

December 17, 1985

DMB-016

Docket No. 50-346

LICENSEE: Toledo Edison Company
FACILITY: Davis-Besse Unit No. 1
SUBJECT: STATUS REVIEW - DAVIS-BESSE COURSE OF ACTION MEETING: DECEMBER 9, 1985

On December 9, 1985, Toledo Edison Company presented a status report regarding the Davis-Besse Course of Action. Enclosure 1 is a list of meeting attendees. Enclosure 2 is a summary of the information presented by Toledo Edison Company.

At the conclusion of the presentation, Toledo Edison Company was requested to prepare a brief statement regarding the major issues addressed by the Course of Action and the significant accomplishments of the overall program for use at the Commission briefing scheduled for December 18, 1985.

Original signed by

Albert De Agazio, Project Manager
PWR Project Directorate #6
Division of PWR Licensing-B

Enclosures:
As stated

cc w/enclosures:
See next page

PBD-6 *AME*
ADe Agazio;cr
12/17/85

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P PDR

TOLEDO EDISON COMPANY - NRC MEETING

BETHESDA, MARYLAND

DECEMBER 9, 1985

<u>Name</u>	<u>Organization</u>
A. DeAgazio	PWR-B/PD-6 Project Manager
O. Parr	PWR-B/PEICS
D. Kosloff	USNRC Davis-Besse R. I.
B. O'Connor	Ass't. Plant Mgr. Toledo-Edison
S. Jain	Toledo Edison
J. Wood	Toledo Edison
J. Lingenfelter	Toledo Edison
P. Hildebrandt	MPR Associates, Inc.
S. Smith	Toledo Edison
T. Myers	Toledo Edison
J. Williams	Toledo Edison
J. Hirsch	Toledo Edison
J. Williamson	Chairman, Toledo Edison
O. Mavro	Toledo Edison/Stoney
K. Farr	Toledo Edison
M. Stewart	Toledo Edison
J. Pearson	B&W
S. Piccolo	Bechtel Power Corp.
S. Quennoz	Toledo Edison
D. Bauser	Shaw, Pittman, Potts & Trowbridge
R. Peters	Toledo Edison
T. Beeler	Toledo Edison
M. Schefers	Toledo Edison
J. Taylor	B&W
B. Dunn	B&W
R. Ellison	B&W
S. Mitra	Impell
D. Ingmire	Management Consultants, Inc.
M. Fertel	Delian Corp.

<u>Name</u>	<u>Organization</u>
J. Fay	Bechtel
E. Ray	Bechtel
C. VanDenburgh	USNRC III
R. Jones	NRS/PBRS
D. Crutchfield	NRR/PWR-B
C. Rossi	NRC/IE
I. Jackiw	NRC/Region III
D. Persinko	NRC/DHFT
G. Cwalina	NRC/DHFT
P. McKee	NRC/IE
A. Howell	NRC/IE
J. Sharkey	NRC/IE
J. Hannah	Associated Press
G. Dick	NRC/NRR
W. Paulson	NRC/NRR
J. Wermiel	NRC/NRR
R. Hernan	NRC/NRR/PPAS
D. Eisenhower	NRC/NRR
J. Keppler	NRC/NRR
J. Taylor	NRC/NRR
G. Edison	NRC/NRR

NRC/Toledo Edison Meeting Agenda

December 9, 1985

John P. Williamson
Chairman

Introduction

Joe Williams, Jr.
*Senior Vice President,
Nuclear*

**Mission Management Changes, An
Update**

Steve Smith
*Assistant Plant Manager,
Maintenance*

**Status of Maintenance
Organization Activities**

Bill O'Connor
*Assistant Plant Manager,
Operations*

**Status of Operational
and Procedural Changes**

John Wood
*Nuclear Plant
Systems Director*

**Status of Event Investigation
(Equipment Investigation)**

Sushil Jain
Nuclear Safety Manager

**Auxiliary Feedwater System
Modifications and Decay Heat Removal**

Phil Hildebrandt
IPRC Chairman

**Independent Process Review
Committee**

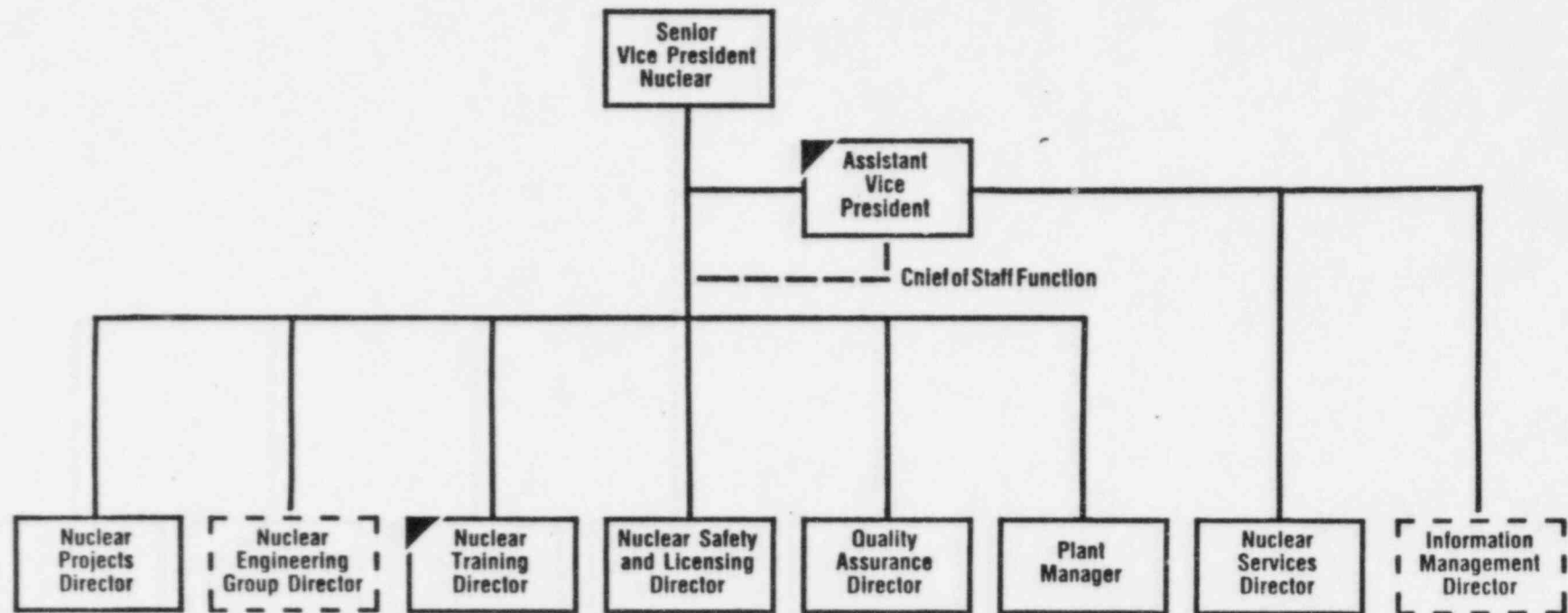
Jacque Lingenfelter
Operations Engineering Manager

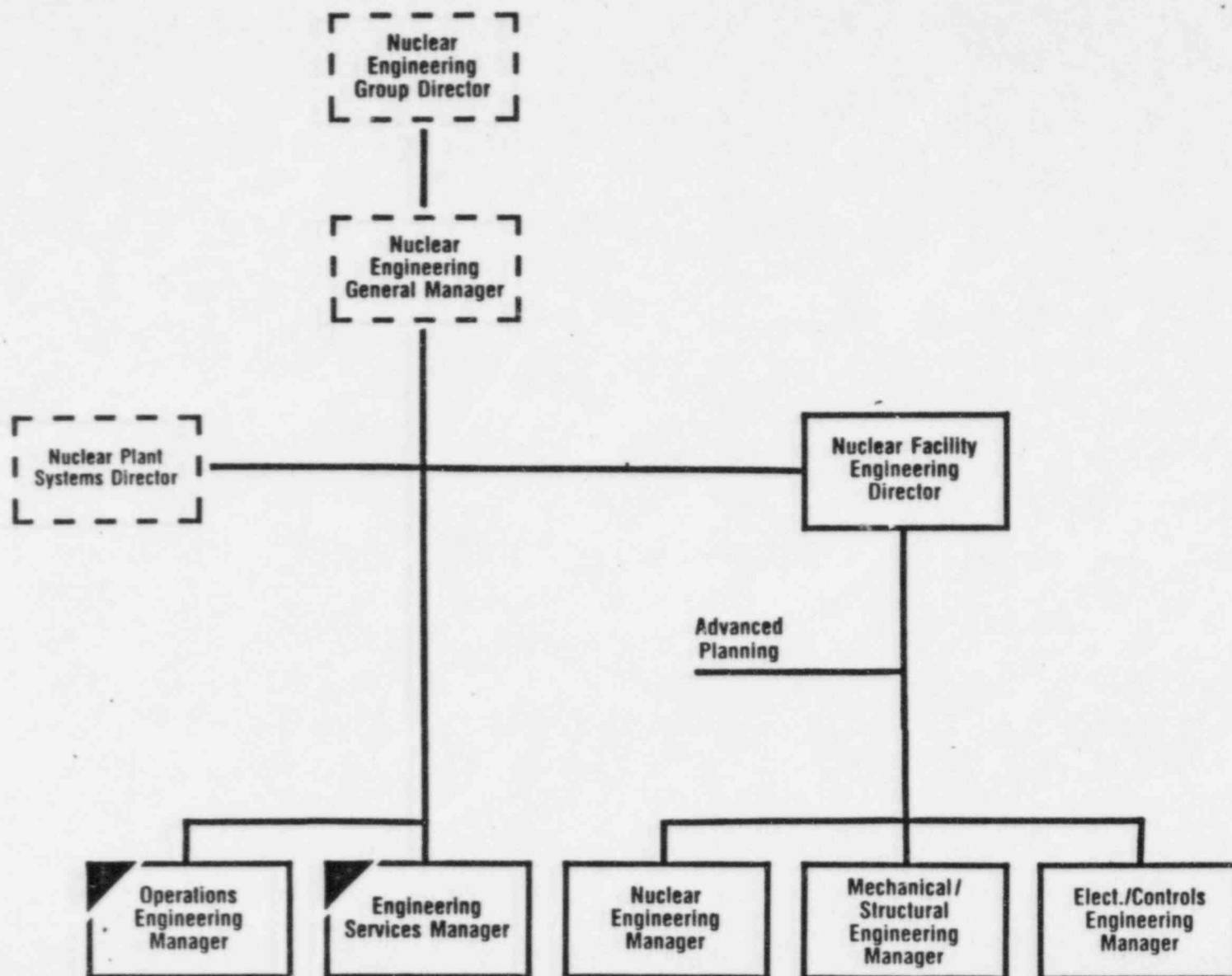
System Review and Test Program

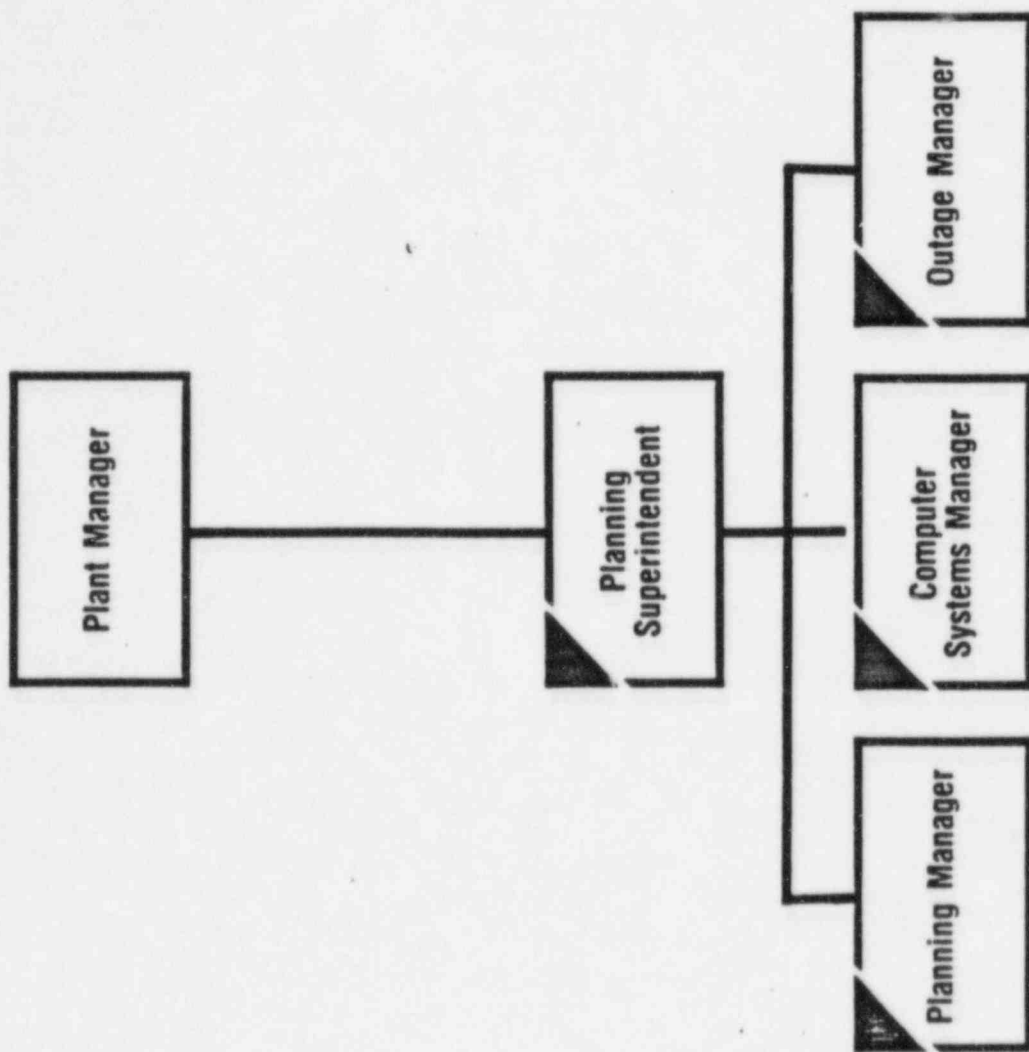
Joe Williams, Jr.

