Official Copy

May 13, 1988

Docket Nos. 50-413. 50-414
License Nos. NPF-35, NPF-52

Duke Power Company
ATTN: Mr. H. B. Tucker, Vice President
Nuclear Production Department
422 South Church Street
Charlotte, NC 28242

Gentlemen:

SUBJECT: ENFORCEMENT CONFERENCE SUMMARY
(NRC INSPECTION REPORT NOS. 50-413/88-14 AND 50-414/88-14)

This letter refers to the Enforcement Conference held at our request on April 29, 1988. This meeting concerned activities authorized for your Catawba facility. The issue discussed at this conference related to the degradation of the Nuclear Service Water (RN) system and Auxiliary Feedwater (CA) system due to clam infestation. A summary, a list of attendees, and a copy of your handout are enclosed. We are continuing our review of these issues to determine the appropriate enforcement action.

In accordance with Section 2.790 of the NRC's "Rules of Practice," Part 2, Title 10, Code of Federal Regulations, a copy of this letter and its enclosures will be placed in the NRC Public Document Room.

Should you have any questions concerning this matter, please contact us.

Sincerely,

Original Signed by
J. Nelson Grace

J. Nelson Grace
Regional Administrator

Enclosures:
1. Enforcement Conference Summary
2. List of Attendees
3. Handout

cc w/encls:
T. B. Owen, Station Manager
Senior Resident Inspector - McGuire

bcc w/encls: (See page 2)

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IE01

bcc w/encls:
K. N. Jabbour, NRR
NRC Resident Inspector
DRS, Technical Assistant
Document Control Desk
State of South Carolina

RII	RII	RII	RII
TPeebles	VBrownlee	LReyes	MErnst
5/10/88	5/10/88	5/11/88	5/12/88

May 13, 1988

ENCLOSURE 1

ENFORCEMENT CONFERENCE SUMMARY

On April 29, 1988, representatives of Duke Power Company (DPC) met with the NRC in the Region II office in Atlanta, Georgia to discuss degradation of the Nuclear Service Water (RN) and Auxiliary Feedwater (CA) systems due to clam infestation at Catawba Unit 2. The event resulting in the degradation occurred on March 9, 1988, and was investigated by an Augmented Inspection Team (AIT).

Following opening remarks given by M. L. Ernst, NRC, RII Deputy Regional Administrator, DPC gave a presentation (see Enclosure 3) which addressed NRC concerns. The presentation covered a sequence and analysis of the events, a design evaluation of the transient and transient test results, the safety significance, past programs for clam control, and Catawba clam task force activities.

M. McIntosh, DPC, Manager Nuclear Station closed the DPC presentation by stating that DPC felt their actions were prudent and based on the information available; that DPC had aggressively pursued the problem immediately after the event and their short-term corrective actions had been effective; and that the AIT was constructive and beneficial to the short-term solutions.

The NRC is presently considering enforcement action on these issues. This meeting served to enhance Region II's understanding of the issues and DPC's corrective actions.

May 13, 1988

ENCLOSURE 2

LIST OF ATTENDEES

U. S. Nuclear Regulatory Commission

M. L. Ernst, Deputy Regional Administrator
L. A. Reyes, Director, Division of Reactor Projects (DRP)
E. W. Merschoff, Deputy Director, Division of Reactor Safety (DRS)
V. L. Brownlee, Branch Chief, DRP
T. A. Peebles, Section Chief, DRP
P. K. VanDoorn, Senior Resident Inspector - Catawba, DRP
K. N. Jabbour, Catawba Project Manager, NRR
B. R. Bonser, Project Engineer, DRP
J. W. Thompson, Reactor Engineer, NRR
M. S. Lesser, Resident Inspector - Catawba, DRP
B. Uryc, Senior Enforcement Coordinator, Enforcement and Investigation Coordination Staff (EICS)
W. J. Ross, Reactor Inspector, Division of Radiation Safety and Safeguards (DRSS)
R. J. Goddard, Regional Counsel
R. D. Starkey, Reactor Inspector, DRS
R. P. Schin, Reactor Inspector, DRS
L. M. Slack, EICS, Assistant
B. R. Crowley, Reactor Inspector, DRS
G. R. Jenkins, Director, EICS
K. I. Parczewski, Reactor Engineer, NRR

Duke Power Company

M. D. McIntosh, Manager Nuclear Station
T. B. Owen, Manager Catawba Nuclear Station
N. A. Rutherford, Manager Licensing
C. L. Hartzell, Compliance Engineer-Catawba
P. G. LeRoy, Licensing Engineer
W. A. Haller, Manager Technical Services
D. Tower, Shift Operating Engineer
E. W. Fritz, Design Engineer
J. A. Kammer, Test Engineer
J. E. Colvin, Jr., Technical Systems Manager
J. C. Knight, Supervising Scientist
G. B. Swindlehurst, Supervising Design Engineer

ENCLOSURE 3

OPENING REMARKS

- CATAWBA NUCLEAR STATION'S FIRST PRIORITY WAS NUCLEAR SAFETY. THIS WAS DEMONSTRATED BY THE FACT THAT UNIT 1 WAS REMOVED FROM SERVICE WHEN THE PROBLEM WAS DETERMINED TO BE GENERIC.

- THE ROOT CAUSE OF THE CA SYSTEM RESPONSE WAS THOROUGHLY REVIEWED AND UNDERSTOOD PRIOR TO RESTART.

- THE DESIGN BASIS FOR THE OPERATION OF THE CA SYSTEM WAS REVIEWED AND DEMONSTRATED SOUND DURING TRANSIENT TESTING.

- THE OPERABILITY OF THE CA SYSTEM UNDER DEGRADED FLOW WAS THOROUGHLY ANALYZED.

- THE COMMITMENTS FOR INSPECTION AND TESTING OF CATAWBA NUCLEAR STATION IN RESPONSE TO IE BULLETIN 81-03 WERE FOLLOWED.

  PROGRAMS ASSOCIATED WITH THESE COMMITMENTS NEED STRENGTHENING.

- SHORT TERM ACTION TO INSURE PIPING IS FREE OF CLAMS HAS ALREADY BEEN TAKEN.

  LONG TERM PLANS ARE UNDER REVIEW.

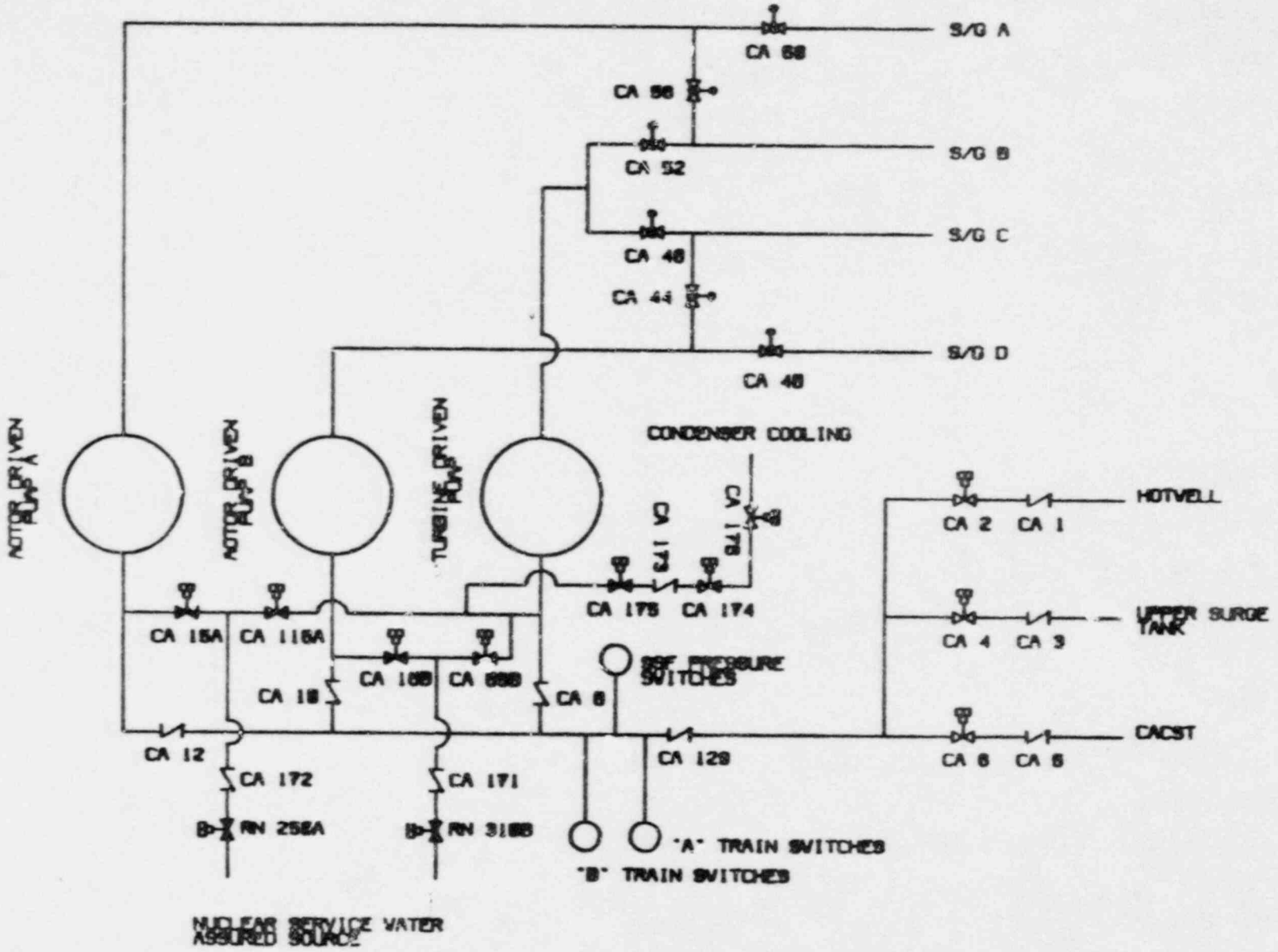
SEQUENCE OF EVENTS

- AUXILIARY FEEDWATER SYSTEM DESIGN
- MARCH 9 SEQUENCE OF EVENTS

CATAWBA NUCLEAR STATION
SYSTEM ABBREVIATIONS

ABBREVIATION	SYSTEM DESCRIPTION
CA	AUXILIARY FEEDWATER
CS	CONDENSATE STORAGE
KC	COMPONENT COOLING
KF	SPENT FUEL POOL COOLING
NS	CONTAINMENT SPRAY
NW	CONTAINMENT VALVE INJECTION WATER
RC	CONDENSER COOLING WATER
RF	FIRE PROTECTION
RL	LOW PRESSURE SERVICE WATER
RN	NUCLEAR SERVIVE WATER

CATAWBA NUCLEAR STATION
AUXILIARY FEEDWATER SYSTEM



CATAWBA NUCLEAR STATION
AUXILIARY FEEDWATER SYSTEM

CA SYSTEM SUCTION SOURCES:

- AUXILIARY FEEDWATER CONDENSATE STORAGE TANK (CACST)
- UPPER SURGE TANK (UST)
- CONDENSER HOTWELL
- NUCLEAR SERVICE WATER SYSTEM (RN)
- CONDENSER CIRCULATING WATER SYSTEM (RC).

