UNITED STATES
NUCLEAR REGULATORY COMMISSION
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October 24, 1990

Docket No. 50-302

Mr. Percy M. Beard, Jr.
Senior Vice President,
Nuclear Operations
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ATTN: Manager, Nuclear Operations
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Dear Mr. Beard:

SUBJECT: CRYSTAL RIVER UNIT 3 - SAFETY AND PERFORMANCE IMPROVEMENT PROGRAM IMPLEMENTATION AUDIT (TAC NO. 68200)

Enclosed is our evaluation report on the implementation of the Babcock & Wilcox Owners Group's Safety and Performance Improvement Program (SPIP) at Crystal River, Unit 3 (CR-3). This evaluation is based on a staff audit at the Florida Power Corporation (FPC) headquarters in St. Petersburg, Florida and the CR-3 site in Crystal River, Florida during the week of June 25 through 28, 1990. The audit was conducted with assistance of Idaho National Engineering Laboratory consultants.

The staff audit of SPIP implementation was conducted in two phases: (1) a programmatic audit to evaluate the commitment and involvement of corporate management and the site organization in the SPIP, and the process for disposition of SPIP technical recommendations (TRs), and (2) an implementation audit to perform more detailed review of the implementation and disposition of individual SPIP TRs. We had completed the programmatic audit in 1989 and transmitted our report on that audit to you by letter dated November 1, 1989. This implementation audit completes Phase 2 of the SPIP audit.

As a result of our implementation audit, the staff finds that the TRs: (1) had been satisfactorily implemented or were in the process of being satisfactorily implemented; (2) had acceptable analysis that verified that the existing plant procedures or design met TR intent; (3) had acceptable justification basis for rejection; and (4) had acceptable analysis to support non-applicability. The staff also found that good communication channels existed between FPC headquarters and CR-3 personnel.

In our previous programmatic audit, we expressed concern that FPC has not completed closure of certain TRs that required plant modification in a timely manner, and that in some cases, TRs closed prior to implementation of the current SPIP program lacked adequate documentation to support conclusions regarding TR disposition. During the implementation audit, the staff found that FPC and CR-3 had satisfactorily upgraded the TR files in accordance with the programmatic audit recommendations. In addition, based on our review of the TR status summary, we found that more than 80 percent of the TRs had been closed, and by the end of Cycle 8 refueling outage in late-1992, all the remaining TRs

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except TR-98-MFW, which is under review as required by GL 89-19, will be completed. Since the current SPIP program was not implemented until the end of Refueling Cycle 6, and since CR-3 is on a 2-year refueling cycle, we found that the TRs are being implemented in a timely manner and that the previous concern of implementation timeliness had been satisfactorily resolved. Therefore, the staff concludes that FPC had adequately strengthened the areas of concern identified in the programmatic audit report, and that Florida Power Corporation had established a SPIP program that satisfactorily controls the disposition and the implementation of the BWOG SPIP TRs.

This completes our effort on TAC No. 68200.

Sincerely,

(Original Signed By)

Harley Silver, Project Manager
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Enclosure:
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ENCLOSURE

SAFETY AND PERFORMANCE IMPROVEMENT PROGRAM
IMPLEMENTATION AUDIT
FLORIDA POWER CORPORATION
CRYSTAL RIVER, UNIT 3

1.0 SAFETY AND PERFORMANCE IMPROVEMENT PROGRAM AUDIT

1.1 Introduction

From June 25 to 28, 1990, the Nuclear Regulatory Commission (NRC) staff conducted an implementation audit of the Safety and Performance Improvement Program (SPIP) at Florida Power Corporation's (FPC) corporate office in St. Petersburg and at the Crystal River Unit 3 (CR-3) site in Crystal River, Florida. The SPIP program was developed by the Babcock & Wilcox Owners Group (BWOG) in order to reduce both the number of reactor trips and the complexity of post-trip response. The purpose of this audit was to evaluate the BWOG SPIP technical recommendation (TR) implementation at CR-3.

1.2 Background

After the accident at Three Mile Island, Unit 2 (TMI-2), nuclear power plant owners made a number of improvements to their facilities. Despite these improvements, the NRC staff was concerned that the number and complexity of events at B&W nuclear plants had not decreased as expected. This concern was reinforced by the loss-of-feedwater event at Davis-Besse Nuclear Power Station on June 9, 1985, and the overcooling transient at Rancho Seco Nuclear Generating Station on December 26, 1985.

