ATTACHMENT II

FINAL REPORT

JANUARY 10, 1992

FLORIDA POWER CORPORATION
GENERIC IMPLICATIONS OF
REACTOR TRIP EVENTS
IN DECEMBER 1991

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TABLE OF CONTENTS

CHARTER 1

OPERATIONS 2

MAINTENANCE 4

TRAINING 7

ENGINEERING 11

SUMMARY OF RECOMMENDED ACTIONS 13

CHARTER

OBJECTIVE: To determine whether any generic factors contributed to three reactor trip events occurring in the last quarter of 1991 or whether there are any additional recommended actions that should be accomplished prior to restart.

SCOPE: The investigation concentrated on the following functional areas:

- Maintenance
- Operations
- Training
- Engineering

and their relation to the plant trips and equipment failures that occurred since initial criticality following the 8M outage.

MEMBERS:

G. L. Boldt - Team Leader
P. M. Ezell - Maintenance
P. V. Fleming - Operations
B. J. Hickle - Training
F. X. Sullivan - Engineering

OPERATIONS

A. Observation

Each of the three reactor trips occurred while engaged in activities associated with changing plant/system configurations in support of plant startup or shutdown.

Recommendations

*1. Provide plant startup training to the specific shift(s) which will conduct the next startup.

*2. Ensure all shifts are knowledgeable about all three events (OSB, Night Order, or Training Summary)

3. Provide refresher training for available operators in the area of startups and shutdowns (with and without failures). Focus on realistic events that have occurred or have a reasonably high probability of occurring.

B. Observation

Shift activities were not adequately controlled as indicated by complex simultaneous evolutions being performed and inappropriate actions accomplished during transients.

Recommendations

*1. Reinforce obtaining concurrence prior to taking specific/ defined actions (working in systems that can trip the plant) as addressed in AI-500. (OSB, Night Order)

*2. Reinforce obtaining concurrence (permission) from SRO prior to taking specific actions (bypass an ESF actuation). (OSB, Night Order)

3. Correct any information resource deficiencies. Revise procedures and operating practices as necessary to assure predictable/consistent operation of systems and plant evolutions (CD system and main turbine operation during startup/shutdown, develop guidance for decreasing RCS pressure symptoms equivalent to existing RCS leakage guidance).

*Denotes actions which should be taken prior to startup from this outage.

4. Determine if shift staffing is appropriate in terms of balancing experience, competence, confidence, and command/control styles.

5. Conduct a review and issue a report/recommendation regarding a proposed "Shift Manager" who would replace the "Man On Call". Duties assigned to this position might include, but not be limited to, Emergency Coordinator, Outage Shift Manager, Start-Up Manager, and Shift Maintenance Manager, among others.

C. Observation

The current operator progression removes the most experienced people from the main control board operating position.

Recommendation

1. Abolish six (6) Nuclear Operator (NO) positions and create six (6) Chief Nuclear Operator (CNO) positions. Utilize rotational schemes between the new CNO positions and the existing CNO positions which maintain a higher level of experienced personnel at the main control board.

MAINTENANCE

A. Observation

Several maintenance items were contributing factors to plant trips. While the maintenance items, except for RCV-14, were not the cause of the trips, they either required a plant shutdown to correct or they did not function properly during plant manipulations.

Recommendations

*1. Review other work performed during the Midcycle 8 Outage to identify potential maintenance items that could cause plant transients. This review should include a review of the AHF-2A/2B work, work performed by contractors, MOVATS work, and equipment critical to plant operations (i.e., pressure, temperature, and reactivity control). From this review, develop a list of actions to be accomplished prior to plant startup (see attached Actions Required Prior to Startup on page 7).

2. Revise SP-324 to ensure that on the final RB walkdown, the reactor vessel seal plate is verified to be in the raised position.

B. Observation

The work control process did not require a review of the post-maintenance testing on AHF-2A/2B (WR 287111) after the work was completed. The original work scope was troubleshooting the differential pressure switches, and the post-maintenance testing was designed to test the functioning of these switches. When the flow discharge damper was repositioned, the post-maintenance testing should have been reviewed and revised to functionally verify proper flow. The issue of expanded work scope without proper post-maintenance testing review/revision has generic implications.

Recommendations

1. Evaluate methods to ensure post-maintenance testing is reviewed/revised when the work scope significantly expands.

2. Evaluate methods to involve system engineers more closely with maintenance and post-maintenance testing on their systems.

*Denotes actions which should be taken prior to startup from this outage.