MOTOR DRIVEN CA PUMP AUTO-STARTS:

- 1/4 STEAM GENERATORS AT LO-LO LEVEL
- LOSS OF BOTH FEEDWATER PUMPS
- SAFETY INJECTION
- Blackout

TURBINE DRIVEN CA PUMP AUTO-STARTS:

- 2/4 STEAM GENERATORS AT LO-LO LEVEL
- BLACKOUT.

MOTOR DRIVEN PUMPS LOW SUCTION PRESSURE PROTECTION:

AUTO-SWAP TO RN:
- 2/3 SUCTION PRESSURE SWITCHES INDICATE LOW FOR 3 TO 5 SECONDS
- PUMP BREAKER IS CLOSED
- AUTO-START SIGNAL IS
- PRESENT.

PUMP TRIP:
- 2/3 SUCTION PRESSURE SWITCHES LOW FOR 3 TO 5 SECONDS
- PUMP BREAKER IS CLOSED
- NO AUTO-START SIGNAL PRESENT.

TURBINE DRIVEN PUMP LOW SUCTION PRESSURE PROTECTION:

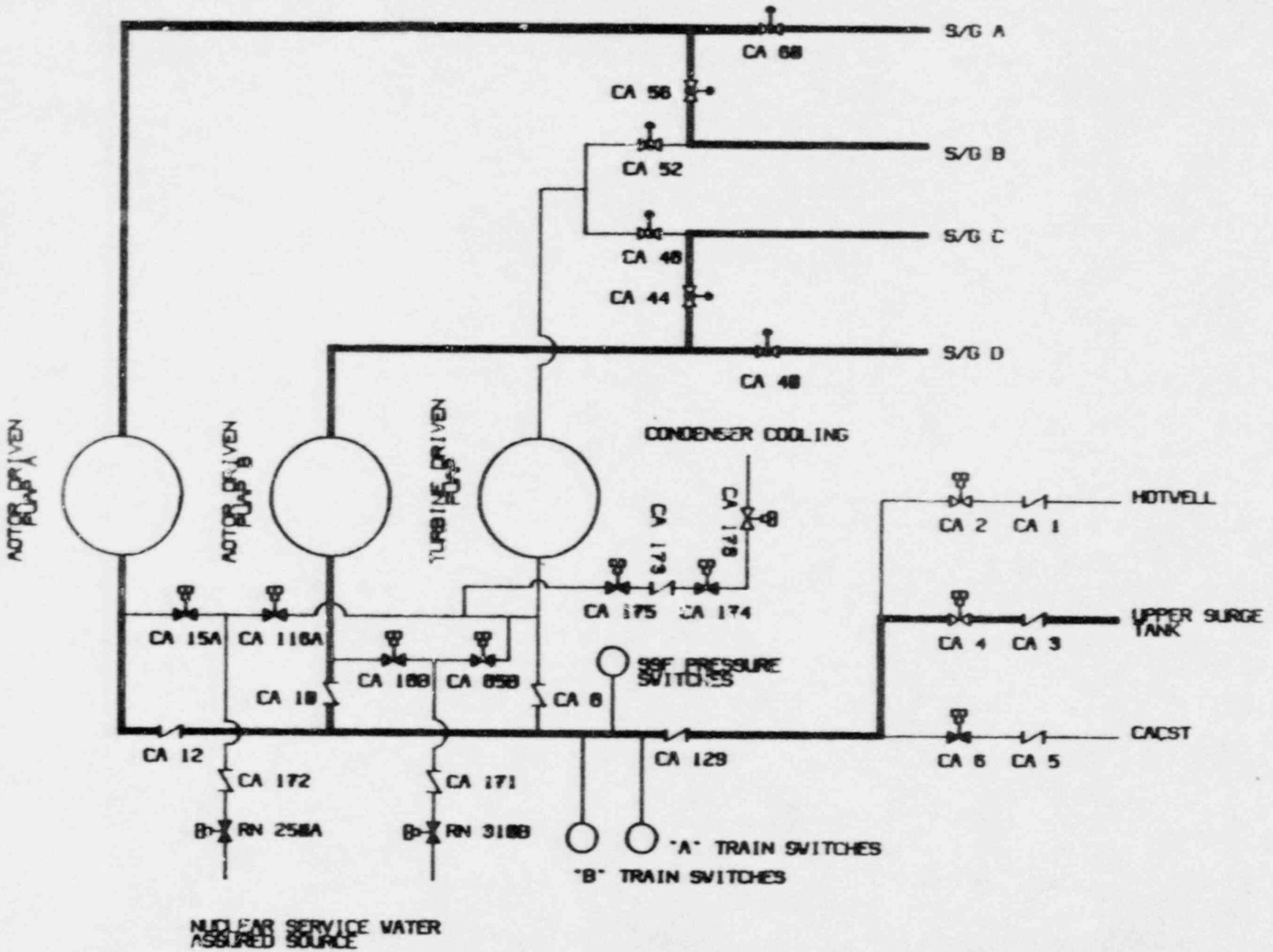
AUTO-SWAP TO RN:
- 2/3 SUCTION PRESSURE SWITCHES LOW FOR 3 TO 5 SECONDS
- SA 2 OR SA 5 ARE "NOT CLOSED"
- TRIP AND THROTTLE VALVE OPEN
- AUTO-START SIGNAL IS PRESENT.

PUMP TRIP:
- 2/3 SUCTION PRESSURE SWITCHES LOW FOR 3 TO 5 SECONDS
- SA 2 OR SA 5 ARE "NOT CLOSED"
- TRIP AND THROTTLE VALVE OPEN
- NO AUTO-START SIGNAL IS PRESENT.

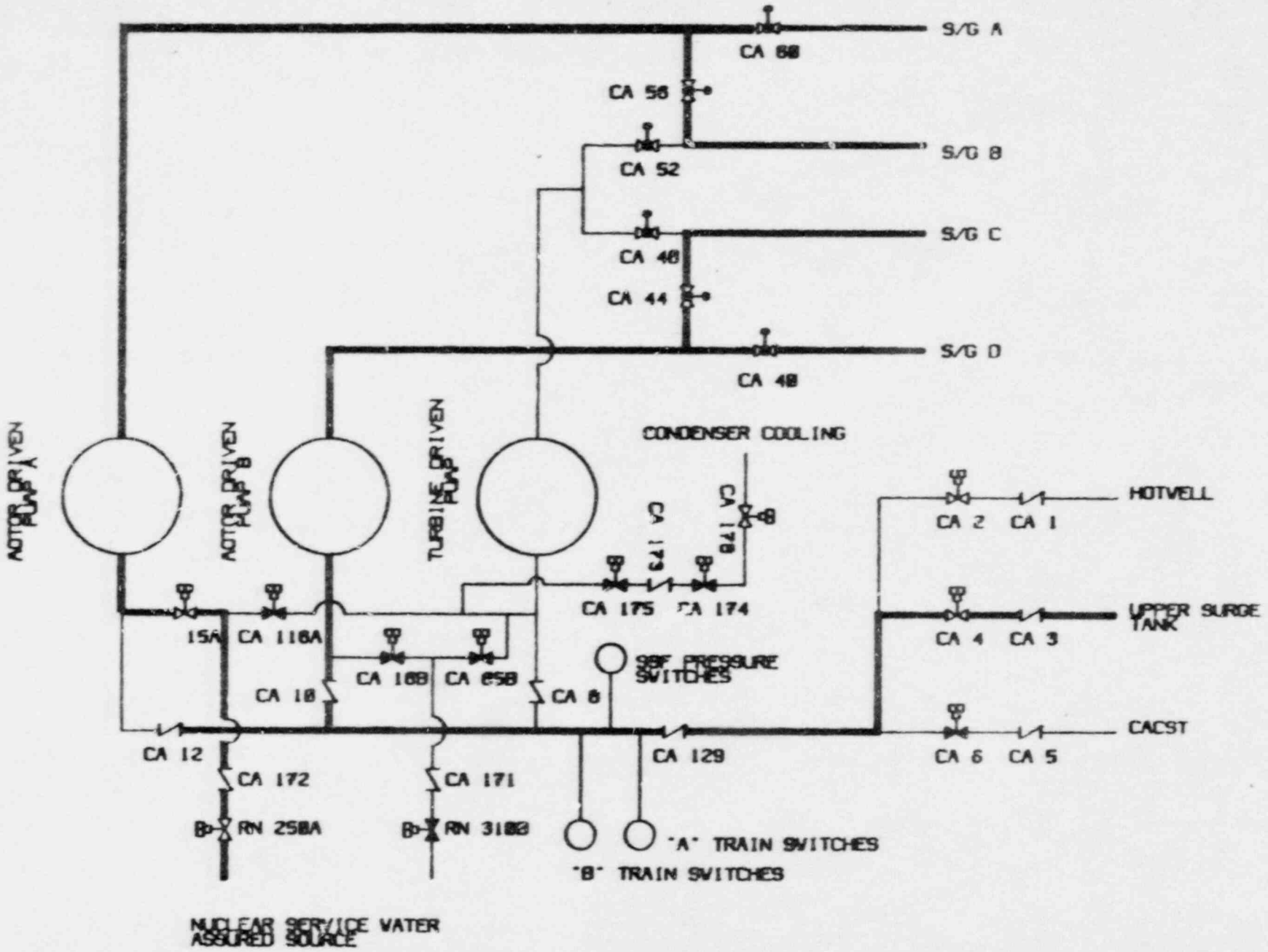
CATAWBA NUCLEAR STATION
AUXILIARY FEEDWATER AUTO-SWAP TO ASSURED SOURCE
SEQUENCE OF EVENTS
MARCH 9, 1988

