U. S. NUCLEAR REGULATORY COMMISSION

REGION II

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Licensee:	Duke Power Company
Facility:	Catawba Nuclear Station, Units 1 and 2
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ENCLOSURE

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EXECUTIVE SUMMARY

Catawba Nuclear Station, Units 1 & 2
NRC Inspection Report 50-413/96-18, 50-414/96-18

This integrated inspection included aspects of licensee operations, maintenance, engineering, and plant support. The report covers a 6-week period of resident inspection; in addition, it includes the results of announced inspections by regional reactor safety and reactor projects inspectors.

Operations

- The licensee's efforts to implement a cold weather protection program were not commensurate with the significance of and frequency with which equipment problems have been encountered during previous winter seasons (Section 02.1).

- Progress toward drafting both corporate and station guidance in the development of a structured cold weather protection program has been narrow in scope and not timely (Section 02.1).

- Corporate and site assessments of the cold weather protection program have effectively revealed problem areas, and ensuing recommendations have been thorough and broad in scope (Section 02.1).

- The licensee's licensed operator requalification program evaluators administered JPMs effectively and consistently (Section 05.1).

- During Requalification Program simulator scenarios crew communications were satisfactory; however, improvements could be made concerning plant announcements, announcing changes to major plant equipment, and repeat back of specific plant parameters (Section 05.2).

- Simulator scenarios used for operator requalification were acceptable. The scenarios could have been enhanced to capture specific plant equipment interactions that would have provided additional competency evaluation for the examination team (Section 05.3).

- The examination documentation, remedial training, and retesting programs were satisfactory (Section 05.4).

- Operations Management has committed to participate in annual requalification examinations. The inspector viewed this as a good practice (Section 05.5).

- Operations Management has aggressively pursued the identification and correction of problems with the Employee Training and Qualification System. Since licensee corrective actions were not complete, additional inspector review of corrective actions was necessary. Specific operator qualifications will be checked as part of Inspector Follow-up Item 50-413,414/96-18-01 (Section 05.6).

ENCLOSURE

Maintenance

- Preventive Maintenance Thermography of switchyard connections effectively identified the degrading condition of a bolted connection. The connection was able to be removed from service for a planned repair prior to failure (Summary of Plant Status).

- Maintenance activities following the failure of the Unit 1 standby makeup pump pulsation dampener were well coordinated and executed. Extensive modification, inspection, and testing of the pump were completed prior to the expiration of a TS action statement that would have required a unit shutdown (Section M1.1).

- The licensee's investigation of a Unit 1 main transformer cooler failure was effective in identifying the cause of the failure and initiating actions to prevent future fan failures. Subsequent actions to reduce power, deenergize the 1A main transformer, and degas the transformer oil system were appropriate (Section M1.2).

- Warehouse storage conditions were good. The licensee took appropriate corrective actions to review motor storage practices following the identification of an improperly stored motor (Section M2.1).

- Two Non Cited Violations were identified regarding missed offsite power availability surveillances. The inspector reviewed the circumstances of both cases and concluded that the root causes were different. Therefore, corrective actions for a December 1995 issue would not have been expected to have prevented a recent occurrence (Sections M3.1 and M8.1).

Engineering

- Engineering support in the form of an evaluation of standby makeup pump operation with an incorrect cylinder cover and implementation of a minor modification for the replacement of the standby makeup pump discharge dampener was appropriate (Section M1.1).

- The licensee's efforts to mechanically contain a FWST heater leak were appropriate. However, pending additional review of inclusion of a wind velocity factor in a calculation for heat losses through the FWST roof while the heater capacity was reduced, Inspector Followup Item 50-413,414/96-18-04 was opened (Section E2.1).

Plant Support

- An annual unannounced after-hours augmentation drill demonstrated that required Emergency Operations Facility positions could be staffed with post-game stadium traffic in the vicinity of the Emergency Operations Facility. Additionally, the resident inspectors participated in a semi-annual emergency drill. Performance during the drill and critique was appropriate (Sections P2.1 and P2.2).

Report Details

Summary of Plant Status

Unit 1 operated at or around 100% power until October 27, when reactor power was reduced to 50% and then 47% to support repairs to and degassing of the A main transformer following an oil cooler fan blade failure. The transformer was returned to service on October 31, and power ascension to 100% commenced. On November 2 the unit reached 100% power and remained at 100% for the rest of the inspection report period.

Unit 2 operated at or around 100% power until November 14. By use of thermography for preventive maintenance, high temperatures were identified at a bolted connection in the switchyard. Reactor power was reduced to 47% and the A train of main power was removed from service. The high temperature was attributed to resistance caused by corrosion. The connection was cleaned, and a corrosion-inhibiting lubricant was applied. Train A of main power was placed back in service and reactor power returned to 100% on November 15. Reactor power remained at 100% for the remainder of the inspection report period.

While performing inspections discussed in this report, the inspectors reviewed the applicable portions of the UFSAR that were related to the areas inspected. The inspectors verified that the UFSAR wording was consistent with the observed plant practices, procedures, and/or parameters.