By letter dated January 24, 1986, the NRC Executive Director for Operations (EDO) informed the Chairman of the BWOG that a number of recent events at B&W-designed reactors should be reexamined. In its February 13, 1986, response to the EDO's letter, the BWOG committed to lead an effort to define concerns relative to reducing the frequency of reactor trips and the complexity of post-trip response in B&W plants. The BWOG submitted a description of the B&W program entitled "Safety and Performance Improvement Program" (BAW-1919) to the NRC staff on May 15, 1986. Five revisions to BAW-1919 have also been submitted. Included in BAW-1919 were specific tasks identified as Technical Recommendations (TRs) to be completed by each utility under the SPIP program.

The NRC staff reviewed BAW-1919 and its five revisions and presented its evaluation in NUREG-1231, dated November 1987, and in Supplement No. 1 to NUREG-1231 dated March 1988. The NRC staff had previously performed an audit of the BWOG's disposition of TRs that were developed by various BWOG committees and task groups. The results of that audit, which were favorable, were reported in NRC Inspection Report 99900400/87/01. However, the staff determined that an NRC audit program to ensure the quality of each utility's program used to control the disposition and implementation of TRs is necessary since the majority of the recommendations developed by the BWOG did not provide specific design details.

Initially, a programmatic audit was conducted that evaluated the adequacy of the SPIP programmatic process and TR disposition. This was followed by an implementation audit that evaluated the adequacy of TR implementation.

1.3 BWOG Recommendation Categories

All BWOG recommendations are to be tracked through closure. The following categories have been selected as "bins" to be used by the utility when assigning tracking status. These categories, as well as explanatory notes, are addressed in the BWOG Recommendation Tracking System (RTS), in BAW-1919, and in NUREG-1231.

Evaluating for Applicability (E/A)

The recommendation is being evaluated by the utility for applicability to their particular plant. The evaluation may conclude that the recommendation (a) is not applicable, (b) was implemented previously and is operable, or (c) if applicable, requires further evaluation to determine if it should be implemented.

Evaluating for Implementation (E/I)

An evaluation of the recommendation for applicability has been completed, and the recommendation is now being evaluated to determine if it should be implemented.

Implementing (I)

Utility evaluation is complete and the need for software/hardware changes to meet the intent of the recommendations has been identified.

Software changes have been assigned to the appropriate organization and are scheduled and budgeted. Hardware changes have been assigned to the appropriate organization for implementation, funding is approved, and the changes are included in a corporate plan for implementation.

Additional comments on implementation status or method of implementation are appropriate.

Closed/Operable (C/O)

Utility meets the intent of the recommendation, and implementation is complete.

Review of existing plant software or hardware results in a conclusion that the intent of recommendation is already met. If software changes were required, new/revised training procedures, training plans, etc. are approved and issued. Personnel are trained and procedures issued.

Closed/Not Applicable (C/NA)

Utility evaluation determines that the recommendation does not apply to plant-specific configuration; no past experience of underlying problems has occurred.

Software/hardware of concern does not exist, and existing software/hardware is such that a similar problem could not develop at their plant.

Additional comments on why it is not applicable are required.

Closed/Rejected (C/R)

Utility evaluation determines software/hardware changes meeting the intent of the recommendation are unacceptable and will not be implemented.

Recommendations may be unacceptable because:

(1) Implementation would not result in an overall improvement in plant safety or performance.

(2) Implementation of recommendation as described would not effectively resolve problem of concern.

(3) Resources required for implementation are excessive for expected plant improvement or benefit.

Additional comments on why it is rejected are required.

1.4 Programmatic Audit - Scope and Summary

The NRC staff has performed the SPIP Programmatic Audits at five utilities having B&W-designed reactors. The Programmatic Audit included an evaluation of (1) the process used to control BWOG SPIP TR disposition, (2) the adequacy of TR file documentation, (3) corporate and site organizational involvement in the SPIP process, (4) the disposition of approximately 34 selected TRs, and (5) the disposition and implementation status of the approximately 222 BWOG SPIP TRs.

As a result of the programmatic audit at CR-3 in February 1989, the staff found that:

(1) FPC headquarters and CR-3, using the existing organizational structure, had established a formal, proceduralized SPIP program that adequately controlled TR disposition;

(2) CR-3 had established and maintained TR files which contained complete and accurate information for those files developed after the implementation of the current SPIP program. However, for those TR files developed prior to the current SPIP program, the staff recommended that CR-3 upgrade these files by including statements in the TR files addressing the disposition action taken and any engineering analysis performed and provide a brief description of the modification implemented and the associated modification approval record, including a copy of the TR closure memo;

(3) The decisions made regarding TR intent and applicability during the E/A and E/I reviews were satisfactory and led to proper TR disposition, and that the SPIP program included the necessary self assessment mechanisms to ensure the continued adequacy of the decisions regarding TR disposition;

(4) TRs were being implemented in a timely manner with the exception of those TRs which required a plant hardware change for implementation;

(5) There was evidence of adequate corporate and site management involvement in the SPIP program and that personnel involved in the SPIP program were knowledgeable with respect to their SPIP duties and responsibilities and that good communication channels existed between SPIP organizations.

