Power Level

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555

August 28, 1980

NOTE TO: R. Tedesco
T. Novak
G. Lainas

I agree with E. Jordan's memo in that further debate on this issue is probably not warranted at this time. Please ensure that your staff is aware of this interpretation and that this will be the NRC position on this matter at this time.

Darrell G. Eisenhut

Enclosure

cc: E. Jordan
J. Scinto

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UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

AUG 2 2 1980

SSINS #0200

MEMORANDUM FOR: E. J. Brunner, Chief, RO&NSB, RI
R. C. Lewis, Acting Chief, RO&NSB, RII
R. F. Heishman, Chief, RO&NSB, RIII
G. L. Madsen, Chief, RO&NSB, RIV
J. L. Crews, Chief, RO&NSB, RV

FROM: E. L. Jordan, Assistant Director for Technical Programs
Division of Reactor Operations Inspection, IE

SUBJECT: DISCUSSION OF "LICENSED POWER LEVEL" (AITS F14580H2)

Dating back at least to 1974, there have been many lengthy "discussions" regarding the exact meaning of "full, steady-state licensed power level" (and similarly worded power limits). We do not believe the real safety benefits that might be derived from an NRC-wide agreement would be worth the further expenditure of manpower in meetings, etc. that would be required to achieve a consensus.

We do realize that some common uniform basis for enforcing maximum licensed power is needed by I&E inspectors. Therefore, until and unless an NRC-wide position is put forward and agreed upon (and as stated, I&E does not propose to initiate proceedings to that end), I&E will use the following guidance.

The average power level over any eight hour shift should not exceed the "full steady-state licensed power level" (and similarly worded terms). The exact eight hour periods defined as "shifts" are up to the plant, but should not be varied from day to day (the easiest definition is a normal shift manned by a particular "crew"). It is permissible to briefly exceed the "full, steady-state licensed power level" by as much as 2% for as long as 15 minutes. In no case should 102% power be exceeded, but lesser power "excursions" for longer periods should be allowed, with the above as guidance (i.e., 1% excess for 30 minutes, 1/2% for one hour, etc., should be allowed). There are no limits on the number of times these "excursions" may occur, or the time interval that must seperate such "excursions," except note that the above requirement regarding the eight hour average power will prevent abuse of this allowance.

CONTACT: H. W. Woods, IE
49-28180

8010070 7

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The above is considered to be within the licensing basis and, therefore, acceptable to us, and it is also fair to the utilities and their ratepayers.

E. L. Jordan, Assistant Director for
Technical Programs
Division of Reactor Operations Inspection
Office of Inspection and Enforcement

cc: R. C. DeYoung, IE
S. E. Bryan, IE
B. Eisenhut, NRR
D. Ross, NRR

15.2.4 CHEMICAL AND VOLUME CONTROL SYSTEM MALFUNCTION - BORON DILUTION EVENT

15.2.4.1 Identification of Causes

The chemical and volume control system (CVCS) described in Section 9.3.4 regulates both the chemistry and the quantity of coolant in the reactor coolant system. Changing the boron concentration in the reactor coolant system is a part of normal plant operation, compensating for long-term reactivity effects, such as fuel burnup, xenon buildup and decay, and plant startup and cooldown. For refueling operations, borated water is supplied from the refueling water tank, which assures adequate shutdown margin. An inadvertent boron dilution in any operational mode adds positive reactivity, produces power and possibly temperature increases, and, in Modes 1 and 2 (startup and power operations) can cause an approach to both the DNBR and CTM limits.

Boron dilution is conducted under strict administrative procedures which specify permissible limits on the rate and magnitude of any required change in boron concentration. Boron concentration in the reactor coolant system can be decreased either by controlled addition of unborated makeup water with a corresponding removal of reactor coolant (feed and bleed) or by using the deborating ion exchanger. The deborating ion exchanger is normally used for boron removal when the boron concentration is low (<ppm) and the feed-and-bleed method becomes inefficient. A boronometer is located in a line upstream of the deborating and purification ion exchangers in the CVCS. This instrument provides a continuous measure of boron concentration and high-low boron concentration alarms.

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 demineralizer water control valve is shut automatically.

Dilution of the reactor coolant can be terminated by isolation of the makeup water system, by stopping either the makeup water pumps or the charging pumps, or by closing the charging isolation valves. A charging pump must be running in addition to a makeup water pump for boron dilution to take place.

The CVCS is equipped with the following indications and alarm functions, which will inform the reactor operator when a change in boron concentration in the reactor coolant system may be occurring:

a) Boronometer high and low alarms and concentration indication

b) Volume control tank level indication and high and low alarms

DDD/103

c) Makeup flow indication and alarms

d) Volume control tank isolation.

Changes in boron concentration while the reactor is on automatic control at full power are compensated for by repositioning the CEA's. However, to assist the reactor operator in maintaining an adequate shutdown margin, CEA insertion below a position that would provide a minimum of one percent shutdown margin (assuming one stuck CEA) is accompanied by control room alarms. 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.

15.2.4.2 Analysis of Effects and Consequences

15.2.4.2.1 Method of Analysis

The time required to achieve criticality from a subcritical condition due to boron dilution is based on the initial and critical boron concentrations, the boron reactivity worth, and the rate of dilution. Reactivity increase rates due to boron dilution are based on the boron worth and the dilution rate.

Cases have been analyzed for all six operational modes, i.e., power operation, startup, hot standby, hot shutdown, cold shutdown, and refueling.* In each case, it is assumed that the boron dilution results from pumping unborated demineralized water into the reactor coolant system at the maximum possible rate of 132 gpm (3 x 44 gpm per charging pump) and that the boron concentrations are uniform at all times.

The boron dilution rate is calculated by CESEC for all cases except dilution during refueling. CESEC described in Section 15.1.4-1 divides the reactor coolant system into 15 control volumes with the continuity equation being satisfied by all nodes. The charging rate of non-borated water and the boron content of the system are inputs to CESEC. The maximum dilution rate (10.5 ppm/minute) occurs at the initiation of the transient. For dilution during refueling the reactor coolant system is assumed to be one control volume with the boron concentration calculated by: the time rate of change of boron equals flow in times the boron concentration minus flow out times boron concentration.

The uniformity of the boron concentration can be assured for the different modes of operation as follows:

a) During refueling

Prior to cooldown, the reactor coolant system boron concentration is increased to a minimum of 1720 ppm. The boron is mixed by the reactor coolant system pumps. Because the boron is chemically dissolved in the reactor coolant, it will not precipitate. The only possible means of obtaining a nonuniform solution is by the addition of demineralized water via the charging pumps. However, because the maximum water

* An additional boron dilution event would be via the Iodine Removal System (NaOH spray additive). This event is not governing, however. See Reference 42.

MAR 12 1996 / RAC on this. At Staff mtg this morning Seniors - there are other issues in this report that don't rise to VIOs but should have been looked at as precursors.

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,

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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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 Date Signed
Reactor Inspector

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, Chief Date Signed
Engineering Branch
Division of Reactor Safety

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.

TABLE OF CONTENTS

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.

1/21/96

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.

1/22/96

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:

	RO (initial)	SRO (initial)	Requalification
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 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 ... 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, ... 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.

Type	Item Number	Status	Description and Reference
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
SRO	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