I. Operations

O2 Operational Status of Facilities and Equipment

O2.1 Cold Weather Protection Preparations

a. Inspection Scope (71714, 40500)

The inspector reviewed the licensee's plan for ensuring that plant equipment that is either safety-related or important to safety is adequately protected from extreme cold weather. The inspector reviewed the licensee's actions to implement a cold weather protection plan, interviewed the designated site Freeze Protection Coordinator, accompanied personnel in heat trace and instrument cabinet inspections, and reviewed station PIPs to determine if previously identified, cold weather induced equipment problems were addressed. The inspector also reviewed corporate office and station PIPs documenting program deficiencies to assess the adequacy of corrective actions and their timely implementation.

b. Observations and Findings

The inspection effort primarily focused on the eight areas listed in NRC Inspection Procedure 71714, Cold Weather Protection. Observations and findings in each area were as follows:

1. Station cold weather checklist

The station assigned a freeze protection coordinator to monitor the status of preparation activities. The freeze protection coordinator generated a matrix of the work items with their associated work order numbers. The matrix included items from surveillance procedure PT/0/B/4700/38, Cold Weather Protection, approved February 7, 1994, which is performed annually in the fall. Open work orders for inspection and testing of electrical heat trace, cabinet heaters, and insulation were also added to the matrix. In addition, the main potential transformer control cabinet space heaters were included to ensure that their functioning would preclude an electrical fault similar to the one that resulted in a Unit 2 loss of offsite power last winter (documented in NRC Inspection Report 50-413,414/96-03). The matrix, coupled with the surveillance procedure, served as the cold weather protection checklist.

2. Instrumentation calibration and testing

The inspector accompanied licensee personnel during the inspection and testing of heat trace. Thermostat operation was checked; the cabinet, door gasket, cable entries, and door fasteners were inspected for material condition and proper functioning; and pipe heat trace and insulation was inspected. To test the heat trace, the thermostat setting was increased to energize the heat trace. Amperage was then measured to ensure that sufficient heat could be generated. The inspector also reviewed a sample of task completion notes associated with predefined work order 96065640-01, Preventive Maintenance of the Heat Trace System, and reviewed other work orders that were generated to investigate and repair identified deficiencies. At the end of the inspection report period several work orders for inspecting and repairing heat tracing, heat trace heaters and insulation were outstanding. A deficient heater associated with the refueling water system was among them.

The licensee does not calibrate space heater thermostats; however, a corrective action in Station PIP 0-C96-1232 has prompted an evaluation of the need to add area electric space heater checkouts to predefined model work order 91004266 for the inspection and testing of electric heat tracing. The inspector noted that some area heaters could not be adjusted to control at a specific minimum temperature; they could either be turned up (for increased heat output) or turned down (for reduced heat output). The inspector expressed concern that adequate controls for maintaining room temperatures above a specified minimum were not provided. The licensee responded that discussions were in progress with the vendor to determine how a finer resolution in the controls could

be obtained. The inspector did not identify any equipment problems that have resulted from thermostat control issues. Heater failure has been the cause of cold weather induced equipment failures in previous winter seasons.

The inspector also performed a walkdown of the fire water and low pressure service water intake structure to evaluate the presence and material condition of heat tracing and insulation on exposed piping. New insulation had been or was being installed to enclose segments of exposed piping that had been traced with heating elements. The inspector noted that the condition of these protective devices was much improved over previous years.

The licensee's current freeze protection efforts are implemented through predefined model work orders. Work Order 91004266-01 provides for (1) the verification of thermostat and heater operation in heat trace cabinets, and (2) the visual inspection of heater installation and pipe insulation. Work Order 91002154-01 provides for the verification of thermostat and heater operation for 54 mechanical instrument boxes and the visual inspection of insulation and boxes for general material condition. Work Order 95073814-01 provides for the inspection and repair of insulation at various outdoor areas potentially exposed to cold weather. These work orders are typically initiated in September. Identified discrepancies are corrected via the work request process.

3. Inspection of systems susceptible to cold weather effects

The freeze protection coordinator, assisted by an operations staff member, performed walkdowns of plant equipment to ensure that protective equipment, such as heat trace, insulation and area heaters, was in good material condition. Discrepancies were identified and work orders were initiated to correct them. However, plant equipment walkdowns were still in progress, and subsequent work orders remained outstanding, at the end of the inspection period. An enhancement to the freeze protection efforts associated with outside area instrument cabinets, electric area heaters, and heat tracing this season was to close the heater breaker and energize the heater to verify electrical continuity in the circuit as well as power availability. In previous years, only power availability was verified.

4. Inspection of systems subjected to maintenance in past year

The licensee does not, as a practice, inspect systems that have been subjected to maintenance during the previous year to verify that cold weather protective measures have been reestablished. Instead, the work control process for post maintenance restoration is relied upon to ensure that any cold weather protective

equipment disturbed during maintenance activities is restored to its normal, functional status before equipment is returned to service. The licensee does consider the plant equipment walkdown to be a check to ensure that any disturbed or damaged freeze protection equipment is identified and corrected. The inspector did not identify equipment problems associated with this practice.

5. Protection of areas during periods of prolonged shutdowns

   The licensee has identified a need to determine, during long periods of prolonged shutdowns, if areas that are no longer kept warm by normal plant operation are adequately protected from cold weather. A Nuclear Station Directive for an Equipment Freeze Protection Program was under development with the lead responsibility assigned to the Duke Power Company General Office.

6. Correction of cold weather non-conformances previously identified

   The inspector evaluated the scope of the licensee's efforts to determine if cold weather non-conformances that had been identified in previous years by the NRC and the licensee were included in the current season's cold weather preparations. The inspector determined that, although some equipment vulnerabilities from the previous year (including the 22 kV potential transformer compartment heaters and main steam pressure impulse lines in the turbine building basement) were addressed in this year's cold weather preparations, the items were salient; the first had contributed to a loss of offsite power event in February 1996, and the second had been a recurring problem.

   However, other equipment problems (e.g. those affecting the auxiliary feedwater condensate storage tank level instrumentation and safe shutdown system diesel generator jacket cooling water system) that had been experienced in the previous year, were not brought to the attention of the freeze protection coordinator or evaluated to ensure that protective measures that had been taken in the previous year, would be effective in the current year. The licensee had documented cold weather-induced problems with auxiliary feedwater condensate storage tank level instrumentation as early as 1991 in PIP 0-C91-0304; the inspector noted that a problem recurrence had been documented in NRC inspection report 50-413,414/94-07. Operating experience during the winter months is a source of information that could improve the thoroughness of cold weather preparations and enhance the effectiveness of a cold weather protection program. The inspector considered the lack of this information on less salient equipment problems a missed opportunity to correct potentially persisting deficiencies.