These conclusions were documented in the letter, H. Silver to P. Beard, "Programmatic Audit of the Safety and Performance Improvement Program at Crystal River, Unit 3" dated November 1, 1989.

These staff concerns can be summarized as: (1) inadequate TR file documentation, i.e., in some cases TRs which were closed prior to the implementation of the current SPIP Program lacked adequate documentation to support conclusions regarding TR disposition; and (2) tardiness of TR implementation, i.e., closure of TRs that required plant modification had not been completed in a timely manner.

1.5 Implementation Audit - Scope

The SPIP implementation audit included an evaluation of selected TR files to determine if (1) plant modification met the intent of the TR, (2) the operating, training and/or maintenance procedures implemented met the intent of the TR, (3) the engineering analysis used to verify that the existing plant design and/or existing procedures met the intent of the TR was adequate, (4) the basis used to reject a TR was adequate, and (5) communication channels and interfaces between the corporate and site management, operations, training, and maintenance were adequate. The results of the implementation audit at CR-3 are documented in the Section 3.2 of this report.

2.0 FPC AND CR-3 TR IMPLEMENTATION

Presently, the Director, Nuclear Operations Site Support exercises oversight of the CR-3 SPIP program and also serves as the BWOG Steering Committee representative. The Supervisor, Nuclear Licensing, is responsible and accountable for the overall CR-3 SPIP program. Nuclear Operations Department Procedure NOD-15 formally establishes the methods and responsibilities associated with processing the BWOG SPIP TRs. In addition, Nuclear Licensing Procedure NL-11 formally defines the methods and responsibilities that assure adequate review, tracking, resolution, and proper disposition of TRs. TR implementation is achieved through normal (existing) plant procedures/processes. The Nuclear Operations Department Tracking and Expediting System (NOTES) is used by the FPC Compliance Group to monitor the progress of each TR and assure that the projected schedules are met.

The Supervisor, Nuclear Licensing, is responsible for the implementation and closure of each TR. The appropriate documentation is attached to a closure memo and reviewed and signed by the reviewer, the Supervisor of Nuclear Licensing, the director of the department responsible for implementation of the TR, and the BWOG Steering Committee Representative. Following distribution of the closure memo, the FPC Compliance Group updates NOTES to reflect the new closed status.

3.0 REVIEW OF SELECTED RECOMMENDATIONS

3.1 Audited TR Selection Criteria

The staff reviewed 16 TR files and associated documentation and evaluated the timeliness and acceptability of TR implementation. These TRs were selected based on NUREG-1231, "Safety Evaluation Report Related to Babcock and Wilcox Owners Group Plant Reassessment Program," the most recent Recommendation Tracking System (RTS) report, and the "Programmatic Audit Report - Safety and Performance Improvement Program at Crystal River, Unit 3." A broad selection of TRs were selected so that representative samples from the following categories were reviewed: (1) TRs that required further attention based on the concerns identified during the programmatic audit, (2) TRs designated "key" by the BWOG and TRs designated high priority by the NRC staff, (3) TRs that required a plant software change for closure, (4) TRs that required a plant hardware change for closure, (5) TRs of major importance based on individual plant operating experience, and (6) TRs that were rejected by the individual utilities. A listing of TRs reviewed and TR status at the conclusion of the SPIP Implementation Audit is contained in Appendix A.

3.2 Results of Staff Review

During the course of the SPIP implementation audit, the staff reviewed the TR files, plant drawings, plant modification packages, training documents, operating procedures, and maintenance procedures associated with the selected TRs. In addition, the staff conducted interviews with FPC and CR-3 personnel to obtain supplemental information and resolve concerns found during the audit. The staff also performed in-plant walk-downs to verify the accuracy of the above reviewed paperwork and information received during the interviews.

As a result of this audit, the staff found evidence that the TRs reviewed had been satisfactorily implemented or were in the process of being satisfactorily implemented, had acceptable analysis that verified existing plant procedures or design met TR intent, had acceptable justification basis for rejection, and had acceptable analysis to support non-applicability. The staff also found that good communication channels existed between FPC and CR-3 personnel and that the TRs were being implemented in a timely manner. A brief discussion of the TR documentation reviewed as well as any exceptions to the above are discussed below.

