0005 dated February 6, 1995 concluded that vortexing in the BWST has the potential to begin at 5' 6" in the tank. Taking level instrument error and calibration tolerances into consideration increases the level required by 1' 2" and the swapover to the RB sump suction should be complete before an indicated level of 7 feet is reached in the BWST.

The licensee's analysis indicated that after dispositioning these considerations, it was acceptable to raise the BWST swap over to the 15 foot level. The EOPs have been revised to reflect that the swapover should occur starting at 15 feet and be completed by 7 feet.

The swapper from the BWST to the RB sump is a manual operation and has been designated over the years as follows:

- | | |
|------------------|-----------------------------|
| (1) 6/75 to 5/79 | 2.5 feet in the BWST |
| (2) 5/79 to 6/83 | 3 foot 9 inches in the BWST |
| (3) 6/83 to 6/90 | 2.5 feet in the BWST |
| (4) 6/90 to 4/93 | 2.2 feet in the RB |
| (5) 4/93 to 2/95 | ≤ 5 feet in the BWST |

The licensee is conducting a more rigorous analysis of the swapper level. There are vortex and NPSH considerations for the pumps taking suction from the reactor building sump. Additionally, there are Trisodium Phosphate baskets for pH control in the RB lower basement areas. The calculations for their placement assume a certain volume of water in the sump and a certain flow rate. Both the volume and flow rate of BWST water into the sump area will change if the swap over level in the BWST changes. These changes will result in a different rate of Trisodium Phosphate dissolution.

10 CFR 50, Appendix B, Criterion III, Design Control, requires that measures be established to assure that applicable regulatory requirements and the design basis, as defined in 10 CFR 50.2, Definitions, and as specified in the license application, are correctly translated into specifications, drawings, procedures, and instructions.

FSAR Section 6.1.2.1.2, LPI, states that when the BWST level reaches an elevation of 5 feet, the operator will take action to open the LPI System suction valves from the RB emergency sump, permitting recirculation of the spilled reactor coolant and injected water from the RB sump.

EOP EOP-08, LOCA Cooldown, revision 2, steps 3.35 and 3.63, and EOP-07, Inadequate Core Cooling, step 3.9, revision 1, require realigning the LPI pump suction from the BWST to the RB sump and aligning for piggyback operation of the Make Up Pumps (MUPs) when the BWST reaches an indicated level of less than or equal to five feet.

As discussed above, the design basis for the ECCS was not correctly translated into drawings, procedures, and instructions for operation of the manual swap over of the ECCS pumps suction from the BWST to the RB sump in that on February 2, 1995 an engineering evaluation identified that initiation of swap over of ECCS pump suction from the BWST to the RB sump should be completed prior to an indicated level of seven feet to prevent vortexing and resultant disabling of the ECCS pump. Since 1975 (except for the time period of June 1990 through April 1993) plant procedures have required the manual swapper from the BWST to the RB sump at a level of five feet or less in the BWST, which is insufficient to assure that all of the ECCS pumps would not be damaged by vortexing.

This is an apparent violation of 10 CFR 50, Appendix B, Criterion III, Design Control and is identified as example 1 of apparent violation 50-302/95-13-03.

6. Follow-up of Licensee Event Report 92-003, Personnel Error and Lack of Technical Review in Past Procedure Revision Process Leads to Incorrect Procedures Resulting in Violation of Technical Specification and Design Basis (92903)

On August 1, 1991, the licensee identified a potential problem concerning a calculation to support the basis for assuring EDG fuel oil storage volumes were maintained as required by TS and design basis. On April 16, 1992, the licensee determined that two procedures for documenting the volume of fuel stored in the EDG fuel oil storage tank had been erroneously revised, resulting in one occurrence of failure to meet the minimum volume of fuel assumed in the design basis and 14 occurrences of failure to meet TS requirements for minimum fuel volume. The cause of the problem was attributed to a failure to recognize that due to suction locations, some of the volume in the storage tanks would be unusable and could not be taken credit for.

As part of the corrective actions, the licensee stated that the relationship of suction point to tank level for other tanks having a TS required minimum volume would be verified. A corrective action plan, which prioritized the various tanks, was developed. Originally, the various tanks were scheduled to be completed by December 1994, with the highest priority tanks being scheduled for completion by December 1993. The priority 1 tanks included the CST, the BWST, the EDG fuel oil day tanks, the BASTs, and the CFTs.

On September 19, 1994, the corrective action plan was revised, as none of the steps for recalculating the volumes had been completed. The new completion dates called for the project to be completed by April 1997, and the priority 1 tanks were scheduled to be completed by March 1995. This delay has an impact on the concerns on the BWST discussed in previous paragraphs. The calculation of the BWST volume concerns has a direct impact on the BWST issues. This issue was a previous opportunity for the licensee to identify and correct the problems with BWST suction.

A recent NRC review of the fire water storage tanks FST-1A and FST-1B tank calculations, M93-0028, revealed a discrepant condition between the FPP and the EDBD requirements. The FPP required that 345,000 gallons of water be contained in each fire water storage tank. The EDBD required a minimum capacity of 300,000 gallons of water be available from each tank to the fire pumps. However, the capacity of the FSTs is less than 345,000 gallons of usable water in either tank. When full the tanks each contain approximately 318,000 gallons of usable water. The requirement in the FPP for each tank to contain 345,000 gallons does not appear to correspond to the design basis requirement of 300,000 gallons. The licensee's volume calculations of the tanks concluded that when

345,000 gallons of water are contained in the tanks. Only approximately 297,000 gallons of usable water are in the tanks.

The surveillance procedure, SP-300, Operating Daily Surveillance Log, requires that each tank be verified to contain greater than 35 feet of water by level indicators FS-1-LI and FS-2-LI. These indicators are read on a 0 to 37 foot scale in the control room. The 37 foot level corresponds to approximately 315,500 gallons of usable water. The 35 foot requirement specified in SP-300 corresponds to approximately 295,000 gallons of usable water. The procedural requirement does not appear to account for instrument tolerances, which between the transmitter and the indicator, are nearly 14 inches. This worse case condition, considering the instrument tolerance and a level of 35 feet in the tank, would only ensure a value of approximately 283,000 gallons of usable water in the tank. This value is outside of the design basis. The licensee has stated that they normally operate above the 35 foot level, since there is an alarm eight inches above this level. The alarm is calibrated to assure that approximately 302,000 gallons of usable water are available in the tank. However, the level switch has an allowable tolerance of four inches, meaning that the alarm, set within the tolerance, could correspond to only approximately 299,000 gallons of water, which is outside of the design basis.

When made aware of the inspectors concerns, the operators increased FST levels to the maximum the tank can hold, to assure that there was enough water available to guarantee that the design basis calculated minimum requirements were met. This placed the FST usable water above the levels where concerns exist. Operators were informed of this issue by a note in the shift supervisors' log.

The Crystal River Facility Operating License No. DPR-72, paragraph 2.C.(9), Fire Protection, requires that fire protection measures be implemented. FSAR Section 9.8 states that the fire protection program has been formulated in accordance with specific fire protection governing documents listed in FSAR Table 9-18. Table 9-18 includes the FPP. The FPP required that 345,000 gallons of water be contained in each fire water storage tank. To implement this requirement, the ED&O required a minimum capacity of 300,000 gallons of water be available from each tank to the fire pumps.

10 CFR 50, Appendix B, Criterion XVI, Corrective Action, states, in part, that measures shall be established to assure that conditions adverse to quality, such as nonconformances, are promptly identified and corrected. In the case of significant conditions adverse to quality, measures shall assure that the cause of the condition is determined and corrective action taken to preclude repetition. Failure to implement timely corrective action to review potential significant conditions adverse to quality involving safety related tanks, including the BWST and FST, is a violation of the requirements of 10 CFR 50, Appendix B, Criterion XVI and is identified as example 2 of apparent violation 50-302/95-13-03.

10 CFR 50, Appendix B, Criterion III, Design Control, requires that measures be established to assure that applicable regulatory requirements and the design basis, as defined in 10 CFR 50.2, Definitions, and as specified in the license application, are correctly translated into specifications, drawings, procedures, and instructions. Failure to translate the design basis requirements of the FST into operating procedures is a violation of 10 CFR 50, Appendix B, Criterion III and is identified as example 3 of apparent violation of 50-302/95-13-03. This issue was previously followed up under URI 50-302/95-08-04. This unresolved item is now closed.

7. Operation With One LPI Pump and Two HPI Pumps While in the Piggy Back Mode (92901)

On March 22, 1995, at 5:07 p.m. the licensee made a 10 CFR 50.72(b)(1)(ii)(B) report regarding the finding of inadequate post LOCA RB water inventory to support the current EOP requirement to align one operating LPI pump with two operating HPI pumps. During a followup engineering investigation of previously identified problems involving operation of the MUT outside of the design basis (See LER 94-009, Personnel Errors in Determining MUT Level/Hydrogen Pressure, BWST Vortexing and RB Sump Level Parameters Result in Potential for Operation Outside Design Basis, and URI 50-302/94-22-01 addressed in IRs 50-302/94-22, 95-02, and 95-07) the licensee identified a condition specified in EOP-08, LOCA Cooledown, revision 2, steps 3.39 and 3.67, and EOP-07, Inadequate Core Cooling, revision 1, step 3.10 that directs the operator to accomplish the following:

If only 1 LPI pump is operating, then ensure MUP suction cross tie valves are open;

- * MUV-62
- * MUV-69

This created a system alignment where one LPI pump could be subjected to supplying 2200 gpm nominal to the RV, 540 gpm to the suction of each of two HPI pumps, and 100 gpm recirculation flow. A recently revised flow calculation (M90-0021) shows that insufficient water inventory would exist in the RB to provide adequate NPSH to the single LPI pump at the noted flow rates. This lineup could result in the loss of the only operable LPI pump.

As immediate corrective action, the HPI pumps' suction cross tie valves were caution tagged to the SSOD. STI 95-0022 was issued on March 22, 1995, to provide operators with additional guidance. The STI is required reading for all operators and it advised operators of the reason for the revised calculation and to alert them to the tagging order on the HPI suction cross tie valves. The STI also alerted the operators that EOP-07 and EOP-08 were affected. The STI had a 10 CFR 50.59 safety evaluation, an independent review, a PRC review, and DNPO approval. The control copy of the affected EOPs in the control room were marked with a red pen at the appropriate steps to remind the

operators that a STI affecting that step had been issued. The formal change to the EOPs is scheduled to be accomplished within ten days. The inspectors verified that the EOPs had been marked as specified and that the STI was in the control room.

10 CFR 50, Appendix B, Criterion III, Design Control, requires that measures be established to assure that applicable regulatory requirements and the design basis, as defined in 10 CFR 50.2, Definitions, and as specified in the license application, are correctly translated in to specifications, drawings, procedures, and instructions.

FSAR Section 6.1.1, which describes the design basis of the ECCS states, in part, that the ECCS has been designed to perform its functions if a single active failure occurs and that one of the design functions of the ECCS is to provide long term cooling by recirculation of injection water from the reactor building sump to the core through LPI.

EOP-08, steps 3.39 and 3.67, and EOP-07, step 3.10, direct the operators to open the HPI pumps' cross tie valves in the event only one LPI pump is available to supply suction when in the piggy-back mode of operation. These procedural directions have existed since April 8, 1993.

However, engineering calculation M90-0021, revision 5, dated March 22, 1995, determined that during post LOCA operation there was inadequate inventory in the RB sump to provide adequate NPSH to a LPI pump, with the HPI pump suction crosstie valve open, supplying two operating HPI pumps. This lineup could result in the loss of the only operable LPI pump. This is an apparent violation of 10 CFR 50, Appendix B, Criterion III, Design Control, and is identified as apparent violation 50-302/95-13-04.

8. Review of Management Oversight and Control of Licensed Activities

In regard to the actions of the licensed operators on September 5, 1994, the NRC is concerned that appropriate management oversight and control was not exercised to preclude the apparent intentional violation of plant procedures. In the licensee's letter to the NRC dated May 5, 1995, the licensee characterizes the operator's concerns about the makeup tank operating curve as a legitimate technical concern, yet the record reflects that engineering found the curve to be adequate and proposed that the issue be closed. It is not clear that management was properly involved in resolution of these differing technical opinions. In addition, operators did not seek approval of management in conducting the evolution to evaluate response of the system. This raises questions as to the adequacy of communications between management and the licensed operating staff including whether management has clearly conveyed its expectations in regard to procedural adherence and the need to use established review mechanisms for planned activities that are outside routine operation.

