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SEP 15 1994

Docket Nos. 50-390, 50-391
License Nos. CPPR-91, CPPR-92

Tennessee Valley Authority
ATTN: Mr. Oliver D. Kingsley, Jr.
President, TVA Nuclear and
Chief Nuclear Officer
6A Lookout Place
1101 Market Street
Chattanooga, TN 37402-2801

Gentlemen:

SUBJECT: MEETING SUMMARY - WATTS BAR UNITS 1 AND 2

This letter refers to the NRC/TVA management meeting held at the NRC Region II office in Atlanta, Georgia on September 1, 1994. The meeting was held to discuss lessons learned in preoperational testing and hot functional testing, CAPs and SPs, plant status and licensing issues. Enclosure 1 is a list of the individuals who attended the meeting and Enclosure 2 is the handout information material supplied by TVA.

Enclosure 3 is material that we used in our analysis of Hot Functional Testing. We request that you review this and respond within 30 days of the receipt of this letter with your assessment of the hardware and operational issues, your plans and schedule for using the lessons learned to enhance future testing, and your detailed schedule for retests.

It is our opinion that this meeting was beneficial and provided a better understanding of TVA's activities. Should you have any questions concerning this letter, please contact me.

Sincerely,

Original Signed By:
J. P. Jaudon

Johns P. Jaudon, Acting Deputy Director
Division of Reactor Projects

Enclosures:
1. List of Attendees
2. Meeting Agenda and TVA Handout
3. HFT Analysis

cc w/encls: (See page 2)

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9409270154 940915
PDR ADOCK 05000390
A PDR

IE45

cc w/encls:
Mr. Craven Crowell, Chairman
Tennessee Valley Authority
ET 12A
400 West Summit Hill Drive
Knoxville, TN 37902

Mr. W. H. Kennoy, Director
Tennessee Valley Authority
ET 12A
400 West Summit Hill Drive
Knoxville, TN 37902

Mr. Johnny H. Hayes, Director
Tennessee Valley Authority
ET 12A
400 West Summit Hill Drive
Knoxville, TN 37902

Dr. Mark O. Medford, Vice Pres.
Engineering and Technical Services
Tennessee Valley Authority
3B Lookout Place
1101 Market Street
Chattanooga, TN 37402-2801

Mr. D. E. Nunn, Vice President
New Plant Completion
Tennessee Valley Authority
3B Lookout Place
1101 Market Street
Chattanooga, TN 37402-2801

Mr. J. A. Scalice, Site Vice Pres.
Watts Bar Nuclear Plant
Tennessee Valley Authority
P. O. Box 2000
Spring City, TN 37381

General Counsel
Tennessee Valley Authority
ET 11H

400 West Summit Hill Drive
Knoxville, TN 37902

Mr. R. W. Huston, Manager
Nuclear Licensing and
Regulatory Affairs
4G Blue Ridge
1101 Market Street
Chattanooga, TN 37402-2801

Mr. B. S. Schofield
Site Licensing Manager
Watts Bar Nuclear Plant
Tennessee Valley Authority
P. O. Box 2000
Spring City, TN 37381

TVA Representative
Tennessee Valley Authority
11921 Rockville Pike
Suite 402
Rockville, MD 20852

Mr. M. H. Mobley, Director
Division of Radiological Health
3rd Floor, L and C Annex
401 Church Street
Nashville, TN 37243-1532

The Honorable Robert Aikman
County Executive
Rhea County Courthouse
Dayton, TN 37321

The Honorable Garland Lanksford
County Executive
Meigs County Courthouse
Decatur, TN 37322

Danielle Droitsch
Energy Project
The Foundation for Global
Sustainability
P. O. Box 1101
Knoxville, TN 37901

Mr. Bill Harris
Route 1, Box 26
Ten Mile, TN 37880

bcc w/encls: (See page 3)

SEP 15 1994

Tennessee Valley Authority 3

bcc w/encls:
S. D. Ebneter, ORA/RII
E. W. Merschoff, DRP/RII
A. F. Gibson, DRS/RII
J. P. Stohr, DRSS/RII
F. J. Hebdon, NRR
G. C. Lainas, NRR
A. P. Hodgdon, OGC
B. K. Keeling, GPA/CA
RII Coordinator, OEDO
P. S. Tam, NRR
NRC Document Control Desk

NRC Resident Inspector
U.S. Nuclear Regulatory Commission
Route 2, Box 700
Spring City, TN 37381

SEND	OFC	DRP/RII	DRP/RII	DRP/RII		
TO	NAME	ARuff:vyg	PFredrickson	CJulian		
PDR?	DATE	09/ 14 /94	09/ 14 /94	09/ 14 /94	/ /94	/ /94
Yes No	COPY?	Yes No	Yes No	Yes No	Yes No	Yes No

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ENCLOSURE 1

LIST OF ATTENDEES

Name	Title
NRC Staff	
W. T. Russell	Director Office of NRR
F. J. Hebdon	Director Project Directorate II-4, Office of Nuclear Reactor Regulation (NRR)
M. W. Peranich	Section Chief, Inspection Regulatory Criteria Branch, NRR
P. S. Tam	Senior Project Manager, NRR
S. A. Varga	Director, Division of Reactor Projects I/II, NRR
S. D. Ebneter	Regional Administrator, Region II (RII)
J. P. Jaudon	Deputy Director, Division of Reactor Projects (DRP), RII
C. A. Julian	Branch Chief Watts Bar (WB) Operations Branch, DRP, RII
P. E. Fredrickson	Branch Chief WB Construction, DRP, RII
A. B. Ruff	Project Engineer WB Construction Branch, DRP, RII
G. A. Walton	Senior Resident Inspector, WB Construction Branch, DRP, RII
P. K. Van Doorn	Senior Resident Inspector, WB Startup Branch, DRP, RII
TVA Staff	
D. E. Nunn	Vice President, New Plant Completion, TVA
M. O. Medford	Vice President, Engineering and Technical Services, TVA
J. A. Scalice	Site Vice President
O. J. Zeringue	Senior Vice President, Nuclear Operations, TVA
R. R. Baron	General Manager, Nuclear Assurance and licensing
M. Bajestanj	Start Up Manager
W. L. Elliott	Engineering and Modifications Manager
D. R. Keuter	Operational Readiness Manager
B. V. E. Martocci	Public Relations Manager
D. E. (Don) Moody	Plant Manager
R. T. Purcell	Plant Program Manager
J. R. Ratliff	TVA Nuclear-Corporate
B. S. Schofield	Site Licensing Manager
J. Simmons	CAP/SP Manager
M. D. Skaggs	Acting Manager of Projects
L. B. Spiers	WB Site Quality Manager
OTHERS	
S. Keisling, Auditor, GAO	

ENCLOSURE 2

AGENDA

I.	INTRODUCTION/OPERATIONS OVERVIEW	O. ZERINGUE
II.	OPERATIONAL READINESS	R. PURCELL
III.	OPERATIONAL READINESS CONCLUSIONS	J. SCALICE
IV.	PREOPERATIONAL TESTING	M. BAJESTANI
V.	CORRECTIVE ACTION PROGRAMS /SPECIAL PROGRAMS	M. SKAGGS
VI.	CLOSING REMARKS	D. NUNN

I. INTRODUCTION/OPERATIONS OVERVIEW

O. ZERINGUE

INTRODUCTION/OPERATIONS OVERVIEW

- OPERATIONAL READINESS
  - SETTING EXPECTATIONS
  - PEOPLE/NOT JUST PROGRAMS
  - MONITORING PROGRAMS AND PERFORMANCE
  - BENEFITING FROM BFN & SQN RESTART EXPERIENCE
  - OPERATIONAL READINESS MANAGER
    - SQN RESTART READINESS
    - FREQUENT BRIEFINGS
  - MINI HFT
    - OPERATIONS IN CONTROL OF PLANT

- PREOPERATIONAL TESTING
  - OBJECTIVE OF TESTING IS TO FIND PROBLEMS
  - TEST PROGRAM IS DEVELOPING TEAMWORK AND EFFICIENCY IN KEY PLANT DEPARTMENTS

- ASSURANCE OF OPERATIONAL READINESS

II. OPERATIONAL READINESS

R. PURCELL

WBN DEPARTMENT READINESS

(PEOPLE/PROGRAMS/PROCEDURES)

- PRIOR TO DECEMBER 1993

  - DEPARTMENTAL APPROACH TO OPERATIONAL READINESS
  - MANY INPO, CORPORATE, AND QA ASSESSMENTS PERFORMED
  - EFFORT WAS INCONSISTENT BETWEEN DEPARTMENTS, HARD TO MONITOR PROGRESS

- DECEMBER 1993, SITE INTEGRATED OPERATIONAL READINESS PROGRAM (ORP)

  - ORP PROGRAM PLAN ISSUED
  - DESCRIPTION OF PROGRAMS REQUIRED FOR OPERATIONS ISSUED
  - DEFINED AN OPERATIONAL READINESS MODEL FOR PROGRAMS USING INPO 90-15, NRC INSPECTION MODULES, TVA EXPERIENCE
  - DEVELOPED PROGRAM SPECIFIC ACTION PLANS
  - IN DEPTH ASSESSMENT PROCESS

- WBN ASSESSMENT PROCESS

  - EACH PROGRAM
    - DEPARTMENT SELF-ASSESSMENT (WITH OFFSITE AUGMENTATION)
    - QA INDEPENDENT ASSESSMENT
    - OPERATIONAL READINESS MANAGEMENT REVIEW TEAM
    - PAC/AQ OVERSIGHT

  - WBN OPERATIONAL READINESS REVIEW (ORR PHASE II) CORPORATE ASSESSMENTS OCTOBER 5, 1994 AND INPO DECEMBER, 1994

  - INTEGRATED PLANT ACTIVITY ASSESSMENTS
    - HOT FUNCTIONAL TEST ASSESSMENTS
    - INTEGRATED TESTING SEQUENCE (ITS) ASSESSMENTS BEING PLANNED
    - MINI HFT (JANUARY 1995)

WBN Department Readiness Summary

Date: 08/29/94

		A. Ops Readiness Programs (1) (R. Tolley)	B. Implement Procedures (TO GO) (J. Rollins)	C. Org Respon & Staffing (J. Wallace)	D. Technical Training & Qual (B. Thompson)	E. Prog/ Process Training (R. Tolley)	F. Dept Expectations for Conduct (R. Purcell)	G. Perf. & Backlog Indicators (D. Hodge)	H. Personnel Perf (HPES) (T. Tucker)	I. SQN Lessons Learned (G. Capodanno)	J. Dept Open TROI ACTIONS (E. McNair)	K. Mgt Review & Approval (D. Keuter)
1	**Ops & Fire** Mende (Davis/Rusbridg	2/2/2 6	232	100%	90%	0/65				0/68	66	
2	**Maintenance** Nelson (Candage)	6/5/5 9	13	100%	90%	0/41				0/67	111	
3	**PSO** Bush (Davis)	1/1/0 4	Complete	100%	100%	0/52				N/A	23	
4	**RADCON** Cox (Hickman)	4/4/0 4	4	90%	81%	0/28				N/A	11	
5	**Chem/Environ** Cox (Voeller/Shanks)	6/2/2 7	56	68%	69%	0/32				0/6	7	
6	**Tech Support** Koehl (Moses)	15/6/4 27	715	100%	66%	0/64				0/82	180	
7	**Training** Thompson	Complete 7	Complete	100%	100%	0/14				N/A	16	
8	**Mods** Singh (Houshang)	1/0/0 1	Complete	100%	N/A	0/34				0/6	77	
9	**Site Engr** Elliott (Young/Koontz)	7/5/5 7	9	100%	100%	0/55				0/352	257	
10	**Materials** Crane	Complete 4	Complete	100%	N/A	0/14				N/A	5	
11	**Site Support** Maillett (Kabiri/Ken C.)	Complete 4	1	100%	N/A	0/10				0/2	35	
12	**Security** Hardin (Ale)	Complete 3	14	56%	12%	0/6				N/A	0	
13	**Nuc Assurance** Spiers (Crittenden)	2/0/0 5	Complete	100%	90%	0/63				0/5	121	
14	**Licensing** Schofield (Vorees)	0/0/0 1	3	100%	81%	0/7				0/6	51	
15	**Human Res** Wallace (Roza)	5/0/0 5	N/A	100%	N/A	0/5				N/A	17	
16	**Misc.** R. Gibbs	1/0/0 4	1	100%	N/A	0/66				0/28	163	
	Summary:	68/43/36								622	1140	