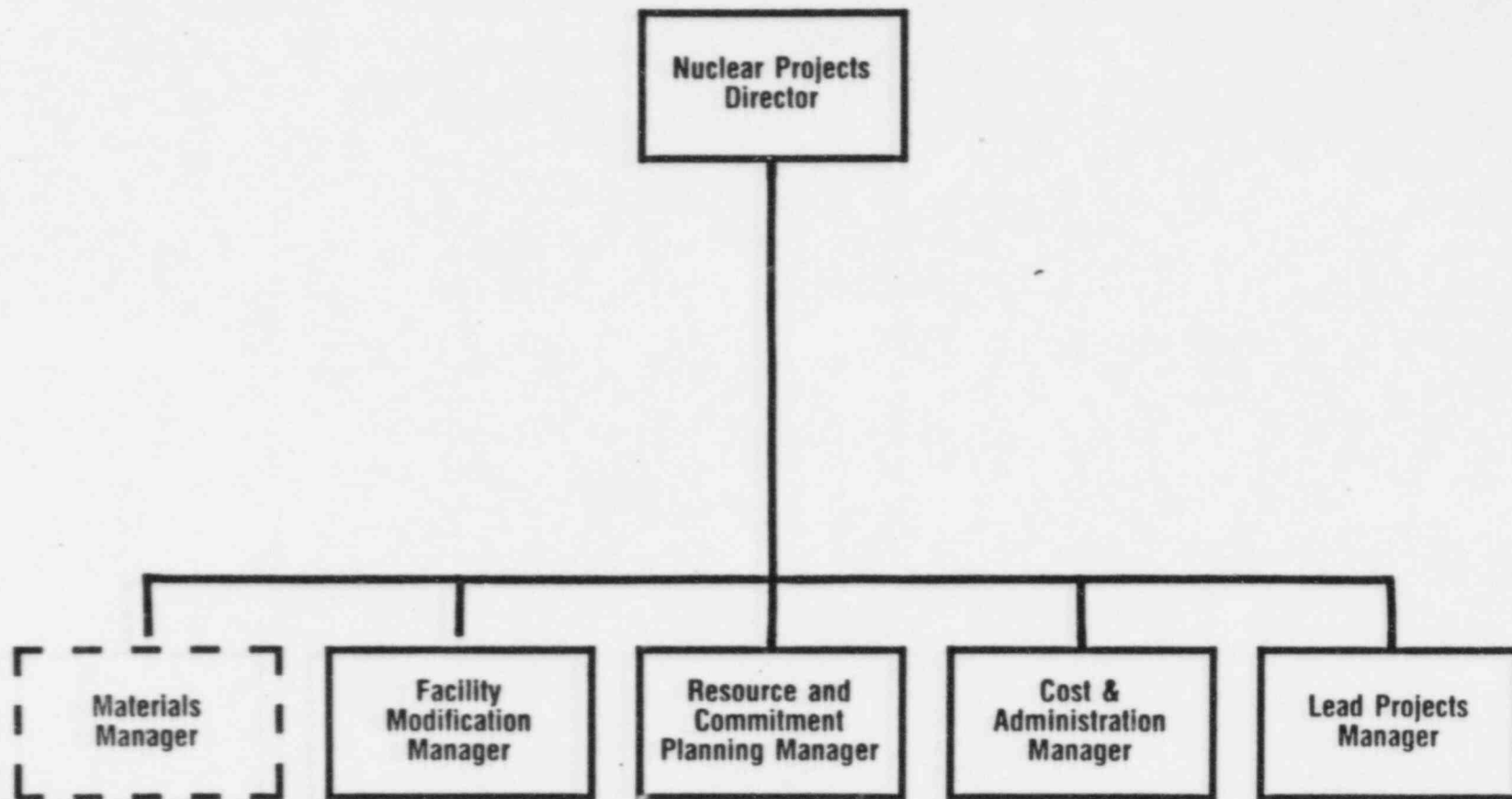
Closing Remarks

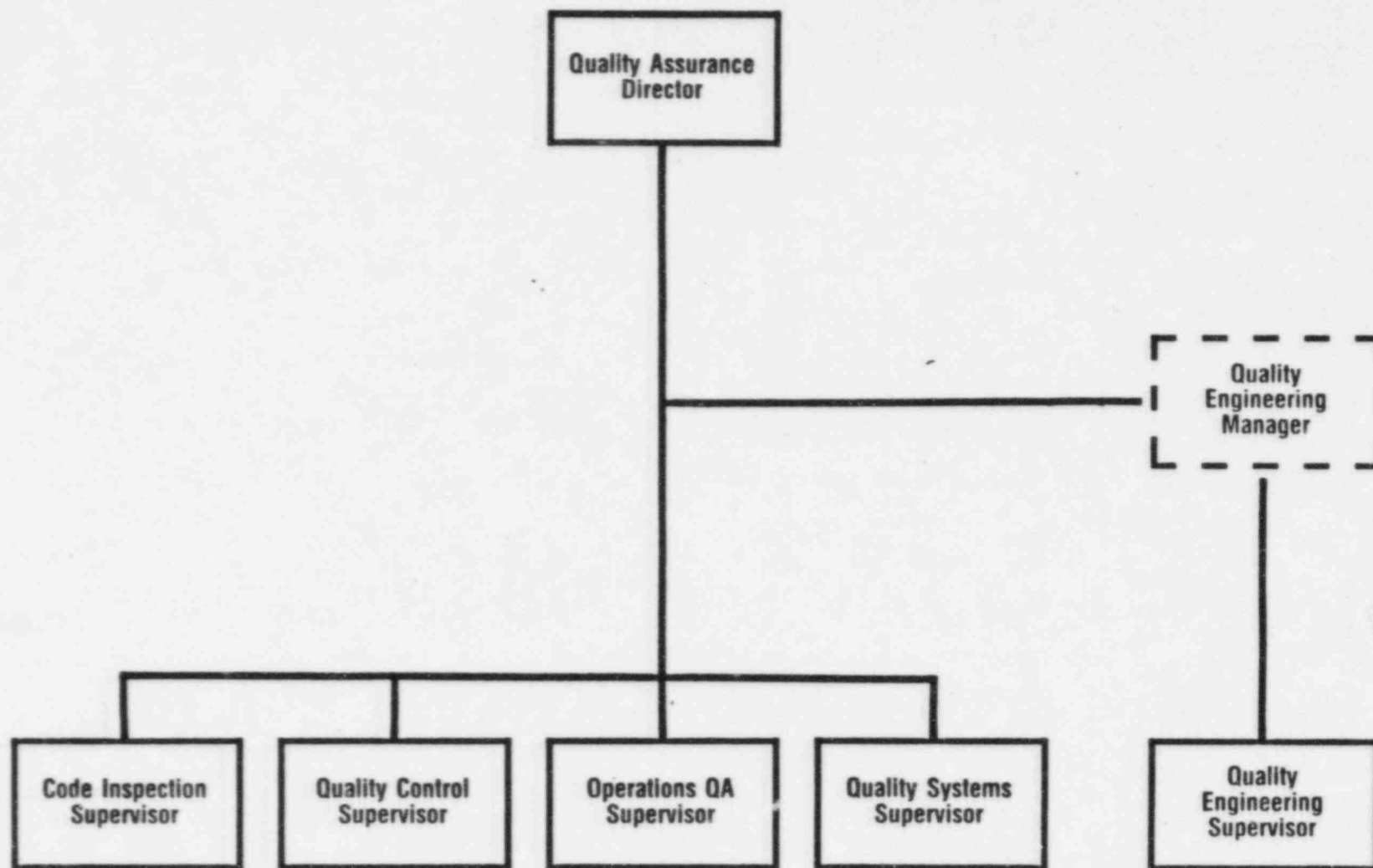
Nuclear Mission Organization

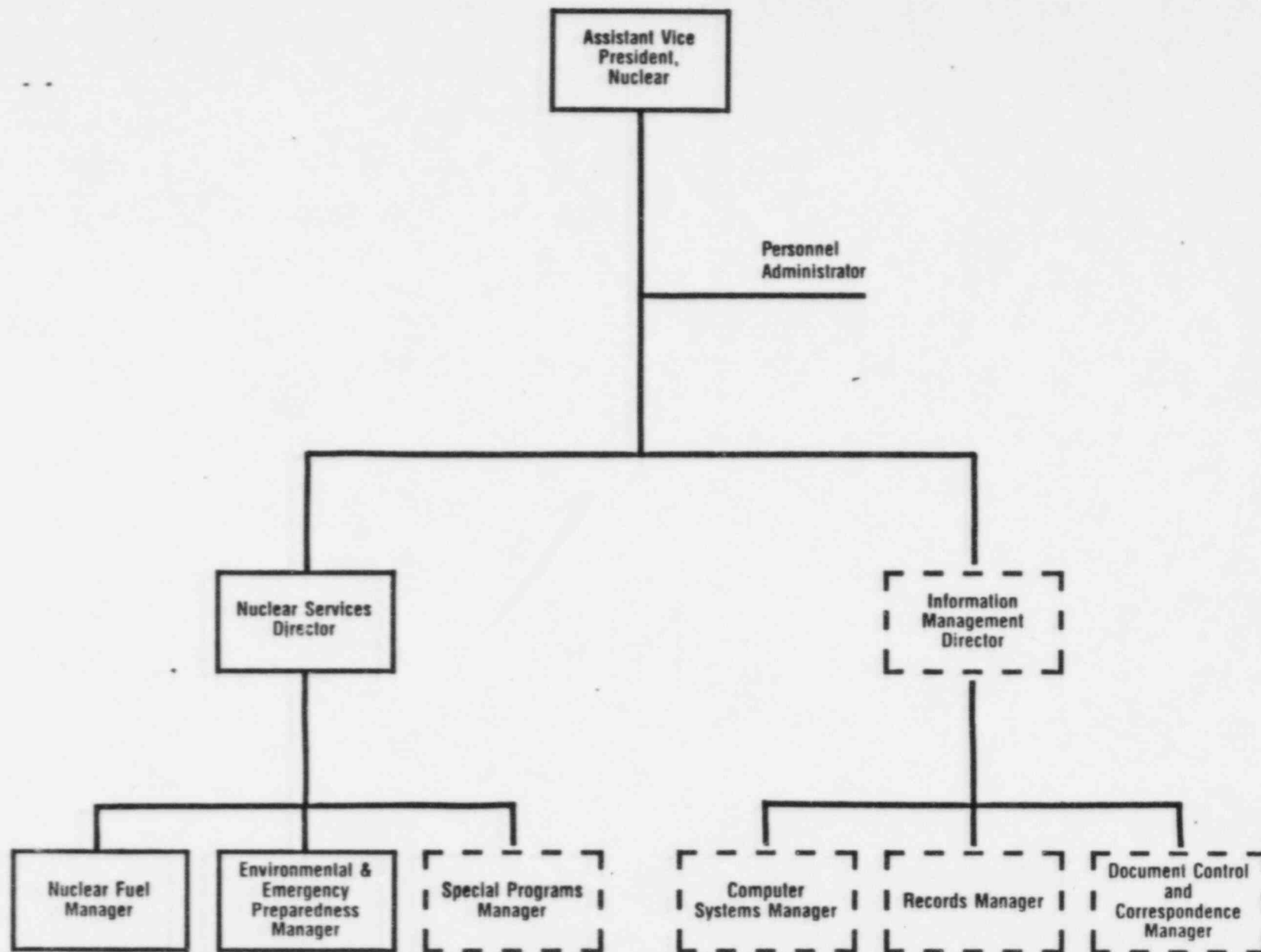












Summary of Major Changes Within The Nuclear Mission

- A new centralized Planning Department, reporting to the Plant Manager, has been established and an experienced manager has been hired as Superintendent.
- The previous Plant Manager has assumed the duties as head of the expanding Engineering Division.
- The Nuclear Engineering Division has been substantially enlarged and is being staffed.
- The position of Nuclear Plant Systems Director has been filled by the former Manager of Mechanical/Structural Engineering.

Summary of Major Changes Within The Nuclear Mission

- A new Plant Manager is in place.
- The position of Assistant Plant Manager, Operations has been established and filled.
- The position of Assistant Plant Manager, Maintenance has been established and an experienced maintenance manager has been hired for that position.
- The Maintenance Department has been reorganized, enlarged, and experienced personnel have been hired for all positions.
- The position of Materials Manager has been established. An experienced manager has been hired. Organization is functioning smoothly.

Summary of Major Changes Within The Nuclear Mission

- Position descriptions for all management positions in the Nuclear Mission were completed October 15, 1985.
- All Nuclear Mission personnel, except the Nuclear Fuel Department, have been moved to the site.
- A new Quality Assurance Director has been hired.
- The previous Quality Assurance Director has assumed the position of Manager of the expanding Quality Engineering organization.
- A new Information Management Division has been formed to provide better management of data processing, records, documents and correspondence.

Summary of Major Changes Completed

- New organization structure approved. Staffing increases from 690 to 930 to more than 990 with Records Management/Document Control, Procedures and reorganization of QA/QC.
- Salary increases approved. 60% of increase on January 1, 1986 and 40% on January 1, 1987, depending on performance.
- On-shift SRO license bonus increased from \$550 to \$800/month; on-shift RO license bonus increased from \$485 to \$550/month.

Recruiting

Three Career Days

125 Applicants

46 Offers

28 Acceptances

3 Offers Pending

22 Future Offers Being Developed

Two Career Days Planned in December

35 Applicants

Manning Status

644 July 1

686 December 1

244 Vacancies (1985 and 1986 positions)

88 Contractors secunded

**56 Of those contractors secunded are
engineers**

Reassignment of PEP and SALP Improvement Program Activities

High priority—will receive commensurate emphasis and resources:

- **Prepare detailed position descriptions for new organization (completed)**
- **Merit Review and Salary Administration Program (completed)**
- **Configuration Management (in process)**
- **Management Training (in process)**
- **Management By Objectives (resume after restart)**
- **Fire Protection (in process)**
- **Nuclear Mission Procedures (in process)**
- **QA Awareness Program (in process)**
- **Non-outage Work Prioritization (resume after restart)**
- **STA Assume Interim EDO Function (completed)**

Configuration Management (in process)

- Program Manager established — Toledo Edison/MPR.
- Program Basis:
 - Component/system data base.
 - System descriptions/design basis.
 - Validated vendor manuals.
 - Control of drawing and manuals.
 - Accurate spare parts allowance.
- Plan to be issued
- Schedule — completion by December, 1987.
 - 120 man-years of work.
- Prototype program — Four Systems
 - High pressure injection.
 - 4.16 KV electrical system.
 - Instrument air.
 - SFRCS.
- Containment equipment information walkdowns
 - 12 teams; 25 people.

Configuration Management Plan

- Establish the as-built configuration of the plant.
- Develop an on-line computerized equipment data base.
- Use as-built information to validate design documents.
 - Vendor drawings and technical manuals
 - Piping & Instrument Drawings
 - Updated Safety Analysis Report (USAR)
- Develop system descriptions which include the following on both a system and component level:
 - System design bases
 - Limiting Conditions for Operation
 - Technical Specifications requirements
- Establish procedures to ensure that all controlled information stays current throughout plant modifications and maintenance.
 - Equipment data base
 - Vendor documentation
 - System descriptions
 - P & IDs and electrical elementaries
 - Other design documents
- Program will be implemented on a system basis. After the prototype phase is complete (approximately 7/1/86), groups of systems will progress through the program.

Fire Protection Program

- Interim Fire Protection Compliance Assurance Manager assigned.
- Two phase program developed, action plans drafted November, 1985.

PHASE 1 Regulatory Improvement (October 1985 - February, 1986).

- 30 technical and programmatic issues related to Fire Protection compliance assigned and prioritized.
- Development of detailed action plans underway.
- Final Appendix R assessment (compliance assessment report) with revised exemption requests to be submitted to NRC - March 6, 1986.
- Updated Fire Hazards Analysis Report to be submitted March 6, 1986.
- Revised Technical Specifications to be submitted June 1, 1986.