As stated in the cover letter, these apparent violations also indicate significant weaknesses in the management control of the review and

resolution of significant conditions adverse to quality. These weaknesses include (1) the failure to adequately review operator concerns on gas entrainment in the high pressure injection pumps which had been identified in several problem reports and correspondence between operations and engineering; (2) inadequate engineering reviews of the design assumptions for the pressure/level operating curve of the makeup tank; and (3) failure to implement timely corrective actions for indications of deficiencies in the design assumptions for various safety-related tank levels. The root cause of these issues appears to be a lack of management oversight of the review process. The NRC has previously expressed concerns with management oversight and commitment to program implementation in meetings with licensee management on November 22, 1994 and March 1, 1995.

9. Exit Interview

The inspection scope and findings were summarized on July 5, 1995, with those persons indicated in paragraph 1. The inspectors described the areas inspected and discussed in detail the inspection results listed below. Proprietary information is not contained in this report.

<u>Type</u>	<u>Item Number</u>	<u>Status</u>	<u>Description and Reference</u>
EEI	95-13-01	Open	Deliberate operation of makeup tank operation outside of acceptable operating region. (paragraph 2)
EEI	95-13-02	Open	Operating curves for makeup tank outside design basis and failure to take adequate corrective actions. Three examples. (paragraphs 3 and 4)
EEI	95-13-03	Open	Inadequate design assumptions for borated water storage tank swapover level, inadequate corrective actions, and inadequate stored fire protection water. (paragraphs 5 and 6)
EEI	95-13-04	Open	Inadequate Net Positive Suction Head to an Engineered Safeguards pump during accident conditions. (paragraph 7)
URI	94-22-01	Closed	Makeup tank operation outside the acceptable operating region. (paragraphs 2, 3, and 4)
URI	95-08-04	Closed	Discrepancies in the implementation of the fire service water tank level versus volume calculations. (paragraph 6)

<u>Type</u>	<u>Item Number</u>	<u>Status</u>	<u>Description and Reference</u>
LER	92-003	Open	Personnel Error and Lack of Technical Review in Past Procedure Revision Process Leads to Incorrect Procedures Resulting in Violation of Technical Specification and Design Basis. (paragraph 6)

10. Acronyms and Abbreviations

AI	- Administrative Instruction
ANO	- Auxiliary Nuclear Operator
ANSS	- Assistant Nuclear Shift Supervisor
BSP	- Building Spray Pump
B&W	- Babcock & Wilcox
BWST	- Borated Water Storage Tank
CCHE	- Control Complex Habitability Envelope
CFM	- Cubic Feet per Minute
COC	- Certificate of Compliance
CP	- Compliance Procedure
CRDM	- Control Rod Drive Mechanism
CREVS	- Control Room Emergency Ventilation System
CVT	- Constant Voltage Transformer
DCP	- Decay Heat Closed Cycle Cooling Pump
DCV	- Decay Heat Closed Cycle Cooling Valve
DHP	- Decay Heat Pump
DHV	- Decay Heat Valve
DNPO	- Director Nuclear Plant Operations
ECCS	- Emergency Core Cooling System(s)
EDSFI	- Electrical Distribution System Functional Inspection
EGDG	- Emergency Diesel Generator
EOP	- Emergency Operating Procedure
ESF	- Engineered Safeguards Feature
ESAS	- Engineered Safeguards Actuation System
F	- Fahrenheit
FCN	- Field Change Notice
FLUR	- First Level Undervoltage Relay
FPC	- Florida Power Corporation
FSAR	- Final Safety Analysis Report
HEPA	- High-efficiency Particulate Air
HPI	- High Pressure Injection
IR	- Inspection Report
LCO	- Limiting Condition for Operation
LER	- Licensee Event Report
LOCA	- Loss of Coolant Accident
LPI	- Low Pressure Injection
MAR	- Modification Approval Record
MP	- Maintenance Procedure
MUP	- Makeup Pump
MUT	- Makeup Tank
MUV	- Makeup Valve
NCV	- Non-cited Violation

NOTIS - Nuclear Operations Tracking & Information System
 NOV - Notice of Violation
 NPSM - Net Positive Suction Head
 NPTS - Nuclear Plant Technical Support
 NSS - Nuclear Shift Supervisor
 NUREG - NRC technical report designation
 OI - NRC Office of Investigations
 OP - Operating Procedure
 PM - Preventive Maintenance
 ppm - parts per million
 PR - Problem Report
 PRC - Plant Review Committee
 psi - pounds per square inch
 psig - pounds per square inch gauge
 QC - Quality Control
 QA - Quality Assurance
 RB - Reactor Building
 RBS - Reactor Building Spray
 RCA - Radiation Control Area
 RCP - Reactor Coolant Pump
 RCS - Reactor Coolant System
 RPS - Reactor Protection System
 RV - Reactor Vessel
 RW - Raw Water
 RWP - Raw Water Pump
 RWV - Raw Water Valve
 SCBA - Self Contained Breathing Apparatus
 SLUR - Second Level Undervoltage Relay
 SP - Surveillance Procedure
 SR - Surveillance Requirement
 SRP - Standard Review Plan
 SSOD - Shift Supervisor on Duty
 STI - Short Term Instruction
 SWP - Service Water Pump
 TDP - Training Department Procedure
 TIS - Training Information System
 TS - Technical Specification
 TSI - Technical Specification Interpretation
 URI - Unresolved Item
 VIO - Violation
 WR - Work Request



UNITED STATES
NUCLEAR REGULATORY COMMISSION
REGION 3
391 MARSHALL STREET, N.W., SUITE 2000
ATLANTA, GEORGIA 30333-0001
February 6, 1996

EA 95-126

Mr. P. M. Beard Jr.
Senior Vice President, Nuclear Operations
ATTN: Manager, Nuclear Operations Licensing, NRC
Florida Power Corporation
15760 West Power Line Street
Crystal River, FL 34428-6708

50-302/95-22
SUBJECT: ORR Force Limit
FILE NO.: 340296-02
RECEIVED: 2/6/96
ACTION BY: Calopa/McLoughlin
DUE DATE: (N/A)

SUBJECT: NRC INSPECTION REPORT NO. 50-302/95-22

Dear Mr. Beard:

This refers to a special team inspection conducted on December 11-15, 1995, at the Crystal River facility. The purpose of the inspection was to determine whether operation of Crystal River Unit 3 was safe and in accordance with NRC requirements. At the conclusion of the inspection, the findings were discussed with those members of your staff identified in the enclosed report.

Areas examined during the inspection are identified in the report. Within these areas, the inspection included selective examinations of procedures and records, and interviews with personnel concerning the facts and circumstances pertaining to control of pressure and level in the reactor coolant system makeup tank.

Based on the results of this inspection, and the results of the inspection described in Inspection Report 50-302/95-13, four apparent violations were identified and are being considered for escalated enforcement action in accordance with the "General Statement of Policy and Procedure for NRC Enforcement Actions" (Enforcement Policy), NUREG-1600. In addition, enforcement action is being considered against the licensed operators involved in the apparent violations on September 4 and 5, 1994, which are described below. A synopsis of an NRC investigation of activities related to the September 5, 1994, apparent violations was provided to you by our letter of July 7, 1995. An investigation of activities on September 4, 1994, is in progress and a synopsis of that investigation will be provided to you when the investigation is complete.

With regard to the first apparent violation described in the enclosed report, nine examples of operators exceeding the maximum overpressure curve for the make-up tank while adding hydrogen were identified. Additionally, in the nine examples reviewed by the NRC, the action required by the alarm response procedure was not carried out for periods of time ranging from 30 minutes to 190 minutes.

The second apparent violation concerns the evolutions of September 4 and 5, 1994. These evolutions were also apparent violations of the maximum overpressure curve. Since these evolutions were not required by plant conditions at the time, but were instead initiated by operators for the

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purpose of gathering data relative to the makeup tank curve, they are considered to have been tests or experiments. Performance of tests or experiments without a written safety evaluation which provides the bases for the determination that an unreviewed safety question is not involved is a violation of 10 CFR 50.59.

The third apparent violation, with three examples, involved failures to meet 10 CFR, Part 50, Appendix B, Criterion XVI, Corrective Action, in that once design deficiencies were identified by your staff, they were not adequately corrected in a timely manner.

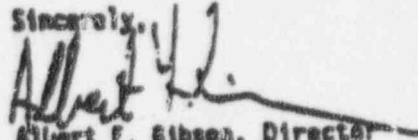
The fourth apparent violation, with four examples, involved failures to meet the requirements of 10 CFR, Part 50, Appendix B, Criterion III, Design Control, in that the design basis was not correctly translated into drawings, procedures, or instructions, for: (1) operation of the makeup tank; (2) operation of the manual swap over of the Emergency Core Cooling System pumps suction from the borated water storage tank to the reactor building sump; (3) maintaining adequate inventory in the reactor building sump to provide adequate net positive suction head to one low pressure injection pump with the high pressure injection (HPI) pump suction cross tie valve open and supplying the operating High Pressure Injection pumps; and (4) maintaining adequate water quantity in the fire water storage tank.

No Notice of Violation is presently being issued for these inspection findings. In addition, please be advised that the number and characterization of the apparent violations described in the enclosed inspection report may change as a result of further NRC review. A predecisional enforcement conference to discuss these apparent violations will be scheduled at a later date. No response to these apparent violations is required at this time.

In accordance with 10 CFR 2.790 of the NRC's "Rules of Practice", a copy of this letter and its enclosures will be placed in the NRC Public Document Room.

Should you have any questions concerning this letter, please contact us.

Sincerely,


Albert F. Gibson, Director
Division of Reactor Safety

Docket No.: 50-302
License No.: DPR-72

Enclosure: NRC Inspection Report 50-302/95-22

(cc w/encl: (See page 3))

cc w/enc1:

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(cc w/enc1 cont'd - See page 4)

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UNITED STATES
NUCLEAR REGULATORY COMMISSION
DIVISION 6
161 MARNETTA STREET, N.W., SUITE 200
ATLANTA, GEORGIA 30333-0000

Report No.: 50-302/95-22

Licensee: Florida Power Corporation
3201 34th Street South
St. Petersburg, FL 33733

Docket No.: 50-302

License No.: DPA-72

Facility Name: Crystal River Nuclear Plant Unit 3

Inspection Conducted: December 11-15, 1995

Inspector:

[Signature]
Paul O. Kellogg, Team Leader

1/31/96
Date Signed

Accompanying Inspectors:

C. Rapp, Reactor Inspector
R. Schin, Reactor Inspector

Approved by:

[Signature]
Harold O. Christensen, Chief
Maintenance Branch
Division of Reactor Safety

1/31/96
Date Signed

SUMMARY

Scope:

An inspection was conducted to determine if management provided adequate guidance, training, procedures, and other support necessary to meet management's expectations for operation of the Make-up Tank System. The inspection reviewed Make-up Tank data to determine if the system was operated in accordance with approved procedures and if appropriate actions were taken for out of specification conditions.

Results:

Four apparent violations were identified:

Apparent violation 50-302/95-22-01: Nine examples of operation of the makeup tank outside the acceptable operating region while adding hydrogen.

Apparent violation 50-302/95-22-02: Two examples of conducting an unauthorized test or experiment without a written safety evaluation containing the bases for the determination that an unreviewed safety question did not exist.

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Apparent violation 50-302/95-22-03: Three examples of inadequate corrective action concerning inadequate revisions to Curve 8, Maximum Make-up Tank Overpressure; inadequate review of Problem Report 94-149; and inadequate corrective action for required tank volumes.

Apparent violation 50-302/95-22-04: Four examples of inadequate design control concerning the incorrect design information contained in Curve 8 which allowed the plant to be operated outside of its design basis, incorrect swapper point for the borated water storage tank, inadequate net positive suction head for the low pressure safety injection pumps during swapper to the Reactor Building sump, and minimum volume requirement for the fire water storage tank not being met.

Weaknesses were identified in the human factors aspects of information provided to operators for control of makeup tank level and pressure, lack of tracking out of calibration data, the failure to place the makeup tank level/pressure alarm in a routine calibration program, ineffective communications between operations and engineering and within both departments, vague guidance provided to operators in procedures for when procedures are adequate for evolutions being performed, for alarm response times, and for determining when evolutions constitute a test or experiment.