7. Freeze protection annunciator response procedures

The inspector reviewed the F/8 annunciator response procedure, "Trace Heating Freeze Protection Outdoor Trouble," to verify that the licensee's procedures have sufficient immediate and supplementary actions to preclude freezing in the event of a failure of the freeze protection system. The procedure indicates that probable causes of the annunciator alarm are (1) loss of power supply to heat tracing panelboard 2HTP6 or (2) malfunction of a heat tracing transformer. Although no immediate actions are specified, the supplementary actions are to (1) dispatch an operator to determine which panelboard is alarming, (2) verify that power to each transformer is energized and the feeder breaker is closed, and (3) initiate a work request to have the cause of the transformer malfunction investigated.

A corrective action to revise the F/8 annunciator response procedure is documented in PIP 0-C96-1232. The revision will consist of the addition of two Supplementary Actions to the procedure: (1) a step to stress the urgency of having the problem corrected during the months of November to March, and (2) a step prompting the operator to contact the engineering group to assist in identifying the affected equipment and to evaluate the need for temporary backup heating. The inspector considered these supplementary actions sufficient to preclude freezing in the event of a failure of the freeze protection system.

8. Effects of a failure of a single train of non-safety-related freeze protection system on safety-related systems

The licensee has documented a corrective action in PIP 0-C96-1232 to (1) evaluate the effects of a failure of a single train of non safety-related freeze protection on safety-related systems, and (2) evaluate the adequacy of established compensatory measures for safety-related systems that can be adversely affected. At the end of the inspection period, this corrective action was outstanding.

The inspection effort also focused on the licensee's efforts to initiate a formal cold weather protection program at both the corporate and site levels to verify that programmatic controls were adequate. Station PIP 0-C96-1232 documents issues that were identified during a station evaluation of the cold weather protection program. The PIP included (as of May 1996) a list of 31 issues that needed to be evaluated. Corrective actions were developed to resolve these issues. Resolution of about half of the items listed was contingent upon feedback from system engineers on cold weather-related equipment vulnerabilities and operating experience to be incorporated into the station program. At the end of the report period, only one-third of the information had been provided to the freeze protection coordinator, and the

due date for closing these corrective actions was moved from November 30 to December 30, 1996.

General Office PIP 0-G96-0328 documents the findings of a Cold Weather Protection Program Performance Assessment that was performed by the Duke Power Company (DPC) corporate office. The PIP documents cold weather preparation programmatic and procedural deficiencies at all three DPC nuclear sites that could result in inadequate protection of plant equipment from freezing conditions. A generic, utility wide finding of the assessment was that administrative controls for cold weather were not adequately proceduralized, resulting in possible inadequate protection of plant equipment and delays in preparing for cold weather; the assessment was completed in September 1996, and documented in the PIP on October 31.

Station PIP 0-C96-2916 was generated to document observations from the assessment pertaining to Catawba and recommendations for managing cold weather preparations at Catawba during the 1996-7 winter season or until a Nuclear System Directive (NSD) could be finalized to delineate the scope of the program, administrative controls and group responsibilities. The recommendations were broad in scope and proposed thorough, detailed investigation and preparation activities. Several of the recommendations were implemented: a freeze protection coordinator was designated, some work scheduling deficiencies (activity initiation due dates and grace periods) were improved, and critical system vulnerabilities were selected for monthly monitoring. However, many of the recommendations were not incorporated into a programmatic structure and were not included in the station's cold weather preparations. The inspector considered this to be a function of the timing of the assessment and subsequent lack of time available to implement the recommendations in preparation for the current cold weather season.

Duke Power Company had been drafting a NSD for cold weather preparations since the spring of 1996. At the end of the inspection period, the NSD was still in draft form. As a result, programmatic guidance on fundamental issues (e.g. program initiation schedule and program scope to focus on equipment freezing versus broader, cold weather precautions such as moisture condensation) as well as programmatic details was not available to the site.

c. Conclusions

The inspector concluded that the licensee has endeavored to identify, at the corporate and site levels, programmatic deficiencies in cold weather protection efforts. Corporate and site assessments have effectively revealed problem areas, and ensuing recommendations have been thorough

and broad in scope. The designation of a cold weather protection coordinator and adjustments to the work scheduling system constituted site improvements. However, progress toward drafting both corporate and station guidance in the development of a structured cold weather protection program has been untimely and narrow in scope. The inspector concluded that, although equipment problems attributed to cold weather and freezing temperatures have been identified previously by both the NRC and licensee, the licensee's efforts to implement a cold weather protection program have not been commensurate with the significance of and frequency with which equipment problems have been encountered during previous winter seasons. No equipment problems have resulted from exposure to cold weather or freezing temperatures thus far this season.

05 Operator Training and Qualification

05.1 Job Performance Measure Evaluations (71001)

a. Inspection Scope

During the period of October 21 - 25, 1996, the inspector reviewed the licensee's licensed operator requalification program to determine compliance with 10 CFR 55.59, *Requalification*. The inspector used Inspection Procedure 71001 to review and evaluate the licensee's operator requalification program in the area of Job Performance Measure (JPMs) evaluations.

b. Observations and Findings

The inspector observed the administration of JPMs to Senior Reactor Operators (SROs) and Reactor Operators (ROs) on the simulator and in the plant. The licensee evaluator's grading was consistent with that of the inspector's. Evaluators effectively queried the operators using follow-up questions based upon operator performance. This allowed the evaluators to determine generic or individual areas needing improvement. There were no JPM failures observed.

c. Conclusions

The inspector concluded that the licensee's evaluators administered JPMs effectively and consistently.

