



Florida Power & Light Company, P.O. Box 14000, Juno Beach, FL 33408-0420

APR 23 1996

L-96-93

10 CFR 2.201

Mr. James Lieberman
Director, Office of Enforcement
U. S. Nuclear Regulatory Commission
Attn: Document Control Desk
Washington, D. C. 20555

Dear Sir:

Re: St. Lucie Unit 1
Docket No. 50-335
Inspection Report 96-03
Reply to Notice of Violation EA 96-040

Florida Power and Light Company (FPL) has reviewed the subject notice of violation. Pursuant to the provisions of 10 CFR 2.201 and Section 182 of the Atomic Energy Act of 1954, as amended, the reply to the notice of violation is attached. FPL will remit payment of the civil penalty by electronic transfer on or before April 27, 1996.

Very truly yours,

A handwritten signature in cursive script, appearing to read 'T. F. Plunkett'.

T. F. Plunkett
President - Nuclear Division

TFP/EJB

Attachment

cc: Stewart D. Ebnetter, Regional Administrator, USNRC Region II
Senior Resident Inspector, USNRC, St. Lucie Plant

000114

J.P. BRANNEN
C. WASK
S. D. GER

W.R. CORCORAN
C.J. BUSHRO
M. REIS

L.W. BLADOW
G.M. NADDEN
L.D. LEON

VAUT
M.A. SCHOFFMAN

an FPL Group company

9704140084 970404
PDR FOIA
BINDER96-485 PDR

Re: St. Lucie Unit 1
Docket No. 50-335
Reply to Notice of Violation
Inspection Report 96-03

STATE OF FLORIDA)
)
COUNTY OF PALM BEACH) ss.

T. F. Plunkett being first duly sworn, deposes and says:

That he is President, Nuclear Division of Florida Power & Light Company, the Licensee herein;

That he has executed the foregoing document; that the statements made in this document are true and correct to the best of his knowledge, information and belief, and that he is authorized to execute the document on behalf of said Licensee.

T. F. Plunkett

T. F. Plunkett

Subscribed and sworn to before me this

23 day of April, 1996.

Roberta S. Economy

ROBERTA S. ECONOMY

NOTARY PUBLIC, in and for the County of
Palm Beach, State of Florida

My Commission expires _____



ROBERTA S. ECONOMY
MY COMMISSION / CC283823 EXPIRES
June 1, 1997
BONDED THROUGH TROY PAUL DELMONTE, INC.

St. Lucie Unit 1
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VIOLATION A:

Technical Specification 6.8.1.a requires that written procedures be established, implemented and maintained covering the activities recommended in Appendix A of Regulatory Guide 1.33, Revision 2, February 1978. Appendix A includes operating procedures for the chemical and volume control system and administrative procedures for relief turnover, procedural adherence, and authorities and responsibilities for safe operation.

Operating Procedure No. 1-0250020, Boron Concentration Control - Normal Control, Revision 35, step 8.5.14, requires, in part, that when adding a blend of primary makeup water and boric acid to the reactor coolant system by using the manual mode of operation and a flow path directly to the charging pump suction, that operators monitor the water flow totalizer and close valve V2525 after the desired volume was added.

Administrative Procedure No. 0010120, Conduct of Operations, Revision 79, Appendix D, Crew Relief/Shift Turnover, requires, in part, that, for short term watchstander relief, a turnover be conducted including: general watchstation status, off-normal conditions, and tests in progress.

Administrative Procedure No. 0010120, Appendix M, Procedural Compliance and Implementation, requires, in part, that controlled procedures be implemented and complied with in accordance with the instructions provided in QI 5-PR/PSL-1. Procedure QI 5-PR/PSL-1, Preparation, Revision, Review/Approval of Procedures, Revision 67, Section 5.13.2, provides that all procedures be strictly adhered to and identified that Operating Procedure 1-0250020 was not considered "skill of the trade" and was not to be performed from memory without referring to the procedure.

Administrative Procedure No. 0010120, Appendix E, Notification of Operations Supervisor/FPL Management, requires, in part, prompt verbal notification of the Operations Supervisor for unplanned reactivity changes.

Contrary to the above:

1. On January 22, 1996, at approximately 2:30 a.m., the licensee failed to implement the requirements of Operating Procedure No. 1-0250020 in that Unit 1 operators failed to monitor the water flow totalizer and failed to close valve

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additions of primary water were made to maintain 100 percent power. (Reference FPL letter L-96-61, dated March 6, 1996)

Contributing factors to the violation include the following:

- 1) Cognitive personnel error on the part of the licensed utility operator who initiated the reactor coolant system (RCS) dilution resulted in the failure to properly complete the evolution. The operator initiated the RCS dilution and then left the immediate area after responding to an unrelated control board annunciator.
- 2) The administrative requirements of the Conduct of Operations Procedure regarding watchstander relief, procedure use and management notification were not fully understood or consistently applied by operations personnel.
- 3) St. Lucie Plant's Operating Experience Feedback program did not adequately respond to similar reactivity management events at other facilities. As a result, FPL did not identify routine dilutions as an evolution which required special attention.

3. CORRECTIVE STEPS TAKEN AND THE RESULTS ACHIEVED

- A. The RCS dilution was secured and RCS temperature and reactor power were restored to within the required limits of 549 degrees Fahrenheit and 100 percent, respectively (within approximately 50 minutes), upon discovery of the condition on January 22, 1996.
- B. The Operations Department Supervisor was informed of the event at approximately 0545 on January 22, 1996.

4. CORRECTIVE STEPS TO AVOID FURTHER VIOLATIONS

- A. The operator who performed the subject boron dilution was removed from licensed operator duties.
- B. FPL completed a performance assessment for the licensed operator involved in this event and developed a remedial training plan to be successfully completed prior to returning the individual to licensed duties.

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- C. The Operations Supervisor discussed with each Nuclear Plant Supervisor (NPS) the purpose and threshold for providing notification to plant management in accordance with the requirements of the Conduct of Operations Procedure, AP 0010120.
- D. Operations Administrative Procedure, AP 0010120, Conduct of Operations, was revised to provide clearer standards regarding operator attentiveness, watchstation turnover, control room oversight and procedure adherence. These changes include the following:
1. Additional watchstander relief requirements were added to specifically address short term watchstander relief during reactivity changes.
 2. Supervisory presence by the licensed Senior Reactor Operator with the control room command function is now required during reactivity changes.
 3. Additional guidance was included which specifies that the Reactor Control Operator (RCO) is to remain in the immediate vicinity of the control board during all reactivity changes.
 4. The acceptable methodology for procedure adherence during boration or dilution activities was specified.
- E. Reactor operating guidelines were revised to establish normal operation with a reduced Reactor Coolant System cold leg temperature (T-cold) in order to increase the operating margin between the 100 percent T-cold value and the Technical Specification limit.
- F. Management conducted crew briefings with each operating crew to emphasize conservative plant operation and review Institute of Nuclear Plant Operations (INPO) recommendations regarding reactivity management.
- G. Plant management issued a letter to each licensed operator to re-emphasize personal responsibility for reactor safety and to stress the importance of reactivity control and constant attention to detail.

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- H. FPL Quality Assurance is performing an evaluation of the adequacy and effectiveness of the St. Lucie Plant program for transferring lessons learned from industry events. This evaluation will be completed and recommendations forwarded to St. Lucie management by April 30, 1996.
5. Full compliance was achieved on January 22, 1996 with the completion of items 3A and 3B above.

VIOLATION B:

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 specified in the license application, are correctly translated into procedures.

Units 1 and 2 Technical Specifications (TS) 6.8.2 requires that each procedure of TS 6.8.1 be reviewed periodically as set forth in administrative procedures. TS 6.8.1 requires that written procedures be maintained covering the activities recommended in Appendix A of Regulatory Guide 1.33, Revision 2, February 1978. Appendix A included operating procedures for the chemical and volume control system. Procedure QI 5-PR/PSL-1; Preparation, Revision, Review/Approval of Procedures, Rev 61; required that all plant procedures shall be reviewed every 36 months.

Section 15.2.4.1 of the Updated Final Safety Analysis Report (UFSAR) states, in part, that during normal operation, concentrated boric acid is mixed with demineralized makeup water... and is automatically introduced into the volume control tank in response to a low water level signal from the volume control. To effect boron dilution, the makeup controller mode selector switch must be set to "Dilute" and the demineralizer water batch quantity set to the desired quantity. When the specific amount has been injected, the demineralizer water control valve is shut off automatically.

Contrary to the above, from approximately January 24, 1976 (before the Unit 1 operating license was issued), through January 23, 1996, the licensee failed to correctly translate the design basis, as specified in UFSAR Section 15.2.4.1, into procedures in that the UFSAR description of the method for adding a mixture of boric acid and demineralized water to the reactor coolant system was not incorporated into the Operating Procedure No. 1-0250020, Boron Concentration Control - Normal Control, Revision 35, for

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St. Lucie Unit 1. Specifically, Operating Procedure No. 1-0250020 described a method for adding a mixture of boric acid and demineralized water to the reactor coolant system (in manual and directly to the suction of the charging pumps) that was different from the method stated in the UPSAR (in automatic and to the volume control tank). Further, the licensee failed to conduct an adequate periodic review of Operating Procedure No. 1-0250020 as required by TS 6.8.2. Specifically, during periodic reviews, the last of which was accomplished on July 11, 1995, the licensee failed to correct the difference between the procedure and the UPSAR. (01023)

RESPONSE B:

1. FPL concurs with the violation.

2. REASON FOR VIOLATION

The root cause for the violation was that an inadequate process existed for ensuring that UPSAR design requirements were translated into plant procedures during procedure development and periodic review.

3. CORRECTIVE STEPS TAKEN AND THE RESULTS ACHIEVED

In accordance with 10 CFR 50.59, a safety evaluation was completed which reviewed St. Lucie Unit 1 and 2 UPSAR requirements regarding boron concentration control. The evaluation provided changes to be included into the Unit 1 and Unit 2 UPSARs which more clearly describe the acceptable methods available for boron concentration control. The boron concentration control operating procedures (1-0250020 and 2-0250020) are consistent with these methods. Additionally, the evaluation determined that operation of the Chemical Volume and Control Systems (CVCS) in accordance with these changes does not constitute an unreviewed safety question and is supported by the UPSAR accident analysis. This action was completed on February 15, 1996.

4. CORRECTIVE STEPS TO AVOID FURTHER VIOLATIONS

- A. The process for the development and periodic review of plant procedures was changed to improve referencing of applicable UPSAR and Technical Specification (TS) sections in the procedures. Documentation of UPSAR and TS sections reviewed has been included in the process.

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- B. A change was issued to update the Unit 1 and Unit 2 UFSARs to clarify acceptable operation of the Chemical and Volume Control System with regard to boron concentration changes.
 - C. FPL is reviewing the Unit 1 and Unit 2 UFSARs and plant procedures for mutual consistency. This review will be completed by December 31, 1996.
5. Full compliance was achieved on February 15, 1996, with the completion of item 3 above.

VIOLATION C:

10 CFR 50.59 allows the licensee to make changes to its procedures as described in the Safety Analysis report (SAR), without prior Commission approval, unless the change involves, in part, an unreviewed safety question. The licensee shall maintain records of changes in procedures made pursuant to this section, to the extent that they constitute changes in procedures as described in the SAR. These records must include a written safety evaluation which provides a basis for the determination that the change does not involve an unreviewed safety question.

Contrary to the above, on January 23, 1996, the licensee made Temporary Change 1-96-017 to Operating procedure 1-0250020, Boron Concentration Control - Normal Operation, Revision 35, a procedure described in the UFSAR, and failed to include a written safety evaluation which provided a basis for the determination that the change did not involve an unreviewed safety question. Specifically, the licensee added instructions for dilution in manual and directly to the suction of the charging pumps which is contrary to the UFSAR, paragraph 15.2.4.1, which states that boron dilution must be conducted in the "Dilute" mode (such that when the specific amount has been injected, the demineralized water control valve is shut automatically) and described a flowpath into the volume control tank. (01033)

RESPONSE C:

- 1. FPL concurs with the violation.
- 2. REASON FOR VIOLATION

The root cause of the violation was cognitive personnel error by the shift technical advisor (STA) who performed the

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10 CFR 50.59 screening review for the temporary change to procedure 1-0250020, Boron Concentration Control - Normal Operation. The review by the STA determined that the temporary change did not represent a change to a procedure as described in the UFSAR, and therefore that a safety evaluation was not required.

A contributing factor to the violation was a weakness in the process for performing 10 CFR 50.59 screening evaluations. The process did not require that the applicable UFSAR sections reviewed during the screening be documented.

3. CORRECTIVE STEPS TAKEN AND THE RESULTS ACHIEVED

In accordance with 10 CFR 50.59, a safety evaluation was completed which reviewed St. Lucie Unit 1 and 2 UFSAR requirements regarding boron concentration control. The evaluation provided changes to be included into the Unit 1 and Unit 2 UFSAR periodic updates which more clearly describe the acceptable methods available for boron concentration control. The boron concentration control operating procedures (1-0250020 and 2-0250020) are consistent with these methods. Additionally, the evaluation determined that operation of the Chemical Volume and Control Systems (CVCS) in accordance with these changes does not constitute an unreviewed safety question and is supported by the accident analysis. This action was completed on February 15, 1996.

4. CORRECTIVE STEPS TO AVOID FURTHER VIOLATIONS

- A. Additional STA training was conducted to address and clarify the requirements associated with screening procedure changes for 10 CFR 50.59 applicability.
 - B. As discussed under the corrective actions for violation B, the process for procedure development and periodic review was revised to improve referencing of applicable UFSAR and TS sections in the plant procedures.
 - C. The process for performing 10 CFR 50.59 screening relative to procedure changes was revised to require documentation of the UFSAR and Technical Specification sections reviewed during the screening process.
5. Full compliance was achieved on February 15, 1996 with the completion of item 3 above.



UNITED STATES
NUCLEAR REGULATORY COMMISSION
REGION II
101 MARIETTA STREET, N.W., SUITE 2800
ATLANTA, GEORGIA 30323-0196

February 22, 1996

EA 96-040

Florida Power & Light Company
ATTN: J. Goldberg
President - Nuclear Division
P. O. Box 14000
Juno Beach, Florida 33408-0420

SUBJECT: NRC INSPECTION REPORT NOS. 50-335/96-03 AND 50-389/96-03

Dear Mr. Goldberg:

This refers to the special followup inspection of the January 22, 1996, Unit 1 overdilution event. The inspection was conducted on January 26-30, 1996, at the St. Lucie facility. This matter was again discussed on February 8, 1996, in a meeting in Atlanta. The purpose of the inspection was to determine whether activities authorized by the license were conducted safely and in accordance with NRC requirements. At the conclusion of the inspection, the findings were discussed with you and 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 consisted of selective examinations of procedures and representative records, interviews with personnel, and observation of activities in progress.

Based on the results of this inspection, three 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. The first apparent violation involves operator failures to follow procedures for reactor coolant system boron dilution, watch turnover, adherence to procedures, and prompt reporting of events. As a result of these errors, operators exceeded 100% reactor power on January 22, 1996. The second apparent violation involves inadequate design control in that the procedure for adding a mixture of demineralized water and boric acid to the reactor coolant system did not implement the method stated in the Final Safety Analysis Report (FSAR), and had not done so since January 1976. The third apparent violation involves a change that was made to the Unit 1 procedure for reactor coolant system boron dilution on January 23, 1996, that differed from the method stated in the FSAR, without performing a required safety evaluation.

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 has been scheduled for March 8, 1996. Also, you have been requested to bring

ENCLOSURE 1

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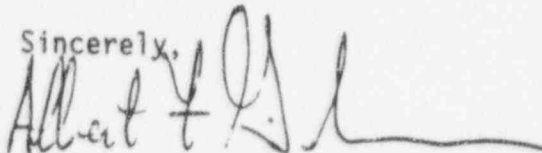
the three licensed operators who were involved in the overdilution event to the enforcement conference. The decision to hold a predecisional enforcement conference does not mean that the NRC has determined that a violation has occurred or that enforcement action will be taken. This conference is being held to obtain information to enable the NRC to make an enforcement decision, such as a common understanding of the facts, root causes, missed opportunities to identify the apparent violations sooner, corrective actions, significance of the issues, and the need for lasting and effective corrective action. In addition, this is an opportunity for you to point out any errors in our inspection report and 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.