REPORT DETAILS

1. Persons Contacted

Licensee Personnel

- *K. Baker, Manager Nuclear Configuration Control
- G. Becker, Nuclear Plant Operations Evaluator
- *G. Belt, Vice president Nuclear Production
- *R. Bright, Nuclear Principle Licensing Engineer
- J. Campbell, Manager Nuclear Power Technical Support
- *R. Davis, Maintenance Manager
- *D. deMonfort, Nuclear Operations Instructor
- *M. Donovan, Supervisor Nuclear Power Technical Support
- *R. Enfinger, Senior Licensing Engineer
- P. Flemming, Senior Nuclear Licensing Engineer
- *A. Friend, Nuclear Principle Licensing Engineer
- *B. Gutherman, Nuclear Licensing Manager
- *G. Hainon, Manager Nuclear Plant Operations
- V. Hernandez, Senior Nuclear Employee Concern Specialist
- *B. Hinkle, Director, Nuclear Power Operations
- *L. Kelly, Director, Nuclear Operations Site Support
- *W. Kizner, Jr., Senior Nuclear Schedule Coordinator
- *K. Lancaster, Nuclear Projects Manager
- *J. Lind, Manager Nuclear Operations Training
- *G. Longhouser, Manager Nuclear Security
- *J. Masada, Manager Nuclear Engineering Design
- *R. McLaughlin, Nuclear Regulatory Specialist
- B. Moore, Manager Work Controls
- *S. Robinson, Manager Nuclear Quality Assurance
- J. Smith, Supervisor Operator Training
- *D. Stenger, Attorney
- *P. Tanguay, Director Nuclear Engineering and Projects
- *S. Weinberg, Attorney
- R. Widell, Nuclear Operations Training

Other licensee employees contacted included engineers, technicians, operators and office personnel.

NRC Personnel

- *R. Butcher, Senior Resident Inspector
- *T. Cooper, Resident Inspector
- *P. Kellogg, Senior Project Manager, Division of Reactor Safety, Region II
- *K. Landis, Branch Chief, Division of Reactor Projects, Region II
- *C. Rapp, Reactor Inspector
- *R. Schin, Reactor Inspector

* Attended Exit Interview.

2. Operation of the Makeup Tank

The inspection documented in NRC Inspection Report (IR) 50-302/95-13 reviewed the circumstances surrounding the September 5, 1994 event involving pressure control of the reactor coolant system makeup tank. Details of the review of the September 5, 1994 event are documented in paragraph 2 of IR 50-302/95-13. Apparent violation 50-302/95-13-01 was identified as a result of that review. After further review, the NRC has concluded that, on two occasions on September 4 and 5, 1994, not only did operators fail to follow procedures, but 10 CFR 50.69 was also violated in that the manipulations were not required by plant conditions and no approved procedure existed for the conduct of the tests. This apparent violation is discussed in detail in Section 2.1 of this report and identified as apparent violation 50-302/95-22-02. Apparent violation 50-302/95-13-01 is administratively closed and the failure to follow procedures on September 5, 1994 identified in 50-302/95-13-01 is incorporated into example 2 of apparent violation 50-302/95-22-02.

Paragraph 3 of IR 50-302/95-13 documents the NRC review of the design basis of MJT operating limits. During this review, it was determined that the MJT pressure limit curve constitutes a design basis limit. Apparent violation 50-302/95-22-01 described in detail below therefore represents examples not only of a failure to follow procedures, but also examples of the failure to operate within the design basis limit.

2.1 Makeup Tank Data

The inspectors reviewed make-up tank data for the time period June 1, 1994, through September 7, 1994, to determine the number of times Curve B limits on make-up tank pressure and level had been exceeded. The inspectors also observed the make-up tank pressure and level instrumentation in the control room, reviewed drawings and calibration records for that instrumentation, reviewed the design calculation that supported Curve B, reviewed operator logs, and discussed the instrumentation design and operation with engineers and operators.

Instrumentation in the control room for make-up tank level and pressure included a high pressure alarm, computer points, and a chart recorder. During the time period June 1, 1994, through September 7, 1994, the alarm was driven by the computer such that whenever the computer value for make-up tank pressure exceeded the Curve B limit for the existing make-up tank level, the alarm would be activated. When the pressure was equal to or below Curve B, the alarm would be de-activated (there was no programmed dead band). Operators could display the computer points for make-up tank level and pressure on video screens above the main control board or on the right side of the control board. The computer data was saved by the plant computer every minute and was available for the inspector to review. The chart recorder was located on the vertical section of the main control board and

displayed make-up tank level and pressure on one strip chart. The chart records were saved by the licensee and copies were available for the inspector to review.

Plant computer records of make-up tank pressure and level indicated that Curve 8 limits had been exceeded, and the related control room alarm had been validly activated, on numerous different occasions during the time period in question. The inspectors selected the eleven most significant occasions for further review, when the alarm had been in continuously for more than 30 minutes and Curve 8 had been exceeded by more than 0.5 psig. These occasions were:

	<u>Date</u>	<u>Time</u>	<u>Duration (minutes)</u>	<u>Maximum pressure over Curve 8 (psig)</u>
1)	7/23/94	12:13-14:14	122	1.08
2)	7/25/94	10:27-11:14	48	0.63
3)	7/27/94	14:44-16:01	78	0.68
4)	7/28/94	14:26-17:29	184	2.10
5)	7/30/94	09:28-12:38	190	0.73
6)	8/6/94	09:55-12:15	141	0.82
7)	8/8/94	10:08-11:14	67	1.54
8)	8/24/94	13:24-14:50	87	0.81
9)	9/4/94	04:24-05:06	43	2.36
10)	9/4/94	15:21-16:46	86	2.07
11)	9/5/94	04:45-05:21	37	1.71

On the first occasion (7/23/94), the computer data indicated that operators reduced make-up tank level to about 53 inches (below the 55 inch low level limit), added hydrogen to increase pressure from about 11 psig to about 14 psig (above the Curve 8 limit), then increased level to about 82.5 inches. As level was increased, make-up tank pressure increased to about 29 psig. The computer data indicated that the Curve 8 alarm would have been activated during the hydrogen addition, remained in through the level increase, and then stayed in for about another 95 minutes as pressure gradually decreased to below the alarm point. Chart recorder data indicated approximately 1.0 inch higher level (54 inches and 83.5 inches) and approximately 0.5 to 1.5 psig lower pressure (11.5 psig and 27.5 psig) than the computer data. Calibration and accuracy of these instruments are addressed later

in this report. When plotted on Curve 8, chart recorder data indicated that make-up tank pressure exceeded Curve 8 during the hydrogen addition, crossed to the acceptable region of Curve 8 during the level increase, and then remained in the acceptable region. Operator logs included bleeding 585 gallons from the RCS to the "C" RCST, then feeding 935 gallons from the "C" RCST to the RCS. There were no other log entries concerning this evolution. An assessment of operator logkeeping is addressed later in this report.

The inspectors assessed whether operator actions during the 7/23/94 evolution were in accordance with operating procedures. Procedure OP-402, Makeup and Purification System, Rev. 75, step 4.4.3, directed operators to stop reducing make-up tank level "when MUT decreases to low level alarm". Since the procedure directed operators to stop reducing level after getting the 55-inch low level alarm and the data indicated that the make-up tank level was increased, within approximately 11 minutes, to above 55 inches, the inspectors concluded that operators did not violate the procedure when they decreased make-up tank level below 55 inches. However, the inspectors noted that engineering calculation 190-0024, from which Curve 8 was derived, assumed that the make-up tank would always be operated at an indicated level of greater than or equal to 55 inches. The inspectors concluded that the operating procedure and low level alarm setpoint (at 55 inches) were weak in supporting the engineering calculation. The inspectors also concluded that operators violated procedures during subsequent parts of this evolution. Operators did not follow OP-402 instructions for adding hydrogen. The applicable step in OP-402 specifically stated "refer to Curve 8 of OP-1038 for maximum MUT overpressure". However, operators exceeded Curve 8 during hydrogen addition. Operators also exceeded the administrative limits of OP-1038, Curve 8, Maximum Makeup Tank Overpressure, for an extended period of time (about 122 minutes). Engineering calculation 190-0024 assumed that the make-up tank would always be operated at an indicated pressure of less than or equal to Curve 8. In addition, procedure AR-403, Annunciator Response, required that, for a valid alarm, operators take action to reduce pressure to within the limits of OP-1038, Curve 8. However, during this evolution, operators did not take timely action in response to the "MAKEUP TANK PRESS HIGH" annunciator. Operators stated that venting the make-up tank to reduce pressure would take approximately ten minutes because of the required auxiliary operator actions. The auxiliary operator actions included selecting a waste gas decay tank, donning anti-contamination clothing and entering a contaminated area, closing one manual valve and opening another, exiting the contaminated area, and starting a waste gas compressor. During this evolution, instead of reducing pressure in response to the alarm, operators increased level (and pressure) in the makeup tank and then left the alarm in for approximately an additional 95 minutes without taking action to reduce pressure. While the computer/alarm and

chart recorder data differed, all instruments were operational and indications from all should have been considered valid. Operation with a valid pressure indication outside of values allowed by procedures, as indicated by the alarm, constituted a violation of the procedures. To rely on the chart recorder indication and disregard the alarm and computer data, without having the alarm/computer indication checked by maintenance personnel and proven to be invalid, would be considered nonconservative and unacceptable. As discussed later, in this instance the chart recorder indication was apparently inaccurate and nonconservative. The failure of operators to follow procedures by violating the limits of OP-402 while adding hydrogen on 7/21/94 is identified as an example of apparent violation 80-302/95-22-01.

On the second occasion (7/25/94), computer data indicated that operators reduced make-up tank level to approximately 58.5 inches (pressure went to about 15 psig), then increased level to approximately 83 inches while pressure increased to approximately 29 psig. The data indicated the Curve 8 alarm would have been activated when level was decreased to 58.5 inches, remained in through most of the level increase, and then deactivated as level increased above 79 inches. Chart recorder data indicated that pressure went from a low of approximately 15.5 psig to a high of approximately 28 psig while level went from a low of about 59 inches to a high of about 84 inches. When plotted on Curve 8, the chart recorder data indicated that make-up tank pressure was on or below Curve 8 throughout this evolution. Operator logs included bleeding 400 gallons to the "C" RCBT, then feeding 550 gallons from the "C" RCBT and 100 gallons from the "A" RCBT to raise hydrogen pressure to 27 psig. There were no other log entries for this evolution. The inspectors concluded that operators violated procedures during this evolution. Operators exceeded the administrative limits of OP-1038, Curve 8, Maximum Makeup Tank Overpressure, for an extended period of time (about 48 minutes). In addition, operators did not take timely action in response to the "MAKEUP TANK PRESS HIGH" annunciator. Instead of reducing pressure in response to the alarm as required by the annunciator response procedure, operators increased level (and pressure) in the makeup tank. This is an example of apparent violation 80-302/95-22-01.

On the third occasion (7/27/94), computer data indicated that operators started at a make-up tank level of approximately 72 inches and a pressure of approximately 19.5 psig, added hydrogen to increase pressure to about 21.5 psig, then increased level to about 77.5 inches (pressure went to about 25 psig). The data indicated that the Curve 8 alarm would have activated during the hydrogen addition, remained in during the level increase, then stayed in for about another 70 minutes as pressure gradually decreased to below the alarm point. Chart recorder data indicated that initial make-up tank level was about 73 inches and initial pressure was about 19 psig, pressure was increased to about 21

psig, then level was increased to about 78 inches (pressure went to about 24 psig). When plotted on Curve 8, the chart recorder data indicated that make-up tank pressure was below Curve 8 throughout this evolution. Operator logs included feeding 150 gallons from the "C" RCBT and 30 gallons of demineralized water to the make-up tank. There were no other log entries for this event. The inspectors concluded that operators violated procedures during this evolution. Operators did not follow OP-402 instructions for adding hydrogen by manually bypassing the 15 psig hydrogen regulator. The applicable step in OP-402 specifically stated "Determine maximum HWT overpressure using Curve 8 of OP-1038. Add desired amount of hydrogen while ensuring HWT pressure limit is not exceeded." However, operators exceeded Curve 8 during hydrogen addition. Operators also exceeded the administrative limits of OP-1038, Curve 8, for an extended period of time (about 78 minutes). In addition, during this evolution, operators did not take timely action in response to the "MAKEUP TANK PRESS HIGH" annunciator. Instead of reducing pressure in response to the alarm as required, operators increased level (and pressure) in the makeup tank and then left the alarm in for about an additional 70 minutes without taking action to reduce pressure. This is an example of apparent violation 50-302/95-22-01.