TIME MIN:SEC	EVENT DESCRIPTION
	S/G HI-HI LEVEL (P-14) SIGNAL
	TURBINE TRIP
	MAIN FEEDWATER PUMP TRIP
0	CA MOTOR DRIVEN PUMPS AUTO-START ON LOSS OF MAIN FEED PUMPS
3	LO CA SUCTION PRESSURE INDICATION ON OPERATOR AID COMPUTER (OAC)
7	RN-CA AUTO-SWAP INITIATED
7	CA 15A INDICATES "NOT CLOSED"
7	RN 250A INDICATES "NOT CLOSED"
12	CA 15A INDICATES "OPEN"
21	RN 250A INDICATES "OPEN"
28	2/4 S/G LO-LO SIGNAL
32	SA 2 INDICATES "NOT CLOSED"
35	SA 5 INDICATES "NOT CLOSED"
54	LO CA SUCTION PRESSURE INDICATION CLEARS ON OAC
1:53	SA 2 INDICATES CLOSED
13:09	RN 250A INDICATES "NOT OPEN"
13:18	RN 250A INDICATES "CLOSED"

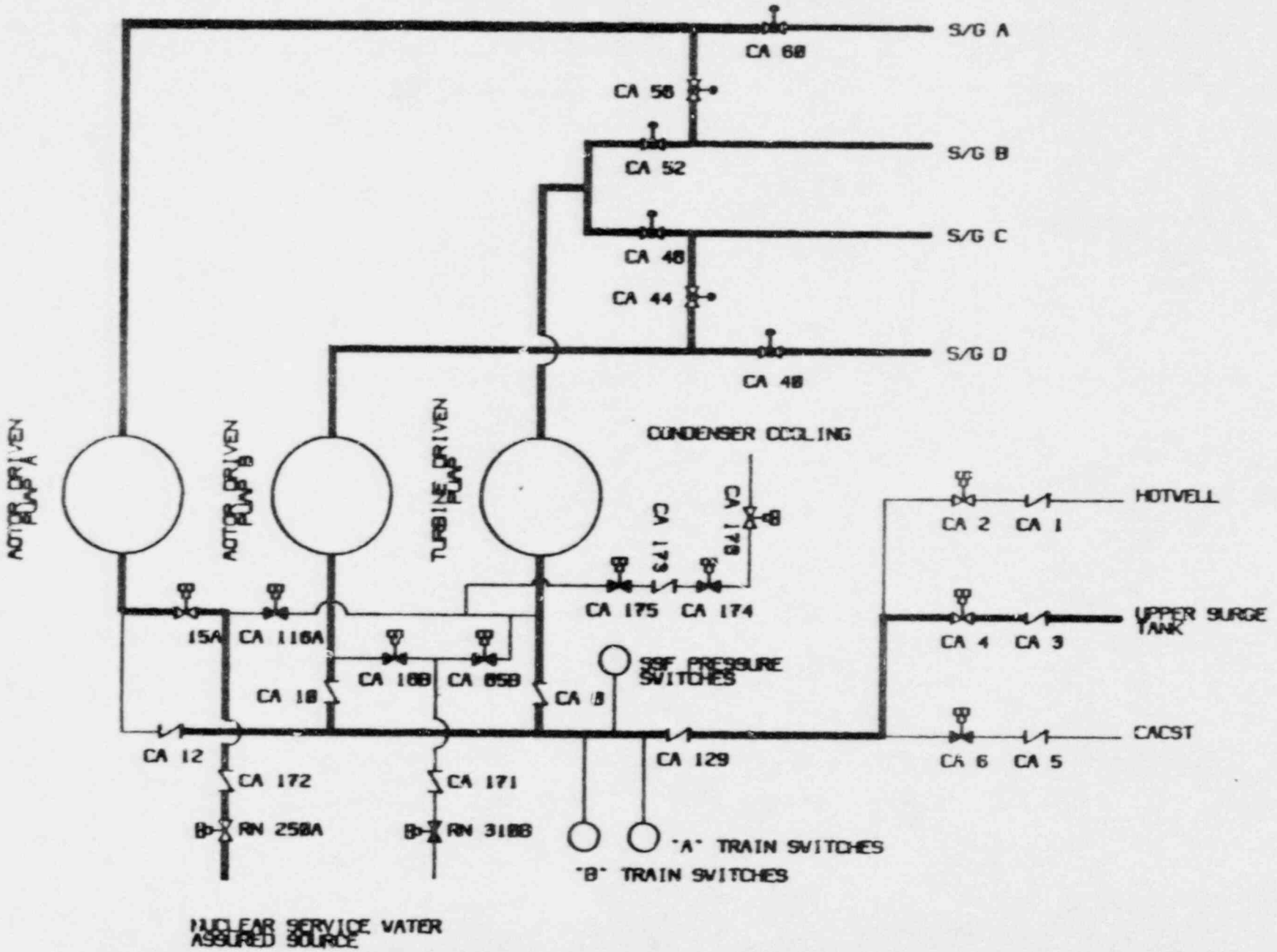
CATAWBA NUCLEAR STATION
AUXILIARY FEEDWATER SYSTEM



CATAWBA NUCLEAR STATION
AUXILIARY FEEDWATER SYSTEM



CATAWBA NUCLEAR STATION
AUXILIARY FEEDWATER SYSTEM



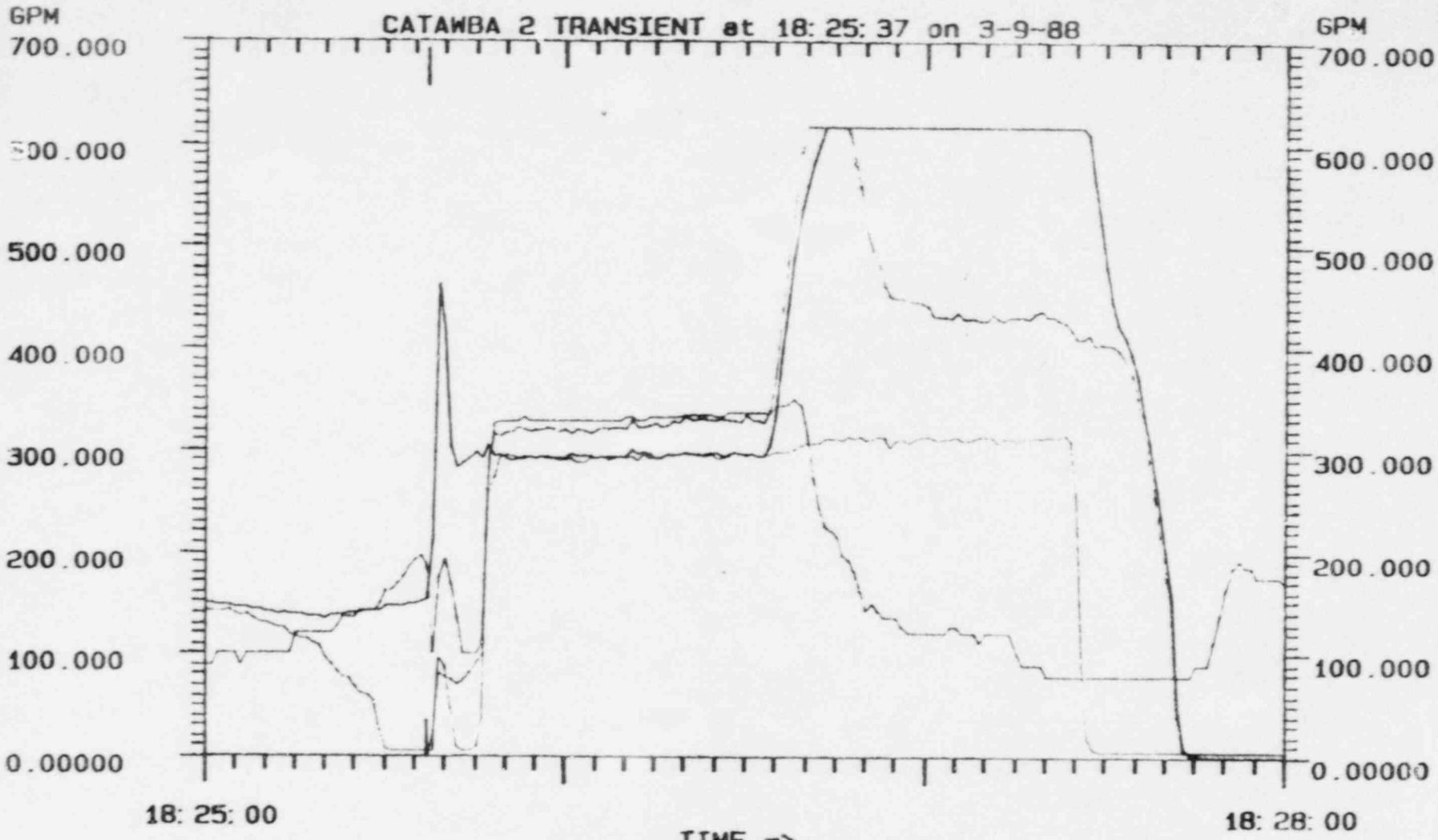
ANALYSIS OF EVENT

- IMMEDIATE POST TRIP ANALYSIS
- POST TRIP INVESTIGATION
- CONCLUSIONS

POST TRIP ANALYSIS

- OPERATOR INTERVIEWS REVEALED LOW CA FLOWS
- OPERATOR INTERVIEWS REVEALED CA "A" TRAIN SWAP TO RN
- TRANSIENT MONITOR DATA INDICATED DEGRADED FLOW TO STEAM GENERATORS A AND B
- POST-TRIP CA FLOW VERIFICATION YIELDED THE FOLLOWING RESULTS:

	FLOW VERIFICATION ALIGNMENT	
STEAM GENERATOR	STANDBY READINESS	ALIGNED INDIVIDUALLY
S/G A	220 GPM	320 GPM
S/G B	100 GPM	190 GPM
S/G C	310 GPM	N/A
S/G D	310 GPM	N/A