Fire Protection Program

- **Engineering design package development.**

FCR's identified to date: 64

FCR's to be completed by 5th refueling: 24

(Engineering scheduled to be completed by 12/31/85)

17 Barrier Modifications (upgrade walls, install new dampers, etc.)

6 Safe Shutdown Modifications (reroute/protect cable; electrical isolation)

FCR's to be completed by 6th refueling: 40

(Engineering scheduled to be completed by 12/1/86)

FCR schedule based on a PRA Risk Assessment

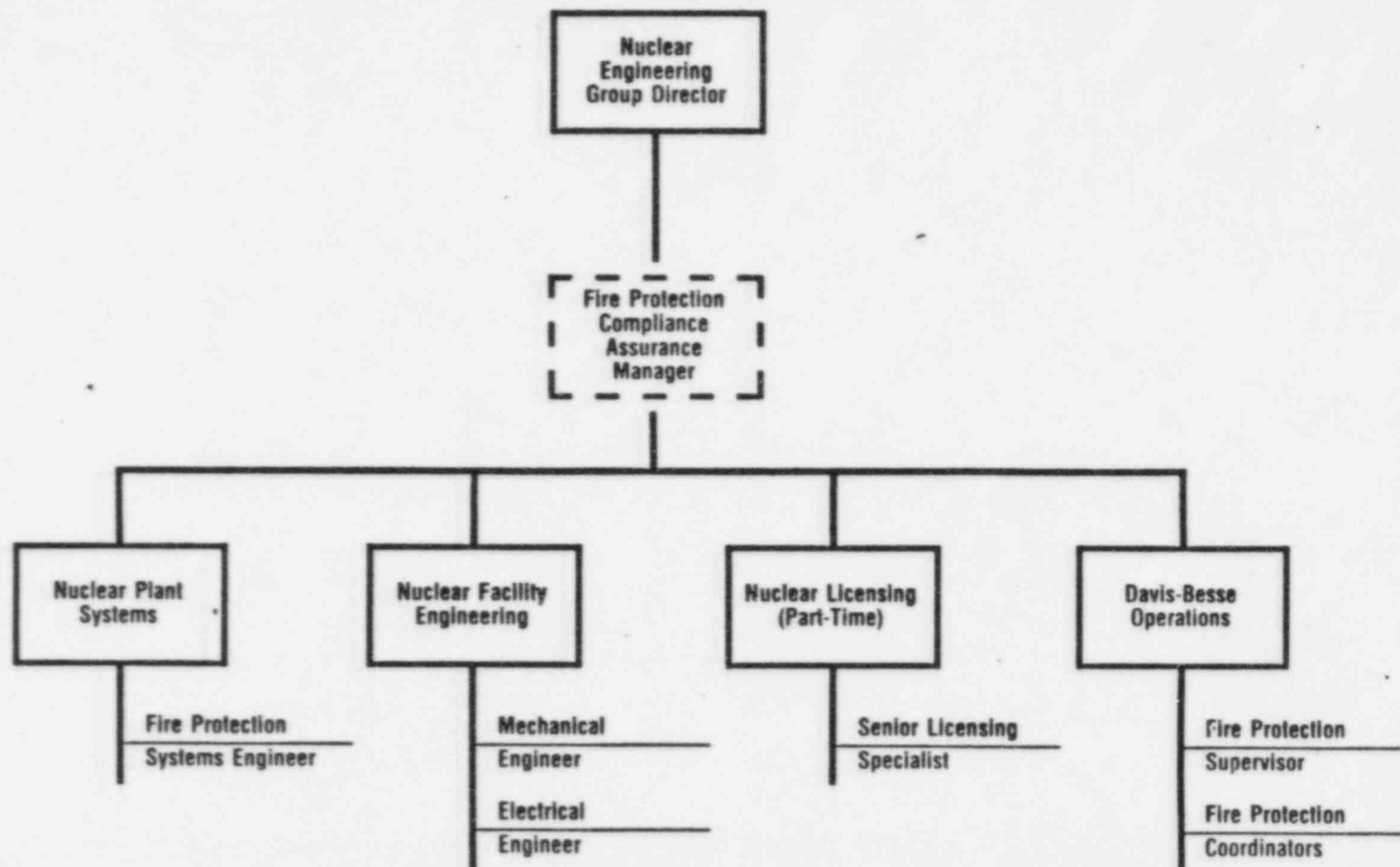
PHASE 2 Program development and ongoing implementation (February - August, 1986).

- **Finalization of the Fire Protection organization and identification of staffing requirements - January 1, 1986.**

- **Fire Protection responsibility and commitment document, draft, April, 1986.**

- **Resolution of remaining technical issues (August, 1986) with follow up action plans as necessary.**

Interim Fire Protection Functional Organization



Davis-Besse Procedures

- Nuclear mission procedures (NMPs) are being prepared to:
Implement commitments and Corporate/Mission policies.

- Control interfaces between Nuclear Mission Divisions.

- Provide basis for review and upgrade of Division procedures.

- Establish consistency throughout Nuclear mission.

- NMP Project Team is planning, scoping and scheduling all procedure efforts.

- 20 Toledo Edison personnel directly supporting NMP effort supplemented by 20 contract writers.

- Division procedures are being revised or prepared to:
Implement applicable NMP requirements.

- Upgrade selected maintenance, operations, test procedures and environmental qualification procedures.

- 20 Toledo Edison personnel preparing or revising Division procedures supplemented by about 35 contract writers.

- Procedure Integration

- NMP and Division procedures coordinated by NMP Project Team to ensure continuity of programs during procedure implementation by:

- Monitoring cross-referenced procedures.

- Ensuring cross-functional reviews.

Davis-Besse Procedures Effort

	Required For Restart	Additional in 1986
Nuclear Mission Procedures	18	55
Division Procedures		
Station		
Administrative	5	90
Maintenance	112	801
Operations	75	229
Other	0	318
Sub-Total	192	1,438
Engineering		
Environmental Qualification	40	0
Test	95	
Other	7	63
Sub-Total	142	63
Quality Assurance	13	17
Nuclear Training		32
Nuclear Services		90
Nuclear Projects		20
Nuclear Safety & Licensing		15
Other Divisions		35
Total	365	1,765
Complete 12/2/85	28	—
In Process 12/2/85	201	—

Training Program Enhancements

Management Involvement

- **Training Department elevated to Division status.**

Recognition.

Desirability.

Morale.

- **Director level management reporting to Senior Vice President, Nuclear.**

Upper management attention.

Support.

Better able to address training issues.

Training Program Enhancements

Staffing

- **Training supervisors to manager level.**
Promotion path within Training.
Appropriate level to work with Mission counterparts.
- **Training instructors elevated to comparable level with Station positions.**
Attract high caliber personnel.
Alternate career option.
In line with other utilities.

Training Program Enhancements

Staffing (Cont'd)

- Nuclear Training staffing levels.

54 positions currently approved.

43 filled by Toledo Edison people.

4 new employees will report by 2/86.

This is being supplemented by 10 additional contract personnel.

- Progress

	8/84	8/85	11/85
Approved Positions	24	41	54
Toledo Edison Staff	17	35	43
Contract Instructors	2	10	10

- Additions

Additional staff is being added to support the simulator and expanded maintenance training.

Training Program Enhancements

Program Improvements

- **INPO Accreditation.**
 - **NUMARC commitment.**

All programs ready by December 1986.
 - **Operator Programs (NLO, RO, SRO/SS)**

Expect to submit Self Evaluation Report to INPO by 12/31/85.
 - **Remaining programs (Mechanical, Electrical, I&C, Chemistry, Health Physics, Shift Technical Advisor, Technical Staff and Managers).**

Concerted effort to have these programs ready prior to December, 1986.
Expect the three maintenance programs to be ready closer to mid-1986.
- **Clarification of responsibilities for training functions.**
 - **Mission procedure defining responsibilities.**

Training responsible for development and implementation.
Line organization responsible for training and qualification of assigned people.
 - **Will be complete prior to restart.**

Training Program Enhancements

Upgrading of Facilities

- **New Training offices and classrooms completed.**
 - **Doubled number of classrooms.**
 - **Much improved learning environment.**

- **Dedicated Training labs to be completed this month for:**

Mechanical

Electrical

Instrumentation & Control

Chemistry

Health Physics

Quality "Hands On" Training is being emphasized.

Laboratory Facilities

Mechanical Maintenance Lab

Area—1440 square feet

Major equipment includes - fully equipped machine shop, air conditioning and refrigeration equipment, vibration analysis equipment, valve test stand, wide variety of plant specific items.

Electrical Maintenance Lab

Area—850 square feet

Major equipment includes - motor control center, numerous circuit breakers, soldering stations, motor generator trainer, electrical test equipment.

Instrument and Control Lab

Area—1300 square feet

Major equipment includes - sophisticated Lab-Volt process control simulator, control rod drive part task trainer, functional Reactor Protection System channel, electronic test equipment.

Chemistry and Health Physics Labs

Area—1120 square feet total

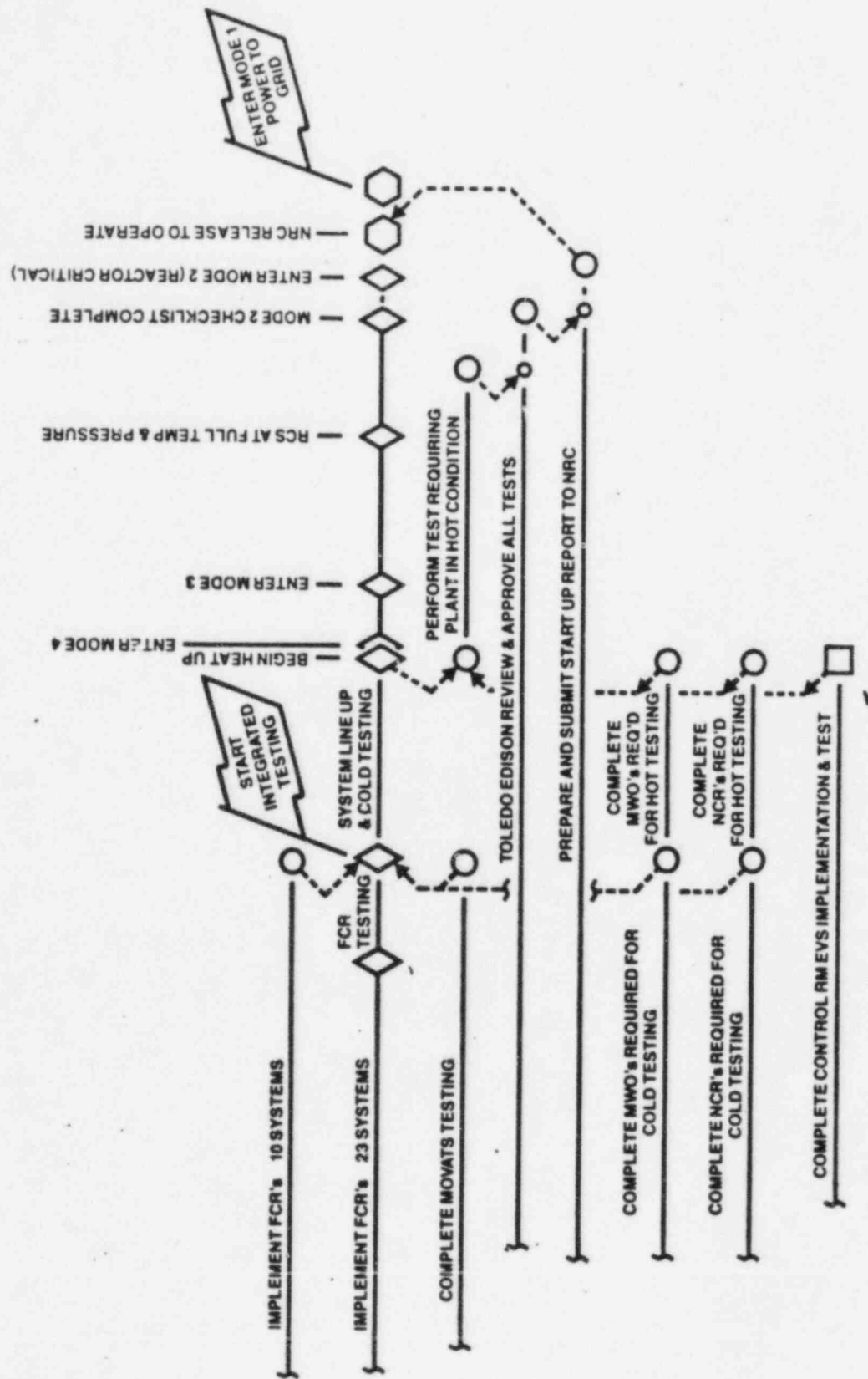
Major equipment includes - spectrophotometers, gas chromatograph, gamma ray spectroscopy systems, counting and survey equipment.

Training Program Enhancements

Upgrading of Facilities (Cont'd)

- Plant specific simulator will be built.
 - Design specifications finalized and out for bid.
 - Bid review process in early 1986.
 - 32-36 month lead time.
 - On site and operable by December, 1988.
 - Nearly 300 simulated malfunctions will be available to test and evaluate operators.