On the fourth occasion (7/28/94), computer data indicated that operators started with a make-up tank level of about 73.5 inches and a pressure of about 16.5 psig, added hydrogen to increase pressure to about 24 psig, then increased level to about 83 inches (pressure went to about 30.5 psig). The data indicated that the Curve 8 alarm would have activated when the hydrogen was added, remained in through the level increase, then stayed in for about 180 minutes longer as pressure gradually decreased to below the alarm point. Chart recorder data indicated that the initial make-up tank level was about 74 inches and pressure was about 16 psig, pressure was increased to about 23 psig, then level was increased to about 84 inches (pressure went to about 29 psig). When plotted on Curve 8, the chart recorder data indicated that make-up tank pressure was on or below Curve 8 throughout this evolution. Operator logs included adding hydrogen to the make-up tank to the maximum for the curve, feeding 47 gallons from the "A" RCBT and 253 gallons from the "B" RCBT, then adding 60 gallons of demineralized water to the make-up tank. There were no other log entries for this evolution. The inspectors concluded that operators violated procedures during this evolution. Operators did not follow OP-402 instructions for adding hydrogen by manually bypassing the 15 psig hydrogen regulator. The applicable step in OP-402 specifically required "ensuring HWT pressure limit is not exceeded." However, operators exceeded the Curve 8 HWT pressure limit during hydrogen addition. Operators also exceeded the administrative limits of OP-1038, Curve 8, for an extended period of time (about 184 minutes). In addition, during this evolution, operators did not take timely action in response to the "MAKEUP TANK PRESS HIGH" annunciator. Instead of reducing pressure in

response to the alarm as required, operators increased level (and pressure) in the makeup tank and then left the alarm in for about an additional 180 minutes without taking action to reduce pressure. This is an example of apparent violation 50-302/95-22-01.

On the fifth occasion (7/30/94), computer data indicated that operators started at a make-up tank level of about 74.5 inches and a pressure of about 19.0 psig, added hydrogen to increase pressure to about 23.5 psig (when the alarm activated), then about 190 minutes later increased level to about 82.5 inches (pressure went to about 28 psig). The data indicated that the Curve 8 alarm would have activated when hydrogen was added and remained in until it cleared when level was subsequently raised. Chart recorder data indicated that the initial make-up tank level was about 76 inches and pressure was about 18.5 psig, pressure was increased to about 23 psig, then level was increased to about 84 inches (pressure went to about 25.5 psig). When plotted on Curve 8, the chart recorder data indicated that make-up tank pressure remained below Curve 8 throughout this evolution. Operator logs included feeding 45 gallons from the "A" RCNT and 255 gallons from the "B" RCNT to the make-up tank. There were no other log entries for this evolution. The inspectors concluded that operators violated procedures during this evolution. Operators did not follow OP-402 instructions for adding hydrogen by manually bypassing the 15 psig hydrogen regulator. The applicable step in OP-402 specifically required "ensuring RCNT pressure limit is not exceeded." However, operators exceeded the Curve 8 RCNT pressure limit during hydrogen addition. Operators also exceeded the administrative limits of OP-1038, Curve 8, for an extended period of time (about 190 minutes). In addition, during this evolution, operators did not take timely action in response to the "MAKEUP TANK PRESS HIGH" annunciator. Instead of reducing pressure in response to the alarm as required, operators took no action for about 190 minutes, then increased level (and pressure) in the makeup tank to clear the alarm. This is an example of apparent violation 50-302/95-22-01.

On the sixth occasion (8/6/94), computer data indicated that operators increased make-up tank level to about 81 inches (pressure went to about 22 psig), then added hydrogen to increase pressure to about 27.5 psig. The data indicated that the Curve 8 alarm would have activated when the hydrogen was added, then stayed in for about 141 minutes as pressure gradually decreased to below the alarm point. Chart recorder data indicated that the maximum pressure was about 26.5 psig at about 82 inches. When plotted on Curve 8, the chart recorder data indicated that make-up tank pressure remained below Curve 8 throughout this evolution. Operator logs included adding 150 gallons from the "A" RCNT to the make-up tank. There were no other log entries for this evolution. The inspectors concluded that operators violated procedures during this evolution. Operators did not follow OP-402 instructions for

adding hydrogen by manually bypassing the 15 psig hydrogen regulator. The applicable step in OP-402 specifically required "ensuring MJT pressure limit is not exceeded." However, operators exceeded the Curve 8 MJT pressure limit during hydrogen addition. Operators also exceeded the administrative limits of OP-1038, Curve 8, for an extended period of time (about 141 minutes). In addition, during this evolution, operators did not take timely action in response to the "MAKEUP TANK PRESS HIGH" annunciator. Instead of reducing pressure in response to the alarm as required, operators left the alarm in for about 141 minutes. This is an example of apparent violation 50-302/95-22-01.

On the seventh occasion (8/8/94), computer data indicated that operators started with a make-up tank level of about 79 inches and a pressure of about 20 psig, then added hydrogen to increase pressure to about 27.5 psig. The data indicated that the Curve 8 alarm would have been activated when the hydrogen was added, then stayed in for about 67 minutes as pressure gradually decreased to below the alarm point. Chart recorder data indicated that the maximum pressure was about 25 psig at a level of about 80 inches. When plotted on Curve 8, the chart recorder data indicated that make-up tank pressure remained on or below Curve 8 throughout this evolution. There were no operator log entries for this evolution. The inspectors concluded that operators violated procedures during this evolution. Operators did not follow OP-402 instructions for adding hydrogen by manually bypassing the 15 psig hydrogen regulator. The applicable step in OP-402 specifically required "ensuring MJT pressure limit is not exceeded." However, operators exceeded the Curve 8 MJT pressure limit during hydrogen addition. Operators also exceeded the administrative limits of OP-1038, Curve 8, for an extended period of time (about 67 minutes). In addition, during this evolution, operators did not take timely action in response to the "MAKEUP TANK PRESS HIGH" annunciator. Instead of reducing pressure in response to the alarm as required, operators left the alarm in for about 67 minutes. This is an example of apparent violation 50-302/95-22-01.

operators started at a make-up tank level of about 79 inches and a pressure of about 18 psig, increased level to about 81.5 inches (pressure went to about 21 psig), then added hydrogen to increase pressure to about 25 psig. The data indicated that the Curve 8 alarm would have been activated when hydrogen was added, then stayed in for about 67 minutes as pressure gradually decreased to below the alarm point. Chart recorder data indicated that the maximum pressure was about 27 psig at about 82.5 inches. When plotted on Curve 8, the chart recorder data indicated that make-up tank pressure remained below Curve 8 throughout this evolution. There were no operator log entries for this evolution. The inspectors concluded that operators violated procedures during this evolution. Operators did not follow OP-402 instructions for adding hydrogen by manually bypassing the 15 psig hydrogen

regulator. The applicable step in OP-402 specifically required "ensuring MJT pressure limit is not exceeded." However, operators exceeded the Curve 8 MJT pressure limit during hydrogen addition. Operators also exceeded the administrative limits of OP-1038, Curve 8, for an extended period of time (about 87 minutes). In addition, during this evolution, operators did not take timely action in response to the "MAKEUP TANK PRESS HIGH" annunciator. Instead of reducing pressure in response to the alarm as required, operators left the alarm in for about 87 minutes. This is an example of apparent violation 50-302/95-22-01.

On the ninth occasion (9/4/96), computer data indicated that operators started at about 80 inches and 23 psig in the make-up tank, increased level to about 85 inches (pressure went to about 25 psig), added hydrogen to increase pressure to about 31 psig (when the alarm activated), reduced level to about 52.5 inches (pressure went to about 14.5 psig), increased level to about 79 inches (pressure went to about 26 psig), then vented the make-up tank to about 20 psig. The data indicated that the 55 inch minimum level was exceeded during the evolution. Also, the Curve 8 alarm would have been activated from the time that hydrogen was added at the beginning of the evolution until the make-up tank was vented at the end of the evolution. The data also indicated that, as level was reduced from about 85 inches to about 52.5 inches, pressure exceeded Curve 8 by an increasing amount. Chart recorder data indicated that pressure went from a high of about 29.5 psig at a level of about 85 inches, to a low of about 14.5 psig at a level of about 52 inches, then to a high of about 25 psig at a level of about 80 inches. When plotted on Curve 8, the chart recorder data indicated that make-up tank pressure went above Curve 8 as level was being decreased below about 80 inches, remained above Curve 8 during the level decrease, then returned below Curve 8 during the level increase. Operator logs included feeding 125 gallons from the "B" RCBT; adding hydrogen; bleeding 924 gallons to the "B" RCBT; and feeding 120 gallons from the "A" RCBT, 380 gallons from the "C" RCBT, and 350 gallons from the "C" RCBT. There were no other log entries for this evolution. The inspectors concluded that operators violated procedures during this evolution. Operators did not follow OP-402 instructions for adding hydrogen by manually bypassing the 15 psig hydrogen regulator. The applicable step in OP-402 specifically required "ensuring MJT pressure limit is not exceeded." However, operators exceeded the Curve 8 MJT pressure limit during hydrogen addition. Operators also exceeded the administrative limits of OP-1038, Curve 8, for an extended period of time (about 43 minutes). In addition, during this evolution, operators did not take timely action in response to the "MAKEUP TANK PRESS HIGH" annunciator. Instead of reducing pressure to clear the alarm as required, operators reduced level (and pressure) which caused the Curve 8 limits to be exceeded by an increasing amount. Operators left the alarm in for about 43 minutes before venting the make-up tank to

regulator. The applicable step in OP-402 specifically required "ensuring MJT pressure limit is not exceeded." However, operators exceeded the Curve 8 MJT pressure limit during hydrogen addition. Operators also exceeded the administrative limits of OP-1038, Curve 8, for an extended period of time (about 87 minutes). In addition, during this evolution, operators did not take timely action in response to the "MAKEUP TANK PRESS HIGH" annunciator. Instead of reducing pressure in response to the alarm as required, operators left the alarm in for about 87 minutes. This is an example of apparent violation 50-302/95-22-01.

On the ninth occasion (9/4/96), computer data indicated that operators started at about 80 inches and 23 psig in the make-up tank, increased level to about 85 inches (pressure went to about 25 psig), added hydrogen to increase pressure to about 31 psig (when the alarm activated), reduced level to about 52.5 inches (pressure went to about 14.5 psig), increased level to about 79 inches (pressure went to about 26 psig), then vented the make-up tank to about 20 psig. The data indicated that the 55 inch minimum level was exceeded during the evolution. Also, the Curve 8 alarm would have been activated from the time that hydrogen was added at the beginning of the evolution until the make-up tank was vented at the end of the evolution. The data also indicated that, as level was reduced from about 85 inches to about 52.5 inches, pressure exceeded Curve 8 by an increasing amount. Chart recorder data indicated that pressure went from a high of about 29.5 psig at a level of about 85 inches, to a low of about 14.5 psig at a level of about 52 inches, then to a high of about 25 psig at a level of about 80 inches. When plotted on Curve 8, the chart recorder data indicated that make-up tank pressure went above Curve 8 as level was being decreased below about 80 inches, remained above Curve 8 during the level decrease, then returned below Curve 8 during the level increase. Operator logs included feeding 125 gallons from the "B" RCBT; adding hydrogen; bleeding 924 gallons to the "B" RCBT; and feeding 120 gallons from the "A" RCBT, 380 gallons from the "C" RCBT, and 350 gallons from the "C" RCBT. There were no other log entries for this evolution. The inspectors concluded that operators violated procedures during this evolution. Operators did not follow OP-402 instructions for adding hydrogen by manually bypassing the 15 psig hydrogen regulator. The applicable step in OP-402 specifically required "ensuring MJT pressure limit is not exceeded." However, operators exceeded the Curve 8 MJT pressure limit during hydrogen addition. Operators also exceeded the administrative limits of OP-1038, Curve 8, for an extended period of time (about 43 minutes). In addition, during this evolution, operators did not take timely action in response to the "MAKEUP TANK PRESS HIGH" annunciator. Instead of reducing pressure to clear the alarm as required, operators reduced level (and pressure) which caused the Curve 8 limits to be exceeded by an increasing amount. Operators left the alarm in for about 43 minutes before venting the make-up tank to

clear the alarm. Evolutions, not required by plant conditions, conducted to collect data constitute a test or experiment. 10 CFR 50.59 requires in part that tests or experiments that are conducted must contain a written safety evaluation that provides the bases for why an unreviewed safety question does not exist. The evolution conducted on 9/4/94 without a written safety evaluation is identified as example 1 of apparent violations 50-302/95-22-02.

