ENCLOSURE

U.S. NUCLEAR REGULATORY COMMISSION

REGION IV

AUGMENTED INSPECTION TEAM (AIT) REPORT

Inspection Report: 50-397/95-13

Operating License: NPF-21

Licensee: Washington Public Power Supply System (WPPSS)
Richland, Washington

Facility Name: Washington Nuclear Project 2 (WNP-2)

Inspection at: WNP-2
Benton County, Washington

Inspection Conducted: April 24-26, with additional inoffice inspection between May 3 and 25, 1995

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1 INTRODUCTION

1.1 Purpose and Scope of the Inspection

The NRC has established a policy to provide for the timely, thorough, and systematic inspection of significant operational events at nuclear power plants. This includes the use of an augmented inspection team to determine the causes, conditions, and circumstances relevant to an event and to communicate its findings, safety concerns, and recommendations to NRC management. In accordance with NRC Inspection Manual Chapter 0325, an Augmented Inspection Team (AIT) was dispatched to the Washington Public Power Supply System (WPPSS) Nuclear Project 2 (WNP-2) facility on April 24, 1995, to review the circumstances surrounding the operation of the reactor water cleanup system on April 9, 1995.

The decision to dispatch an AIT was made by NRC management based on the potential willful nature of the action taken by licensed control room personnel and the recurrent nature of personnel errors at the WNP-2 facility. A number of events have occurred recently that heightened NRC management's concern regarding the ability of the WNP-2 operations staff to operate the plant in a conservative manner. This event was of particular concern because of the apparent involvement of supervisory and management personnel.

The AIT consisted of five NRC inspectors, engineers, and behavioral scientists. The AIT Charter (Appendix A) directed the team to conduct fact finding to determine what occurred, the system impact and significance, the attitudes of control room operators and licensee supervision and management towards procedure compliance, and licensee management's response to the event.

The inspection was conducted from April 24-26, 1995. An entrance meeting was held with the licensee on April 24, 1995 at WNP-2. A public exit meeting was held at the corporate headquarters on April 26, 1995. Appendix B identifies the attendees at both meetings, as well as the list of personnel contacted during the AIT.

1.2 Inspection Methodology

After an initial briefing by licensee personnel at the entrance meeting on April 24, 1995, the AIT interviewed members of the operating crew who were on shift at the time of the event, the shift managers and control room supervisors from the other operating shift crews, and licensee management personnel. The AIT reviewed licensee records documenting system and plant response during the event. The AIT also reviewed licensee documents that discussed safety significance, root cause analyses, and internal investigations of the event. A list of documents reviewed is contained in Appendix C.

2 NARRATIVE DESCRIPTION OF THE EVENT OF APRIL 9, 1995

On April 9, 1995, the WNP-2 plant staff was conducting operations to prepare the facility for restart following a plant trip which had occurred on April 5,

1995. At approximately 1:45 a.m., the control room supervisor opened Valve RWCU-V-31, a bypass valve around the reactor water cleanup system (RWCU) blowdown line flow restricting orifice. The valve was operated in such a way that the valve position indication indicated that the valve was closed. The valve was open sufficiently to allow approximately 10-20 gallons per minute flow through the valve. Reactor coolant system (RCS) pressure was approximately 215 psig when the valve was initially opened. The system operating procedure contained a caution that prohibited operation of Valve RWCU-V-31 above 125 psig. A reactor operator (RO) questioned the control room supervisor (CRS) regarding this action for two reasons. First, the RO felt that the CRS manipulating controls was contrary to management expectations regarding CRS supervisory responsibilities. Second, the RO pointed out that operation of this valve was in violation of the procedure caution.

A second on-shift RO became involved in the discussions regarding the plant conditions for operation of Valve RWCU-V-31. Following a discussion between both ROs and the CRS, the CRS twice consulted with the shift manager. The CRS returned to the control panels, and stated that Valve RWCU-V-31 would remain open. The action was not logged in the Control Room Operator's Log by any of the control room operators. A procedure deviation was not written, nor was a problem evaluation request (PER) generated by any of the control room operators to identify the nonconformance with procedures.

During the shift, one of the operators was relieved by an oncoming operator. The relieving RO closed the valve following a discussion with the CRS.

One of the ROs contacted the Assistant Operations Manager and the Nuclear Safety Issues Program (NSIP) on April 10, 1995. The NSIP is part of the licensee's employee concerns program. In addition, this RO contacted the Operations Manager on April 11, 1995, to express his concern regarding the acceptability of his actions to raise this issue. The licensee started an investigation of the event on April 10, 1995, after the Assistant Operations Manager wrote a PER. Following its initial investigation, the licensee removed both the CRS and shift manager from licensed duties, and requested in a letter dated April 27, 1995, that the NRC withdraw the senior operator licenses for both individuals.

2.1 Sequence of Events

The following information describes the initial conditions and sequence of events as reconstructed by the NRC AIT through interviews and a review of the licensee's records.

Sunday, April 9, 1995

~ 12 a.m.
- 2:30 p.m. The reactor was in Mode 3 (hot shutdown); prestartup preparations were in progress.

The RCS pressure was ~ 215 psig.

The feedwater flow was in ~ 5 percent position on Valve RFW-V-10A.

Valve RWCU-V-31 was fully closed. Blowdown from the RCS was in service through an orifice to the main condenser.

The main steam lines were open; a vacuum was formed in the condenser.

The auxiliary boiler was tripped, and being recovered to provide sealing steam.

The reactor vessel level was slowly increasing.

The CRS was concerned about reducing control rod drive flow which might result in heating of the control rod drives; a scram surveillance test was planned later in the shift.

The operators maintained feedwater flow to ensure that no thermal stratification existed in feedwater lines.

~ 1:45 a.m. Control Room Operator 1 (CRO1) asked the CRS for guidance on controlling reactor water level with blowdown at its maximum through the blowdown orifice.

The CRS cracked open the RWCU-V-31 valve increasing the flow to the RWCU system by ~ 10 gallons per minute (gpm).

~ 2:30 a.m. CRO1 turned over his duties to the relief CRO1, who was the overtime replacement for CRO1, but did not tell him that Valve RWCU-V-31 was cracked open. CRO1 had stayed on 4 hours from the previous shift to cover a temporary vacancy created by an employee's vacation.

~ 3 a.m. Control Room Operator 2 (CRO2) told the relief CRO1 about Valve RWCU-V-31 position.

The CRS and the relief CRO1 discussed RWCU system operation.

The CRS gave permission to close Valve RWCU-V-31.

~ 3:45 a.m. Following a discussion with the CRS, the relief CRO1 closed Valve RWCU-V-31 and reduced the control rod drive flow to the control reactor vessel level. The relief CRO1 did not inform the CRS, nor did he log this action in the control room operator's log.

~ 5 a.m.	CRO2 told a senior reactor operator (SRO) license candidate about his concern about the operation of the RWCU system.
~ 6:30 a.m.	CRO2 discussed with the relief CRO1 the RWCU issue and his intent to call the Nuclear Safe Issues Program (NSIP). The relief CRO1 advised CRO2 to use the chain of command (Operations Manager, etc.).
6:55 a.m.	The reactor pressure was 185 psig.
~ 7 p.m.	CRO2 attempted to call the Operations Manager at home.
	CRO2 consulted with the NSIP peer advisor.

Monday, April 10, 1995

~ 12 a.m.	CRO2 called the NSIP.
~ 6:30 a.m.	CRO2 told the relief CRO1 that he called the NSIP.
6:45 a.m.	The NSIP Manager received transcript of the call to the NSIP direct line.
~ 8:30 a.m.	The Assistant Operations Manager received a message from CRO2 indicating a nuclear safety issue.
~ 8:45 a.m.	The Assistant Operations Manager called CRO2 at home to discuss the nuclear safety issue.
~ 9 a.m.	The Assistant Operations Manager briefed the Operations Manager on the procedure violation and an investigation was initiated.
~ 10 a.m.	The NSIP Manager reached CRO2 by phone and was told that CRO2 had discussed the issue with the Assistant Operations Manager.
~10:30 a.m.	The NSIP Manager contacted the Assistant Operations Manager, who was writing a PER on the nuclear safety issue. The NSIP Manager said he would monitor how operations handled the issue and would want to talk to the shift crew later.
~ 12 p.m.	The Assistant Operations Manager generated PER 295-0317.
	The Plant Manager was informed of the event.
	The Plant Manager discussed the course of action and the followup with the Operations Manager, including pulling the CRS and the shift manager off shift.

The Plant General Manager talked to the operators regarding the event.

Tuesday, April 11, 1995

~ 7:30 a.m. The CRS and the shift manager were removed from licensed duties.

3 DESCRIPTION OF OPERATOR ACTIONS AND ANALYSIS OF SYSTEM RESPONSE

3.1 Plant Conditions

When the event occurred, licensee personnel were in the process of recovery from a reactor scram that had occurred on April 5, 1995. The recovery was proceeding normally, with required surveillance testing being performed, and a reactor scram surveillance test scheduled to be performed within a few hours. The team verified the plant condition that existed prior to and during the event. Using the results of interviews with personnel, review of station logs, and information retrieved from the plant computer, a logical sequence of plant conditions was developed to account for the conditions that existed at the time of the event.

Prior to the day of the event, maintenance was performed on the auxiliary boiler. During this maintenance, it was necessary to break main condenser vacuum because the auxiliary boiler was the source of main turbine gland seal steam required for maintaining the condenser under vacuum. Without a vacuum in the condenser, reactor vessel steam could not be dumped to the condenser for maintaining vessel pressure. Therefore, the main steam isolation valves were shut during the auxiliary boiler maintenance causing vessel pressure to increase to 600-625 psig. During the afternoon of April 8, 1995, auxiliary boiler maintenance was completed, condenser vacuum was established, and the main steam isolation valves were opened. This caused a slow decrease in reactor pressure due to steam line warming, steam drains removing moisture, and the addition of feedwater to maintain vessel level. As a result, an approximate 95°F cooldown equivalent to about a 350 psi pressure drop occurred over the next 8-9 hours. The team determined from data retrieved from the plant computer and the results of interviews that when Valve RWCU-V-31, Blowdown Flow Control Orifice Bypass Valve, was opened at approximately 1:45 a.m. on April 9, 1995, reactor vessel pressure was about 215 psig. When the valve was closed at approximately 3:40 a.m., vessel pressure was about 200 psig and decreasing 3-4 psi per hour. Before opening Valve RWCU-V-31, reactor pressure vessel level was slowly increasing. Water sources contributing to the increase included control rod drive flow that provided cooling for the control rod drive mechanisms, and a small amount of feedwater flow that was required to prevent thermal stratification in the feedwater piping.