NOTE (1) Self-Assessed / QA Assessed / ORMRT Approved - Total Programs Noted Under

A. PROGRAM READINESS

- TOTAL 98
- SELF-ASSESSMENTS 69
- QA ASSESSMENTS 54
- ORMRT APPROVAL 48

B. PROCEDURE READINESS

- TECHNICAL SUPPORT 736
- OPERATIONS 233
- CHEMISTRY 70

C. ORGANIZATION RESPONSIBILITIES AND STAFFING

- WBN HAS FINALIZED AND COMMUNICATED WORKFORCE PLAN
- STANDARDIZING OUR ORGANIZATION STRUCTURE AND POSITION DESCRIPTION AS PART OF THE TVA NUCLEAR PROCESS IMPROVEMENT PLAN
- EVALUATING CORPORATE INTERFACE AGREEMENTS
- VERIFIED INCUMBENTS MEET QUALIFICATION REQUIREMENTS FOR KEY POSITIONS (INCLUDING NEW HIRES)
- MANAGEMENT/SUPERVISOR PERFORMANCE ASSESSMENT PROCESS
  - SUBORDINATE EVALUATION BY SUPERVISOR WITH SUPERVISOR PEERS AND CUSTOMER
  - EVALUATED AGAINST PRE-DETERMINED KEY PERFORMANCE BEHAVIORS
  - IDENTIFIES PERSONAL STRENGTHS AND WEAKNESSES
  - TAILOR INDIVIDUAL DEVELOPMENT PROGRAM (IDP) TO ADDRESS WEAKNESS
  - ENSURE INDIVIDUALS ARE SUITED FOR THEIR POSITIONS
  - PRESENT EVALUATIONS ARE COMPLETE TO FIRST LINE SUPERVISORS, DEVELOPING IDPs
- SUCCESSION PLANNING

D. TECHNICAL TRAINING

- 12 ACCREDITED PROGRAMS
- TRACKING PERSONNEL QUALIFICATIONS

E. PROGRAM/PROCESS TRAINING

- EVALUATION OF ORP ASSESSMENTS TO DATE, AND NOV/CAQ TRENDS SHOW ADDITIONAL EFFORT REQUIRED ON ADMINISTRATIVE PROGRAM COMPLIANCE
- IDENTIFYING ADMINISTRATIVE PROGRAMS USED BY EACH ORGANIZATION
- DEVELOP TRAINING NEEDS
- RE-ENFORCE MANAGEMENT EXPECTATIONS TO SUPERVISORS

F. DEPARTMENT EXPECTATIONS

- DEFINES DEPARTMENT OBJECTIVES IN SUPPORT OF TVA NUCLEAR/WBN OBJECTIVES
- ROLLS DOWN SPECIFIC OBJECTIVES FOR EACH SECTION
- IDENTIFIES TO EACH LEVEL IN ORGANIZATION WHAT THEIR RESPONSIBILITIES ARE AND HOW THEY TIE TO DEPARTMENTAL/SITE/CORPORATE OBJECTIVES
- EXPECTATIONS WILL ALSO TIE TO PERSONAL PERFORMANCE EVALUATIONS AND TO BUSINESS PLAN
- TOTAL EMPLOYEE BUY-IN PART OF PROGRAM

G. PERFORMANCE AND BACKLOG INDICATORS

- STANDARDIZING PERFORMANCE AND QUALITY INDICATORS AS PART OF TVA NUCLEAR PROCESS IMPROVEMENTS
- TYING PERFORMANCE TO INDIVIDUAL EVALUATIONS
- ESTABLISHING UPFRONT COMMODITIES IN ALL DEPARTMENTS WITH BACKLOG POTENTIAL
  - IDENTIFYING PROCESS TO CONTROL THEM
  - ESTABLISHING OPERATIONALLY ACCEPTABLE GOALS
  - ENSURING MANAGEMENT VISIBILITY
  - BACKLOG REDUCTION BUILT INTO OUR COMPLETION PLAN
- GOOD PERFORMANCE IN MANAGING BACKLOG ON PLANT OWNED SYSTEMS

H. PERSONNEL PERFORMANCE IMPROVEMENT

- ANALYZING NOV/CAQ DATA TO IDENTIFY CONTRIBUTING CAUSES
- FOCUSING EFFORTS TOWARD PROBLEM PROCESS/ORGANIZATIONS
- SENIOR MANAGEMENT INVOLVEMENT
- RE-ENFORCING QUESTIONING ATTITUDE AND USER FRIENDLY ROOT CAUSE TOOLS
- USING T.E.A.M. (TOGETHER EVERYONE ACCOMPLISHES MORE) MEETINGS, SHIFT BRIEFINGS, SECTION MEETINGS, TO COMMUNICATE LESSONS LEARNED

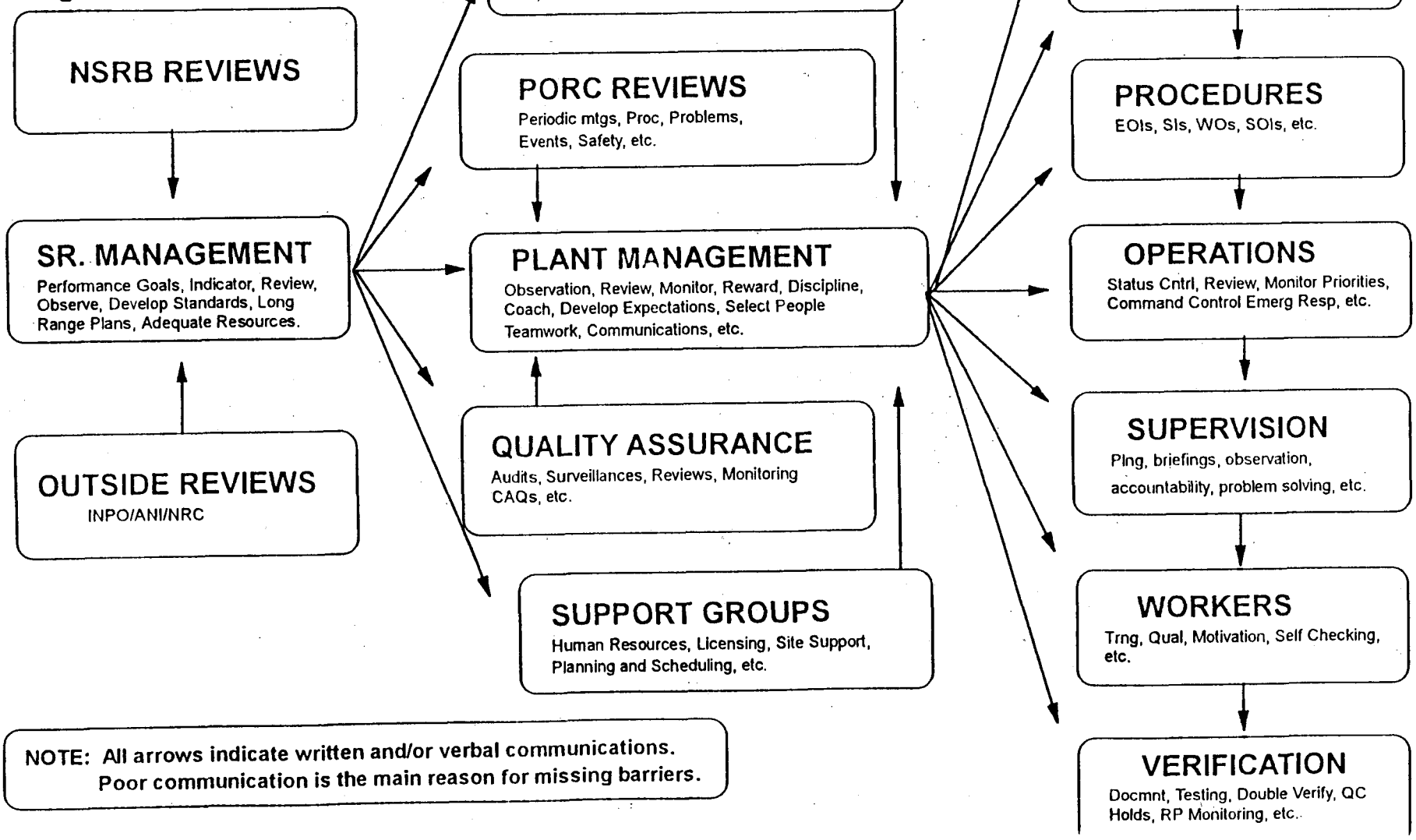
NUCLEAR QUALITY ASSURANCE:

Methodology Of Ensuring Adequate Barrier In Place (Defense In Depth)

Sr. Mgmt Responsibility Is To Review Plant Mgmt

Plant Management Responsibility Is To Ensure Adequate Barriers Are In Place & Working

Barriers To Prevent Bad Things From Happening



NOTE: All arrows indicate written and/or verbal communications. Poor communication is the main reason for missing barriers.

EVENT BARRIER ANALYSIS

EVENT: **Deenergization of 120V AC Vital Board During Diesel Testing (3/25/94) - II-94-011**

During hot functional testing (HFT) automatic diesel generator (D/G) 1A-A loading test, the 120V AC Vital Instrument Power Boards 1-II and 2-II unexpectedly lost power. This event was the result of a charger power supply transfer switch being in an incorrect position.

PROBLEMS/ISSUES (Cause of failure or missing barrier)	**BARRIERS**	**CORRECTIVE ACTIONS** (Strengthen or added barriers)
• Equipment Operated as designed.	**EQUIPMENT**	
• Sys 236 was not required to be controlled per PAI-2.10, "Sys and Equip Status Control Prior to Fuel Load."	**ADMINISTRATIVE**	• PAI-2.10 was changed to control Sys 236 position of vital power transfer switches. • Ensured all systems required to support HFT are controlled by PAI-2.10
• TOP for Sys 236 was based on old SOI and contained wrong alignment of vital power transfer switches. • Some Sys 236 were being controlled by Sys 235 SOI • Test procedure did not provide sufficient guidance on power supplies alignment.	**PROCEDURES**	• TOP 236.02 was revised to reflect correct switch position. • Reviewed TOPs to ensure base on latest SOIs. • Revised SOI-235 to delete System 236 components.
• Alignment changes were made to 480V breakers without being statused in the off normal position. • There was inadequate time for the Ops crew to prepare for the test.	**OPERATIONS**	• SOI-236.02 checklist was performed and status file was updated. • Sampled other components to verify system status file. • Provide at least 24 hour for Operations to prepare for test.
• Since the ASOS was actually doing the field alignment there is no supervisor to check worker.	**SUPERVISION**	
• Insufficient attention by ASOS who lead task of verifying power supply alignments. • SUT and Operations personnel did not stop when there was insufficient procedural guidance.	**WORKERS**	• Counselled ASOS on importance of self-verification and STAR principals. • Clarified to SUT and Operations personnel the expectation for test procedure to specify alignments.
• The use of independent verification (IV) could have precluded the mispositioned switch.	**VERIFICATION**	• Operations to implement IV for safety-related checklists performed after 4/1/94.

EVENT BARRIER ANALYSIS

EVENT: **Operation of Main Turbine With Exciter Cooling Isolated (5/12/94) - II-94-018**

During testing of Unit 1 turbine, it was tripped upon discovery of exciter housing temperature increase due to operation at 1800 RPM without exciter cooling water in service. Test prerequisites were not specific on support system alignment. TOP was available for raw cooling water alignment, but not totally completed. Off Normal Deviation Log showed exciter cooling water isolated, but not reviewed before test.