	@TRIP	MAX	MIN	PID	MESSAGE
	4.12500	314.250	3.75000	A0977	CA FLOW TO S/G D
	154.125	617.625	3.75000	A0976	CA FLOW TO S/G C
	.375000	617.625	.375000	A0975	CA FLOW TO S/G B
	188.065	349.656	78.1632	A1035	CF FLOW TO S/G A CA NOZZLE

Initiating point was D2720. CF PUMP TURB A

POST TRIP INVESTIGATION

- CA OPERABILITY INVESTIGATION
- RN ASSURED SOURCE VERIFICATION
- AUTO SWAP INVESTIGATION
- TRANSIENT TEST

CA SYSTEM CLEANUP AND OPERABILITY VERIFICATION

SYSTEM CLEANUP:	RESULTS:
• CA LINES TO STEAM GENERATORS FLUSHED	• "B" FLOW CONTROL VALVE ALMOST CLEAN "A" FLOW CONTROL FOULED WITH CLAMS. REFLUSHED AND REINSPECTED BOTH VALVES CLEAN.
• INSPECTED FLOW CONTROL VALVES FROM CAPT TO S/G'S B AND C	• BOTH FLOW CONTROL VALVES CLEAN.
• INSPECTED CAPT LUBE OIL COOLER LINE PRESSURE REDUCTION ORIFICE	• PRESSURE REDUCTION ORIFICE CLEAN.
• INSPECTED AND REPLACED CA PUMP 2A MINIFLOW VALVE	• MINIFLOW FLOW VALVE WAS FOUND TO HAVE A "GUMMY" SUBSTANCE ON IT WHICH RESTRICTED FREE TRAVEL.

OPERABILITY VERIFICATIONS:	RESULTS:
• CA PUMP 2A HEAD CURVE VERIFIED	• NO APPARENT DEGRADATION.
• FLOW BALANCED CA LINES TO STEAM GENERATORS A, B AND C	• ALL LINES SUCCESSFULLY FLOW BALANCED.
• SETUP AND STROKE TIMED ALL VALVES DISASSEMBLED.	• ALL VALVES SUCCESSFULLY SETUP AND RETIMED.

RN ASSURED SOURCE OPERABILITY VERIFICATION

SYSTEM:	RESULTS:
• RN TO NW FLOW VERIFICATION	• FLOW RATES OBTAINED WERE ACCEPTABLE.
• RN TO KC LINES RADIOGRAPHED THEN FLUSHED AS REQUIRED	• KC 1A, NO FLUSHING REQUIRED. • KC 1B, THE LINE WAS FLUSHED AND RERADIOGRAPHED • KC 2A, THE LINE WAS FLUSHED AND RERADIOGRAPHED • KC 2B, THE LINE WAS FLUSHED AND RERADIOGRAPHED TWICE
• RN TO KF LINES RADIOGRAPHED THEN FLUSHED AS REQUIRED	• KF 1A, THE LINE WAS FLUSHED AND RERADIOGRAPHED. • KF 1B, NO CLAMS OBSERVED, LINE FLUSHED AND RERADIOGRAPHED. • KF 2A, NO CLAMS OBSERVED, LINE FLUSHED AND RERADIOGRAPHED. • KF 2B, THE LINE WAS FLUSHED AND RERADIOGRAPHED.
• RN TO CA LINES FLUSHED	• BOROSCOPIC EXAMINATION OF THE RN/CA SUCTION PIPING REVEALED NO CLAMS REMAINING. SPOT RADIOGRAPHS OF UNIT 2 RN SUPPLY PIPING TO CA REVEALED NO CLAMS.

DESIGN EVALUATION OF TRANSIENT

- DESIGN BASIS OF RN-CA SWITCHOVER LOGIC
- INVESTIGATION OF LOW SUCTION HEADER PRESSURE CONDITIONS
- TRANSIENT TEST RESULTS

DESIGN BASIS OF RN-CA SWITCHOVER LOGIC

- SAFETY FUNCTION - ENSURE ADEQUATE SOURCE OF EMERGENCY FEEDWATER IN THE EVENT OF FAILURE OF NORMAL CONDENSATE SOURCES.

  - CRITICAL PARAMETER - ACCOMPLISH SWITCHOVER TO RN WITHOUT VIOLATING CA PUMP NPSH REQUIREMENTS.

- OPERATIONAL CONSIDERATION - PROVIDE ADEQUATE OPERATING MARGIN TO PRECLUDE INADVERTENT SWITCHOVER TO RN.

  - CRITICAL PARAMETER - ALLOW FOR PUMP START TRANSIENT WITHOUT CAUSING SWITCHOVER TO RN. TIME DELAY CIRCUIT ON PUMP START LOGIC.

INVESTIGATION OF LOW SUCTION HEADER PRESSURE CONDITIONS

- INSTRUMENTATION/CIRCUITRY VERIFICATIONS
  - PRESSURE SWITCH CALIBRATIONS VERIFIED
  - TIME DELAYS VERIFIED
  - INSTRUMENT IMPULSE LINES VERIFIED OPERABLE
  - WIRING TO OAC VERIFIED
  - RN-CA SWITCHOVER LOGIC VERIFIED
  - SUCTION PRESSURE SWITCH OUTPUT RELAY CONTACTS VERIFIED

- INSPECTION OF SUCTION HEADER VALVES
  - 2 CA 129
  - 2 CA 3
  - 2 CA 1
  - 2 CS 19

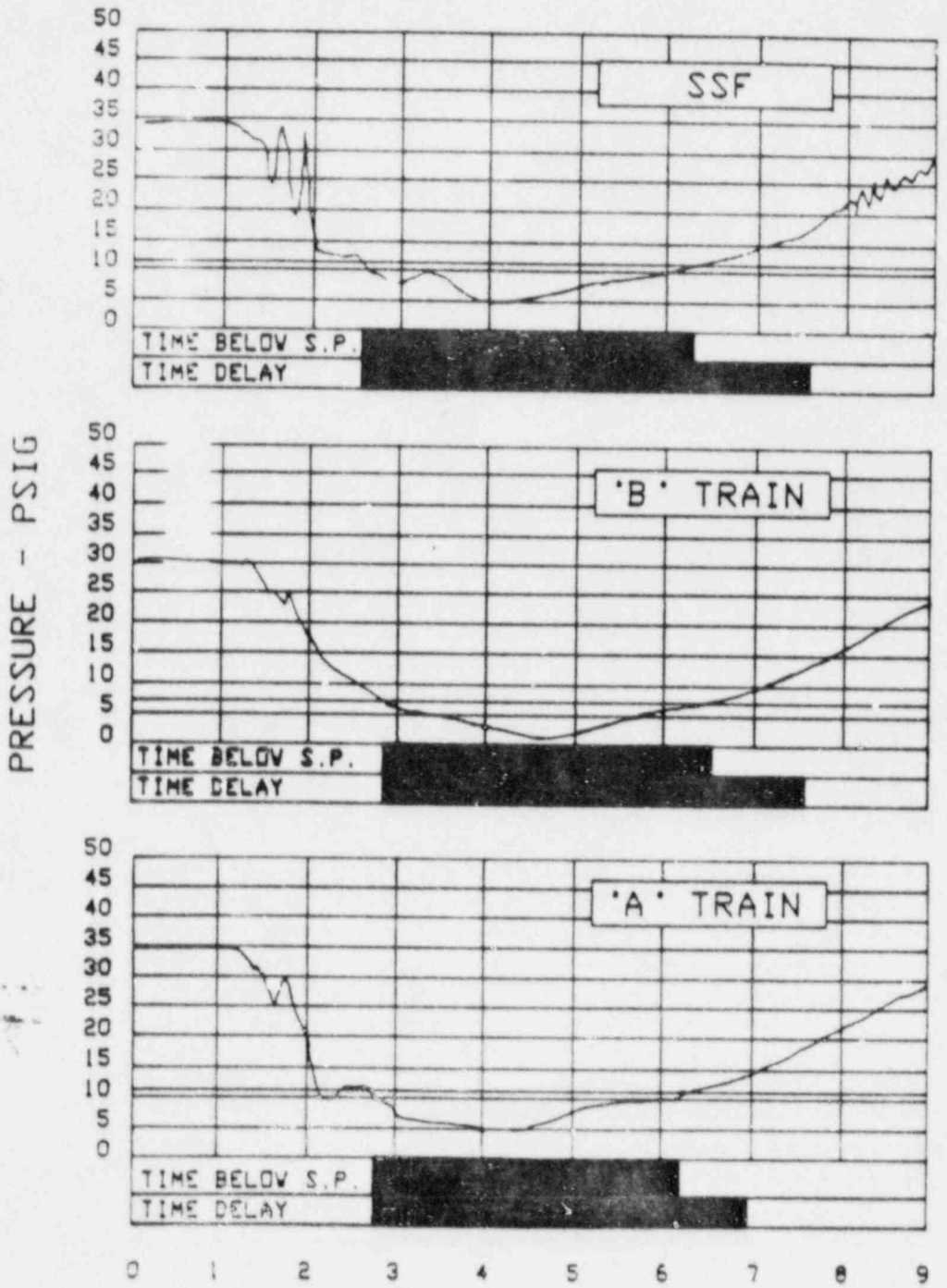
- MEASURE ACTUAL CONDITIONS IN SUCTION HEADER (TRANSIENT TEST)