3.2 Procedure Actions for Plant Conditions

The team found that early in the first shift on April 9, 1995, operators became concerned about the slowly increasing reactor vessel level. Level was increasing because feedwater flow and control rod drive flow into the vessel totaled more than blowdown flow from the reactor water cleanup system to the main condenser. Additionally, operators apparently reasoned, a planned reactor scram surveillance test would have approximately doubled control rod drive flow into the vessel creating an additional challenge to vessel level control. The team reviewed the options available for maintaining reactor vessel level during the hot shutdown condition that existed at the time of the event. Procedure 3.2.2, "Normal Shutdown to Hot Shutdown," Revision 9, provided methods for attaining and maintaining reactor vessel pressure at hot shut down conditions. These methods included using condensate and the reactor core isolation cooling pumps as sources for maintaining reactor vessel level, while using the reactor core isolation cooling pump turbine or the main condenser as a heat sink for maintaining reactor vessel pressure.

The licensee staff made the team aware of difficulties associated with vessel level control. A problem with vessel feed line stratification had resulted in previous severe feedwater piping stress, and as a result it was necessary to maintain a continuous minimum feedwater flow to preclude this stress condition from recurring. The avoidance of feedwater piping stress was addressed by Procedure 3.2.2 in the precaution and limitations section by directing that a portion of reactor water cleanup flow be directed through the blowdown system to the main condenser in order to maintain a continuous minimum feedwater flow rate to the reactor vessel. However, the team noted that a caution prior to Step 5.3.10 of Procedure 2.2.3, "Reactor Water Cleanup System," Revision 20, specifically stated that Valve RWCU-V-31 shall not be opened when reactor vessel pressure was greater than 125 psig to prevent over pressurization of reactor water cleanup system blowdown piping.

The licensee staff also indicated to the team that operators need to maintain control rod drive flow rate sufficiently high to maintain control rod drive temperatures below the alarm temperature of 250°F. Control rod drive temperature less than 250°F was desired to enhance the performance and life of the control rod drive Graphitar seals. This drive cooling flow eventually ended up in the reactor vessel and contributed to increasing vessel level. According to Procedure 2.1.1, "Control Rod Drive System," Revision 19, Section 5.1.34, allowable control rod drive system flow with no rod motion was 37-63 gpm. According to licensee operations and engineering personnel, control rod drive flow could be maintained at the minimum allowed if the temperature for all control rod drives could be maintained below the high temperature alarm point of 250°F.

The team determined that there were two separate options available to the control room operators for controlling vessel level with the conditions that existed at the time of the event. Control rod drive flow could have been reduced to the minimum of 37 gpm. From a review of pertinent data provided by engineering, the team determined that control rod drive flow at the time

Valve RWCU-V-31 was opened was approximately 53 gpm and there was no indication of any individual control rod drive overheating. Following the eventual full closure of Valve RWCU-V-31, the oncoming CRO1 reduced control rod drive flow to control reactor vessel level, with no adverse consequences to the control rod drives. Based on additional operational information provided by licensee personnel, the team determined that the approximate 16 gpm reduction in makeup to the vessel, with feed flow remaining constant, would have decreased the vessel water level. An additional option for controlling vessel level was to lower the vessel pressure to 125 psig which would have allowed increasing the blowdown rate to the main condenser by opening orifice by-pass Valve RWCU-V-31. Vessel pressure reduction could have been attained by changing the automatic reactor pressure control setpoint of the digital electrohydraulic system, or by using the reactor core isolation cooling pump turbine as a heat sink. Attaining 125 psig vessel pressure would have required about a 40-degree cooldown.

The team concluded that viable procedural options were available to the control room staff for maintenance of the required reactor vessel level without opening Valve RWCU-V-31 with reactor vessel pressure above 125 psig, contrary to Procedure 2.2.3. These options were not fully considered or discussed by the operating crew prior to opening Valve RWCU-V-31.

3.3 Operator Actions

The team identified the actions taken by the operating staff that resulted in the event and then compared those actions to applicable administrative and operating procedural requirements. The team conducted interviews of licensee staff personnel and reviewed the applicable procedures.

Valve RWCU-V-31 had been manipulated contrary to the requirements of Procedure 2.2.3 to attain additional reactor water cleanup system blowdown flow to the main condenser. However, while Valve RWCU-V-31 was passing 10-15 gpm of filtered and demineralized reactor coolant, the control board valve position indicated that the valve was shut. The team requested the Motor Operated Valve Master Data Sheet for Valve RWCU-V-31. The valve position indication switch setting tolerance information on the data sheet indicated that when the valve indicated closed, it could be as much as 4 percent open. This information supported information obtained through interviews indicating an operator had partially opened Valve RWCU-V-31 and then bumped the control switch until shut indication was obtained. Apparently, the operator had initially closed down on the blowdown flow control valve, RWCU-FCV-33, to assure that blowdown flow was being controlled, and then manipulated Valve RWCU-V-31 to obtain the slightly open, but indicated shut condition. Finally Valve RWCU-FCV-33 was slowly reopened and a 10-15 gpm flow increase was observed. Using data retrieved from the plant computer, the team was able to verify that reactor vessel level started decreasing at the time the above manipulations occurred. The team concluded that the action taken to increase blowdown system flow, with the plant conditions that existed, conflicted with the requirements of Procedure 2.2.3.

The team sought information about the licensee management expectations regarding procedure adherence. Interviews with operations personnel generally indicated that management expected personnel to strictly adhere to procedures or revise procedures where strict adherence was not possible. The team verified that the licensee process for procedure modification would support timely and documented revision of procedures that were unworkable.

The team then reviewed licensee material that provided guidance for safety-related procedure preparation and usage as discussed in Section 6.1.1 of this report.

The team concluded that the operator actions on April 9, 1995, to obtain flow through Valve RWCU-V-31 with shut indication did not comply with operational and administrative procedural requirements. Additionally, the actions did not meet WNP-2 written management expectations for procedural adherence.

3.4 Systems Affected and Consequences to Systems by Operator Actions

According to engineering personnel a request was received on April 10, 1995, from operations management to assess the safety significance of the event related to potential system consequences as a result of the inappropriate system lineup. On April 24, 1995, the team asked licensee personnel to provide any existing documentation and the interim or final results of the safety significance assessment. The team was informed that there was no documentation of the assessment activities, but the currently final assessment had revealed that the event was not safety significant and there was no risk to public health and safety.

Team discussion with licensee engineering personnel and review of applicable prints and design documentation revealed the considerations upon which the licensee based their conclusion. The piping run between the reactor water cleanup system and the main condenser was constructed of 6-inch diameter piping designed for a pressure of 150 psig. The reactor water cleanup system design provided for overpressure protection of the piping between the reactor water cleanup system and the main condenser. Pressure Switch RWCU-PS-14 sensed piping pressure just downstream of Valve RWCU-V-31 and the blowdown flow control orifice. At a sensed pressure of 140 psig, PS-14 would actuate and cause Flow Control Valve RWCU-FCV-33 to trip closed. This valve was normally positioned remotely from the control room to control blowdown flow. Automatically tripping this valve closed would stop blowdown flow to the main condenser and also the alternate flow path to the liquid radioactive waste system.

The team requested testing program information and records for Pressure Switch PS-14 and Valve RWCU-FCV-33. Records were provided that substantiated that the pressure switch had been calibration tested for setpoint and reset point in June 1994. The licensee's preventive maintenance program required that the switch be calibrated biennially. A review of the last three calibration records provided information that for each test, the as-left condition was identical to the as-found condition, indicating that the switch

setpoint had not drifted out of tolerance between calibrations. There were calibration records available which effectively tested the control function of Valve RWCU-FCV-33. However, there were no programmatic requirements or any records available to substantiate that the trip or system isolation function of Valve RWCU-FCV-33 had ever been tested. No additional information regarding the safety significance was provided to the team prior to their departure on April 26, 1995.

The team concluded that the initial safety assessment determination performed by licensee engineering arrived at the conclusion that the event was not safety significant on the basis of an automatic system isolation capability function that was not periodically tested. The team concluded that the licensee's initial assessment of the safety significance of the event was deficient.

4 EVALUATION OF SHIFT COMMAND, CONTROL, AND COMMUNICATIONS

The team interviewed members of the crew who were on shift in the control room at the time of the April 9, 1995, event. The interviews focused on the specific actions of individual crew members and the nature and content of pertinent exchanges of information. Additionally, the team interviewed members of the other operations crews to assess their command, control, and communication capabilities.

4.1 Command

A memorandum from the Operations Manager had been electronically distributed to all shift supervisors and managers on March 3, 1995, and stated in part, "Shift managers and Supervisors will not be operating equipment unless it is necessary to mitigate an emergency, i.e., steam leak, personnel safety, etc." Although the condition and trends in the plant were abnormal immediately before the operation of the RWCU system blowdown orifice bypass valve, the team considered that they did not constitute an emergency condition or a rapidly degrading plant condition. Therefore, the actions of the control room supervisor in personally operating the valve were not appropriate for the plant conditions. The team concluded that the control room supervisor failed to comply with explicit management expectations and abandoned his command and control responsibilities when he manipulated the RWCU system control.