You will be advised by separate correspondence of the results of our deliberations on this matter. No response regarding 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 enclosure 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 Nos. 50-335, 50-389
License Nos. DPR-67, NPF-16

Enclosures: 1. Inspection Report
2. Enforcement Policy:
Section V, "Predecisional
Enforcement Conferences"

cc w/encls:
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Vice President
St. Lucie Nuclear Plant
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Ft. Pierce, FL 34954-0128

cc w/encls cont'd: See page 3

cc w/encls cont'd:
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Juno Beach, FL 33408-0420

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cc w/encls cont'd: See page 4

FPL

4

cc w/encls cont'd:
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Charles B. Brinkman
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UNITED STATES
NUCLEAR REGULATORY COMMISSION
REGION II
101 MARIETTA STREET, N.W., SUITE 2800
ATLANTA, GEORGIA 30323-0198

Report Nos.: 50-335/96-03 and 50-389/96-03

Licensee: Florida Power & Light Co
9250 West Flagler Street
Miami, FL 33102

Docket Nos.: 50-335 and 50-389

License Nos.: DPR-67 and NPF-16

Facility Name: St. Lucie 1 and 2

Inspection Conducted: January 26-30, 1996

Lead Inspector:

R. Schin
R. Schin
Reactor Inspector

2/22/96
Date Signed

Accompanying Inspectors: B. Desai, Resident Inspector, Turkey Point
M. Miller, Senior Resident Inspector, St. Lucie
S. Sandin, Senior Operations Officer, AEOD

Approved by:

C. Casto
C. Casto, Chief
Engineering Branch
Division of Reactor Safety

2/24/96
Date Signed

SUMMARY

Scope:

This special inspection was conducted on site to review the Unit 1 overdilution event of January 22, 1996.

Inspections were performed during normal and backshift hours and on a weekend.

Results:

The inspectors identified concerns with licensee control of licensed activities and with licensed operator attentiveness. Three related apparent violations were identified:

a. Operators failed to follow procedures, with four examples:

- 1) Operators failed to stop dilution of the reactor coolant system when the proper amount of demineralized water had been added.

- 2) There was inadequate watch turnover for the operator at the controls during dilution.
- 3) Operators performed the boron dilution procedure from memory, without referring to the procedure, and without strictly adhering to the procedure.
- 4) Operators failed to promptly verbally report the event to licensee management.

As a result of these errors, operators exceeded 100% reactor power. This event was bounded by the FSAR Chapter 15 accident analysis.

- b. Design control was inadequate, in that Unit 1 procedures for adding a mixture of demineralized water and boric acid to the reactor coolant system (in manual and directly to the suction of the charging pumps) did not implement the method stated in the Final Safety Analysis Report (FSAR), Chapter 15 (in automatic and to the volume control tank), and had not done so since January 1976, before Unit 1 was licensed.
- c. A 10 CFR 50.59 evaluation was inadequate, in that the licensee made a change to the Unit 1 boron dilution procedure on January 23, 1996 (after the event), to allow adding demineralized water in "Manual" and directly to the suction of the charging pumps, that was different from the method stated in the FSAR, Chapter 15 (in "Dilute" and to the volume control tank) and without preparing a 10 CFR 50.59 safety evaluation.

In addition, a weakness in control room command and control was identified, with the following examples:

- a. The senior reactor operator (SRO) in the control room was not aware of the boron dilution in progress.
- b. The board operator did not inform the SRO of the boron dilution - this was a general practice at the site and not required by procedures.
- c. The watchstander board in the Unit 1 control room was not maintained (on Saturday, January 27).
- d. The SRO in the control room was allowed by procedures to be in the Assistant Nuclear Plant Supervisor's (ANPS) office for unlimited time, out of sight of control room activities and out of hearing range of almost all control room activities except annunciator alarms. (During this event, the control room SRO was at the control room desk operator's area and in sight of control room activities.)

Also, a weakness in procedures was identified, with the following examples:

- a. The procedure change process failed to address deficiencies in the Unit 1 procedure at the time the Unit 2 procedure was changed. During the

event, manual boron dilution as performed by operators could not be accomplished by strict compliance with the Unit 1 procedure.

- b. Procedures did not require the operator at the controls to remain by the dilution controls during a manual boron dilution.

There was also an identified weakness in corrective action, with the following examples:

- a. The licensee's initial investigation of the event was not thorough. Specifically, the initial investigation concluded that maximum reactor power was 100.2%, but subsequent review by the NRC and licensee found that maximum reactor power was approximately 101.18%. The licensee's initial investigation also did not identify that the reactor operator who started the boron dilution had left the control room with the dilution in progress and without telling other operators that a dilution was in progress.
- b. The revised procedure for manual boron dilution (after the event) did not require the operator at the controls to remain by the dilution controls during a manual boron dilution.

Further, there was an identified weakness in operating experience feedback:

- a. In response to Significant Operating Events Report 94-02, dated September 1994, which described a similar Turkey Point overdilution event, the licensee reviewed the St. Lucie operating procedures related to boron dilution and concluded that no changes were needed. This was a missed opportunity to strengthen operating procedures to prevent the January 22, 1996, overdilution event.

The inspectors also had the following comments:

- a. There was no clearly noticeable indication of boron dilution in progress. The dilution clicker was quiet (and possibly inaudible from the desk area) and sounded identical to other nearby clickers that routinely made noise.
- b. No alarms came in during this event to alert the operators that reactor coolant system cold leg temperature (Tc) and reactor power had exceeded allowable values. The licensee had raised the Tc alarm setpoint so that it no longer served to alert operators that they had entered a Technical Specification two-hour action statement. Also, control room operators did not have complete information available about the Digital Data Processing System computer alarms.
- c. Operators routinely did not log reactivity additions; however, the licensee's Conduct of Operations procedure stated that operators should log significant reactivity changes.

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REPORT DETAILS

NOTE: Acronyms used in this report are defined in paragraph 12.

1. Persons Contacted

Licensee Employees

- * Bladow, W., Site Quality Manager
- # Bohlke, W., St. Lucie Plant Vice President
- * Burton, C., Site Services Manager
- * Dawson, R., Licensing Manager
- * Denver, D., Site Engineering Manager
- * Fincher, P., Training Manager
- * Fulford, P., Operations Support and Testing Supervisor
- * Marchese, J., Maintenance Manager
- * Olson, R., Instrument and Control Maintenance Supervisor
- # Plunkett, T., incoming President - Nuclear Division
- * Sager, D., St. Lucie Plant Vice President
- *# Scarola, J., St. Lucie Plant General Manager
- *# Weinkam, E., Licensing Manager
- * West, J., Operations Manager
- * Wood, C., Operations Supervisor

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

NRC Personnel

- # C. Casto, Branch Chief, Division of Reactor Safety, RII
- * B. Desai, Resident Inspector, Turkey Point
- # K. Landis, Branch Chief, Division of Reactor Projects, RII
- * M. Miller, Senior Resident Inspector, St. Lucie
- * R. Musser, Resident Inspector, Browns Ferry
- * S. Sandin, Senior Operations Officer, AEOD
- *# R. Schin, Reactor Inspector

* Attended exit interview on January 30, 1996.

Attended exit interview on February 8, 1996.

2. General Description of the Overdilution Event (92700)

At approximately 2:25 a.m. on January 22, 1996, the Unit 1 control board RCO began a manual boron dilution of the RCS by aligning primary makeup water (demineralized water) directly to the suction of the 1B Charging Pump. Moments after beginning the dilution, the Board RCO responded to a secondary plant annunciator and then saw the Desk RCO return from the kitchen. He requested that the Desk RCO relieve him so that he could prepare his meal. During the turnover, there was no discussion of the dilution in progress. Following the turnover, the relief operator at the controls and the NPS, who was at the Desk RCO station, were not aware that a dilution was in progress. The original Board RCO returned between 5-10 minutes later and immediately recognized his error. He informed the

other RCO of the overdilution, which was overheard by the NPS, and stopped the dilution. The NPS directed the ANPS to take charge and begin a manual boration. Unit 1 entered two-hour TS LCO Action Statement 3.2.5 for Tc greater than 549°F. The maximum Tc obtained was 549.9°F and the maximum reactor power was 101.18%. Tc was above the TS limit of 549°F for approximately 50 minutes and reactor power was above 100% for approximately 70 minutes. The operators did not promptly verbally notify plant management or the NRC of this event. During this event, the TS LCO Action Statement for Tc was not exceeded and the guidance of the NRC memorandum from E. L. Jordan of August 22, 1980, on maximum reactor power was not exceeded. Also, this event was bounded by the FSAR Chapter 15 accident analysis.

3. Detailed Sequence of Events (92700)

See Attachment 1 for the Unit 1 control room arrangement and locations of operators. Also, note that the times in the sequence of events are approximations and only relevant events are mentioned.

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11:00 p.m. Incoming mid shift assumed Unit 1 responsibility with the Unit at 100% power, 870 MWe, Tavg at 575 degrees F, Th at 600 degrees F, Tc at 548.9 degrees F, RCS Boron concentration at 376 ppm, Xe worth at -2722 pcm, all CEAs fully withdrawn and in manual, and no Technical Specification action statements in effect. Major evolution planned for the shift was to place the waste gas system in service. Further, there was an annunciator alarm E-9 associated with circulating water pump lube water supply strainer delta P high that was intermittently coming in due to a failed pressure switch.

11:45 p.m. Board RCO reset to zero the primary water (to VCT or charging pump) flow totalizer in preparation for inventory balance (RCS leak rate calculation).

11:00 p.m.-
2:00 a.m. Board RCO recalled performing at least two RCS boron dilutions of approximately 35 gallons each between 11:00 p.m. and 2:20 a.m. without resetting the totalizer.

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2:00 a.m. NPS arrived in Unit 1 control room to gather data for morning report meeting and sat near desk behind control boards. STA was also present, near NPS.

2:10 a.m. ANPS turned over control room senior reactor operator responsibility to NPS and proceeded to the kitchen to prepare meal.

- 2:15 a.m. Desk RCO left the control room to go to the kitchen.
- 2:20 a.m. Normal continued fuel burnup resulted in indicated Tc of 548.7 degrees F on RTGB-104 (digital meter). At this point, the Board RCO decided to restore Tc to maximum allowable program value of 549.0 degrees F.
- 2:23 a.m. Desk RCO arrived in the control room with his meal.
- 2:25 a.m. Board RCO began a manual dilution by aligning primary water to the suction of the charging pumps, by opening FCV-2210X and AOV-2525. The flow rate was approximately 44 gpm.
- 2:26 a.m. Annunciator E-9 associated with circulating water pump lube water supply strainer high delta P was received. The Board RCO walked to the panel and acknowledged the annunciator.
- 2:27 a.m. After acknowledging the annunciator, the Board RCO decided to proceed to the kitchen to prepare his meal. The Board RCO conveyed this to the Desk RCO and requested that he take over the 'operator at the controls' responsibilities. However, he did not mention the ongoing dilution. The Desk RCO got up and proceeded to the board in the vicinity of RTGB 103. The original Board RCO proceeded to the kitchen and started preparing his meal. At this time, the NPS and the STA were in the control room at the desk area. The NWE had been in and out of the control room throughout the shift. The relief operator at the controls, NPS, STA, and NWE were not aware of the ongoing dilution.
- 2:35 a.m. The original Board RCO returned from the kitchen with his meal. Upon approaching the board, he realized that he had left the control room with an ongoing manual dilution. He exclaimed that he had overdiluted and immediately began securing the dilution. The Desk RCO questioned how much water was added and the Board RCO noted from the totalizer that approximately 400 gallons was added.
- 2:35 a.m. Soon after, annunciator M-16 associated with RCP controlled bleedoff pressure high was received. At this point, the Tc was noted by the Desk RCO to be 549.6 degrees F. Entry into the two-hour action statement associated with TS 3.2.5, DNB parameters, was recognized and later logged.
- 2:36 a.m. Desk RCO directed the Board RCO to initiate boration to restore Tc to program. The NWE calculated the amount of borated water to be added to the RCS. The NPS asked the Desk RCO to notify the unit ANPS to come to the control room.

2:40 a.m. ANPS walked into the control room.

2:41 a.m. Tc reached the highest noted value of 549.9 degrees F. MWe reached 875 and indicated reactor power was approximately 101.2%

2:50 a.m. Operators secured boration.

3:14 a.m. Tc noted below 549.0 degrees F. TS Action Statement was exited.

3:45 a.m. STA initiated an In-House Event Report and notified HPES personnel by telephone.

5:45 a.m. NPS informed Operations Supervisor of the overdilution during a routine morning phone call.

5:45 a.m.-
6:00 a.m. Shift turnover occurred. The dilution event was apparently not discussed with the oncoming shift.

6:25 a.m. In-House Event Report was E-mailed to standard distribution, which included plant management, by the STA.

6:30 a.m. Operations Manager toured the control room but was not informed of the overdilution event.

7:20 a.m. Operations Manager read the control room logs (in his office by computer) and questioned the log entry associated with the overdilution event.

7:30 a.m. Licensee initiated a detailed investigation associated with the event.

7:45 a.m. Senior plant management discussed the event during the morning meeting.

10:00 a.m. NRC resident inspector was given the event report that was initiated associated with the event.

4. Shift Manning, Operator Qualifications, and Overtime (92700)

4.1 Adequate Shift Manning

The inspectors reviewed actual shift manning as compared with TS requirements. TS Table 6.2-1 establishes the minimum shift crew composition for St. Lucie Unit 1. With both Unit 1 and Unit 2 operating in a mode 1 condition, a Unit SRO, two ROs, and two AOs are required for each unit. In addition, a Shift Supervisor (SRO) and an STA are required, who may be the same individuals for both units. Additionally, although not required by TS, an NWE (SRO) was assigned to support both units. At any time, at least one RO (at the controls) and one SRO

(control room command function) are required to be in the Unit 1 control room.

During the event, operators on shift included an NPS (SRO), who was at a desk in the Unit 1 control room (fulfilling the control room command function); an ANPS (SRO), who was in the kitchen near the Unit 1 control room until summoned to supervise restoration of Unit 1 reactor power and reactor coolant system cold leg temperature; a Board RCO (RO) who started the boron dilution (while at the controls) and then went to the kitchen after being relieved at the controls by the Desk RCO; a Desk RCO (RO) who relieved the Board RCO at the controls; an NWE (SRO), who was in the NWE office in the Unit 1 control room; and an STA, who was in the Unit 1 control room near the NPS. The Unit 1 control room arrangement and operator locations are shown in Attachment 1. The inspectors concluded that the TS requirements for shift manning and the minimum number of operators in the control room were satisfied.

4.2 Adequate Operator Qualifications

The inspectors reviewed the Unit 1 licensed shift crew qualifications, medical status, and experience. All licensed operators had a current license and medical certification on file. The dates of initial RO and SRO licenses and most recent requalifications were as follows:

	<u>RO (initial)</u>	<u>SRO (initial)</u>	<u>Regualification</u>
NPS	March 1985	September 1988	November 1995
ANPS	August 1984	September 1988	December 1995
Board RCO	November 1993	N.A.	November 1995
Desk RCO	May 1992	N.A.	October 1995
NWE	May 1987	November 1991	December 1995

The inspectors concluded that the qualification status of the Unit 1 licensed operators was current and that the operators had considerable operating experience.

4.3 Adequate Overtime Use

The inspectors reviewed the operators' recent work history (including overtime) and alertness. St. Lucie shift crews worked a forward rotation schedule consisting of:

- Seven Peak shifts (1500-2300) Monday through Sunday,
- Seven Mid shifts (2300-0700) Wednesday through Tuesday,
- Six Day shifts (0700-1500) Friday through Wednesday, followed by
- Five Day shifts (0700-1500) in either a relief capacity or in requalification training before beginning Peak shift the following Monday.

On the morning of January 22, the Unit 1 crew was working their sixth consecutive mid shift. The inspectors questioned the RCOs to determine whether fatigue may have affected their alertness. Both RCOs said they

were alert and rested. The NWE and STA confirmed this. The inspector reviewed the Operations Overtime Tracker sheets which showed that the licensee had been tracking overtime to assure compliance with TS requirements. During the week prior to the event, some Unit 1 shift crew members had stood a double shift (two consecutive eight-hour shifts plus one-half hour turnover, followed by seven and one-half hours off, followed by an eight-hour shift), but all Unit 1 shift crew members had complied with the TS 6.2.2.f requirements for maximum working hours. The inspectors concluded that neither excessive overtime nor operator fatigue contributed to this event.