TRANSIENT TEST RESULTS

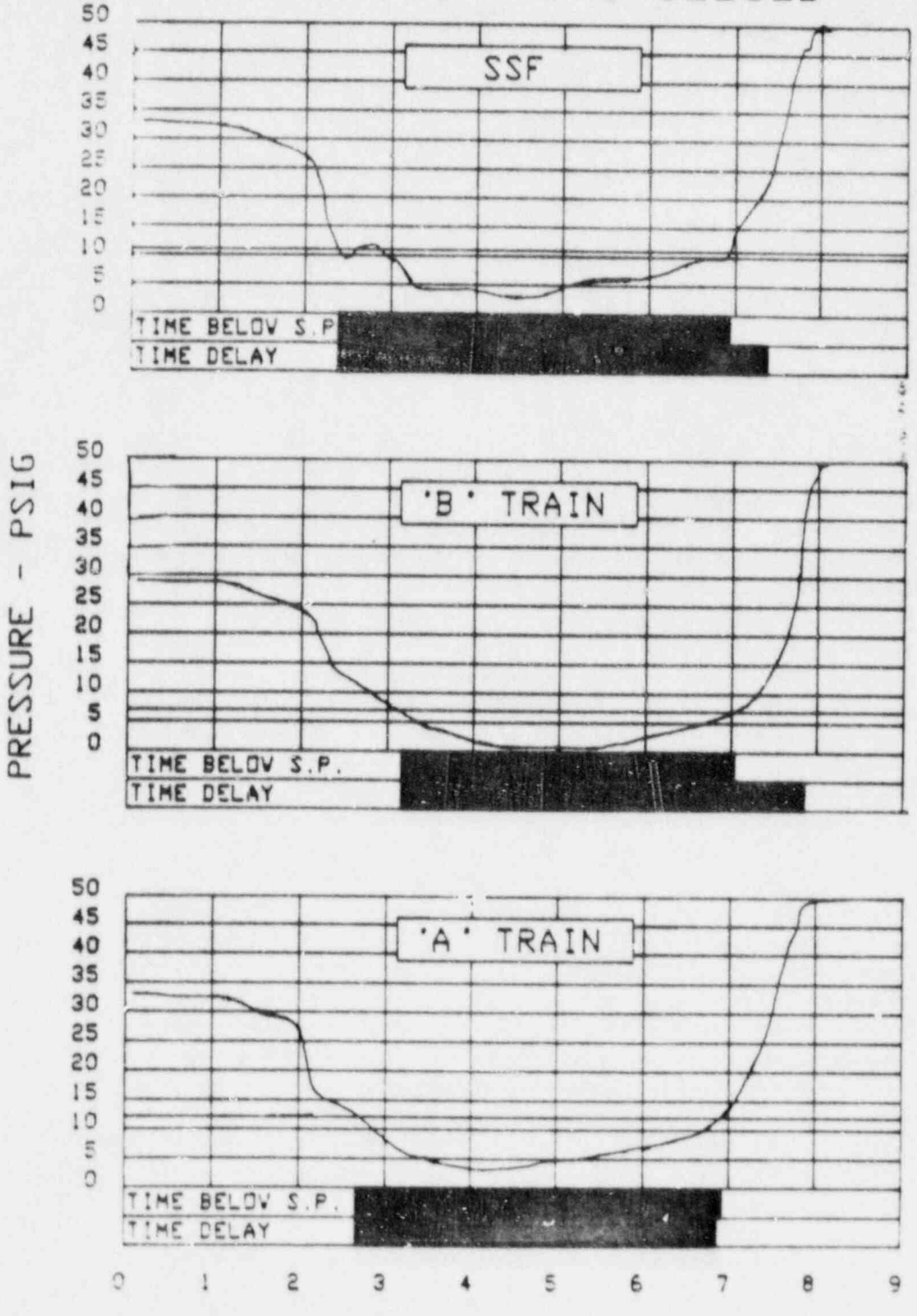
CASE	CALCULATED PRESSURE	ACTUAL PRESSURE (STEADY STATE)
CAMDP'S ONLY CACST ISOLATED	13-21 PSIG	17.6 PSIG
CAMDP's ONLY CACST OPEN	25-38 PSIG	30.2 PSIG
CAMDP's & TDP CACST OPEN	17-29 PSIG	21 PSIG
CAMDP's & TDP CACST ISOLATED	2-7 PSIG	4.1 PSIG

UST	60 - 80% FULL
CACST	80 - 100% FULL

CATAWBA NUCLEAR STATION
TRANSIENT TEST RESULTS
UST ~ 65% CA6 CLOSED



CATAWBA NUCLEAR STATION
TRANSIENT TEST RESULTS
UST ~ 55% CA6 CLOSED



CONCLUSIONS

- CA SYSTEM OPERABLE AFTER FLUSHING BASED ON FLOW BALANCE RESULTS
- CA SYSTEM NOT DEGRADED FROM CLAM PASSAGE BASED ON PUMP HEAD CURVE
- RN ASSURED SOURCES VERIFIED OPERABLE
- "A" TRAIN AUTO SWAP OCCURED DUE TO CACST BEING ISOLATED AND SHORT TIME DELAY SETTING

CORRECTIVE ACTIONS

- MAINTAIN CACST ALIGNED TO CA PUMP SUCTION
  OR
  MAINTAIN UST LEVEL GREATER THAN 90%

- INCREASED TIME DELAY SETTING "A" TRAIN TIMER
  - REPEATED RN TO CA SWAPOVER TEST
  - REPEAT TRANSIENT TEST

SAFETY ANALYSIS CONSEQUENCES

ANALYSIS OF THE IMPACT OF A DEGRADED AUXILIARY FEEDWATER SYSTEM ON THE LIMITING FSAR TRANSIENT

- BACKGROUND
- TRANSIENT SCENARIO AND ANALYSIS METHODOLOGY
- SIMULATION RESULTS
- CONCLUSIONS

BACKGROUND

- FSAR STATES THAT AT LEAST TWO STEAM GENERATORS CAN BE SUPPLIED WITH A MINIMUM OF 491 GPM OF AUX FEEDWATER

- MINIMUM FLOW WITH A NORMAL ALIGNMENT IS 499 GPM AT 1210 PSIG, BASED ON ONE MOTOR-DRIVEN PUMP SUPPLYING TWO STEAM GENERATORS

- DUE TO CLAM FOULING, THE IMMEDIATELY AVAILABLE AUX FEEDWATER FLOW IS:

  STEAM GENERATOR A = 220 GPM

  STEAM GENERATOR B = 100 GPM

  NOTE: THE TURBINE-DRIVEN PUMP IS ASSUMED TO FAIL, AND THE B MOTOR-DRIVEN PUMP SUPPLIES THE FAULTED D STEAM GENERATOR

- AT 30 MINUTES CREDIT IS TAKEN FOR THE OPERATOR MANUALLY REALIGNING THE B MOTOR-DRIVEN PUMP TO STEAM GENERATOR C. A MINIMUM DEGRADED FLOW OF 190 GPM IS ASSUMED.

- THE AVAILABLE AUXILIARY FEEDWATER FLOWRATE IS LESS THAN THAT ASSUMED IN THE FSAR CHAPTER 15 TRANSIENT AND ACCIDENT ANALYSES

- THE SAFETY CONCERNS TO BE AVOIDED ARE:

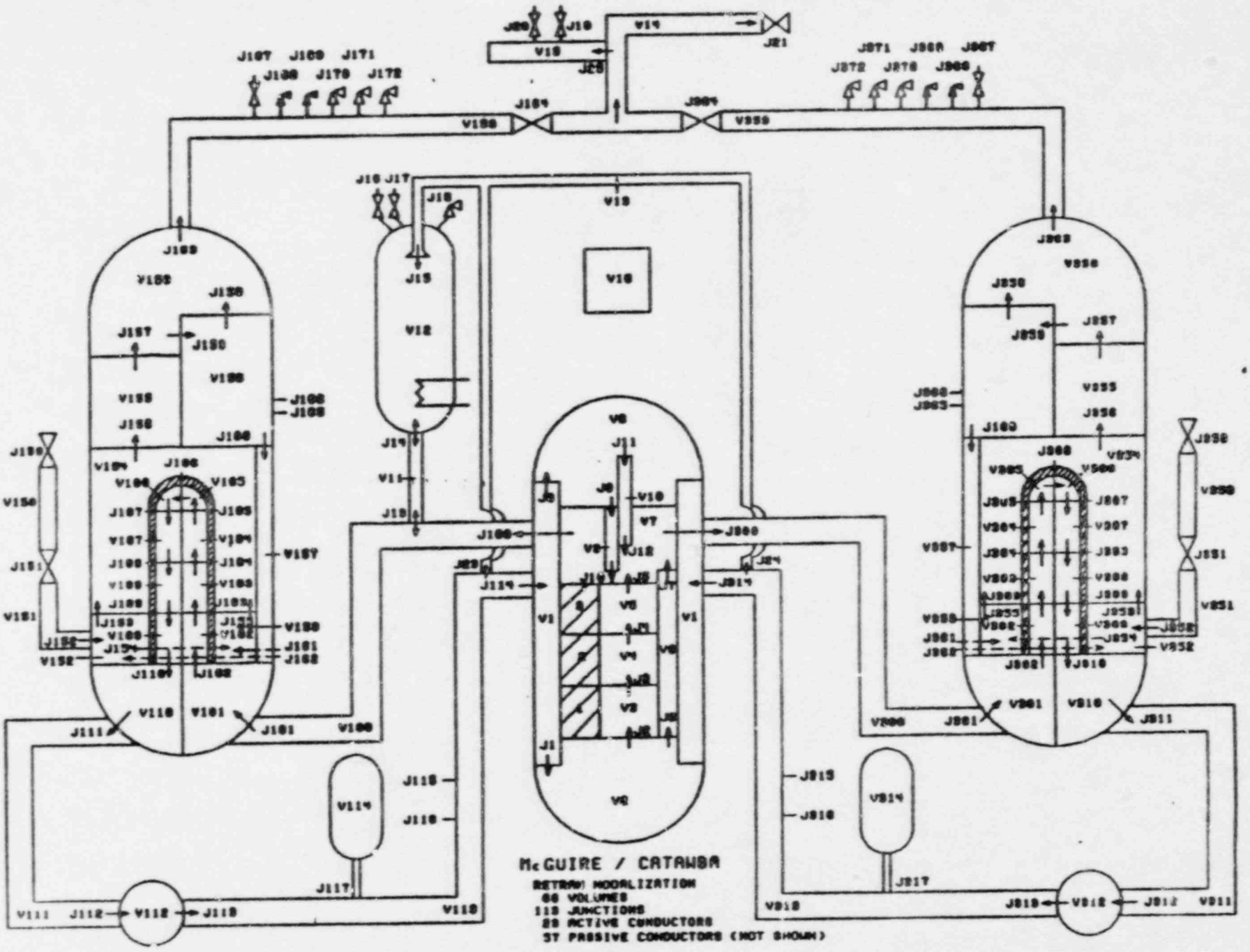
  - BULK BOILING IN THE RCS
  - RCS OVERPRESSURIZATION

