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

Report Nos. 50-413/89-13 and 50-414/89-13

Licensee: Duke Power Company
422 South Church Street
Charlotte, N.C. 28242

Docket Nos.: 50-413 and 50-414 License Nos.: NPF-35 and NPF-52

Facility Name: Catawba 1 and 2

Inspection Conducted: March 26, 1989 - April 29, 1989

Inspectors: Leigh Trocine for 6-23-89
W. T. Orders Date Signed

Leigh Trocine for 6-23-89
M. S. Lesser Date Signed

Approved by: 6-27-89
M. B. Shymlock, Section Chief Date Signed
Projects Branch 3
Division of Reactor Projects

SUMMARY

Scope:

This routine, resident inspection was conducted on site inspecting the areas of review of plant operations; surveillance observation; maintenance observation; review of licensee nonroutine event reports; followup of previously identified items; facility drawings review; and licensee Self-Initiated Technical Audit.

Results:

In the areas inspected two strengths and two weaknesses of the licensee's programs were identified. Two violations of NRC requirements and two unresolved items were identified.

Strength: A Self-Initiated Technical Audit (SITA) was performed by Duke Power Company Quality Assurance Department on the 600 Volt AC Essential Power System. The audit included an in depth technical review of design documentation, calculations, equipment walkdowns and maintenance procedures. The SITA program is considered a strength (paragraph 9).

Strength: The licensee's planning and execution efforts associated with the removal of a stuck reactor vessel head stud were observed to be a strength (paragraph 3.c).

Weakness: One weakness was identified concerning certain aspects of the licensee's program to position and verify positions of valves throughout the plant as follows:

- There is no method to identify valves that have been backseated open. This contributed to a violation involving a reactor coolant leak and spill (paragraph 3.d).

- Two operators failed to recognize that a rising stem valve was open while implementing a procedure that required it to be closed. This also contributed to the above mentioned violation (paragraph 3.d).

- The licensee does not have measures in place to ensure that when remotely verifying valve positions, the control board valve position indication is used instead of the Operator Aid Computer (OAC) graphics. The OAC graphics are unreliable when power is removed from the valve actuator (paragraph 4.d).

- One operator failed to fully close a chain operated valve when the stem apparently hung up at an intermediate point. This resulted in a glycol liquid spill inside containment (paragraph 3.a).

Weakness: A review of the drawing control system and selected drawings in the control room, technical support center, and the crisis management center revealed that the program appeared inadequate to assure that drawings in the field relect actual as-built conditions. This is considered to be a programmatic weakness (paragraph 8).

Violation: One violation was identified one involving four examples of a failure to follow procedures.

- Operators failed to close a valve which was backseated open which resulted in a reactor coolant leak and spill (paragraph 3.d).

- Two different procedures were not followed which resulted in a cable being left installed through the seat of a refueling cavity drain valve. This resulted in a leaking drain valve during refueling operations (paragraph 3.e).

- Operators failed to establish communications between the control room and containment during a refueling cavity fill procedure which resulted in overflowing of the cavity and a 25,000 gallon spill (paragraph 3.f).

Violation: A second violation was identified involving several examples of inadequate drawing control (paragraph 8.b).

- Control room drawings do not reflect as-built plant configuration.

- Changes to control room drawings were inaccurate, in that the drawings were mislabeled.

- Technical Support Center drawings do not reflect as-built plant configuration.

- Crisis Management Center drawings do not reflect actual as-built plant configuration.

Unresolved Item: An unresolved item was identified involving connection drawing errors associated with incorrectly labeled optical isolators (paragraph 4.c).

Unresolved Item: A second unresolved item was identified involving a SITA identified failure scenario allowing sump water to circulate to RWST (paragraph 9).

REPORT DETAILS

1 Persons Contacted

Licensee Employees

*H. Barron, Operations Superintendent
W. Beaver, Performance Engineer
T. Crawford, Integrated Scheduling Superintendent
*J. Forbes, Technical Services Superintendent
*R. Glover, Compliance Engineer
T. Harrall, Design Engineering
R. Jones, Maintenance Engineering Services Engineer
F. Mack, Project Services Engineer
W. McCollough, Mechanical Maintenance Engineer
W. McCollum, Maintenance Superintendent
*T. Owen, Station Manager
J. Stackley, Instrumentation and Electrical Engineer
R. Wardell, Station Services Superintendent

Other licensee employees contacted included technicians, operators, mechanics, security force members, and office personnel.

NRC Resident Inspectors

*W. Orders
*M. Lesser

*Attended exit interview.

2. Unresolved Items

An Unresolved Item is a matter about which more information is required to determine whether it is acceptable or may involve a violation. There were two unresolved items identified in this report (paragraphs 4.c and 9).

3. Plant Operations Review (71707 and 71710)

a. The inspectors reviewed plant operations throughout the reporting period to verify conformance with regulatory requirements, Technical Specifications (TS), and administrative controls. Control room logs, danger tag logs, Technical Specification Action Item Log, and the removal and restoration log were routinely reviewed. Shift turnovers were observed to verify that they were conducted in accordance with approved procedures.

The inspectors verified by observation and interviews, that the measures taken to assure physical protection of the facility met current requirements. Areas inspected included the security organization, the establishment and maintenance of gates, doors, and

isolation zones in the proper conditions, and that access control and badging were proper and procedures followed.

In addition to the areas discussed above, the areas toured were observed for fire prevention and protection activities. These included such things as combustible material control, fire protection systems and equipment, and fire protection associated with maintenance activities. The inspectors reviewed Problem Investigation Reports to determine if the licensee was appropriately documenting problems and implementing corrective actions.