Davis-Besse Restart Schedule

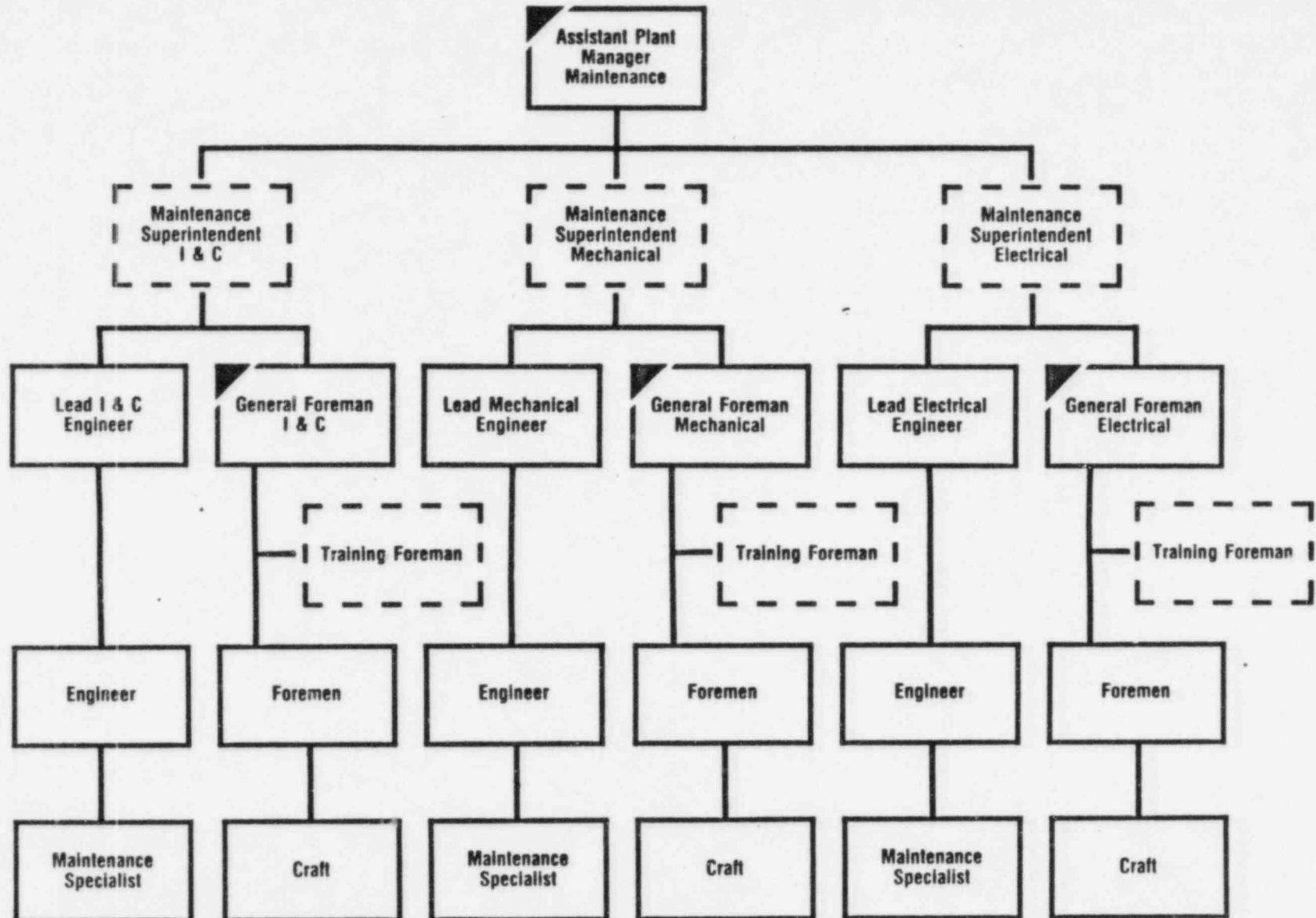


Maintenance Improvement Program

Changes have been implemented in these broad areas:

- **Organization and Staffing.**
- **Training.**
- **Maintenance Administrative and Technical Procedures.**
- **Maintenance Activities.**
- **Spare Parts and Material Control.**
- **Engineering Interface and Support.**
- **Plant Cleanliness and Material Readiness.**
- **Facilities.**

Plant Maintenance



Organization

- New management personnel.
- Increased supervisory personnel for each discipline.
- Improved supervisor/craftsman ratios.
- Improved department communications.
- Training Foreman.

Training

- Each discipline has a designated Training Foreman.
- Training shift concept has been adopted.
- Training Councils formed in each discipline.
- Outside organizations or facilities are utilized to provide training.

Plant Cleanliness and Material Readiness

- Continuing program in place.
- General improvement accomplished.
26,000 manhours in 3½ months.
- Significant improvements in specific areas.
Water treatment plant.
Service water tunnel.
Turbine Building 658 and 643 elevations.

Spare Parts and Materials Control

- Responsibility transferred to Materials Manager.
New position in Nuclear Projects Division.
Onsite with Warehouse office.
- Program developed and implemented.
- Spare parts adequacy and inventory control implemented.
- Surplus identified and inventoried and being evaluated for disposition.

Engineering Interface and Support

- **Engineering attendance at Plan of the Day meeting.**
- **Duty Manager Roster System.**
- **Station Technical Support Section.**
- **Request for Engineering Assistance Process.**

Maintenance Procedures

Administrative

- 6 procedures required for restart.**
- 3 approved.**
- 2 in the review cycle.**
- 90 will be completed after restart.**

Technical

- 112 procedures required for restart.**
- approved.**
- 13 in the review cycle.**
- 801 will be completed after restart.**

Corrective and Modification Work Orders

Backlog:

- 1339 Corrective work orders open on June 9.**
- 898 Of those closed as of December 4.**
- 111 Facility Change Requests open on June 9.**
- 40 Of those closed as of December 4.**

Current:

- 3394 Corrective work orders issued since June 9.**
- 1674 Of those closed as of December 4.**
- 574 FCR's issued since June 9.**
- 159 Of those closed as of December 4.**

Preventive Maintenance

Backlog:

405 Work orders open on June 9.

368 Of those closed as of December 4.

All will be closed prior to restart.

Current:

895 Work orders opened since June 9.

615 Of those closed as of December 4.

At restart - no backlog PM work orders will be outstanding.

New Maintenance Facilities

Five-story structure being constructed.

- Adds 100,000 square feet of shop and office space.
- On schedule for occupancy—November, 1986.

Adding additional test and support equipment.

- MOVATS for testing of Limitorque Valve Actuators.
- Test system for Hydromotor Damper Actuators.
- New Metrology Laboratory with new reference standards.

Operational and Procedural Changes

Training/Administrative

- Increased emphasis by management and training on adherence to procedures. Training for operators to begin 12/16.
- Pre-startup training of all operators on high priority-infrequent operator actions (e.g. AFPT-trip throttle valve). Begins 12/16 except for AFPT which will be done in Mode 3.
- Manual vs. automatic safety system actuation.
 - Operating philosophy requiring Reactor Operator to inform Senior Reactor Operator of intent to manually actuate system. AD 1839.00 modified. Training to begin 12/16.
- Pre-startup training for licensed operators to begin 12/16.
 - Loss of feedwater events.
 - Control logic and operation of AF 599/608.
 - SFRCS changes and actuation.
 - Control of steam header pressure following a reactor trip.
 - Simulator training completed 12/8/85 includes SFRCS mock-up and manual P-T plotting (assumes inoperable SPDS).
 - Other new FCR modifications.

Operational and Procedural Changes

Emergency and Abnormal Procedures

- EP 1202.01 will be modified to:
 - Provide definitive criteria for Makeup/HPI cooling.
 - Correct SFRCS response verification.
 - Realignment of Auxiliary Feedwater mini-recirculation flowpath.
 - MSIV status verification.
 - New motor driven feedwater pump operation.
- Criteria for AFW suction transfer from service water to the CST. (SP.1106.06 AFP operating procedure modified.)

Operational and Procedural Changes

Emergency and Abnormal Procedures

- SRO required to remain in the Control Room Panel area directing actions of the RO once EP 1202.01 is implemented. (AD.1839.00 modified)
- Review all Emergency/Abnormal Procedures to assure clarity of instructions when unusual actions are required. (Completed 11/15)
- Review all Emergency/Abnormal Procedures to assure Control Room instrumentation is adequate to support the decision statements requiring operator action. (Completed 11/15)
- Provide manual pressure-temperature plotting capability on the operator console. (Completed 10/30)

Operational and Procedural Changes

NRC Notification

- Checklist provided in the Control Room to ensure information provided to the NRC Duty Officer is timely and accurate.
AD.1839.00, Enclosure 6, provides checklist for Control Room operators. (Completed 11/23)
- Additional training will begin 12/16 for personnel responsible for NRC emergency notifications.

Operational and Procedural Changes

Shift Technical Advisor (STA)

- Shift schedule changed from 24-hour duty day to rotating 12-hour shifts. (Completed 10/30)
- STA spends entire shift within protected area. (Completed 9/1)
- STA office located within 1-2 minutes of the Control Room. (Completed 9/1)
- Trained as Interim Emergency Duty Officer to advise the Shift Supervisor in event classification and Protective Action Guidelines. (Completed 11/6)
- New class of STA'S currently in training will be SRO licensed and part of normal shift complement.

Equipment Investigation

Purpose: Determine root cause of equipment malfunctions in order that appropriate and effective corrective actions are implemented.

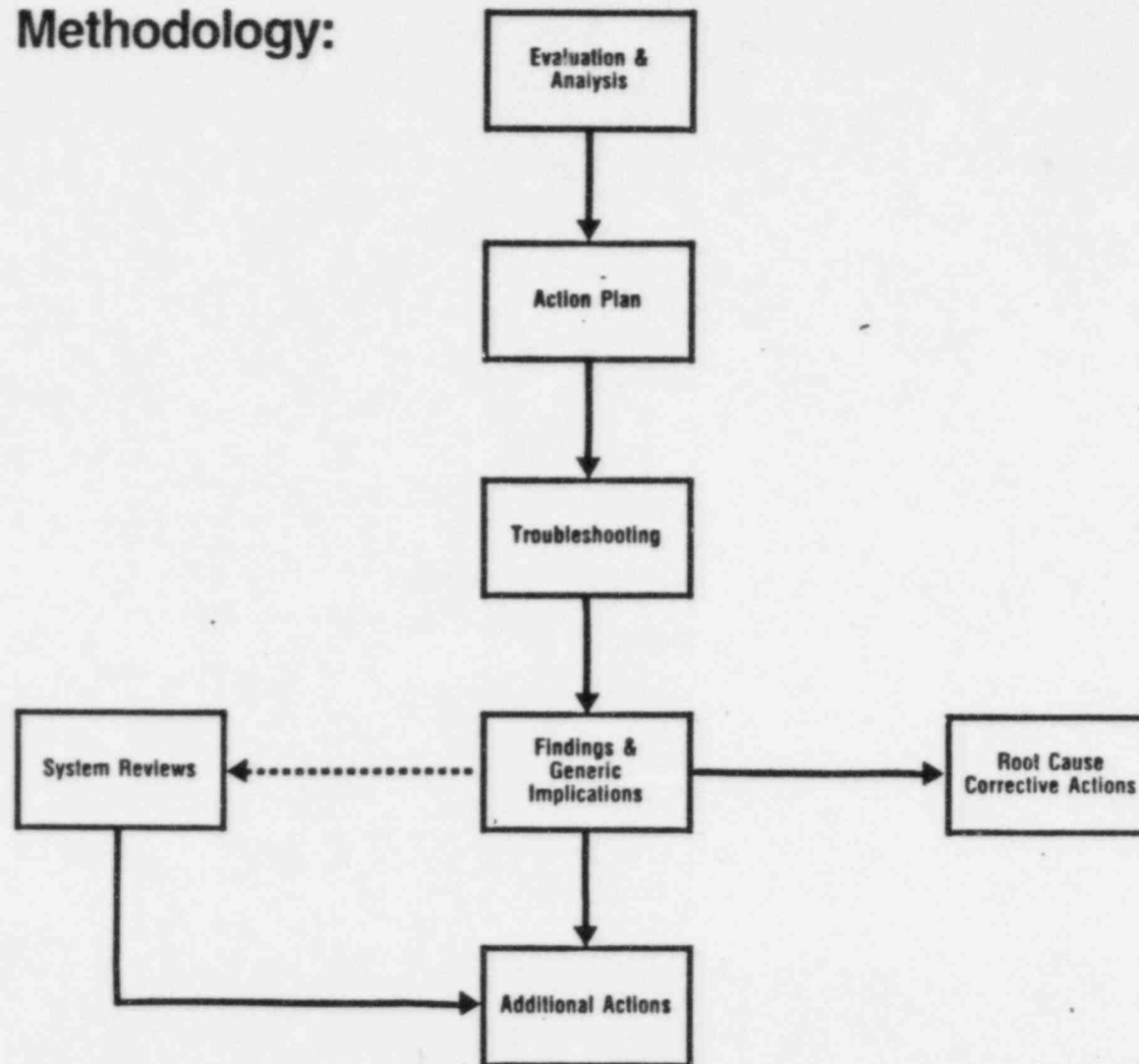
Scope: Thirteen (13) areas of equipment concern were identified for investigation.

Seven (7) systems were impacted:

1. Auxiliary Feedwater
2. Main Feedwater
3. Steam Feedwater Rupture Control System
4. Main Steam
5. Reactor Coolant System
(pilot operated relief valve only)
6. Nuclear Source Range Instrumentation
7. Safety Parameter Display System

Equipment Investigation

Methodology:



Equipment Investigation

Major Issues:

A. Auxiliary Feedpump Turbines

- Installing new steam admission valves.
- Designing for high energy line breaks.
- Installing new governor on AFPT #1.
- Improving trip/throttle valve reset capability.

B. Pilot Operated Relief Valve (PORV)

- No specific root cause identified.
- Performing control panel changes.
- Rebuilding PORV with new parts.
- Testing program performed/planned.

C. Motor—Operated Valves

- Resetting limit switches/torque switches.
- Using MOVATS test equipment.
- Performing differential pressure tests.
- Correcting/Checking other features
 - Pre-LLRT Stem checks
 - Post-LLRT Lubrication checks
 - T-Drains Current signatures
 - Space heaters Parts check
 - Wiring checks Valve design data
 - EQ wire checks Operator design data

Equipment Investigation

Findings: Detailed in reports generated for each of the 13 areas of concerns.

Root causes identified in the areas of:

Design

Maintenance

Testing

Procedures

Training

Corrective Actions: Root cause corrective actions to be done prior to restart.

Include:

15 Design modifications

13 Maintenance/replacement activities

5 Procedural and/or training issues

Piping Supports Walkdown

Phase I—Prior to Restart

A. Inspect and complete evaluation of 945 supports.

Three complete systems—Auxiliary Feedwater, High Pressure Injection, Low Pressure Injection.

Four systems, containment portion only—Core Flood, Containment Spray, Hydrogen Dilution, Pressurizer Relief.

**Results: Inspection complete—875 NCRs
80% acceptable as-found
20% minor rework**

B. Inspect and preliminarily evaluate 1465 supports.

Addresses balance of in-containment piping supports.

Results: Inspection complete.

No major problems noted.

Phase II—After Restart

Complete inspection and evaluation of all safety-related piping supports prior to end of next refueling outage. Adds 2500 supports.

Environmental Qualification

Environmental Qualification (EQ) program assures that safety-related electrical equipment will perform their important functions under accident environmental conditions (e.g., temperature, pressure, radiation).

EQ Program Activities Include:

- Review and upgrade of the Qualification Files.
- Review and reissue of the EQ Equipment Master List.
- Preparation of programmatic and implementing procedures.
- Walkdown (baseline survey) of "as-installed" plant EQ equipment.
- Review and documentation of to-date maintenance and surveillance of EQ equipment.

Outage Related EQ Activities:

- Evaluation of the reconfigured auxiliary feedwater system and the newly installed motor driven feedwater pump for high energy line break and EQ impacts.
- Modification or replacement of non-qualified EQ equipment.

Main Feedpump Turbine (MFPT)

Concern: Overspeed tripping of MFPT 1-1 initiated a plant runback.

Findings: Failed circuit board capacitor in General Electric control system.

Corrective Actions: 1. Replace faulted board.
2. Check and test control circuits for both MFPT 1-1 & 1-2.

Generic Implications: None-problem is specific to MFPT control circuits.

Steam Feedwater Rupture Control System (SFRCS)

- | | |
|------------------------------|--|
| Concern: | Spurious SFRCS actuation closed both main steam isolation valves and isolated steam to main feedpump turbines. |
| Findings: | Turbine trip caused pressure oscillations which SFRCS detected as low steam generator level. Level pressure tap was made more sensitive due to transmitter changeouts. |
| Corrective Action: | Add electronic filtering to signals. |
| Generic Implications: | Increase in sensitivity/response can result due to transmitter changeouts. Installing filtering in Reactor Protection System flow transmitter circuitry. |

Auxiliary Feedpump Turbines

Concern:	Both auxiliary feedpump turbines tripped on overspeed - this prevented supply of water to steam generators.
Findings:	Condensation in long steam inlet lines disrupts proper turbine control.
Corrective Actions:	<ol style="list-style-type: none">1. Keep lines hot with steam to greatly reduce water formation.2. Increase steam trap capability.3. Improve governor controls.
Generic Implications:	None-no other quick start steam driven turbines.