TRANSIENT SCENARIO AND ANALYSIS METHODOLOGY

- THE LIMITING TRANSIENT IS THE MAIN FEEDWATER LINE BREAK
  - BREAK IN D FEEDWATER LINE AT TIME ZERO
  - ALL MAIN FEEDWATER FLOW LOST OUT BREAK
  - DEGRADED AUXILIARY FEEDWATER FLOW DUE TO CLAM FOULING
  - MAXIMUM DECAY HEAT
  - OPERATOR ACTION TO MANUALLY REALIGN AUXILIARY FEEDWATER TO STEAM GENERATOR C AT 30 MINUTES

- PLANT SPECIFIC SIMULATION OF CATAWBA UNIT 1 USING A THREE-LOOP RETRAN-02 MODEL

- THE ANALYSIS APPROACH CONSISTS OF A REALISTIC SIMULATION WITH REALISTIC AND CONSERVATIVE ASSUMPTIONS

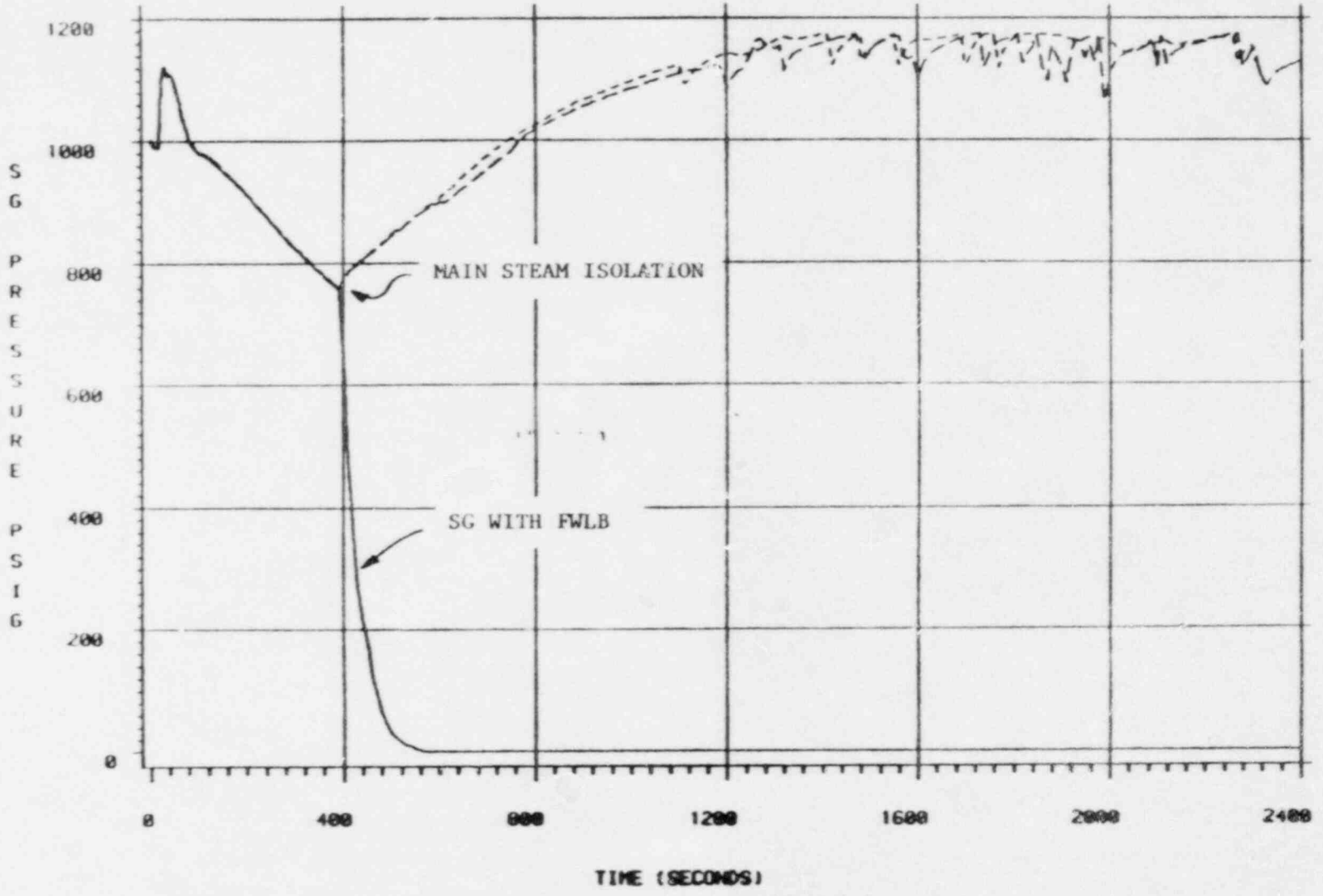

McGUIRE / CATAWBA
RETRAN NODALIZATION
66 VOLUMES
118 JUNCTIONS
88 ACTIVE CONDUCTORS
37 PASSIVE CONDUCTORS (NOT SHOWN)

RESULTS

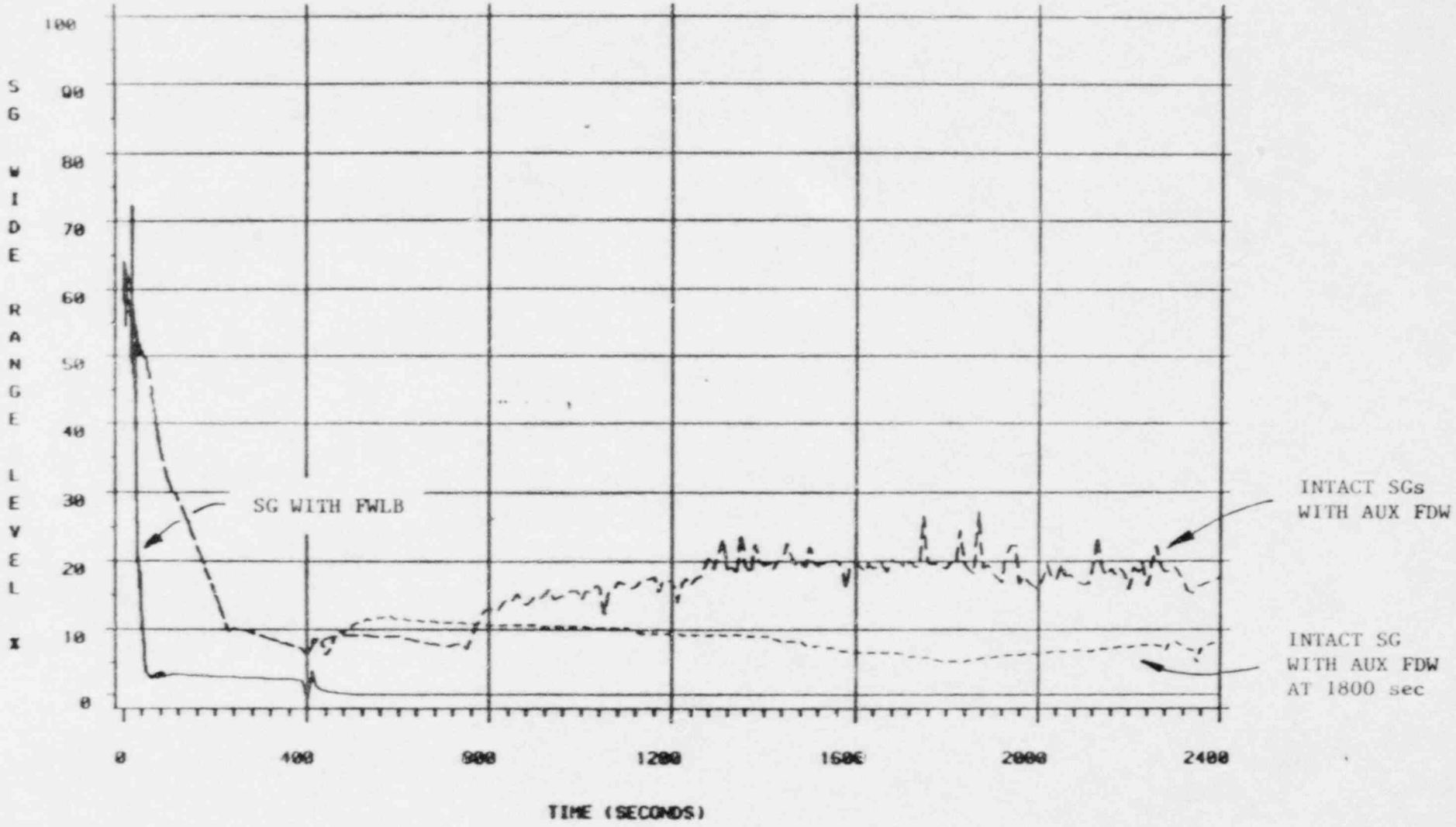
SEQUENCE OF EVENTS

TIME (sec)	EVENT
0	FEEDWATER LINE BREAK AT SG D
2.7	PRESSURIZER SPRAY ON
14.5	RX TRIP ON LOW-LOW SG LEVEL
14.8	TURBINE TRIP
19.5	MOTOR-DRIVEN AUX FDW PUMP A STARTS
63	SG D BOILS DRY
171	SAFETY INJECTION ON LOW PZR PRESSURE
181	SAFETY INJECTION PUMPS DELIVERING
300	MINIMUM RCS PRESSURE = 1816 PSIG
393	STEAM LINE ISOLATION @ 725 PSIG
390	MINIMUM PZR LEVEL = 7.7%
420	MINIMUM RCS T-AVE = 520 F
1100	SG PORVs BEGIN CYCLING
1430	PZR IS WATER SOLID
1435	PZR PORVs BEGIN CYCLING
1800	MOTOR-DRIVEN AUX FDW PUMP B ALIGNED TO SG C
2400	END OF SIMULATION