The CRS opened the RWCU system blowdown orifice bypass valve before discussing its use with the shift manager. He stated to the team that although he was aware that operation of the valve was a deviation from procedure, he did not consult with the shift manager before opening it. It was also apparent that the CRS did not perceive the situation as an emergency or rapidly degrading plant condition. The team concluded that the behavior of the CRS undermined the command responsibility and authority of the shift manager by deviating from procedures before gaining concurrence from the shift manager.

The shift manager confirmed that he had remained in his office during the entire shift and had not toured the control room or other parts of the plant

because of his unusually heavy administrative responsibilities during the shift. He further indicated that his awareness of plant conditions at any time during the shift, particularly during the event, was the result of the information provided to him by the CRS. Therefore, the shift manager failed to satisfy the duties of the shift manager as stated in Procedure 1.1.3, "Plant Responsibilities," Revision 16, Section 3.2.2, which states in part, "He (the shift manager) monitors the shift activities by making periodic inspections of the plant." By remaining in his office during the entire shift, the team concluded the shift manager failed to maintain a command presence in the control room.

After discussions between the oncoming CRO1 and the CRS regarding the use of the RWCU system blowdown orifice bypass valve, the CRS authorized the oncoming CRO1 to shut Valve RWCU-V-31. Almost immediately, the oncoming CRO1 shut the valve and then reduced control rod drive cooling water flow to control reactor pressure vessel level without notifying the CRS. The team concluded that by not notifying the CRS, the control room operator undermined the CRS's command authority.

Another control room operator stated that a recent shift in operating practices had placed more operational control and oversight responsibility and authority on the CRS and the lead control room operator. He stated that the presence of the shift manager in the at-the-controls area of the control room had notably declined, and that the shift manager position had become more administrative and clerical, particularly during day shifts when the shift manager was often attending meetings. The NRC resident inspectors, as a result of their observations of control room activity, also found the presence of the shift manager in the at-the-controls area of the control room was generally infrequent. The team concluded that recent shifts in the duties and responsibilities of control room shift personnel may have lessened the exercise of command authority by the shift managers.

4.2 Control

The CRS stated that before operating the RWCU blowdown controls, he was aware of the problems in the auxiliary boiler, the adverse trends in level in the reactor pressure vessel, and the vulnerability to damage of the feedwater and RWCU systems under the existing conditions. Moreover, he stated that he knew his intended course of action was a deviation from procedures. However, he failed to follow Procedure 1.3.1, "Department Policies, Programs, and Practices," Revision 19, Section 4.5, "Plant Problems/Troubleshooting." The procedure required use of the "Stabilize/Stepback, Think (Collect Information, Analyze Plan), Act or execute the plan, Review Results" (STAR) method and stated in part, "The Operations Department will utilize the teamwork approach to problem solving and troubleshooting of plant systems and equipments....key elements are to be utilized in the problem resolution process, with the intent of having a step-back, controlled evaluation and subsequent problem resolution process . . . When a problem exists, do not proceed alone . . . Communicate all aspects of the condition in concern . . . Consult the various plant procedures as required." The team concluded that no rapidly changing

condition existed to warrant prompt action, therefore, the requirements of Procedure 1.3.1, Section 4.5, should have preceded the operation of any controls to correct reactor pressure vessel level.

During interviews, the shift manager showed a generally accurate understanding of plant conditions that existed at the time that the CRS discussed the use of the RWCU system blowdown orifice bypass valve. The shift manager stated that he was aware of the problems with the auxiliary boiler and the adverse trend in reactor pressure vessel level. He also stated that he was aware that the recommendation of the CRS was a deviation from the procedural requirements. The team concluded that he also failed to follow Procedure 1.3.1, Revision 19, Section 4.5.

Other than the initial question by a control room operator on how to respond to increasing reactor pressure vessel level, no other members of the crew attempted to initiate the actions of Procedure 1.3.1, Section 4.5. Operators on the affected crew and other crews stated that no specific guidelines existed to help determine what plant conditions or activities warranted a crew briefing before the crew operated controls or equipment. A shift manager on another crew stated that it was his prerogative to determine if an activity was sufficiently unusual, infrequent, or complex to hold a crew briefing before initiating a course of action.

Before opening the RWCU system blowdown orifice bypass valve, no member of the shift crew, including the shift manager who believed he was agreeing to an action before it was taken, referred to the controlling procedure, Plant Procedures Manual 2.2.3, "Reactor Water Cleanup System," Revision 20, Section 5.3. This did not meet the intent of the guidance in Procedure 1.3.1, Revision 19, Section 4.9.7.b which stated in part that "For all normal operations, procedures should be referenced prior to their performance. The general Precautions and Limitations Section, any deviations to the procedure, and the specific section to be performed should be reviewed." Even though all cognizant shift crew members knew that operation of the valve was contrary to a caution in the procedure, they failed to refer to the procedure. They stated that they had read the procedure the day before the event. The relief CRO1, who assumed the duties of CRO1 at about 2:30 a.m. on April 9, 1995, for monitoring and operating the RWCU system, was informed separately by CRO2 that the RWCU system blowdown orifice bypass valve was partially open to control reactor pressure vessel level. The relief CRO1 stated that he recognized that the use of the bypass valve for the existing plant conditions was a deviation from the procedure. However, like other members of the shift crew, he stated that he relied on his memory, since he had read the procedure recently, to justify not referring to it when he became aware of the valve position. The team concluded that failure to refer to the procedure immediately before operating the RWCU system blowdown orifice bypass valve was a failure to exercise appropriate control of safety-related activities.

4.3 Communications

As noted previously, the CRS authorized the relief operator to close the RWCU system blowdown orifice bypass valve following their discussions. The CRS did not assign any operational parameters (such as reactor pressure vessel level or RWCU system pressure) to control the use of the valve and did not require the CR01 to inform anyone once the valve was shut. The team concluded that communication was informal and that the CRS' directions to the control room operator were open-ended and vague.

The Control Room Operator 3 (CR03), or lead control room operator, has primary responsibility for maintenance of the control room log; however, all members of the crew are responsible for ensuring that log entries are made for significant actions or events. The failure to record the operation of the RWCU system blowdown orifice bypass valve in the control room log was due in part to the fact that the CR03 was not aware that the valve had been operated. He stated that he did not become aware of the event until several days later. At the time of the event, CR03 stated that he was concentrating on monitoring main condenser vacuum while the auxiliary boiler was being restored to service. Since the controls and indications for the main condenser were several feet from the controls and indications for the RWCU system, the lead operator would not have necessarily been aware that specific RWCU system components were being operated.

The high ambient noise level in the control room made it very difficult to overhear at one location a normal conversation at the other locations. Personal observation by the team was that the background noise levels made hearing normal conversations between control board operating stations difficult.

CR03 stated that even if he had noticed the CRS and the other two control room operators engaged in a discussion, he probably would not have moved to be able to hear the discussion because operations management discouraged "clustering" at the control panels.

As previously noted, a control room operator shut the RWCU system blowdown orifice bypass valve and began controlling reactor pressure vessel level by adjusting control rod drive cooling water flow. The control room operator did not report these actions to the CRS nor ensure that an appropriate log entry was made.

During the middle of the shift, a turnover was conducted for CR01. The person in that position monitored and operated the RWCU system as part of normal shift responsibility. The relief CR01 had not been in the control room at any time during the shift and, therefore, was not present when the RWCU system blowdown orifice bypass valve was opened. In addition, he was not informed during the turnover briefing of the valve's position or the fact that it had been operated. The relief CR01 could not have easily determined that the valve was partially opened because the valve position indication lights showed that the valve was shut and the operation and position of the valve had not

been entered into the control room log. The team concluded that poor logkeeping was a communication weakness that contributed to prolonging the event.

Two control room operators stated that they had voiced strong opposition to having the valve open at the existing system pressure (approximately 215 psig) and had attempted to point out that opening the valve was a violation of procedures. However, the CRS stated that he had been aware of only moderate concern on the part of only one operator regarding the fact that system pressure was above 125 psig. In response to the operator's concern, the CRS discussed the use of the RWCU system blowdown orifice bypass valve to control reactor pressure vessel level with the shift manager. However, the CRS did not inform the shift manager that the valve was already open or that the control room operator(s) had expressed concern regarding opening the valve.

At no time during the shift did any member of the crew express concern about or objection to the use of the RWCU system blowdown orifice bypass valve to the shift manager. As previously noted, the control room operators voiced their initial objections to the CRS at the time the valve was opened, and shortly thereafter, the CRS discussed the use of the valve with the shift manager. The control room operators assumed that the CRS had conveyed their concern to the shift manager.

The team concluded that several breakdowns in communication had occurred once the RWCU system blowdown orifice bypass valve was opened.

Statements from the CRS and two control room operators confirmed that the RWCU system blowdown orifice bypass valve had been opened by the CRS before any discussions with the shift manager regarding its use. However, the shift manager stated that it was his understanding that the CRS was seeking permission to open the valve. The team concluded that the shift manager's failure to recognize that the CRS was informing him that the RWCU system blowdown orifice bypass valve had already been opened, was a significant communication error which reflected on the lack of control focus by the shift manager.

After the CRS discussed the use of the valve with the shift manager and informed crew members that the valve could remain partially open until the end of the shift, one control room operator continued to object to the valve being partially open. However, he did not pursue his concern any further with shift management or supervision. He stated that he believed that it would have done no good to express his objection to the shift manager once the CRS and the shift manager had agreed on the matter. An interpersonal conflict had arisen between the control room operator and the shift manager in the 4 months preceding the event. Other crew members and operations management were aware of the situation but did not believe it warranted restructuring crews. The team concluded that the interpersonal conflict between the CRO2 and the shift manager was a barrier to effective face-to-face communications at the time of the event.

In summary, the team concluded that, the crew on shift during the event exhibited numerous weaknesses in command, control, and communications.