At 5:15 p.m. on April 18, Unit 1 received an Ice Condenser Refrigeration System (NF) expansion tank low level alarm, and operators noticed the expansion tank level decreasing. The Unit 2 expansion tank was initially at 65% level and went off scale high. Reports were received from containment of a glycol spill occurring. Operations was in the process of realigning from a type C local leak test on penetration M-373 when the spill occurred. At 6:00 p.m., it was determined that the cause of the NF spill was due to valve 1NF-54 not being fully closed as required. The valve was found to be four (4) turns open. This valve was closed earlier in the morning to realign NF chillers following ice making. This valve being open cross connected Unit 1 to Unit 2 when the last valve in the penetration (1RN-191) was opened.

Valve 1NF-54 is a rising-stem, chain-operated, gate valve. This is one of two examples of operators failing to recognize and/or confirm the position of rising-stem valves identified in this report and is considered to be a weakness of the licensee's program to position and verify the position of valves throughout the plant.

b Unit 1 Summary

The unit started the reporting period at 100% power. On March 31, the Train "A" Control Room Area Air Handling Unit failed when a motor bearing seized. The Train "B" unit was inoperable at the time due to maintenance activities in progress. The licensee appropriately entered Technical Specifications (TS) 3.0.3 and shutdown the reactor. The Train "A" motor was replaced, maintenance activities were completed, and the reactor was started up on April 2, 1989.

The unit operated at full power until April 20 when the licensee detected that a compression fitting was leaking on a wide range pressurizer pressure instrument line. This line located inside the annulus was leaking approximately 0.4 gpm and could not be isolated while at power. Independent of the leak, at approximately 10:00 p.m. operators noted that pressurizer pressure was slowly decreasing with all pressurizer heaters energized. The licensee followed the action statement for TS 3.2.5 which required power to be reduced to less than 5% when pressurizer pressure is less than 2222 psig. As power was being reduced the licensee identified that pressurizer spray

valve 1NC-29 had failed in the partially open position. A circuit card was replaced, and they recovered from the transient. They decided, however, to continue with the plant shutdown due to the aforementioned instrument line leak. After the shutdown, the leak was repaired and the reactor was re-started on April 22. The reactor operated at full power for the remainder of the reporting period.

c. Unit 2 Summary

The unit started the report period in mode 6 making preparations to begin core unloaded. During reactor vessel head removal, one head stud was found to be frozen in position. Attempts to remove the stud were unsuccessful and the licensee requested assistance from Babcock and Wilcox Co. (B&W). To allow continuation of core alterations, the stud was cut off 3 inches above the vessel flange. On March 30 operators inadvertently overflowed the refueling cavity while gravity filling from the Fueling Water Storage Tank. The spill amounted to approximately 25,000 gallons and was a setback for the outage as significant resources were required to clean up and decontaminate lower containment. (See paragraph 3.f). Core unload then proceeded and the unit entered "no mode" on April 11.

After core unload, B&W began preparations to cut out the remainder of the stud. The planning evolution included among other things cavity decontamination and lead shielding installation. Ultimately, the stud was removed, although some threads in the stud hole were galled in the process. The damaged areas were subsequently corrected by chasing and machining.

The stud removal and replacement effort is an example of effective planning and execution particularly in view of the fact that this was the first use of this boring equipment in the U.S. This effect was considered a strength.

Core reload commenced on April 27 and was completed by the end of the reporting period.

d. Reactor Coolant Leak and Personnel Contamination due to Failure to Properly Position Valve 2NV-20.

In preparation for a test on March 14, operators were in the process of draining portions of the Unit 2 Chemical and Volume Control (NV) Systems letdown line using enclosure 4.67 of OP/2/A/6200/20, Drain and Fill of Penetration M347. Step 2.3 of that procedure requires the operators to ensure that 2NV-20, Letdown Reheat Heat Exchanger Back Pressure Control Bypass Valve, is closed. The valve is normally closed, but had been opened on May 6, 1988 when 2NV-18, Letdown Reheat Heat Exchanger Back Pressure Control Valve, was isolated to repair a bonnet leak.

Removal and Restoration (R&R) Tagout Record Sheet 28-988 was used to document the isolation and the opening of 2NV-20. A tag was not attached to 2NV-20 due to the fact that the valve was not being repositioned to protect personnel or equipment. Furthermore, 2NV-20 had been backseated open apparently to stop a packing leak.

On March 14 two operators performing OP/2/A/6200/20 attempted to ensure 2NV-20 was closed by applying pressure to the handle in the closed direction. No motion was obtained and although 2NV-20 is a rising stem valve, both operators concluded that the valve was closed. In reality the valve was stuck open on the backseat.

Shortly thereafter, control room operators desired to initiate letdown flow with the belief that 2NV-20 was closed. When this action occurred the penetration was pressurized and approximately 40 gallons of reactor coolant spilled out the open vent and drain valves. Although one of the operators and 800 square feet of the surrounding are were contaminated, the two operators quickly informed the control room to secure letdown flow which terminated the leak. Had they not still been in the area, the leak may have continued for a longer period of time.

The inspectors had the following concerns which were relayed to the licensee:

- Two Operators failed to recognize that valve 2NV-20 was stuck open on the backseat in spite of the fact that it is a rising stem valve.