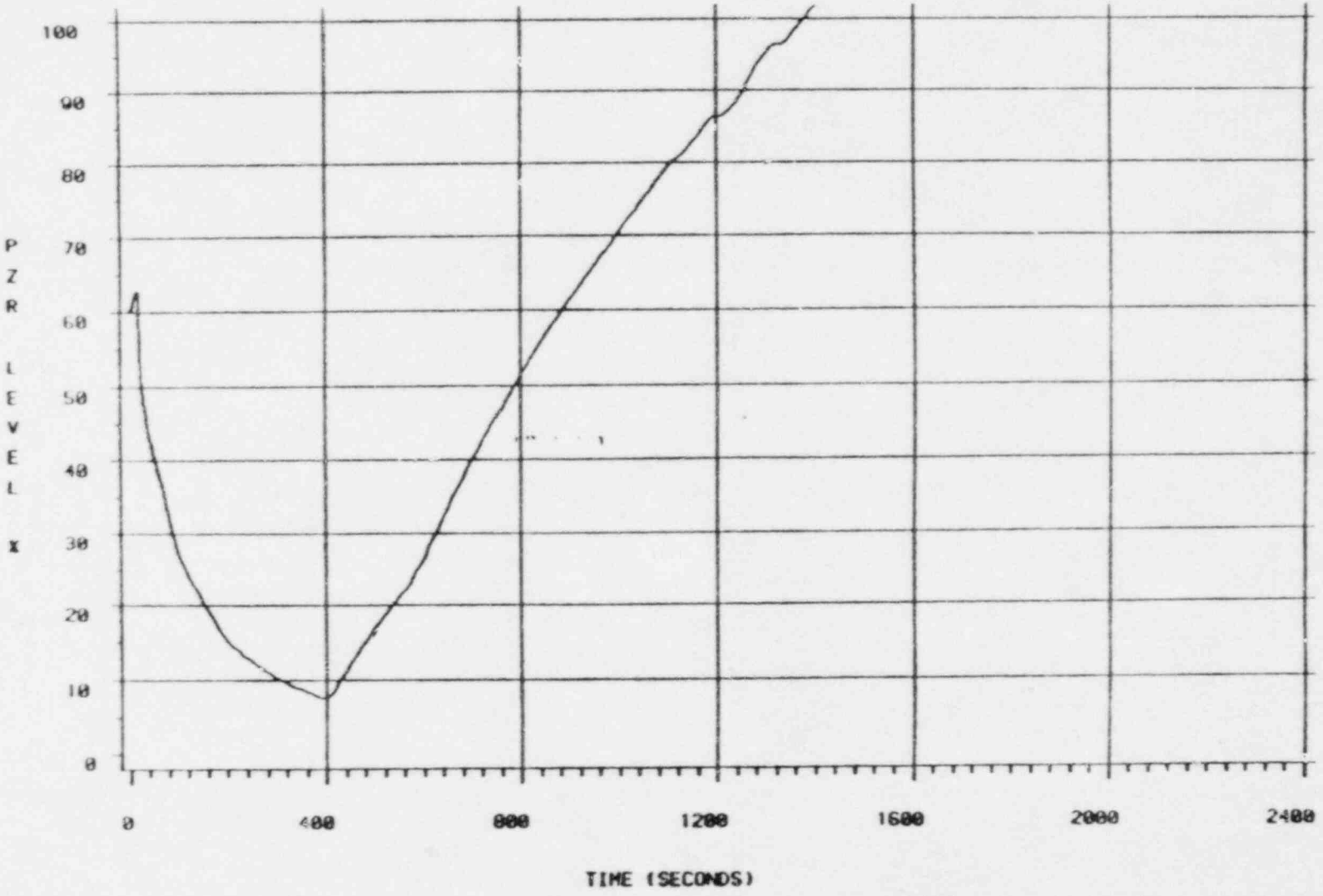
CNS FEEDWATER LINE BREAK WITH DEGRADED CA



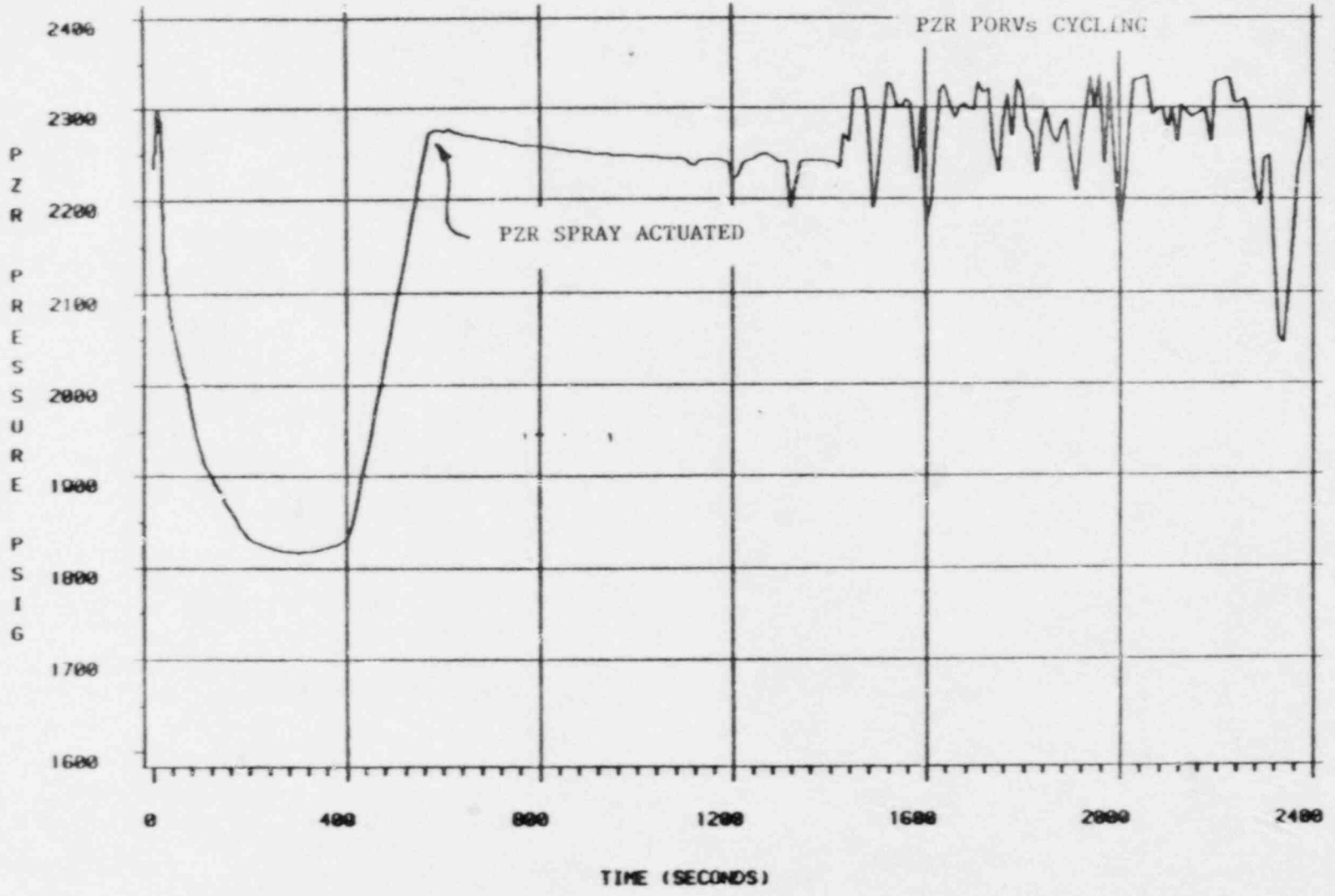
CNS FEEDWATER LINE BREAK WITH DEGRADED CA



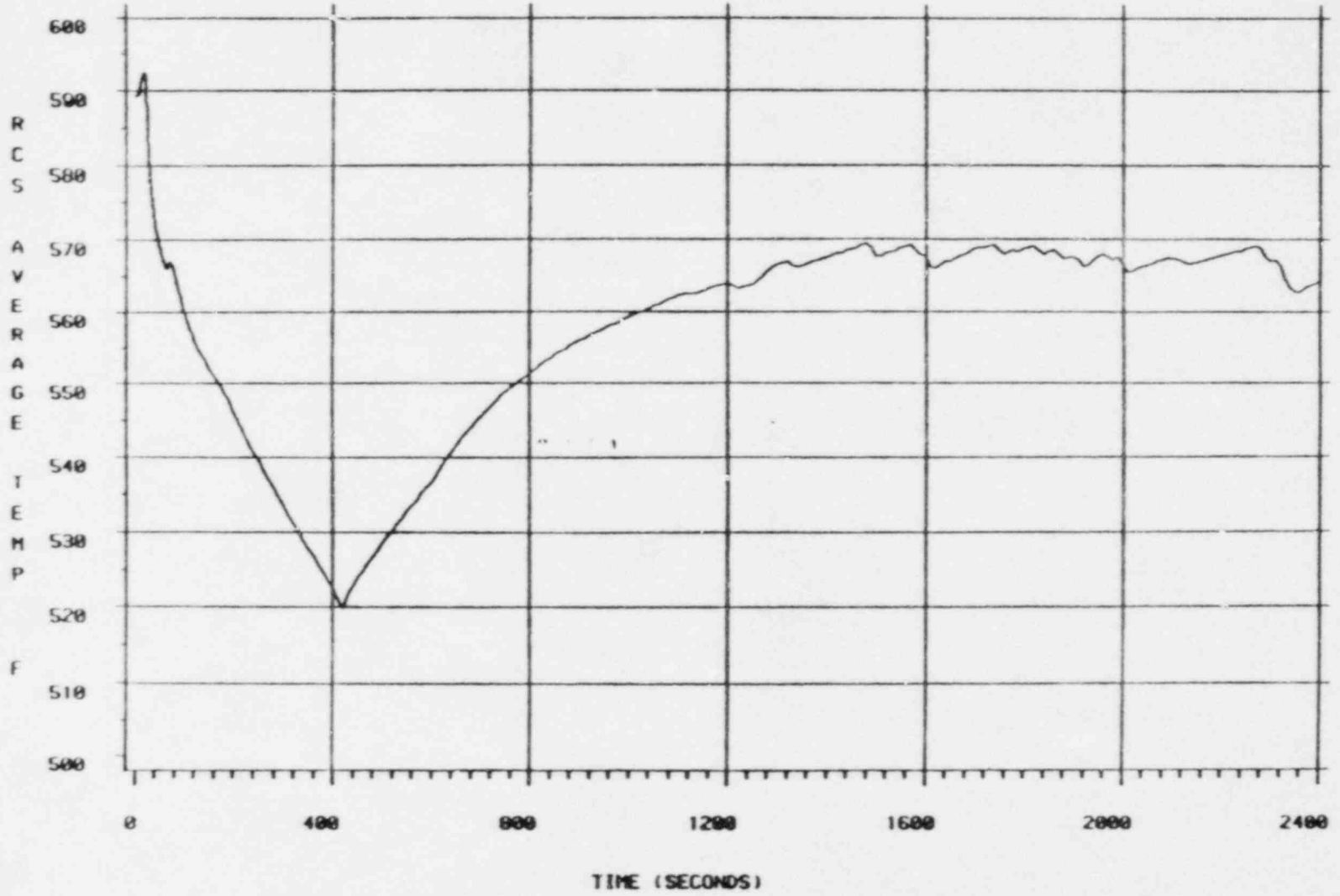
CNS FEEDWATER LINE BREAK WITH DEGRADED CA



