



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

Report Nos.: 50-413/90-05 and 50-414/90-05

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 Nuclear Station Units 1 and 2

Inspection Conducted: January 3 - 23, 1990

Inspectors: W. T. Orders, Senior Resident Inspector 2-2-90
Date Signed
M. S. Lesser, Resident Inspector 2-2-90
Date Signed
Approved by: M. B. Shymlock 2-2-90
Date Signed
M. B. Shymlock, Section Chief
Projects Branch 3
Division of Reactor Projects

SUMMARY

Scope: This special inspection, conducted by the resident inspectors, concerns an event involving an open circuit breaker for the 1B Containment Air Return Fan motor which rendered the fan inoperable.

Results: One apparent violation was identified involving the inoperability of 1B Containment Air Return Fan in that its power lockout breaker was opened and remained open for an indeterminate period of time. (paragraph 5)

One non-cited violation of the licensee's equipment installation procedures was identified involving the failure to properly label electrical switchboards as being nuclear safety related. (paragraph 7)

One weakness was identified associated with a lack of control room indication of an inoperable Containment Air Return Fan system. (paragraph 6)

One weakness was identified involving numerous unauthorized beds/resting areas discovered in electrical cable trays, in that licensee efforts appear to have been ineffective in eliminating what appears to have been a problem for several years. (paragraph 9)

REPORT DETAILS

1. Persons Contacted

Licensee Employees

B. Caldwell, Station Services Superintendent
*R. Casler, Operations Superintendent
*J. Forbes, Technical Services Superintendent
*R. Glover, Compliance Engineer
*T. Harrall, Design Engineering
R. Kirk, Catawba Safety Review Group
W. McCollum, Maintenance Superintendent
J. Roach, Station Security Coordinator
*T. Owen, Station Manager

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. Executive Summary

On January 3, 1990, during the performance of a Technical Specification (TS) surveillance test on the 1B Containment Air Return Fan (CARF), the fan failed to start as required. The licensee subsequently identified the power lockout circuit breaker for the fan to be open, thus preventing both an automatic start upon a safety signal or a manual start from the control room. The breaker was observed to be in the "open" position as opposed to the "tripped" position. The licensee closed the breaker and successfully completed the test, but could not identify specific activities which would have caused the breaker to be open. Subsequent investigation by the licensee identified makeshift bedding materials in electrical cable trays over the breaker switchboard panel. The licensee theorized that the CARF breaker may have been grabbed or kicked by an individual climbing the switchboard to rest or sleep in the cable tray bed above. As investigations continued, approximately 15 more beds were discovered in other cable trays throughout the plant.

3. System Description

The CARF is part of the Containment Air Return and Hydrogen Skimmer (VX) System. The VX system is located entirely within containment with the two CARF's located in the upper compartment. Each fan has a capacity of 40,000 cfm and is capable of performing the design function of displacing air from the upper compartment to the lower compartment, returning air

which was displaced by the loss-of-coolant blowdown to the lower compartment.

Both fans start 9 minutes after the High-High Containment Pressure actuation signal of 3 psig. After being discharged into the lower compartment, air mixes with steam produced by residual heat and flows through the ice condenser doors into the ice condenser compartment where the steam is condensed. The air flow returns to the upper compartment through the vents in the upper portion of the ice condenser compartment. The air return fans operate continuously after actuation, circulating air through the containment volume provided that containment pressure is above the Containment Pressure Control System (CPCS) termination setpoint, (0.25 psig).

The terminate and permissive features of the redundant CPCS are provided by eight independent pressure sensors (four per train). The sensors interlock the controls of the Containment Spray System and the Containment Air Return Fans to stop operation when containment pressure is below approximately 0.25 psig to prevent excessive depressurization of the containment. The CPCS termination permissive feature as applicable to the CARF, is accomplished by means of the aforementioned power lockout circuit breaker and contactor which is in series with the main power supply breaker.