Auxiliary Feedpump Turbine Trip and Throttle Valves

Concern:	Operators experienced problems resetting the valves - delayed initiation of auxiliary feedwater to steam generators.
Findings:	Procedures and prior training not sufficient.
Corrective Actions:	<ol style="list-style-type: none">1. Provide improved hands-on training.2. Provide placards and local indicators on T&TV to help operators.3. Enhance communications between pump rooms and from pump rooms to Control Room.
Generic Implications:	Other crucial operator actions performed locally. Covered by Operator Actions review.

Auxiliary Feedwater Valves AF 599 and AF 608

Concern:	Valves failed to open on demand after closing earlier - would have prevented auxiliary feedwater flow.
Findings:	Motor operators on valves were not properly adjusted allowing valves to "torque out".
Corrective Actions:	<ol style="list-style-type: none">1. Readjust AF 599 and AF 608.2. Evaluate and readjust other motor operated valves.3. Test valve operations.4. Provide new maintenance procedures.
Generic Implications:	Applicable to other motor operated valves

Pilot Operated Relief Valve (PORV)

Concern: During transient PORV failed to close properly after third opening - closure of the block valve isolated the PORV and it reseated.

Findings: No physical evidence found to explain improper closure - foreign material in pilot cannot be ruled out - performance similar to industry experience.

Corrective Actions:

1. Testing of valve - old/new.
2. Add acoustic monitor flow indication light on PORV control panel.
3. Change PORV annunciator light from white to red.
4. Improve panel labeling of solenoid open/close switch.
5. Provide for PORV exercising during shutdowns.

Generic Implications: None-no valves of similar design.

Main Steam Headers

Concern: After closure of main steam isolation valves, pressure control problems were experienced in the main steam headers.

Findings: Manual actuation of atmospheric vents valves (AVV) caused large pressure drop in header #1 - AVV control circuitry on header #2 is a lesser concern. Switch contacts corroded on ICS module.

Corrective Actions:

1. Full check-out and adjustment of AVV control circuitry.
2. Testing and refurbishment of main steam safety valves.
3. Refurbishment of ICS modules for AVV circuitry.

Generic Implications: Switch contacts being evaluated and refurbished on other ICS modules.

Main Feedwater Startup Control Valve

Concern:	Operators were uncertain of status of control valve SP-7A due to blown light bulb.
Findings:	Valve operated properly - technician inserted incorrect voltage lamp during event.
Corrective Action:	Provide additional information to operators.
Generic Implications:	None-no significant findings.

Auxiliary Feedwater Pump #1 Suction Supply

Concern: Pump suction transferred from normal to backup water supply about 20 minutes after reactor trip.

Findings: No impact to steam generator - transient low suction pressure caused transfer.

Corrective Actions:

1. Revise strainer arrangement.
2. Revise transfer switch setpoints.
3. Provide time delay.

Generic Implications: Other pump suction transfer systems.

Main Steam Valve MS-106

Concern: Valve position indication recorded as closed to not closed to closed in about one-third the expected time - this valve is used to admit steam from steam generator #1 to auxiliary feedpump turbine #1.

Findings: Motor operator on valve was not properly adjusted.

Corrective Action: Readjust, inspect, and test valve.

Generic Implications: Other motor operated valves.

Nuclear Instrumentation Neutron Source Range Detectors

Concern: Prior to event NI-1 was inoperable and NI-2 failed during transient - previous problems had been experienced.

Findings: NI-1—Inadequate grounding of shield found at preamp due to paint and lack of star washers.

NI-2—intermittent failure of containment penetration cable center conductor.

Triax cable connectors also found degraded in each detector string.

Corrective Action:

1. NI-1—proper ground established.
2. NI-2—replacing penetration/module.
3. Replacing/refurbishing connectors as required.

Generic Implications: Preventative maintenance program needed for source range, intermediate range, and power range connectors.

Turbine Bypass Valve

Concern: Pneumatic actuator assembly cracked and failed during cooldown operations several hours following reactor trip.

Findings: Internal valve components became disengaged and caused hammer blow forces which damaged actuator.

Corrective Action:

1. Repair damaged valve.
2. Repair steam traps and drains.
3. Refurbish other turbine bypass valves.
4. Revised operating procedure to assure proper drainage of headers.

Generic Implications: Applies to both turbine bypass valve headers.

Safety Parameter Display System (SPDS)

Concern:	Both SPDS Control Room display devices were inoperative during event - they are intended to be used by the operators during transients.
Findings:	Bad fiber optic cable and faulty terminations on data transmission cable.
Corrective Action:	<ol style="list-style-type: none">1. Use spare cable.2. Correct terminations.3. Replace obsolete terminal.
Generic Implications:	None-no other fiber optic systems.

Decay Heat Removal Reliability Improvement Program

Task Force Effort

- Chartered to review all systems used for decay heat removal.
 - Main Feed and Steam
 - AFW
 - SUFP
 - SFRCS
 - Feed and Bleed
- Identified changes to improve operational reliability and to reduce complexity of SFRCS.
- Broad Membership
 - Experience in design, engineering, operations.
 - Included outside expertise:
 - MPR Associates
 - Babcock and Wilcox
 - Cygn

Task Force

Objectives:

- **Reduce frequency of demand for emergency decay heat removal.**
- **Reduce number of automatic system responses required to initiate auxiliary feedwater.**
- **Reduce potential for common mode failure.**
- **Evaluate diverse and redundant means of decay heat removal.**

Goal:

- **Provide equipment recommendation that would improve reliability of systems used for decay heat removal. Specific improvements for the AFW should eventually achieve SRP reliability criteria.**

Task Force Methodology

- Multiple "techniques" used.
 - Deterministic
 - Preliminary Scoping Analysis
 - Engineering Judgment
 - Assessment of existing PRA's
- Reviewed Documentation.
- Evaluated past operating experience.
- Interviewed Toledo Edison personnel.

AFW/SFRCS Reliability

Reduction of spurious initiators:

- **Filter existing steam generator level signals.**
- **Improve SFRCS power supply performance.**
- **Remove main steam and main feedwater isolation on SG low level.**

AFW/SFRCS Reliability

AFW initiation to SG—improvements:

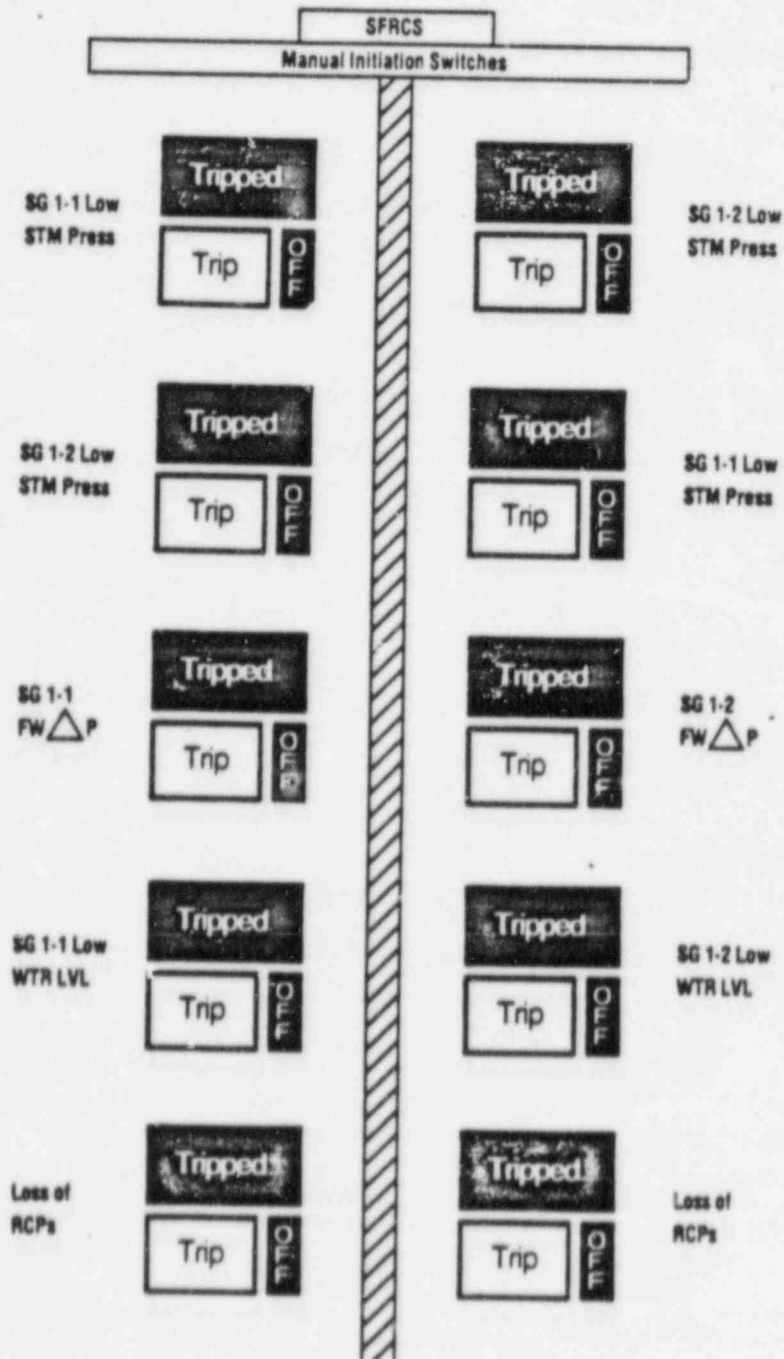
- Provide hot steam lines to AFW pumps.
- Valve motor operator improvements.
- Depower CST to AFWPT suction valves.
- Eliminate deaerator suction paths.
- Disable feed isolation to last steam generator depressurized.
- SFRCS manual initiation improvements.
- Raise ICS low level limit.

AFW/SFRCS Reliability

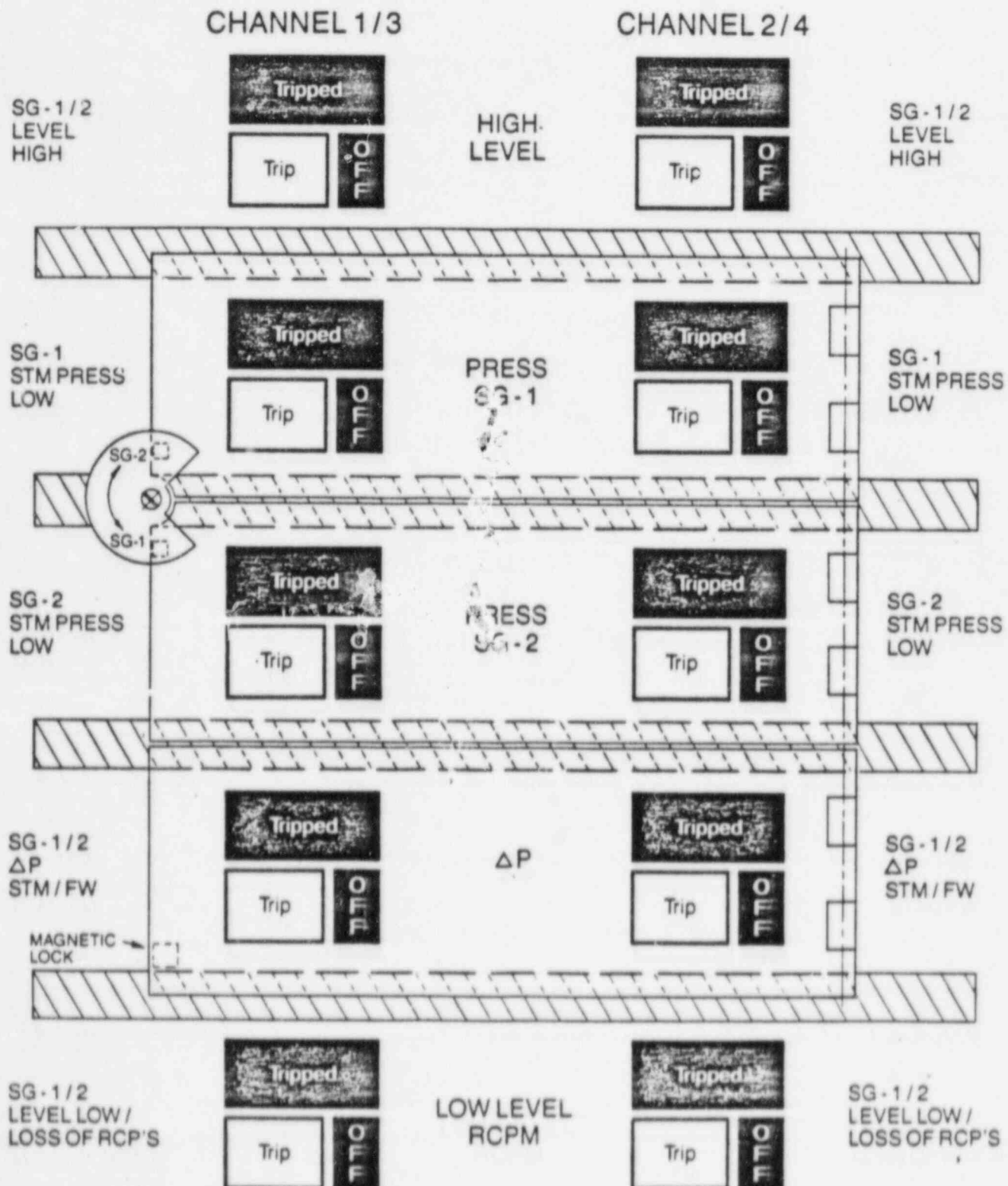
AFW continuation improvements:

- Install PGG governor on AFPT-1.
- Provide seal-in manual reset for SFRCS full trip alarm.
- Remove AFW pump suction strainers.
- Resize strainer from CST.
- Revise AFP suction transfer scheme.
- Install local AFPT trip throttle valve indication.

Original Layout



SFRCS Manual Initiation Switches



Installation of Motor Driven Feedwater Pump

New pump design features:

- Provides 100% capacity auxiliary feedwater flow.
- Pump discharge aligned to the auxiliary feedwater headers during normal full power operation.
- Pump suction normally from the Condensate Storage Tank.
- Pump capable of being started from the Control Room.
- Pump motor can be supplied from either emergency diesel generator following a loss of offsite power.
- Can be manually realigned to feed the Main Feedwater System. This will be the normal alignment during low power operation. Pump suction in this alignment will be from the Deaerator Storage Tank.
- Eliminates high energy line break concerns associated with existing start up feedpump.
- Resolves some fire protection compliance items.