- 2NV-20 was not tagged although the valve was backseated as an apparent safety precaution. It appears that enhanced requirements should be considered to document and indicate valves in unusual conditions. The licensee agreed to review their requirements. This is identified as one example of a violation of Technical Specification 6.8.1, 414/89-13-01: Failure to Follow Procedures.

e. Refueling Cavity Drain Valve Leak

As part of the instrumentation necessary for the Unit 2 Containment Integrated Leak Rate Test (C LRT), the licensee temporarily installed a temperature detector in the refueling canal by routing the cable from lower containment into upper containment through a refueling cavity drain valve, 2FW-26. A Removal and Restoration (R&R) Tagout Record Sheet was issued to keep 2FW-26 tagged open. In order to provide a mechanism to ensure operations was notified that the R&R on 2FW-26 could be cleared after the CILRT, change 2 to PT/2/A/4200/01A, Containment Integrated Leak Rate Test was approved. The change added step 12.2.26.18.A which required the test engineer to "notify operations to clear the R&R on 2FW-26 after the temperature detector cable has been removed." On March 13, due to a communication error,

the step was signed off as completed and the R&R was cleared although the cable had not been removed. At the time 2FW-26 was left open. This is identified as another example of a violation of Technical Specification 6.8.1 414/89-13-01: Failure to Follow Procedures.

On March 28, preparations were in progress to commence filling the refueling cavity to facilitate defueling the reactor. Operators were in the process of removing the transfer tube blind flange using procedure OP/2/A/6200/13. Step 2.1 of enclosure 4.13 of that procedure requires two operators to visually inspect each refueling cavity drain valve seat for those valves which can be inspected, remove any debris, then unlock and close the valve. 2FW-26 is listed as one of the drain valves. Two operators independently performed this step but failed to notice the cable that had been routed through the open ended piping and 2FW-26 from lower to upper containment. Subsequently, 2FW-26 could not seat properly and leaked significantly when the refueling cavity was filled. The licensee reduced the leak by using an inflatable plug.

The licensee had two opportunities to remove the cable and in each case failed to follow procedures. The result was a continuing leak through the valve during core unload and reload. This is identified as another example of a violation of Technical Specification 6.8.1 414/89-13-01: Failure to Follow Procedures.

f. Refueling Cavity Overfill

On March 28, the licensee commenced gravity fill of the refueling cavity from the refueling water storage tank using enclosure 4.3 of OP/2/A/6200/13 on March 28. Step 1.5 of that procedure required communications to be established between the control room and the refueling cavity for the purpose of visually observing cavity level. This was performed at 6:10 a.m. on March 29. Delays in the fill process occurred during the next several hours and communications were not continuously maintained. At 6:02 p.m. the fill was secured at 93% level due to minor problems with the containment purge ventilation system. During the next hour shift turnover was also in progress. At 6:27 p.m. the control room operator resumed filling the cavity to 97%. The shift supervisor nor the unit supervisor were made aware that the fill had commenced nor were their reliefs. No one had been assigned to visually monitor level and establish communications with the control room. At 8:10 p.m. the fill was secured when the control room was informed that the refueling cavity was overflowing through the control rod drive ventilation windows into lower containment.

An extensive decontamination effort was required to clean up the spill, estimated to be approximately 25,000 gallons. Dose received due to work associated with the cleanup was estimated to be 3.5 person-rem. General area contamination levels in lower containment

were increased by a factor of about 5 even after decontamination efforts.

Operators use two level gages to monitor refueling cavity level from the control room. When the fill was secured channel 5200 of indicated 97% and channel 6450 indicated 98.5%. The level instruments span approximately 400 inches of water level with a tolerance of +/- 1.2% equating to an error of +/- 4.8 inches of level. Considering the fact that the ventilation windows are about 6 inches above 97% level (normal level for refueling operations) it becomes apparent how important it is to locally monitor the actual level. The inspectors reviewed calibration data for the level channels (performed on March 28 and 29, 1989 under work request 8910 SWR and concluded that the level instruments were in tolerance during the event. The failure to maintain communications between the control room and the refueling cavity resulted in the spill. This is identified as another example of a violation of Technical Specifications 6.8.1, 414/89-13-01: Failure to Follow Procedures.

Violation 414/89-13-01 includes these four examples as identified in paragraphs 3.d, 3.e, and 3.f.

4. Surveillance Observation (61726)

a. During the inspection period, the inspector verified plant operations were in compliance with various TS requirements. Typical of these requirements were confirmation of compliance with the TS for reactor coolant chemistry, refueling water tank, emergency power systems, safety injection, emergency safeguards systems, control room ventilation, and direct current electrical power sources. The inspector verified that surveillance testing was performed in accordance with the approved written procedures, test instrumentation was calibrated, limiting conditions for operation were met, appropriate removal and restoration of the affected equipment was accomplished. Test results met acceptance criteria and were reviewed by personnel other than the individual directing the test, and that any deficiencies identified during the testing were properly reviewed and resolved by appropriate management personnel.

b. The inspectors witnessed or reviewed the following surveillances:

3777 SWR	Monthly Analog Channel Test for Power Range Nuclear Instrument
TT/1/A/9200/56	Test of S/G PORV
PT/2/A/4200/02D	Containment Closure Verification

c. On March 21, the licensee was performing testing to verify that Containment Purge System (VP) would isolate on a high relative humidity or high radiation signal when the VP Train "A" valves failed to isolate as required. Work Requests 6953 PRF and 6954 PRF were written to identify and repair the problem. Instrumentation and

Electrical (IAE) technicians replaced three optical isolators which were suspected of being inoperable using connection diagram CN-2784-03.02-01 as a reference. After replacement, the test again failed. It was then determined that the output terminals of the optical isolators were reversed. Further review indicated the wires had been terminated in accordance with the connection diagram which was itself incorrect, in that the optical isolator terminals as labelled on the connection diagram did not reflect labelling standard as specified by Duke Power Company design criteria DC 14.05. This resulted in the incorrect installation of the replacement optical isolators by IAE. The licensee immediately corrected the wiring error, satisfactorily passed the re-test and initiated action to correct the drawing.

The inspectors questioned the licensee as to whether the optical isolators had been incorrectly wired up for an extended period of time or only after they were replaced by IAE under the above mentioned work request. A maintenance history search by the licensee did not reveal any previous maintenance activities on the optical isolators, and in as much as the VP valves functioned properly during previous tests, they were apparantly wired correctly, but not in accordance with the drawing.