05.2 Crew Communications and Operator Performance (71001)

a. Inspection Scope

The inspector used Inspection Procedure 71001 to review and evaluate the licensee's operator requalification program in the area of crew communications and operator performance.

b. Findings and Observations

The inspector observed the administration of two dynamic simulator scenarios to three crews. The crews consisted of five operators; two SROs, two ROs and one STA. The inspector observed that crews, during page announcements, did not provide informative plant status to personnel outside of the control room. The inspector also noted that plant announcements concerning major plant equipment starts or stops during normal plant and emergency evolutions are not performed. Operations Management Procedure 1-11, "Operations Communications Standards," did not have a requirement to announce the starts/stops of major plant equipment. However, a safety hazard may be present to plant personnel in the immediate area of the equipment. The inspector observed that ROs did not regularly report equipment auto-start malfunctions to the Control Room SRO or the Operations Shift Manager when the equipment was able to be manually placed in service. The inspector observed that operators generally met Operations Managements communications standards delineated in OMP-1-11, however, ROs did not report specific plant status when the Control Room SRO read a step in the emergency operating procedure. The ROs would repeat back the step, but, would not provide actual plant status. An example of this was when the SRO asked if pressurizer level was greater than 17%. The repeat back was, "Yes, pressurizer level is greater than 17%." Specific plant status was not provided. This practice of not providing detailed plant status can slow down the implementation of the procedures. It forces the SRO to request specific plant status after a step has been acknowledged. The inspector also observed operators who failed to take appropriate action until they obtained concurrence from the SRO and the Operations Shift Manager prior to taking procedurally directed actions. An example of this was during Steam Generator depressurization following a tube rupture. The ROs were provided with specific plant parameters, which when achieved, required stopping the depressurization. The ROs did not automatically stop the depressurization but waited to obtain concurrence from the SROs when these plant parameters were met. This caused the parameters to be exceeded.

c. Conclusions

The inspector concluded that communications, in general, were satisfactory, however, improvements could be made. Concerning plant announcements, the inspector concluded that more information concerning plant status could be provided to personnel outside the control room. In the area of announcing changes to major plant equipment, the inspector concluded that additional attention is necessary in this area. In the area of repeating back specific plant parameters, the inspector concluded that repeating back the actual value of the specific parameter requested would reduce confusion and increase the efficiency of emergency operating procedure implementation. The inspector concluded that ROs should perform required action steps when plant parameters have been met without soliciting the concurrence of control room supervisors.

05.3 Simulator Scenario Evaluation (71001)

a. Inspection Scope

The inspector used Inspection Procedure 71001 to review and evaluate the licensee's operator requalification program in the area of simulator scenario evaluation.

b. Findings and Observations

The inspector reviewed the dynamic simulator scenarios administered during the inspection week. The dynamic scenarios were considered satisfactory and met the requirements of scenario construction.

The inspector reviewed the simulator scenario grading criteria. The inspector noted that the licensee used Generic Westinghouse Owners Group Critical Tasks for crew performance. Crew performance was evaluated using Crew Critical Tasks (CCTs). Individual performance was evaluated using individual competencies. It should be noted that CCTs are not required by regulation to evaluate crew performance. The inspector determined that many CCTs were not based on specific plant parameters, rather they were based on generic Westinghouse critical tasks, coupled to procedural anchors.

The inspector observed the administration of simulator scenarios by the licensee's evaluators. The final facility evaluators' grading/evaluation was consistent with the inspector's. The inspector noted that evaluators effectively used post-scenario follow-up questions concerning operator actions.

The inspector reviewed final individual evaluation reports. The inspector noted that evaluators regularly provided comments for competency values less than "3."

c. Conclusions

The inspector concluded that while the simulator scenarios were acceptable they could have been enhanced to capture specific plant equipment interactions which would have provided additional competency evaluation for the examination team. The inspector concluded that CCTs could be improved to encompass more objective performance measures that contain measurable performance indicators. Objective performance measures allow a common ground for evaluators to objectively evaluate operator performance. The inspector concluded that CCTs, as written, may fail to identify less than satisfactory performance. The inspector concluded that the licensee's evaluators effectively used follow-up questions to ascertain individual and group knowledge deficiencies. The inspector also concluded that documentation of competencies with less

than a value of "3" was a good practice. Maintaining documentation concerning less than satisfactory performance allows trending of operator performance and determination and tracking of generic operator weaknesses.

05.4 Documentation and Remediation of Failures (71001)

a. Inspection Scope

The inspector used Inspection Procedure 71001 to review and evaluate the licensee's operator requalification program in the area of documentation and remediation of failures.

b. Observations and Findings

The inspector reviewed examination documentation, remedial training and retesting of two operators that failed annual requalification examinations. The inspector noted that adequate documentation was provided for examination failures and that remedial programs administered contained pertinent and substantive topics.

c. Conclusion

The inspector concluded that the licensee's examination documentation, remedial training and retesting programs were satisfactory.

05.5 Operations Management Practices (71001)

a. Inspection Scope

The inspector used Inspection Procedure 71001 to review and evaluate the licensee's operator requalification program in the area of Operations Management practices.

b. Observations and Findings

The inspector observed a cooperative relationship between Operations, Operations Management, and the Training Department. The inspector observed that Operations Management participated in the annual requalification examinations. This practice is not currently required by plant procedure. The inspector observed that the Operations Training Manager acted as the operations representative during one simulator session.

c. Conclusions

The inspector concluded that Operations Management has committed to participate in annual requalification examinations. The inspector viewed this as a good practice. However, the use of the Operations Training Manager as the Operations Representative does not necessarily

provide an independent view of the training department's performance or crew's performance by the operations department. In addition, it may not provide current Operations management expectations to the crew.