4.4 Conclusions

The inspectors concluded that TS requirements for shift manning and minimum number of operators in the control room were satisfied. Also, the qualification status of the Unit 1 licensed operators was current and those operators had considerable operating experience. In addition, neither excessive overtime nor operator fatigue contributed to this event.

5. Operating and Administrative Procedures (92700)

The inspectors reviewed operator actions related to this event and the licensee's related operating and administrative procedures.

5.1 Inadequate Boron Dilution

Operating Procedure No. 1-0250020, Boron Concentration Control - Normal Control, Rev. 35, established a method to supply boric acid and makeup water to the RCS at a desired boron concentration and provided instructions for various modes of control. The Board RCO had used procedure section 8.5, Manual Mode of Operation, to initiate the boron dilution. Procedure step 8.5.14 required that operators monitor the boric acid and water flow totalizers and, when the desired amounts had been added, close valve V2525 or V2512, as applicable, to stop the addition of boric acid and primary makeup water. The Board RCO desired to add between 25 and 40 gallons of primary makeup water, but failed to stop dilution until approximately 400 gallons were added. During this time, the temporary relief operator at the controls was unaware that a boron concentration dilution was in progress, which resulted in an unmonitored reactivity addition. The SRO and other operators in the control room were also unaware that a reactivity addition was in progress. This failure to follow OP 1-0250020 requirements, to monitor and stop the dilution when the desired amount was added, is an example of apparent violation 50-335,389/96-03-01.

5.2 Inadequate Watch Turnover

Administrative Procedure No. 0010120, Conduct of Operations, Rev 79, Appendix D, Crew Relief/Shift Turnover, required that, for short term watchstander relief, a turnover be conducted that include: general

watchstation status, off-normal conditions, and tests in progress. However, the Unit 1 operator at the controls conducted a short term watchstander relief with an inadequate turnover in that it failed to include general watchstation status and conditions including that a boron concentration dilution was in progress. As a result, the relief operator at the controls was unaware that a boron concentration dilution was in progress and failed to adequately monitor and control the dilution. This failure to follow AP 0010120 requirements, for a short term watchstander relief, is a second example of apparent violation 50-335,389/96-03-01.

The inspectors questioned both RCOs as to how they typically conducted short term watchstation turnovers and, more specifically, what occurred during this event. The Board RCO said that he recalled responding to a recurring annunciator alarm E-9 moments after starting the dilution. He moved from the charging station at RTGB-105 to RTGB-102. He did not recall how long he was at RTGB-102 before seeing the Desk RCO returning from the kitchen. He left RTGB-102 by stating "I will be over the line. I am going to get my food" (over the line refers to the boundary within which the operator at the controls must remain). The Desk RCO acknowledged, assumed operator at the controls responsibility, and moved from behind the desk to a position in front of RTGB-103. None of the short term relief requirements were performed prior to notifying the NPS of the watchstation turnover. The Board RCO stated that it was a general practice, and management's expectation, to inform his relief of any evolutions, maintenance, or work in progress. Typically, this would not involve a face-to-face board walkdown. In this particular event, the Board RCO felt he was distracted by the E-9 annunciator alarm; however, he had no explanation of why he lost track of the dilution. The Desk RCO confirmed the general practice and management's expectation regarding short term relief. He further said that he did not ask the Board RCO for the status of the watchstation based on:

- His past experience and expectation that the operator requesting relief would provide the information routinely, and
- His observation that the annunciators were "black board" and his knowledge that there was no maintenance or other activities scheduled for that shift.

The inspector discussed the Desk RCO's performance in short term shift relief with both the Operations Supervisor and Operations Manager and concluded his performance was consistent with past practices and management's expectations.

5.3 Inadequate Adherence to Procedures

Administrative Procedure No. 0010120, Appendix M, Procedural Compliance and Implementation, stated: "Controlled procedures are available in both Control Rooms and shall be implemented and complied with in accordance with the instructions provided in QI 5-PR/PSL-1." Procedure QI 5-PR/PSL-1, Preparation, Revision, Review/Approval of Procedures, Rev 67, Section 5.13.2, stated "A strict adherence to procedural requirement - Verbatim

Compliance - is the policy expected and required of all St. Lucie Plant personnel." AP 0010120, Appendix M, also identified those tasks considered "skill of the trade" which were repetitive and routine in nature and may be performed from memory without referring to the procedure. Boron concentration control was not identified as one of these tasks. The inspectors determined during interviews that both RCOs, the NWE, and the Operations Supervisor mistakenly believed that OP 1-0250020, Boron Concentration Control, was a "skill of the trade" task. During this event, the Board RCO had started the boron dilution from memory without referring to the procedure.

OP 1-0250020, Section 8.5, provided steps for adding a blend of boric acid and primary water to the VCT or directly to the suction of the charging pumps. It did not describe adding primary water with no boric acid. It included steps for starting a boric acid makeup pump and opening the boric acid makeup isolation valve and those steps were not indicated as optional. During this event, the Board RCO did not strictly adhere to OP 1-0250020 in that he added primary makeup water with no boric acid, did not start a boric acid makeup pump, and did not open the boric acid makeup isolation valve. Operator performance of OP 1-0250020 from memory, without referring to the procedure, and without strictly adhering to the procedure (as required by AP 0010120), is a third example of apparent violation 50-335,389/96-03-01.

5.4 Inadequate Prompt Notification

The inspectors noted that AP 0010120, Appendix E, Notification of Operations Supervisor/FPL Management, required prompt verbal notification to the Operations Supervisor of unplanned reactivity changes. However, on January 22, 1996, between 2:30 a.m. and 7:20 a.m., operators failed to give prompt verbal notification to the Operations Supervisor of unplanned reactivity changes that had occurred during the overdilution event. In addition, the Operations Manager toured the Unit 1 control room at 6:30 a.m., but control room operators did not inform him of the overdilution event. It was not until about 7:30 a.m., when the Operations Manager and the Plant General Manager read the operator logs on their office computers, that plant management became aware of the overdilution event. The failure of operators to follow requirements of AP 0010120, for prompt verbal notification to the Operations Supervisor of unplanned reactivity changes, is a fourth example of apparent violation 50-335,389/96-03-01.

5.5 Weakness in Control Room Command and Control

During this event, the Board RCO did not inform the NPS that he was beginning a boron dilution. Operators told the inspectors that not notifying the SRO about boron dilution was a general practice at the site. Also, licensee procedures did not require the Board RCO to notify the SRO about starting boron dilution. In addition, during this event the NPS was not aware that a boron dilution was in progress. The inspectors identified that the Board RCO not telling the NPS about a boron dilution in progress and the NPS not being aware that a boron

dilution was in progress were examples of a licensee weakness in control room command and control.

A review of licensee procedures revealed that the control room SRO was allowed to be in the ANPS office for an unlimited time, out of sight of control room activities and out of hearing range of almost all control room activities except annunciator alarms. The SRO was not in the ANPS office during this event and the inspectors did not identify any examples where the SRO spent excessive time in the ANPS office. Nonetheless, the inspectors identified the fact that licensee procedures allowed the SRO to be in the ANPS office for an unlimited time as another example of a licensee weakness in control room command and control.

While visiting the Unit 1 control room on Saturday, January 27, the inspectors noted that the watchstander board on the wall of the control room was not maintained current. The watchstander names indicated on the board were not those of the crew that was currently on watch. The inspectors identified this as another indication of a licensee weakness in command and control.

5.6 Weakness in Operating Procedures

The Operations Manager and other licensed operators told the inspectors that boron dilution by adding primary water with no boric acid, in manual and directly to the suction of the charging pumps, had been performed by operators for many years and was the routinely used method. The inspectors inquired as to how operators could use OP 1-0250020 to do this while following the verbatim compliance policy. The Technical Operations Supervisor noted that this procedural deficiency had been identified on Unit 2 and corrected prior to restart in January 1996. He further said that usually when a deficiency of this nature is noted, the other Unit's procedures are reviewed and corrected, if applicable. However, in this case, he was surprised to see that it had not been done. The inspectors reviewed the Unit 2 procedure change and verified that it had failed to include changing the Unit 1 procedure. The inspectors identified this failure to address the Unit 1 procedure when the Unit 2 procedure was changed as an example of a weakness in licensee procedures.

The inspectors noted that licensee procedures in effect during this event did not require the operator at the controls to remain by the dilution controls and to closely monitor the dilution during a manual dilution with no automatic shutoff. Boron dilution added reactivity to the nuclear reactor, albeit slower than control rod movement, but was not administratively controlled in the same manner as was control rod movement. The inspectors considered the lack of a requirement for the Board RCO to remain at the dilution controls during a boron dilution to constitute another example of a weakness in licensee procedures.

5.7 Other Comments

The inspectors also noted that operators did not routinely log reactivity additions by boron dilution. However, AP 0010120, Appendix F, Log

Keeping, stated that RCO log entries should include significant changes in plant conditions, including reactivity changes.

5.8 Conclusions

In conclusion, the inspectors identified an apparent violation for operator failures to follow procedures, with four examples: 1) Operators failed to stop dilution of the RCS when the proper amount of demineralized water had been added; 2) There was inadequate watch turnover for the operator at the controls during dilution; 3) Operators performed the boration dilution procedure from memory, without referring to the procedure, and without strictly adhering to the procedure; and 4) Operators failed to promptly verbally report the event to licensee management. As a result of these errors, operators exceeded 100% reactor power.

The inspectors also identified four examples of a weakness in licensee control room command and control: 1) The Board RCO did not tell the NPS about a boron dilution in progress; 2) The NPS was not aware that a boron dilution was in progress; 3) The SRO in the control room was allowed to be in the ANPS office for unlimited time, out of sight of control room activities; and 4) The control room watchstander board was not maintained current.

In addition, the inspectors identified two examples of a weakness in licensee procedures: 1) The procedure change process had failed to address deficiencies in the Unit 1 procedure when the Unit 2 procedure was changed, and 2) Procedures did not require the Board RCO to remain at the dilution controls during a boron dilution.

The inspectors also had the following comment: Operators routinely did not log reactivity additions; however, the licensee's Conduct of Operations procedure stated that operators should log significant reactivity changes.

6. Updated Final Safety Analysis Report Review (92700)

A recent discovery of a licensee operating their facility in a manner contrary to the UFSAR description highlighted the need for a special focused review that compares plant practices, procedures, and/or parameters to the UFSAR description. The inspector reviewed applicable sections of the St. Lucie UFSAR, including System Description, Chapter 9.3.4, and Accident Analysis, Chapter 15.2.4, to verify current plant configuration, procedures, and operating practices conformed to UFSAR description and commitments as well as to determine significance of the dilution event in reference to the assumptions in the accident analysis.

6.1 Inadequate Design Control

The inspector noted inconsistencies between the wording of the UFSAR and plant procedures. UFSAR Chapter 9.3.4.2.1, Chemical and Volume Control

System Normal Operation, described the four modes of makeup to the RCS affecting boron concentration: dilute, borate, manual, and automatic. The UFSAR stated that in the dilute mode, a preset quantity of reactor makeup water is added into the VCT at a preset rate. It stated that the manual mode is primarily used for makeup and filling the safety injection tanks and the refueling water tank.

UFSAR Chapter 15.2.4.1, Chemical and Volume Control System Malfunction-Boron Dilution Event, stated:

Boron dilution is conducted under strict administrative procedures which specify permissible limits on the rate and magnitude of any required change in boron concentration. . . . During normal operation, concentrated boric acid solution is mixed with demineralized makeup water to the concentration required for proper plant operation and is automatically introduced into the volume control tank in response to a low water level signal from the volume control. To effect boron dilution, the makeup controller mode selector switch must be set to "Dilute" and the demineralized water batch quantity selector set to the desired quantity. When the specific amount has been injected, the demineralized water control valve is shut automatically. . . . Because of the procedures involved and the numerous alarms and indications available to the operator, the probability of a sustained or erroneous dilution is very low.

However, the inspectors noted that procedure OP 1-0250020, Boron Concentration Control - Normal Control, Rev. 35, that was in effect during the event, allowed adding a mixture of boric acid and primary water in manual and directly to the suction of the charging pumps. It did not include boron dilution by adding primary water, with no boric acid, in the manual mode of operation.

The inspectors also noted that, during the event, no alarms came in to alert operators of the overdilution. Just after the Board RCO recognized the overdilution and initiated corrective actions, annunciator M-16 associated with RCP controlled bleedoff pressure high alarmed. That alarm, which was not mentioned in the UFSAR, came in because the RCP bleedoff went to the VCT, where the pressure had increased due to the increased level from primary water addition. The alarms that were credited in the UFSAR did not come in during this event, in part, because the dilution path was directly to the suction of the charging pumps and not to the VCT.

Further review, as requested by the inspectors, found that the first time the dilution procedure had been changed to allow adding a mixture of primary water and boric acid in manual and directly to the suction of the charging pumps was in a change to rev. 2 of the procedure, dated January 24, 1976, before the Unit 1 operating license had been issued. The UFSAR Chapter 15.2.4.1 description of the methods for adding a mixture of primary water and boric acid and for boron dilution, as stated above, was on UFSAR pages 15.2.4-1 and 15.2.4-2, which were original

pages - the words remained exactly as reviewed by the NRC, as part of the design basis as specified in the license application, prior to Unit 1 licensing. The inspectors concluded that the licensee's procedures, for adding a mixture of boric acid and primary water to the RCS, differed from the methods described in the UFSAR from January 24, 1976, through January 23, 1996.

10 CFR 50, Appendix B, Design Control, requires that measures be established to assure that applicable regulatory requirements and the design basis, as specified in the license application, are correctly translated into procedures. The inspectors concluded that the UFSAR description of methods for adding boric acid and primary water to the RCS had not been correctly translated into procedures. This is identified as apparent violation 50-335,389/96-03-02: FSAR Description of Methods of RCS Boron Dilution Not Correctly Translated into Procedures.

6.2 Inadequate 10 CFR 50.59 Evaluation

The inspectors reviewed TC 1-96-017, dated January 23, 1996, which revised OP 1-0250020, Rev. 35, on the day after the overdilution event. The TC stated that the reason for the change was to add procedural guidance for manual dilution and boration of the RCS, in the same format as the corresponding Unit 2 procedure. The inspectors noted that in the 10 CFR 50.59 screening that was performed for the TC, the question "Does the change represent a change to procedures as described in the SAR" was answered "No." Consequently, a 10 CFR 50.59 safety evaluation was not performed. The contents of the change included a new two-page step by step instruction on manual dilution and a new three-page instruction on manual boration. The new instruction on manual dilution allowed dilution in manual and directly to the suction of the charging pumps. The inspectors concluded that the TC was a change to the procedure and that the method of dilution described in the TC (in "Manual" and direct to the suction of the charging pumps) was different from the method of dilution described in the UFSAR (in "Dilute" and to the VCT).

10 CFR 50.59 states that the licensee may make changes in the procedures as described in the SAR, without prior Commission approval, unless the proposed change involves an unreviewed safety question. A proposed change shall be deemed to involve an unreviewed safety question if the probability of occurrence of an accident evaluated in the SAR may be increased. The licensee shall maintain records of changes in procedures made pursuant to this section, to the extent that these changes constitute changes in procedures as described in the SAR, and the records must include a written safety evaluation that provides the basis for the determination that the change does not involve an unreviewed safety question. In this case, the licensee had no written safety evaluation. The licensee's failure to perform an adequate 10 CFR 50.59 evaluation for TC 1-96-017 is identified as apparent violation 50-335,389/96-03-03; Change to Procedure as Described in FSAR Without a Safety Evaluation.