The inspectors were also concerned with the potential for the drawing error to be widespread. The licensee initiated Problem Investigation Report (PIR) 2-C89-130 to resolve the issue.

This is identified as Unresolved Item 414/89-13-02: Connection Drawing Errors Associated With Incorrectly Labeled Optical Isolators, pending completion of licensee corrective actions.

d. On April 24, the inspector observed operators performing PT/2/A/4200/02D, Containment Closure Verification in preparation for core alterations. The procedure is intended to meet the requirements of Technical Specification 3.9.4 for containment building penetrations which requires that during core alterations, penetrations providing direct access from containment atmosphere to the outside atmosphere be isolated or exhaust through the Containment Purge System. One operator was observed using the Operator Aid Computer (OAC) to verify valve position of a steam generator blowdown containment isolation valve, versus the control board indication. The inspector questioned the operator concerning the reliability of this method since the OAC graphics may indicate an erroneous valve position when power is removed from the valve. Additionally, if the optical isolator supplying the data fails, (historically a problem at Catawba) the indicated position may be erroneous and may remain undetected until the next scheduled test of the valve.

On April 26, the inspector compared the actual position of several Unit 2 valves which had power removed to the indicated position on

the OAC graphics. Five of the eight valves checked, indicated incorrect positions on the OAC including two Residual Heat Removal and three Chemical and Volume Control Valves.

The control board valve positions are more reliable and should be used instead of the OAC graphics. Supporting this contention is the fact that if power is removed from a valve, it will be readily apparent at the control board as neither the open nor closed position indicator will be lighted. The operator must therefore use another method to verify position such as the tagout which positioned the valve and removed power.

The inspector reviewed the precautions and limitations of the procedure and also Operations Management Procedure (OMP) 2-33, Valve and Breaker Position Verification and Valve Operation. Neither required that the control board be used, nor prevented use of the OAC. This issue was discussed with the licensee who agreed with the inspectors' concerns and committed to revise their procedures to prevent use of the OAC graphics for valve lineups. This is identified as Inspector Followup Item 414/89-13-03: Use of OAC Graphics For Valve Lineups, pending licensee review and policy revision.

No violations or deviations were identified.

5. Maintenance Observations (62703)

a. Station maintenance activities of selected systems and components were observed/reviewed to ascertain that they were conducted in accordance with the requirements. The inspector verified licensee conformance to the requirements in the following areas of inspection: the activities were accomplished using approved procedures, and functional testing and/or calibrations were performed prior to returning components or systems to service; quality control records were maintained; activities performed were accomplished by qualified personnel; and materials used were properly certified. Work requests were reviewed to determine status of outstanding jobs and to assure that priority was assigned to safety-related equipment maintenance which may effect system performance.

b. The inspectors witnessed or reviewed the following maintenance activities:

741 MES	Inspect/Repair 1SV-13 Failure
1084 MES	Inspect/Repair 2ETB2 Failure
50079 OPS	Inspect/Repair 1SV-27 Failure
10340 IAE	Replace Refueling Cavity Level Transmitter

No violations or deviations were identified.

6. Review of Licensee Nonroutine Event Reports (92700)

a. The below listed Licensee Event Reports (LER) were reviewed to determine if the information provided met NRC requirements. The determination included: adequacy of description, verification of compliance with Technical Specifications and regulatory requirements, corrective action taken, existence of potential generic problems, reporting requirements satisfied, and the relative safety significance of each event. Additional inplant reviews and discussion with plant personnel, as appropriate, were conducted for those reports indicated by an (*). The following LERs are closed:

413/89-04	Automatic Alignment of Nuclear Service Water System to Service Water Pond.
413/89-05	Automatic Alignment of Nuclear Service Water System to Service Water Pond.
*414/87-18	Reactor Trip Due to Loss of Cooling Water to Reactor Coolant Pump Motors.
*414/88-01	Blackout Induced Load Sequencer Actuation Due to Personnel Error and Management Deficiency.
414/88-32	Auxiliary Feedwater Autostart Due to Faulty Valve Positioner.

No violations or deviations were identified.

7. Follow-up on Previous Inspection Findings (92701 and 92702)

a. (Closed) Unresolved Item 413/88-38-03: Turbine Driven CA Pump Pressure Seal Failure. The licensee's investigation of the event determined that the pump shaft locked due to failure of the final stage shaft sleeve. The sleeve cracked and became friction welded to the stationary final stage piece of the Bingham Type MSD-D pump. The Duke Power Company Metallurgical Laboratory Report attributed the failure to stress corrosion cracking at the keyway slot of the rotating sleeve. The licensee is aware of similar failures at other facilities through INPO Significant Event Notification (SEN) 42. Based on this event the licensee has determined the failure to be reportable under 10CFR21 and 10CFR50.73 and submitted Licensee Event Report (LER) 413/89-07 dated March 30, 1989. The licensee intends to implement the recommendations of Bingham Pump Technical Bulletin 79 on the turbine driven pumps which includes replacement of the rotating wear components with a less susceptible type 410 wrought material, reducing the interference fit of the shaft sleeves to the shaft, and modifying the drive keyway corner radius. The licensee additionally concluded that the failure of the pump was not due to an inadequate fill and vent of the system. The inspections will

continue to monitor the above corrective actions as followup to LER and based on this, the unresolved item is closed.

b. (Closed) Inspector Followup Item 413,414/88-15-05: Improved Guidance for Part 21 Implementation. The licensee revised Station Directive 2.8.1, Problem Investigation Process and Regulatory Reporting, to include requirements to evaluate every Problem Investigation Report for reportability under 10CFR21. The directive provides guidance for recognizing Part 21 implications and amplifies the reporting requirements. Based on this revision this item is closed.