Summary of AFWS Reliability Analysis

- Analysis conducted in accordance with the scope and methodology provided in NUREG-0611.
- Events modelled
 - Loss of main feedwater (LMFW)
 - LMFW with loss of offsite power
 - LMFW with loss of onsite AC power
- Three configurations analyzed
 - June 9, 1985 AFWS (two pump)
 - AFWS at restart (two pump configuration)
 - AFWS at restart with motor driven feed pump (three pump configuration)
- Results
 - Unavailability of the Davis-Besse AFWS (at restart) with the motor driven feed pump is within the SRP 10.4.9 acceptance criteria.

Longer Term Decay Heat Removal Reliability Improvements

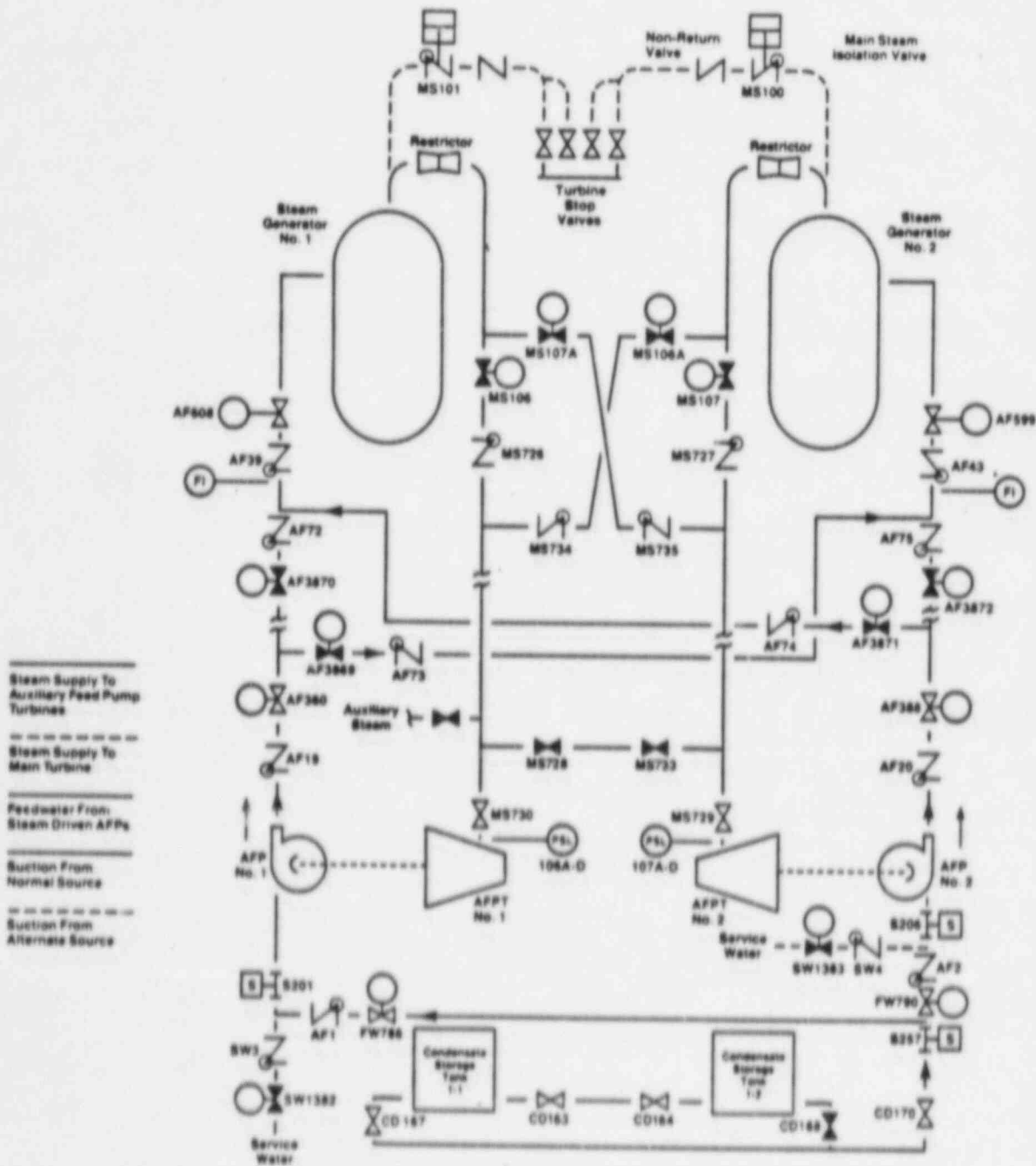
- Provision of primary system blowdown valves for enhancement of feed and bleed capability.
- Restoration of existing startup feedwater pump and provision of Control Room capability for associated valves.
- Provision of Control Room capability for the motor driven feedwater pump discharge valves to the AFW header.
- Further AFW valve flowpath reductions.
- Improve AFW level control.
- Improve margin between SFRCS and ICS low level setpoints.
- SFRCS logic revision to further minimize isolation.
- Control Room "mimic" panel for finalized AFW/SFRCS.

Chronology of PORV Flowrate Data

September, 1977	PORV nameplate flowrate. 112,000 lb _m /hr. at 2300 psig
February, 1983	EPRI Test Flowrate Extrapolation 245,000 lb _m /hr.
August, 1985	Initial Feed and Bleed analysis with 10 min. operator action at 610°F RCS hot leg temperature. Results - acceptable. 226,000 lb _m /hr.
October, 1985	"Preliminary" Marshall Station test results. 174,000 lb _m /hr.
November, 1985	Error discovered in Marshall flow device data application.
November, 1985	Corrected Marshall test results. 213,000 lb _m /hr.
November, 1985	Modified PORV nozzle and seat. Low pressure test extrapolation. 229,000 lb _m /hr. Marshall test—232,000 lb _m /hr.
December, 1985	Feed and Bleed analysis with 10 min. operator action at 600°F RCS hot leg temperature. Results - acceptable. 211,000 lb _m /hr. (including inlet pipe losses)

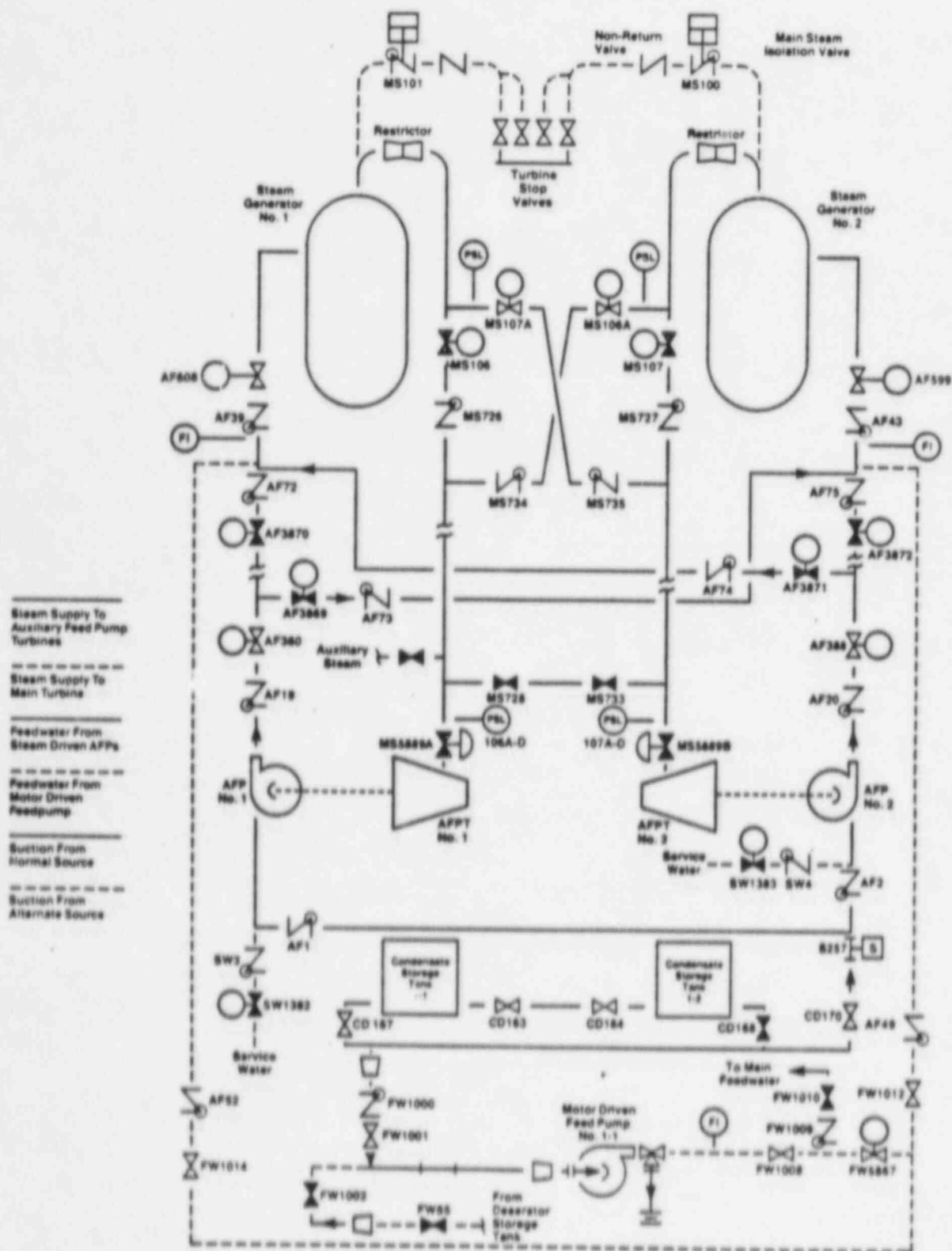
All flowrate data at 2500 psig, unless otherwise noted.

Davis-Besse Auxiliary Feedwater System June 9, 1985

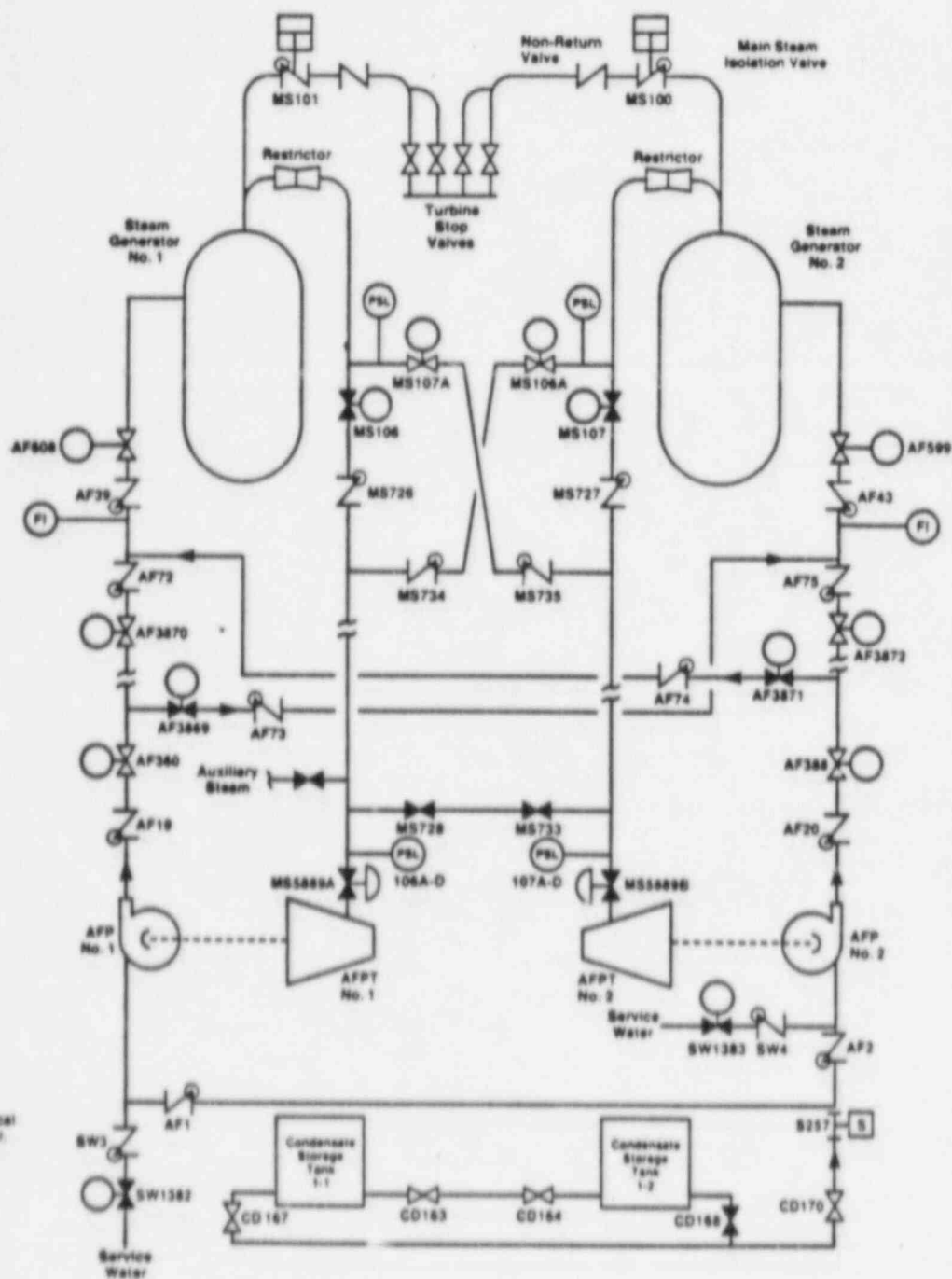


Davis-Besse

Auxiliary and Motor Driven Feedwater Systems Start-Up Configuration



Davis-Besse Auxiliary Feedwater System Long Term Configuration*



*Subject to acceptable analytical verification and NRC approval.

System Review and Test Program Objectives

For systems important to safe plant operation:

- **Identify important and recurring design, maintenance and operations problems and determine whether corrective actions are required prior to restart or can be taken over long term.**
- **Evaluate scope of existing periodic testing to identify any additional testing needed to ensure required functions will be performed.**
- **Conduct test program to assure these systems are functional. Testing will also be performed to verify adequacy of system modifications completed during outage.**

This program will be completed prior to restart of Davis-Besse.

System Review and Test Program Scope

Review encompasses 31 systems judged important to safe operation of Davis-Besse. Attributes considered in system selection included:

- **Performs an active safety function.**
- **Malfunction could lead to challenges to safety systems.**
- **Malfunction could result in abnormal plant transients.**
- **Important to preventing, detecting, controlling or mitigating plant transients.**
- **History of unreliable performance.**
- **Associated with June 9, 1985 event.**

The 31 systems are listed on the following two pages. Two additional systems were identified to have a limited review (gaseous radwaste and post accident sampling system).