05.6 Employee Training and Qualification System (71001)

a. Inspection Scope

The inspector used Inspection Procedure 71001 to review and evaluate the licensee's operator requalification program in the area of Employee Training and Qualification System.

b. Observations and Findings

The inspector reviewed Catawba Nuclear Station Problem Investigation Process (PIP) report (0-C96-1566) concerning the Employee Training and Qualification System (ETQS). The Operations Department requested that the Employee Training and Qualification System be audited by the Nuclear Assessment and Issues Department from the General Office Group because ETQS requirements for some Operations personnel had not been completed as required. Two of the tasks identified required requalification to new standards because of recent plant modifications using new equipment in the areas of air compressors and a new computer. The PIP identified areas where deficiencies were found concerning operations personnel. The type of deficiencies identified were failure to satisfy necessary qualification requirements and a failure to adequately process documentation following completion of qualifications. Additionally, the PIP identified there was inadequate information available to determine if the process to notify and track expired qualifications was effective and to ensure that requalification was accomplished after notification of delinquency. The review identified at least three tasks in which significant numbers of operations personnel were not currently qualified. The inspector discussed these areas with the Operations Superintendent and found reasonable assurance that operators' qualifications were no longer of concern. When the problems with ETQS were initially identified, Operations Management instituted a corrective action program to determine what qualifications were missing and what was necessary to qualify all personnel in their deficient qualifications. The corrective actions requalified the delinquent operators in those areas needing requalification. At the end of the inspection, the inspector was unable to verify completion of all corrective actions delineated in the PIP. The proposed corrective actions due date for this PIP was December 23, 1996. Since all corrective actions have not been completed, this item is characterized as Inspector Follow-up Item 413,414/96-18-01: Verification of Corrective actions for Documentation of Training and Qualification.

c. Conclusion

The inspector concluded that Operations Management has aggressively pursued the identification and correction of problems with the Employee Training and Qualification System. Previously, Plant Management had not provided the proper amount of emphasis/attention on the Employee Training and Qualification System. The inspector concluded that since the PIPs corrective actions have not been completely closed out, additional review of corrective actions was necessary. Specific operator qualifications will be checked as part of this inspector follow-up item.

II. Maintenance

M1 Conduct of Maintenance

M1.1 Standby Makeup Pump Repair and Testing

a. Inspection Scope (62707, 61726)

On Thursday, November 21, a discharge pressure test rig fitting failed during a Standby Makeup Water Pump quarterly test. Operator actions in response to the failed fitting resulted in damage to pump discharge pressure relief valve 1NV-866. Subsequent attempts to test the pump were unsuccessful. The licensee determined that air had entered the system during maintenance of 1NV-866, and the pump discharge pulsation dampener was damaged as a result. The inspector reviewed the circumstances which lead to damage to the pump's discharge dampener, observed portions of the maintenance and inspections of potentially damaged components, and assessed licensee actions to prevent recurrence.

b. Observations and Findings

On November 21, operators were performing a Standby Makeup Water Pump quarterly test when a discharge pressure test rig fitting failed and started spraying water. An operator, located at the pump recirculation valve adjusting valve position to obtain the desired pressure for flow data acquisition, immediately throttled the recirculation valve closed in an instinctive effort to stop the leak. This action caused pump discharge pressure (and flow through the failed fitting) to increase. The operator quickly reversed the action and opened the valve to reduce pressure and flow through the failed fitting. However, the initial pressurization caused relief valve 1NV-866 to open.

The relief valve incurred some damage and was repaired. On November 23 the licensee made several attempts to complete testing and observed pressure fluctuations and insufficient flow rates. A Failure Investigation Team was initiated to determine the cause of the pressure and flow anomalies.

The licensee disassembled the Unit 1 standby makeup pump on November 25 to investigate the cause of low pump discharge flow and to perform inspections of the pump internals for possible debris or foreign material generated by the failure of the pump discharge pulsation dampener bellows (MWO 96093879). The inspector observed the internals of the pump following disassembly and verified that no debris from the bellows migrated into the suction or discharge headers of the pump.

The inspector noticed flakes of rust were in the discharge of the number 1 cylinder. The licensee had previously identified these corrosion products during the initial disassembly and had initiated a review to determine the source. The licensee determined that the corrosion products originated from the number 1 discharge cylinder cover which had a carbon steel insert on the portion of the cover exposed to borated water. The remaining nine cylinder covers had stainless steel inserts which are not susceptible to boric acid corrosion. The licensee determined that the cover with the carbon steel insert was an incorrect part. This part was supplied with the original pump by the pump manufacturer during initial plant construction. The licensee cleaned and reassembled the pump with the carbon steel cover and performed an operability evaluation to justify operating with the carbon steel cover until the next refueling outage. The inspector reviewed the operability evaluation (PIP 1-C96-3137) and concluded that continued operation with the carbon steel insert would not impact performance of the standby makeup pump or reactor coolant pump seals.

On November 26, the inspector witnessed final fill and venting of the Unit 1 standby makeup pump and performance of PT/1/A/4200/07C, Standby Makeup Pump #1 Performance Test, approved February 17, 1993. The inspector verified that the pump was properly filled prior to flow verification testing. The inspector also verified that the proper test equipment and fittings were used during pump testing. Pump flows met the flow rates required by TS, and discharge piping vibration monitoring confirmed that the modified pulsation dampener functioned appropriately.

c. Conclusions

The apparent cause of the dampener damage was air entrainment in the system during maintenance of relief valve 1NV-866. In addition, the test rig fitting failure was attributed to the use of an inappropriate fitting, and the relief valve damage was caused by the throttling of the recirculation valve. Maintenance activities following the failure of the Unit 1 standby makeup pump pulsation dampener were well coordinated and executed. Extensive modification, inspection and testing of the pump were completed prior to the expiration of a TS action statement that would have required a unit shutdown. Engineering support in the form of an evaluation of standby makeup pump operation with an incorrect cylinder cover and implementation of a minor modification for the replacement of the discharge dampener was appropriate.