c. (Closed) Violation 414/87-44-03: Failure to Follow Procedure Resulting in Operation Without Emergency Power Supply For Control Room Area Ventilation. The licensee responded to the violation in correspondence dated March 3, 1988. A Technical Specification Amendment to clarify the shared system aspects of the requirements was submitted to the NRC in correspondence dated July 26, 1988. The licensee has procedures in place to ensure that the shared system aspects are considered when determining operability. Based on this the item is closed.

d. (Closed) Violation 413,414/87-44-01: Failure to Maintain Auxiliary Feedwater Automatic Valves in the Flow Path Fully Open. The licensee responded to the violation in correspondence dated March 3, 1988. The licensee submitted a Technical Specification Amendment request to the NRC on February 15, 1988 to allow for the throttling of the flow control valves when the system is operating. Until the amendment is approved the licensee has measures in place to declare the train inoperable if valves in the discharge flow path are not fully open. Based on this the item is closed.

e. (Open) Unresolved Item 414/88-34-03: Thrust Performance of Rotork Actuator for 2CA-62A. A potential Rotork actuator sizing concern for a series of 4 inch Borg Warner flex wedge gate valves on the Auxiliary Feedwater (CA) System developed in March, 1988 when 2CA-62 failed to close against a differential pressure (dp) of 1800 psi. Based on the event and a subsequent NRC violation (414/88-34-02), the licensee committed, in their correspondence dated December 15, 1988, to conduct testing of the valves to obtain "valve factor" data for use in sizing the actuators and determining torque switch settings. The licensee disassembled 2CA-62 in April, 1989 and determined the valve internals were satisfactory indicating that the event in March 1988 was not a unique failure as the licensee had hypothesized.

In November, 1988 the licensee tested the four Motor Driven CA pump isolation valves on Unit 1 with a dp of 1800 psi. The results of the testing found that all four Motor Operated Valves (MOVs) failed to wedge completely shut with the stem load provided at the existing torque switch settings. Two of the four MOVs did not close off all flow while the other two terminated virtually all flow but failed to

reach the full close position. The four Turbine Driven CA Pump MOVs were not tested.

Prior to Unit 1 returning to service after the refueling outage, the four valves were again tested, however, inconclusive results were obtained due to misapplication of the data acquisition equipment. The licensee started up Unit 1 with no corrective action performed on the valves based upon a Technical Memorandum which provided operator's with compensatory instructions to shut the valves in the event the MOV failed to completely shut on demand. The licensee also determined the maximum expected dp during accident conditions to be 1425 psid, less than the design dp of 1800 psid. Instructions were later incorporated into the Emergency Operating Procedures to reduce the dp on the valve by throttling an upstream valve.

In parallel with the Unit 1 testing, the licensee also conducted testing on a similar valve (6J-219 MOV) at the Duke Power Company Riverbend Power Plant. The testing measured valve factors to be in the range of 0.4 to 0.6, which were higher than the factors used by design engineering to initially size the actuators. (Valve Factors approximate the sliding friction component of the valve disk against the seat rings. A valve factor of 0.3 has historically been used by design engineering to predict the differential pressure stem force needed to shut the valve).

The licensee performed dp testing on the equivalent four Unit 2 valves in March 1989, during its refueling, with improved instrumentation to monitor stem load during operation. The valves were shut with an initial flow of 300 gpm and a full close dp of 1770 psid. In three cases (2CA-42,58,62) full valve closure was not achieved with the torque switch set at the as-found value. In one case (2CA-46) flow isolation was obtained, however, the full wedged closed position was not achieved. Opening valve factors ranged from 0.48-0.67; closing valve factors ranged from 0.38-0.74. Based on the Unit 2 results it was decided to increase the torque switch setting of one Unit 1 valve (1CA-58) from 4.5 to 5.

The licensee has currently determined the CA Systems to be operable based on Revision 2 of their operability evaluation associated with PIR 2-C88-143 dated March 17, 1989. In summary the evaluation makes the following points:

- Valves required for automatic pump runout protection CA-46 and CA-58 have been demonstrated to shut against the required dp of 1425 psid or have had torque switch adjustments to ensure they will shut as a result of testing.

- Valves required to be closed by the operator under certain conditions could be closed by throttling the upstream flow control valve to remove or decrease the dp.

The inspectors raised concerns with the operability statement. The flow control valves used to throttle flow would fail open upon loss of instrument air and thus could not be relied upon under all design basis accidents. The other option discussed by the operability evaluation (but not incorporated into emergency procedures) is to trip the CA pump in order to eliminate the dp. Since this option may involve an unreviewed safety question, it was not incorporated into procedures. Ultimately, it appears that the system may be demonstrated fully operable by using obtained valve factor data to calculate thrust requirements, in the applicable calculations, such that valves could be shown to be able to shut against 1425 psid. The licensee agreed to review data to determine acceptability of current torque switch settings. This item remains open pending completion of licensee review and licensee review of similar Borg Warner valve testing on Safety Injection and Steam Generator Blowdown Valves.

f. (Open) Inspector Followup Item 413/89-07-04: Corrective Action Regarding 2 Failures of 1SV-13. On April 4, 1989 Control Components Inc. (CCI) issued a letter to NRC and licensees which use the CCI valves in question, summarizing an analysis of the Palo Verde Atmospheric Dump Valve failures. Although CCI was unable to explain the failure completely, their calculations indicated that if steam leakage by the piston ring into the bonnet was larger than the ability of the pilot plug to drain the bonnet, excessive pressure would remain in the bonnet and the valve may fail to open. The vendor expressed a concern that a random failure may occur on valves at, among other sites, Catawba.