5 EVALUATION OF MANAGEMENT RESPONSE

5.1 Root Cause Analysis

5.1.1 Licensee's Root Cause Determination

The licensee's resolution for PER 295-0317 was approved on April 28 and received by the team on May 3. The licensee's root cause evaluation was documented in the resolution to PER 295-0317. The report concluded that the root cause of the event was poor work practices (failure to use the system operating procedure initially and not using it correctly when it was used).

The licensee's root cause evaluation also concluded that several contributing factors led to a mindset by shift supervision that the operation was allowed. These included:

- A lack of operator training on the latest revision to the system operating procedure.
- Direct supervisory involvement with equipment operation interfered with the overview role.
- The shift manager's oversight was inadequate in that contact with the crew was too infrequent to detect the problem.
- Verbal communications were inadequate in that the CRS did not pay sufficient attention to operator concerns.

5.1.2 Assessment of Licensee's Root Cause Analysis

The licensee's root cause analysis identified what happened during the event. However, the analysis was inadequate regarding its explanation regarding why the event occurred, why the licensee's previous corrective actions failed to preclude this event, and what the relationship of the potential precursor events that occurred earlier this year were to more generic fundamental human performance problems at the site.

The team's review of the licensee's root cause determination indicated several weaknesses, as follows:

- The event had multiple root causes, rather than a single root cause.
- The change to the procedure was an insignificant contribution to the event.

- Inadequate supervision during work by the CRS, and inadequate management attention and oversight by upper management and the shift manager, were significant causal factors to the event.

- Inadequate organizational culture -- the standardized ways of thinking and acting that individuals have acquired as personnel and workers at the plant -- and poor personal standards were root causes of the event.

The team agreed with the licensee's determination that communication was a contributing factor to the event.

The AIT determined that the root causes of the April 9, 1995, event were as follows:

- Management Systems -- the organizational culture was less than adequate.

- Management Attention and Oversight -- contact with shift crew was infrequent.

- Supervision During Work -- supervision and crew teamwork were less than adequate.

- Procedures -- procedures were followed incorrectly.

Employee communication that was less than adequate was a contributing factor to the event. Interviewees described an organizational culture that had retained remnants of the old practice of using procedures as guidance that relied heavily on skill of the craft. Interviewees, including utility management and control room operations staff, also stated that pockets of resistance and outliers still existed that had not fully accepted management's expectation of strict adherence to procedures. The interviewees also consistently stated that they were amazed that the CRS and shift manager would be involved in an event of this type, since their actions were totally inconsistent with their performance up to the event. This CRS and shift manager were known as sticklers for procedure compliance, to the point of almost being obstructionist to accomplishing work tasks during their shift.

The team's findings are depicted in Appendix D, "Events and Causal Factors Chart of the April 9, 1995, Procedure Non-Compliance Event," and the basis for these findings is discussed in Section 6 of this report. The team does not believe that the events and causal factors chart in Appendix D is the final answer, however, but is based on the information the team was able to gather in a brief inspection. This chart clearly depicts that there is a more fundamental problem that has not yet been clearly identified, and the licensee needs to look further to identify the full scope of problems and identify their underlying causes, and not just identify a cause, and to correct the problems.

The team concluded that the licensee's root cause analysis was incomplete and generally addressed symptoms emphasizing what had happened rather than causes that address why it happened. In addition, the team considered that the licensee's root cause did not address the possibility that the action was either a deviant or malicious action when they performed their Management Oversight and Risk Tree analysis, nor did they address the human performance factors associated with these issues.

5.2 Corrective Actions

5.2.1 Initial Corrective Actions

The licensee provided an initial event description and a description of the initial response to the NRC in a letter dated April 20, 1995, (G02-95-072). The Assistant Operations Manager initiated PER 295-0317 on April 10 after being informed of the failure to follow the reactor water cleanup system operating procedure. Operations management initiated an investigation which included interviews with the involved personnel. Based on preliminary investigation findings, two individuals were removed from licensed duties on April 11.

Other initial corrective actions involved informing station personnel of the event and its implications. These actions included:

- Discussions by the Operations Manager with the shift managers on April 17, including the event and performance expectations. Shift managers then held discussions with their crews.

- Posting a "HOT LINE" message on the electronic mail system to inform employees of the event and address the importance of procedural adherence and appropriate use of the NSIP.

- Briefing managers and supervisors on the event and its significance on April 20.

- Holding discussions with workers during a "time out" on April 21, covering the event, its significance, expectations for procedural adherence, and workers responsibility to raise safety issues.

On April 21, the licensee initiated a management oversight function in the control room. This involved managers observing control room operations to ensure that high standards and management expectations are met. The oversight is planned to be performed on a continuous basis for at least 3 months. In addition, the NSIP staff conducted interviews to identify any indications of procedural adherence attitude problems, any management pressure to violate procedures, or any existing or potential intimidation or harassment for raising safety concerns. The NSIP conclusions and recommendations are summarized in Section 5.2.3 of this report.

5.2.2 Additional Corrective Actions

The licensee's resolution for PER 295-0317 was approved on April 28 and received by the team on May 3. The approved PER resolution included the following additional corrective actions:

- Recalibration of Pressure Switch RWCU-PS-14 to verify as-found condition.
- Performance of an engineering assessment of potential piping damage.
- Review the process for incorporating procedure changes into licensed operator requalification training to ensure that significant changes are made known to operators in a timely manner.
- Hold refresher training for managers and supervisors to emphasize the need to address employee concerns with an open mind and attempt to resolve them prior to the concern being raised as a nuclear safety issue.
- Include teamwork refresher training in licensed operator requalification training.

5.2.3 NSIP Review of the Event

The NSIP staff was informed of the procedural adherence concern on April 10. After learning that operations management was investigating the event, the NSIP assessment plan included monitoring line management's actions to resolve the issue. The second part of the plan was to conduct interviews to identify any indications of procedural adherence attitude problems, any management pressure to violate procedures, or any existing or potential intimidation or harassment for raising safety concerns.

The NSIP investigator interviewed all operations department personnel except for administrative support personnel and a few trainees. He concluded that the operations staff was committed to the policy of strict adherence to procedures and that management pressure was not being applied to violate or circumvent procedures. While no evidence of intimidation or harassment was identified, the investigator found that many operations personnel perceived an expectation that safety issues should be fully pursued through the chain of command before using the NSIP.

The NSIP Report included the following recommendations:

- Continue reinforcement of management expectations on procedural compliance.
- Clean up operations procedures to preclude variable interpretations by different shifts.

- Make sure that the plant staff is aware that there is no negative connotation to be applied to anyone using the NSIP when they have a concern.

- Inform the plant staff that the actions of the reactor operators were proper, reinforcing the challenging of poor decisions, using the chain of command to get resolution, and realizing that each employee has the right to use the NSIP and the NRC when they wish to raise concerns.

5.2.4 Assessment of Licensee's Corrective Actions

The team evaluated the licensee's preventive and corrective actions and concluded that they were narrowly focused. As discussed in Section 5.1.2 of this report, the licensee had not looked broadly enough to assess the root cause of the event and therefore had not fully proposed appropriate corrective actions.

5.3 Reportability Determination

On May 3, 1995, the team was provided a copy of the licensee's reportability evaluation for the event of April 9. The evaluation, dated April 30, 1995, concluded that the event was reportable in accordance with the requirements of 10 CFR 50.74, "Notification of change in operator or senior operator status." The licensee's letter to the NRC, dated April 20, 1995, (G02-95-073), requested termination of the operator licenses for two senior reactor operators, meeting the requirements of 10 CFR 50.74. The team reviewed the licensee's reportability evaluation and determined that the licensee's conclusions were appropriate.

5.4 Evaluation of Safety Significance

After the team's initial contact with site engineering on April 24, 1995, regarding safety assessment of the event, additional discussion was held with engineering personnel on April 25-26. As noted in Section 3.4 above, engineering had not considered any impact on systems or potential failure of piping beyond the automatic closure of Valve RWCU-FCV-33 at 140 psig, to mitigate any failure. Therefore, they were not prepared to discuss the potential for overpressurizing of the 150 psi design piping or the potential effect of such an overpressurization, 14 days after the event.

Through continued inspection, the team became aware that other possibilities existed for mitigating or automatically isolating an unplanned release due to blowdown piping failure occurring as a result of piping overpressurizing. A review of piping and instrument diagrams and design information indicated that reactor water cleanup flow would be automatically stopped by excessive differential pressure across a filter-demineralizer vessel or the vessel resin trap. Excess reactor water cleanup flow caused by an unmitigated failure in the blowdown piping had the potential to cause these high differential pressure conditions. In addition, high temperature on the tube side outlet of

the nonregenerative heat exchanger would have stopped reactor water cleanup flow. This condition could have occurred because of regenerative heat exchanger decreased shell side flow caused by diverted flow through a piping failure. Any of the automatic flow stoppage mechanisms above had the potential to terminate a release because system forward flow would have been stopped automatically and back flow would have been prevented by a check valve. Finally, a leak detection system would automatically isolate the reactor water cleanup system based on flow imbalance within the system indicative of excessive leakage out of the blowdown system. The team communicated this information and concern for complete evaluation of safety significance to various licensee personnel prior to departing the site.

On May 3, 1995, the team received the licensee's investigation report related to the April 9, 1995 event. The report contained two completed documents related to the engineering safety significance assessment of the event. The team reviewed in detail Engineering Evaluation of Potential for Overpressurization of RWCU Blowdown Piping by Operations on April 9, 1995, dated April 27, 1995, and the reportability evaluation dated May 1, 1995, that referenced PER 295-0317.

A detailed review of the licensee's assessment revealed that the engineering review assumed conservatism in determining worse case values while postulating unlikely failures of the initial and final mitigating mechanisms. The pressure just upstream of Valve RWCU-FCV-33 was assumed to be 450 psig based on the combination of vessel pressure, system pump head, and elevation difference head. Calculations assuming that Valve RWCU-V-31 was fully opened indicated that the maximum pressure seen by the piping to the main condenser would be 260 psig. According to applicable code standards, the piping would tolerate 763 psig before the material yield strength was reached. However, engineering review identified a mechanical joint within the system that was capable of withstanding only 425 psig before failure occurred. The assessment concluded that the piping system could not have failed under the worst conditions that could be postulated. The licensee review personnel also determined that the blowdown line high pressure alarm setpoint of 140 psig was not reached during the event. A work request was issued to check the setpoint of Pressure Switch PS-14 which would have provided the alarm and isolation at 140 psig.