TR-138-IAS, Categorized C/R

This TR recommended that the utility install a check valve downstream of each air compressor aftercooler as this would enhance the reliability of the instrument air system by preventing a rapid decrease in system pressure following failure of an air compressor. The rejection was based on the following: (1) each air compressor is equipped with suction and discharge Reed (check) valves which prevent back-flow and loss-of-air in all cases except a catastrophic air compressor failure, (2) installing a check valve immediately downstream of the air compressor would result in severe cycling stresses on the valve as the existing air compressors are of the single cylinder reciprocating type, (3) installing a check valve downstream of the air receiver would result in excessive pressure oscillations in the entire system (when a single air compressor is secured) as the surge volume would be removed, and (4) the installation of check valves as discussed in (2) and (3) would not increase system reliability or performance. The staff reviewed the basis for rejection, found it acceptable, and therefore, concluded that TR-138-IAS was justifiably rejected.

TR-144-IAS, Categorized C/O

This TR recommended that the utility develop or upgrade its loss of instrument air procedure as this would enhance the operators ability to respond to loss-of-air events. In accordance with the TR intent, the procedure should address the loss and restoration of instrument air, including (1) valve failure air pressures, (2) air using component failure positions, (3) isolation valve locations, and (4) a requirement for an administrative reactor shutdown/trip on low air pressure. Also, emphasis should be placed on post-trip control for air-controlled components and on control of the decay heat removal system. FPC and CR-3 developed Procedure AP-470, Loss of Instrument Air. The staff reviewed this procedure and associated documentation, found it acceptable, and therefore, concluded that TR-144-IAS was satisfactorily implemented.

TR-178-ICS, Categorized I

This TR recommended that each utility ensure that the plant goes to a known safe state (KSS) on loss of power to the ICS/NNI systems, as this would reduce the number of inadvertent transients caused by unexpected plant responses and would also reduce the demands placed on operators during transient conditions. FPC and CR-3 (1) developed a list of instruments and controls necessary to achieve KSS, (2) performed an evaluation of the failed positions of the various ICS/NNI controlled components to determine what position would have the least effect of plant operations, (3) performed an evaluation to assure the KSS is achieved using the present signal lineup, provided indication of the power supply necessary for operation of the components, (4) installed an alarm for loss of ICS/NNI AC power to preclude the required manual action to trip MFW, and (5) provided an analysis that addressed the control system and plant response for the scenarios associated with loss of ICS/NNI power. The licensee had developed specific procedures, e.g., AP-581 Loss of NNI-X, to address the above concerns. The staff reviewed the above information, performed an in-plant walk-down using AP-581, found all to be acceptable, and therefore, concluded that TR-178-ICS was satisfactorily implemented to date.

The remaining items necessary to complete TR closure is the operations department review of loss of specific component effects on the electrical loading of other instruments and controls in associated circuits. The results of these reviews may require changes to specific operating procedures.

TR-181-OPS, Categorized C/O

This TR recommended that each utility verify the adequacy of the instrumentation and displays used to assure and control the Abnormal Transient Operating Guidelines (ATOG) stability parameters, as this would reduce transient severity. The staff reviewed the file documentation and performed an in-plant walk-down to observe the instrumentation and displays, found that the required generic Category C events, i.e., loss of off-site power, loss of ICS/NNI, small steam leaks, loss of MFW and EFW, and excessive EFW flow, were adequately addressed, and therefore, concluded that TR-181-OPS was satisfactorily implemented.

TR-219-OPS, Categorized C/O

This TR recommended that each utility include plant response for turbine runback below 45% power in the operator training program, as this would reduce the number of reactor trips due to turbine trips that occur at power levels less than 45%. The staff reviewed Lesson Plan ROT 5-29 which addresses AP-660 "Turbine Trip Without a Reactor Trip", Lesson Plan ROT-4-14, which addresses the Integrated Control System and the Unit Load Demand (ULD) effects on turbine controls and runbacks, and Simulator Lesson Plan ROT-7-24D, which provides simulator training for turbine trip at less than 45% power. The staff found the above to be acceptable, and therefore concluded that TR-219-OPS was satisfactorily implemented.

TR-013-ICS, Categorized C/O

This TR recommended that each utility install the necessary equipment to prevent the loss of + or - 24VDC power to the ICS/NNI following the loss of a single power source as this would reduce the probability of loss of NNI and the resultant plant transient that may lead to a Category C event. Backup power is supplied through automatic transfer switches which transfer power from VBDP-6 to VBDP-7 for NNI-Y, from VBDP-5 to VBDP-1 for NNI-X, and from VBDP-4 to VBDP-2 for the ICS, following normal power source failures. The staff reviewed the support documentation for the above, found it acceptable, and therefore, concluded that TR-013-ICS was satisfactorily implemented.