On April 5, 1989, NRC issued Information Notice 89-38: Atmospheric Dump Valve Failures at Palo Verde describing the failures of the CCI valves.

The licensee has taken the following actions:

- 1SV-13 was modified as recommended by CCI to increase the pilot port capacity.

- Each Power Operated Relief Valve (PORV) will be modified to increase the pilot port capacity when the recommended two piece wedge style piston ring is procured. These piston rings will be installed when obtained.

- The valves have been or will be modified with a test penetration in the bonnet to measure bonnet pressure during testing.

- The Unit 1 PORV's are currently being tested weekly (a partial stroke under pressure with the block valve open). The test, TT/1/A/9200/56 uses safety related nitrogen as the motive power to stroke the valve. A reduced nitrogen pressure is used to compensate for the fact that nominal steam pressure is below the relief setpoint steam pressure in order to demonstrate

operability. Similarly, the Unit 2 valves will be tested on the same frequency until they are modified.

The inspectors witnessed two of the tests and all tests performed thus far have been successful. This item remains open pending completion of licensee action to modify the PORV's.

No violations or deviations were identified.

8. Facility Drawings Review

Recently, significant problems have been identified with the drawing control system and/or drawing accuracy at a number of plants. In some cases it was found that drawings did not reflect actual plant configuration, either due to inadequate or untimely updating of drawings used by the control room operators, or inadequate confirmation of as-built configuration. The objective of this inspection was to determine if similar problems exist at Catawba.

Inspection Elements:

The inspection efforts consisted of the following elements:

- Catawba Control Room, Technical Support Center (TSC), and Crisis Management Center (CMC) prints were reviewed to determine which prints or drawings the licensee considers essential for use during plant operations or emergencies.

- In all three locations, selected drawings were reviewed to ensure legibility and accuracy.

- The drawings at each location were reviewed to confirm that the most current approved revision was in place.

- The operations staff was asked to demonstrate the process of determining if a drawing represents the most current plant configuration and was asked to retrieve any additional approved documents showing changes outstanding but not yet incorporated in the drawing. The process was analyzed to determine if there is a potential to interfere with decision-making during an emergency. The additional supporting documents were reviewed to determine their availability to the control room and TSC and to determine if the supporting documents are in a form that is compatible with the main document.

- The drawings were reviewed to determine if the scope of drawing changes are easily identifiable and to determine if there is a maximum number of outstanding changes prior to a drawing being revised.

- The drawing change process was reviewed to determine if there is a procedure for updating the drawings in the control room and TSC, and if these locations receive any special priority over less critical locations in the update process. The process was also reviewed to determine if periodic audits are performed to verify drawing revisions are current and all drawings are present.

- An evaluation was performed to determine the process used to ensure identified discrepancies in current drawings are corrected. A review of the procedures involved in the process was performed to ensure it includes a safety review, if applicable.

- The procedure that ensures design changes or modifications performed to the plant are incorporated in the drawings was reviewed to determine if the drawing changes are available to operations at the time of equipment turnover to operations, and to determine how operations is made aware of changes to the plant not reflected in the drawings, and if work is partially complete or delayed for a long period of time.

- A safety-related system was selected on which a walkdown of the accessible portions of the system was performed in order to verify that all system components are represented on the P&ID and items on the P&ID exist in the plant.

Summary of Findings:

The control room drawings are in marginally acceptable physical condition.

There are no drawings in the control room to reflect the as built configurations of systems which have been returned to service with partially completed modifications.

The control room drawings do not have temporary station modifications (TSMs) depicted; further, the operators must exit the control room in order to determine the scope of these modifications. A similar problem was identified in a Duke QA Department Audit performed between October 17 and November 30, 1988, when it was noted that the drawings associated with certain Temporary Station Modifications were not flagged to indicate a temporary station modification existed and the affected drawings did not reflect the actual as-built plant conditions. This was also identified in the most recent INPO evaluation of Catawba.

Some of the control room drawings were mislabeled having been stamped both "Interim As Built" and "See Interim As Built." This was a source of confusion to the operators interviewed and is in violation of Station Directive 2.1.5, Drawing Distribution and Control.

Some of the control room drawings reviewed were marked "Revised by NSM (number)". These drawings do not reflect as built configurations in that the modifications were not depicted on the drawing. For these drawings,

the operator must exit the control room to determine the nature/scope of the modification.

The TSC drawings do not reflect the actual as built condition of some systems/components. The TSC does not receive "Interim As Built" drawings which reflect actual as built conditions while "Final As Built Prints" are being generated. Further, there is currently no mechanism in place to update the TSC drawings to reflect TSMs.

The drawings which are designated for use in the CMC do not reflect the actual as built condition for those systems/components which have TSMs installed.

The drawings which are to be used in the CMC are not restricted for use in the CMC. Rather, they are merely the normal document control center drawing files. In as much as these drawings can be checked out and removed from the Document Control Center overnight, they may not be readily available for use in the CMC in an emergency situation.