The team concluded that, while engineering was not aggressive or thorough in its initial evaluation, the final engineering safety significance assessment results were accurate and benefitted from NRC questions about the completeness of the initial assessment. The event was not safety significant from a systems standpoint, and did not represent an additional risk to the public health and safety. The significance of the event was that supervisory and management personnel were involved in not adhering to the requirements of a system operating procedure over the proper objections of reactor operators who had identified that the action constituted a noncompliance with the procedure.

6 EVALUATION OF ORGANIZATIONAL PERFORMANCE

6.1 Procedures and Performance of the Shift Manager, Control Room Supervisor, and Reactor Operators

6.1.1 Administrative and Operating Procedures

Administrative Procedure 1.2.2, "Plant Procedure Preparation," Revision 19, defined "should" and "shall" in regard to the execution of procedures. "Should" is used to denote recommendations but not enforceable regulatory requirements and management expectations. "Shall" is used to denote regulatory requirements, external commitments and selected management direction. "Shall not" is also defined in this procedure. This procedure states that "shall" and "shall not" procedure statements are inviolate, and "should" procedure statements allow discretion for deviations by following an appropriate, documented process. The shift manager and the CRS did not adhere to this guidance regarding the "shall not" related to operation of Valve RWCU-V-31.

Administrative Procedure 1.2.3, "Use of Controlled Plant Procedures," Revision 24, contained guidance on management's expectation regarding procedure usage. It stated: "STRICT ADHERENCE to procedures is our standard to operate and maintain the plant safely and efficiently." The shift manager and the CRS did not adhere to this expectation.

Administrative Procedure 1.3.1, "Department Policies, Programs and Practices," Revision 19, contained guidance on programs, policies, and practices that govern the activities of the WNP-2 operations department, including plant problems and troubleshooting and communications. It stated: "When a problem exists, do not proceed alone. Seek out assistance as needed. The entire plant staff is a resource and should be used accordingly." As discussed in Section 6.1.3 of this report, the CRS did not use this guidance. The procedure instructed control room operators as follows: "Challenge instructions or orders that they do not understand or that they perceive could lead to further plant degradation. Communicate all indications that appear incorrect, or that do not immediately make sense, to the CRS." CROs 1 and 2 behaved in a manner that was consistent with this guidance as demonstrated by their questioning attitudes and the persistence on the part of CRO 2 to resolve his concern about cracked-open Bypass Valve RWCU-V-31.

Administrative Procedure 1.3.12, "Problem Evaluation Request (PER)," described the method to report a problem or to document the occurrence of an event. The Assistant Operations Manager used this guidance to document the April 9, 1995, event. The licensed personnel on shift at the time of the event did not, however, document the event or their concerns using a PER. Section 5.1 of this procedure stated that all personnel are responsible for reporting and documenting actual or potential conditions or events adverse to quality, including serious human performance errors on a PER.

Operating Procedure 2.2.3, "Reactor Water Cleanup System," contained guidance on operating the reactor water cleanup system. Step 10 of this procedure stated: "If Reactor pressure is LT 125 psig, RWCU-V-31, Orifice Bypass Valve, may be jogged open to increase discharge flow." Before Step 10 of this procedure, a caution statement specified the potential consequences of not complying with this Step 10:

> CAUTION: RWCU-V-31 shall not be open with Reactor pressure GT 125 psig, to prevent over pressurization of the RWCU blow down piping.

The CRS opened Valve RWCU-V-31 at a pressure greater than 125 psig. The team found that the caution statement was appropriately placed and satisfactorily formatted according to the guidance in NUREG-1358.

The team concluded that if the guidance in the procedures discussed above had been followed, the April 9, 1995, event would not have occurred.

6.1.2 Shift Manager's Performance

During an interview, the shift manager, who was on watch at the time of the event, stated that the CRS had initially asked him for permission to open Valve RWCU-V-31, and the shift manager had refused this permission. The CRS followed this with a second request about 5 to 10 minutes later to which the shift manager had agreed because the CRS said that he needed to open the valve in order to control vessel level. The shift manager further stated that he had not looked at the applicable procedure, which he stated he had reviewed the day before, or gone into the control room either at the time of the CRS' request or during his entire shift because he was extremely busy with administrative duties. The shift manager stated that he was not aware that Valve RWCU-V-31 was already open at the times the CRS requested to open the valve. The shift manager stated that the CRS had not mentioned any crew concerns about opening the bypass valve and that he had heard about the concerns the next day. The shift manager stated that he did not realize that Procedure 2.2.3 contained a "shall not" statement indicating that if reactor pressure was greater than 125 psig, Valve RWCU-V-31 was not to be opened. When asked if he knew at the time of the event that the CRS' request was a violation of procedure, the shift manager responded, "yes." The shift manager stated that the subject caution in Procedure 2.2.3 had existed for approximately 2 years, that there was no requirement to re-read procedures periodically, and that normally he would have reviewed the procedure, but he had a heavy workload because of instrumentation and control testing.

The team concluded that the shift manager's performance was less than adequate with respect to attention and oversight of the shift crew and plant conditions. Specifically, the shift manager had infrequent contact with the shift crew and did not exhibit a questioning attitude regarding the requirements of Procedure 2.2.3 or the cracked-open bypass valve.

6.1.3 CRS's Performance

During an interview, the CRS on watch at the time of the event stated that the CRO1 had reported to him that reactor pressure vessel level was high and no more blowdown margin was available and the CRS stated that he had instructed CRO1 to open the RWCU-V-31 bypass valve. Because CRO1 had responded that he did not know how, the CRS stated that he opened the valve while CRO1 and CRO2 observed and that CRO2 had raised concerns about the valve being open and the procedural caution. The CRS stated that a few minutes after opening Valve RWCU-V-31, he had opened Procedure 2.2.3, reviewed the caution statement, and acknowledged that the statement pertained to a reactor pressure greater than 125 psig, but that he had not seen the words "shall not." Further, the CRS stated that he believed the situation warranted opening the valve and that CRO2 had not mentioned words "shall or should." He then told CRO2 that the shift manager and the CRS could deviate from a procedure because procedures were not written for every situation. The CRS stated that he had discussed with the shift manager the fact that Valve RWCU-V-31 was cracked open to lower reactor vessel level and that the shift manager had initially indicated that he did not want the valve open and then had agreed to leave the valve open until the end of the shift. The CRS stated that he had not conveyed the CRO2's concern to the shift manager. When asked about the valve indication showing closed, the CRS replied that he could have used a caution tag. The CRS stated that he had discussed the status of the bypass valve with the relief CRO1.

The team concluded that the CRS had inappropriately deviated from procedure by opening the RWCU-V-31 valve. Additional inappropriate actions taken by the CRS were failing to listen to and resolve the concerns of CRO1 and CRO2, fully inform the shift manager about these concerns and the status of Valve RWCU-V-31, log the valve operation, and thoroughly examine the caution statement in Procedure 2.2.3.

6.1.4 Reactor Operators' Performance

The team interviewed CRO1, CRO2, and relief CRO1. During the interview CRO1 stated that he had asked the CRS for guidance in controlling reactor vessel level and that the CRS had responded by stating that "here is what we can do" and then cracked open Valve RWCU-V-31. CRO1 then told the CRS that he did not think this could be done because the procedure specified "shall not." The CRS had opened Valve RWCU-V-31 and then jogged it in the closed direction until the "open" indication light went out. As a result, the valve indication showed that Valve RWCU-V-31 was closed, while in fact there was flow through the valve. Both CRO1 and CRO2 challenged the CRS' action. CRO1 returned to monitoring the control panel. The CRS then discussed the issue with the shift manager. CRO1 was relieved by relief CRO1, but did not tell the relief CRO1 about the position of the bypass valve. When the team asked CRO1 to confirm that he had told the CRS that the procedure said "shall not", he responded, "yes." When asked about the CRS' answer, he stated that it was: "We need to do what we need to do." CRO1 said that he believed that the CRS not only knew

that his action was a procedural violation but also understood CRO1's concern. CRO1 stated that the CRS did not have any known history of this kind of behavior.

CRO2 corroborated aspects of CRO1's statements. He stated that CRO1 had asked the CRS for guidance on controlling reactor vessel level and that the CRS had responded by stating, "Not a problem. Watch this." The CRS then manipulated Valve RWCU-V-31 so that it cracked open. When the "open" indication light went out, the CRO1 stated that the CRS said, "See, it is not open." When CRO2 pointed out the procedure, the CRS stated that his interpretation was that the valve was not fully open. CRO2 told the team that the CRS had discussed the issue with the shift manager. The CRS then returned to the control room and stated that the shift manager agreed that the valve could be left open until the end of the shift without deviating the procedure. CRO2 stated that after the turnover from CRO1 to relief CRO1, he had told relief CRO1 about the status of Valve RWCU-V-31 and that relief CRO1 was not comfortable with this situation and discussed it with the CRS.

Relief CRO1 corroborated the statements made by CRO2 and the offgoing CRO1 that the CRS knew that his action to crack open Valve RWCU-V-31 violated procedure. However, he did not recall if the CRS had stated, as indicated by CRO2, that the procedure was being satisfied because the valve was not fully open. He did say that CRO1 had told the CRS that the CRS' action was deceptive. The relief CRO1 stated that CRO2 had said, "we have a cultural problem" and "these individuals think they're above the law." The relief CRO1 told the team that he believed that both the shift manager and the CRS recognized that their actions were contrary to procedure and that the offgoing CRO1 had expressed his frustration by indicating he would do something about it by calling the Nuclear Safety Issues Group. He stated that the shift manager and the CRS were very strict with respect to procedural compliance and that the offgoing CRO1 was surprised that they allowed the valve to be open. The relief CRO1 concluded by stating that he eventually obtained permission from the CRS and closed Valve RWCU-V-31, but did so without informing the CRS or logging the action.

