Duke Power Company
Catawba Nuclear Station
P.O. Box 256
Clover, S.C. 29710

(803) 831-3000

DUKE POWER

October 19, 1989

Document Control Desk
U. S. Nuclear Regulatory Commission
Washington, D. C. 20555

Subject: Catawba Nuclear Station
Docket No. 50-413
LER 413/89-25

Gentlemen:

Attached is Licensee Event Report 413/89-25, concerning Technical Specification 3.0.3 being entered on both units due to inoperable power range nuclear instrumentation resulting from a power reduction caused by the loss of cooling tower fans during Hurricane Hugo.

This event was considered to be of no significance with respect to the health and safety of the public.

Very truly yours,

Tony B. Owen

Tony B. Owen
Station Manager

keb\LER-NRC.TBO

xc: Mr. S. D. Ebneter
Regional Administrator, Region II
U. S. Nuclear Regulator Commission
101 Marietta Street, NW, Suite 2900
Atlanta, GA 30323

M & M Nuclear Consultants
1221 Avenues of the Americas
New York, NY 10020

INPO Records Center
Suite 1500
1100 Circle 75 Parkway
Atlanta, GA 30339

American Nuclear Insurers
c/o Dottie Sherman, ANI Library
The Exchange, Suite 245
270 Farmington Avenue
Farmington, CT 06032

Mr. K. Jabbour
U. S. Nuclear Regulatory Commission
Office of Nuclear Reactor Regulation
Washington, D. C. 20555

Mr. W. T. Orders
NRC Resident Inspector
Catawba Nuclear Station

IE22
1/1

NRC Form 366
(9-83)

U.S. NUCLEAR REGULATORY COMMISSION
APPROVED OMB NO. 3150-0104
EXPIRES 8/31/88

LICENSEE EVENT REPORT (LER)

FACILITY NAME (1)	DOCKET NUMBER (2)	PAGE (3)
Catawba Nuclear Station, Unit 1	0 5 0 0 0 4 1 3	1 OF 0 8

TITLE (4) Technical Specification 3.0.3 Entered On Both Units For Inoperable Power Range Nuclear Instrumentation Due To Power Reduction During Hurricane Hugo

EVENT DATE (5)			LER NUMBER (6)			REPORT DATE (7)			OTHER FACILITIES INVOLVED (8)	
MONTH	DAY	YEAR	YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	MONTH	DAY	YEAR	FACILITY NAMES	DOCKET NUMBER(S)
0 9	2 2	8 9	8 9	— 0 2 5 —	0 0	1 0	2 0	8 9	Catawba, Unit 2	0 5 0 0 0 4 1 4
										0 5 0 0 0

OPERATING MODE (9)	1
POWER LEVEL (10)	1 0 0

THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check one or more of the following) (11)

[ ] 20.402(b)	[ ] 20.405(c)	[ ] 50.73(a)(2)(iv)	[ ] 73.71(b)
[ ] 20.405(a)(1)(i)	[ ] 50.36(c)(1)	[ ] 50.73(a)(2)(v)	[ ] 73.71(c)
[ ] 20.405(a)(1)(ii)	[ ] 50.36(c)(2)	[ ] 50.73(a)(2)(vii)	[ ] OTHER (Specify in Abstract below and in Text, NRC Form 366A)
[ ] 20.405(a)(1)(iii)	[X] 50.73(a)(2)(i)	[ ] 50.73(a)(2)(viii)(A)	
[ ] 20.405(a)(1)(iv)	[ ] 50.73(a)(2)(ii)	[ ] 50.73(a)(2)(viii)(B)	
[ ] 20.405(a)(1)(v)	[ ] 50.73(a)(2)(iii)	[ ] 50.73(a)(2)(x)	

LICENSEE CONTACT FOR THIS LER (12)

NAME	TELEPHONE NUMBER (AREA CODE)	
R.M. Glover, Compliance Manager	8 0 3	8 3 1 - 3 2 3 6

COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT (13)

CAUSE	SYSTEM	COMPONENT	MANUFAC-TURER	REPORTABLE TO NPRDS	CAUSE	SYSTEM	COMPONENT	MANUFAC-TURER	REPORTABLE TO NPRDS

SUPPLEMENTAL REPORT EXPECTED (14)		EXPECTED SUBMISSION DATE (15)	MONTH	DAY	YEAR
[X] YES (If yes, complete EXPECTED SUBMISSION DATE)	[ ] NO		1 2	0 1	9 0