On the tenth occasion (9/4/94), computer data indicated that operators started with a make-up tank level of about 82.5 inches and pressure about 20.5 psig, added hydrogen to increase pressure to about 30 psig, then about 85 minutes later a different shift of operators vented the make-up tank to reduce pressure to about 19 psig. The data indicated that the Curve 8 alarm would have been activated from the time that hydrogen was added until the time that the make-up tank was vented. Chart recorder data indicated a maximum pressure of about 28.5 psig at a level of about 83 inches. When plotted on Curve 8, the chart recorder data indicated that make-up tank pressure remained on or below Curve 8 during this evolution. Operator logs included venting the make-up tank at the end of this evolution. There were no other log entries for this evolution. The inspectors concluded that operators violated procedures during this evolution. Operators did not follow OP-402 instructions for adding hydrogen by manually bypassing the 15 psig hydrogen regulator. The applicable step in OP-402 specifically required "ensuring MWI pressure limit is not exceeded." However, operators exceeded the Curve 8 MWI pressure limit during hydrogen addition. Operators also exceeded the administrative limits of OP-103B, Curve 8, for an extended period of time (about 85 minutes). In addition, during this evolution, operators did not take timely action in response to the "MAKEUP TANK PRESS HIGH" annunciator. Operators left the alarm in for about 85 minutes before they vented the make-up tank to reduce pressure. This is an example of apparent violation 50-302/95-22-01.

On the eleventh occasion (9/5/94), computer data indicated that operators started with a make-up tank level of about 84 inches and a pressure of about 24 psig, added hydrogen to increase pressure to about 30 psig (when the alarm activated), increased level to about 86.5 inches (when the alarm cleared at a pressure of about 32 psig), decreased level to about 83.5 inches (pressure went to about 14 psig), then increased level to about 81 inches (pressure went to about 27 psig). The data indicated that the Curve 8 alarm would have been activated for about 25 minutes from the time hydrogen was added until the level was increased to about 86.5 inches and the alarm cleared. Then the alarm would have been activated for about 37 minutes from the time the level decrease was begun until the alarm cleared during the subsequent level increase. The data also indicated that, as level was decreased following the alarm, pressure exceeded Curve 8 by an increasing amount. Chart recorder data indicated a maximum pressure of about

30 psig at a level of about 86 inches and a minimum pressure of about 14 psig at a level of about 54 inches. When plotted on Curve 8, the chart recorder data indicated that make-up tank pressure went above Curve 8 about midway during the level decrease and returned to on or below Curve 8 during the subsequent level increase. Operator logs included feeding 185 gallons from the "B" RCST; adding hydrogen; bleeding 955 gallons to the "B" RCST; then feeding 120 gallons from the "A" RCST; 380 gallons from the "C" RCST; and 360 gallons from the "B" RCST. There were no other log entries for this evolution. The inspectors concluded that operators violated procedures during this evolution. Operators did not follow OP-402 instructions for adding hydrogen by manually bypassing the 15 psig hydrogen regulator. The applicable step in OP-402 specifically required "ensuring MJT pressure limit is not exceeded." However, operators exceeded the Curve 8 MJT pressure limit during hydrogen addition. Operators also exceeded the administrative limits of OP-103B, Curve 8, for an extended period of time (about 37 minutes during the level decrease and subsequent level increase). In addition, during this evolution, operators did not take timely action in response to the "MAKEUP TANK PRESS HIGH" annunciator. Instead of reducing pressure to clear the alarm as required, operators cleared the first alarm by increasing level (and pressure). When the alarm came in while operators were reducing level (and pressure), operators continued to reduce level which caused the Curve 8 limits to be exceeded by an increasing amount. Operators subsequently cleared the alarm after 37 minutes by increasing level (and pressure) in the make-up tank. Evolutions, not required by plant conditions, conducted to collect data constitute a test or experiment. 10 CFR 50.59 requires in part that tests or experiments that are conducted must contain a written safety evaluation that provides the bases for why an unreviewed safety question does not exist. This evolution was conducted without a written safety evaluation and is identified as example 2 of apparent violation 50-302/95-22-02.

Of the 11 occasions reviewed, the inspectors noted that two of them, the ninth and eleventh occasions, differed in some material respects from the other nine. On nine of the occasions, operators were taking actions to increase make-up tank hydrogen pressure (as recommended for RCS chemistry control) when they exceeded Curve 8 limits. However, on two of the occasions (9/4/94 a.m. and 9/5/94 a.m.), operators exceeded Curve 8 limits while reducing make-up tank level (and pressure) and while performing an evolution that was not required to support RCS chemistry control. On nine of the occasions, operators took delayed action (or no action) following the alarm to reduce the amount by which make-up tank pressure exceeded the allowable region of Curve 8. However, on two of the occasions (9/4/94 a.m. and 9/5/94 a.m.) operators took nonconservative actions following the alarm to further increase the amount by which make-up tank pressure exceeded the allowable region of Curve 8. Also, the licensee stated that on two of the occasions (9/4/94 a.m. and 9/5/94 a.m.) operators planned the

evolutions to challenge the accuracy of Curve 8 and took data during the evolutions. In addition, on 9/5/94 a.m. operators stationed an auxiliary operator by the make-up tank vent to take action if a plant event occurred while the make-up tank pressure exceeded Curve 8. The inspectors concluded that while operators violated procedures, and the design basis limits established by the M/T pressure limit curve, on each of the 11 occasions reviewed, available information indicated that the intent of the operators during the two occasions (9/4/94 and 9/5/94) differed from the other nine occasions. These unauthorized manipulations of the plant on 9/4/94 and 9/5/95 in addition to violating the procedures OP-402, OP-102B, and AR-403 while adding hydrogen, also violated 10 CFR 50.59 in that the manipulations were not required by plant conditions and no approved procedure existed for the conduct of the tests. As described previously, these two unauthorized tests are identified as examples 1 and 2 of apparent violation 50-302/95-22-02.

While reviewing the computer and chart recorder data, the inspectors noted that many substantial changes in make-up tank level had been made where Curve 8 was not exceeded. The licensee's analysis of this issue found that, during the time period June 1 through September 30, 1994, there were 609 manipulations of make-up tank level or pressure; including 610 level reductions or level increases, 49 hydrogen additions, and 10 vents of the tank. The licensee further stated that 21 of these manipulations (only 3.1%) resulted in the computer-generated annunciator for make-up tank pressure being in the alarm condition. This indicated that, on most make-up tank level or pressure manipulations, operators did not exceed the pressure limits of Curve 8.

In summary, the inspectors concluded that operators exceeded Curve 8 limits and violated operating procedures on at least 11 occasions during the time period June 1, 1994, through September 7, 1994. Two of these occasions were unauthorized tests or experiments not required by plant conditions.

2.2 Human factors and Control Room Instrumentation

The inspector assessed the human factors aspects of the control room instruments for make-up tank pressure and level. The computer data for pressure and level were clearly displayed digitally. Pressure was displayed to the nearest one-hundredth of a psig and level was displayed to the nearest one-hundredth of an inch. The chart recorder was much more difficult to read. Pressure could be read to approximately the nearest one-half psig and level could be read to approximately the nearest inch. Since the Curve 8 calculation (190-0024) provided only two feet of water (about 0.8 psig) as protection for the HPI pump, the inspector considered that the readability of the chart recorder was not sufficient to support operating the make-up tank on or near

Curve 8. Operation on or near Curve 8 was allowed by procedures and was encouraged by licensee management to maximize the hydrogen concentration in the reactor coolant system. Also, there was no display in the control room for proximity to Curve 8. To make a determination of proximity to the limit of Curve 8, operators would have to manually plot make-up tank pressure and level on a copy of Curve 8. The lack of such a display, which could have been provided by the computer, made it very difficult for operators to increase make-up tank pressure close to Curve 8 without exceeding Curve 8. The inspectors concluded that the human factors aspects of the MWT information displayed in the control room were weak in supporting operation near Curve 8.

2.3 Calibration and Accuracy of Makeup Tank Instruments

The inspector assessed the calibration and accuracy of the instruments. Make-up tank pressure inputs to the computer and chart recorder were from the same pressure transmitter and electrical buffer. Maintenance procedure MP 103-A calibration records from October 27, 1994, indicated that the chart recorder pressure string read about 0.7 psig low (at 25 psig). (The make-up tank pressure was normally controlled between approximately 15 and 30 psig.) The inspectors found that the 0.7 psig error was within the 1.12 psig maximum instrument error assumed by Calculation 190-0024, dated August 28, 1992, from which Curve 8 was derived. The inspectors noted that the chart recorder read low (by about 1.0 to 4.0 psig) and out of tolerance, at pressures above 25 psig (i.e., at 50, 75, and 100 psig), on two consecutive calibrations, November 27, 1992 and October 27, 1994. On each occasion, it had been recalibrated and left reading accurately. However, the licensee had no trending program to identify (and initiate corrective action) when an instrument, that was calibrated by a maintenance procedure and possibly important to safety, was repeatedly found to indicate inaccurately outside of the allowed tolerance. From the as-found calibration data, the inspector could not determine whether the chart recorder pressure would have read within the 1.12 psig assumed maximum instrument error, at a make-up tank pressure of 25 or 30 psig, during the period July through September, 1994. When informed of these chart recorder errors, the licensee promptly checked the calibration of the chart recorder for make-up tank pressure and found it to be within the allowable tolerance. The inspectors identified the lack of instrument out of calibration tracking (and corrective action) as a weakness in the licensee's maintenance program.

The inspectors noted that the computer make-up tank pressure and the Curve 8 alarm were not checked by calibration procedures. By comparison of the computer data with the chart recorder data, the inspectors found that the computer generally indicated higher pressure than the chart recorder by about 0.5 to 1.5 psig at about 25 psig and by about 0.2 psig at about 17 psig. The inspectors found that action taken to complete MAR 93-06-06-01A, dated

July 12, 1993, which had installed the computer pressure point and Curve 8 alarm, had failed to revise procedures to assure that the instruments would be calibrated in the future. The MAR functional test had tested the Curve 8 alarm setpoints in July 1993. The inspectors noted that calibration procedures would have required the instruments to be calibrated every two years, and that less than two years had transpired since the instruments were installed. Therefore, the safety significance of the missed procedure revisions was minor. The inspectors identified this failure of the implementation of MAR 93-06-06-01A to appropriately revise procedures as a weakness in the licensee's modification process.

Level inputs to the computer and chart recorder were from two different level transmitters and electrical buffers. Through a selector switch on the vertical section of the main control board, control room operators could select either transmitter to the chart recorder. The non-selected transmitter would then supply the computer. There were no records of the switch position, there was no indicated preferred switch position, and operators stated that they occasionally had changed the switch position. Calibration of level transmitter LT2 on December 8, 1994, per surveillance procedure SP-169E, Enclosure 2, found that the chart recorder level string indicated about 1.0 inches high at 60 and 90 inches of level. (The make-up tank level was normally controlled between about 55 and 80 inches.) The computer point was not checked at that time. Calibration of level transmitter LT1 on March 18, 1994, per SP-169E, Enclosure 1, found that the chart recorder level string indicated about 1.5 inches high at 60 inches of level and about 1.0 inches high at 90 inches of level. That calibration also checked the computer point and found that it indicated about 1.0 inches high at 60 and 90 inches of level. On both dates, the as-found conditions were generally within allowable tolerances, and the instruments were recalibrated and left with approximately zero error. By review of the make-up tank level calibration data, strip charts, and computer data, the inspectors determined that chart recorder normally read higher than the computer by about 0.5 to 1.0 inches. The inspectors concluded that the 1.0 and 1.5 inch errors found during calibration were within the 2.7 inches maximum instrument error assumed by Calculation 190-0024, which derived Curve 8.

In summary, the inspectors identified two licensee weaknesses related to make-up tank instrument calibration: one weakness in the licensee's maintenance program in that out of calibration tracking and corrective action was lacking for instruments that were relied upon to support a safety-related calculation, and one weakness in the licensee's modification process in that a MAR that installed instruments did not revise procedures to require

periodic calibration of these instruments. The inspectors concluded that overall, the make-up tank instrumentation (alarm, computer, and chart recorder) was sufficient to support operation of the make-up tank within the authorized region of Curve 8.

2.4 Operators Logs

In reviewing operator logs, the inspectors found that the information in the logs did not thoroughly or consistently document the evolutions. However, the inspectors concluded that the state of the logs did not violate licensee requirements for logkeeping, as the licensee's requirements were vague. The inspectors also noted that operators on shift during all or part of the eleven evolutions included 30 different licensed operators, approximately 100% of all licensed operators on shift at Crystal River 3. (The operators were on a six-shift rotation, and each shift included five licensed operators, two SROs and three ROs.) Also, the inspectors noted that there were shift turnovers, during three of the eleven occasions, when the make-up tank high pressure alarm would have been in. The shift managers were supposed to attend the shift turnovers, and then would have had the opportunity to become aware that the make-up tank high pressure alarm was in.