PROBLEMS/ISSUES (Cause of failure or missing barrier)	BARRIERS	CORRECTIVE ACTIONS (Strengthen or added barriers)
• Raw cooling water leak inside exciter was reason cooling was isolated.	**Equipment**	• Fixed Leak
• Ops concurrence not required for verification of sys alignment. • Inadequate Corrective Action Program since WBNFIR930132311 called out (8/26/93) that test directors were not conducting proper prerequisite verifications.	**Administrative**	• SUT will revise SMP-9.0 to require verifying system alignment with Operations prior to signing test.
• Test prerequisites were not specific on required supporting systems alignments.	**Procedures**	• ATIs & PTIs will be revised to specify respective TOP or SOI for Operation.
• Failure to adequately verify support system alignment per TOP. • Off Normal Deviation Log was not reviewed before test and log was incorrect for other components.	**Operations**	• Ensure Operations is involved/consulted for system prerequisite signoffs.
• No mention made of exciter cooling being isolated in pre-job briefing even though some people knew.	**Supervision**	
• SUT personnel signed off test prerequisites that raw cooling water was in service to support test. • @520 RPM roll test procedure not changed and not noted in test log to allow isolation of exciter cooling as required.	**Workers**	• Communicate to SUT the revised prerequisite sign off requirements.
	Verification	

I. SEQUOYAH LESSONS LEARNED

- SEQUOYAH FOCUS AREAS
  - •PROGRAMS
  - •OPERATION
  - •BACKLOG
  - •PEOPLE/ORGANIZATION/CULTURE
  - •CORP/SITE INTERFACE
  - •BALANCE OF PLANT

- SPECIFIC SEQUOYAH REVIEWS
  - •400 EQUIPMENT
  - •250 PEOPLE/PROGRAM

J. DEPARTMENT ACTION ITEMS

- OPEN ITEM TRACKING SYSTEMS

K. ADDITIONAL ACTIVITIES

- 1A-A RHR SEAL REPLACEMENT TO BE PERFORMED UNDER SIMULATED RCA/LCO TIMECLOCK CONDITIONS
- OCTOBER 1994, START RCA MOCK-UP WORK
- MINI HFT UNDER OPERATIONS CONTROL
- NEW "D" INSTRUMENT AIR COMPRESSOR BEING INSTALLED TO IMPROVE RELIABILITY

III. OPERATIONAL READINESS CONCLUSIONS

J. SCALICE

OPERATIONAL READINESS CONCLUSIONS

- EXPERIENCE SHOWS FOCUS NEEDS TO BE ON PEOPLE
  - OPERATIONAL READINESS MORE THAN "NOTEBOOKS"
  - MEETING EXPECTATIONS, TEAMWORK, PERFORMANCE
- SEEING EVIDENCE OF OPERATIONAL MENTALITY
  - COORDINATION IMPROVING
  - SENSE OF URGENCY
  - COMMUNICATIONS
- PAPER PROGRAMS ON TRACK
- TRAINING AND STAFFING IN GOOD SHAPE
- PEOPLE WILL BE READY!
- OVERSIGHT
  - OPERATIONAL READINESS MANAGEMENT REVIEW TEAM
  - NUCLEAR SAFETY REVIEW BOARD
  - QA ASSESSMENTS
  - CORPORATE OPERATIONAL READINESS REVIEW (ORR)
  - INPO NTOL REVIEW

IV. PREOPERATIONAL TESTING

M. BAJESTANI

ASSESSMENT OF MAJOR TESTING

- SEVERAL MAJOR TESTS COMPLETE OR IN PROCESS
  - HOT FUNCTIONAL TESTING
  - CONTAINMENT INTEGRATED LEAK RATE TEST
  - OPEN VESSEL TESTING
  - DIESEL GENERATOR TESTING
- TESTING HAS BEEN SUCCESSFUL WITH FEW SIGNIFICANT HARDWARE ISSUES
- NUMBER AND TYPE OF PROBLEMS IDENTIFIED ARE COMMENSURATE WITH OTHER PLANT STARTUPS AND ARE BEING CORRECTED

SPECIFIC HARDWARE ISSUES
(IDENTIFIED DURING TESTING IN 1994)

CATEGORY I - EQUIPMENT TESTED IN BOTH 1994 AND IN OLD TEST PROGRAM (PRE-1985)

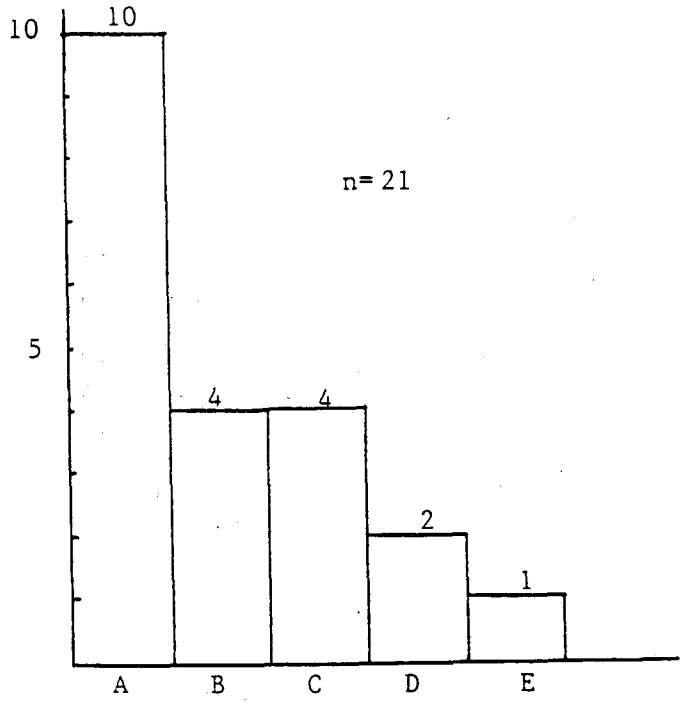
- STEAM GENERATOR SAFETY VALVE LEAKAGE
- POSITIVE DISPLACEMENT CHARGING PUMP VIBRATION
- PRESSURIZER LEVEL CONTROL
- PRESSURIZER SAFETY VALVES (LEAKAGE & SET POINTS)
- RESIDUAL HEAT REMOVAL PUMP 1B-B SEIZURE
- MOTOR DRIVEN AUXILIARY FEEDWATER PUMP FLOW CONTROL
- CILRT TEMPERATURE STABILIZATION
- ECCS PUMP PERFORMANCE ISSUES (SIS, RHR, CCP)
- CENTRIFUGAL CHARGING PUMP 1A-A VIBRATION
- ECCS FLOW BALANCE TEST
- AUXILIARY FEEDWATER LEVEL CONTROL VALVES
- SGBD VALVE LEAKAGE AND POSITION INDICATOR RELIABILITY
- DIESEL GENERATOR 1B-B BEARING INSULATION FAILURE

CATEGORY II - EQUIPMENT TESTED IN 1994 ONLY

- TURBINE DRIVEN AUX. FEEDWATER PUMP RELIABILITY
- RHR CROSS-TIE VALVES (FAILURE TO OPEN)
- MAIN TURBINE MECHANICAL OVERSPEED TRIP

HARDWARE ISSUES	DESIGN	OPERATIONS	EQUIPMENT FAILURE	TEST SETUP/ PROCESS	CRITERIA CHANGE
STEAM GENERATOR SAFETY VALVE LEAKAGE	X			X	
POSITIVE DISPLACEMENT CHARGING PUMP VIBRATION	X				
PRESSURIZER LEVEL CONTROL	X				
PRESSURIZER SAFETY VALVES (LEAKAGE & SET POINTS)	X	X			
RESIDUAL HEAT REMOVAL PUMP 1B-B SEIZURE		X	X		
MOTOR DRIVEN AUXILIARY FEEDWATER PUMP FLOW CONTROL	X				
CILRT TEMPERATURE STABILIZATION				X	
ECCS PUMP PERFORMANCE ISSUES (SIS, RHR, CCP)					X
CENTRIFUGAL CHARGING PUMP 1A-A VIBRATION	X				
ECCS FLOW BALANCE TEST				X	
AUXILIARY FEEDWATER LEVEL CONTROL VALVES	X				
SGBD ISOLATION VALVE LEAKAGE & POSITION INDICATOR RELIABILITY			X	X	
DIESEL GENERATOR 1B-B BEARING INSULATION FAILURE			X		
TURBINE DRIVEN AUX. FEEDWATER PUMP RELIABILITY	X		X		
RHR CROSS-TIE VALVES (FAILURE TO OPEN)	X				
MAIN TURBINE MECHANICAL OVERSPEED TRIP	X				

CAUSAL FACTORS
ALL TEST HARDWARE ISSUES - CATEGORY 1 AND 2



A - DESIGN
B - TEST SETUP/PROCESS
C - EQUIPMENT FAILURE
D - OPERATIONS
E - CRITERIA CHANGE

ANALYSIS OF 16 SPECIFIC HARDWARE ISSUES

- 16 ISSUES OF SIGNIFICANT INTEREST
  - 13 TESTED DURING ORIGINAL PREOP PROGRAM (PRE-1985)
  - 3 NEWLY TESTED AREAS (e.g., AFW ENDURANCE, ETC.)

- MAJORITY OF ISSUES (10 OF 13) NOT EXPERIENCED DURING ORIGINAL TEST PROGRAM DUE TO CHANGING CONDITIONS:
  - DESIGN CHANGES (6 OF 10)
  - EQUIPMENT FAILURE (2 OF 10)
  - TEST SETUP/PROCESS (1 OF 10)
  - CHANGE IN CRITERIA (1 OF 10)

- INSUFFICIENT AWARENESS OF PREVIOUS TESTING FOR 3 OF 13 ISSUES (EFFICIENCY CONCERN)
  - CILRT
  - SG SAFETIES
  - SG BLOWDOWN VALVE POSITION INDICATION

TEST CONDUCT LESSONS LEARNED

STARTUP PROGRAM

AS A RESULT OF HFT AND OTHER RECENT TESTING, IMPROVEMENTS WERE NEEDED AND ARE BEING ACHIEVED IN THE FOLLOWING AREAS:

- TEST BRIEFINGS
- SYSTEM READINESS WALKDOWNS
- TEST PROCEDURE QUALITY
- SHIFT TEST COORDINATION
- OPERATIONS INTERFACE
- ASSIGNED SRO TO SUT

SPECIFIC HARDWARE TEST LESSONS

- IMPORTANCE OF EVALUATING PREVIOUS TEST PROCEDURES AND RESULTS FOR MAJOR TESTING

- ELEMENTS OF PLANNED REVIEW

  - IDENTIFY RECENT ACCEPTANCE CRITERIA CHANGES THAT MAY PRECIPITATE A TEST DEFICIENCY

  - IDENTIFY POTENTIAL RECURRENT TEST DEFICIENCIES

  - IDENTIFY MAJOR EQUIPMENT MODIFICATIONS SINCE 1985 WHICH COULD PRECIPITATE TEST DIFFERENCES

CATEGORY I - EQUIPMENT TESTED IN BOTH 1994 AND IN OLD TEST PROGRAM (PRE-1985)

STEAM GENERATOR SAFETY VALVE LEAKAGE

PROBLEM - SAFETY VALVES SIMMERED AT PRESSURE

COMPARISON - SIMILAR PROBLEMS WERE EXPERIENCED WITH SAFETY VALVE LEAKAGE AND SIMMERING DURING THE PREVIOUS TEST PROGRAM

CAUSE (DESIGN) - SAFETY VALVES SET BY VENDOR AT AN INCORRECT AMBIENT TEMPERATURE

TEST STATUS - THE FOUR VALVES WILL BE RE-TESTED

NON-SAFETY POSITIVE DISPLACEMENT CHARGING PUMP

PROBLEM - MANUAL PUMP SHUTDOWN DUE TO HIGH NOISE/VIBRATION

COMPARISON

PROBLEM NOT IDENTIFIED DURING PREVIOUS TESTING PROGRAM

VENTING AND PUMP RUN TIME VARIED BETWEEN TEST PROGRAMS

CAUSE (DESIGN) - GAS BINDING DUE TO MARGINAL SUCTION PIPING DESIGN AND GAS ACCUMULATION IN SUCTION AND DISCHARGE ACCUMULATORS

TEST STATUS - RETEST DURING NEXT HEATUP

PRESSURIZER LEVEL CONTROL

PROBLEMS

(1) MAKEUP AND SEAL INJECTION FLOW COULD NOT BE CONTROLLED AT LOW RCS PRESSURE

(2) INADEQUATE COOLING FLOW TO REGENERATIVE HEAT EXCHANGER DURING LEVEL TRANSIENT

COMPARISON

PROBLEMS NOT IDENTIFIED DURING PREVIOUS TEST PROGRAM

MECHANICAL VALVE STOP IMPLEMENTED AND SCALING OF SEAL FLOW INSTRUMENTS MODIFIED SINCE PREVIOUS TEST PROGRAM.