The team concluded that CRO1, CRO2, and relief CRO1 acted appropriately in persevering in their efforts to resolve the issue of Valve RWCU-V-31 being cracked open contrary to procedure. None of these personnel, however, logged any of their actions in the control room operator's log, nor did they document the problem or concern in a PER.

6.2 Attitudes, Policies, and Practices Regarding Compliance With Procedures and Conservative Plant Operations

6.2.1 Management's Attitudes, Policies, and Practices

The team assessed management's attitudes, policies, and practices regarding compliance with procedures and conservative plant operations by interviewing the utility's Vice President for Nuclear Operations, the Plant General

Manager, the Operations Manager, the Assistant Operations Manager and by reviewing licensee documentation.

In regard to compliance with procedures, management stated that some procedural steps were inviolate, were based on regulatory requirements and management's expectations, and must be followed with no latitude for deviation (unless public health and safety would be in danger), while other procedural steps allowed some latitude for deviation, if people with similar training and experience reached the same conclusion that a deviation was necessary. Management stated that the deviation process should be documented. Management also stated that they believed that supervisors generally supported their expectations regarding compliance with procedures and had expressed strong disapproval of the CRS' lack of compliance. Management acknowledged that "pockets of problems" still existed with procedure compliance that need to be identified through peer pressure. They noted that individuals who did not comply with procedures were held accountable, giving the example of four corporate-level employees who were fired recently for violating company policy. On the other hand, they stated that they reward compliance through personal praise. Management stated that a recent survey of plant personnel indicated that management's expectations were well understood. With respect to conservative plant operations, management stated that they had communicated to plant personnel that schedule was never a priority over conservative plant operations.

With respect to practices, management stated that they conveyed their expectations regarding compliance with procedures and conservative plant operations to plant personnel through personal contact, procedures, videotapes, and "standards of success" documents. Their efforts regarding compliance with procedures included identifying problems at the simulator and on shift and implementing a management oversight team in the control room on April 21, 1995. This team reports to the Operations Manager, to monitor and coach shift personnel 24 hours per day for an estimated 3 months. Management stated that feedback from this initiative had indicated that operators are questioning inconsistencies. Management noted that compliance with procedures was implemented through internalization of management's expectations. The measures of whether plant personnel were meeting its expectations included PERs, procedure change requests, maintenance work requests, control room deficiencies, chance encounters, discussions, and surveys. Management did not believe that noncompliance was pervasive because if it were, many more instances would have occurred. On the basis of these indicators, management believed its expectations are well understood.

Regarding NRC's previous observation that interactions with the NRC were less than adequate, the licensee's management stated that the NRC should have been notified sooner about the event and that the cause for the delay was that details were lacking.

During the interviews with licensee management, the team discussed known problems pertaining to the affected crew, the manner in which licensee management determined that procedural noncompliance was not a pervasive

problem, and the way licensee management deals with persons who have not internalized management's expectation of strict compliance with procedures.

Management stated that the teamwork on the affected crew was not as good as that on other crews, and interpersonal problems existed between the shift manager and CRO2. Licensee management also identified other crew and individual problems, although several of these were not documented in performance assessments of the personnel involved. Management noted that it had recognized problems on the affected crew and was working on them and acknowledged that its resolution of the problems was slower than it should have been.

Management stated that it did not consider noncompliance with procedures to be a pervasive problem. The Vice President for Nuclear Operations stated that he had achieved a level of comfort by talking to plant personnel and perceiving that personnel were appalled at the event. He added that the management oversight team had indicated that operators were questioning inconsistencies and insisting on corrections. The Plant General Manager stated that of 1700 employees, he would expect a few who did not know the right action. He added that he had talked extensively with operators using prepared remarks emphasizing verification, peer checking, and teamwork to assess whether or not the problem was pervasive. The Plant General Manager stated that while there could always be outliers, and he suspects there may be, he does not believe the problem is pervasive.

Management believed that a very small minority of individuals might not have internalized its expectation of strict adherence to procedures. It stated that it would be a challenge to identify such individuals by peer evaluations and to correct their behavior through peer pressure, and by holding each other accountable. The Vice President for Nuclear Operations stated that the event had surprised and disappointed him greatly. He further stated that he did not believe anyone else is out there who would repeat this. He also stated that he did not think these people would do this. The Vice President for Nuclear Operation's belief that this was an isolated occurrence is inconsistent with the views and perceptions of the operations staff, as discussed in the next two sections of this report.

On the basis of the interviews and the review of licensee documents, the team found the following:

- Management's policies in regard to compliance with procedures and conservative plant operations had been communicated to plant personnel.

- Management's response to the problems on the affected crew was slow which may have contributed to the event.

As discussed in Section 5, as well as in the preceding discussion, the team is concerned that the licensee has not objectively evaluated prior performance and the concerns expressed by their own control room operators to determine the potential for a pervasive procedure adherence problem at WNP-2.

The team also found that the licensee management's current actions for holding people accountable did not ensure the CRS' behavior was appropriate to preclude this event, especially since there was, according to licensee personnel, no prior indication that this CRS would violate a procedure in the manner that he did. Thus it is not clear to the team that the licensee's management has identified the root causes for the event. It is also not clear to the team why use of unchanged corrective actions for human performance problems following this event would be any more effective in identifying or precluding the likelihood of a similar event occurring. This concern is especially important, since the licensee had a similar event in 1992 as documented in NRC Inspection Report 50-397/93-29, and because the licensee evaluated this most recent event in apparent isolation without considering the 1992 event and its corrective actions, nor did they consider the most recent series of human performance problems in their evaluation of human performance issues at WNP-2.

6.2.2 Operations Department's Attitudes, Policies, and Practices

The team assessed the attitudes, policies, and practices of the operations department with regard to compliance with procedures and conservative plant operations by interviewing the Operations Manager, the Assistant Operations Manager, shift managers not involved in the event and reviewing licensee documentation.

During his interview, the Operations Manager reported that when he first heard of the procedure event on Monday, April 10, 1995, at about 8:30 a.m., he had instructed the Assistant Operations Manager to contact the shift manager and the CRS and to write a PER. He stated that CRO2, who had reported the CRS' action to the Nuclear Safety Issues Group, had approached him in the parking lot on April 11, 1995, stating that he had attempted to call him about the CRS' action and asking if he was in trouble. The Operations Manager stated that he had responded that the operator was not in trouble for raising a concern. When the team asked about the personnel attitudes, the Operations Manager indicated that changing it was an issue that the licensee management had identified and was addressing. He stated that he expected procedures to be adhered to and if compliance could not be achieved, to inform the shift manager for oral or written approval of a deviation. He stated that a "shall" procedure statement was a requirement and a "should" procedure statement allowed some discretion in deviating from the procedure. When asked if deviation from a procedure in relation to a "should" statement would result in documentation, he responded that it might. This response raised a concern regarding the Operations Manager's understanding of the procedural guidance contained in Plant Procedures Manual 1.2.3 regarding compliance with procedures, and raises a potential source of the inconsistent understanding by the control room operators of management's expectations regarding procedure compliance. He noted the following as indicators of compliance with procedures and conservative plant operations: Operating Instruction 9 (OI-9); peer observations; the management oversight program; the recent large number of procedure deviations; the number of personnel errors; and data trends.

When asked what was the difference between the current management response to a procedural noncompliance and the past response, he answered that the past response lacked consequences. He stated that he did not believe time constraints conflicted with procedural compliance. The Operations Manager emphasized that the operations department supported operators. He noted that 6 months ago a supervisor in the plant had operated equipment that caused a trip. This led management to reinforce its expectation that supervisors supervised rather than operated controls.

During his interview, the Assistant Operations Manager stated that on April 10 at approximately 8:30 a.m., he became aware of a phone message from CRO2 regarding a nuclear safety issue. He called CRO2, who told his story, briefed the Operations Manager, and agreed to investigate the issue. He stated that everyone (e.g., management, operations department) might have been slower than they should have been in regard to the event. He noted that the CRS did not seek outside help in resolving the issue of reactor vessel level.

The team also interviewed four shift managers who were not involved in the event. The shift managers stated that management expected strict adherence to procedures and that a "shall" statement in a procedure meant it was inviolate. The shift managers' responses to a question about a "should" statement in a procedure were as follows: (1) senior level consultation was expected; oral change was okay; also expected, if there was time, was to get others involved (e.g., operations management, engineering staff); (2) management's expectation was that the shift manager and CRS would exercise some judgment; (3) a "should" statement was not an option, and any change had to be brought to the attention of the CRS, then to the shift manager and to operations and engineering staff; and (4) there used to be latitude, but now "should" and "shall" statements are the same. When queried further on the implementation of management's expectation regarding compliance with procedures, shift manager's responses were as follows: (1) there were several ways to address problems with procedures, including verbal deviation with oral concurrence of two senior reactor operators, followed by documentation of deviation written by the end of the shift and logged in the control room log (the shift manager was unsure whether deviation from a "should" statement necessitated written documentation); (2) there was absolutely no ambiguity--the procedure should be followed, and if it could not be, it should be changed as appropriate (i.e., it should be stopped and fixed); (3) documentation of a change depended on the type of change; and (4) step-by-step adherence was necessary, or a procedure that was not "working" was required to be brought to the attention of the supervisor or deviation was allowed if verbally agreed to by the supervisor, but if critical, should be followup by written documentation. When asked if operators were aware of the shortcut regarding cracking open of the RWCU-V-31 valve, the shift managers generally conveyed that everyone knew. The team asked shift managers to give their perception of how extensive the problem of noncompliance with procedures was at the plant. The shift managers were in general agreement that noncompliance was not pervasive. The team asked shift managers to discuss the history of noncompliance at the plant and to provide insights on why it appeared to be a recurring problem. The shift managers stated that years ago operators manipulated valves in the same way as occurred

during the event, procedures were weak, and greater reliance was placed on skill of the craft. Operators then were known as people who could make things work no matter what; given the poor procedures at the time, operators who knew short cuts were held in awe. The shift managers stated that although currently there was generally a desire to do the right thing and to do what was expected, desire was sometimes overcome by habits, some individuals had not had the "epiphany," pockets of resistance existed, and some individuals believed their knowledge or ability overrode procedures.