ABSTRACT (Limit to 1400 spaces, i.e., approximately fifteen single space typewritten lines) (16)

On September 22, 1989, Units 1 and 2 were in Mode 1, Power Operation, at 100% and 98% power, respectively. At 0547 hours, 1HTA, 13.8 KV Auxiliary Switchgear, deenergized resulting in the loss of power to the Condenser Circulating Water Cooling Tower Fans. This required the Operators to reduce Reactor power in order to maintain condenser vacuum. During the power reductions, Units 1 and 2 entered Technical Specification 3.0.3 at 0600 hours and 0632 hours, respectively, due to greater than 5 percent mismatch between Thermal Power Best Estimate and the Power Range Nuclear Instrumentation (PRNI). Following recalibration of the PRNIs, Units 1 and 2 exited Technical Specification 3.0.3 at 0655 hours and 0640 hours, respectively. The PRNI mismatch is considered to be an expected phenomenon during a power reduction. The power reduction is attributed to unusual weather conditions caused by the high winds and rainfall delivered by Hurricane Hugo which caused water from the Service Building roof to leak on the 1HTA switchgear, thus tripping the switchgear. Although a subsequent inspection of the roof did not identify any defects, the roof is scheduled to be reworked in the near future.

BACKGROUND

The purpose of the Excore Nuclear Instrumentation [EIIS:JG] (ENB) System is to monitor Reactor [EIIS:VSL] Core leakage neutron flux and generate appropriate trips and alarms for various phases of Reactor operations. The three separate overlapping ranges of Source Range, Intermediate Range, and Power Range also provide control functions and indicate Reactor status during Mode 2, Startup and Mode 1, Power Operation. Technical Specification 4.3.1.1 requires that channel calibration be performed daily on the Power Range Neutron Flux High Setpoint. This is to be performed by comparison of calorimetric (reactor thermal power best estimate, based on actual plant indicator temperatures) to excore power (based upon nuclear power levels from detector instrumentation) when the Unit is above 15% Rated Thermal Power (RTP). Excore channel gains are to be adjusted to make indicated excore power consistent with indicated calorimetric power whenever this comparison reveals an absolute difference of more than 2% between the two.

Technical Specification 3.3.1, Table 3.3-1, requires that three out of four channels of Power Range Nuclear Instrumentation (PRNI) must be operable during Modes 1 and 2.

During Mode 1, a power range channel must be considered INOPERABLE whenever a mismatch exists between calorimetric power and excore power indication that is greater than 5.0% in the non-conservative direction (calorimetric power greater than excore power). If the mismatch is between 2.0% and 5.0% in the non-conservative direction, the channel is OPERABLE as long as the calibration process has been initiated. When the Unit is engaged in a power maneuver which results in a mismatch between calorimetric and excore power in excess of 2%, excore adjustment may be delayed until the Unit reaches a steady-state power level, provided the mismatch does not exceed 5.0% in the non-conservative direction, as specified by the Technical Specification Interpretation, dated June 2, 1989.

Technical Specification 3.0.3 is required to be entered when the Unit is operating in a condition prohibited by Technical Specifications. This condition exists when a Limiting Condition for Operation is not met except as provided in the associated Action Requirements. It requires that within one hour action shall be initiated to place the Unit in a Mode in which the specification does not apply by placing it, as applicable, in:

a. At least HOT STANDBY within the next 6 hours,
b. At least HOT SHUTDOWN within the following 6 hours, and
c. At least COLD SHUTDOWN within the subsequent 24 hours.

The Condenser Circulating Water [EIIS:SG] (RC) System is a closed loop system that removes rejected heat from the secondary steam cycle to maintain a vacuum on the main condenser [EIIS:SQ]. This rejected heat is transferred to the atmosphere through three mechanical draft cooling towers on each Unit. The cooling tower fans [EIIS:BLO] air powered from motor [EIIS:MO] control centers that are fed from 13.8 KV Auxiliary Switchgear [EIIS:EA] 1HTA and 2HTA. The 13.8 KV Auxiliary Switchgear is housed in the Service Building [EIIS:MF].