Drawings Reviewed:

Drawing	System
CN 2573 01.02	Component Cooling
CN 2575 02.00	Conventional Service Water
CN 1554 01.00	Reactor Coolant System
CN 1554 01.04	Chemical And Volume Control
CN 1556 01.04	Boron Recycle
CN 1558 01.02	Ice Condenser Refrigeration
CN 1565 01.01	Liquid Waste Recycle
CN 1565 01.10	Liquid Radwaste
CN 1565 02.01	Liquid Radwaste
CN 1563 01.00	Safety Injection
CN 2573 01.02	Component Cooling System
CN 1565 01.06	Liquid Radwaste
CN 1571 01.00	Refueling Water System
CN 1573 01.00	Component Cooling System
CN 1573 01.02	Component Cooling System
CN 1553 01.00	Reactor Coolant System
CN 1553 01.02	Reactor Coolant System
CN 1561 01.00	Residual Heat Removal
CN 1561 01.01	Residual Heat Removal
CN 1562 01.00	Safety Injection
CN 1562 01.01	Safety Injection
CN 1563 01.00	Safety Injection
CN 1554 01.00	Reactor Coolant System
CN 1554 01.04	Chemical And Volume Control
CN 1564 01.00	Annulus Ventilation
CN 1702-02.01	4160 VAC 1ETA Electrical One Line
CN 1702-02.02	4160 VAC 1ETB Electrical One Line
CN 1702-04.01	4160 VAC ETB Blackout One Line

CN 1703-03.01	600 VAC Electrical One Line
CN 1705-02.04-02	120 VAC Electrical One Line
CN 1592 01.01	Auxiliary Feedwater
CN 1554 01.02	Chemical And Volume Control
CN 1554 01.03	Chemical And Volume Control
CN 1554 01.04	Chemical And Volume Control
CN 1558 01.02	Ice Condenser Refrigeration
CN 1559 01.00	Containment Hydrogen Sample And Purge
CN 1705-01.01	125 VDC Vital Instrumentation One Line
CN 1705-02.02	125 VDC Auxiliary Control One Line
CN 1705-04.01	125 VDC Diesel Essential One Line

Specific Observations:

a. All drawings reviewed in the Control Room, TSC and those designated for use in the CMC were legible. Exceptions were noted as follows:

A number of drawings have deteriorated such that legibility of the drawing number and/or revision number is illegible.

CMC drawing CN-1554-1.0 Rev. 11A, Flow Diagram for the NC (Reactor Coolant) System; it was noted that the "Balloons" which defined the scope of the station modification were illegible.

Control Room drawing CN-2575-2.0 Rev. 4A, Flow Diagram for the RL (Low Pressure Service Water) System, had the center portion of the print masked by a wide (1-1/2") black line running the length of the drawing.

b. A number of apparent problems were detected when the drawings were reviewed to determine if the latest revision was in place at each location. The majority of the problems appear to be related to the method employed by the licensee to designate station modifications.

Background:

Pursuant to Station Directive 2.1.5, LIMITED EDITION DRAWINGS are defined as a specific set of drawings that are issued by Design Engineering to depict the plant configuration "as proposed" by the NSM.

INTERIM AS-BUILT DRAWINGS are defined as a specific set of drawings that depict the "actual" plant configuration after a modification has been installed while "Final As Built" prints are being made. When the site receives an NSM from corporate Design Engineering the package contains "Limited Edition" (LE) drawings. The package comes to Master File which distributes copies of the LE drawings to Project Services, the group responsible for implementation of the modification. Project Services in turn sends a copy of the LE drawing to the Operations NSM Coordinator. One concern identified is that the LE drawings do not get distributed to the Control Room or

TSC until after the modification has been fully installed. This means that neither the Control Room nor the TSC have drawings in place for modifications being installed nor for partially completed modifications which have been returned to operations. This has led to at least one previous problem which was identified during this inspection.

Station Problem Investigative Report O-C87-0352 (12-8-87) identified a deficiency in the NSM Program in that there is no mechanism to update drawings on partially completed NSMs. Instances have occurred where NSMs are partially completed and an item is returned to service. This partial completion does not require interim drawings to be issued. As a result, personnel could perform work on the modified items using a drawing that is not current. Examples where this problem occurred are NSM-10736, Exempt VN-901 and Exempt VN-907. Exempt VN's are modifications of small scope that are "exempt" from the full NSM process.

After the modification is installed, Master File pulls their copies of LE drawings, stamps the drawings as "Interim As-Built Drawings", and distributes them to the appropriate station groups including Operations. Operations then, by procedure is to stamp their existing as-built print "See Interim-As-Built" and file the "Interim As Built" print with it.

The apparent problems identified in this area are delineated below:

(1) Selected control room drawings do not reflect as-built conditions. The applicable systems have been modified but the drawings have not been revised to reflect the modifications. These drawings are marked "Revised By NSM (Number)", denoting in effect, that the drawings have been superseded without depicting the modifications on the drawings. Further, the support documents necessary to discern the scope of the modifications are not available in the control room.

Two examples of this problem are:

CN-1559-1.0 Rev 4
CN-2575-2.0 Rev 4

This is identified as an example of Violation 413/89-13-04: Inadequate drawing controls.

(2) Changes to selected control room drawings were not accurate in that:

(a) The drawings were mislabeled stamped both "Interim As Built" denoting that the drawing represents the actual plant configuration after a modification has been

implemented, and "See Interim as Built" denoting that another print reflects the actual plant configuration;

(b) Selected drawings were stamped "See Interim As-Built" yet there were no applicable Interim As-Built drawings.

Examples of these problems are Control Room Drawings:

CN 2573-1.2 Rev 8	CN 1558-1.2 Rev 6
CN 1592-1.1 Rev 6A	CN 1565-1.1 Rev 16B
CN 1554-1.2 Rev 9	CN 1565-1.3 Rev 9A
CN 1554-1.3 Rev 9	CN 1565-1.10 Rev 5A

This is identified as another example of Violation 413/89-13-04: Inadequate drawing controls.

(3) Selected Technical Support Center (TSC) drawings do not reflect as built plant configuration. The TSC is not on distribution for "Interim As Built Prints", which are the prints which depict the actual plant configuration after a modification has been implemented until "Final As-Built Drawings" are generated. Thus the TSC drawings are not accurate for those systems which have been modified but for which final as-built prints have not been issued. This period was observed to be as long as 15 months in which there are interim as-builts on file in the control room dating back to December 1987.

This is identified as another example of Violation 413/89-13-04: Inadequate drawing controls.