CAUSE (DESIGN):

(1) INSUFFICIENT DESIGN FOR MECHANICAL VALVE-STOP ON FCV-62-93

(2) CONTROL ROOM INDICATIONS OF SEAL FLOW INCORRECTLY SCALED RESULTING IN EXCESSIVE SEAL FLOW

TEST STATUS - RETEST DURING NEXT HEATUP

PRESSURIZER SAFETY VALVES (LEAKAGE AND SETPOINTS)

PROBLEMS

(1) ONE VALVE LEAKED SLIGHTLY DURING INITIAL HEATUP
(2) ONE VALVE LIFTED ABOVE 2400 PSIG

COMPARISON

PROBLEMS NOT IDENTIFIED DURING PREVIOUS TEST PROGRAM

PIPING DESIGN AND VALVE INTERNALS HAVE CHANGED

CAUSE (DESIGN AND OPERATIONS)

VENDOR LEAK TIGHT CRITERIA WAS AT 92% VS. 95% SET PRESSURE AND VALVES EXPOSED TO A TEMPERATURE TRANSIENT DURING HEATUP

SAFETY VALVES SET BY VENDOR AT AN INCORRECT AMBIENT TEMPERATURE RESULTING IN DECREASED SETPOINT; ACTUAL RCS OPERATING PRESSURE SLIGHTLY EXCEEDED TEST CONDITIONS

TEST STATUS - PRESSURIZER SAFETIES WILL BE OBSERVED DURING NEXT HEATUP.

RESIDUAL HEAT REMOVAL PUMP 1B-B SEIZURE

PROBLEM - PUMP FAILED TWICE DUE TO RAPID CONTACT OF WEAR RING WITH IMPELLER.

COMPARISON

NO PUMP FAILURES OCCURRED DURING PREVIOUS HOT FUNCTIONAL TESTS.

DIFFERENCES IN METHOD OF BRINGING RHR ON LINE AND CHANGES IN VENTING PROCEDURES CONTRIBUTED TO THE FAILURE.

CAUSE (OPERATIONS & EQUIPMENT FAILURE) - SYSTEM VOIDS DUE TO POOR VENTING COUPLED WITH THERMAL TRANSIENT AND MARGINAL CLEARANCES

TEST STATUS

PUMP RUN SUCCESSFULLY; TESTING AT 350 F WILL BE PERFORMED DURING THE NEXT HEATUP.

MOTOR DRIVEN AFW PUMP FLOW CONTROL

PROBLEM - FLOW AND PRESSURE CONTROL VALVES BECAME UNSTABLE AT LOW FLOW

COMPARISON

STABILITY PROBLEMS NOT OBSERVED DURING PREVIOUS TEST PROGRAM

MODIFICATION CHANGED PRESSURE CONTROL VALVE FROM ELECTRO-HYDRAULIC TO ELECTRO-PNEUMATIC SINCE PREVIOUS TEST PROGRAM

CAUSE (DESIGN)

MAIN CONTROL VALVE TOO LARGE FOR STABLE FLOW CONTROL AT LOW FLOW AND INTERMEDIATE STEAM GENERATOR PRESSURE

SCALING OF PRESSURE CONTROL INSTRUMENTATION RESULTED IN SLOW RESPONSE TIME DURING PUMP START

TEST STATUS - RETEST DURING NEXT HEATUP

CILRT TEMPERATURE STABILIZATION

PROBLEM - DURING CILRT, THE ICE CONDENSER AIR HANDLING UNIT (AHU) MOTORS TRIPPED ON THERMAL OVERLOAD

COMPARISON - SIMILAR PROBLEMS WERE EXPERIENCED AT THE BEGINNING OF THE PREVIOUS CILRT

CAUSE (TEST PROCESS) - INCREASED AIR DENSITY DURING ILRT OVERLOADED FANS

TEST STATUS - TEST SUCCESSFULLY COMPLETED

ECCS PUMP PERFORMANCE ISSUES (SIS, RHR, CCP)

PROBLEM - ECCS PUMP PERFORMANCE DID NOT MEET ACCEPTANCE CRITERIA

COMPARISON

UNDER THE PREVIOUS TEST PROGRAM, THE HYDRAULIC PERFORMANCE FOR ALL SIX ECCS PUMPS MET THE EXISTING ACCEPTANCE CRITERIA.

THE ECCS PUMP PERFORMANCE ACCEPTANCE CRITERIA HAS BEEN CHANGED TO BE MORE RESTRICTIVE; NO PUMP DEGRADATION OCCURRED

CAUSE - CHANGE IN ACCEPTANCE CRITERIA

TEST STATUS - ALL ECCS PUMPS SUCCESSFULLY RETESTED

CENTRIFUGAL CHARGING PUMP VIBRATION 1A-A

PROBLEM - OUTBOARD BEARING HOUSING VIBRATION EXCEEDED DESIGN REQUIREMENTS

COMPARISON

VIBRATION PROBLEMS NOT IDENTIFIED DURING PREVIOUS TEST PROGRAM

MODIFICATIONS HAVE BEEN MADE TO PUMP PEDESTAL

CAUSE (DESIGN) - INSUFFICIENT CONSIDERATION OF PEDESTAL STIFFNESS DURING MODIFICATIONS

TEST STATUS - POST MODIFICATION TESTING WITHOUT TEMPORARY WEIGHTS WILL BE PERFORMED TO CONFIRM RESOLUTION OF VIBRATION PROBLEMS.

EMERGENCY CORE COOLING SYSTEM (ECCS) FLOW BALANCING

PROBLEM - INITIAL INABILITY TO OBTAIN REQUIRED FLOW RATES

COMPARISON - PROBLEMS NOT IDENTIFIED WITH FLOW BALANCING DURING PREVIOUS TEST PROGRAM

CAUSE (TEST PROCESS) - STARTUP TEST INSTRUMENTATION PROBLEMS AND TESTING PROCEDURE

TEST STATUS - FLOW BALANCE SUCCESSFUL

AUX. FEEDWATER LEVEL CONTROL VALVES

PROBLEM - RESPONSE TIME EXCEEDED REQUIRED TIME

COMPARISON

PROBLEMS NOT IDENTIFIED WITH RESPONSE TIME IN PREVIOUS TEST PROGRAM

N_2 CONTROL SYSTEM WAS ADDED SUBSEQUENT TO PREVIOUS TESTING

CAUSE (DESIGN) - CONTROL AIR FLOW WAS RESTRICTED BY AN N_2 ISOLATION VALVE

TEST STATUS - STROKE TIME TESTING SUCCESSFULLY COMPLETED

SGBD ISOLATION VALVE LEAKAGE AND POSITION INDICATOR RELIABILITY

PROBLEMS

(1) BLOWDOWN ISOLATION VALVE LEAKAGE AT PRESSURE
(2) CHANGES IN POSITION INDICATION WITH TEMPERATURE CHANGE

COMPARISON

(1) PREVIOUS TEST IDENTIFIED NO LEAKAGE PROBLEM
(2) POSITION INDICATION PROBLEMS IDENTIFIED

CAUSE

(1) EQUIPMENT FAILURE - APPEARS TO BE EQUIPMENT DEGRADATION
(2) TEST SETUP - EXTREME SENSITIVITY OF SETTING TO TEMPERATURE CHANGES

TEST STATUS - VALVES WILL BE RE-TESTED DURING NEXT HEATUP

DIESEL GENERATOR 1B-B BEARING INSULATION FAILURE

PROBLEM - FAILURE OF BEARING INSULATION ON THE CONNECTION END OF 1B-B GENERATOR

COMPARISON - FAILURE DID NOT OCCUR DURING PREVIOUS TESTING

CAUSE (DESIGN) - PRELIMINARY DETERMINATION FINDS THAT THE INSTALLED INSULATION FAILED TO MEET DESIGN REQUIREMENT

TEST STATUS - THE REMAINING DGs ARE NOT AFFECTED. TESTING COMPLETE FOR THIS DIESEL GENERATOR

CATEGORY II - EQUIPMENT TESTED IN 1994 ONLY

TURBINE DRIVEN AUXILIARY FEEDWATER PUMP ENDURANCE

PROBLEM - PUMP DID NOT SUCCESSFULLY COMPLETE THE 48 HOUR ENDURANCE RUN

COMPARISON - ENDURANCE TESTING WAS NOT PERFORMED PREVIOUSLY.

CAUSE (DESIGN AND EQUIPMENT FAILURE) - CONTROLLER PROBLEMS, STEAM LEAKS, AND FAILURE OF STEAM TRAPS

TEST STATUS - TESTING WILL BE SCHEDULED DURING THE NEXT HEATUP

RHR CROSS TIE VALVES (FAILURE TO OPEN)

PROBLEM - RHR CROSS TIE MOV's TRIPPED THERMAL OVERLOADS DURING TESTING

COMPARISON - GL 89-10 TESTING NOT PERFORMED DURING THE PREVIOUS TEST PROGRAM

CAUSE (DESIGN) - POTENTIAL FOR BONNET OVERPRESSURIZATION LOCKING EXISTS WHEN GOING FROM MODE 4 TO MODE 3

TEST STATUS

GL 89-10 TEST SUCCESSFULLY COMPLETED

POST MODIFICATION TESTING WILL BE PERFORMED FOLLOWING VALVE BONNET MODIFICATION

MAIN TURBINE MECHANICAL OVERSPEED TRIP

PROBLEM - MECHANICAL OVERSPEED TRIP SETPOINT SET TO 111% VS. 110%.