EVENT DESCRIPTION

On September 22, 1989, Unit 1 and Unit 2 were in Mode 1, Power Operation, at 100% and 98% power, respectively. During this time, sustained winds of 42 miles per hour and heavy rainfall were experienced in the vicinity of the plant as a result of Hurricane Hugo. At 0426 hours, the Unit 1 Control Room Operators (CROs) received a Main Condenser Low Vacuum Alarm and began to reduce power by 10% to maintain condenser vacuum. The low vacuum condition on Unit 1 was apparently caused by the warm moist air from the Unit 2 cooling towers being blown into the Unit 1 cooling towers by the high winds, thus reducing the efficiency of the Unit 1 cooling towers. At 0440 hours, the CROs began securing the Auxiliary Building [EIIS:VF] and Fuel Building [EIIS:VG] ventilation systems and secured Containment Purge [EIIS:VA] on both Units as a precautionary measure for the adverse weather conditions per RP/0/A/5000/07, Natural Disaster and Earthquake.

At 0547 hours, the protective relaying [EIIS:RLY] on the 13.8 KV Auxiliary Switchgear deenergized the switchgear due to grounding of the primary disconnects in compartment 1HTA-2, Feeder to Auxiliary Boiler A. The grounding of the primary disconnect was caused by rain water leaking from the Service Building roof into the switchgear compartment. The loss of power to the 1HTA buss resulted in the loss of power to the fans on Cooling Towers 1A and 2A. Therefore, the CROs commenced power reduction at 0547 hours on Unit 1 and 0600 hours on Unit 2 in order to maintain condenser vacuum.

At 0600 hours, Unit 1 entered Technical Specification 3.0.3 due to a greater than 5% mismatch between the Thermal Power Best Estimate and the PRNI on all four channels. Unit 1 was reduced to approximately 85% RTP at that time. At 0632 hours, Unit 2 entered Technical Specification 3.0.3 due to 4 PRNI channels being inoperable while at approximately 85% RTP. At 0640 hours, Unit 2 exited Technical Specification 3.0.3 after Instrumentation and Electrical (IAE) personnel recalibrated the PRNI channels per Standing Work Request 5969 SWR. At 0655 hours, the Unit 1 power reduction was suspended at 30% RTP and Unit 1 exited Technical Specification 3.0.3 after three of the PRNI channels were returned to operable status per Standing Work Request 4099 SWR. Unit 2 continued power reduction and suspended power reduction at 30% RTP at 0746 hours.

After the discovery of the tripped 1HTA switchgear at 0547 hours, the Operators checked 2HTA and found water leaking onto the 2HTA switchgear. The decision was then made to reduce power to 30% RTP to allow fans to be removed from service on Unit 1 and Unit 2 Cooling Towers B and C. 2HTA was to be deenergized to install a temporary protective covering to redirect the leaking water away from the switchgear. A temporary protective covering was also installed on 1HTA.

At 0905 and 0915 hours, respectively, Unit 1 and Unit 2 began power increase after 2HTA was energized and the B and C Cooling Tower fans were returned to service on each Unit. At 1020 hours, Work Request 50047 OPS was written to repair 1HTA. By 1627 hours, faulted breaker 1HTA-2 had been removed and 1HTA was reenergied for checkout by the Transmission Department. By 1642 hours, the fans on Cooling Tower 1A had been restarted and Unit 1 recommenced power increase to 100% RTP. Unit 2 remained at 68% RTP until 0820 hours, on September 23, 1989 in order to remove storm related debris from the Condenser Circulating Water System before resuming power escalation to 98% RTP.

CONCLUSION

The entry into Technical Specification 3.0.3 followed the decrease in Reactor power that was necessitated by the need to maintain condenser vacuum after the loss of Cooling Tower Fans 1A and 2A. The mismatches on the PRNI channels are an expected phenomenon during power changes and are normally recalibrated during load changes, or after the load increase or decrease is suspended.