4. Event Description

On January 3, 1990, the licensee was performing surveillance testing on the unit 1 "B" train CARF pursuant to TS 4.6.5.6.1. The surveillance requires a Containment High-High Pressure test signal be applied and the verification that the CARF automatically starts following a 9 (+/-1) minute time delay and then runs for at least 15 minutes. The fan failed to start and the test engineer immediately suspected faulty test equipment. The NRC resident inspector witnessed a second unsuccessful attempt. The fan had been previously declared inoperable in order to conduct the test and the engineer properly initiated a work request to investigate the cause. While troubleshooting, technicians determined that the power lockout breaker for the 1B CARF fan, breaker FO1A on Motor Control Center 1EMXN, was open, thus interrupting the 600 volt power supply to the fan motor. The licensee verified that the breaker was in the "open" position versus the "tripped" position. The power lockout breaker is in series with the main power supply breaker and provides the termination permissive function from the CPCS. The breaker was closed and the surveillance completed.

The licensee initiated Problem Investigation Report (PIR) 1-C90-01 to further determine the cause. On January 4, 1990 the licensee discovered another circuit breaker in the open position. This breaker powered a non-safety related Unit 2 Containment Floor and Equipment Room Sump Pump.

Inspection of the area above the breaker switchpanel revealed materials such as rags, clothing and mopheads assembled in electrical cable trays for the apparent purpose of constructing a bed. The cable trays above the CARF breaker were then inspected where bedding materials were also found.

Both of the referenced circuit breakers are enclosed in breaker panel cubicles with an operating handle on the outside of the cubicle. The handle is used to open or close the breaker and is labeled with those positions as well as the "tripped" position. Both breakers are located at approximately eye level and the licensee demonstrated the feasibility of a person grabbing or kicking the operating handle while climbing the switchpanel to reach the beds. Upon realization that this could have been a cause for the CARF breaker being opened, licensee management involved the Station Security Coordinator in an expanded investigation.

5. Requirements

Technical Specification 3.6.5.6 requires two independent Containment Air Return Fans to be operable in modes 1-4. With one fan inoperable it must be restored to operable status within 72 hours or the unit must be placed in hot standby within the next 6 hours. The operability of the system ensures that the containment atmosphere is circulated for cooling by the Containment Spray System and is also provided to enhance ice condenser heat and fission product removal. With the power lockout circuit breaker open, the 1B CARF was inoperable with no method of starting the fan either automatically or manually from the control room. Since the breaker does not provide position indication to alarms or computers, there is no record to identify the time at which the breaker was opened. The system was discovered inoperable on January 3, 1990 and restored to service the same day. The system was last known to be operable following testing on October 23, 1989. During the period spanning October 23, 1989 to January 3, 1990, Unit 1 operated for the most part in mode 1 with a shutdown to mode 2 on October 24 for 3 days and a shutdown to mode 5 on November 23 for several days. During the period spanning from October 23, 1989 to January 3, 1990, there were several periods during which the opposite train (1A) CARF was potentially unable to perform its safety functions due to either scheduled maintenance or testing of the fan or support systems. These support systems included the diesel generator, CPCS, VX, and the Solid State Protection System. In most cases the opposite train inoperability lasted for less than 4 hours.

During the licensee's expanded investigation into the beds/resting places, a forensic expert was able to obtain finger prints on January 11, 1990, from an area which would indicate that the person leaving the prints may have been attempting to access the bed/resting area above the CARF breaker. The expert also believes the prints were at most 3 weeks old. A scenario can be hypothesized in which the breaker was opened on or about December 21, 1989. This would reduce the period of time during which the

CARF was inoperable. However, the CARF would have still been inoperable for a period of time in excess of the applicable 72 hour TS Action Statement. It should also be noted that on January 2, 1990, the 1A diesel generator was removed from service for approximately 4-hours for testing, thus removing the opposite train of CARF from service.

The safety significance of the event concerns the time during which the CARF system would have been unable to perform its intended safety function following a postulated design basis accident. At least one of the two fans must start 9 minutes after a LOCA and operate to provide necessary containment air circulation for cooling and fission product removal. With the 1B CARF inoperable for greater than 72 hours, the single failure criterion would not be met for design basis accidents.

If neither operated, temperatures in containment would exceed the qualification temperatures for safety related components required for post accident mitigation.