COMPARISON - MECHANICAL OVERSPEED TEST NOT PERFORMED IN THE PREVIOUS TEST PROGRAM

CAUSE (DESIGN) - THE CHANGE TO 110% FAILED TO IMPLEMENT AN APPROVED VENDOR DESIGN CHANGE

TEST STATUS - WILL BE RETESTED

SUMMARY

- TESTING IS COMPREHENSIVE AND IS IDENTIFYING ISSUES AS EXPECTED - FEW SIGNIFICANT HARDWARE ISSUES
- MAJORITY OF HARDWARE ISSUES IDENTIFIED DUE TO CHANGES IN DESIGN SINCE ORIGINAL TESTING
- DEMONSTRATES PRUDENCE AND REASON FOR TVAs DECISION TO REPERFORM PREOPERATIONAL TEST PROGRAM
- PERFORMANCE OF TEST GROUP AND SUPPORT STAFFS HAS IMPROVED
- IMPROVED PERFORMANCE NEEDED TO ANTICIPATE PAST RECURRING TEST PROBLEMS
- CURRENT SCHEDULE IS ACHIEVABLE

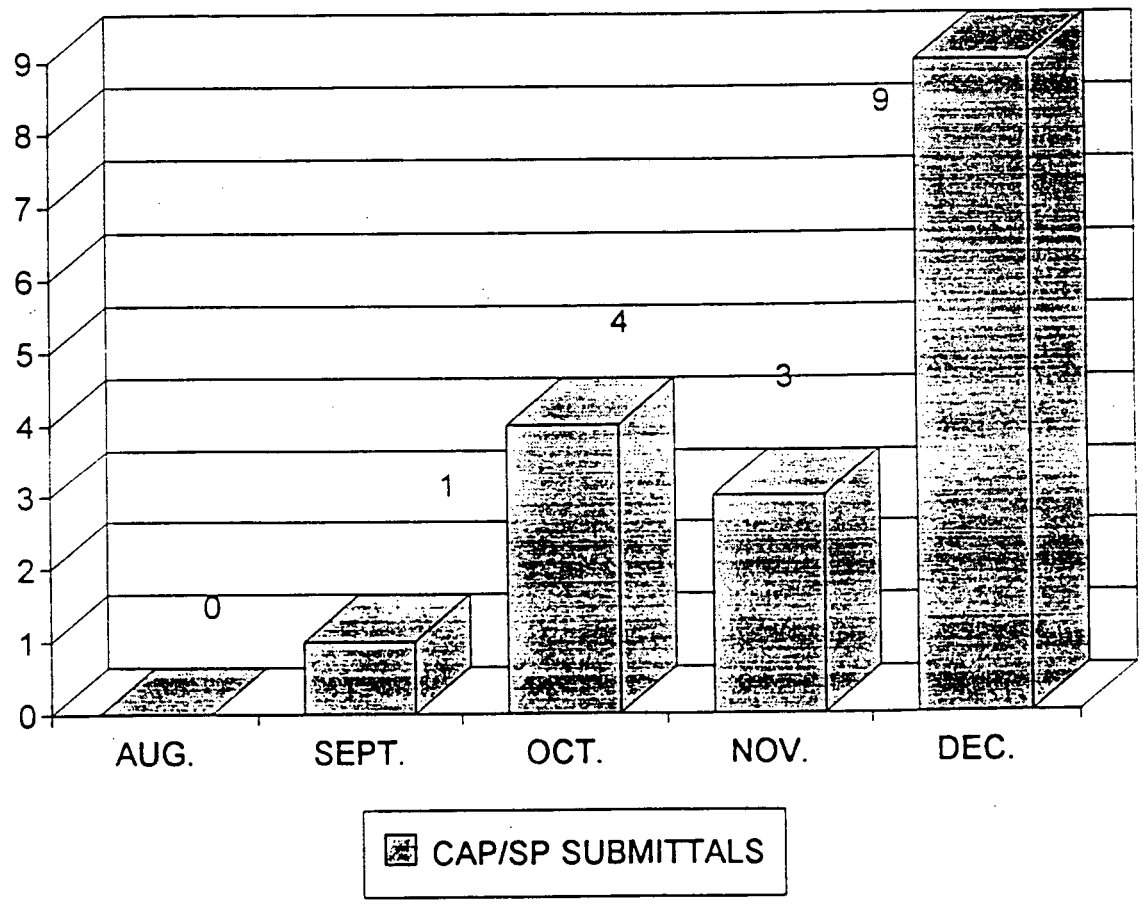
V. CORRECTIVE ACTION PROGRAMS/SPECIAL PROGRAMS

M. SKAGGS

CURRENT CORRECTIVE ACTION PROGRAM (CAP)/SPECIAL PROGRAM STATUS

- 75% SUBMITTALS ARE COMPLETE (RADIATION MONITORING STATUS UNDER REVIEW)
- 100% SUBMITTALS ARE IN PROGRESS (17 OF 28 TO GO)

REMAINING CAP/SP SUBMITTALS FOR WBN



WATTS BAR NUCLEAR PLANT
CAP/SP COMPLETION STATUS AS OF 8/29/94

Corrective Action Program (CAP) or Special Program (SP)	75%		100% Final Report w/ Punchlist	
	TVA	NRC	TVA	NRC
Cable Issues	Complete	Complete	Dec-94	Dec-94
Cable Tray and Cable Tray Supports	Complete	Oct-94	Dec-94	Jan-95
Concrete Quality	Not Required	Not Required	Complete	Closed
Containment Cooling	Complete	Complete	Complete	Jan-95
Design Baseline and Verification Program	Complete	Complete	Oct-94	Jan-95
Detailed Control Room Design Review	Not Required	Not Required	Dec-94	Dec-94
Electrical Conduit and Conduit Supports	Complete	Sep-94	Dec-94	Jan-95
Electrical Issues	Complete	Complete	Dec-94	Dec-94
Environmental Qualification	Complete	Not Required	Nov-94	Nov-94
Equipment Seismic Qualification	Complete	Complete	Oct-94	Jan-95
Fire Protection (Appendix R)	Complete	Not Required	Dec-94	Jan-95
Hanger and Analysis Update Program	Complete	Complete	Dec-94	Jan-95
Heat Code Traceability	Not Required	Not Required	Complete	Closed
HVAC Duct and Duct Supports	Complete	Complete	Dec-94	Jan-95
Instrument Lines	Complete	Complete	Dec-94	Jan-95
Master Fuse List	Complete	Complete	Complete	Closed
Mechanical Equipment Qualification	Complete	Not Required	Nov-94	Nov-94
Microbiologically Induced Corrosion	Complete	Complete	Complete	Closed
Moderate Energy Line Break	Complete	Complete	Oct-94	Jan-95
Q-List	Complete	Complete	Complete	Closed
QA Records	Complete	Complete	Complete	Closed
Radiation Monitoring	Complete	Ongoing	Oct-94	Dec-94
Replacement Items (Piece Parts)	Complete	Complete	Nov-95	Jan-95
Seismic Analysis	Not Required	Not Required	Complete	Closed
Soil Liquefaction	Not Required	Not Required	Complete	Closed
Use-As-Is CAQ's	Not Required	Not Required	Complete	Closed
Vendor Information	Complete	Complete	Sep-94	Jan-95
Welding Issues	Not Required	Not Required	Complete	Ongoing
TVA To Go TVA Complete or Not Required	0 28 of 28		17 11 of 28	
NRC To Go NRC Inspections Ongoing NRC Complete or Not Required		2 1 25 of 28		18 1 9 of 28

NRC CAP INSPECTION RESULTS

CAP/SP (Results)	NRC INSPECTION RESULTS				NRC FINDING	IMPACTED CAP OBJECTIVE	WBN PROGRAMMATIC RESOLUTION
	OVERALL	ENGR.	MODS	QA			
Legend	Objectives met			Objectives being met, but some implementation problems		Some objectives not completely met	
Control Room Design Review (1 Sat. out of 1 Cap Obj.)					None	None	None
Concrete Quality (2 Sat. out of 2 Cap Obj.)					None	None	None
Replacement Parts (6/92) (1 Sat. out of 1 Cap Obj.)					None	None	None
Soil Liquefaction (2 Sat. out of 2 Cap Obj.)					None	None	None
Use-as-is CAQs (5 Sat. out of 5 Cap Obj.)					None	None	None
Master Fuse List (4/93) (3 Sat. out of 3 Cap Obj.)					None	None	None
Containment Cooling (2 Sat. out of 2 Cap Obj.)					None	None	None
Moderate Energy Line Break (2 Sat. out of 2 Cap Obj.)					None	None	None
Heating, Ventilation and Air Conditioning (3 Sat. out of 3 Cap Obj.)					None	None	None
Q-List (2 Sat. out of 2 Cap Obj.)					None	None	None
QA Records (5 Sat. out of 5 Cap Obj.)					None	None	None

NRC CAP INSPECTION RESULTS

CAP/SP (Results)	NRC INSPECTION RESULTS OVERALL	ENGR.	MODS	QA	NRC FINDING	IMPACTED CAP OBJECTIVE	WBN PROGRAMMATIC RESOLUTION
Legend	■ Objectives met			□	Objectives being met, but some implementation problems	■ Some objectives not completely met	
Hanger Analysis and Update Program (2 Sat. out of 3 Cap Obj.)		■			Failure to follow procedures (walkdown issues) - (21 discrepant hanger attributes out of @10,000 inspectable attributes) TVA Resolution Date - Complete	o Verify Structural adequacy of piping and pipe supports	o Project Personnel to confirm Quantity and Quality of implementation o Identified internal process for establishing CAP/SP subissues to maintain focus and schedule compliance o Reinforce Quality Assessment Team with Line Organization personnel
Design Baseline Verification Program (3 Sat. out of 5 Cap Obj.)		■	■		Discrepancies found in Design Basis Documents and Configuration Control Drawings (Needle Valve extent of condition was found to be isolated; NRC Inspection Report 93-066 states,"... Overall implementation of DBVP was good") TVA Resolution Date - 9/94	o Design Basis verification o Configuration Control	
Equipment Seismic Qualification (0 Sat. out of 2 Cap Obj.)		■	■		Failure to follow procedures and inadequate design control (2 deficient attributes out of 67 field attribute inspections) TVA Resolution Date - 10/94	o Adequate qualification of equipment o Equipment qualification is in compliance with WBN criteria	
Vendor Information (1 Sat. out of 2 Cap Obj.)					Failure to follow procedures (NRC Inspection Report 93-027 states,"VTMs reviewed were extensive in detail, of good quality...") TVA Resolution Date - 9/94	o Resolve and prevent recurrence of vendor information problems	
Replacement Parts (7/94) (Inspection Report Not Issued)		■	■		No items cited to date	o No items cited to date	
Radiation Monitoring (Inspection Report Not Issued)					Inspection underway	o Verify adequacy of Radiation Monitoring System design	

NRC CAP INSPECTION RESULTS

CAP/SP (Results)	NRC INSPECTION RESULTS				NRC FINDING	IMPACTED CAP OBJECTIVE	WBN PROGRAMMATIC RESOLUTION
	OVERALL	ENGR.	MODS	QA			
Legend	Objectives met			Objectives being met, but some implementation problems		Some objectives not completely met	
Master Fuse List (8/92) (1 Sat. out of 3 Cap Obj.)					Inadequate design control and failure to thoroughly review and assess adequacy of corrective actions (100% re-verification of MFL and pen. protection completed and a 2 - 3% discrepancy rate was identified) TVA Resolution Date - Complete	o Single Comprehensive Fuse List o Resolve Penetration Protection Issues	o Established method and process for conducting Quality assessment of CAP/SPs prior to NRC notification
Instrument Sense Lines (3 Sat. out of 5 Cap Obj.)					Inadequate Slope and Support Discrepancies (5 instrument support discrepancies out of 188 inspected; 40 ft. of instr. line with discrepancies out of 1500 ft. inspected) TVA Resolution Date - 12/94	o Sense Line slope o Verify structural adequacy of Instrument Supports	o Conduct the Quality Assessment near term to the submittal of NRC review o Conduct additional field inspections to verify objective of CAP/SP satisfied
Electrical Issues (5 Sat. out of 7 Cap Obj.)					Inadequate Conduit Separation and Flex Conduit Installations (100% Re-verification of Conduit Separation and Flex Conduit Installations) TVA Resolution Date - 12/94	o Raceway Separation o Flexible Conduit Installations	o Perform Cradle to Grave reviews to verify adequacy of implementation o Augment Assessment reviews with Line Organization expertise o Defined Inspection support teams o Established plan to expedite the resolution of NRC questions o Disseminate Line Organization problems as lessons learned o Issued site bulletin on CAP/SP Issue Awareness
Cable Issues (7 Sat. out of 10 Cap Obj.)					Failure to implement vertical drop requirements, inadequate design input and differences between field and CCRS (6 out of 14 vertical support inspections were acceptable; no field installation changes req'd for CCRS or SBP) TVA Resolution Date - 12/94	o Cable Support in Vertical Tray and Conduit o Cable Sidewall Bearing Pressure o CCRS Database and Verification and Validation	

CAP/SP Closure

- Remaining Closure Process should involve two steps
  1) Preparation for 100% Inspection
  2) CAP/SP Closure Certification