TR-105-ICS, Categorized as I

This TR recommended that each utility perform a field verification of the ICS/NNI drawing and update them accordingly as this would assure that plant staffs have complete, accurate drawings of the NNI/ICS systems. FPC Interoffice Correspondence (IOC) NEA-90-0454, dated March 9, 1990, extends the NOTES due date for completion of the I-phase from May 1, 1990 to December 31, 1990. The staff found that utility plant walk-downs of the ICS/NNI were completed, and that some design change notices (DCN) were implemented to resolve deficiencies, and that additional DCN's would be issued to resolve any additional deficiencies found during the module and termination cabinet

walk-downs. In addition, the photo/manual enhancement of the drawings and the resolution of deficiencies found on the ICS/NNI external connection drawings are also required to close this TR. The staff reviewed the basis for delay, completed drawing updates, and associated file documentation, found all to be acceptable, and therefore concluded that TR-105-ICS was being satisfactorily implemented to date.

TR-190-ICS and TR-191-ICS, both Categorized C/O

TR-190-ICS recommended that the utility develop backup manual or automatic controls for pressurizer level and pressurizer pressure control powered from an alternate power source, as this would increase the operators ability to maintain pressurizer level and pressure control during a loss of NNI power or an input pressure signal failure. TR-191-ICS recommended that CR-3 separate condensate flow control from NNI-Y power as this would reduce transient response complexity and eliminate reactor trips due to NNI-Y power failures. During the E/I phase, the licensee determined that no changes were required for pressurizer pressure control as the analog-controlled pressurizer heater banks would fail to zero on loss of NNI-X power and that existing plant design allowed for manual on/off control of pressurizer heater banks under this condition. Backup controls for pressurizer level control and condensate flow control were developed and implemented to meet the full intent of these TRs. The staff reviewed the above, found it acceptable, and therefore concluded that TR-190-ICS and TR-191-ICS were satisfactorily implemented.

TR-119-PES, Categorized C/O

This TR recommended that preventive maintenance procedures be implemented for the maintenance of electrical buses, as this would significantly reduce the likelihood of catastrophic bus failure which could create both a plant operational problem as well as a personnel safety hazard. FPC had preventive maintenance procedure PM-119, Rev. 7, in place. The staff reviewed the procedure, found that it adequately addressed the TR intent, and therefore, concluded that TR-119-PES had been satisfactorily implemented.

TR-066-MFW and TR-179-MFW, both Categorized I

TR-066 recommended that each utility check all condensate/feedwater system protective circuits, interlocks, motors, and other necessary electrical equipment for system operation to ensure that no single electric failure would cause a loss of both feedwater trains. TR-179 recommended that each utility evaluate and identify areas for enhancing the reliability of the condensate/feedwater systems and controls with attention given to preventing the failure of an active component from causing a loss of all feedwater (FW), and to make changes identified in this evaluation as practical.

In June 1988 FPC changed the status of TR-066-MFW from E/A to E/I, contacted B&W and purchased an ongoing study, B&W Report DOC 51-1171279-01, "MFW Reliability Improvement Program," dated December 20, 1988, that identified all single failures in the MFW and support systems in the CR-3 plant. The results of the B&W evaluation were contained in B&W report DOC 51-1171279-01, "MFW Reliability

Improvement Program," dated December 20, 1988. The B&W study identified a total of 14 single failures within the feedwater system, condensate system, electrical distribution MCC/panels, gland seal steam system, gland seal water system, turbine drain system, and secondary service component cooling system. These 14 single failure points were prioritized based on their impact on plant operation. In addition, B&W included 19 recommendations which should be considered to enhance system reliability.

Two of the 14 single failures were identified as having a low probability of occurrence but having a "high" impact on plant operations, i.e., the single failure would cause an immediate or very short-term plant trip. These two items are Deaerator Storage Tank high level switch (FW-4-LS) and low-level switch (FW-311-LS). A failure of FW-04-LS or FW-311-LS could result in a trip of both condensate pumps or both booster pumps, respectively, and therefore could result in a complete loss of both feedwater trains. These two items were assigned to TR-066-MFW under FPC modification approval report MAR-86-05-09-01. The remaining 12 single failures were determined to have a medium-to-low impact on plant operations. The 12 single failures, along with the 19 additional B&W recommendations and the 10 FPC internally generated recommendations, were considered reliability enhancement items and were scheduled to be implemented in accordance with MAR-87-02-30-05 under TR-179-MFW.