The inspectors concluded that most of the licensed operators at Crystal River 3 were involved in the nine examples of apparent violation 50-302/95-22-01. Also, licensee management had ample opportunity to identify the apparent violation.

2.5 Reportability

The inspectors reviewed the timeliness of the licensee's reporting of the operation of the make-up tank outside the design basis, with excessive hydrogen overpressure. The operator evolutions that challenged the accuracy of Curve 8 occurred on September 4 and 5, 1994. Problem Report PR 94-0267, HWT Pressure Curve Technical Basis Inadequate, was dated September 7, 1994. Licensee documents and statements indicated that engineering determined on November 16, 1994 that Curve 8 was nonconservative and outside the design basis. The licensee further determined that operation on or above Curve 8 would potentially allow make-up tank hydrogen to enter and damage a make-up (HPI) pump during a certain event, a core flood line break coincident with a failure of one emergency diesel generator. The licensee made the required one-hour 10 CFR 50.72 report at 17:55 on November 16, 1994, and submitted the required LER on December 19, 1994. The inspector concluded that the licensee made the one-hour report promptly after discovering the outside of design basis condition. The LER was submitted late, and was previously identified as VIO 50-302/94-27-02.

3. Engineering Support

The inspectors assessed engineering support to operations. They reviewed problem reports and engineering department correspondence related to the Curve 8 problems; reviewed the engineering calculation from which Curve 8 was derived; and discussed the issues with system engineers, design engineers, and operators to assess the adequacy of engineering support for this issue.

3.1 Accuracy of Curve 8, Maximum Makeup Tank Overpressure Curve

The operators stated that the purpose of the evaluations on September 4, 1994 and on September 5, 1994, was to confirm their perception that Curve 8 was incorrect. The inspectors reviewed engineering support to operations during June - September 1994; specifically, the issue regarding the accuracy of Curve 8. The inspectors reviewed Problem Reports PR 93-0010, Potentially Inadequate Make-up Pump NPSH, dated January 20, 1993; PR 94-0149, MUV-60 Stuck Open, dated May 10, 1994; and PR 94-0267, MJT Pressure Curve Technical Basis Inadequate, dated September 7, 1994. The inspectors also reviewed related REA 940747, concerning air being drawn into the make-up pump during the performance of SP-630 (MUP Full Flow Testing), dated June 7, 1994; and REA 941308, concerning operator burden in ensuring make-up pump operability during accident scenarios, dated December 1, 1994. In addition, the inspectors reviewed engineering Calculation 190-0024, dated August 28, 1992, from which Curve 8 was derived; MAR 93-06-06-01A, Setpoint Changes to MJT Overpressure, Low BMSLT Level, and MUV-491; and a related safety evaluation dated July 15, 1993. The inspectors also reviewed copies of various related internal engineering memoranda and computer mail messages and discussed the issue regarding the accuracy of Curve 8 with system engineers and design engineers.

Based on this review, the inspectors concluded that the operators' concern with the accuracy of Curve 8 was identified as a contributing factor in Problem Report PR 94-0149, dated May 10, 1994, and was also identified more clearly in PR 94-0267 (after the September 4 and 5 evaluations). A June 14, 1994, written engineering evaluation of a stated concern regarding the accuracy of Curve 8, which had been reported in PR 94-0149, concluded that the data supplied did not indicate an error in Curve 8. The engineering evaluation identified no errors in calculation 190-0024, that derived Curve 8. Subsequent licensee review of Curve 8, after September 5, 1994, identified several errors related to the calculation of Curve 8. These errors included the omission of the effects of gas absorption, temperature changes, and the partial pressure of water vapor. Internal memoranda, electronic messages, and statements by engineers indicated that PR 94-0149 corrective action (and Curve 8) were discussed several times between engineers and operators, including at meetings on July 19, 1994, and on August 5, 1994. In addition, engineers were

aware that at least one operator was not satisfied with the responses from engineering and made attempts to get the operator's concerns more clearly documented. Engineering managers (and operations managers) did not get proactively involved in the problems with resolving operator's concerns with the accuracy of Curve 8. The inspectors concluded that the failure of the engineering evaluation in response to PR 94-0149 to identify errors in Calculation 190-0024 with respect to the slope of Curve 8 constituted inadequate corrective action. This inadequate corrective action is identified as example 1 of apparent violation 50-302/95-22-03. Additional examples of failure to take adequate corrective actions were identified as apparent violations in IR 50-302/95-13. As described in Section 7 of this report, these examples are incorporated into examples 2 and 3 of apparent violation 50-302/95-22-03.

Internal licensee documents also indicated that engineers and operators discussed the method utilized by operators to maintain adequate hydrogen overpressure in the MUT to achieve 25 cc/kg of dissolved hydrogen in the RCS. Also, a memorandum from a system engineer on August 8, 1994, to one SRO and one RO (apparently in response to questions from them) advised the operators to use the computer points for make-up tank pressure and level when making hydrogen additions, since they would give more accurate indication than the chart recorder. The memo further stated that the alarm took precedence over the recorder indications. This informal response to a question was not disseminated to other operators by engineering or by operations. The inspectors noted that the response also was not consistent with a conservative operating practice that any valid indications (i.e. alarm, computer, and recorder) be kept out of the unacceptable operating regions. This was another indication of a weakness in communications between operations and engineering and also within operations.

Records available to the inspectors indicated that the calibration/accuracy of the make-up tank pressure and level instruments (alarm, computer, chart recorder) were not challenged by operators or engineers. Maintenance records revealed that the make-up tank pressure indicators had not been calibrated between November 1992 and October 1994 and then in October 1994 the chart recorder pressure indication was found to be erroneous and nonconservative. (The instruments were scheduled for routine calibration every two years). No corrective action was taken to preclude recurrence of this problem.

The inspectors concluded that engineering responded to problems or questions that were clearly stated in PRs and REAs. However, the quality and timeliness of these responses varied. While the above responses were incomplete and untimely, others appeared to be thorough. In one example, engineers identified the cause of make-up pump cavitation identified in PR 94-0149 to be air pockets left after maintenance in certain sections of piping - they then

initiated modifications and procedure changes to assure that the sections of piping were vented after maintenance. In another example, REA 941308, engineers performed a detailed Kaplan-Trope decision making analysis of various potential corrective actions to reduce or eliminate operator burden in ensuring make-up pump operability during an accident. An example of another issue where operators were dissatisfied with corrective action involved the emergency feedwater control system, where operators had to routinely place the EPV pumps in manual control and reduce the flowrates during transients. This action was required in the EOPs and successfully practiced on the simulator, but was considered by operators to be an unnecessary burden. This operator burden was on licensee's list of "operator workarounds" for which corrective actions were being appropriately pursued by plant management.

While reviewing Calculation 190-0024, dated August 28, 1982, from which Curve 8 was derived, the inspectors noted a discrepancy between a calculation assumption and licensee procedures. The calculation assumed that, during a LOCA, the switchover of ECCS pumps' suction from the BWS to the reactor building sump would occur by procedure at an RB sump level that would equate to a BWS level of about 14 ft. The calculation assumption stated that the value for BWS switchover level would be valid through refuel 8, which had occurred in 1983. However, licensee emergency operating procedures in effect during June - September 1984 required operators to begin the switchover at a BWS level of 5 ft. The inspectors found that a NAR to raise the level of certain instruments in the reactor building (for fixed plane concerns) had been installed in 1983. The NAR indicated that the emergency operating procedures were to be changed but did not indicate that Calculation 190-0024 was affected. Following the NAR, the emergency operating procedures had been changed to require the switchover at a BWS level of 5 ft. The licensee showed the inspectors an internal engineering memorandum dated March 24, 1983, with an evaluation showing that the 5 ft switchover level was appropriate. While the 14 ft level was based on two running MPI (make-up) pumps in one train, the 5 ft level was based on only one running MPI pump per train and thus less flow and less pressure loss from the BWS to the MPI pumps. The inspector reviewed the evaluation in the memorandum and concluded that it was a logical and reasonable extension of Calculation 190-0024 with respect to ensuring the make-up tank hydrogen was kept out of the MPI pumps. However, it overlooked potential vortexing in the BWS and introduction of air into all ECCS pumps. Also, it overlooked the fact that the EOP started switchover at 5 ft in the BWS and that there would be ties (and BWS level decrease) involved during the switchover. Further, both the memo and calculation 190-0024 overlooked the fact that, with make-up tank level allowed to go below zero, operators would have no indication of adequate make-up pump RPSH and as a result could decide to stop the affected pump. The inspector verified that the emergency

operating procedures included a requirement for operators to ensure that no more than one MPI pump per train was running when BWST level decreased below 25 ft. The internal engineering memorandum was signed by a senior nuclear engineer and a nuclear engineering supervisor. However, no formal change was made to the official calculation. The formal change to the calculation, a quality record, might have identified the discrepancies with the calculation and would have required independent verification by a second qualified engineer in addition to the supervisors approval. The inspectors noted that problem report PR 94-0169, dated May 10, 1994, had identified the need for a formal calculation to support the 5 ft BWST swapper point. The engineering schedule for completion of that analysis was September 30, 1994. Also, problem report PR 94-0267, dated September 7, 1994, identified the need to update calculation 190-0024.

The inspectors concluded that the licensee's failure to generate a new official calculation or revise the calculation 190-0024 in March 1993 was an apparent violation of 10 CFR 50, Appendix B, Criterion III requirements for design control including independent verification of design calculations. This inadequate design control will be included in example 2 of apparent violation 50-302/95-22-04. Apparent violation 95-13-03, example 1, paragraph 5 of IR 50-302/95-13, described an apparent violation of 10 CFR 50, Appendix B, Criterion III, Design Control, for inadequate design assumptions for borated water storage tank swapper level. This apparent violation is administratively closed and incorporated into apparent violation 50-302/95-22-04, example 2.

Additional examples of inadequate design control were identified as apparent violations in IR 50-302/95-13. As described in Section 7 of this report, these examples are incorporated into examples 1, 3 and 4 of apparent violation 50-302/95-22-03.

3.2. Review of Operability Concern Resolution Evaluation Report

As part of the review of the licensee's new operability evaluation process, the inspectors reviewed the operability evaluation concerning an unsecured section of RB sump grating installed over the ECCS pump suction pit. While installed mainly for personnel protection, this grating was credited in the FSAR for preventing objects larger than 1.5 inches from entering the ECCS pump suction pit.

To determine if the unsecured RB sump grating could affect the operability of the ECCS pumps, the licensee calculated the pressure on the grating created by the worst case flowrate out of the suction pit and into the RB sump and compared that to the force necessary to lift the grating. Based on this calculation, the licensee concluded the worst case flowrate caused insufficient force to lift the grating. The licensee also considered the force

on the grating resulting from opening the DH drop line with the reactor at pressure. This action was directed by procedure to protect the DH pumps from failure in the event the DH pumps had been operated at low flow for an extended period of time. The licensee dismissed this as a potential cause using "engineering judgement" based on the calculated flow rate necessary to exert a force sufficient to lift the grating. Using the same methodology for calculating the force from suction pit outflow, the licensee calculated that greater than 3,000,000 gpm would be required to lift the grating. However, independent calculations by the inspectors, using the licensee's methodology, found that only 138,000 gpm was required to lift the grating. Because of the significant difference between the two values, the inspectors questioned how the value of 3,000,000 gpm was calculated. The licensee stated the value was calculated by structural engineering and not by mechanical engineering. Structural engineering failed to recognize that flow varied as a function of the square root of the differential pressure and had performed an inappropriate extrapolation. Furthermore, structural engineering did not communicate this value to mechanical engineering for review. The licensee said the value was questioned by mechanical engineering after the operability resolution was issued, but no mechanism existed to amend the value.

The inspectors questioned the effect of steam/water impingement on the grating due to opening the DH drop line with the reactor at pressure. The inspectors reviewed the procedural guidance provided by the licensee. Prior to direction to open the DH drop line, actions were taken to reduce RCS temperature to less than 200°F. Furthermore, the DH drop line was required to be opened only if DH pump operation at low flowrate would exceed ten hours. Based on the procedural actions to reduce RCS temperature below 200°F and the extended time period before this action would be required, the inspectors concluded there was no potential for steam/water impingement on the grating.