The rapid load reduction on Unit 1 and Unit 2 was due to the trip of the 1HTA switchgear which was caused by rainwater leaking into compartment 1HTA-2 and grounding the primary disconnect. The rainwater leaked through the Service Building roof and was reported to be dripping off the ductwork above the 1HTA-2 breaker compartment. The exact location of the leak in the rooms housing 1HTA and 2HTA has not been determined. Rainwater leaks have not previously been reported in these rooms although they are normally locked and are not routinely surveyed by plant personnel. Faint streaking marks were observed on the west walls of the 1HTA and 2HTA switchgear rooms and rainwater may have possibly leaked down the west wall onto the ductwork that penetrates the west wall. The west wall of the 1HTA and 2HTA switchgear rooms protrudes above the Service Building roof to provide a wall for the adjacent stairwell. The flashing on the stairwell wall appears to be intact with no obvious defects. The water may have been blown under the flashing by the abnormally high winds and high rainfall produced by Hurricane Hugo. It was also noted that a downspout for the stairwell roof directs drainage to the Service Building roof within one foot of the flashing. Water splashing from the downspout may have also contributed to this problem. The Service Building roof is currently scheduled to be replaced per Nuclear Station Modification CN50350 before the end of the year due to previous leaks that have occurred in other areas of the Service Building.

There have been two previous Technical Specification 3.0.3 events involving inoperable PRNI channels. However, these events did not involve the 1HTA or 2HTA switchgear, or roof leaks, therefore this is not a recurring event.

CORRECTIVE ACTION

IMMEDIATE

1) The CROs began reducing Reactor power to maintain Main condenser vacuum.

SUBSEQUENT

1) Work Requests 4099SWR and 5969SWR were issued and the PRNI on Unit 1 and Unit 2 were recalibrated.

2) Temporary protective coverings were placed on 1HTA and 2HTA to redirect leakage from the switchgear.

3) The Transmission Department removed the burned breaker from the 1HTA-2 compartment per Work Request 50047 OPS and 1HTA was returned to service.

4) Flashing on the Service Building roof was inspected.

PLANNED

1) Breaker 1HTA-2 will be repaired per Work Request 50047 OPS.

2) The Service Building roof is scheduled for modification and replacement per NSM CN50350.

3) An Operations procedure is currently being developed and evaluated to possibly allow the Control Room Operators to adjust the PRNI channels while load changes are in progress.

4) The Safety Analysis will be revised if necessary after further review.

SAFETY ANALYSIS

The excore power range neutron detectors are arranged and located such that one detector measures core leakage neutron flux for one quadrant. Each detector and its associated circuitry comprise one channel, for a total of four PRNI channels. The Power Range High Neutron Flux Trip (High Setpoint) function utilizes a 2-out-of-4 logic.

Catawba Technical Specification 4.3.1.1 requires that channel calibration be performed daily on the Power Range Neutron Flux High Setpoint. This is to be performed by comparison of calorimetric (thermal best estimate) to excore power indication when the Unit is above 15% RTP. Excore channel gains are to be adjusted to make indicated excore power consistent with indicated calorimetric power whenever this comparison reveals an absolute difference of more than 2% between the two.

Operability requirements of the PRNI channels are met provided the process of adjusting the excore channel(s) has been initiated and the mismatch does not exceed 5.0% in the non-conservative direction.

The basis for an allowable non-conservative mismatch of up to 5.0% is the application of Technical Specification 2.2.1. Operation with setpoints less conservative than the trip setpoint but within the allowable value is acceptable since an allowance has been made in the safety analysis to accommodate this error. An optional provision has been included for determining the operability of a channel when its trip setpoint is found to exceed the allowable value. The methodolgy of this option utilizes the as-measured deviation from the specified calibration point for rack and sensor [EIIS:XI] components in conjunction with a statistical combination of the other uncertainties of the instrumentation to measure the process variable and the uncertainties in calibrating the instrumentation.

In Technical Specification Equation 2.2.1, $Z + R + S \leq TA$, the interactive effects of the errors in the rack and the sensor and the as-measured values are considered. Z, as specified in Table 2.2-1 in percent span, is the statistical summation of errors assumed in the analysis excluding those associated with the sensor and rack drift and the accuracy of their measurement. TA or Total Allowance is the difference in percent span, and R or Rack Error is the as-measured deviation, in percent span, for the affected channel from the specified trip setpoint. S or Sensor Error is either the as-measured deviation of the sensor from its calibration point or the value specified in Table 2.2-1 in percent span, from the analysis assumptions. Use of Equation 2.2.1 allows for a sensor drift factor, an increased rack drift factor, and provides a threshold value for reportable events, as described in the Bases of Technical Specifications.