In regard to the single failure concern of TR-066-MFW, FPC determined the need to add two additional level switches, one to supplement FW-04-LS and one to supplement FW-311-LS, and revise the condensate and booster pumps control switch schemes such that a single failure would not trip both main feedwater (MFW) trains. Detailed designed work is scheduled to begin in March 1990 with installation scheduled for Refuel VIII (in mid-1992).

With regard to TR-179-MFW, FPC had reviewed the potential reliability enhancement items to determine whether they were covered by other SPIP TRs, whether they would enhance CR-3 MFW reliability, and whether they were cost effective. As a result of this evaluation, a complete list of items recommended for implementation was generated. These reliability enhancement items are scheduled for implementation during Refuel 8, in accordance with MAR 87-02-30-05.

In an October 30, 1989 speed letter, FPC addressed an additional possible single failure in the MFW system. FWV-28 is an 18" motor-operated gate valve that cross ties MFW trains A and B downstream of the MFW pump discharges. The BWOG audit indicated that a failure of the FW crossover valve to open would result in closure of the MFW block valves (FWV 29/30) via an interlock, thus causing a loss of main feedwater. However, FPC stated that the operators are trained to respond to this type event and prevent a loss of MFW, therefore a system modification is not required.

The staff reviewed and evaluated the above information, found all to be acceptable, and therefore concluded that TR-066-MFW and TR-179-MFW had been satisfactorily implemented to date.

TR-071-MFW, Categorized C/O

This TR recommended the installation of valve position indication for the startup and main feedwater regulating valves or low load control valves, as it would provide true valve position and eliminate confusion and allow faster operator response during transient conditions.

The CR-3 feedwater configuration has three parallel feedwater paths to each steam generator, i.e., main, low load, and startup flow paths. Flow regulating valves are only installed in the startup and low load lines. When flow demand exceeds 50%, the ICS controls FW flow by varying the speed of MFW pump turbine. Therefore, the only CR-3 valves affected by this TR are the low load valves FWV-37 and 38, and startup valves FWV-39 and 40.

This TR was closed by implementing MAR 86-05-09-05, "Feedwater Valve Position Indication," which required: (1) analog position indicators be added to the MCB-ICS Section and located above their associated valve auto/manual stations, (2) Bailey RQ-20 electronic analog position transmitters be yoke-mounted on each of the four regulating valves, and (3) that four single-loop 24 VDC power supplies be installed on the rear of and inside the MCB to supply power to the 4-20 MADC current loops.

The staff concluded that TR-071-MFW was satisfactorily implemented.

TR-098-MFW, Categorized as E/I

This TR recommended that the MFW system design include an operational automatic overfill protection system in order to prevent a loss of heat sink or water inventory in the main steam lines.

The original CR-3 emergency feedwater initiation and control (EFIC) system design submitted to NRC included such an overfill protection system. However, the steam generator overfill protection feature was removed from the EFIC system because of a concern over MFW pump trips due to fluctuations in steam generator level, as level is maintained close to the SG aspiration ports level and the EFIC high level trip setpoint. FPC performed an evaluation and concluded that safe operation with the steam generator overfill trip feature disconnected could be continued, and therefore, this TR was originally categorized C/R.

However, this TR was reopened on June 22, 1990 and categorized E/I, based on the suggestions of NRC Generic Letter 89-19, "Request for Action Related to Resolution of Unresolved Safety Issue A-47," which requires that all PWR plants provide automatic steam generator overfill protection. The E/I phase will begin Janaury 2, 1991 and is scheduled to be completed by March 31, 1992. FPC responded to GL 89-19 in a letter dated March 9, 1990, which stated that an appropriate system will be developed to protect against steam generator overfill. Implementation of TR-098-MFW will be during Fuel Cycle 9 (1992-1994) commensurate with construction work package development and material delivery. This schedule is based on the following considerations: (1) there is a low probability of an overfill event because adequate instrumentation and procedures are available to aid in manual operator actions, (2) sufficient indications are available for the operators to recognize overfill problems, and (3) there is adequate time

for the operators to react to an overfill condition. In addition, the FPC letter also expressed concerns that the GL 89-19 recommendation may not have fully considered the integrated effects of all of the installed and proposed control systems associated with the MFW system. Since the NRC staff is currently reviewing and evaluating the implementation of GL 89-19, this TR should be implemented based on the resolution of GL 89-19. FPC may be required to take additional actions to ensure satisfactory implementation of TR-098-MFW.