6.3 Licensee Dissenting Comments

The licensee had dissenting comments with regard to the apparent 10 CFR 50.59 violation. The dissenting comments, from the Engineering Manager and the Licensing Manager, were:

- a. The previous procedure allowed diluting in manual and directly to the suction of the charging pumps, and that had been the practice for many years. Therefore, the TC on January 23, 1996 (after the event) did not change the method of dilution, but only clarified a previously existing procedure and made it conform to "verbatim compliance" rules.
- b. The design of the plant (piping, valves) always was such that dilution in manual and directly to the suction of the charging pumps was possible.
- c. The accident analysis assumed a worst case dilution event with demineralized water going directly to the suction of the charging pumps and three charging pumps running. That would be three times the flowrate of this event and therefore that analysis bounds this event.
- d. The FSAR Chapter 9 description of the Chemical and Volume Control System did not prohibit dilution in manual and directly to the suction of the charging pumps.
- e. The automatic mode of dilution is less safe than the manual mode, in that there is more opportunity for a malfunction that could result in a maximum flowrate approaching the design limit.
- f. The procedure change that first allowed dilution directly to the suction of the charging pumps was made before the operating license was issued, therefore 10 CFR 50.59 did not apply to that change.
- g. Since the operating procedure that was in effect at the time the operating license was issued allowed dilution in manual and directly to the suction of the charging pumps, that method was included in the original licensing basis of the plant.

After receiving these licensee comments, the inspectors' concern remained unchanged: TC 1-96-017 of January 23, 1996 (after the event) described procedure steps for dilution in manual and directly to the suction of the charging pumps. That procedure was different from the one described in the FSAR. The licensee's procedure differed from the FSAR in that it allowed a faster rate of reactivity addition and without an automatic shutoff. The licensee had not performed a safety analysis of this difference and had not revised the procedure and/or FSAR to make them agree.

6.4 Conclusions

The inspectors concluded that licensee design control was inadequate, in that Unit 1 procedures for adding a mixture of demineralized water and boric acid to the reactor coolant system (in manual and directly to the suction of the charging pumps) did not implement the procedure as stated in the FSAR, Chapter 15 (in automatic and to the VCT) and had not done so since January 1976, before Unit 1 was licensed.

The inspectors also concluded that a 10 CFR 50.59 evaluation was inadequate, in that the licensee made a change to the Unit 1 dilution procedure on January 23, 1996 (after the event), to allow adding pure demineralized water in "Manual" and directly to the suction of the charging pumps, that was different from the procedure as stated in the FSAR, Chapter 15 (in "Dilute" and to the VCT) without a 10 CFR 50.59 safety evaluation.

7. Human Factors & Equipment Condition (92700)

The inspectors reviewed control room layout including operator desks, ANPS office, and kitchen location; as well as system and annunciator panels, controls, and indications to assess their potential contribution to the overdilution event. A plan view of the Unit 1 control room layout is included as Attachment 1. The inspectors had the following observations in this area:

7.1 Control Room Arrangement

The location of the operators' desks where the STA, NPS, and desk operator were seated were within visual and audible range of all significant alarms and indications and did not compromise the operators' ability to react to an abnormal condition or indication.

The location of the ANPS office (where it was acceptable for the ANPS to perform administrative tasks) was not within the visual range of the control room panels and indications but was within audible range of most annunciator alarms. This did not contribute to the overdilution event as the control room SRO responsibility was fulfilled by the NPS who was seated at a desk in the control room during the overdilution event. Further, the inspectors were informed by the licensee that the ANPS routinely spends a majority of his/her time in the control room outside the office, i.e. in the controls area. The inspectors were informed that, after the overdilution event, the licensee was considering relocating the ANPS work area/office to within the controls area of the control room.

7.2 Water Flow Totalizer and Batch Integrator

The inspectors noted that there was no clearly noticeable indication in the control room of dilution in progress. The dilution water flow totalizer clicker was quiet (and possibly inaudible from the desk area),

sounded identical to the nearby clickers from the waste gas and liquid release totalizers that routinely made noise, and was masked by noise from the control room air conditioning units.

Operators stated that the makeup water batch integrator that was designed to enable automatic makeup had not been used in the last several years. The inspectors noted that there was no open work request on the makeup water batch integrator.

7.3 Alarms

The annunciator panel and DDPS (computer) alarm setpoints associated with Tc had been modified from 549 degrees F to 552 degrees F for the annunciator panel and 551 degrees F for DDPS. The inspector reviewed and discussed the modification with the licensee. The licensee operated the plant with Tc close to 549 degrees F for thermal efficiency purposes. With the alarm set at 549 degrees F, the annunciator would often alarm, becoming a nuisance to the operators. Also, the alarm would at times remain locked in, thereby becoming unavailable for future use. Therefore, the licensee raised the setpoint sufficiently so that the alarm would not routinely come in. The inspector concluded that, while the decision to raise the alarm setpoints might have seemed reasonable, the alarms no longer functioned to alert the operators when they were exceeding the TS limit on Tc of 549 degrees F and entering a two-hour action statement.

The inspectors asked if there were any other alarms or indications that would alert the operator of an overdilution event, and the licensee indicated that there was a delta T power alarm on the DDPS computer, set at 101 percent power. Since 101 percent power had been exceeded during this event and that alarm had not come in, the inspectors asked the licensee to verify the alarm setpoint and functionality. Upon investigation, the licensee determined that the DDPS delta T power Unit 1 alarm setpoint was 101 percent and Unit 2 setpoint was 150 percent. However, these alarms were not in use and were disabled. The inspectors concluded that control room operators and other licensee personnel did not have complete information available about DDPS computer alarms.

The licensee informed the inspectors that a feedwater high temperature alarm, set at 437 degrees F, would come in at approximately 102 percent power. Also, the Tc alarms would have come in at 551 and 552 degrees F to alert the operators of a more severe transient than the one that occurred on January 22, 1996.

7.4 Conclusions

The inspectors concluded that the control room arrangement did not contribute to the overdilution event. However, the location of the ANPS office was previously addressed as an example of weakness in control room command and control.

The inspectors noted that there was no clearly noticeable indication of dilution in progress. The dilution clicker was quiet (and possibly inaudible from the desk area) and sounded identical to the nearby clickers that routinely made noise.

The inspectors also noted that no alarms came in during this event to alert the operators that Tc and reactor power had exceeded allowable values. The licensee had raised the Tc alarm setpoint so that it no longer served to alert operators that they had entered a TS two-hour action statement. Also, control room operators did not have complete information available about the DDPS computer alarms.

8. Operating Experience Feedback (92700)

The inspectors reviewed previous industry events involving reactivity management to determine applicability and effectiveness of licensee actions.

8.1 Turkey Point Overdilution Event

INPO SOER 94-02, Boron Dilution Events in Pressurized Water Reactors, dated September 19, 1994, discussed a similar overdilution event at Turkey Point and several inadvertent dilution events at other utilities. The SOER made specific recommendations with regard to factors that could potentially affect reactivity as a result of a gradual boron dilution while at power, including: identification and training of those plant personnel who have the potential to affect reactor coolant system boron concentration, and conducting a systematic evaluation of their initial and continuing training programs to verify that lessons learned from these events are addressed through classroom, simulator, and on-the job training where appropriate. Further, the SOER recommended reduction in the risk of an inadvertent dilution through administrative controls, availability of appropriate monitoring of key parameters and/or alarm functions, and minimization of operating crew distractions during activities involving changes to boron concentration.

The inspector reviewed licensee actions with regard to the specific recommendations of the SOER. The licensee had completed numerous actions in the area affecting training, chemistry procedures involving CVCS ion exchanger activity, Health Physics Procedures involving decontamination, and Nuclear Materials Management involving Boric Acid purchase and storage. However, the licensee had concluded that operating procedures for boron dilution adequately addressed the recommendations involving administrative controls and availability of appropriate monitoring of key parameters and/or alarm functions. In response to the SOER, the licensee made no changes to the operating procedures for boron dilution or the related administrative controls.

The inspector concluded that licensee response to the SOER was weak in that it primarily focused on inadvertent dilution events and did not adequately address overdilution events, such as the one described in the

SOER that occurred at Turkey Point. The changes in administrative controls that the licensee made after the January 22, 1996, overdilution event were similar to changes in administrative controls that Turkey Point had made after their overdilution event. This SOER was a missed opportunity to strengthen St. Lucie operating procedures to prevent the January 22, 1996, overdilution event.

8.2 St. Lucie Inadvertent Dilution

The inspector also reviewed a minor inadvertent dilution event that occurred at St. Lucie on January 11, 1996, during the valving in of a CVCS ion exchanger. During this event, the control room board operator had prematurely diverted, to the VCT, letdown flow through an ion-exchanger that had been aligned to the HUT, pending boron sampling by chemistry. As a result, water with a very low boron concentration was added to the VCT. This event resulted in a slight increase to Tc that was promptly detected and addressed through boration. Licensee corrective actions included a change to procedure OP-0210020, to ensure completion of a boron sample prior to placing ion exchanger in service. The inspector noted that the event was not logged in the control room operator logs; however, the Operations Manager had been made aware of the issue. The inspectors concluded that the licensee had missed another opportunity following the January 11, 1996, inadvertent dilution event to recognize, emphasize, and rectify a weakness in the conduct of operations during evolutions affecting reactivity.

8.3 Conclusions

The inspectors concluded that the licensee's response to SOER 94-02, dated September 1994, which described a similar Turkey Point overdilution event, was weak. This was a missed opportunity to strengthen operating procedures to prevent the January 22, 1996, overdilution event.

The inspectors also concluded that the St. Lucie inadvertent dilution event of January 11, 1996, was another missed opportunity to strengthen administrative controls for the conduct of operations during evolutions affecting reactivity.

9. Management Expectations (92700)

The inspectors reviewed recent documented indications of management expectations; including a memo from the President - Nuclear Division to plant personnel emphasizing corporate policy on the responsibility and authority of the Nuclear Plant Supervisor and the Shift Technical Advisor on Shift; a memo from the St. Lucie Plant Vice President to plant personnel about procedure usage; various Operations Night Orders; and inter-office correspondence.

9.1 Conclusions

The inspectors concluded that some management expectations had been recently documented and transmitted to plant personnel. Those management expectations had specifically addressed adherence to procedures, but had not specifically addressed overdilution events or the other issues addressed in this report as apparent violations or weaknesses.

10. Initial Corrective Actions (92700)

The inspectors reviewed the timeliness and thoroughness of the licensee's initial corrective actions for the overdilution event.

10.1 Weakness in Initial Event Investigation

The licensee initiated an In-House Event Report summarizing the event and began distribution of that report within about four hours after the event. The licensee's initial investigation, as documented in the In-House Event Report, was timely but was not sufficiently thorough. The In-House Event Report stated that maximum reactor power was 100.2%, however, subsequent review by the NRC and licensee found that maximum reactor power was approximately 101.18%. Also, the In-House Event Report did not identify that the reactor operator who had started the boron dilution had left the control room with the dilution in progress and without telling other operators that a dilution was in progress. As a result of the weakness in the In-House Event Report, licensee management did not promptly recognize the significance of the event and the licensee's subsequent more thorough investigation was unduly delayed.

10.2 Corrective Actions

Following the event, the licensee immediately removed the reactor operator who had initiated the event from licensed duties, promptly issued a Night Order and conducted training on the event with operators on each shift; revised the Unit 1 procedure for dilution so that manual dilution could be performed by strict compliance to the procedure steps; revised the Conduct of Operations procedure to require the RO to get prior approval from the SRO for dilution/boration, to require the SRO to directly supervise dilution/boration, to require no RO or SRO turnover during dilution/boration, and to require RTGB walkdown prior to RO or SRO short term relief; and initiated further review of the event.

The inspectors concluded that the licensee's initial corrective actions were reasonably prompt and comprehensive. However, the inspectors noted a weakness in that the revised procedure for manual dilution (after the event) did not require the operator at the controls to remain by the dilution controls and to closely monitor the dilution during a manual dilution with no automatic shutoff.

10.3 Licensee Dissenting Comments

The licensee had a dissenting comment on the inspector-identified weakness in the licensee's initial investigation. The dissenting comment, from the Plant General Manager, was:

The initial investigation, for the In-House Event Summary, was done by the STA. Timeliness was more important than quality at that time. A subsequent more thorough review would be performed by the licensee.

10.4 Conclusions

The inspectors concluded that the licensee's initial corrective actions were reasonably prompt and comprehensive. However, the licensee's initial investigation was weak. The In-House Event Report significantly understated the peak reactor power during the event and failed to state that the reactor operator who had started the boron dilution had left the control room with the dilution in progress and without telling other operators that a dilution was in progress. Also, the revised procedure for manual dilution (after the event) did not require the operator at the controls to remain by the dilution controls and to closely monitor the dilution during a manual dilution with no automatic shutoff.

11. Exit Interview

The inspection scope and findings were summarized on January 30, 1996, and on February 8, 1996, 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. There were numerous licensee dissenting comments, as documented in paragraphs 6.3 and 10.3.

<u>Type</u>	<u>Item Number</u>	<u>Status</u>	<u>Description and Reference</u>
EEI	335,389/96-03-01	Open	Operators Failed to Follow Procedures for Boron Dilution, Watch Turnover, Procedure Adherence, and Event Reporting (paragraphs 5.1, 5.2, 5.3, and 5.4)
EEI	335,389/96-03-02	Open	Inadequate Design Control of Reactor Coolant System Boron Dilution Procedure (paragraph 6.1)
EEI	335,389/96-03-03	Open	Inadequate 10 CFR 50.59 Safety Evaluation of Change to Boron Dilution Procedure (paragraph 6.2)

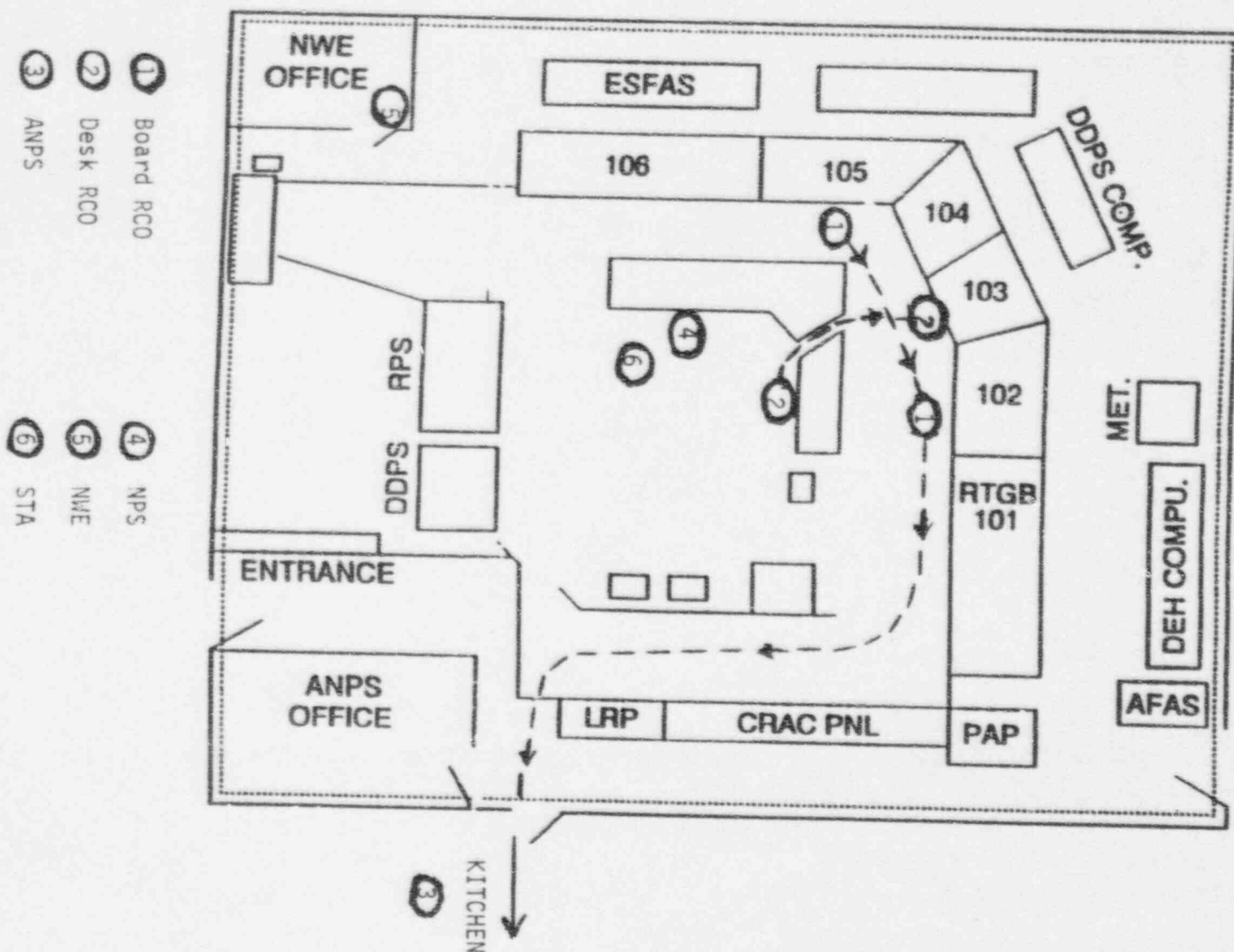
12. Abbreviations, Acronyms, and Initialisms