On the basis of the interviews with operations management and the review of licensee documentation, the team found the following:

- Some shift managers and CRSs stated that they believed that a relatively small cultural remnant or cultural lag existed at the plant that had not fully accepted management's expectation regarding strict adherence to procedures and that operated the plant in the old manner, with emphasis on operator skill of the craft over procedure compliance.

- The operations department generally conveyed an expectation of strict adherence to procedures and conservative plant operations.

- The operations department was unclear about implementation of the "should" aspects of management's policy on compliance with procedures especially with regard to documentation of a departure from a "should" statement in a procedure. It was clear about management's policy and expectation regarding conservative plant operations.

- The operations department's response to the problems of the affected shift crew was not rapid and may have contributed to the event.

6.2.3 Control Room Staff's Attitudes and Practices

The team assessed the attitudes and practices of the control room staff by interviewing CRSs not involved in the event, the three CROs involved in the event, and the lead control room operator and by reviewing licensee documentation.

The team interviewed six CRSs who had not been involved in the event. The CRSs stated that management expected strict adherence to procedures and that a "shall" procedure statement was inviolate, whereas a "should" statement allowed room for interpretation. When queried about the implementation of management's expectation in regard to compliance with procedures, the responses of the CRSs were as follows: they might or might not inform the shift manager or log deviations from "should" statements, it was not cut and dry whether deviation from a "should" statement must be documented, administrative procedures did not describe how "should" statements were to be handled, no documentation was needed for deviation from a "should" statement, and they might log a deviation from a "should" statement under some circumstances. When asked if operators were aware of the short cut regarding

the cracking open of Valve RWCU-V-31, the CRSs were about equally divided on whether others knew. The team asked the CRSs to discuss their views of how extensive the problem of noncompliance with procedures was at the plant. One CRS stated that 4 to 5 years ago it might have been okay to comply with a procedure because a valve was cracked open (rather than fully open), that the event brought into question the plant culture, and that the affected shift crew was dysfunctional and lacked teamwork. One CRS considered strict adherence to procedures to be an insult because if one knew how to perform an action correctly, prescriptive following of procedures prevented one from accomplishing a task that departed from the norm and did not allow any room for interpretation or skill of the craft. Most of the CRSs agreed that the view of most operators was similar in regard to adherence to procedures. The consensus was that the operations department was committed to compliance with procedures rather than skill of the craft; however, procedures needed work to better support compliance.

Interviews of the three control room operators involved in the event are discussed in Section 6.1.4 of this report. The team interviewed the person who was the lead CRO3 during the event. CRO3 stated that he had served as the lead CRO for about 6 months. He described his duties as follows: keeping various logs, directing CRO2 in certain tasks, coordinating actions as directed by the CRS, reviewing surveillances, and tracking surveillances. He stated that during the event he was busy because of forced-outage activities and did not become aware of the event until several days later. His response to a question about the mood of the control room staff on April 9 was he perceived some frustration with "being down but not rushing to get up." He stated that the atmosphere had changed over the last year or so--the pace on the back shift was slower than it had been. He stated that he had expected to be informed of the CRS' valve manipulation. His response to a question on crew briefing was that no criteria existed except experience, and that he had expected a briefing on the circumstances of the April 9 event. CRO3 said that the shift manager was infrequently in the control room because of the work load on the backshift and meetings on the day shift. When asked if a lot of steps were in caution statements, he responded, "yes." He added that caution statements should be highlighted. When asked about old and new employees, he responded that some of the old employees were having to forget their old ways and noted a difficulty in getting beyond "get the job done."

On the basis of the interviews with the control room staff and the review of licensee documentation, the team found the following:

- The control room staff generally conveyed an attitude of strict adherence to procedures and conservative plant operations. However, it appeared that "outliers" and "pockets of resistance" still existed regarding strict compliance with procedures.

- Improvement in the quality of procedures would better support and ensure procedure compliance.

6.2.4 Management Control of Expectations and Effectiveness in Ensuring Conservative Plant Operations

Management had transmitted its expectations regarding compliance with procedures and conservative plant operations to plant personnel through meetings, face-to-face sessions, e-mail, videotapes, and procedures. By procedure, management had conveyed strict adherence to procedures regarding "should" and "shall" statements in practice. By verbal communication, it had conveyed strict adherence to procedures. Management had conveyed clear and consistent expectations, both in writing and orally, regarding conservative plant operations including the message that safety must take precedence over time pressures.

On the basis of interviews and the review of licensee documentation, the team concluded that management communication of expectations was deficient, in that there was inconsistent understanding and application of the written policies regarding procedure compliance by operations department personnel.

7 FINDINGS AND CONCLUSIONS

The AIT made numerous findings, observations, and conclusions which are detailed in this report. The following sections summarize the more significant findings and conclusions.

7.1 Findings

- The operating crew did not conduct any briefings to discuss the available methods for controlling reactor pressure vessel level.
- The CRS partially opened Valve RWCU-V-31 on April 9, 1995, such that the control room valve position indication indicated closed.
- The CROs expressed concern to the CRS about opening the valve and, also, about the valve remaining open.
- The system operating procedure contained a caution statement prohibiting operation of Valve RWCU-V-31 above an RCS pressure of 125 psig.
- RCS pressure was above 125 psig when the CRS opened Valve RWCU-V-31. Valve RWCU-V-31 remained open for approximately 2 hours. RCS pressure remained above 125 psig while Valve RWCU-V-31 was open.
- The relieving CRO was told of the condition of Valve RWCU-V-31 after he relieved the watch. After a discussion about the open condition of Valve RWCU-V-31 with the CRS, the relieving CRO closed the valve.
- The blowdown portion of the RWCU system did not exceed its design pressure of 150 psig during the event.

- Management expectations regarding procedure compliance are clearly stated in procedures, and the operations personnel that were interviewed clearly and consistently stated the written policy. The operations staff that were interviewed, however, demonstrated inconsistent understanding and application of these expectations.

- The licensee's root cause analysis identified the root cause as poor work practice, with contributing causes of change management and training, and poor supervisory methods.

- Procedural options were available to the control room staff for maintenance of the required reactor vessel level without opening Valve RWCU-V-31 with reactor vessel pressure above 125 psig.

7.2 Conclusions

- The event was not safety significant from a systems standpoint and it did not represent an additional risk to the public health and safety. The significance of the event was that supervisory and management personnel were involved in not adhering to the requirements of a system operating procedure over the objections of reactor operators.

- There were several breakdowns in each of the areas of command, control, and communications during the first operations shift on April 9, 1995, which contributed to the occurrence of the event.

- The licensee's root cause analysis was incomplete and generally addressed symptoms rather than causes, emphasizing what had happened rather than why it happened. As a result, the licensee's preventive and corrective actions were narrowly focused.

- The AIT review concluded that the event likely involved multiple root causes.

- The licensee's event assessment did not include an evaluation of prior corrective actions for procedure compliance problems or of their program to monitor procedural compliance. In addition, the licensee's root cause evaluation did not assess the event in conjunction with the more recent plant staff performance problems, nor did the assessment include an evaluation of the history of plant staff procedure compliance problems to determine if more fundamental or generic root causes to these problems existed.

- The control room staff generally conveyed an attitude of strict adherence to procedures and conservative plant operations. However, a relatively small percentage might not have fully internalized the expectation of the strict adherence to procedures. Although the number

estimated was small, some operators and others interviewed believed that "outliers" and "pockets of resistance" still existed regarding strict compliance with procedures.

- The initial safety assessment determination performed by site engineering personnel was untimely and incomplete in that it arrived at the conclusion that the event was not safety significant on the basis of an automatic system isolation capability function that was not periodically tested. The licensee's final engineering safety significance assessment results were accurate.

APPENDIX B

Persons Contacted

Washington Public Power Supply System (WPPSS)

* W. G. Counsil, Managing Director
*#J. V. Parrish, Vice President Nuclear Engineering
* J. P. Burn, Director, Engineering
*#P. R. Bemis, Director, Regulatory and Industry Affairs
* G. O. Smith, Director, Quality Assurance
* J. J. Muth, Manager Quality Support Services
#P. J. Inserra, Manager Quality Services
*#J. Baker, Director, Training
#W. D. Shaeffer, Operations Training Manager
#J. F. Streeter, Executive Assistant to Managing Director
* J. Gearhart, Assistant to Vice President
* M. P. Flasch, Assistant to Vice President
*#J. H. Swailes, Plant General Manager
*#C. Schwarz, Operations Manager
*#A. A. Langdon, Assistant Operations Manager
* G. Reed, Manager, Emergency Preparedness
*#M. M. Monopoli, Maintenance Manager
*#M. E. Reddeman, Technical Services Manager
#J. P. Albers, Radiation Protection Manager
* W. H. Sawyer, Operations Support Manager
* G. D. Sanford, Assistant Operations Support Manager
* M. Brant, Operations Observer
M. Consierre, Shift Manager
M. Baird, Shift Manager
W. Estes, Shift Manager
P. Taylor, Shift Manager
G. Hendrick, Shift Manager
N. Hancock, Shift Manager
M. Gallagher, CRS
R. Nelson, CRS
K. Hlavaty, CRS
G. Westergard, CRS
W. Green, CRS
D. Strote, CRS
D. Rambo, CRS
R. Gumm, Reactor Operator
M. Herring, Reactor Operator
S. Drinkard, Lead Reactor Operator
M. Mann, Operations Representative to Nuclear Safety Issues Program
K. Cuttler, Instrumentation and Controls Supervisor
*#D. M. Swank, Licensing Manager
* J. M. Pedro, Compliance Specialist
#B. R. Hugo, Licensing Engineer
* P. Thurmon, Licensing Engineer
#J. R. Holder, Manager Special Projects
#R. Anderson, Regulatory Support Specialist

This memorandum designates you as the AIT Leader. Your duties will be as specified in Manual Chapter 0325-04.02. The team composition will be discussed with you directly. During performance of the AIT; designated team members are separated from their normal duties and report directly to you. The AIT is to be conducted in accordance with NRC Manual Chapter 93800, "Augmented Inspection Team Implementing Procedure." The team is to emphasize fact-finding in its review of the circumstances surrounding the event, and it is not the responsibility of the team to examine the regulatory process. Safety concerns identified that are not directly related to the event should be reported to the Region IV office for appropriate action.