TR-155-EFW, Categorized C/O

This TR recommended that each utility: (1) consider a means to limit the maximum flow rate delivered by the emergency feedwater (EFW) system, (2) make plant-specific modifications to limit EFW flow when once-through-steam-generator (OTSG) level is increased to the natural circulation level setpoint for plants without auto flow limits, and (3) determine whether an EFW pump runout condition is possible at their plant and evaluate the consequences.

The basis for this recommendation is to ensure that EFW flow to the OTSGs is limited in order to reduce the potential for overcooling of those plants having EFW capacity significantly in excess of that needed for decay heat removal, and to prevent EFW pump runout following a rupture of a MFW or EFW line, or a steam line break. CR-3 had previously installed EFIC, which has a built-in level rate control system that regulates the OTSG fill rate and maintains the natural circulation setpoint. The OTSG fill rate is controlled using OTSG outlet pressure so that the system will initially supply high EFW flow (8 inches/minute at 1050 psig) for high decay heat levels, but will automatically throttle back (2 inches/minute at 800 psig) if overcooling becomes apparent as evidenced by decreasing OTSG pressures.

During the Cycle 6 refueling outage, a modification was made via modification approval record MAR-86-05-25-01 to alter part of the EFW control valve circuitry in order to limit the EFW flowrate and provide pump net positive suction head (NPSH) protection. The EFW flow control circuitry acts to partially close the control valves when the EFW flow exceeds 600 gallons per minute (gpm).

Despite the EFIC system limitations on EFW flow, it may be necessary for the operators to further reduce flow in certain low power/low decay heat scenarios. There is adequate guidance in procedures to avoid exceeding maximum allowable cooldown rates. Step 3.15 of AP-450, "EFW Actuation," directs the operators to maintain allowable RCS cooldown rates once EFW has been initiated.

With regard to the concern over the EFW pump runout during OTSG depressurization, FPC contracted Gilbert/Commonwealth Corporation to perform a hydraulic analysis of the EFW system (W.O. 045510 140, dated December 1, 1987. The analysis calculated the available and required NPSH at various pump/OTSG combinations, control valve positions and OTSG pressures. The results showed that if the EFW control system limits EFW flow to 650 gpm per pump or less, sufficient NPSH is available to prevent pump cavitation. Since the EFIC system limits the EFW flow to less than 600 gpm, there is no concern over pump cavitation.

The staff reviewed the above information, found it acceptable, and therefore concluded that TR-155-EFW was satisfactorily implemented.

TR-163-EFW, Categorized C/O

This TR recommend that each utility review the EFW surveillance and test procedures to ensure that components used in emergency or abnormal operating procedures are included in those procedures, and that these components are tested as near as possible to the expected operating conditions to demonstrate EFW system and component operability, thus enhancing the overall plant reliability.

FPC had reviewed all applicable emergency and abnormal procedures, compiled a list of all components and/or functions of the EFW and EFIC systems, and evaluated the specific surveillance procedures that test these components. As a result of these reviews, FPC concluded that the EFW system components used in the emergency and abnormal operating procedures are satisfactorily tested with four exceptions. These four exceptions, which were addressed by Nuclear Plant Systems Engineering, are summarized below:

(1) The use of the "manual permissive" push button after an EFW initiation, originally found not to be tested in any surveillance procedure, is tested every 18 months per SP-416, "Emergency Feedwater Automatic Initiation."

(2) EFW is never initiated and supplied to the steam generators, nor is the auto level control checked under real flow conditions. However, SP-435, "Valve Testing During Cold Shutdown," is performed every 18 months and after every mode 5 or 6 outage that lasts for more than 30 days. It is CR-3's policy to run a full-flow test whenever a major change is made to the control room. Otherwise, the flow test in SP-435 and electronic checks in SP-416 are performed to verify adequate flow paths and control.

(3) The EFW tank level indication was checked in a functional test during Refuel 6 and it was confirmed that SP-169A has been revised and now includes a calibration of the EFW tank level string.

(4) The hot well level transmitter and level switches have scheduled calibration intervals of 24 and 36 months under the approved PM-200 periodic calibration program. The staff reviewed the above information, found it acceptable, and therefore concluded that TR-163-EFW had been satisfactorily implemented. However, the safety-related motor-operated valve testing and surveillance program is currently under NRC staff review per requirement of GL 89-10. This TR implementation should be consistent with the resolution of GL 89-10.