AEOD	Analysis and Evaluation of Operational Data, Office for (NRC)
AO	Auxiliary Operator

AOV	Air Operated Valve
ANPS	Assistant Nuclear Plant Supervisor
AP	Administrative Procedure
CEA	Control Element Assembly
CFR	Code of Federal Regulations
CVCS	Chemical and Volume Control System
DDPS	Digital Data Processing System
delta P	Differential Pressure
DNB	Departure from Nucleate Boiling
DPR	Demonstration Power Reactor (A type of operating license)
EEI	Escalated Enforcement Item
FCV	Flow Control Valve
FPL	The Florida Power & Light Company
FSAR	Final Safety Analysis Report
gpm	gallons per minute
HPES	Human Performance Evaluation System
HUT	Hold-up Tank
INPO	Institute for Nuclear Power Operations
IR	[NRC] Inspection Report
LCO	TS Limiting Condition for Operation
MWe	Megawatts Electric
N.A.	Not Applicable
NPS	Nuclear Plant Supervisor
NRC	Nuclear Regulatory Commission
NWE	Nuclear Watch Engineer
OP	Operating Procedure
pcm	percent milli (a measure of reactivity)
ppm	Part(s) per Million
QI	Quality Instruction
RCO	Reactor Controls Operator
RCP	Reactor Coolant Pump
RCS	Reactor Coolant System
Rev	Revision
RII	Region II - Atlanta, Georgia (NRC)
RO	Reactor Operator
RTGB	Reactor and Turbine Generator Board
SAR	Safety Analysis Report
SOER	Significant Operating Events Report
SKO	Senior Reactor Operator
STA	Shift Technical Advisor
Tavg	Reactor Coolant System Average Temperature
TC	Temporary Change
Tc	Reactor Coolant System Cold Leg Temperature
Th	Reactor Coolant System Hot Leg Temperature
TS	Technical Specification(s)
UFSAR	Updated Final Safety Analysis Report
Xe	Xenon

ST. LUCIE PLANT
ADMINISTRATIVE PROCEDURE NO. 0010120, REVISION 79
CONDUCT OF OPERATIONS

FIGURE 3



ST LUCIE UNIT 1
CONTROL ROOM ARRANGEMENT

February 22, 1996

EA 96-040

Florida Power & Light Company
ATTN: J. Goldberg
President - Nuclear Division
P. O. Box 14000
Juno Beach, Florida 33408-0420

SUBJECT: NRC INSPECTION REPORT NOS. 50-335/96-03 AND 50-389/96-03

Dear Mr. Goldberg:

This refers to the special followup inspection of the January 22, 1996, Unit 1 overdilution event. The inspection was conducted on January 26-30, 1996, at the St. Lucie facility. This matter was again discussed on February 8, 1996, in a meeting in Atlanta. The purpose of the inspection was to determine whether activities authorized by the license were conducted safely and in accordance with NRC requirements. At the conclusion of the inspection, the findings were discussed with you and 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 consisted of selective examinations of procedures and representative records, interviews with personnel, and observation of activities in progress.

Based on the results of this inspection, three 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. The first apparent violation involves operator failures to follow procedures for reactor coolant system boron dilution, watch turnover, adherence to procedures, and prompt reporting of events. As a result of these errors, operators exceeded 100% reactor power on January 22, 1996. The second apparent violation involves inadequate design control in that the procedure for adding a mixture of demineralized water and boric acid to the reactor coolant system did not implement the method stated in the Final Safety Analysis Report (FSAR), and had not done so since January 1976. The third apparent violation involves a change that was made to the Unit 1 procedure for reactor coolant system boron dilution on January 23, 1996, that differed from the method stated in the FSAR, without performing a required safety evaluation.

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 has been scheduled for March 8, 1996. Also, you have been requested to bring

the three licensed operators who were involved in the overdilution event to the enforcement conference. The decision to hold a predecisional enforcement conference does not mean that the NRC has determined that a violation has occurred or that enforcement action will be taken. This conference is being held to obtain information to enable the NRC to make an enforcement decision, such as a common understanding of the facts, root causes, missed opportunities to identify the apparent violations sooner, corrective actions, significance of the issues, and the need for lasting and effective corrective action. In addition, this is an opportunity for you to point out any errors in our inspection report and 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.

You will be advised by separate correspondence of the results of our deliberations on this matter. No response regarding 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 enclosure will be placed in the NRC Public Document Room.

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

Sincerely,
Original signed by
Albert F. Gibson

Albert F. Gibson, Director
Division of Reactor Safety

Docket Nos. 50-335, 50-389
License Nos. DPR-67, NPF-16

Enclosures: 1. Inspection Report
2. Enforcement Policy:
Section V, "Predecisional
Enforcement Conferences"

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Vice President
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cc w/encls cont'd: See page 3

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FPL

4

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L-96-81
March 6, 1996

U. S. Nuclear Regulatory Commission
Attn: Document Control Desk
Washington, DC 20555

Re: St. Lucie Units 1 and 2
Docket Nos. 50-335 and 50-389
Excess Dilution of the Reactor Coolant System Due to Personnel Error
Nuclear Problem Report 96-008, Revision 1

As the result of an event involving the excess dilution of the Reactor Coolant System at St. Lucie Unit 1 on January 22, 1996, Florida Power & Light Company (FPL) initiated a cross-functional investigation to determine root cause and corrective actions. On February 21, 1996, an Interim Nuclear Problem Report (NP) 96-008 was issued discussing preliminary conclusions.

The purpose of this letter is to forward to the NRC Revision 1 to NP 96-008 which, in addition to presenting the results of the original cross-functional investigation concerning root cause and corrective actions, includes the event analysis and conclusions of an independent, non-FPL expert on nuclear plant operations and event analysis.

If you have questions on the attached report, please contact us.

Very truly yours,

W. H. Bohke
Vice President
St. Lucie Plant

Attachment

WHB/EJW

cc: Stewart D. Ebner, Regional Administrator, Region II, USNRC, Atlanta, GA
Senior Resident Inspector, USNRC, St. Lucie Plant

DDP/16

ST. LUCIE PLANT
NP-700 PROBLEM REPORT 96-008

I. EVENT TITLE

Excess Dilution of the Reactor Coolant System Due to Personnel Error.

St. Lucie Unit 1

Event Date: 22 January, 1996

II. INITIAL PLANT CONDITIONS

Unit 1 was at 100 percent power, steady state operations.

III. EVENT SEQUENCE

At approximately 0220 on January 22, 1996 normal reactor fuel depletion resulted in an indicated reactor coolant cold leg temperature (T_c) of 548.7F. The Board Reactor Control Operator (BRCO) commenced a dilution to the Reactor Coolant System (RCS) in order to restore T_c to a temperature of 548.9F. He began a manual dilution with Primary Makeup Water (PMW) at approximately 38 gpm directed to the suction of the 1B Charging Pump at approximately 0225. According to the BRCO, shortly after the dilution was commenced annunciator E-9, "Lube Water Supply Strainer d/p HI", was received. The BRCO at the controls left the vicinity of RTGB-105 (this is the location of the controls for the boration and dilution system) to acknowledge this alarm on RTGB 102. After responding to the alarm, the BRCO requested that the Desk RCO (DRCO) relieve him at the controls so he might go to the kitchen. The DRCO moved into the vicinity of RTGB-103. The dilution in progress was not communicated by the BRCO during the short term turnover process. The BRCO then left the "at the controls area" and went to the kitchen to prepare his meal.

Approximately five minutes later, the BRCO returned to the control room and heard the PMW integrator "clicking". The BRCO realized the addition of primary makeup water to the RCS was still in progress and immediately took corrective actions to secure the dilution and commenced boration the RCS. The BRCO commenced boration to the suction of the 1B Charging Pump for a total initial addition of approximately 26 gallons of boric acid and informed the DRCO and the Nuclear Plant Supervisor (NPS) of his actions. At approximately the same time the BRCO was taking corrective action, annunciator M-16 "RCP CONT BLD OFF PRESS HIGH" alarmed, due to a higher than normal Volume Control Tank (VCT) pressure from the increase in VCT level and Pressurizer level as a result of the expansion of RCS inventory from T_c increasing. The Assistant Nuclear Plant Supervisor (ANPS) was summoned by the NPS to the control room from the kitchen to assist in actions to return the plant to within normal operating parameters. T_c was observed to be greater than 549F.

With the boration started, the NPS and STA reviewed the Technical Specifications and

entered a two hour action statement to restore RCS T, to less than or equal to 549F in accordance with Technical Specification Limiting Condition of Operation (LCO) 3.2.3, DNB Parameters. At 0314, indicated T, was returned to less than 549F, and the LCO Action Statement was exited. All other parameters reached normal levels concurrently. As was later calculated, and confirmed by recorded plant indications, the highest reactor power and RCS cold leg temperature during the event was 101.13 percent and 550.8F (single point maximum).

549.75
observed

Before the crew left the site that morning, several reviews of the event began. The crew shift supervision verbally counseled the BRCO for leaving his station while a dilution was in progress. The ANPS also wrote a notification of the event in the form of Data Sheet (DS) 7 (Operations Department Problem Report, Conduct of Operations procedure) and mailed a paper copy to the Operations Supervisor. The ANPS provided a verbal notification of the event to the Operations technical supervisor during his normal morning tour of the control rooms. The STA prepared a draft In House Event (IHE) summary 96-008 to convey the facts of the event to the site management and to initiate a STAR for root cause determination. The STA also requested that the Human Performance Evaluation System (HPES) Coordinator be called out to investigate the event. The HPES Coordinator arrived onsite at 0515, reviewed the draft IHE and conducted interviews with the personnel involved. At the 0740 morning management phone call, the Operations Supervisor and the Plant General Manager were provided with a copy of the IHE. On that same day, the Operations technical supervisor began an event review which included discussions with the relief crew, RCO chronological review, the DS 7, training and performance appraisals related to the BRCO. At the end of the day, the Operations technical supervisor recommended to the Operations Supervisor that the BRCO be removed from watch standing duties. He also notified the NRC Resident of the investigation status.

On the following day (January 23), the Operations technical supervisor conducted a fact finding meeting with the crew and bargaining unit representative. Following that meeting, the Operations Supervisor concurred in the suspension of the BRCO from watch standing duties. The Operations technical supervisor provided the NRC resident with an update to the event. On January 26, the IHE was updated by the HPES Coordinator to include all of the facts learned about the event during the week. At the direction of the Plant General Manager, on January 31, 1996, a cross functional team was formed to review the event and subsequent plant staff response.

IV. ANALYSIS

The team identified two primary problems for this event. They are discussed in detail below.

PROBLEM 1:

A reactivity evolution was initiated without adequate controls.

Root Cause:

Routine boron dilutions to maintain 100 percent power are not treated with the same importance as other reactivity management evolutions. This is particularly true toward the end of core life when frequent small additions of primary water are injected in to the RCS to maintain 100 percent power.

Contributing Factors:

1) Cognitive error on the part of the BRCO who initiated the dilution evolution. The BRCO, as part of his normal responsibilities, recognized the need to dilute the RCS and concluded it was necessary to inject approximately 30 gallons of primary makeup water (PMW) into the RCS. The PMW injection rate was to be about 38 gallons per minute; therefore, the entire dilution evolution was to have lasted less than one minute. Once this evolution was initiated, the BRCO failed to follow it to its proper completion in that he responded to an annunciator (E-9) and subsequently left the immediate area.

a. The operator's integrated performance was not adequately evaluated by supervision.

The BRCO's training and personnel records were reviewed for insight into his past performance. The subject received an "Unsatisfactory" rating in his May 1995 simulator evaluation (control board operations) and was placed on the operator non-qualified list. After remediation and reevaluation, the subject received an individual rating of "Sat/Marginal - Safety Significant." Upon further remediation the subject received an individual rating of "Satisfactory" (6/2/95). The BRCO was identified in a Training department memo (9/8/95) as a Historical Poor Performer due to failing a static exam in June 1995 and simulator performance exam in May 1995. In particular, the memo noted that he is "in too much of a hurry, and doesn't communicate well." Other noted observations taken from simulator evaluation summary forms and performance reviews:

- "need to work on communications" and "should mark time/level when monitoring containment sump" - simulator evaluation of 4/29/94;
- "failed to realize that pressurizer safety valve was open" - simulator evaluation of 11/6/95;
- "easily diverted and needs to improve in this area" - performance review 11/10/94.

This review of training and performance suggests that the qualification of the

individual should have been more closely scrutinized by Operations and Training Management.

- b. There was no supervisory involvement at the start of the dilution.

Neither the dilution procedure, OP 1-0250020 "Boron Concentration Control - Normal Operation", nor the "Conduct of Operations" procedure require the BRCO to inform the ANPS or other watchstanders of the initiation of any boration or dilution evolutions. Borating or diluting the RCS changes the reactivity of the reactor core and should be considered a significant evolution. Given that there was no procedural requirements for any type of notification at St. Lucie, the BRCO was not deficient in this area. Had this been a plant policy, the ANPS (or other watchstanders) would have been aware of the evolution and may have recognized and corrected the error of the BRCO.

- 2) Conduct of Operations expectations are not fully understood or consistently applied.

The BRCO left the RTGB area and went "over the line" to the kitchen. During this transition, he turned over the RTGB watch to the DRCO who was returning from the kitchen. Appendix D of the "Conduct of Operations" procedure provides instructions for providing a turnover for "short term relief" which is defined as less than two hours. According to the procedure, minimum turnover requirements consist of providing: a general watch station status; off-normal conditions; and tests in progress. Operations management's expectation is that short term turnover is applied whenever a watchstander goes "over the line" and is out of line of sight of the board. However, based on interview of seven operators after the event, this expectation is not clearly understood by operators. A proper turnover may have prompted the BRCO to recall the dilution and take appropriate action. Misunderstanding of such a fundamental policy indicates a weakness in monitoring of the implementation of policies and expectations by management.

Management's expectation of "verbatim" compliance to procedure does not fully recognize the quality of current procedures nor accountability for instances of non compliance. Procedure OP-1-0250020 did not contain sufficient detail to permit "verbatim" compliance, yet none of the operators identified the need for a procedure change. In fact most of the operators interviewed after the event felt that this evolution should not require a procedure. They felt it was "skill of the craft."

- 3) Recent plant events involving operator personnel errors have been previously identified and corrective actions have not been completely effective.

A Q/A assessment, Technical Review Report #1TR 95-023, performed at the request of the site Vice President, reviewed sixteen events that occurred since August 1995, identified that many of the events' corrective actions did not go far enough to address all potential causal factors. It concluded that many similar events had a medium to high probability for recurrence.

- 4) The plant's Operating Experience Feedback program did not respond to similar reactivity management events at other nuclear plants.

Because of a number of industry events involving reactivity management, INPO issued a Significant Operating Experience Report (SOER) 94-2, which alerted the industry to the importance of reactivity management during normal operation. This report included a dilution event very similar to the St. Lucie event which occurred at Turkey Point in October 1993. In responding to the report, the plant did not identify routine dilutions as an evolution that required special attention.

- 5) Licensed Operator Requalification Training focuses principally on abnormal or emergency situations.

Lesson plans and simulator experience deal almost exclusively with abnormal or emergency situations. As a result, routine evolutions, which are often the precursor of abnormal or emergency events, tend to have less significance.

- 6) The plant's Self Assessment Programs have not been fully effective in preventing recurrence of problems.

As discussed earlier, the Quality Assurance organization has identified operator performance shortcomings where corrective actions have not been fully effective.