C. Observation

The documentation on some field work performed did not provide sufficient information to determine what was done, and in what sequence, or that the work was accomplished as instructed.

Recommendations

1. Emphasize providing adequate documentation on work performed with first line supervisors. Consider the quality of documentation as a performance goal for first line supervisors.

2. Evaluate methods for monitoring the quality of the work package completion information.

D. Observation

Maintenance personnel worked excessive overtime (sometimes in excess of 80 hours per two week period) during the 8M outage. This could be a contributing factor to the AHF-2A/2B damper scenario.

Recommendation

1. Evaluate why excessive overtime was worked, and take the necessary actions to bring overtime to an acceptable level for future outages.

ACTIONS REQUIRED PRIOR TO START-UP

ACTION		STATUS
1.	Verify RV seal plate installed in raised position	Complete
2.	Verify AHF-2A/B flow	Complete
3.	Repair Main Generator Hydrogen leaks	Complete
4.	NI-6 cable and detector replacement	Complete
5.	AHF-1A high bearing temperature repair	Declared Inoperable
6.	Eng. to verify RCP vibration alarms sat.	Complete
7.	Control Rod Drive indications repaired	Complete
8.	ASV-28,29,30 verified to operate properly	Complete
9.	MUV-40 operates properly from control room	Complete
10.	Pressurizer Heaters troubleshooting/ repair	Complete
11.	Engineering to provide instructions to Operations on start of AHF-2A and AHF-2B to hold pistol grip in start position 20 seconds after damper open indication received.	Complete
12.	RCV-14 repair	Complete

TRAINING

A. Observation

Plant startups involve complex operations which require increased attention to detail, procedural familiarity, and team coordination. Operating crews perform plant startups on the simulator only once a year as part of their operator requalification training. Actual plant startups have been performed by crews which have not had recent startup experience and, in some cases, have not practiced as a whole crew on the simulator because crew composition has changed since the date of last simulator training.

Recommendations

1. Operating crews performing plant startups after long outages should first practice a startup on the simulator.

2. Startup crews should be supplemented with additional operators to perform tasks in support of the startup so that undivided supervisory attention can be given to startup operations from the time when reactor startup commences until plant is at ≈ 60% power.

   (NOTE: Extra coverage should be discretionary during startup physics testing power level holds.)

B. Observation

During the most recent transient, operators pulled rods multiple times in an attempt to restore RCS pressure while depressurization went on for about twenty minutes until the reactor tripped. Increasing power to correct an RCS pressure decreasing transient is a non-conservative operating practice because heat and radioactive inventory are being added to the system at a time when plant response was not understood by the operating crew.

Recommendation

1. Operations and training staff should review operator actions during this transient, and determine whether or not remedial training is required for the shift that was on duty.

C. Observation

During the most recent event, the high pressure injection system was bypassed on two separate occasions before it could automatically actuate. The first time the operator at the controls removed the bypass after thinking over his actions; the second bypass was preplanned by the crew. The appropriateness of the operator actions have been the subject of debate by various review groups. According to the training staff, no specific guidelines are available to the training department to train operators on the general requirements/philosophy for bypassing safety systems prior to actuation (except for the procedural guidance which covers some limited specific situations).

Recommendations

*1. Develop a clear and consistent guideline for bypassing safety functions.

*2. Train operators on guideline.

D. Observation

Over the past few years, training emphasis has increased in the area of preparing operators to cope with severe transients, largely in response to NRC requirements. Also "lessons learned" training is continually factored into the training program as a result of operating experience reviews. These changes to the training program have caused a decrease in the amount of time and emphasis placed on normal operations.

Recommendations

1. Review the scope of training provided to operators, and identify opportunities to emphasize training which would enhance normal operations.

2. Ensure that "lessons learned" items added to operator training program receive review and approval of operations and training staff prior to revising training program.

E. Observation

It has been identified that the shift crew on duty during the last trip has some weaknesses in the areas of teamwork and diagnostic skills. This has been observed during training sessions on the simulator. The two NOs on the shift were recently assigned to control board duties and have not trained with the balance of the shift on the simulator. The ANSS and SSOD are viewed as having similar leadership styles (i.e., to the degree that they may not fully offset each other's strengths/weaknesses).

*Denotes actions which should be taken prior to startup from this outage.

Recommendations

*1. Review shift crew composition and restructure shift or provide special simulator training to strengthen team (applies only to shift involved with last trip). Do this prior to allowing shift to operate. Solicit training department input to address this issue.