The inspectors concluded that, while there was no immediate operability concern, the operability concern resolution process lacked adequate reviews to ensure that conservative operability determinations were made. Furthermore, the fact that plant management had accepted the resolution indicates that insufficient management attention was given to this particular resolution and a willingness by management to accept, without review, engineering evaluations that resulted in continued plant operation. The failure of the structural engineering group to communicate the value to the mechanical engineering group for review is another example of weak communications between plant organizations.

In summary, the inspectors identified two apparent violations and two weaknesses in the area of engineering support to operations. The failure of the engineering evaluation in response to PR 94-0014 to identify errors in Calculation 190-0024 with respect to the accuracy of

Curve 8 constituted inadequate corrective action. The failure to generate a new or revised official calculation for Curve 8 in March 1993, to support the revised operating procedure lowering BWSI switchover level to 5 ft. constituted inadequate design control including a lack of independent verification. The informal communications between engineering and operations regarding operator use of wake-up tank instruments and lack of such communications within operations indicated a weakness in intra and interdepartmental communications. Also, the incorrect calculation and lack of communications within the engineering department, with respect to an evaluation of an unsecured section of RS sump grating, indicated a weakness in the licensee's operability evaluation process.

4. Procedures

The inspectors reviewed the procedures that were in effect during the period June 1 to September 5, 1994. Particular emphasis was placed on the adequacy of guidance available to operators for the conduct of plant evolutions, responding to plant alarms, and determining when an evolution was covered by existing plant procedures.

AI-500, Conduct of Operations, revision 75, provided general guidance on operator responsibilities and procedure usage. AI-500 section 3.3.2.15 stated that operators were responsible for taking timely and proper actions to ensure safe operation of the plant. Furthermore, AI-500 section 4.3.2.2.4 stated that annunciator response procedures shall be used to diagnose alarms not directly related to intentional manipulation of plant controls and for any alarm the operators were not explicitly familiar with. No further guidance on timeliness in responding to alarms or implementing alarm response operator actions was provided in AI-500. AI-500 section 4.2.35.1 stated that it was the duty of every member of the Crystal River Unit 3 workforce to strictly adhere to written policies and to comply with procedures written for Crystal River Unit 3. However, AI-500 section 4.3.2.3.2.a stated that when the adequacy of existing procedures was questioned, shift supervision would make the determination as to which procedural requirements were applicable.

NOD-12, Implementation of Technical Specification, revision 3 provided a mechanistic process to determine when procedures were required for conducting activities covered by Technical Specification 5.6.1.1. This process did not provide guidance for determining when procedures were potentially inadequate or when an activity was not covered by existing procedures. Procedure NOD-12 was an upper-tier procedure and was implemented by AI-400A, Description and General Administration of Plant Procedures. Procedure AI-400A, revision 8, gave direction on the generation process for new procedures including any reviews that were required. However, no guidance on when new procedures should be generated was present.

Procedure AI-400E, Performance and Transmittal of Procedures, provided a checklist to assist in determining if a procedure constituted a test or infrequent evolution. However, this checklist only would be used if a new procedure had been generated and not to determine if an evolution being conducted using existing procedures was a test or an infrequent evolution. No guidance was present to assist in determining if an evolution being conducted was a test or infrequent evolution. Furthermore, the licensee did not define what activities constituted a test or experiment.

The inspectors discussed with the licensee the issues concerning when new procedures would be developed. The licensee said there was no specific guidance and it would have been the shift supervisors' judgement to determine if new or additional procedural guidance was required. The inspectors asked if the shift supervisors received any training that would assist them in making this determination. The licensee stated they relied on the shift supervisors' experience and licensed operator training.

Procedure AI-402B, Procedure Writing (Except for EOP/AP/VP), provided direction for the content and format of plant procedures. Specifically, the guidance for operating procedures stated that parameters that may jeopardize equipment safety if exceeded should be included in the limits and precautions section of the procedure. Procedure OP-103B Curve B was a limit established for the purpose of protecting the high pressure injection pumps from hydrogen gas intrusion. Contrary to the guidance of AI-402B, no reference to Curve B was present in the limits and precautions section of procedure OP-402, Makeup and Purification System, revision 7E. AI-402B did not provide guidance on use of plant curves referenced within procedures.

Procedure OP-402, revision 7E, gave instructions for normal operation of the makeup and purification system including MJT hydrogen gas addition and water level changes. This procedure was presented in a sectional format to allow for operator flexibility by implementing only the applicable section or sections. However, a precaution or limitation given in one section did not apply to other sections of the procedure. The only precautions and limitations that were applicable throughout the entire procedure were those given in the precautions and limitations section. The precaution or limitation for MJT pressure was presented only in the section for hydrogen gas addition. No further guidance for MJT pressure limit was given in procedure OP-402 including lowering and raising MJT water level.

Procedure AR-403, PSA H Annunciator Response, revision 21, provided guidance for operator response to a MJT high pressure alarm. The alarm was driven by a comparison of MJT level and pressure to a computer algorithm that approximated the MJT pressure limit (Curve B). The guidance for a valid alarm was to ensure MJV-141 and MJV-143 were closed and to reduce pressure within the MJT pressure limit (Curve B). No guidance for timeliness to initiate operator actions or the method for reducing MJT pressure was given.

Procedure OP-103B, Plant Operating Curves, provided the administrative operating limits for normal plant operations. This procedure did not provide guidance on normal plant operations or on the applicability of administrative operating limits. In fact, procedure OP-103B was used only to provide revision/control when administrative operating limits were revised.

Procedural guidance was not provided to assist the shift supervisor in determining when existing procedures were adequate or if new procedures were necessary. Furthermore, the inspectors concluded that procedure OP-402 did not provide sufficient emphasis on maintaining M/T pressure within the limits of procedure OP-103B Curve 8. Additionally, no specific guidance for timeliness of response to plant alarms was present.

The inspectors concluded that operating procedures, as written, were adequate for operations within the authorized region of Curve 8. All nine of the examples of apparent violation 95-22-01 involved hydrogen addition, for which procedures were clear in invoking Curve 8 limits. However, there were weaknesses in written directions to operators regarding applicability and use of procedures.

5. Training

The inspectors reviewed the licensed operator initial and requalification training programs to determine if adequate training existed.

The licensed operator requalification program was presented over a two-year period. However, not all procedures or systems were covered within that two-year period. The inspectors determined that the AI-400 series procedures were last covered in 1991 and the Makeup and Purification operating procedure was last covered in 1990. Procedure AI-500 was covered during the licensed operator requalification cycle prior to September 8, 1994.

The licensee supplemented the licensed operator requalification program with the licensed operator required reading program. This program was used to keep operators aware of procedural changes. Guidance for the licensed operator required reading program consisted of a process for developing the required reading list and processing of sign-off sheets. However, no formal direction on the intent of the required reading program was present. Furthermore, procedures that the operators used routinely were not always included as required reading.

Training on plant curves and administrative limits was presented during initial license training. Routine plant operations, such as M/T hydrogen addition or water level changes, were not specifically included during licensed operator requalification training. The licensee explained that covering routine plant operations was not considered an effective use of training resources because the operators were familiar with such operations. Requalification training instead emphasized using

the abnormal and emergency plant procedures to respond to plant transients. Evaluations of operator performance were conducted during observed real-time simulator training. The licensee was using NUREG 1021, Operator Licensing Examiner Standards, as the evaluative standard for acceptable operator performance. NUREG 1021 was used by NRC examiners to determine if an individual demonstrated sufficient knowledge and abilities to receive or maintain an operator's license. NUREG 1021 evaluated operator performance in a variety of areas including procedure use and adherence, alarm response, and compliance with administrative limits.

The inspectors concluded the licensed training program was adequate.

6. Employee Concern Program

The inspector reviewed the ECP to determine the adequacy of the program. The inspector reviewed NOD Manual Procedure MCD-36, Revision 5, dated 12/21/94 to determine the content and purpose of the program. The purpose of the program is to call attention to the CFR requirements which prohibit discrimination by FPC, its contractors, or sub-contractors against an employee for engaging in certain protected activities. This includes providing the NRC information about possible violations of requirements imposed by the Atomic Energy Act or the Energy Reorganization Act. It assures that employees have a process to express concerns or make suggestions without fear of retribution or discrimination. The program establishes a process for documenting, investigating, and resolving the concerns. Additionally, the program assures that exiting employees have an opportunity to identify concerns.

The program contains a confidentiality provision to protect the identity of the individual providing the concern. This protection is not absolute in that there are some circumstances under which the identity could be revealed. These include an order of the court, hearing board or similar legal entity. Also, an individual is considered to have waived the right to confidentiality if he/she acts in a manner reasonably expected to disclose his/her identity.

The program requires notification of the individual of the resolution of his/her concern. The program also allows the individual the right to appeal the resolution of the concern to the Director, Nuclear Operations Site Support for review of the concern and resolution to determine if further investigative action is necessary or desired.

The inspector discussed the program with the ECR and reviewed the records of the program including several concerns that were completed and others that were still active. This review indicated that in the past year, the program received 30 to 40 concerns. In 1995, the number had dropped to three to four concerns per year. The inspector discussed this decrease in activity with plant management and the ECR and concluded that the reason for this decrease was the implementation of the precursor card system. This system was implemented to allow the licensee to identify concerns prior to their rising to the level where a

problem report was required to be generated. The precursor cards are reviewed at the daily plan of the day meeting and are assigned to individuals for action. The cards are then tracked to closure. Both the licensee and the inspector concluded that this program was an enhancement of their corrective action program and that its widespread implementation should have reduced the number of employee concerns. The inspector concluded that the closed concerns had received proper attention and that the open concerns were still active with long term corrective actions in progress.

The inspector reviewed audits of the ECP conducted in December 1993 and July 1994. The audit results indicated that training of personnel on the ECP was effective. Seventy five percent of the individuals surveyed indicated the expected degree of familiarity with the program. Eighty percent of the individuals surveyed indicated an adequate understanding of management's expectation as to when an ECP form should be submitted. In general, the survey indicated that employees generally were pleased with the program and management's commitment to the program. The inspector randomly interviewed personnel while onsite and arrived at essentially the same conclusions as the audit reports.

7. Disposition of Apparent Violations Identified in NRC Inspection Report 50-302/95-13

The inspection documented in NRC IR 50-302/95-13 identified apparent violations involving the adequacy of design control and corrective actions.

Apparent violation 50-302/95-13-02, example 1, described in paragraph 3 of IR 50-302/95-13, involved the failure to translate the design basis to ensure proper operation of the Makeup and Purification System, such that the system is automatically switched from its normal operating mode to the emergency operating mode (High Pressure Injection) and is capable of delivering water from the BWST into the reactor vessel, as an apparent violation of 10 CFR 50, Appendix B, Criterion III. This apparent violation is administratively closed and incorporated into apparent violation 50-302/95-22-04, example 1.

Apparent violation 95-13-02, examples 2 and 3, described in paragraph 4 of IR 50-302/95-13, involved the failure to meet the requirements of 10 CFR 50, Appendix B, Criterion III and XVI for the interim curves and the curves issued in Revision 13 to RP-1038. This apparent violation is administratively closed and incorporated into apparent violation 50-302/95-22-03, example 2.

Apparent violation 95-13-03, example 1, described in paragraph 5 of IR 50-302/95-13, involved the manual swapper from the BWST to the RB sump at a level of five feet or less in the BWST, which is insufficient to assure that all of the ECCS pumps would not be damaged by vortexing. This is an apparent violation of 10 CFR 50, Appendix B, Criterion III, Design Control for inadequate design assumptions for borated water

storage tank swapover level. This apparent violation is administratively closed and incorporated into apparent violation 50-302/95-22-04, example 2.

Apparent violation 95-13-02, example 2, described in paragraph 6 of IR 50-302/95-13, involved the failure to implement timely corrective action to review potential significant conditions adverse to quality involving safety related tanks, including the BMST and FST, which is a violation of the requirements of 10 CFR 50, Appendix B, Criterion XVI. This apparent violation is administratively closed and incorporated into apparent violation 50-302/95-22-03, example 3.

Apparent violation 95-13-03, example 3, described in paragraph 6 of IR 50-302/95-13, involved the failure to translate the design basis requirements of the FST into operating procedures which is a violation of 10 CFR 50, Appendix B, Criterion III. This apparent violation is administratively closed and incorporated into apparent violation 50-302/95-22-04, example 4.