- 100% Inspection and Closure Certification Criteria

  100% Inspection

  o 75% Inspection complete and found to be adequate

  o Essentially all Field work complete (remaining items are repetitive tasks)

  o All CAP/SP issues have been implemented to the point that compliance can be demonstrated

  Closure

  o No unresolved 100% NRC Inspection issues

  o Selected testing, modifications and Corrective Action Documents open as a result of schedule restraints or plant evolutions (Any remaining items would be tracked by the schedule)

- Examples of CAP/SP Completion status at both points:

CAP/SP	100% Inspection	CAP/SP Closure
Control Room Design Review	o Field Work Complete o @ 25 open out of 117 HED's o Certain documentation closure packages will remain open (For example, corrective action step #4 for WBSCA940010 to correct deficiencies associated with HED field inspection will not be completed until 11/28/94)	o Certain documentation closure packages will remain open
Radiation Monitoring	o Field Work Complete o Calibration and Testing ongoing o Certain documentation closure packages will remain open (For example, corrective action step 7 for WBP89036 to perform primary calibrations of liquid monitors cannot be closed until completion of calibration and testing scheduled for Nov. 30,1994)	o Calibration and testing ongoing o Certain documentation closure packages will remain open
Moderate Energy Line Break	o Field Work Complete excluding Conduit Seals being worked in accordance with Area Turnover Schedule o Certain documentation closure packages will remain open (For example, DCN-W20217 will not be field work complete for conduit seals in areas scheduled for turnover after Jan., 1995 - approx. 14 areas will remain with the DCN approx. 60% complete. Last area turn over is in early March 1995.)	Minor Area Punchlist items (i.e., conduit seals) o Certain documentation closure packages will remain open

CAP/SP Conclusion

- 75% Milestone process has been successful in early identification of problems

- Improved Line Organization preparation process and field verification will provide better assurance of quality

- Improved site focus on CAP/SP NRC Inspections and dedication of resources to resolve issues should facilitate successful future NRC Inspections

VI. CLOSING REMARKS

D. NUNN

ENCLOSURE 3
NRC STAFF OBSERVATIONS

WATTS BAR

HOT FUNCTIONAL TESTING SUMMARY

HFT began on April 4, 1994 and was concluded on June 8. During this testing period, equipment problems were encountered that require resolution, repair, and retesting. Examples are:

- Turbine driven AFW pump could not complete the 48 hour endurance run followed by a cooldown and restart. Two attempts were made to complete this test. At the end of HFT the turbine was apart for maintenance. The TDAFW pump must be repaired and retested prior to licensing.

- The B RHR pump malfunctioned on June 6, 1994, for the second time and could not be used to complete the PTI on RHR cooldown. This must be repaired and tested prior to licensing.

- The Motor driven AFW system experienced oscillations and the level control valves (LCV's) did not response in timely fashion to meet the requirements for adding water to the steam generators. Their response time was slow. This condition needs investigation, repair and retesting. Also, two of four LCV's on the TDAFW system opened slowly because of an incorrect modification. This issue needs resolution and retesting.

- Problems were experienced with the pressurizer pressure and level automatic controls during performance of the PTI. Automatic level control was slow to respond to an error signal and did not meet the acceptance criteria. Pressurizer PORVs opened early and pressurizer pressure control functions were inconsistent. These issues need resolution prior to licensing.

- Turbine bypass valves responded slowly and did not fully open in 3 seconds as designed. The slow response of the turbine bypass valves effects load reject capability for the plant. This issue needs resolution.

- Pressurizer and steam line safety valves experienced simmering and inconsistent lift settings. The safety valves should be removed and repaired.

- The positive displacement charging pump experienced high vibration and high temperatures and was removed from service. As a result, it was not available for much of HFT and was not fully tested. This issue requires resolution.

The following provide more details on the equipment problems encountered.

I. Analysis

The Watts Bar HFT test series took longer than the scheduled period and was completed on June 8, 1994. Most of the tests went very much as planned by the procedure, but some did not. With the exception of auxiliary feedwater and RHR, all equipment that was scheduled for test was tested.

Some of the equipment failures were beyond the control of TVA and could not have been predicted. For example the TDAFW pump could only be run for the first time with steam generated by HFT heatup. The RHR pump had run well when first started up and the exact cause of the its failure had not been determined at completion of HFT, but may have been caused by the introduction of hot water to the pump suction. Further testing, after repairs, is required to demonstrate that the pump is capable of operating through thermal transients.

The MDAFW system oscillations was caused by an inadequate design of its control system. The control system allowed the level control valves and the pressure control valves to oppose each other when controlling throttle flow.

Many problems were the result of previous actions taken or inactions not taken before starting HFT. These actions or inactions were not fully resolved or researched prior to starting HFT. TVA states that the pressurizer safety valves simmered and lifted early because the vendor set them at ambient temperatures. This would be a procurement error.

The clock for the first 48 hour TDAFW endurance run was restarted after about 14 hours when it was discovered that the installed ultrasonic flow measuring device was not accurate. This was caused by a failure to calibrate the sensor properly prior to starting the test. TVA restarted the test, but the turbine tripped 46 hours into the test run. The exact cause was not found, but it was postulated that water backed up into the turbine by a failure of redundant steam traps. The test engineer, however, stated to NRC inspectors that the steam traps had been inspected prior to the test, and when re-inspected after the test, only minor debris was found. No further root cause determination was pursued. After discussion with the NRC, the test was repeated.

The second 48 hours run failed because water entered the control oil. This failure was caused by the installation of an incorrect gasket during prior maintenance. As result of these problems and failures the system will be tested again during a second HFT.

During testing of the MDAFW system, level control valves were slow to open. This was attributed to a modification that provided backup nitrogen supply to the valves. A three way valve in this modification was installed backwards. The valves were bypassed and testing was continued. The system will need to be retested during next HFT.

The performance of the automatic pressurizer pressure and level controls were not properly prepared prior to HFT. Although the instruments were calibrated prior to HFT, The HFT performance was initially poor requiring much trouble shooting, repair, and adjustment. Initially the non repeatable performance of the pressurizer pressure control system could not be explained by the startup staff. It was later attributed a TVA unique design and errors in the test procedure due to the authors lack of understanding of the control system design.

Because of schedule pressure, TVA entered HFT with significant work ongoing and when HFT took longer than scheduled, it created additional schedule pressure. NRC observed that the typical first response from Engineering was to try to rationale the problem rather than to find the root cause and deal with it.

The NRC staff concluded that future testing could be performed better if the pace of testing were slowed. Haste does not allow time for the TVA staff to complete tests and resolve problems. TVA has been slow to complete final review and acceptance of test packages.

During HFT, NRC observed the performance of the operators to be acceptable for preoperational testing but needing improvement for actual plant operation. The operators did not exhibit an attitude of ownership for equipment, because in fact, the equipment under test was not yet turned over to operations. There were several instances where procedures were not followed as a result of poor communications. One example of this occurred during pressurizer pressure control testing, when pressure, on two different occasions, was allowed to exceed 2400 psig. The procedure stated, as a precaution, that 2400 psig was not be exceeded. The operators were taking directions from the test director and had apparently not read or had forgotten the precaution.

During the next HFT scheduled for January 1995, NRC recommends that TVA give the operators ownership of the equipment, by turnover or temporary turnover if necessary, and allow them to direct all aspects with regard work or testing of this equipment. This will provide training and will aid the operators in performing the plant operations when nuclear fuel is loaded in the reactor vessel.

II. Problem Descriptions:

A. Turbine Driven Auxiliary Feedwater Pump (TDAFWP)

Prior to the start of preoperational testing, several control problems were observed. The electronic governor modules were replaced and numerous control system adjustments made before the pump could be operated.

During the first attempt at a 48 hour endurance run, the turbine tripped on over-speed at approximately 46 hours into the run. The cause of the trip was not conclusively determined. The cause was thought to be failure of redundant steam traps that allowed condensate to back up drains into the turbine exhaust. During a second attempt to complete the endurance run, the pump completed the 48 hour run. However, at approximately 44 hours into the run, the control/lube oil samples were observed to contain up to 20% water. As part of the test, the pump was to be shut down after 48 hours, cooled to ambient, a cold quick start performed, and the pump run for one hour. After cool down, a start attempt was made, but the turbine tripped on overspeed. The start attempt was repeated and the turbine again tripped on over speed. The contaminated oil was changed and the turbine was then successfully started, indicating the most probable cause of the trip was the water in the oil. No information was available to determine if the build up of water in the oil had been gradual and had been the cause of the earlier trips. The licensee concluded that various steam leaks on the turbine caused the water to enter the oil. One improperly installed gasket on a steam line caused steam and condensate to impinge on a turbine bearing housing. The causes of this problem were poor corrective maintenance and poor troubleshooting. There was more focus on completing the test by any means than on finding the root cause of the problems with the TDAFWP.

Part of the testing called for five consecutive cold quick starts of the TDAFWP. On the third start, an operator in the control room observed that the level control valves (LCV's) were not opening to supply feedwater to steam generators 3 & 4 and tripped the turbine. The licensee later concluded that the failure of the valves to open was insufficient air pressure. This was the result of a 3-way valve in the air supply for the LCV's being incorrectly installed. The 3-way valve was installed some months earlier as a part of a modification to provide a redundant nitrogen supply for the LCV's. The valve was installed in a different orientation than specified in the design. This problem resulted from inadequate field engineering during the installation of the modification.

The pump experienced binding at the end of HFT and testing was never completed. The pump was torn down and a small quantity of resin beads was found inside the pump casing. The resin beads were removed and the pump reassembled. After reassembly, the pump was rotated and the binding was still present. The pump is currently being sent back to the manufacturer to determine and correct the cause of the binding. All of

the auxiliary feed water (AFW) pumps had twice previously been returned to the factory for upgrade and reassembly prior to the start of testing and supposedly tested satisfactory at the factory.

The TDAFWP requires retesting to demonstrate endurance and reliability. The level control valves and control system requires retesting over the design range of steam generator pressures.

B. Residual Heat Removal Pump (RHRP) 1B-B

During heat up for HFT, an attempt was made to place Residual Heat Removal Pump 1B-B in service. The pump seized as the result of apparent galling because of thermal binding of the pump impeller to the casing wear ring. The pump failed while operating in recirculation followed by opening the suction to admit hot RCS water to the RHR system. The pump was repaired during HFT and toward the end of HFT a cool down was initiated to perform a special performance test of RHRP 1B-B. The objective of the test was to demonstrate the adequacy of the repair. The pump was started, and the performance test of the RHRB pump was successfully completed.

During the cool down from HFT, testing was performed to demonstrate that the RHR system could be used to cool the RCS in a controlled manner and to ensure that the system's performance would be in accordance with design. An attempt was made to use RHRP 1B-B to perform this testing. The pump failed again, apparently as a result of thermal binding of the pump impeller to the casing wear ring. HFT was completed without the B Train RHR system testing being completed. The licensee did an extensive Incident Investigation (II) and postulated several failure causes.

The licensee has determined that the most probable cause(s) of the pump failures was improper pump clearances and/or entrained air in the system (ref. II-W-94-014). The pump was again rebuilt by the licensee with particular attention paid to pump tolerances and clearances. The operating instructions for the RHR system have also been revised to improve the fill and vent process to avoid entrained air. RHRP 1B-B was tested under ambient conditions during the recently completed Open Vessel Testing. No problems were observed with the pump when run cold.

Since the cause of the RHR pump failures has only been postulated, the B Train of the RHR System requires testing under hot plant conditions. Also some testing to ensure that RHRP 1B-B will start reliably and repeatedly under hot plant conditions will be required. In addition, this hot condition testing should place the RHR system in service for each RHR system configuration.