Additional concerns identified during the event review which warrant further investigation include:

- 1) Plant procedures do not specify the preferred method of making boration or dilution changes.

Operating Procedure OP 1-0250020 "Boron Concentration Control-Normal Operation" allows several flowpaths for dilution. The procedure does not state which flowpath is preferred for making boron concentration changes. A note in section 8.1.7 states that "Makeup from the Boron concentration control system can be directed to either the VCT (for long term effects, in any mode of operation) or the Charging Pump suction (for short term effects), in the MANUAL or BORATE modes of operation." Section 8.5 "Manual Mode of Operation" allows blending directly to the VCT or use of a direct path to the charging pump suction. Dilution via the Volume Control Tank provides a slower reactivity response and in this incident may have allowed for recovery prior to power escalation. Dilution via the VCT also lengthens the duration of the evolution. Operations must evaluate the various flowpath options for making boron concentration changes, identify the preferred methods and revise procedures accordingly.

- 2) The practice for operating at the Technical Specification limit for T₁ provided no operating margin.

For PSL Unit 1, the limit for DNB considerations for cold leg temperature is less than or equal to 549F. The St. Lucie plant practice to operate cold leg temperature at the Technical Specification limit of 549F did not provide margin for error. Changing RCS boron concentration is a normal plant operation, compensating for long term reactivity effects, such as fuel depletion, xenon buildup and decay, plant startups, shutdowns, or changes in reactor power. As the cycle progresses, the RCOs are required to make more frequent reactivity manipulations, resulting in a higher chance of occurrence of an error due to lessened sense of awareness or importance.

3) Lack of annunciation and indication during this event.

A control room alarm responding to a dilution evolution in progress annunciates only when the dilution becomes excessive. The only alarm to annunciate in the control room as a result of this over-dilution event was M-16, RCP CONT BLDOFF PRESS HIGH, which was caused by rising Volume Control Tank (VCT) Pressure as reactor coolant inventory increased. An alarm for RCS high cold leg temperature is available, but to avoid nuisance alarms (operator distraction), the alarm setpoint is approximately 3F greater than the applicable Limiting Condition for Operation of 549F. Similarly, a Delta-T Power alarm (Point ID-742) on the plant DDPS computer is no longer maintained in a functional status.

4) The UFSAR has not been maintained current with regard to operating practices.

PSL-1 UFSAR Section 9.4.2.3 primarily discusses boration and dilution utilizing the automatic mode of operation. Little discussion is provided regarding the manual mode of operation. No specific discussion regarding dilution directly to the charging pump suction is provided in this section of the UFSAR. St. Lucie operators have historically made reactivity changes via the manual mode of operation. Discrepancies between the PSL UFSAR and existing operating practices are a recognized problem at St. Lucie. A recent QA audit Finding and an NRC deviation have provided examples of this issue. The UFSAR has been maintained current with regard to physical plant changes via the plant change/modification (PC/M) process. The UFSAR has not always been maintained current with regard to descriptions of operating practices, procedures and administrative details. The UFSAR has not been routinely referred to during the periodic review of plant procedures or during the procedure revision process to ensure continuing agreement with plant operating practices.

PROBLEM 2:

The plant staff's recognition of this event's significance was slow.

Root Cause:

The root cause of this problem is lack of a well defined threshold for recognizing safety significance. The operating crew quickly diagnosed the problem, took quick and appropriate corrective action prior to challenging any safety systems and reported the event in that

context. Management should have recognized that In House Event Reports and HPES interventions identify issues of safety significance which should be followed up more aggressively.

Contributing Factors:

The In-house Event summary had insufficient detail to gain management attention and management did not respond aggressively to an unplanned reactivity change event, regardless of significance. Specifically, the IHE did not contain the information that the BRCO had left a reactivity change unattended. Additionally, based on the observed indications of Digital Data Processing System (DDPS) digital display provided by the operating crew and NPS to the STA, the IHE reported that the peak reactor power as 100.2 percent. Subsequent detailed analysis revealed that reactor power peaked at 101.13 percent. Subsequent to the event, Plant and Operations management did not pursue details surrounding the dilution in a time frame consistent with the event's significance.

At approximately 0545, the Operations Supervisor made his routine phone call from offsite to the control rooms for a unit status. The NPS related details about the event per this phone conversation. The discussion included corrective actions, the Technical Specification LCO entered and exited, the RCO Chronological log entry, individuals involved, initiation of an IHE and DS 7. (Appendix E of the Conduct of Operations procedure requires the Shift Supervision to make prompt verbal notification for unexplained or unplanned reactivity changes.) As indicated above, the ANPS was prompt with completion of the DS 7 before he went off shift. Review of the DS 7 revealed that the specific detail related to the BRCO leaving a reactivity change unattended was not included in the report.

Additional concerns identified during the event review which warrant further investigation include:

- 1) The plant staff's initial investigation of this event was less than adequate.

There were several initial investigations into this event, all of which were independent of each other to a large degree. Prior to the end of the shift Monday, several independent event reviews took place. The Operations crew shift supervision evaluated the event as warranting documentation to the Operations Supervisor via a DS 7. The STA also wrote an IHE to site management for the event. The HPES coordinator interviewed the personnel involved. On Tuesday, Operations supervision conducted a fact finding meeting with the crew. On Wednesday, Operations management conducted a review of the event. Nine days after the event, a cross functional team was formed to review the event and subsequent plant response. Contributing causes to the slow and independent efforts included lack of site procedures for integrated event response investigation, root cause analysis, and self assessment. Additionally, the level of detail in existing procedures and guidelines is inadequate in that:

- DS 7 does not contain requirements for a significant level of detail,

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Revision 1

- The HPES guideline does not contain reporting time or audience requirements, and,
 - there is no procedural guidance on classifications of event severity and appropriate levels of resources required for event investigation.
- 2) The self assessment by the operating crew was less than adequate.

The Operations crew shift supervisor verbally counseled the RCO for leaving his station with a dilution in progress, but did not include this level of detail in the DS 7. A thorough self assessment of the event should have been conducted by the crew prior to their leaving the site on the day of the event. Contributing causes to this condition were the absence of a definitive site self assessment policy and procedure and no continuing training provided to operations personnel on self assessments and personnel error analysis.

- 3) The transfer of lessons learned from a similar event at Turkey Point to St. Lucie was less than adequate.

As previously discussed, a similar event to this one has previously occurred at Turkey Point, with similar countermeasures applied.

V. ANALYSIS OF PHYSICAL PLANT RESPONSE DURING EVENT

The key safety parameter associated with this event is departure from nucleate boiling (DNB). There were two plant operating parameters that were notably affected by this event, reactor coolant cold leg temperature (T_c) and reactor power. Per Technical Specification 3.2.5, T_c is limited to $\leq 549^\circ\text{F}$ and is normally controlled at about 548.9°F . As a result of the dilution, T_c increased to a peak value of 549.7°F (per ERDADS). Graphical data showed T_c above 549°F for approximately 50 minutes. Reactor power is normally maintained at ≤ 100 percent. From a review of ERDADS (Q power) and calorimetric power data, it can be inferred that calorimetric power did not exceed 101.13 percent. Interpolation of the data shows that reactor power was above 101 percent for approximately four minutes and above 100 percent for approximately 50 minutes.

UFSAR section 15.2.4 provides an analysis of the design basis boron dilution events. These events assume the injection of unborated demineralized water into the RCS at a rate of 132 gpm (3 charging pumps x 44 gpm/pump). The analysis notes that boron dilution events are relatively slow events and that there are numerous indications and alarms available to operators (e.g., boronometer, VCT level, makeup flow, VCT isolation). However, should dilution proceed without operator intervention, the event would be terminated by the TM/LP or variable high power trip. DNB ratio (DNBR) limits would not be exceeded in such a case. The subject dilution occurred at a rate of 38 gpm. Thus, the event is clearly enveloped by the existing UFSAR analysis for a boron dilution at power event. Additionally, a core flux map generated from DDPS data polled at 0300 (after the event) and compared to the data from 0200 (before the event) indicated a normal flux distribution.

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In conclusion, the boron dilution event of January 22, 1996 was within the design basis and analysis of the plant and did not present a challenge to plant safety systems or pose a risk to the health and safety of the public. The event was terminated by operators prior to the onset of the alarms and automatic protective actions provided for such an event. The license condition of maximum steady-state thermal power was not violated. 1 ?

VI. CORRECTIVE ACTIONS

Personnel

1. The BRCO was removed from licensed operator duties. Complete
2. Human Resources and Training are developing an assessment and remediation plan for possible return of the BRCO to licensed operator duties. Complete
3. Lessons learned from this event were reinforced via supervisory expectations communicated to Shift Technical Advisors in the areas of: Sensitivity to plant events, In-House Events summary accuracy and completeness of supporting data, and 10 CFR 50.59 reviews. Complete
4. The Operations Supervisor has discussed with each NPS the purpose and thresholds of Appendix E, Conduct of Operations, and the necessary notifications. Complete

Procedures/Documents/Policies

5. The Conduct of Operations Procedure was revised to include the following:
 - Board walk down is now included as part of the "Short Term Turnover" process,
 - Direct supervision of reactivity changes is required by a Senior Reactor Operator,
 - Reactor Control Operator is to remain at the controls during all reactivity changes while in progress,
 - Reactivity changes shall not be turned over while in progress.

Complete

6. Operations will revise the "Conduct of Operations" to clarify "short term turnover". Examples of when "short term turnover" is required will be included in the revision. This revision should be communicated to Operation's personnel by Night Order and discussed with operating crews. Training should reinforce these expectations during training sessions and Management should monitor its effectiveness. Complete

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March 6, 1996
Revision 1

- Abstract only
other still of
craft vs
proc. use?*
7. Engineering has performed a 50.59 evaluation to reflect Operation's practice of using the "manual" mode of dilution and boration. (This 50.59 will be included in the next annual update to the UFSAR.) Complete *directly to section of ds for pi?*
8. Engineering has reconvened the UFSAR review team to complete the review of the UFSAR versus plant procedures. Sampling completed 2/29/96. Full scope and schedule due by 3/31/96. Dan Denver
9. Operations will revise the "Conduct of Operations" procedure to require a sufficient level of detail in DS 7 reports so management will have adequate information for assessment of the problem. Jeff West - Due 3/31/96
10. System and Component Engineering is developing an Event Response procedure. The procedure will include or reference: Root Cause Analysis techniques, event severity classifications and resources required for analysis. This procedure will also include expectations for the team to include cross functional membership from: SCE, Operations, Engineering, Maintenance and QA. Turkey Point's Event Response Procedure is under review for incorporation at St. Lucie. Chuck Wood - Due 3/15/96
11. The procedure upgrade process will include UFSAR review to identify inconsistencies for correction. Complete
12. For the balance of plant procedure not captured in the upgrade process, Information Services will ensure that the UFSAR is examined during the three year procedure review process and that inconsistencies are noted and corrected. Jim Holt - Due 3/15/96

Equipment Performance

13. The Plant General Manager has reemphasized the reduction of nuisance alarms to all line organizations to support the "blackboard" concept for operations. Complete
14. Engineering is evaluating the current control room annunciation for possible improvements to help focus awareness of reactivity changes. Dan Denver - Due 3/31/96
15. OST will survey the industry on the use of automatic and manual boration and dilution controls to benchmark St. Lucie and determine best means of reactivity changes by chemical control. Complete

Training & Quality Assurance

16. All DS 7s, Operational Events, will be transmitted to the Training Department for lessons learned to be included in the training program. Complete
17. QA should evaluate performing a performance based audit on the adequacy and

effectiveness of the corporate program for transferring lessons learned between Turkey Point and St. Lucie for events which occur at the other site, and for events which occur in the industry. Wes Bladow - Due 3/15/96

Supervision and Management

18. Operations will review the current watchstanders for Historical Poor Performance, and assess need for action. Complete
19. A Training and Performance Review Board will be instituted to conduct a consolidated review of all performance indicators for licensed operations personnel who are identified as Historical Poor Performers. The review will assess the need for additional remedial measures and/or the removal of the Historical Poor Performer from licensed duties. Complete
20. Plant management has developed a mechanism for providing feedback on the understanding and implementation of all policies and expectations for all plant organizations. (Standards Assessment Guideline by Management) Complete
21. A review was undertaken to evaluate the adequacy of the existing policy and guidance involving reactivity control. Plant management will now reinforce expectations and the importance of reactivity control in a personal letter from the Plant General Manager and Site Vice President to each RCO and SRO. Complete
22. Operating crew briefings by Operations Supervision were held discussing the dilution event, Zach Pate's "The Control Room" and management's expectations with respect to conservative plant operation. Operations Supervision also reinforced expectations in "Conduct of Operations" with respect to notification of Operations Management, log keeping, focus on reactivity changes, and the short term turnover process. Complete
23. Operations Management reviewed its expectations for command and control using information obtained from other sites including Turkey Point. The implications of this event will also be reviewed by a team for applicability to other operation's activities both inside and outside the control room. J. A. West - STAR 960146B & C - Schedules due 3/31/96
24. Nuclear Plant Supervisors have been directed to review all new In-House Events at the 0740 meeting with Plant Management to help prioritize activities. Complete
25. In addition to specific corrective actions, plant management will self-assess the operation of St. Lucie plant. This self-assessment will include, but is not limited, to Conduct of Operations, alarm setpoint policy, operating experience feedback, training, procedures, corrective actions, and management policies. This review will be performed by plant personnel augmented by experienced individuals from off-site. Recommended actions will

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be reviewed and statused in the monthly indicator book. Independent oversight of this self-assessment will be provided via the Company Nuclear Review Board. Jim Searola - Report due 7/31/96



UNITED STATES
NUCLEAR REGULATORY COMMISSION
REGION II
101 MARIETTA STREET, N.W., SUITE 200
ATLANTA, GEORGIA 30323-0198

FILE COPY

March 13, 1996

Florida Power and Light Company
ATTN: Mr. T. Plunkett
President - Nuclear Division
P. O. Box 14000
Juno Beach, FL 33408-0420

SUBJECT: MEETING SUMMARY - PREDECISIONAL ENFORCEMENT CONFERENCE
ST LUCIE - DOCKET NOS 50-335 AND 50-389

Gentlemen:

This refers to the predecisional enforcement conference conducted at our request at the NRC Region II office in Atlanta, Georgia, on March 8, 1995. The purpose of the meeting was to discuss apparent violations regarding a January 22, 1996, event involving excessive boron dilution on Unit 1. It is our opinion that this meeting was beneficial.

A list of attendees is provided in Enclosure 1 and the material you presented is provided in Enclosure 2.