2. Review current methods for determining shift crew composition. Revise these where enhancements can be made.

F. Observation

Operating crews could benefit from a heightened "questioning attitude." Some of the actions taken during the transients reviewed may have been different if plant systems and response had been questioned a little more and annunciator response procedures had been used as a diagnostic tool.

Recommendations

1. Review training programs and identify methods to develop the "questioning attitude" of shift. Enhance training program as appropriate. This should be reinforced by line management during simulator sessions and control room observations.

2. Ensure training that is conducted on the simulator evaluates the shift willingness and capability to use outside resources in decision making. (For example, exercises could involve man-on-call or engineer-on-call consultations.)

3. Emphasize the use of annunciator response procedures and other diagnostic tools during simulator training.

G. Observation

During the last plant transient, the operating crew and the OTA on duty had difficulty diagnosing the problem as a stuck open pressurizer spray valve. According to the training staff, some OTAs have exhibited occasional difficulty with basic concepts. The training staff has had difficulty training to standard performance measurements for OTAs since they are used inconsistently on the operating shifts (as observed during simulator training).

*Denotes actions which should be taken prior to startup from this outage.

Recommendations

1. Clearly define the role of the OTA, and develop detailed performance standards to train to.

2. Review the OTA training and qualification program and revise where necessary to improve OTA diagnostic skills. Include additional emphasis on application of thermodynamic principles to operational events.

3. Identify mechanisms to increase operational experience and familiarity, and provide for improved teamwork between OTA and balance of crew. Evaluate placing OTA on shift.

4. Review and revise, as necessary, verification procedures to ensure ease of use and to make sure their use does not dilute OTA's ability to get the "big picture".

5. Consider developing aides for operators and OTAs to improve diagnostic capabilities (flow charts are used at some plants).

ENGINEERING

A. Observation

Since 1980, there has been a significant amount of documented problems associated with the pressurizer spray valve RCV-14. Since Refuel 7, RCV-14 has failed three times. RCV-14 has two associated limitorque operators that have been changed out when problems with the mounted operator are identified. Both operators have displayed limit switch indication problems, and the operator that was mounted to RCV-14 during the startup from 8M failed partially open during the December 8, 1991, transient. It should be noted that this particular operator has failed in a similar manner (reference NCOR 90-122).

Recommendations

*1. Clearly identify the root cause for the most recent RCV-14 failure.

2. Evaluate the long term maintenance history of RCV-14, and initiate any additional long term corrective actions.

3. Review the existing mechanisms utilized to identify plant components with long term maintenance histories that may result in a forced shutdown. Evaluate methods to accelerate the identification process. Once identified, the priority components should be analyzed for corrective actions. The corrective actions should then be presented to plant management for scheduling and budgetary funding.

B. Observation

During interviews with the system engineering organization concerning the RCV-14 failure and the AHF 2A/2B damper problem, it became apparent that both the organizations' management and engineers are frustrated by their limited ability to perform the perceived vital system engineering functions. The identified vital functions include the performance of detailed system walkdowns, monitoring/enhancing system performance, component failure analysis, post-maintenance test development/review, and improved involvement of maintenance planning/ activities. The reasons identified for limiting the performance of these vital functions include heavy burdens in procedure review/ development, "Problem Report" analysis, and vendor technical information reviews. The system engineering organization has been in place for approximately two and one-half years. The organization was founded to improve system/plant performance through the initiation of the aforementioned vital tasks.

*Denotes actions which should be taken prior to startup from this outage.

Recommendations

1. Initiate a time study of the system engineers' daily activities over an acceptable time frame (including outage time).

2. Plant/engineering management should evaluate the time study data and determine corrective actions.

3. Ensure "vital" engineering functions are tracked by performance indicators which are visible to senior management.

C. Observation

During the review of the NI-2 and RCV-14 trouble-shooting efforts, it became apparent there is a need for a consistent methodology for component trouble-shooting/root cause determination during periods of forced outages. Improvements in data recording, concise problem analysis, true single point of accountability, corrective action plan documentation/ control, and accurate turnover documentation may be warranted.

Recommendations

1. Establish a minimum set of criteria that should be utilized during component trouble-shooting/root cause determination (i.e., time-line of known events prior to the failure, expectations of proper component performance, "as found" field data taken during the course of trouble-shooting, etc.)