System Review and Test Program Systems Selected

Reactor Coolant System

High Pressure Injection System

Core Flooding System

Decay Heat Removal and Low Pressure Injection System

Containment Spray System

Containment Emergency Ventilation System

Containment Air Cooling and Hydrogen Control System

Makeup and Purification System

**Electrical 125/250 VDC System (includes Battery Room
H&V)**

Electrical 4.16 KV System (13.8/4.16 KV transformers)

**Electrical 480 V Distribution (includes inverters and
required transformers)**

**Electrical 13.8 KV System (includes startup and auxiliary
transformers)**

**Emergency Diesel Generators (includes "Q" fuel oil
tanks and diesel room ventilation)**

**Instrument AC Power System (includes inverters and
required transformers)**

System Review and Test Program Systems Selected

Anticipatory Reactor Trip System
Control Rod Drive Control System
Incore Monitoring (Includes core exit thermocouples)
Reactor Protection System
Steam and Feedwater Rupture Control System
Safety Features Actuation System
Integrated Control System
Security System
Control Room Normal and Emergency H&V Systems
Station and Instrument Air
Station Fire Protection
Component Cooling Water System
Service Water System
Auxiliary Feedwater System
Main Steam System
Steam Generator System
Main Feedwater System

System Review and Test Program Approach

- **"Team" for each system.**
 - Headed by Toledo Edison engineer.
 - Supported by highly-qualified industry personnel.
- **Focused interviews of operations, maintenance and engineering personnel.**
- **Review of selected records for Davis-Besse experience (E.G., Licensee Event Reports, NPRDS Data, Maintenance Work Orders, Transient Assessment Program Reports, Deviation Reports).**
- **Identify corrective actions for problems.**
 - Prior to restart.
 - Long term.
- **Prepare report including summary of system functions, problems and corrective actions.**

System Review and Test Program Test Review

- Review periodic test requirements for each system to ensure required functions are adequately demonstrated and confirmed.
- Prepare report summarizing results of test review and identifying test changes required.
- Prepare test outlines and procedures for:
 - Post-modification testing.
 - New periodic testing.
 - Revised periodic testing.
 - One-time tests supporting restart.
- Review results of test program and prepare test summary.

Independent Process Review Committee

- Overall review of system review and test program.
- Ensure system review and corrective action process in combination with system and equipment testing will adequately demonstrate the operational readiness of the systems and equipment important to safe operation of Davis-Besse.
- Committee membership combines a broad background of nuclear industry experience with specific knowledge of the Davis-Besse plant design.
- Concurrence with:
 - Scope and depth of review by "Teams".
 - System functions.
 - Corrective actions required prior to restart and over long term.
 - Periodic test review.
 - Test requirements to support restart.
 - Test results.

Independent Process Review Committee Membership

P.C. Hildebrandt
Chairman
(MPR Associates)

R.S. Brodsky
(BETA)

J.D. Carlton
(B&W)

E.C. Novak
(TED Engineering)

J.P. O'Hanlon
(UESC)

L.P. Simon
(TED Operations)

J.G. Walker
(Bechtel)

C.A. Hengge
Secretary
(TED Nuclear Safety)

INDEPENDENT PROCESS REVIEW COMMITTEE

ROBERT S. BRODSKY

Bob Brodsky is a principal managing partner of Basic Energy Technology Associates, Inc. (BETA), a consulting firm serving clients in the nuclear industry and at all levels of government. He has over 25 years of experience in the naval nuclear program. As Assistant Director for Reactor Safety and Computation in the Naval Reactors Division at the Department of Energy, he was responsible for design and operational safety of the Navy's shipboard nuclear propulsion plants, the Department of Energy's naval nuclear prototypes, and the Shippingport Atomic Power Plant.

JAMES D. CARLTON

Jim Carlton is currently manager of Performance Analysis in B&W's Nuclear Engineering Department. He is responsible for the performance, safety, ECCS, radiation and reliability analysis of B&W and competitor NSS's. Prior to his current position, Mr. Carlton managed integrated organizations for B&W and B&W's licensee in Germany. His responsibilities in this integration function included overview of the design, specification, and analyses of B&W's scope of supply in the NSS. Mr. Carlton was also a systems and components design engineer at B&W for several years. His activities included design and operating experience on the NSS Savannah. He participated in the design of B&W's 177 and 205 FA NSS by activities such as the reactor coolant system design, the once-through steam-generator design and prototype testing, and development and prototype testing of the Integrated Control System.

CRAIG A. HENGGE, SECRETARY

Craig A. Hengge is a Senior Assistant Engineer in the Nuclear Safety Department at Toledo Edison Company. He began full-time employment with Toledo Edison as an Assistant Engineer in 1981. Mr Hengge has been involved in probabilistic risk assessment and system reliability activities at Davis-Besse. Most recently, he participated as a member of the Decay Heat Removal Group which conducted an in-depth review of various systems utilized for reactor decay heat removal at Davis-Besse and identified specific improvements to those systems. Mr. Hengge also serves as Secretary of the Company Nuclear Review Board. He holds a B.S. degree in Nuclear Engineering from the University of Cincinnati and was employed at Toledo Edison from 1978 through 1980 as a Co-op Student.

PHILIP C. HILDEBRANDT, CHAIRMAN

Phil Hildebrandt is a consulting engineer with MPR Associates, Inc. of Washington, D. C. He has been with MPR Associates since 1979 involved with a wide range of engineering tasks for both nuclear and fossil-fired power plants. Prior to joining MPR he was a design engineer with Duke Power Company, responsible for resolution of nuclear steam generator related problems and design for specific fluid systems. Mr. Hildebrandt was with the Naval Nuclear Propulsion Program for ten years. He was on Admiral Rickover's staff and was responsible for nuclear steam generator operation, maintenance and design, and earlier, involved with the design of fluid and mechanical systems for submarine propulsion plants. He is a registered professional engineer in the Commonwealth of Virginia.

EUGENE C. NOVAK

Eugene C. Novak is Director of Fossil Facilities Engineering and Construction at Toledo Edison Company. In that capacity he is responsible for all capital improvements projects and offsite engineering support activities for the Company's non-nuclear electric generating facilities. Mr. Novak is also chairman of the Company Nuclear Review Board. Mr. Novak began full-time employment with Toledo Edison as Assistant Engineer in 1959. For ten years he held various engineering positions at the Company's fossil fueled generating facilities. From 1970 through 1980 Mr. Novak was directly involved in the Davis-Besse project holding various engineering positions including Project Engineer and Director of Power Engineering and Construction. Mr. Novak holds a B.S. degree in Mechanical Engineering and an M.S. degree in Industrial Engineering from the University of Toledo, and an M.S. Degree in Nuclear Engineering from the University of Michigan. He is a registered professional engineer in the State of Ohio.

JAMES P. O'HANLON

James P. O'Hanlon is the manager of the operations service division for United Energy Service Corporation in Atlanta, Georgia. Mr. O'Hanlon has over 20 years supervisory and management experience in the nuclear industry. His experience includes that of a general manager of a multi-unit operating nuclear station responsible for all onsite activities. It also includes experience as Assistant Director of Evaluation and Assistance at the Institute of Nuclear Power Operations with responsibility for direction of evaluations of all nuclear utilities in the U.S.

LOUIS P. SIMON

Louis Simon maintains an Senior Reactor Operator's license for Toledo Edison's Davis-Besse Nuclear Power Station. He is Operational Projects Supervisor in the Operations Engineering Department. Mr. Simon has over 27 years steam plant operating experience, naval, industrial, and utility. Mr. Simon joined Toledo Edison in Fossil Operations in 1962. He participated in the Davis-Besse cold licensing program and was a Shift Supervisor through startup and commercial operation. Mr. Simon became Operations Supervisor in January 1979 and held this position until December 1985.

JOHN G. WALKER

John Walker is manager of operating plant services for Bechtel Power Corporation in Ann Arbor, Michigan. He has been with Bechtel since 1966 involved with the startup of numerous nuclear and fossil power plants in the U.S. and foreign countries. He served as chief startup engineer for eight years and was a project manager for three years prior to becoming manager of operating plant services. Prior to joining Bechtel, Mr. Walker was a plant operations supervisor for Texas Electric Service Company. He graduated from Texas A&M with a B.S. degree in Mechanical Engineering and is a licensed professional engineer in California and Texas.

Determination of Corrective Actions Required Prior to Restart

- Corrective actions necessary to ensure safe and reliable plant operation.
- Based on collective experience and judgment of Independent Process Review Committee considering
 - Plant design basis described in the Updated Safety Analysis Report.
 - Technical Specification requirements.
 - Reliable plant operation.
 - Protection of personnel, systems and equipment.
 - Prudent engineering practice.

Current Status of System Review and Test Program

- Identification of specific system and equipment problems requiring resolution prior to restart is complete.
- System review reports summarizing system functions, problems, and required corrective actions complete.
- Review of periodic tests for system operability

Problem Areas Identified During System Reviews

- **For the 31 systems**
 - Approximately 140 problem areas require resolution prior to restart.
 - Approximately 200 problem areas require resolution over long term.
- **Resolution ranges from engineering evaluation to hardware changes in plant.**
- **Facility Change Requests, Maintenance Work Requests or Requests for Engineering Evaluation have been prepared to address all problems that must be resolved prior to restart.**

Examples of Important Problem Areas

- **Control Room Emergency Ventilation System.**
- **Auxiliary feedwater discharge piping overpressurization.**
- **Potential flooding of pit containing decay heat removal valves (DH-11 and 12 motor operated valves).**
- **Inadequate ventilation in service water pump room.**
- **Widespread station and instrument air system leaks and dependence on temporary diesel air compressor.**

Recurring Problem Areas

- Inattention to heating/ventilation/air conditioning requirements.
- Inoperable nitrogen regulators.
- Inadequate maintenance for hydromotor actuators.
- Tracking and replacement of limited life components (e.g., seals, elastomers, electrical components).
- Valve packing leakage.
- Steam trap maintenance.
- I&C preventive maintenance/calibration.

System Review and Test Program Objectives

For systems important to safe plant operation:

- **Identify important and recurring design, maintenance and operations problems and determine whether corrective actions are required prior to restart or can be taken over long term.**
- **Evaluate scope of existing periodic testing to identify any additional testing needed to ensure required functions will be performed.**
- **Conduct test program to assure these systems are functional. Testing will also be performed to verify adequacy of system modifications completed during outage.**

This program will be completed prior to restart of Davis-Besse.

System Review and Test Program Test Review

- Evaluate each system important to safe plant operation considering the effects of modifications made during the outage.
- For each system function important to safe plant operation:
 1. Identify existing periodic tests which adequately demonstrate the function
 - or
 2. Prepare outlines for new or revised test which will adequately demonstrate the function
 - or
 3. Provide justification that the function cannot or should not be tested prior to restart.
- Document the results of this evaluation for review by the Independent Process Review Committee.
- Independent Process Review Committee concurs with scope of testing to be performed.

Restart Tests To Be Conducted

Preliminary results of the test review have identified:

- 46 Existing periodic tests to be performed prior to restart to demonstrate system functions.
- 87 New or modified periodic tests or one time tests necessary to demonstrate functions including tests required as a result of modifications.
- 7 Integrated tests to demonstrate system functions involving multiple systems.
- 140 *Total Tests*
- Average test duration is approximately 12 hours excluding test setup time.
- Total test program will require approximately 11 weeks including power escalation testing.

Restart Test Program Approach

- Use existing station administrative procedures to implement and control the restart test program to the extent possible.
- New procedures developed to control activities unique to the restart test program include:

Organization structure, functions, and responsibilities of the various groups and committees supporting the system review and test program.

Development of test procedures for new or modified tests:

Independent Process Review Committee concurs with scope.

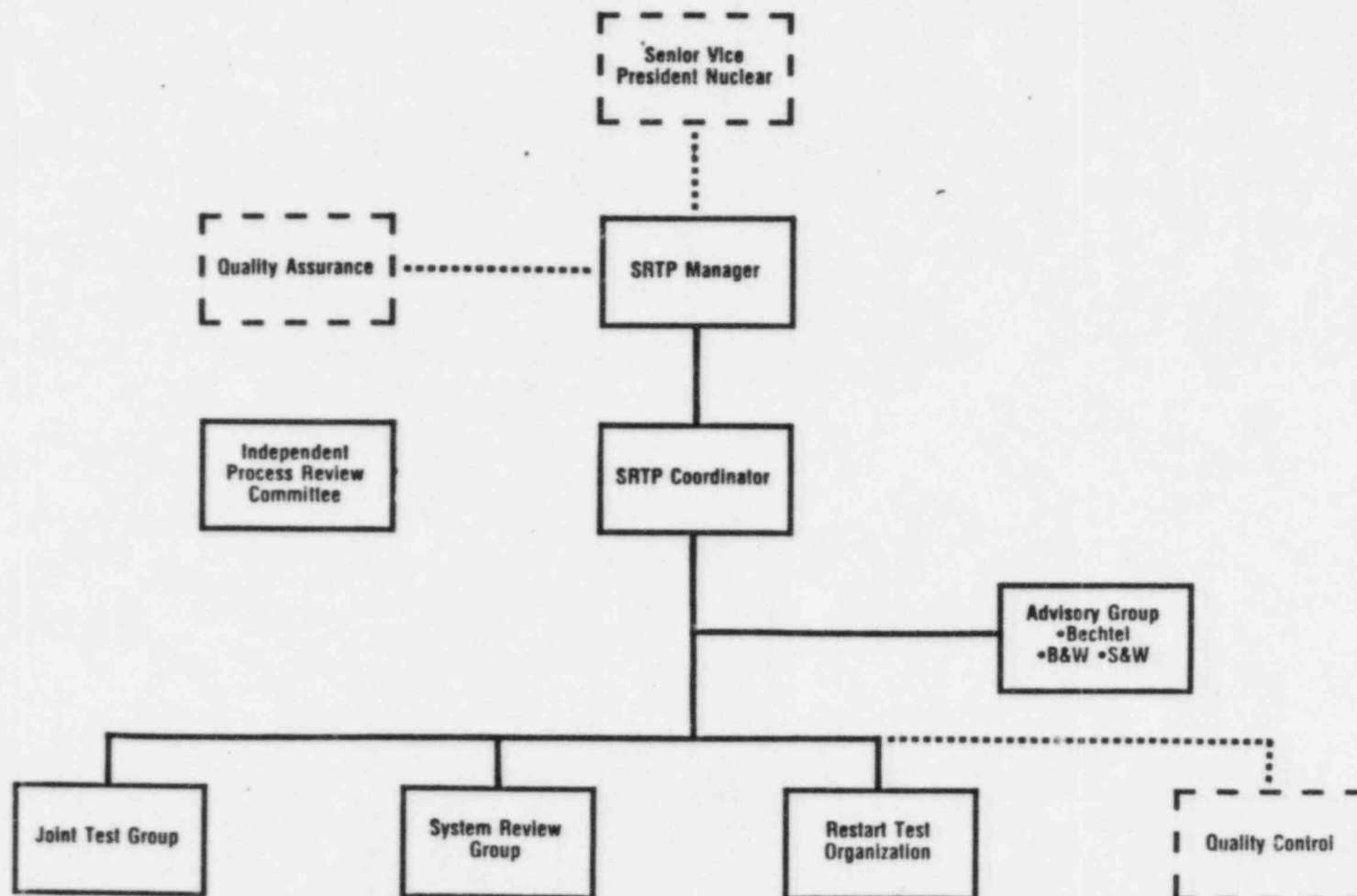
Joint Test Group approves test procedures.