(4) Control room drawings do not reflect actual as-built conditions for those systems on which part of a modification has been completed. Systems with partially completed modifications have been, and are returned to service without drawings in the control room which depict as-built configurations. The licensee's current document control system does not issue drawings to the control room until a modification is complete.

This is identified as another example of Violation 413/89-13-04: Inadequate drawing controls.

(5) Selected Crisis Management Center (CMC) drawings do not reflect current As Built conditions.

(a) CMC drawings do not reflect Temporary Station Modifications (TSMs), nor are the drawings marked to indicate that a TSM exists.

(b) CMC drawings are not updated to reflect partially completed station modifications, even though the plant may return to

service. Some partially completed modifications are over 2 years old.

(c) CMC drawings are not kept updated in a timely manner to reflect completed NSM's. CMC drawings are updated through issuance of Final As-Builts. There are interim as-builts on file at Catawba dating back to December 1987 which indicates that final as-builts have not been issued for the modified systems. This in turn indicates that the CMC drawings are inaccurate for those systems.

This is identified as another example of Violation 413/89-13-04: Inadequate drawing controls.

(6) Some Control Room drawings have up to 4 copies of the same drawing, some of which have the same revision number. Examples of these are Control Room Drawings:

CN 1554-1.4 Rev 7A, 7A, and 8
CN 1565-1.10 Rev 10, 7A, 5A, and 5A
CN 1565-1.1 Rev 16B, 16B, and 18

Some drawings have two or more revisions which have the same number, example 7A and 7A as in the case with CN 1554-1.4 above, but the two 7A revisions are for different modifications. This numbering scheme is based on the design engineering method of identifying limited edition drawings for a particular NSM by adding a letter to the then current as built print. Thus if five engineers each originate an NSM against revision 7 of a print, there could be five different revision 7A's of that print, all five of which could be on file in the Control Room. This may have been responsible for a problem identified in Problem Investigation Report PIR-1-C87-0120 (5-8-87) when it was found that the operations shift supervisor was not able to determine as-built system status due to "Red Marked Drawings" being attached to incorrect revisions of flow diagrams.

One violation was identified.

9. Self-Initiated Technical Audit

On February 13, 1989, Duke Power Company Quality Assurance Department submitted the results of a Self Initiated Technical Audit (SITA) on the licensee's 600 Volt AC Essential Power System. The inspectors reviewed the report and the licensee's response dated March 14, 1989.

The audit consisted of a detailed review of design documentation, calculations, equipment walkdowns and maintenance procedures. The audit and the SITA program is considered to be a strength.

The inspectors were concerned with finding 88-02 (CN)(01) involving a potential unanalyzed condition which could allow containment sump water to be circulated outside containment.

Valves NV252A and NV253B are Motor Operated Valves (MOVs) placed in paralleled to provide flow from the Fueling Water Storage Tank (FWST) to the suction of the Centrifugal Charging Pumps (CCPs). These valves receive a non-safety signal from the process control system to open on a low-low level in the volume control tank. Downstream of the MOVs, the lines combine and the common line contains a single check valve. During the recirculation mode these valves are to be closed to provide a barrier between the recirculated coolant and the FWST. Applying the single failure criterion per IEEE-379 the MOVs must be assumed to fail open because of the non-safety signal. If the check valve, NV254, fails to reclose or leaks significantly, then the Residual Heat Removal (ND) pumps will pump some of the recirculated flow back to the FWST. The single failure criterion is not satisfied in this scenario. The FWST is vented to atmosphere. In the short term, a release in excess of 10CFR100 limits may result. In the long term, operator action would be required to prevent a loss of recirculation capability.

The licensee brought the potential safety issue to the attention of Westinghouse with the belief that the issue may be generic. The Westinghouse Safety Review Committee is currently reviewing the issue as stated in a November 8, 1988 letter from Westinghouse Customer Project Department to Duke Power Mechanical and Nuclear Division.

The inspectors were concerned that no measures to date have been taken by the licensee to compensate for the failure scenario. Operators have been made aware of the potential during an operator update briefing, however, the failure could occur at any point in the accident and it may be impractical to expect operators to continuously monitor for the failure. The inspectors also questioned the licensee if this were an unanalyzed condition and reportable per 10CFR50.73. The licensee does not believe the item is reportable, however, has determined to submit a voluntary report describing the scenario. The inspectors reviewed the licensee's test program for check value NV254. The 8 inch valve receives a partial open stroke at cold shutdown and a full open stroke during refueling but not a seat leak test. This issue is identified as Unresolved Item 413/89-13-05: SITA Identified Failure Scenario Allowing Sump Water to Circulate to FWST, pending licensee and NRC determination of the safety significance of the scenario.

10. Exit Interview

The inspection scope and findings were summarized on May 1, 1989, with those persons indicated in paragraph 1. The inspector described the areas inspected and discussed in detail the inspection findings listed below. No dissenting comments were received from the licensee. The licensee did not identify as proprietary any of the materials provided to or reviewed by the inspectors during this inspection.

Item Number	Description and Reference
VIO 414/89-13-01	Failure to Follow Procedures, Four Examples Involving a Spill, a Refueling Cavity Drain Valve Leak and a Refueling Cavity Overfill (paragraphs 3.d, 3.c, and 3.f).
VIO 413/89-13-04	Inadequate Drawing Control, Five Examples (paragraph 8).
UNR 414/89-13-02	Connection Drawing Errors Associated With Incorrectly Labeled Optical Isolators (paragraph 4.c).
UNR 413/89-13-05	SITA Identified Failure Scenario Allowing Sump Water to Circulate to FWST (paragraph 9).
IFI 414/89-13-03	Use of OAC Graphics For Valve Lineups (paragraph 4.d)