CNS FEEDWATER LINE BREAK WITH DEGRADED CA



CNS FEEDWATER LINE BREAK WITH DEGRADED CA



CONCLUSIONS

- THE RCS T-AVE NEVER EXCEEDS 570 F POST-TRIP, WHICH IS THE NORMAL POST-TRIP TEMPERATURE FOLLOWING ANY TRANSIENT THAT RESULTS IN A MAIN STEAM ISOLATION SIGNAL

- THE INITIALLY AVAILABLE AUXILIARY FEEDWATER FLOW IS 320 GPM (@ 1000 PSIG). WITH OPERATOR ACTION TO REALIGN MOTOR-DRIVEN AUX FDW PUMP B AT 30 MINUTES, THE AVAILABLE TOTAL FLOW IS 510 GPM (@ 1000 PSIG). AT THE MAXIMUM SG PRESSURE THAT RESULTS DURING THE TRANSIENT, THE TOTAL AVAILABLE FLOW IS 452 GPM.

- THE AUX FEEDWATER FLOW REQUIRED TO REMOVE DECAY HEAT AND REACTOR COOLANT PUMP HEAT AT 40 MINUTES IS 443 GPM

- AT 40 MINUTES THE AVAILABLE HEAT SINK EXCEEDS THE HEAT LOAD AND THEREFORE THE TRANSIENT HAS BEEN SUCCESSFULLY MITIGATED

- RESTORING A NORMAL POST-TRIP CONDITION WOULD BE ACHIEVED BY

  - TERMINATING SAFETY INJECTION
  - ESTABLISHING A PRESSURIZER BUBBLE
  - RESTORING STEAM DUMP TO CONDENSER
  - RESTORING NORMAL STEAM GENERATOR LEVELS USING MAIN OR AUXILIARY FEEDWATER

CONCLUSIONS (CONT.)

- THE TRANSIENT RESPONSE OF THE UNIT FOR THE LIMITING FSAR CHAPTER 15 TRANSIENT WITH DEGRADED AUXILIARY FEEDWATER FLOW DUE TO CLAM FOULING DOES NOT RESULT IN ANY UNACCEPTABLE CONSEQUENCES

PAST PROGRAMS FOR CLAM CONTROL

- RESPONSE TO IE BULLETIN 81-03
- CLAM EXPERIENCE AT CATAWBA
- RAW WATER MONITORING PROGRAM
- CONCLUSIONS

RESPONSE TO IE BULLETIN 81-03

JULY 8, 1981	PERFORMANCE MONITORING PROGRAM INSPECTIONS DURING ROUTINE MAINTENANCE
MARCH 17, 1983	DIFFERENTIAL PRESSURE MONITORING •NS HEAT EXCHANGER •ASPSU CHILLER CONDENSER INSPECTIONS DURING ROUTINE MAINTENANCE
SEPTEMPER 16, 1983	DIFFERENTIAL PRESSURE MONITORING •KC HEAT EXCHANGER •D/G AIR COMPRESSOR AFTERCOOLER INSPECTIONS DURING ROUTINE MAINTENANCE
OCTOBER 17, 1983	INTERNAL MEMO RECOMMENDING PERIODIC FLUSHING OF SNSWP SYSTEM

CLAM EXPERIENCE AT CATAWBA

PRE 1982	LOW PRESSURE SERVICE WATER SYSTEM • MOTOR COOLER LINES • RADWASTE AREA "Y" STRAINER • SUPPLY PIPING TO PLANT FIRE PROTECTION SYSTEM • CLAM SHELLS FOUND IN A FEW DELUGE NOZZLES • CLAM SHELLS FOUND IN STRAINER NUCLEAR SERVICE WATER SYSTEM • NO CLAMS LOCATED SAMPLING OF LAKE WYLIE AND NUCLEAR SERVICE WATER POND VERIFY CLAMS PRESENT IN VICINITY OF CATAWBA NUCLEAR STATION
8/82 - 2/83	ROUTINE CHILLER MAINTENANCE REVEALS ONE SLIGHT CASE OF CLAM INFESTATION
SEPTEMBER 82	FIRE PROTECTION STRAINER BASKET INSPECTION REVEALS NO CLAMS
OCTOBER 82	SMALL CLAMS FOUND IN MULSIFYRE NOZZLES DURING FIRE PROTECTION SYSTEM INSERVICE TESTING
82 TO 87	CLAMS PERIODICALLY FOUND IN LOW PRESSURE SERVICE WATER SYSTEM CLAMS FOUND RARELY IN NUCLEAR SERVICE WATER SYSTEM
APRIL 87	RN TO CA SUPPLY LINE RADIOGRAPHED FOR CLAMS IN RESPONSE TO TESTING REVIEW COMMITTEE CONCERNS
OCTOBER 87	CLAMS FOUND IN NUCLEAR SERVICE WATER PUMP LUBE INJECTION LINES
MARCH 88	RN TO CA SUPPLY LINE ON UNIT 1 RADIOGRAPHED FOR CLAMS

RAW WATER MONITORING PROGRAM

DIFFERENTIAL PRESSURE MONITORING

THE FOLLOWING HEAT EXCHANGERS OF THE NUCLEAR SERVICE WATER SYSTEM ARE MONITORED FOR DIFFERENTIAL PRESSURE ON A QUARTERLY BASIS:

- COMPONENT COOLING HEAT EXCHANGER
- CONTAINMENT SPRAY HEAT EXCHANGER
- AUXILIARY SHUTDOWN PANEL AIR HANDLING UNIT CONDENSERS
- DIESEL GENERATOR COOLING WATER HEAT EXCHANGER
- DIESEL GENERATOR AIR COMPRESSOR AFTERCOOLERS

HEAT EXCHANGER PERFORMANCE MONITORING

THE FOLLOWING HEAT EXCHANGERS ARE PERIODICALLY TESTED FOR HEAT TRANSFER CAPABILITIES:

- COMPONENT COOLING HEAT EXCHANGERS
- CONTAINMENT SPRAY HEAT EXCHANGERS
- DIESEL GENERATOR COOLING WATER HEAT EXCHANGERS

NUCLEAR SERVICE WATER SYSTEM FLOW BALANCING

THE NUCLEAR SERVICE WATER SYSTEM CURRENTLY IS BEING FLOW BALANCED ON A YEARLY FREQUENCY OR AS REQUIRED FOR RETESTS DUE TO STATION MODIFICATIONS OR MAINTENANCE.

CONCLUSIONS

- ALL COMMITMENTS RELATIVE TO IE BULLETIN 81-03 HAVE BEEN MET OR EXCEEDED

- BASED ON PAST EXPERIENCE CLAMS HAVE NOT BEEN A SIGNIFICANT PROBLEM IN THE NUCLEAR SERVICE WATER SYSTEM

- INTERNAL RECOMMENDATIONS RELATIVE TO PERIODIC FLUSHING OF THE "SNSWP" SYSTEM HAVE BEEN MET OR EXCEEDED

Catawba Clam Task Force Objectives

1. Provide Recommendations to Prevent Inadvertent Swap Over of Auxiliary Feedwater Supply to Nuclear Service Water

2. Review Near Term Raw Water Controls and Provide Appropriate Recommendations

3. Develop a Long Term Solution to Resolve the Clam Problem at Catawba

Catawba Clam Task Force
Near Term Plan

1. Define Clam Life-cycle and Control Mechanisms

2. Brief Review of Catawba's History/ Problems with Clams

3. Review Industry and Duke Fossil Experience and Solutions

4. Review Past Responses and Commitments to NRC on Clams

5. Review Catawba's Recent Event in Regard to Clams

6. Review Catawba's Recent Event in Regard to Auxiliary Feedwater, Condensate Storage, and Nuclear Service Water System Interaction

Catawba Clam Task Force
Near Term Conclusions

1. The Potential for Clam Larvae to Get into RN Systems at Catawba is High

2. The Potential for Adult Clams to Get into RN Systems at Catawba is Low

3. No Significant Clam Infestation Has Been Experienced in High Flow Areas of Catawba RN Systems

4. Significant Clam Fouling Can Occur in Low Flow and Stagnant Areas ofCatawba's RN Systems

5. Catawba's Present Flushing Velocities are Adequate for Near Term Clam Control

6. The Near Term Problem with Clams Potentially Degrading Safety Systems at Catawba is in Low Flow and Stagnant Lines

Catawba Clam Task Force
Near Term Recommendations

1. Add Analog Point to OAC with 2 Alarms
    1. UST < 66% Level
    2. CA6 Closed & UST < 90%

2. Clam Findings Should Be Better Documented

3. RN to CA Lines - Flush Monthly
    - Install Strainer to Collect Clams During Flush

4. RN to KC Lines - Flush Quarterly
   RN to KF Lines
   RN to NW Lines

Results of Latest RN to CA Flush
April 8, 9, & 10

Procedure - Flush 3 Times for 15 Minutes with a Strainer
Flush for 30 Minutes without Strainer
Flush for 5 Minutes with a Strainer with Condensate

Results - 1 Live Clam 1/4 inch
34 1/2 Clam Shells (25 1/2 from 2B Line)
10 1/2 Shell Pieces

Conclusion - Lines were Relatively Clean
Consider Extending RN to CA Flush Frequency After the Next Monthly Flush

Catawba Clam Task Force
Long Term Solution Development

1. Develop Long Term Alternatives to Resolve Problems Found in Near Term Review.

Consider:

a. Design Modifications
b. Chemical Treatment
c. Mechanical Techniques
d. Operational Changes

2. Provide Cost Benefit Analysis of Potential Solutions

3. Confirm Optimum Solution by Test and/or Analysis

4. Define Method to Track Effectiveness of Solution

5. Provide Report to Management