In accordance with Section 2.790 of the NRC's "Rules of Practice," Part 2, Title 10 Code of Federal Regulations, 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,

Charles A. Casto, Chief
Engineering Branch
Division of Reactor Safety

Docket Nos. 50-335, 50-389
License Nos. DPR-67, NPF-16

Enclosures: 1. List of Attendees
2. FPL Presentation

cc w/encls: See page 2

DDO/18

ENCLOSURE 3

cc w/encls:

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cc w/encls cont'd: See page 3

FPL

3

cc w/encls cont'd:
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Ft. Pierce, FL 34982

Charles B. Brinkman
Washington Nuclear Operations
ABB Combustion Engineering, Inc.
12300 Twinbrook Parkway, Suite 3300
Rockville, MD 20852

LIST OF ATTENDEES

Florida Power and Light Company

T. Plunkett, President - Nuclear Division, FPL
W. Bohlke, Vice President, St. Lucie Nuclear Plant
J. Scarola, Plant General Manager, St. Lucie
D. Denver, Engineering Manager, St. Lucie
E. Weinkam, Licensing Manager, St. Lucie
P. Honeysett, Nuclear Plant Supervisor, St. Lucie
F. Cone, Reactor Controls Operator, St. Lucie
H. Holzmacher, Reactor Controls Operator, St. Lucie

Nuclear Regulatory Commission

S. Ebnetter, Regional Administrator, Region II (RII)
A. Gibson, Director, Division of Reactor Safety (DRS), RII
J. Johnson, Deputy Director, Division of Reactor Projects (DRP), RII
J. Beall, Enforcement Coordinator, Office of Enforcement (OE)
B. Uryc, Director, Enforcement and Investigation Coordination Staff (EICS),
RII
C. Casto, Chief, Engineering Branch, DRS, RII
T. Peebles, Chief, Operations Branch, DRS, RII
K. Landis, Reactor Projects Branch 3, DRP, RII
J. Norris, Project Manager, NRR
L. Watson, Senior Enforcement Specialist, EICS, RII
C. Evans, Regional Counsel, RII
M. Miller, Senior Resident Inspector, St. Lucie, DRP, RII
R. Schin, Reactor Inspector, Engineering Branch, DRS, RII
D. Lanyi, Project Engineer, DRP, RII

PRE-DECISIONAL ENFORCEMENT
CONFERENCE

ST.LUCIE PLANT

NRC INSPECTION REPORT

NOS. 50-335/96-03 AND 50-389/96-03

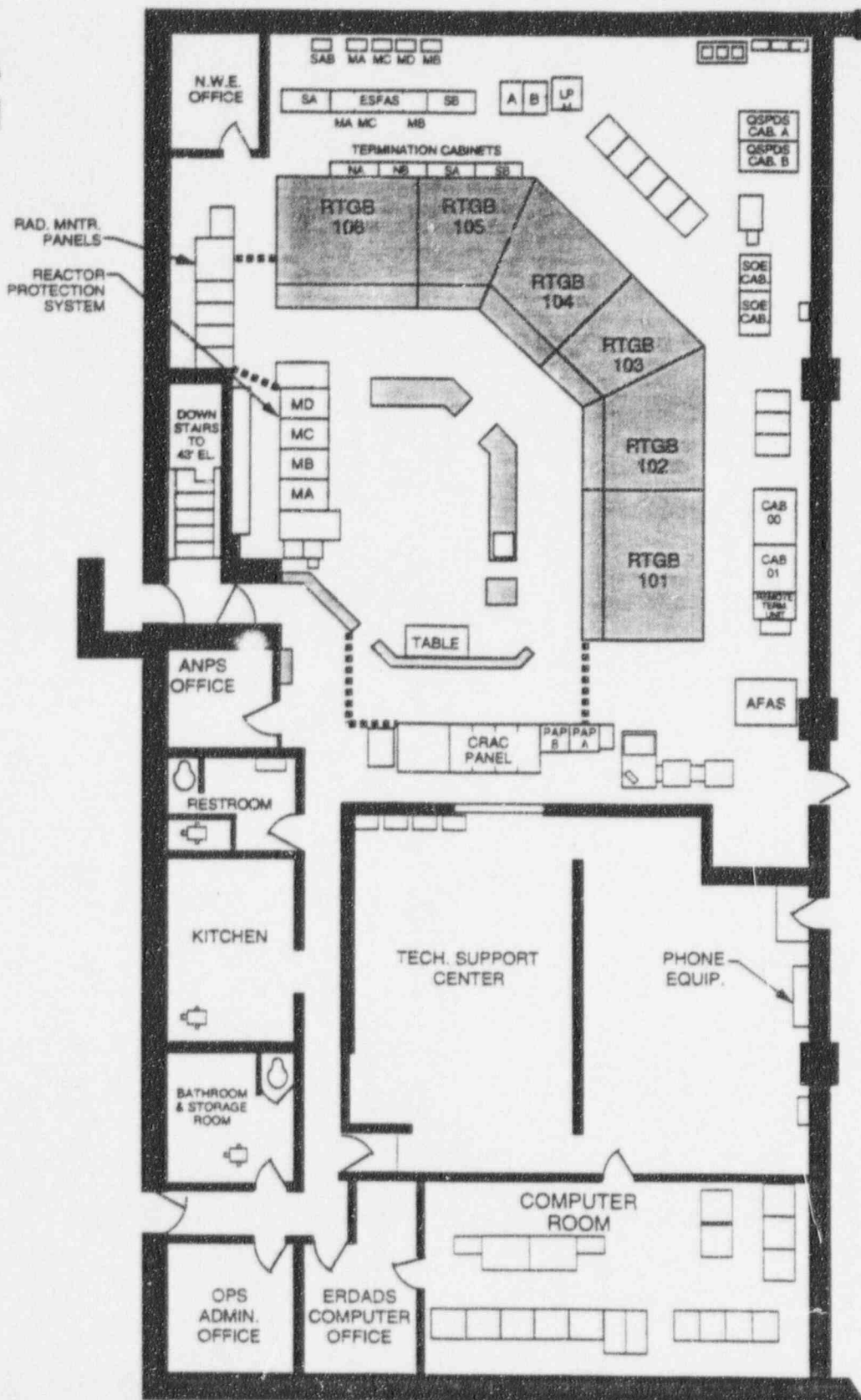
MARCH 8, 1996

ATLANTA, GA

Enclosure 2

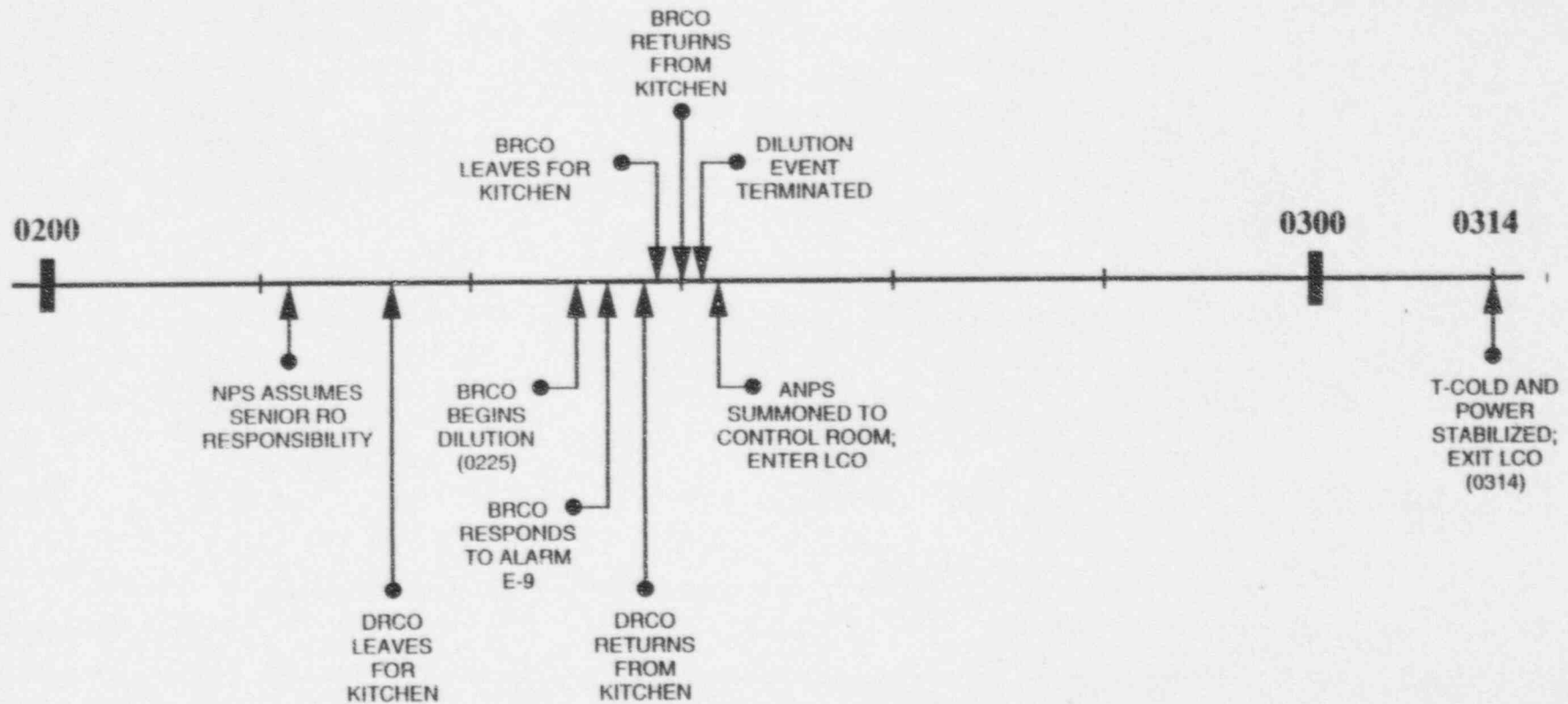
UNIT 1 FLOOR PLAN RAB CONTROL ROOM

ELEVATION 62.00

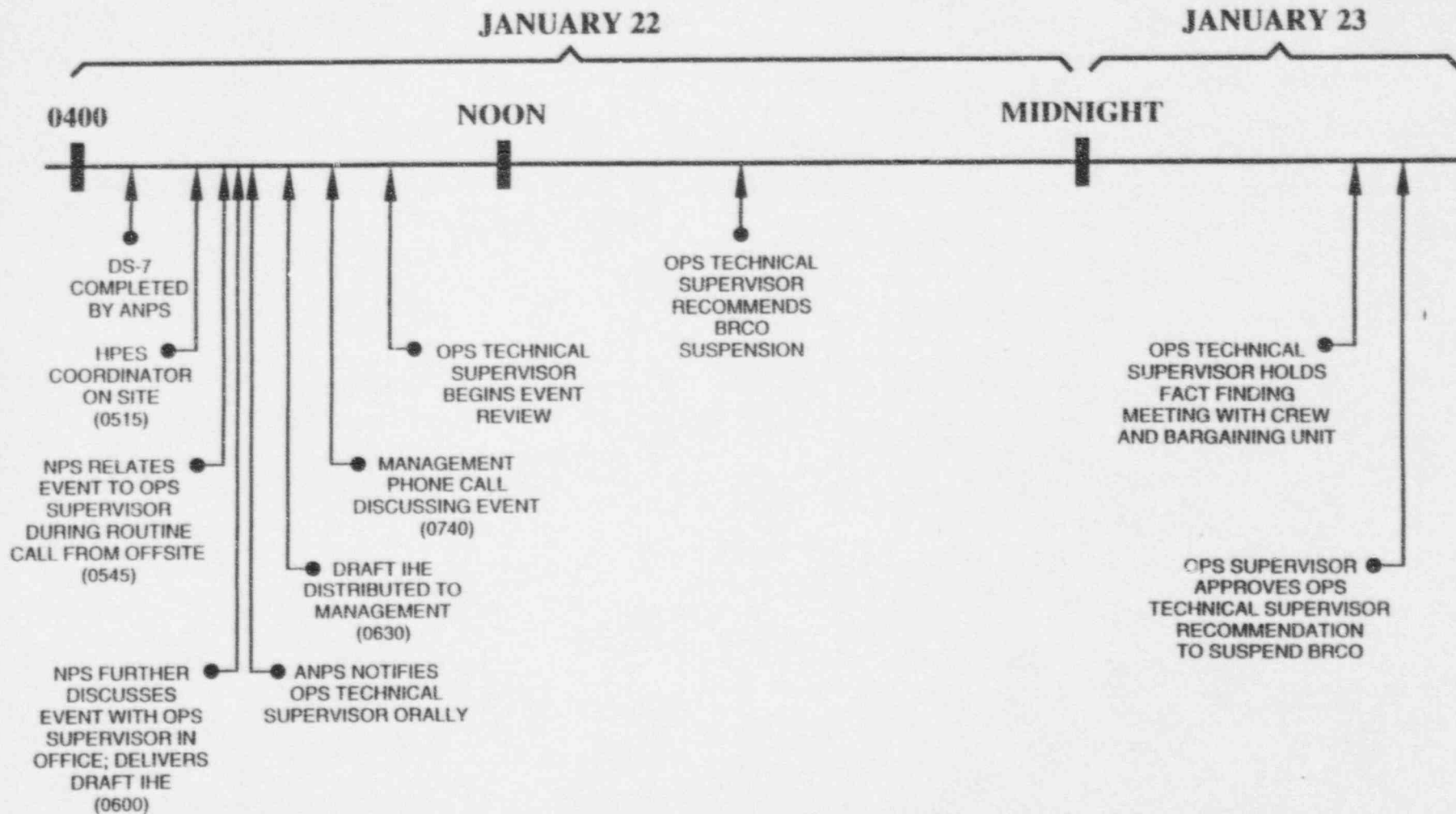


UNIT 1 DILUTION EVENT

JANUARY 22, 1996



UNIT 1 DILUTION EVENT PROMPT ACTION



Root Cause Evaluation

PROBLEM 1:

A reactivity evolution was initiated without adequate controls.

Root Cause: Routine boron dilutions to maintain 100 percent power are not treated with the same importance as other reactivity management evolutions.

PROBLEM 2:

The plant staff's recognition of this event's significance was slow.

Root Cause: The root cause of this problem is lack of a well defined threshold for recognizing safety significance.

PROBLEM 1

A reactivity evolution was initiated without adequate controls.

Corrective Actions

- Personnel
- Procedures/Documents/Policies
- Equipment Performance
- Training and Quality Assurance
- Supervision and Management

PROBLEM 2

The plant staff's recognition of this event's significance was slow.

Corrective Actions

- Personnel
- Procedures/Documents/Policies
- Equipment Performance
- Training and Quality Assurance
- Supervision and Management

Management Lessons Learned

Management's Operational Guidance to Maintain T_c at 549F

Adjustment of High T_c Alarm

Reinforcement of Expectations to the Operating Crews Concerning
Personal Accountability

Operating Crew Communication with Plant Management

Personnel Lessons Learned

Operating Staff Has the Highest Levels of Honesty, Integrity, and Accountability

Confirmation of Crew Members' Fitness to Perform Licensed Duties

Procedures and Policies Lessons Learned

Senior Reactor Operator Direct Oversight of Reactivity
Manipulations

Periodic Dilution of the Reactor Coolant System Is Not an Activity
to Be Turned Over to Another Operator

Clarification of Short Term Turnover of Control Station
Responsibility

Implementation of Event Response Teams

Equipment Lessons Learned

Continued Focus on “Dark Board”

Use of “Manual” Mode versus “Automatic” Mode of Control for
Boration and Dilution

Training and Quality Assurance Lessons Learned

Lessons Learned Need to be Included in Continuing Training

Effectiveness of Corrective Actions

Safety Significance

Reactor Power Peak at 101.13%

Observed Cold Leg Temperature (T_C) Maximum of 549.75F

Technical Specification Limiting Condition for Operation
ACTION Limit with $T_C > 549F$ is 2 Hours; T_C Exceeded 549F for
About 50 Minutes

UFSAR Boron Dilution Event Licensing Basis Assumptions
Bounds Subject Boron Over-Dilution Event

Probabilistic Safety Assessment Evaluation Concluded That the
Plant's Core Damage Frequency Was Unaffected by the Event

Apparent Violations B and C

Apparent Violation B - Inadequate Design Control

- Review & Conclusions
- Corrective Actions

Apparent Violation C - Inadequate 10 CFR 50.59 Evaluation

- Review & Conclusions
- Corrective Actions

Apparent Violation C (Cont'd)

Conclusions:

- TC 1-96-017 10 CFR 50.59 Screening Conclusions Are Not Supported by UFSAR Description
- UFSAR and 10 CFR 50.59 Screening Process Need Improving

Apparent Violation C (Cont'd)

Corrective Actions

- Improve 10 CFR 50.59 Screening Process
 - Improve Process by Documenting the UFSAR and Technical Specifications Sections Reviewed During Screening
 - Conduct 10 CFR 50.59 Training for Departments Responsible for Procedure Changes with New Emphasis on the Definition of "...procedures as described in the safety analysis report"
 - Clarify Screening Criteria
 - Reference Applicable UFSAR Sections within Procedures
- Improve UFSAR
 - Eliminate Procedure / UFSAR Inconsistencies

Impact of the Boron Dilution Event on St. Lucie Plant

Management Expectations

Programs and Procedures

Training

Personnel Performance

Management Performance

March 13, 1996

Florida Power and Light Company
ATTN: Mr. T. Plunkett
President - Nuclear Division
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Should you have any questions concerning this letter, please contact us.