2. Establish good "brainstorming" practices.

3. Develop consistent single point of accountability responsibilities.

4. Develop a consistent method for issuing/modifying trouble-shooting and corrective action plans.

SUMMARY OF RECOMMENDED ACTIONS

	ACTION		ASSIGNED TO	DUE
OPERATIONS	*A1	Training for shift which will restart the plant	D. Porter	Complete
	*A2	OSB entries for all three trips	D. Porter	Complete
	A3	Refresher S/U training for available operators	D. Porter	Complete
	*B1	Reinforce MOC concurrence for required actions (especially work in systems that can trip the plant)	D. Porter	Complete
	*B2	Reinforce SRO concurrence for required actions (especially bypassing ES)	D. Porter	Complete
	B3	Correct any information resource deficiencies	D. Porter	3/1/92
	B4	Balance shift staffing	D. Porter	Complete
	B5	Review "shift manager" concept	P. McKee	3/1/92
	C1	Additional CNO's on shift	D. Porter	3/1/92
MAINTENANCE	*A1	Review other 8M work	P. Ezell	Complete
	A2	Revise SP-324	D. Porter	2/1/92
	B1	Evaluate methods for review of PMT when WR scope expands	K. Lancaster	4/1/92
	B2	Evaluate methods to involve system engineers more closely in maintenance	G. Halnon	4/1/92
	C1	Improve documentation of work performed	H. Koon	4/1/92
	C2	Monitor quality of work package completion	K. Lancaster	4/1/92
	D1	Reduce maintenance overtime in future outages	H. Koon	3/1/92
TRAINING	A1	Provide S/U training prior to S/U in future outages	L. Kelley	6/1/92
	A2	Supplement operating crews during S/U's	W. Marshall	4/1/92
	B1	Remedial training for shift on duty during trip #3	L. Kelley	Complete

*Denotes actions which should be taken prior to startup from this outage.

	*C1	Develop guideline for bypassing safety functions	D. Porter	Complete
	*C2	Train operators on guideline	D. Porter	Complete
	D1	Enhance operator training in "normal operations"	L. Kelley	6/1/92
	D2	Review/approval of lessons learned	L. Kelley	3/1/92
	*E1	Restructure composition of crew on duty during trip #3	D. Porter	Complete
	E2	Review shift composition practices	W. Marshall	3/1/92
	F1	Develop questioning attitude	W. Marshall	3/1/92
	F2	Involve MOC/SOTA/Engineer on call in simulator exercises	L. Kelley	3/1/92
	F3	Emphasize use of annunciator response procedures	W. Marshall	3/1/92
	G1	Define role of SOTA	P. Alberdi	4/1/92
	G2	Improve training on SOTA diagnostic skills	W. Bandhauer	4/1/92
	G3	Enhance operational experience and teamwork opportunities for SOTA's	W. Bandhauer	4/1/92
	G4	Ensure verification procedures do not dilute OTA ability to "get the big picture"	W. Bandhauer	4/1/92
	G5	Develop diagnostic aides for OTA's	W. Bandhauer	6/1/92
ENGINEERING	*A1	Define root cause for RCV-14	G. Halnon	Complete
	A2	Evaluate RCV-14 history	G. Halnon	4/1/92
	A3	Accelerate failure history review for other equipment	G. Halnon	4/1/92
	B1	Time study system engineering activities	G. Halnon	9/1/92
	B2	Take corrective action	G. Halnon	12/31/92
	B3	Establish performance indicators for vital functions	G. Halnon	4/1/92
	C1	Establish root cause criteria	G. Halnon	6/1/92
	C2	Establish "brainstorming" practices	G. Halnon	6/1/92
	C3	Establish single point of accountability resporsibilities/practices	P. McKee	6/1/92
	C4	Establish method to issue troubleshooting/ correction action plans	G. Halnon	6/1/92

*Denotes actions which should be taken prior to startup from this outage.

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GENERIC IMPLICATIONS OF REACTOR TRIP EVENTS IN DECEMBER 1991

ITEM	ITEM DESCRIPTION	ITEM STATUS
OPERATIONS		
A1	Training for shift which will restart the plant	Complete
A2	OSB entries for all three trips	Complete
A3	Refresher S/U training for available operators	Complete
B1	Reinforce MOC concurrence for required actions (especially work in systems that can trip the plant)	Complete
B2	Reinforce SRO concurrence for required actions (especially bypassing "ES")	Complete
B3	Correct any information resource deficiencies	Complete
B4	Balance shift staffing	Complete