The following is a list of Catawba FSAR Chapter 15 transients in which credit is assumed for the Power Range High Neutron Flux Trip (High Setpoint):

1) Startup of an Inactive Reactor Coolant Pump [EIIS:P] at an Incorrect Temperature (discussed in Section 15.4.4).

2) Feedwater System Malfunctions that Result in a Reduction in Feedwater Temperature (discussed in Section 15.1.1).

3) Excessive Increase in Secondary Steam Flow (discussed in Section 15.1.3).

4) Inadvertent Opening of a Steam Generator Relief of Safety Valve (discussed in Section 15.1.4).

5) Steam System Piping Failure (discussed in Section 15.1.5).

6) Uncontrolled Rod [EIIS:ROD] Cluster Control Assembly Bank Withdrawal From a Subcritical or Low Power Startup Condition (discussed in Section 15.4.1).

7) Uncontrolled Rod Cluster Control Assembly Bank Withdrawal at Power (discussed in Section 15.4.2).

8) Spectrum of Rod Cluster Control Assembly Ejection Accidents (discussed in Section 15.4.8).

The following discussion outlines the protective features which existed for the above scenarios other than the Power Range High Neutron Flux Trip Function (High Setpoint):

1) The "Startup of an Inactive Reactor Coolant Pump at an Incorrect Temperature" scenario is not applicable and the Abnormal Procedures do not permit the Operators to start an inactive Reactor Coolant Pump above 25% RTP.

2) The Unit would be protected against a "Feedwater System Malfunctions that Result in a Reduction in Feedwater Temperatures " scenario by the Overtemperature and Overpower Delta-T trip functions.

3) The Unit would be protected against the "Excessive Increase in Secondary Steam Flow" scenario by the Overtemperature and Overpower Delta-T trip functions.

4) The Unit would be protected against the "Inadvertent Opening of a Steam Generator Relief or Safety Valve" scenario by initiation of a Safety Injection signal (due to steamline pressure) which initiates a Reactor Trip signal. The Overtemperature and Overpower Delta-T trip functions also provide Reactor protection in this scenario.

5) The Unit would be protected against a "Steam System Piping Failure" scenario by initiation of a Safety Injection signal (due to steamline pressure) which initiates a Reactor Trip signal. The Overtemperature and Overpower Delta-T trip functions also provide Reactor protection in this scenario.

6) The "Uncontrolled Rod Cluster Control Assembly Bank Withdrawal From a Subcritical or Low Power Startup Condition" scenario is not applicable as this incident involved a load follow power reduction.

7) The "Uncontrolled Rod Cluster Control Assembly Withdrawal at Power" scenario is assumed to be terminated by the following trip functions in addition to the Power Range High Neutron Flux Trip Function (High Setpoint): Overtemperature and Overpower Delta-T, pressurizer pressure, and pressurizer level. In addition to these trip functions, there are the following RCCA withdrawal blocks:

   a) high neutron flux, b) Overtemperature Delta-T, and c) Overpower Delta-T. For slow RCCA withdrawal accidents, thermal time constraints on the heatup do not become a factor; the plant is tripped and DNBR is maintained above the limit value.

8) The "Spectrum of Rod Cluster Control Assembly Ejection Accidents" scenario assumes credit for the High Neutron Flux Rate Trip Function.

The calibration problem was one of gain setting, or overall absolute value power indication. The ability of the PRNI to detect axial flux difference (AFD) and high flux rate was unaffected. The Overtemperature Delta-T Trip Function receives AFD as an input to the setpoint equation, and the Overpower Delta-T Trip Function is unaffected by neutron flux. Therefore, the high flux rate, Overtemperature Delta-T, and Overpower Delta-T Trip Functions remained intact and functional throughout the incident. The Overtemperature Delta-T Trip function protects against DNB conditions, and the Overpower Delta-T Trip Function ensures that allowable heat generation rate (kw/ft) is not exceeded.

Based on the above analysis, it can be concluded that the Reactor was protected at all times, and that no postulated scenario could have occurred which would have challenged the Power Range High Neutron Flux Trip Function.

Further review of the Safety Analysis will be performed.

The health and safety of the public were unaffected by this incident.

*U.S. GPO: 1988-520-589-00070