M1.2 Unit 1 A Main Transformer Cooling Fan Failure and Oil Leak

a. Inspection Scope (62707)

On October 27, the Unit 1 control room received a Main Transformer 1A trouble alarm. Operators responded to the 1A transformer and investigation revealed that a gas detection alarm had actuated and a cooling fan in cooler #2 had broken from its shaft. During investigation of the source of gas in the transformer, a low transformer oil level alarm was also received. The licensee deenergized the fan motors and oil pump associated with cooler #2 as part of the troubleshooting. When the oil pump was deenergized a severe oil leak began on the pump suction piping. Operations then entered Rapid Downpower procedures and reduced Unit 1 power to 50% within thirty minutes, secured the 1A main transformer and isolated the oil leak. The inspector discussed the issue with licensee personnel, reviewed PIP 1-C96-2880 which documents the failure and reviewed the results of the licensee's failure investigation.

b. Observations and Findings

The source of the gas in the transformer and the oil leak both resulted from a cracked weld in the cooler #2 suction piping. Excessive vibration when the fan in cooler #2 broke from its shaft which initiated the crack. Outside air was then drawn into the transformer which initiated the transformer gas detection alarm. The severe oil leak occurred when oil was forced out of the cracked weld by pressure from the 8 other operating transformer oil cooler pumps after the cooler #2 pump was shutdown.

The licensee subsequently performed visual examinations of all transformer cooler fans. One fan that had a crack indication was replaced. A metallurgical examination of the failed cooler # 2 fan blade which was performed as part of the licensee's failure investigation determined that the fan failure was not a premature failure. The fan had reached the end of its normal service life. The licensee initiated actions to perform random nondestructive examinations of a sample of transformer cooler fans to determine if other fans were approaching the point of failure.

Transformer repair activities included removing the damaged cooler unit and isolating and installing blank flanges to the cooler pipe connections. Since oil level in the transformer did not decrease below the top of the transformer windings the licensee in conjunction with the corporate transformer maintenance support personnel decided to top off the transformer with the volume of oil that had leaked (800 gallons) and vent the small amount of air that was expected to remain after filling. The 1A transformer was then placed back in service and Unit 1 power was increased to 100%. After approximately 18 hours, small amounts of air were still required to be vented from the transformer. Venting was

initially expected to be required for up to 12 hours. Corporate transformer maintenance support personnel were contacted and determined venting for this extended period of time was an abnormal condition that may have resulted from an air pocket that remained trapped below the transformer core or air suspended in the oil since the initial cooler piping weld failure. As a result a Unit 1 power reduction to 50% was initiated and the 1A main transformer was removed from service again to completely drain and vacuum refill the transformer to remove all entrained air. Degassing and vacuum refill activities were completed successfully and the transformer was placed back inservice.

c. Conclusions

The investigation of a Unit 1 main transformer cooler failure was effective in identifying the cause of the failure and initiating actions to prevent future fan failures. Returning the 1A main transformer to service with air entrained in the oil system occurred because of a lack of experience or knowledge with this type of failure. The licensee's subsequent actions to reduce power, deenergize the 1A main transformer and degas the transformer oil system were appropriate.

M2 Maintenance and Material Condition of Facilities and Equipment

M2.1 Warehouse Storage Condition Walkdown

a. Inspection Scope (62707)

The inspector performed a walkdown of warehouse storage conditions and reviewed corrective actions for a licensee identified problem with the storage of a spare containment spray pump motor in the contaminated warehouse (PIP 0-C96-2488).

b. Observations and Findings

Items stored in the contaminated material warehouse were appropriately packaged, boxed or wrapped to prevent the spread of contamination. Access to the contaminated material warehouse was controlled. The licensee had initiated work requests to energize heaters in a spare containment spray pump motor that was found without its heaters energized. The licensee is also reviewing overall motor storage practices to correct any similar motor storage deficiencies. The inspector found that storage conditions in the non-contaminated warehouses were good. The storage areas were well lit and clean. Items were neatly stored on shelves and clearly labeled. The licensee addressed minor discrepancies that the inspector identified during the walkdown.

c. Conclusions

Warehouse storage conditions were found to be good. The licensee took appropriate corrective actions to review motor storage practices following the identification of an improperly stored motor.

M3 Maintenance Procedures and Documentation

M3.1 Offsite Power Verification

a. Inspection Scope (71707, 61726)

On November 2 the control room Senior Reactor Operator identified that Technical Specification action 3.8.1.1.a1 was not performed as required when the 2A diesel generator was out of service for normal maintenance testing for 64 minutes. The inspector discussed the missed TS surveillance with operations personnel; reviewed the associated maintenance procedure, station PIP and Licensee Event Report (LER 414/96-06), Missed Technical Specification Surveillance for AC Offsite Power Sources; assessed the adequacy of proposed corrective actions; and verified that corrective actions had been completed.

b. Observations and Findings

On November 1 the 2A diesel generator was removed from service and placed in maintenance for normal diesel generator maintenance testing per PT/2/A/4350/02A, approved September 30, 1996. On November 2 the control room Senior Reactor Operator discovered that the diesel was inoperable the previous day from 10:13 a.m. until 11:17 a.m., for a total of 64 minutes and that Technical Specification action 3.8.1.1.a1 was not performed. The action requires operators to demonstrate the operability of the remaining required offsite circuit by performing Specification 4.8.1.1.1a (verifying correct breaker alignments and indicated power availability) within 1 hour.