The licensee responded to the inoperability condition by closing the breaker and performing the surveillance test. Additional immediate corrective actions included placing locks on the breaker operating handles, conducting periodic surveillances of the area and the breaker positions, conducting a review of all operational and maintenance activities which could have opened the breaker, conducting a complete search of the plant for beds and resting places, and the initiation of a separate investigation using forensic techniques. Other power lock out breakers positions for Unit 1 and Unit 2 were inspected and appropriately locked.

6. Control Room Indications

With the power lockout breaker open, power was removed from the 1B CARF and no indications were available in the control room to alert the operators of the situation. The loss of electrical power input for the ESF Bypass Panel required by Regulatory Guide (RG) 1.47 comes from control power circuits upstream of the power lockout breaker and downstream of the main power supply breaker. Indication of the running status of the fan is also from this control power circuit which was not deenergized during the event. This appears to be a deviation from the licensee's commitments to RG 1.47. The licensee initiated a Station Problem Report to address the lack of control room indications. The issue is to be resolved by Design Engineering.

7. Switchpanel Labeling

During a followup to the event, the inspectors identified that panel 1EMXN (the panel which houses the CARF breaker) and two of three similar switchpanels were not labeled as being Nuclear Safety Related. The licensee has identified all electrical equipment which is to be labeled with a "Nuclear Safety Related" identification tag in the Catawba Nuclear Station Installation Specification Manual, Document CNS 1390-01-00-0095.

Procedure For Tagging Electrical Nuclear Safety Related Equipment. The panels associated with the CARF power lockout breakers are identified in the procedure and should have been labeled accordingly. This violation is not being cited because the criteria specified in Section V.A of the Enforcement Policy were satisfied.

8. Protection of Plant Equipment

The possibility that an individual kicked or grabbed the subject breaker to climb up to a cable tray is an indicator of an underlying weakness previously identified by the NRC involving the licensee's program for the protection of installed equipment. Recent NRC enforcement action (Report 89-14) involved cases where inspectors witnessed personnel climbing and walking on equipment important to safety such as cable trays, pipe supports and instrument lines which could present a hazard to the equipment as well as the persons. The applicable violation characterized a major weakness in the area of plant protection in that adequate management guidance in the area did not exist. Licensee corrective actions to date include providing guidance for personnel to ensure that care and caution is exercised when accessing equipment in congested areas and to identify and protect components. Initial training and baseline listing of the components is to be complete by December 1990.

9. Cable Tray Beds

Following the licensee's discovery of the two beds on January 4, the inspectors, in an independent effort, discovered at least two more beds in the cable trays located in the Unit 2 electrical penetration room. By January 6, the licensee had performed additional searches of all levels of the auxiliary and turbine buildings and had removed a total of 15 beds and/or resting areas. These beds/resting areas were located in inconspicuous locations. One bed was identified in a contaminated cable tray and another employed a contaminated sack used for collecting contaminated clothing as bedding. It was not clear if the beds were recently assembled or were several years old.

The licensee's housekeeping and cleanliness directives clearly prohibit the accumulation of trash and combustible waste material in safety related areas. The program also requires periodic housekeeping surveillances to identify areas needing specific attention including cable trays. The inspectors determined that beds have been discovered in cable trays previously and were simply disassembled and discarded. Although bedding in the cable trays is against station policies, it appears that they were tolerated in as much as management efforts to prevent and/or eliminate the problem were minimal. In response, the licensee is initiating a formal monthly inspection of cable tray areas throughout the plant and will record the findings for trending and review.

10. Exit Interview

The inspection scope and findings were summarized on January 22, 1990, 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.

One apparent violation was identified involving the inoperability of 1B Containment Air Return Fan in that its power lockout breaker was opened and remained open for an indeterminate period of time. (paragraph 5)

One non-cited violation of the licensee's equipment installation procedures was identified involving the failure to properly label electrical switchboards as being nuclear safety related. (paragraph 7)

One weakness was identified associated with a lack of control room indication of an inoperable Containment Air Return Fan system. (paragraph 6)

One weakness was identified involving numerous beds/resting places discovered in electrical cable trays and ineffective licensee efforts to eliminate the problem over several years. (paragraph 9)