Apparent violation, 95-13-04, described in paragraph 7 of IR 50-302/95-13, involved inadequate design control to ensure adequate inventory in the RB sump to provide adequate NPSH to a LPI pump, with the HPI pump suction cross-tie valve open, supplying two operating HPI pumps. This lineup could result in the loss of the only operable LPI pump. This was identified as an apparent violation of 10 CFR 50, Appendix B, Criterion III, Design Control. This apparent violation is administratively closed and incorporated into apparent violation 50-302/95-22-04, example 3.

B. Exit Interview

The inspection scope and findings were summarized on December 15, 1995, with those persons indicated in paragraph 1. The inspectors described the areas inspected and discussed in detail the inspection results listed below. Proprietary information is not contained in this report.

<u>Type</u>	<u>Item Number</u>	<u>Status</u>	<u>Description and Reference</u>
EEI	95-22-01	Open	Nine examples of operation of the makeup tank outside of acceptable operating region. (paragraph 2.1)
EEI	95-22-02	Open	Two examples of unauthorized tests / experiments during which the plant was operated in a nonconservative manner outside the acceptable operating region without a safety evaluation. (paragraph 2.1)

EEI	95-22-03	Open	Three examples of inadequate corrective action concerning inadequate revision to curve 8, inadequate reviews, inadequate tank volumes. (paragraph 3.1)
EEI	95-22-04	Open	Four examples of inadequate design control concerning Curve 8, various setpoints, and tank volumes. (paragraph 3.1)
EEI	95-13-01	Closed	Item closed by incorporating the example into 95-22-02.
EEI	95-13-02	Closed	Item closed by incorporating the examples into 95-22-03 and 04.
EEI	95-13-03	Closed	Item closed by incorporating the examples into 95-22-03 and 04.
EEI	95-13-04	Closed	Item closed by incorporating the example into 95-22-04.

8. Acronyms and Initialisms

BWST	Borated Water Storage Tank
DH	Decay Heat
ECOS	Emergency Core Cooling System
ECP	Employee Concern Program
ECR	Employee Concern Representative
EFW	Emergency Feedwater
EOP	Emergency Operating Procedure
FPC	Florida Power Corporation
FSAR	Final Safety Analysis Report
HPI	High Pressure Injection
LOCA	Loss Of Coolant Accident
MAR	Modification Action Request
MUP	Make Up Pump
MUT	Make Up Tank
NOD	Nuclear Operations Department
NPSH	Net Positive Suction Head
PR	Problem Report
RB	Reactor Building
RCBT	Reactor Coolant Bleed Tank
RCS	Reactor Coolant System
REA	Request for Engineering Assistance
RO	Reactor Operator
SRO	Senior Reactor Operator

CURVE 8A, 8B & 8C OPERATIONAL CRITERIA

The DESIGN LIMIT curve is based on Engineering Calculation M94-0053, Rev. 2.

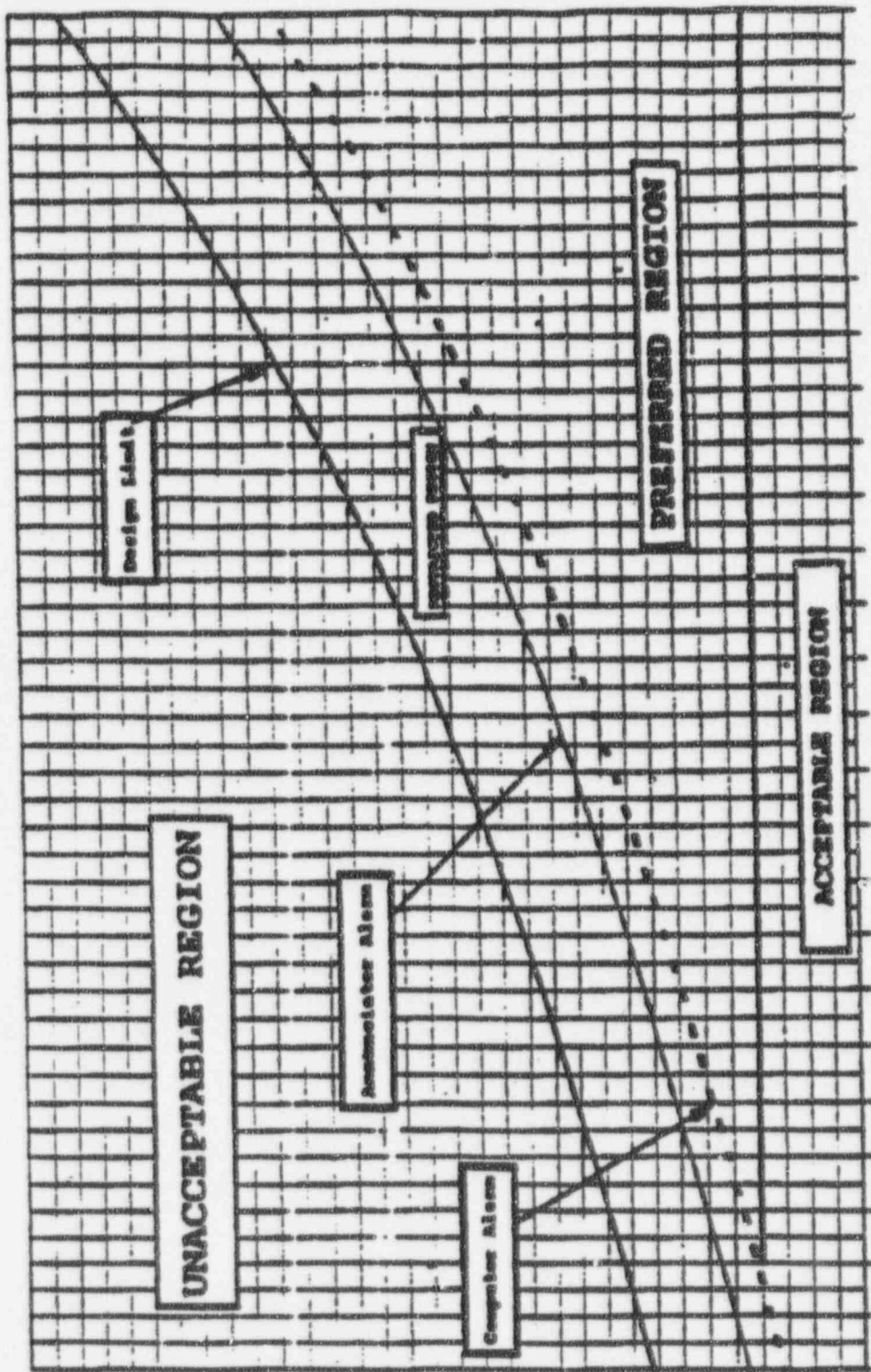
- o The DESIGN LIMIT curve is based on instrument error for pressure and level as read from MU-14-LTRI.
- o The UNACCEPTABLE REGION is on or above the DESIGN LIMIT curve. Operation in the UNACCEPTABLE REGION shall require an evaluation in accordance with CP-111 'Initiation and Processing of Precursor Cards and Problem Reports'.
- o The ANNUNCIATOR ALARM is a variable alarm based on a Pressure/Volume relationship for the makeup tank and initiates at 3 psi below the design limit curve at a level of 55 inches.
- o The COMPUTER ALARM is a variable alarm based on a Pressure/Volume relationship for the makeup tank and initiates at 4 psi below the design limit curve at a level of 55 inches.
- o The ACCEPTABLE REGION is below the ANNUNCIATOR ALARM above '0' psig and encompasses the PREFERRED REGION. It is bounded by the Low and High Level alarms (55" & 100") respectively. The COMPUTER ALARM is provided to alert the operator that the makeup tank pressure is approaching the annunciator alarm. Exceeding the computer alarm does not require any immediate action.

Exceeding the ANNUNCIATOR ALARM will require operator action in accordance with the appropriate Annunciator Response Procedure. This area is considered a RESTRICTED REGION.

- o The PREFERRED REGION is an area below and to the right of the COMPUTER ALARM and equal to or greater than 16 psig. This region should provide adequate hydrogen concentration (≥ 25 cc/kg) in the RCS if makeup tank pressures are consistently maintained in this area.
- o Operation outside the PREFERRED REGION is acceptable during plant maneuvering; however, under steady state conditions, efforts should be made to operate in the PREFERRED REGION.
- o Makeup Tank Pressure should be maintained above '0' psig during normal operating conditions, and during venting evolutions. This will prevent damage to the MUT during a draw-down from a design basis accident.
- o Exceeding the MUT HIGH and LOW LEVEL alarm setpoints (100", 55") will require action in accordance with the appropriate Alarm Response procedure(s). These areas are RESTRICTED REGIONS.

MAX. MUT OPERATING PRESSURE vs LEVEL

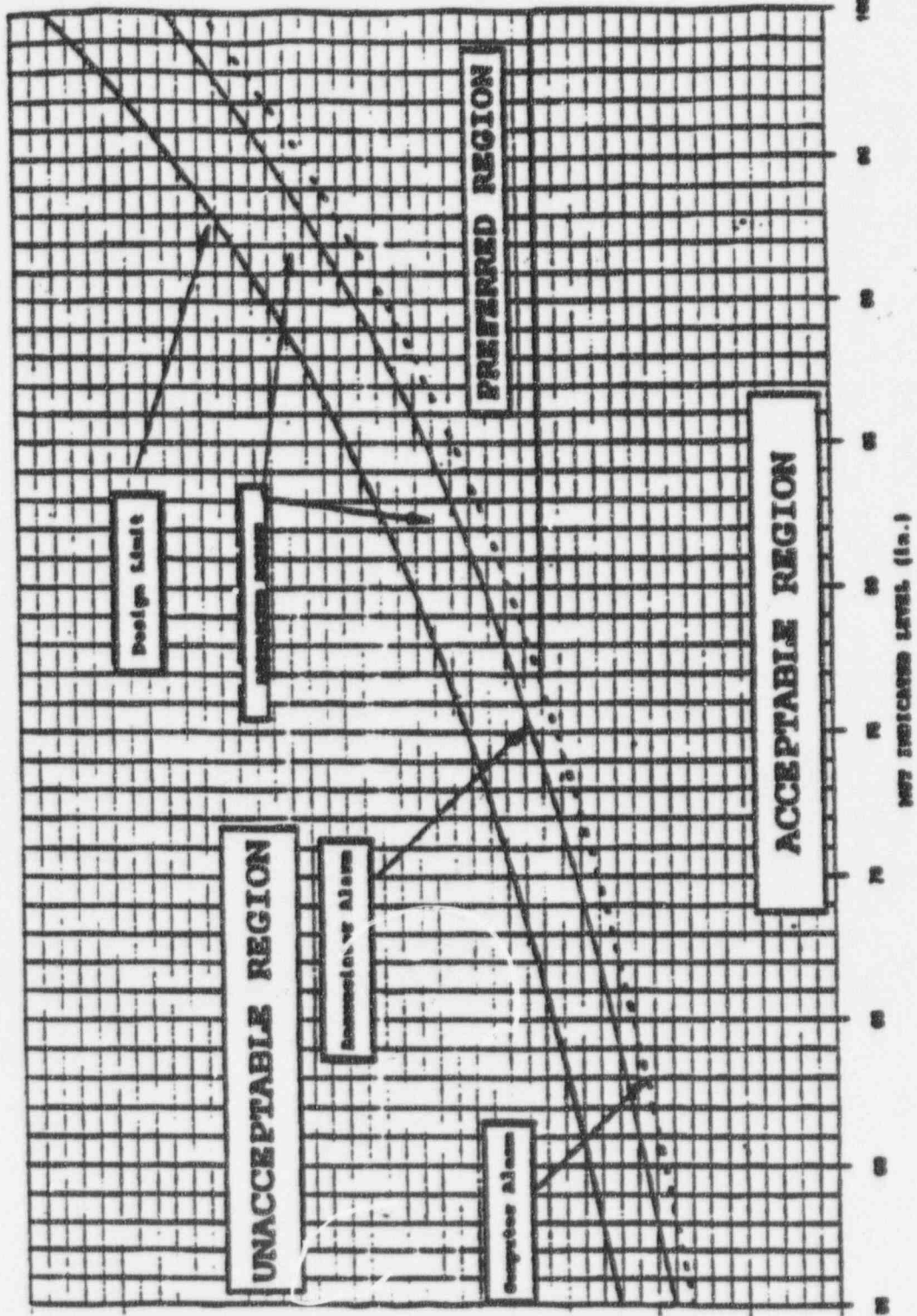
Preferred Range



NOT INDICATED LEVEL (in.)

1000

MAX. MUT OPERATING PRESSURE VS LEVEL
Operating Range



MAX. MUT OPERATING PRESSURE VS LEVEL Wide Range