4.0 CONCLUSIONS - SPIP PROGRAMMATIC AND IMPLEMENTATION AUDITS

During the programmatic audit, the staff reviewed the disposition of 34 TRs and found that evidence of adequate FPC corporate and site management involvement in the SPIP process, and determined that a formal, well-documented proceduralized SPIP process had been used at CR-3 to control the disposition of TRs. The staff also found that: (1) FPC has not completed closure of certain TRs that required plant modification in a timely manner, and (2) in some cases, TRs closed prior to implementation of the current SPIP program lacked adequate documentation to support conclusions regarding TR disposition.

During the implementation audit, the staff reviewed the implementation of 16 TRs. Several of these TRs were identified during the programmatic audit as TRs that would require follow-up action. As a result of the review, the staff found that the TRs: (1) had been satisfactorily implemented or were in the process of being satisfactorily implemented; (2) had acceptable analysis that verified the existing plant procedures or design met TR intent; (3) had acceptable justification basis for rejection; (4) had acceptable analysis to support non-applicability. The staff also found that good communication channels existed between FPC and CR-3 personnel.

Our previous programmatic audit found that the timeliness of implementation need strengthening. Based on our review of the TR status summary, we found that more than 80 percent of the TRs had been closed, and at the end of Cycle 8 refueling outage in mid-1992, all the remaining TRs except TR-98-MFW will be completed. Since the current SPIP program was not implemented until the end of Refueling Cycle 6, and since CR-3 is on a 2-year refueling cycle, we found that the TRs were being implemented in a timely manner and that the programmatic audit concern of implementation timeliness had been satisfactorily resolved. In addition, the staff found that FPC and CR-3 had satisfactorily upgraded the TR files in accordance with the programmatic audit recommendations. Therefore, the staff concluded that FPC had adequately strengthened the areas of concern identified in the programmatic audit report. Therefore, the staff concluded that Florida Power Corporation and Crystal River Unit 3 had established a SPIP program that satisfactorily controlled the disposition and the implementation of the BWOG SPIP TRs.

APPENDIX A

IDENTIFICATION OF TRs REVIEWED, TR STATUS, AND CONCLUSION STATEMENT

Instrumentation and Control System (ICS)
Instrument Air System (IAS)
Motor Operated Valves (MOV)
Emergency Feedwater (EFW)
Operations (OPS)
Plant Electrical Systems (PES)
Main Turbine System (MTS)
Main Feedwater System (MFW)

TR	Status 6/28/90	Comments on Implementation/Recommendations
013-ICS	C/O	Satisfactorily Implemented
105-ICS	I	Satisfactory Implementation to date
119-PES	C/O	Satisfactorily Implemented
190-ICS	C/O	Satisfactorily Implemented
191-ICS	C/O	Satisfactorily Implemented
066-MFW	I	Satisfactory Implementation to date
179-MFW	I	Satisfactory Implementation to date
071-MFW	C/O	Satisfactorily Implemented
098-MFW	E/I	Satisfactory Implementation to date
155-EFW	C/O	Satisfactorily Implemented
163-EFW	C/O	Satisfactorily Implemented
138-IAS	C/R	Justifiably Rejected
144-IAS	C/O	Satisfactorily Implemented
178-ICS	I	Satisfactory Implementation to date
181-OPS	C/O	Satisfactorily Implemented
219-OPS	C/O	Satisfactorily Implemented

APPENDIX B

LIST OF ATTENDEES AT THE ENTRANCE AND EXIT MEETINGS
FPC/CR-3 SPIP IMPLEMENTATION AUDIT
JUNE 25-28, 1990

Attendee	Organization/Title	Entrance	Exit
Edwin Froats	FPC/Supv Nuc Licensing	X	X
Rolf Wiaell	Dir Nuc Ops Site Support	X	
James Owen	Training Supv (acting)	X	
James Kraiker	Man Sup Superintendent	X	X
Richard Low	Principal Nuc I&C Engr	X	X
Paul Tanguay	Dir Nuc Ops Eng & Proj (acting)	X	
Pablo Rubio	Nuc I&C Engr Supv	X	X
Chris Doyel	Mgr Mech/Struc Eng	X	
Max Yost	INEL/NRC Engr Spec	X	X
John Fehringer	INEL/NRC Engr Spec	X	X
Y. Gene Hsii	NRC/NRR SRXB	X	X
J. A. Frijouf	Nuc Regulatory Spec		X
Richard Iwachow	Senior Nuc I&C Engr		X
Ronald Zareck	SKO/Tech Consultant		X
Gary Boldt	VP Nuc Production		X
Bruce Hinkle	Mgr Nuc Plant Ops		X
W. L. Rossfeld	Mgr Nuc Compliance		X
Sarah Johnson	Mgr Site Nuc Serv		X
Ken Lind	Mgr Lic Oper Training		X
Ken Wilson	Mgr Nuc Licensing		X