GENERIC IMPLICATIONS OF REACTOR TRIP EVENTS IN DECEMBER 1991

ITEM	ITEM DESCRIPTION	ITEM STATUS
OPERATIONS		
B5	Review "Shift Manager" concept	Complete
C1	Additional CNO's on shift	Complete

ITEM	ITEM DESCRIPTION	ITEM STATUS
MAINTENANCE		
A1	Review other 8M work	Complete
A2	Revise SP-324	Complete
B1	Evaluate methods for review of PMT when WR scope expands	Open The evaluation of methods for review of PMT when WR scope has expanded has been completed. Instruction for re-evaluation and post maintenance test review will be provided more explicitly in the next revision to CP-1138 which will be completed by August 31, 1992. This completion date is consistent with existing goals to re-evaluate the entire work control process. As an interim action, training has been provided to shop supervisors regarding the need to have work packages reviewed for PMT changes when the WR scope is changed.

GENERIC IMPLICATIONS OF REACTOR TRIP EVENTS IN DECEMBER 1991

ITEM	ITEM DESCRIPTION	ITEM STATUS
MAINTENANCE		
B2	Evaluate methods to involve System Engineers more closely in maintenance	Complete
C1	Improve documentation of work performed	Open A comprehensive plan has been identified to improve documentation of work performed. This plan includes the following: 1) Develop written standards for work package documentation; 2) Develop written standards for shop log keeping; 3) Train personnel on items 1 & 2; and 3) Implement a review of work package documentation. These actions will be completed by 8/28/92.
C2	Monitor quality of work package completion	Open Guidance to accomplish this activity will be included in the next revision to CP-113 which will be complete by August 31, 1992. This is consistent with existing goals to re-evaluate the entire work control process.
D1	Reduce maintenance overtime in future outages	Complete

ITEM	ITEM DESCRIPTION	ITEM STATUS
TRAINING		
A1	Provide S/U training prior to S/U in future outages	Complete

GENERIC IMPLICATIONS OF REACTOR TRIP EVENTS IN DECEMBER 1991

ITEM	ITEM DESCRIPTION	ITEM STATUS
	TRAINING	
A2	Supplement operating crews during S/U's	Complete
B1	Remedial training for shift on duty during trip #3	Complete
C1	Develop guideline for bypassing safety functions	Complete
C2	Train operators on guideline	Complete
D1	Enhance operator training in "normal operations"	Complete
D2	Review/approval of lessons learned	Complete
E1	Restructure composition of crew on duty during trip #3	Complete

ITEM	ITEM DESCRIPTION	ITEM STATUS
	TRAINING	
E2	Review shift composition practices	Complete
F1	Develop questioning attitude	Complete
F2	Involve MOC/SOTA/Engineer on call in simulator excercises	Complete
F3	Emphasize use of annunciator response procedures	Complete
G1	Define role of the SOTA	Complete
G2	Improve training on SOTA diagnostic skills	Open The current schedule for completion of this item is 7/15/92
G3	Enhance operational experience and teamwork opportunities for SOTA's	Complete

ITEM	ITEM DESCRIPTION	ITEM STATUS
TRAINING		
G4	Ensure verification procedures do not dilute OTA ability to "get the big picture"	Open Accomplishment of this item involves revisions to VP-540 and VP-580. The revision to VP-540 is complete. The revision to VP-580 is in progress and is expected to be complete by 8/31/92
G5	Develop diagnostic aids for OTA's	Open The current completion date for this item is 1/31/93

ITEM	ITEM DESCRIPTION	ITEM STATUS
ENGINEERING		
A1	Define Root Cause for RCV-14	Complete
A2	Evaluate RCV-14 history	Complete RCV-14 history is contained in failure analysis 91-RCV-14-01
A3	Accelerate failure history review for other equipment	Complete
B1	Time study System Engineering activities	Open This remains on schedule to be complete by 9/1/92

GENERIC IMPLICATIONS OF REACTOR TRIP EVENTS IN DECEMBER 1991

ITEM	ITEM DESCRIPTION	ITEM STATUS
	ENGINEERING	
B2	Take Corrective action	Open This remains on schedule to be complete by 12/31/92
[illegible]	Establish performance indicators for vital functions	Complete
	Establish Root Cause criteria	Open This remains on schedule to be complete by 6/1/92
C2	Establish "brainstorming" practices	Complete
C3	Establish single point of accountability	Complete
C4	Establish method to issue troubleshooting/ correction action plans	Open This remains on schedule to be complete by 6/1/92