C. Positive Displacement Charging Pump (PDP)

During the performance of HFT, a test requirement was that the Positive Displacement Charging Pump (PDP) and its associated control system were to control and maintain pressurizer level. Initial attempts were unsuccessful. The licensee determined that modifications to flow control valve (FCV) 1-FCV-62-93 and tuning of the associated control circuits were required. The proposed modifications to the FCV included changes to (or deletion of) the valve closure mechanical stops. These stops were originally installed to prevent full valve closure to address an Appendix R concern. During PDP testing, the valve could not be closed far enough to control pressurizer level.

Prior to the implementation of the changes and retest of the system, a PDP bearing failed and resulted in bearing housing damage. The pump has been repaired and a post maintenance test completed. The licensee has not determined the final resolution relative to 1-FCV-62-93 and the Appendix R requirements for this valve.

The final design configuration for FCV 1-FCV-62-93 will have to be implemented and the system will require tuning and retesting under hot plant conditions.

D. Pressurizer Level Control

During the performance of PTI 68.15, The Pressurizer Pressure and Level Control Test, pressurizer level control system performance was sluggish. The test was performed by introducing a 5% step change in the pressurizer level automatic control demand setpoint and observing the response of the automatic level control system. During the initial testing, it took in excess of three hours for the control system to respond to the error signal to dampen oscillations and to restore pressurizer level. The test procedure did not specify a response time requirement or an acceptance criteria. The test engineer discussed the results of the initial testing with Operations, Nuclear Engineering, and Westinghouse. The licensee qualitatively determined that the pressurizer level control system should be able to respond in something over an hour but less than two hours. To achieve the desired response time, tuning and troubleshooting of the system were undertaken.

During the initial troubleshooting, low charging flow rates through the regenerative heat exchanger resulted in unacceptable high letdown water temperatures and apparent flashing. Control room instrument readings for the Charging and letdown flow rate and temperature data were taken. A heat balance calculation was performed as an independent verification. The results indicated that the flow rate instrument reading were incorrect. The licensee determined that the RCP seal injection flow measuring loops were incorrectly scaled, which caused an excess of flow to the RCP's and less than design flow through the regenerative heat exchanger. Consequently, the RCP seal injection flow loops were rescaled, recalibrated and seal injection flows adjusted to the proper values.

After the flow rates were adjusted, the Pressurizer Level Control system was tuned and a retest performed. During the retest, the system responded to a 5% setpoint change in approximately 90-120 minutes. This was considered acceptable by the licensee. No similar test of the pressurizer level control system with the CCP's has been specified.

Since FCV-62-93 is common to the CCP and PDP control systems, it is not certain, at this time, that the system response will not be affected by changes to this valve for CCP operations or other licensee activities. The possibility exists that a retest of this system will be required.

E. Motor Driven Auxiliary Feedwater Pump Pressure/Level Control System

The control system for the Motor Driven Auxiliary Feedwater Pumps (MDAFWPs) consists of two basic subsystems; a backpressure control system to prevent pump run out and a steam generator level control system. During HFT, the controls exhibited unsatisfactory and occasionally unstable response. This was particularly evident during testing at low to moderate steam generator pressures. The level control system consists of a 4" Level Control Valve (LCV) for use when high flow rates are required and a 2" bypass LCV for use when low flow rates are required. The sequencing of these valves is controlled by a downstream pressure switch and a time delay relay. The discharge pressure control valve (PCV) and associated controls are to prevent pump run out.

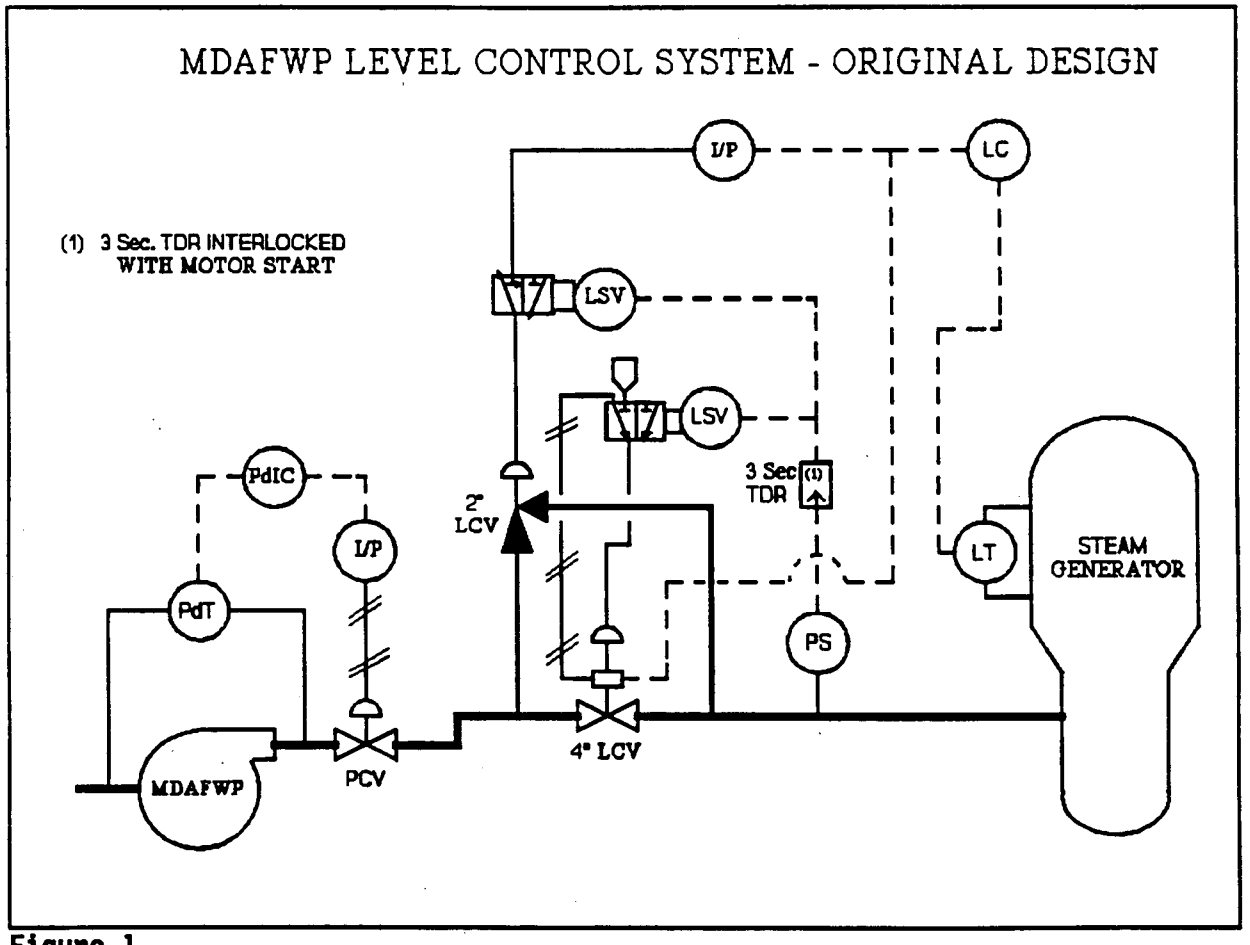


Figure 1

The trouble shooting of the control system by the licensee identified the following problems:

1. The level control system was unstable due to the response of the pressure switch interaction with the 2" and 4" LCV's and

oscillations of the pump discharge PCV. The instability is manifested only at low steam generator pressures with flow directed through the 4" LCV.

2. The 4" LCV would not close when high differential pressure (approximately 1500 lbs) existed across the valve. The resolution of this issue is still pending.

3. The interaction of the pressure switch, TDR and the LCV's resulted in slow response time for the MDAFWPs. This longer time for the MDAFWPs to deliver design flow rates exceeded maximum times specified in the design output documents.

The licensee is implementing a design change that splits the range of the 2" and 4" LCVs. The design modification will change the sequencing logic, reduce the pressure switch set point to sense a faulted steam

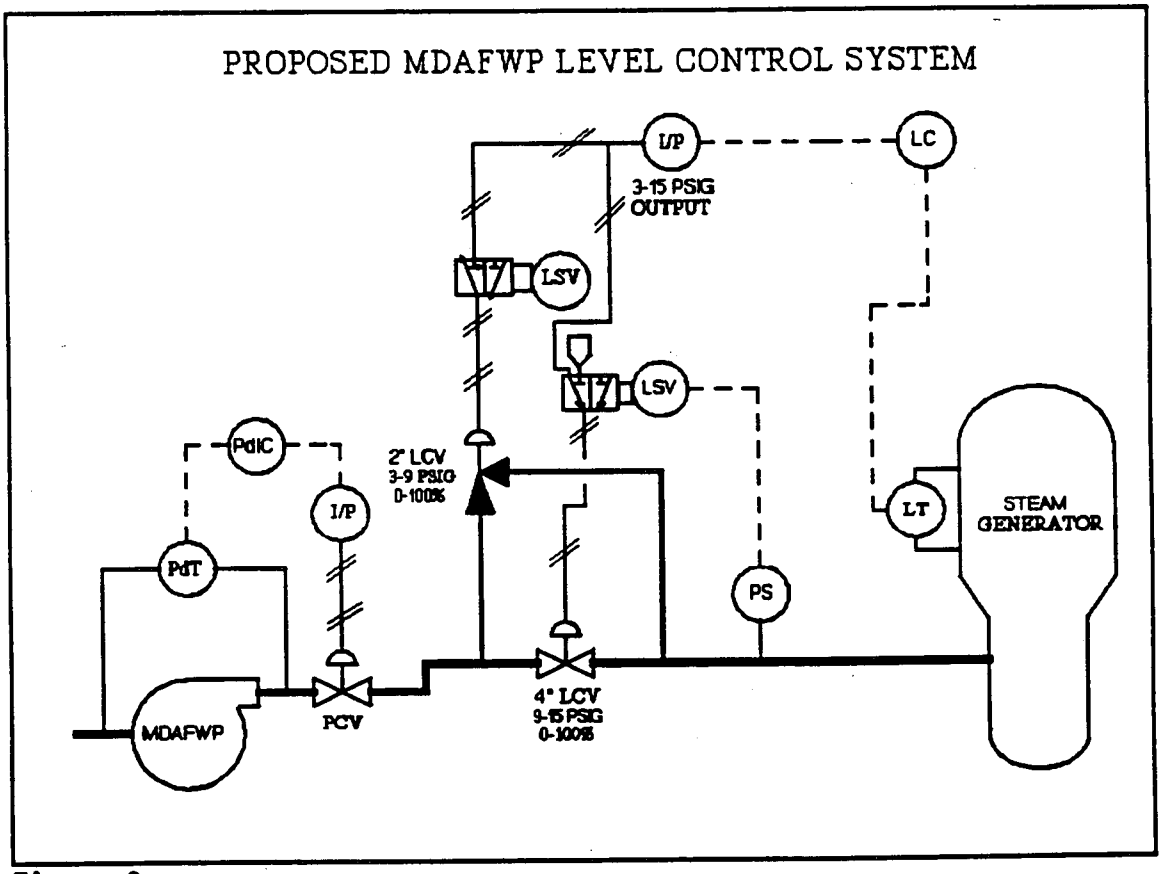


Figure 2

generator and provide an isolation signal to the LCV. The new modification will only opens the 2" valve at low SG pressures, and as pressure increases the 4" valve opens.

This modification will require that the control system be tested over the expected range of operation, including response time and at steam generator pressures in the high, medium and low ranges.

The licensee also observed flow control problems, sudden loss of flow, and MDAFWP discharge check valve chatter at low flow rates during the performance of PTI-868-13, Shutdown from Outside the Main Control Room. Test Deficiency Notice (TDN) 94-0968 was written to investigate and resolve these problems. Resolution is still pending at this time.

Since The 2" and 4" valves alternate opening in response to the downstream sensed pressure switch, and the action of the valves along with PCV interaction causes sensed pressure to change, this may be indicative of a inadequate review of the design for this system.