The licensee speculated that a procedural discrepancy contributed to the missed TS surveillance. The inspector discussed this possibility with a procedure writer who indicated that two procedures had been changed: PT/2/A/4350/02A, Diesel Generator 2A Operability Test, and OP/1(2)/A/6350/02, Diesel Generator Operation. The change incorporated a vendor recommendation to bar and air-roll the DG before starting it. The inspector obtained a copy of the maintenance procedure, PT/2/A/4350/02A, approved September 30, 1996, to determine if procedural guidance for barring and rolling the diesel generator was adequate.

A note at the beginning of the procedure stated "Due to the short duration of the inoperability, the following considerations, which are normally performed with the inoperability of a D/G, are not required." The performance of PT/1/A/4350/02C, Available Power Source Operability, was listed as one of the considerations that was not required. Step

12.12 of the procedure directed operators to bar the diesel generator per Enclosure 13.7 and step 12.13 directed operators to then roll the diesel generator per Enclosure 13.6. The inspector determined that the procedure change to bar the diesel generator before rolling it had been made without consideration of the additional time incurred by performing both tasks, the subsequent impact on duration of inoperability, and the appropriateness of the guidance provided in the note at the beginning of the procedure.

A second note in the procedure stated that "the inoperability of a D/G is not required to be logged in the [Technical Specification Action Item Log] computer, but may be logged for tracking purposes if desired." The practice is for control room operators to log DG inoperability in the Reactor Operator Logbook, but this practice is not well defined with a formal structure and clear expectations and, in this case, was not used to ensure actions were performed as required by TS.

The LER conclusion attributes two root causes to the missed TS surveillance: (1) management expectations for short-term inoperability items have not been well-defined, and (2) insufficient detail was provided in the test procedure. Corrective actions included changes to PT/1(2)/A/4350/02A(B) to (1) provide one enclosure for barring and rolling the DG; (2) remove guidance on short-term inoperability, and (3) perform the available AC power source operability test before placing the DG in maintenance mode. The inspector verified that these changes were made to the procedure, which was approved November 5. An operator update was issued to communicate the procedure change, and a step was added in OP/1(2)/A/6350/02, Diesel Generator Operation, enclosures to complete the available AC power source operability test before checking for cylinder head leakage or barring a DG. An additional planned corrective action is to create a quality improvement team to improve the tracking of short-duration inoperabilities.

c. Conclusions

The inspector concluded that the root cause determination and corrective actions were appropriate. The inspector also reviewed a previous LER (50-414/95-006) for a missed offsite power availability surveillance and concluded that the root causes were different (see Section M8.2). Therefore, corrective actions for that issue would not be expected to have prevented the recent occurrence. This licensee-identified and corrected violation is characterized as Non-Cited Violation 50-414/96-18-02: Inadequate Procedure Results in Missed AC Power Availability Surveillance, consistent with Section VII.B.1 of the NRC Enforcement Policy. LER 50-414/96-06 is closed.

M8 Miscellaneous Maintenance Issues (92902)

M8.1 (Closed) LER 50-414/95-06: Missed Technical Specification Surveillance for AC Offsite Power Sources. On December 15, 1995, at 2:35 a.m. the control room SRO identified that a verification of Unit 2 offsite power availability was not performed as required at 1:00 a.m. The licensee completed the surveillance within 25 minutes of this discovery. The cause was determined to be a result of inattention to detail by the Unit 2 operator at the controls who was involved in performing a power reduction maneuver prior to the time the surveillance was missed. The licensee's corrective actions included counseling the operator and discussing this event with all control room operators.

The inspector verified the licensee's corrective actions were completed. In addition, since 1995, the licensee has implemented a detailed daily schedule of control room work activities to evenly distribute control room work activities throughout the day. The licensee also has an ongoing human performance improvement program which is intended to reduce human errors of this nature. The inspector concluded that the failure to perform the offsite power availability verification was a violation of TS action requirement 3.8.1.1c, AC Sources. This licensee identified and corrected violation is characterized as Non-Cited Violation 50-414/96-18-03: Personnel Error Resulting in Missed AC Power Availability Surveillance, consistent with Section VII.B.1 of the NRC Enforcement Policy.

III. Engineering

E2 Engineering Support of Facilities and Equipment

E2.1 Refueling Water Storage Tank Heater Leak

a. Inspection Scope (37551)

On July 24, 1996, the licensee identified steam coming out of a weep hole in electrical conduit from a Unit 1 refueling water storage tank (FWST) heater. The licensee initiated a modification to enclose the heater to contain the leak; this rendered the heater non-functional. The licensee performed an evaluation to demonstrate that minimum tank temperature could be maintained with the three remaining heaters. The inspector discussed the modification with engineers involved and reviewed PIP 1-C96-1870, work orders associated with the modification, and the engineering evaluation in support of the modification.

b. Observation and Findings

On July 24, 1996, the licensee identified steam coming out of a weep hole in electrical conduit from a Unit 1 refueling water storage tank (FWST) heater. To contain the leak, the licensee initiated a modification to enclose the heater in a flanged pipe, which would serve

as the pressure boundary. The inspector discussed the modification plan with the engineers involved and concluded that the approach to containing the leakage was reasonable.

Per the Updated Final Safety Analysis Report (UFSAR), four immersion-type heaters are used to maintain the FWST above 70° to preclude possible damage to the containment vessel as a result of an inadvertent operation of the Containment Spray System.