Sincerely,

Original signed by
Charles A. Casto

Charles A. Casto, Chief
Engineering Branch
Division of Reactor Safety

Docket Nos. 50-335, 50-389
License Nos. DPR-67, NPF-16

Enclosures: 1. List of Attendees
2. FPL Presentation

cc w/enc's: See page 2

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cc w/encls cont'd: See page 3

FPL

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

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PRE-DECISIONAL ENFORCEMENT
CONFERENCE

ST.LUCIE PLANT

NRC INSPECTION REPORT

NOS. 50-335/96-03 AND 50-389/96-03

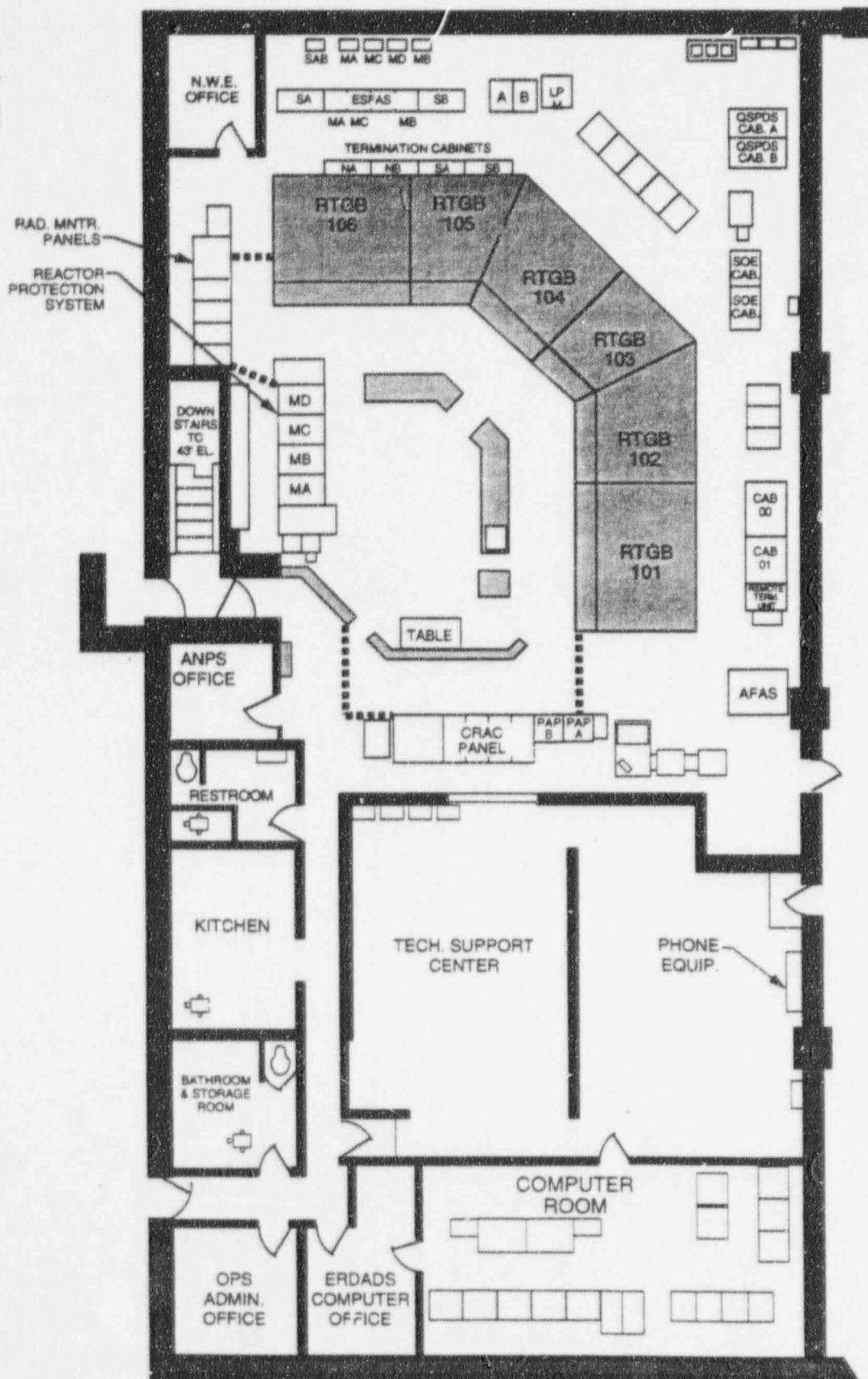
MARCH 8, 1996

ATLANTA, GA

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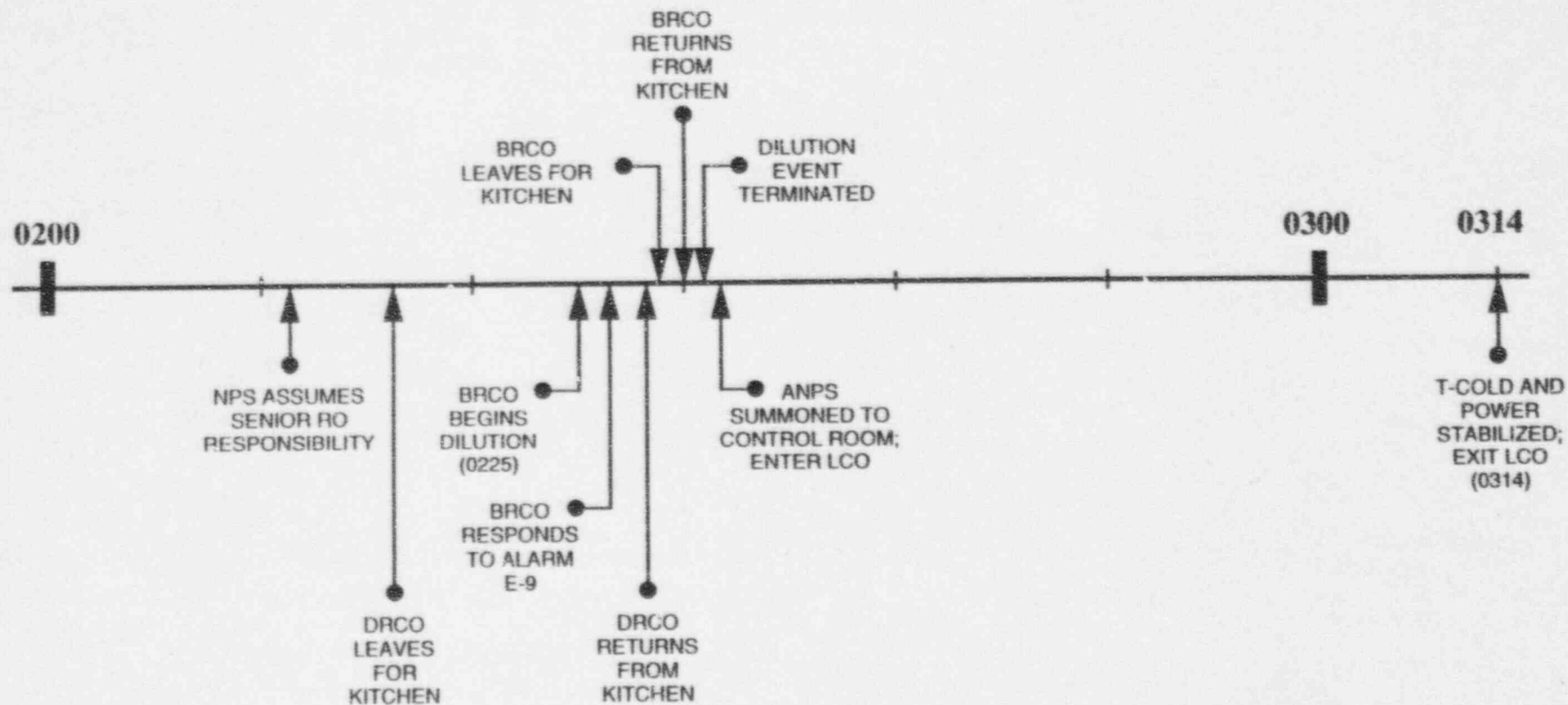
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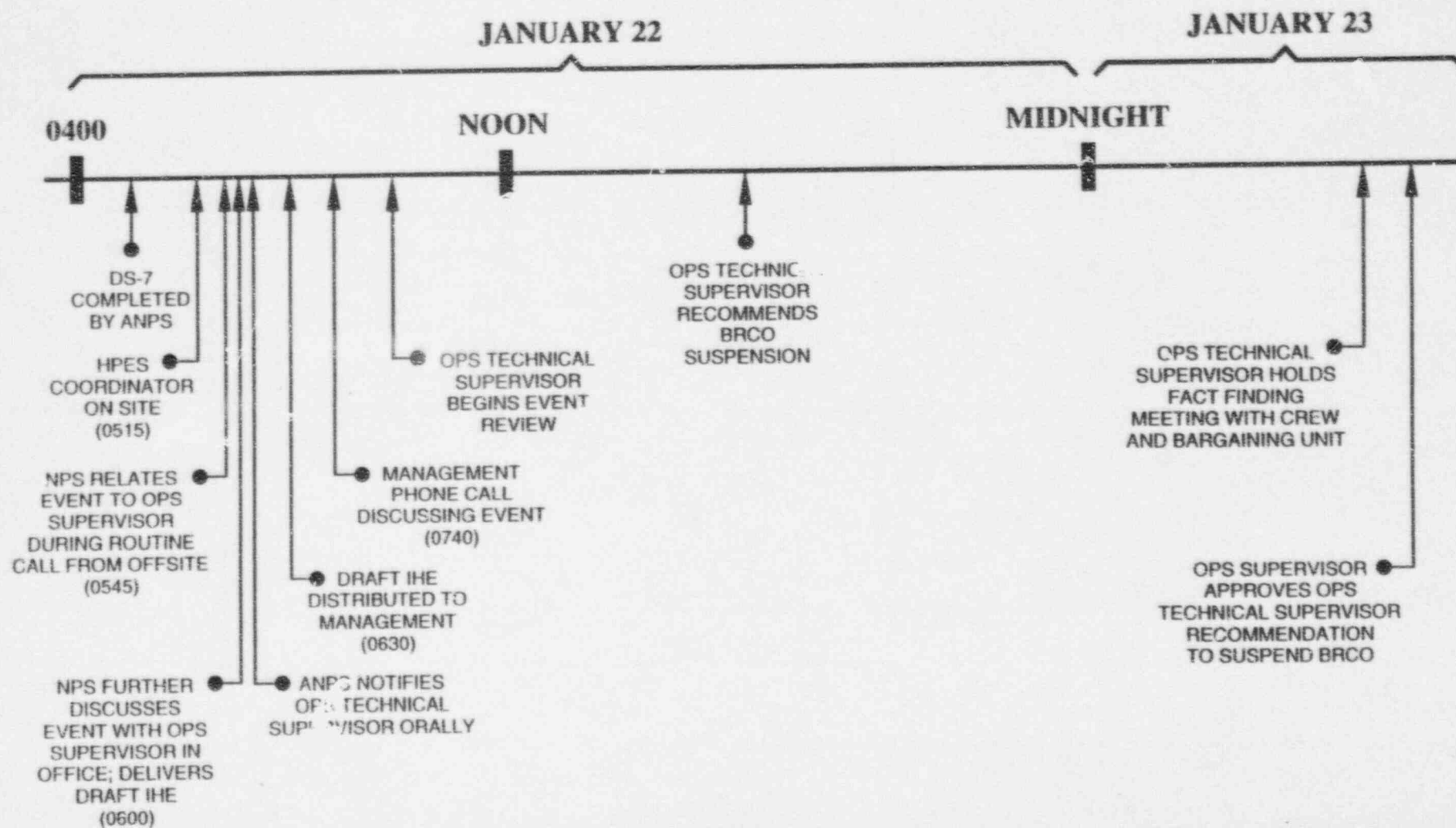
UNIT 1 DILUTION EVENT

JANUARY 22, 1996



UNIT 1 DILUTION EVENT

PROMPT ACTION



Root Cause Evaluation

PROBLEM 1:

A reactivity evolution was initiated without adequate controls.

Root Cause: Routine boron dilutions to maintain 100 percent power are not treated with the same importance as other reactivity management evolutions.

PROBLEM 2:

The plant staff's recognition of this event's significance was slow.

Root Cause: The root cause of this problem is lack of a well defined threshold for recognizing safety significance.

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Clarification of Short Term Turnover of Control Station
Responsibility

Implementation of Event Response Teams

Equipment Lessons Learned

Continued Focus on “Dark Board”

Use of “Manual” Mode versus “Automatic” Mode of Control for
Boration and Dilution

Training and Quality Assurance Lessons Learned

Lessons Learned Need to be Included in Continuing Training

*need to keep this
in constant focus.
industry events to be
reviewed -*

Effectiveness of Corrective Actions

Safety Significance

Reactor Power Peak at 101.13%

Observed Cold Leg Temperature (T_C) Maximum of 549.75F

Technical Specification Limiting Condition for Operation

ACTION Limit with $T_C > 549F$ is 2 Hours; T_C Exceeded 549F for About 50 Minutes (*which is less than 2 hrs*).

UFSAR Boron Dilution Event Licensing Basis Assumptions

Bounds Subject Boron Over-Dilution Event

DNB limits
operator would know by VET alarms

Probabilistic Safety Assessment Evaluation Concluded That the Plant's Core Damage Frequency Was Unaffected by the Event

no significant PSA

Apparent Violations B and C

Apparent Violation B - Inadequate Design Control

- Review & Conclusions
- Corrective Actions

Apparent Violation C - Inadequate 10 CFR 50.59 Evaluation

- Review & Conclusions
- Corrective Actions

Apparent Violation B

Proposed Violation:

“Design control was inadequate, ... procedures for adding ... demineralized water and boric acid to the ... [RCS] (in manual and directly to the suction of the charging pumps) did not implement the method in... Chapter 15 (in automatic and to the volume control tank), ...since January 1976 ...”

Assessment:

FPL Concurs with the Apparent Violation

- UFSAR Describes Automatic Mode as Normal in Contrast to Plant Practice:
 - 15.2.4: “During normal plant operation, concentrated boric acid solution is mixed with demineralized makeup water...and is automatically introduced into the [VCT]...”

Apparent Violation B (Cont'd)

29 volumes
for St. Lucie

Conclusions

- Design as Described in the UFSAR Is not Consistently Translated into Procedures
- UFSAR Inconsistencies with Plant Practices Need to Be Eliminated
- Safety Analysis Has Concluded No Unreviewed Safety Question

Corrective Actions

- Review and Enhance UFSAR
 - Assessment by Multi-Discipline Team (Covered ~ 1/3 UFSAR Content)
 - Complete Identification and Elimination of Inconsistencies
 - Unit 1 by mid-December 1996
 - Unit 2 by September 30, 1996
- Improve the Procedure Review Process to Include Feedback for UFSAR Update

As far as inconsistencies
650 in consistency
7500 non-mathematical
7200 it is found?
inconsistency
between practice
and FSAR.

Apparent Violation C

Proposed Violation:

“A ... 50.59 evaluation was inadequate, ... the licensee made a change to the Unit 1 boron dilution procedure on January 23, 1996 (after the event), to allow adding demineralized water in “Manual” and directly to the suction of the charging pumps, that was different from the method stated in the UFSAR, Chapter 15 (in “Dilute” and to the volume control tank) and without preparing a ... 50.59 safety evaluation.”

Assessment:

FPL Concurs with the Apparent Violation

- UFSAR Description Is Not Consistent with Plant Practices

Apparent Violation C (Cont'd)

Conclusions:

- TC 1-96-017 10 CFR 50.59 Screening Conclusions Are Not Supported by UFSAR Description
- UFSAR and 10 CFR 50.59 Screening Process Need Improving

Apparent Violation C (Cont'd)

Corrective Actions

- Improve 10 CFR 50.59 Screening Process
 - Improve Process by Documenting the UFSAR and Technical Specifications Sections Reviewed During Screening
 - Conduct 10 CFR 50.59 Training for Departments Responsible for Procedure Changes with New Emphasis on the Definition of "...procedures as described in the safety analysis report"
 - Clarify Screening Criteria
 - Reference Applicable UFSAR Sections within Procedures
- Improve UFSAR
 - Eliminate Procedure / UFSAR Inconsistencies

*Reviewed
Safety
Question*

*"touch every
page"*

*Sep/Dec 96
completion*

*Procedure
completion April*

Impact of the Boron Dilution Event on St. Lucie Plant

Management Expectations

Programs and Procedures

Training

Personnel Performance

Management Performance

*lic did a lot to cause
the problem*

*- clarity
- consistency*

*Boron dilution event was
a real wake up call
we need world class operators*