F. Pressurizer Pressure Control

Pressurizer pressure is controlled and limited by a number of subsystems. These include the pressurizer heaters, proportional spray, power operated relief valves, and code safety (relief) valves. The licensee encountered problems with operation and the testing of these subsystems during HFT. The problems encountered can be categorized as problems with the testing of the pressure control system and problems with the code safeties as described below.

1. Code Safeties

During the heat up and pressurization of the primary, weeping and premature lift setpoints for the code safety valves were observed. One or more of the code safeties was gagged for virtually the entire duration of HFT.

- The licensee first determined that these problems were the result of improperly bench setting the valves. The vendor reportedly set the valves with the valve body at ambient temperature. The elevated temperatures experienced by the valves in normal operation could result in the problems observed.

- The licensee expended substantial effort to diagnose and correct the problem without cooling down. A vendor (Furmanite) was contracted to reset the safety valves under actual operating conditions. During this process, it was verified that the setpoints were lower than design at the elevated operating temperature. The valves were reset in place. This appeared to eliminate premature lifting, but did not correct the weeping.

- Sequoyah operating experience was reviewed. It was determined that Sequoyah had experienced some problems of a similar nature. To alleviate the problem, Sequoyah determined that very slow pressurization of the primary, starting at approximately 1800 psig and continuing the slow rate until normal operating pressure was achieved, resulted in satisfactory operation of the valves. This was attempted at WB with no noted improvement in the condition of the valves.

- The licensee then hypothesized that movement of the tail pipe assembly attached to the valves might be the problem. The assumption was that movements of the tail pipe assembly may be introducing stresses in the valves and causing the problems. To confirm this, tail pipe temperatures and movement were monitored through out the remainder of HFT. The results of this monitoring were inconclusive.

The licensee has not determined the root cause of the problem. Currently the licensee is planning to monitor the valves and tail pipe movements during the next heat up. This does not provide a positive success path for determination of the root cause. The valves currently

installed are apparently degraded or defective. Monitoring of the system without installing new (or refurbished) valves which have been properly bench set may well prove inconclusive. Replacement of the valves with refurbished spares would be more sure solution.

2. Pressurizer Pressure Control

During initial testing of the pressurizer pressure control system, it was observed that the control functions were not occurring at the expected pressures specified in the procedure. It was also observed that the control functions at various pressures were not repeatable.

Some of the functions, such as, the operation of the PORVs and alarms, are solely functions of pressurizer pressure. These were corrected by calibration of the affected components and successfully retested.

The remaining control functions, such as pressurizer heaters and proportional spray, are actuated by a master pressure controller. This controller is an integrating controller; meaning that the actuation of these control functions is based on pressurizer pressure and the rate at which the pressure is changing. Since the rate of pressure change is an integral part of this control function, it affected the repeatability of the function at various pressures. This was not recognized in the test procedure, and during HFT. Consequently, each time the test was re-performed, the rate of change in the pressure was different. After the test, it was recognized that the test procedure contained errors. The procedure did not specify measurement and recording of the correct voltage level control signals at the correct test points for use in evaluating the operation of the control system. The licensee did not officially recognize this procedure problem during HFT, correct the procedure, and retest. The initial results of the test were evaluated subjectively and determined to be acceptable. The subjective evaluation was based on discussions with test engineers and their recollection of the rate of change in pressure. The apparent cause of these procedure problems was that the PTI author and the reviewer did not recognize the uniqueness of this control system.

The licensee has since retested the calibration of the control system at ambient. This, combined with the testing conducted during HFT, appears to satisfy the testing requirements. However, observation of system performance during the next heat up is recommended.

G. Reactor Coolant Pump Operation

During the performance of HFT, some Reactor Coolant Pump (RCP) operational problems were identified.

The RCP vibration levels observed during HFT were often in the alert range. The vibration levels were spiking, causing numerous alarms, and the average vibration levels were gradually changing up and down in magnitude. Several attempts were made to balance the RCP's during HFT. This did not correct the vibration problems. The licensee is planning to realign the pumps and motors prior to the next heat up. Analysis of the vibration HFT data should be performed and, if necessary, other inspections or repairs should be accomplished. The pumps should be monitored and re-balanced, as necessary, during the next heat up.

The seal leak flow rates observed on RCP's 2 and 3 were higher than originally specified by Westinghouse. Further evaluation of the data by Westinghouse indicated that the leak off rates observed were not of immediate concern.

RCP oil analysis indicated high and increasing lead concentration in the oil. This could be indicative of bearing wear. The licensee's future plans for these problems are unknown.

H. RVLIS/Inadequate Core Cooling Monitor

There were problems with the Reactor Vessel Level Indication System (RVLIS) and the Inadequate Core Cooling Monitor (ICCM) system.

The ICCM problems were with the RTD's and Thermocouples. The initial testing uncovered some configuration control problems, which included wiring problems because of incomplete modifications, leads landed on plastic, and an incorrect sign put in to the Eagle 21 hardware by TVA. Also One RTD did not response to heatup because of miswiring at a containment penetration. Component testing completed before HFT just checked resistance and was not adequate to detect the open circuit. All of these problems were corrected and programs to prevent recurrence were implemented.

Subsequent testing discovered several failed in-core thermocouples. Several RCS RTD's were identified as needing re-scaling. The RTD's were rescaled and retested prior to the completion of HFT. The thermocouples are being repaired. Neither of these problems was an unusual HFT occurrence. Retest of the thermocouples and RTDs during the next heat up would be prudent.

During HFT, the testing of the RVLIS system did not respond as specified in the PTI. The system was initially programmed with constants based on the Catawba Plant to facilitate basic functional testing. When the system did not respond as specified in the preoperational test, the licensee and Westinghouse site staff started an analysis of the data. Westinghouse analyzed the Watts Bar specific HFT data and determined that the system, with Catawba programming and Watts Bar inputs, was probably responding correctly. Watts Bar specific data will have to be taken post core load so the core differential pressure will be known. This data will be further analyzed by Westinghouse and the RVLIS will then be re-programmed.

The licensee has agreed to completely retest the RVLIS system after it is re-programmed. An FSAR change incorporating a Power Ascension Test Abstract has been submitted to formalize this commitment.

I. Shutdown from Outside the Main Control Room

During HFT performance of the test to demonstrate the ability to shutdown the plant from outside the main control room, a number of problems were encountered. These included hardware, procedural, and design problems as described below:

- The operators were not able to control auxiliary feedwater flow from the auxiliary shutdown panel (ASP). Control instabilities at low steam generator pressures, as described in Item 5 above, were encountered.
- Pressurizer temperature indication was not available at the ASP. As a result, the 200°F/hour cool down limit was approached and would have been exceeded if the test director had not been notified by the backup crew.
- The 1A-A RHR Pump suction valve would not open using the hand switch at the ASP. A RCS pressurized interlock had to be defeated to open the valve.
- During the cool down using RHR, Component Cooling System (CCS) water temperature exceeded procedural limits. An instrument for reading this parameter was not installed at the ASP.
- Steam Generator PORV ASP controller outputs were not consistent. One PORV opened at 5% controller output while another opened at 50%.
- A number of the equipment control transfers did not occur as expected. These were primarily attributed to procedural errors.

The corrective actions for the hardware problems are still being finalized. The test will be performed again during power ascension. However, during power ascension it is not anticipated to lower the plant temperature and pressure to the point of initiating cool down using the RHR system. Consequently, some retest during the next HFT heat up would be appropriate. The retests might include demonstrating the ability to control auxiliary feedwater, steam generator PORV's, and CCS temperature from the ASP.

J.. Post Accident Sampling System (PASS)

Several problems were identified During the performance of PASS PTI-043-01. Only a Reactor Coolant System (RCS) sample was collected successfully from the PASS liquid panel. Testing to verify collection of containment sump and containment air samples were deferred.

PTI-043-01, Post Accident Sampling System, Rev. 1, required demonstrating that sample casks/carts are operational. Specifically, § 6.5.113 required an undiluted RCS sample to be collected in the sample cask/cart. The cart was then moved to Railroad Bay to be shipped off-site for analysis. Test records dated May 27, 1994, indicated that PTI 043-01, Step 6.5.113 was completed satisfactorily. Several significant test deficiencies involving the transfer cask/cart equipment operability were identified during this test. First, liquid of an undetermined origin was observed on the cask following collection of the PASS panel RCS sample and the subsequent placement of the sample vial into the sample cask/cart. The cask/cart hydraulic lines required to introduce or retrieve the liquid sample vial from the shielded cask were damaged during movement of the cart over the PASS room door threshold (jam). This rendered the internal transfer system inoperable. Since difficulties were encountered in aligning and moving the shielded transfer cask/cart over door thresholds between the PASS and Railroad Bay facilities, four individuals were required for this evolution. Dose projections assume two people can do the job. In addition, for one segment of the transfer, between the PASS room and adjacent hallway, the licensee did not use a portable ramp specifically fabricated to move the equipment over the door threshold.

As of June 17, 1994, a Test Deficiency Notice (TDN) had not been completed for the identified issues affecting the cask/cart operability and no additional startup tests involving movement of the sample cask/cart were planned. Further, no evaluation of the source of liquid observed on the outside of the cask had been conducted. Licensee representatives stated that the problems in moving the cask/cart were discussed with the cognizant engineer but were not documented.

NRC issued a violation for failure to document these testing problems with a TDN. This portion of the PASS test needs to be re-evaluated and possibly repeated. The remainder of PASS sampling requirements have yet to be completed.

The cause of these problems was personnel error. Procedures were not followed for doing the test or documenting deficiencies. Radiological control/chemistry personnel should have been more involved in this test.

K. Miscellaneous Valves

The following valve problems were also identified During HFT:

- Excess back leakage past the Loop 3 SI check valve was identified. Present plans are to refurbish the valve and retest it during the next HFT heat up.

- During dynamic MOVATs testing of the RHR discharge cross tie valves, the valves were closed and would not re-open. After The valves were allowed to cool, they were successfully opened. The licensee suspects that thermal binding may be the problem. Problems with thermal binding of similar valves were previously identified and evaluated as a result of an INPO SOER. Since the problem was detected, the licensee has surveyed six other plants to determine if these particular valves were contained in their thermal binding programs. The consensus from these plants was that the SOER applied to these valves. The licensee has not determined a specific corrective action but has committed to fixing and retesting these valves during the next heat up.

- During response time testing of the steam dump valves, it was determined that the valves would not open within the time limit specified in the design output documents. The slower stroke times were evaluated by the licensee and determined to be adequate for plant operations. Currently the design output document is scheduled for revision, consequently, no work or retest of these valves is planned.

  These valves will be dynamically tested during the power ascension 50% load rejection test.

- The Steam Generator Code Safeties were reset in place by Furmanite during HFT. One of the safeties was not set in accordance with code requirements and will require retest.

L. Miscellaneous Problems

The resolution of other equipment problems that occurred is still being formulated. These items are discussed below:

1. Centrifugal charging pump CCP 1A-A operation was limited during HFT due to excessive vibration at the outboard bearing. Minimum run time was accumulated. The pump was rebuilt after HFT but still has high vibration, and this high vibration still needs be looked at. The reliability and endurance of this pump should be demonstrated during the next heat up.

2. A number of problems were noted with the main turbine and auxiliaries during HFT. These included numerous EHC leaks and EHC system valve failures, one of the overspeed trips was out of spec, etc.

3. The steam generator PORV's failed to meet their stroke time requirements. The stroke times are apparently considered to be satisfactory by the licensee and stroke time requirements will be changed accordingly. NRC will review the basis for this decision.

4. The Boric Acid Transfer pumps failed to meet their head flow requirements.

5. Numerous target rock valves performed poorly during HFT, particularly in the head vent and PASS systems.

6. PASS testing for the Train B RHR system will require retest during the next heat up.

7. There were Eagle 21 Rack problems due to connectors (particularly Rack 13). Connectors are to be replaced.

8. Standby main feedwater pump and lube oil pump showed high vibration. Resolution of these problems is still pending at this time.

9. Source range instrumentation exhibited high noise levels.