Each heater has a 30 kW capacity, yielding a total output capacity of 120 kW. Because the modification required all conduit to the affected heater to be disconnected, the heater would not be operable. The licensee performed an evaluation to demonstrate that minimum tank temperature could be maintained with the three remaining heaters, generating a total capacity of 90 kW.

The inspector reviewed calculation CNC-1249.00-00-0065 to determine if the analysis was logical and thorough. In reviewing the calculation the inspector determined that the licensee accounted for heat losses from the tank to the ground and to the environment through the tank walls, which are insulated, and roof, which is not insulated. Heat losses were quantified assuming a minimum temperature of -5°F. An assumed wind velocity of 20 mph was factored into the equation for quantifying heat loss to the environment through the tank walls; however, wind velocity was not factored into the calculation for heat losses from the roof. The calculation illustrated that the heat losses amounted to 81.88 kW, which is within the 90 kW capacity of the 3 remaining heaters. Since the walls are insulated and the roof is not, the inspector questioned the validity of the calculation if a wind velocity factor is not considered in the heat loss calculation from the roof. The licensee planned to address the question in a revised analysis.

c. Conclusions

The inspector considered the licensee's efforts to mechanically contain the FWST heater leak appropriate. However, pending resolution of the wind velocity factor for calculating heat losses through the FWST roof, this issue is characterized as Inspector Followup Item 50-413,414/96-18-04: Quantification of FWST Heat Losses Through Tank Roof Including a Wind Velocity Factor.

IV. Plant Support

P2 Status of EP Facilities, Equipment and Resources

P2.1 Annual Augmentation Drill (71750)

On October 20 the inspector observed the performance of an annual unannounced after-hours augmentation drill. Emergency Response Organization pagers were activated to announce the drill at 3:53 p.m. on

a Sunday to coincide with the last two minutes of a Charlotte Panthers football game. The objective of the drill was to determine if required Emergency Operations Facility positions could be staffed within a 75 minute time period, as required by their Emergency Plan, with post-game traffic in the vicinity of the Emergency Operations Facility. The resident inspector was present to independently verify that response was executed in accordance with NRC requirements. All required positions were manned within 52 minutes.

P2.2 Emergency Drill (71750)

On November 13 the resident inspectors participated in the licensee's semi-annual emergency drill. The drill was conducted from the training simulator, beginning at 10:00 a.m. and terminating at 1:00 p.m. Inspector participation included manning the simulator and the Technical Support Center. The licensee's critique is documented in station PIP 0-C96-3133. The inspectors reviewed sections of the PIP and determined that discrepancies and strengths identified were appropriately characterized. Corrective actions were assigned and documented in the PIP to resolve areas of concern. In general, the inspectors concluded that licensee performance during the drill was appropriate.

V. Management Meetings

X1 Exit Meeting Summary

The inspectors presented the inspection results to members of licensee management on October 21, 1996, and at the conclusion of the inspection on December 10, 1996. The licensee acknowledged the findings presented. No dissenting comments were received from the licensee management and no proprietary information was identified.

PARTIAL LIST OF PERSONS CONTACTED

Licensee

Bhatnager, A., Operations Superintendent
Coy, S., Radiation Protection Manager
Forbes, J., Engineering Manager
Harrall, T., IAE Maintenance Superintendent
Kelly, C., Maintenance Manager
Kimball, D., Safety Review Group Manager
Kitlan, M., Regulatory Compliance Manager
McCollum, W., Catawba Site Vice-President
Peterson, G., Station Manager
Propst, R., Chemistry Manager
Rogers, D., Mechanical Maintenance Manager
Tower, D., Compliance Engineer

ENCLOSURE

INSPECTION PROCEDURES USED

IP 37551:	Onsite Engineering
IP 40500:	Effectiveness of Licensee Controls in Identifying, Resolving, and Preventing Problems
IP 61716:	Surveillance Observation
IP 62707:	Maintenance Observation
IP 71707:	Plant Operations
IP 71714:	Cold Weather Operations
IP 71750:	Plant Support Activities
IP 77001:	Licensed Operator Requalification Program Evaluation
IP 92902:	Followup - Maintenance
IP 93702:	Onsite Response to Events

ITEMS OPENED, CLOSED, AND DISCUSSED

Opened

50-413,414/96-18-01	IFI	Verification of Corrective actions for Documentation of Training and Qualification (Section O5.6)
50-413/96-18-04	IFI	Quantification of FWST Heat Losses Through Tank Roof Including a Wind Velocity Factor (Section E2.1)

Closed

50-414/96-18-02	NCV	Inadequate Procedure Results in Missed AC Power Availability Surveillance (Section M3.1)
50-414/96-18-03	NCV	Personnel Error Resulting in Missed AC Power Availability Surveillance (Section M8.1)
50-414/95-06	LER	Missed Technical Specification Surveillance for AC Offsite Power Sources (Section M8.1)
50-414/96-06	LER	Missed Technical Specification Surveillance for AC Offsite Power Sources (Section M3.1)

LIST OF ACRONYMS USED

AC	-	Alternating Current
CCT	-	Crew Critical Task
CFR	-	Code of Federal Regulations
DPC	-	Duke Power Company
ETQS	-	Employee Training and Qualification System
FSAR	-	Final Safety Analysis Report
IAE	-	Instrument and Electrical
IFI	-	Inspector Followup Item
IR	-	Inspection Report
JPM	-	Job Performance Measure
kV	-	kiloVolts
LER	-	Licensee Event Report
NCV	-	Non Cited Violation
NSD	-	Nuclear Site Directive
PIP	-	Problem Investigation Process
SRO	-	Senior Reactor Operator
TS	-	Technical Specifications
TSAIL	-	Technical Specifications Action Item Log
UFSAR	-	Updated Final Safety Analysis Report
VIO	-	Violation
WO	-	Work Order