The AIT should meet in Richland, Washington, the evening of April 23, 1995, and report to the site the following morning. Tentatively, the inspection should be completed by April 26, 1995, with a report documenting the results of the inspection issued within 3 weeks of the completion of the inspection. While the team is on site, you will provide daily status briefings to Region IV management, who will coordinate with NRR to ensure that all other parties are kept informed.

Should you have any questions concerning this Charter, contact Thomas P. Gwynn, Director, Division of Reactor Safety at (817)860-8248.

APPENDIX A

Augmented Inspection Team Charter

April 20, 1995

MEMORANDUM TO: W. D. Johnson, Chief, Project Branch A, Division of Reactor Projects

FROM: L. J. Callan, Regional Administrator

SUBJECT: AUGMENTED INSPECTION TEAM AT WASHINGTON NUCLEAR PROJECT 2

On April 8, 1995, during plant startup and heatup, a senior reactor operator on shift as the control room supervisor operated a bypass valve in the reactor water cleanup system contrary to system procedures. On or about April 14, 1995, the control room supervisor and the shift manager were removed from licensed duties. These circumstances heighten existing agency concerns pertaining to licensee operational and management performance. Therefore, in accordance with Manual Chapter 0325-05.02.f, an augmented inspection team (AIT) is appropriate.

An AIT will be dispatched to better understand the actions of the operators involved, the procedure requirements, the safety significance of the event, shift crew attitudes and practices regarding plant operating procedures, and management expectations and response. The team is expected to perform fact-finding in order to address the following:

1. The initial conditions and sequence of events up to the point in which the operations manager was informed of the issue by the reactor operator and took action in response to the information;

2. Command, control, and communication interactions of the involved shift operators and other shift crews;

3. The administrative and operating procedures applicable to the event;

4. System impact and safety significance, including the potential for an intersystem loss of coolant;

5. Management response to the event, including a review of the licensee's root cause determination, the corrective actions that have been or will be taken, and the reporting of the event to NRC; and

6. Attitudes, policies, and practices of control room operators and licensee supervision and management towards procedure compliance and conservative plant operations.

In addition, the team will coordinate with and support the Office of Investigations, as requested.

#C. VanHoff, Acting Director, Communications and External Affairs
#J. O'Donnell, Program Manager-Emergency Communications
#B. E. Linville, Human Resource Specialist
#S. Brown, Quality Improvement Specialist
*#M. Hatcher, WPPSS Attorney
* M. P. Hedges, Corporate Chemist

Bonneville Power Administration (BPA)

* J. Irish, BPA Program Analyst
* J. H. Partridge, BPA
#D. L. Williams, Nuclear Engineer

Winston and Strawn

#D. Repka, Attorney

Nuclear Regulatory Commission (NRC)

*#R. C. Barr, Senior Resident Inspector

Others

#W. Briggs, Tri-City Herald
#C. M. Michael
#J. Ames
#A. A. Shaw
#S. M Dahl
#W. A. Kiel

* Attended Entrance Meeting April 24, 1995
\# Attended Public Exit Meeting April 26, 1995

APPENDIX C

Documents Reviewed

December 10, 1993 Letter G02-93-289, Response to Notices of Violation, NRC IRs 93-18, 93-24, and 93-29

GIB/APM 3.4.6, Nuclear Safety Issues Program, dated October 31, 1994

Transcript of CRO report to NSIP

PPM 1.1.3, "Plant Responsibilities," Revision 16

PPM 1.2.2, "Plant Procedure Preparation," Revision 19

PPM 1.2.3, "Use of Controlled Plant Procedures," dated January 16, 1995

PPM 1.3.1, "Department Policies, Programs, and Practices," Revision 19

PPM 2.2.3, Reactor Water Cleanup Operating Procedure, dated March 31, 1995

PPM 3.2.2, "Normal Shutdown to Hot Shutdown," Revision 9

OI-09 dated March 30, 1995 - Expectations for Supervisory and Peer Oversight

Plant Procedure 1.3.1 (Excerpt), Shift personnel responsibilities

March 1995 Performance Indicator Report

WNP-2 Corrective Action Audit Report, Audit 295-016, dated March 24, 1995

PER 295-0201, Human Performance Issues, dated March 13, 1995 (generated by QA during Audit 295-016)

Control Room Logs, starting 4/8/95 at 1010

Licensee's in-briefing slides, REACTOR WATER CLEANUP SYSTEM PROCEDURE VIOLATION, dated April 9, 1995

Night Orders from April 9, 1995 through April 12, 1995

April 18, 1995, Internal WPPSS Memo, Discussion of Organizational Survey Results

April 20, 1995, Memo From L.J. Callan to W.D. Johnson, Augmented Inspection Team at Washington Nuclear Project 2 (Charter)

April 20, 1995, Letter G02-95-073, Request for Termination of Operator Licenses

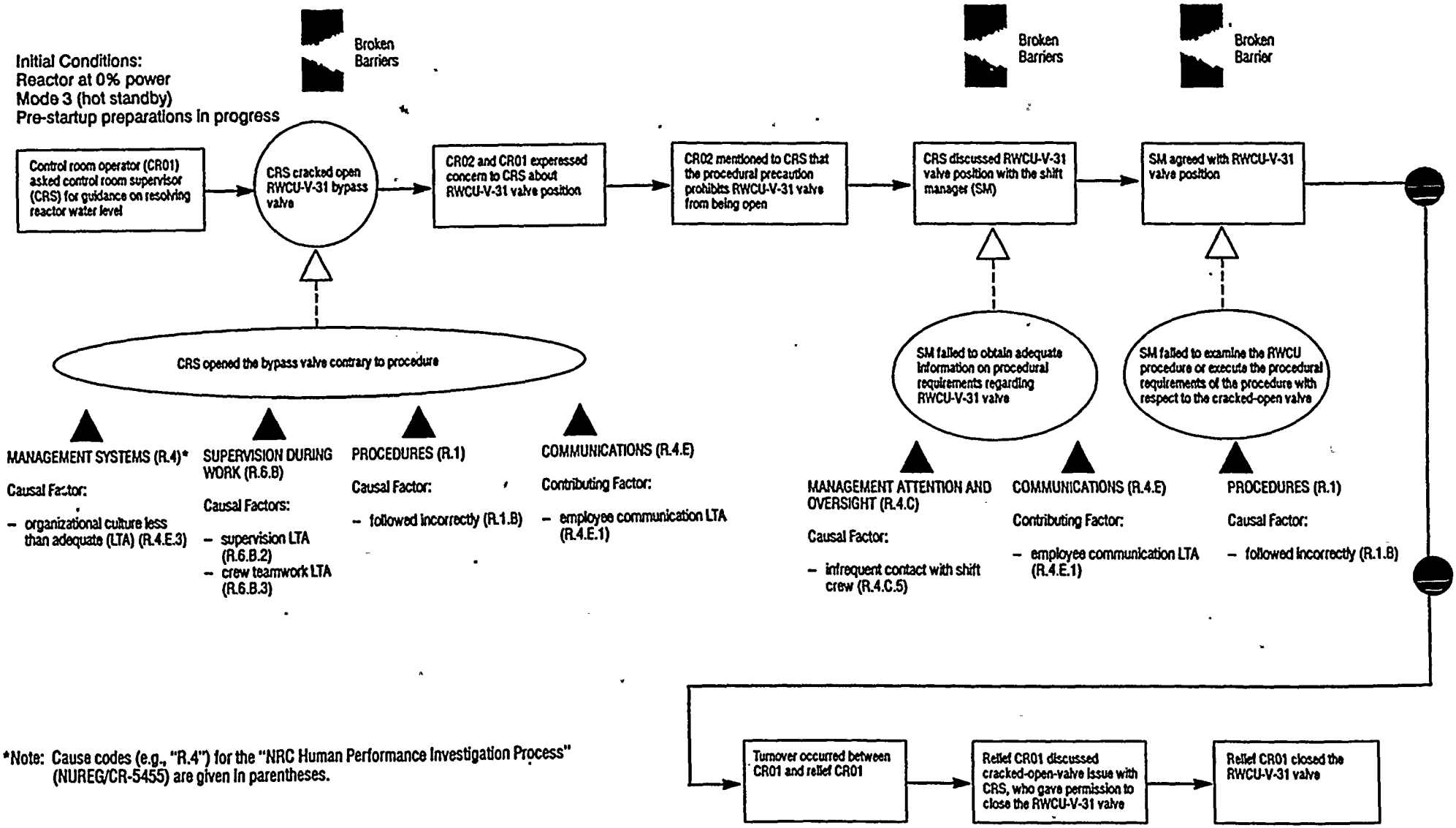
April 21, 1995, Internal WPPSS Memo, Suggested Reading for the Management Oversight Team Members

Nuclear Safety Issues Program Issue 95-008 Assessment Plan, Preliminary Report dated April 25, 1995

Plant Manager/Operations Department Organization Charts, dated October 1994 and March 1995, respectively

Appendix D

Events and Causal Factors Chart of the April 9, 1995, Procedure Noncompliance Event



*Note: Cause codes (e.g., "R.4") for the "NRC Human Performance Investigation Process" (NUREG/CR-5455) are given in parentheses.