Station Review Board and Plant Manager approve test as usual.

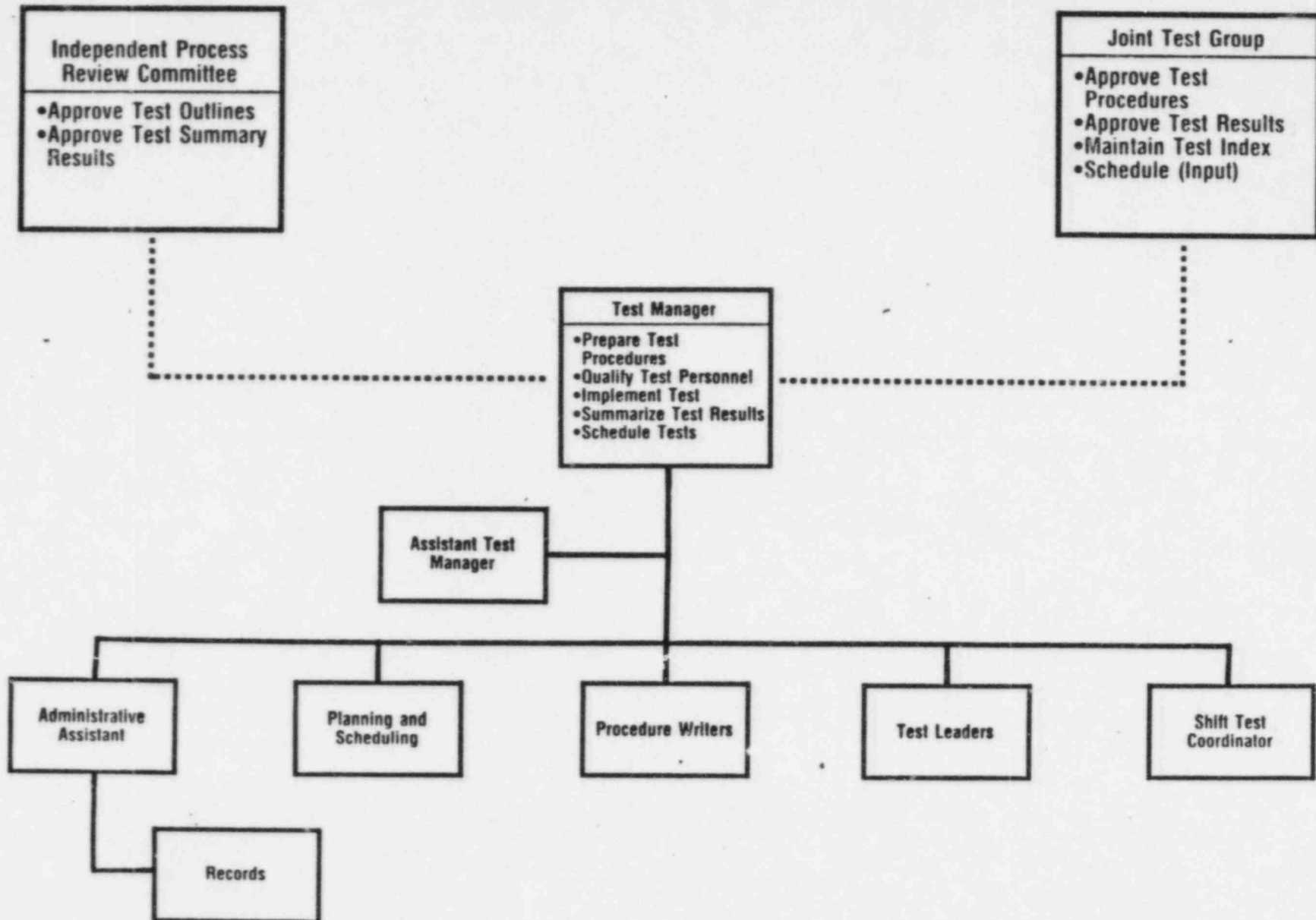
Conduct of new or modified test by special test organization.

Results of all test conducted to demonstrate functions important to safe plant operation to be reviewed by Joint Test Group and Independent Process Review Committee.

System Review and Test Program (SRTTP) Organization



Restart Test Organization



SYSTEM REVIEW AND TEST PROGRAM

SUMMARY OF CORRECTIVE ACTION ITEMS

FOR DAVIS-BESSE

Reactor Coolant System

Prior To Restart

- Improve stroke time on containment isolation valve.
- Repair leakage from RCS to nitrogen system.
- Repair/replace and calibrate PORV discharge line temperature element.
- Install PORV loop seal drain line.
- Modify PORV status indications.
- Realign hot leg Rosemount RTDs to TSAT meter.

Long Term

- Repair end plugs on out-of-service pressurizer heater elements.
- Improve maintenance capability for RC drain tank.
- Repair/replace nitrogen regulator for RC drain tank.
- Repair/replace Tave digital readout.
- Evaluate RC pump seal or motor parameters to be used for securing pumps.
- Calibrate RC pump vibration instrumentation.
- Improve core exit temperature measurement capability.
- Modify pressurizer heat bank operation to handle larger heat losses.

High Pressure Injection System

Prior To Restart

- **Confirm HPI pump capability at high flow, low head conditions.**
- **Confirm HPI pump capability at high suction temperature.**
- **Investigate standing water from unidentified sources in several areas (e.g., ECCS room #1; containment vessel annulus floor).**
- **Remove startup strainers from HPI pump suction.**
- **Modify HPI pump suction check valves (HP10 and HP11) to facilitate proper disk seating.**
- **Verify proper operation of several HPI pump component cooling water stop check valves.**
- **Revise plant documentation to reflect higher design pressure capability of section of piping downstream of discharge check valve HP23.**
- **Investigate increasing trend in inboard bearing vibration for HPI pump 1-1.**

High Pressure Injection System (Cont'd)

Long Term

- Evaluate need for design modification to HPI pump component cooling water stop check valves to preclude "sticking".
- Calibrate HPI pump motor temperature instrumentation.
- Eliminate low flow nuisance alarm on HPI pumps.
- Replace improper flow measurement orifice in HPI pump 1-1 minimum recirculation line.
- Relocate control cable for AC lube oil pump for HPI pump 1-1 per Appendix R requirements.
- Improve communications capability between ECCS rooms and Control Room.
- Resolve means of leak testing for back-to-back check valves in HPI discharge valves.
- Evaluate cyclic life of 3/4 inch elbowlets attached to HPI discharge line.

Core Flood System

Prior To Restart

- **Confirm location of level taps on Core Flood tanks.**
- **Inspect/repair nitrogen regulator for Core Flood tanks.**

Long Term

- **Prepare calibration procedure for Core Flood tank level instrumentation.**
- **Evaluate required purge time for sampling of Core Flood tanks.**
- **Calibrate sampling purge flow meter.**

Decay Heat Removal System

Prior To Restart

- Install level indicating capability for DH11 & DH12 valve pit.
- Install modified packing in DH11 & DH12.
- Modify procedures to preclude overpressurization of decay heat pump suction.
- Improve cold weather operation of BWST level instruments.
- Reinstall mis-assembled studs on decay heat pump.
- Calibrate boron dilution flow transmitter instrument strings.

Decay Heat Removal System (cont'd)

Long Term

- Evaluate means of eliminating sealed pit design for valves DH11 & DH12.
- Evaluate possible system modifications to preclude decay heat pump suction overpressurization.
- Ensure spare parts availability for BWST recirculating pump and heater.
- Add temperature alarm on BWST; evaluate improved temperature control.
- Evaluate alternative means of precluding over-ranging of low range decay heat pump suction pressure gauges.
- Evaluate more easily read oil level indicators for decay heat pumps.
- Evaluate means of reducing leakage from cyclone separators on decay heat pumps.
- Improve preventive maintenance for pneumatic valves DH13A & B.
- Investigate means of improving disk seating for check valves DH76 & DH77.

Containment Spray System

Prior To Restart

- **Verify torque switch and torque switch bypass settings for two Containment Spray System valves (CS1530 and CS1531)**
- **Determine specific operator response required when containment emergency sump level indicator lights are illuminated.**

Long Term

- **Evaluate adequacy of oil level sight glasses for containment spray pumps.**
- **Evaluate need for containment spray pump discharge pressure indication in Control Room.**

Containment Emergency Ventilation System

Prior To Restart

- Provide weather shield for EVS fan controller sensing line to ensuring operability.
- Replace seals on hydromotor actuator for ventilation damper.

Long Term

- Provide protection for instrumentation controls for fans.

Containment Air Cooling System and Hydrogen Control System

Prior To Restart

- Repair backdraft dampers for Containment Air Cooling System fans.
- Confirm proper operation of fans when shifted from high to low speed (overload indication is being received).
- Bench test hydrogen dilution system relief valve.

Long Term

- Confirm flow balancing of Containment Air Cooling System.
- Replace failed return bend on cooler C1-1.
- Evaluate installation of flow meter in purge test line to facilitate performing surveillance tests.
- Install soft seat for valve CV210 (containment isolation check valve).
- Confirm hydrogen recombiner is compatible with Davis-Besse system and can be made operable within required time.

Makeup and Purification System

Prior To Restart

- **Repair or replace failed containment isolation valve MU33.**
- **Remove any startup strainers in system.**
- **Confirm correct valve trim in MU32.**
- **Repair or replace leaking reactor coolant letdown pressure reducing valve (MU6) and controls.**
- **Provide indicator of makeup flow for use during feed and bleed operations.**
- **Remove inoperable and unused reactor coolant pump (RCP) seal leakage indication.**

Makeup and Purification System (Cont'd)

Long Term

- Repair/replace leaking reactor coolant batch makeup flow control valve, MU39 (currently isolated).
- Repair/replace batch controller.
- Repair minor oil leaks on makeup pumps.
- Evaluate and repair leaking valves MU19 (RCP seal injection valve) and MU216 (RCP seal injection bypass valve).
- Evaluate and repair boronmeter.
- Perform review of problems with hydrogen system (for maintaining makeup tank overpressure).
- Repair MU1903 (Cation demineralizer inlet isolation valve).
- Repair/replace seal injection stop check valves.
- Replace letdown block orifice.
- Improve communications capability between makeup pump room and control room.
- Evaluate intended function of boron permissive light.
- Perform review of failure modes of makeup system equipment (e.g., power supplies) and ability of operators to recognize problem and take corrective action.

250/125 Volt DC System

Prior To Restart

- None

Long Term

- Improve temperature control in battery room.
- Improve ground fault detection and location.
- Evaluate design change for low voltage relays to reduce failures.

4160 Volt AC System

Prior To Restart

- **Confirm operability of several breakers with original levering-in device.**
- **Replace CVE synchrocheck relay with different design.**
- **Resolve tap setting for 4160/480 Volt transformers and reset alarm accordingly.**

Long Term

- **Review consequence of paralleling bus tie transformers out-of-phase.**
- **Visually inspect all 4160 Volt breakers in "Q" cubicles for "E"-ring damage.**
- **Control non-"Q" 4160 Volt breakers to ensure they are not utilized in essential applications.**
- **Provide improved control of circuit breaker and relay setting records.**

480 Volt AC Distribution System

Prior To Restart

- **Confirm operability of switchgear cabinet door and stab withdrawal interlocks to ensure 480 VAC breaker operability.**

Long Term

- **Evaluate removal of stab withdrawal interlock feature.**
- **Evaluate alternative means of providing ground fault protection for 480 Volt AC motor control centers.**
- **Establish program for tracking limited life components in motor control centers.**
- **Improve preventive maintenance on switchgear cabinet door hardware and gasketing.**

13.8 KV System

Prior To Restart

- Investigate cause of fast transfer breaker failures and calibrate relay timing.

Long Term

- Improve method for racking in/out of 13.8 KV breakers.
- Repair small oil leak in Auxiliary Transformer.

Emergency Diesel Generators

Prior To Restart

- Eliminate electrical noise problems associated with diesel governor to improve stability.
- Improve temperature control for diesel generator room by changes to control/alarm system and maintaining ventilation damper actuators.
- Improve reliability of lubricating oil soak back pumps.

Replace set.

Check condition of filters and strainers.

- Test multiple air start capability of diesel generator.
- Calibrate low cooling water flow alarm switch.
- Investigate cause of SCR diode failure nuisance alarm.
- Minimize ice buildup on diesel generator air intake.

Emergency Diesel Generators (Cont'd)

Long Term

- Evaluate improvements to diesel generator air start system and improve reliability of air compressors.
- Implement improvements for emergency diesel fuel oil system.
- Replace cooling water flow gauge.
- Perform evaluation of overall improvement to diesel generator air intake configuration.
- Improve diesel generator speed and electrical frequency control capability.
- Correct erratic bearing temperature indications for diesel generators.
- Improve Control Room/diesel generator room communications capability.

120 Volt Instrument AC Power

Prior To Restart

- **Install larger power rating resistors in essential inverters YV1, YV2, YV3 and YV4.**

Long Term

- **Install ventilation fans for inverters.**
- **Evaluate installation of static transfer switches and/or tank circuits to reduce potential for losing an inverter when a ground fault occurs.**

Anticipatory Reactor Trip System

Prior To Restart

- Evaluate adequacy of no actuation of annunciator alarms when ARTS cabinet door is open.

Long Term

- Modify lamp test circuit.
- Provide labeling to minimize problems in correlating channel and breaker designations.
- Evaluate separating ARTS channel signal inputs to computer to facilitate determining which parameter initiated an ARTS trip.
- Review main turbine stop valve testing as potential source of spurious low pressure ARTS trips.

Control Rod Drive Control System

Prior To Restart

- Determine improved power supply fuse size and design; perform inrush current and current waveform test.
- Improve cleanliness of CRDCS cabinets to reduce contact fouling problems.
- Ensure adequate forced air cooling of reactor service structure.

Control Rod Drive Control System (Cont'd)

Long Term

- Evaluate alternate control rod direction error circuit design.
- Evaluate control rod motion momentary interrupt circuit.
- Review overall service structure cooling design.
- Improve power cable mating and handling procedures.
- Evaluate use of higher temperature silicon power cables.
- Inspect all control rod leaf spring anti-rotation devices at each refueling outage.
- Evaluate improved control rod drop time test techniques.
- To preclude low voltage problems, check voltage output of CRD transformers frequently; clean and inspect Inductrol voltage regulator and lubricate motor-generator set every refueling outage.
- Determine long-term resolution of CRDM nozzle flange leaks.
- Evaluate means of minimizing occurrence of low insulation resistance in CRD stators.

Incore Monitoring System

Prior To Restart

- Determine proper correction factors for neutron detectors.

Long Term

- Improve reliability of incore neutron detectors for 15% to 30% reactor power.
- Evaluate need for two incore instrumentation multipoint recorders.

Reactor Protection System

Prior To Restart

- **Repair/replace defective components in NI Source Range string contributing to erratic noise and loss of signal problems.**
- **Install electronic filters on reactor coolant flow transmitters to reduce flow turbulence noise.**

Long Term

- **Evaluate Technical Specification change to permit placing a defective channel in manual bypass.**
- **Evaluate providing more reliable power range signal to Integrated Control System.**
- **Eliminate noise spikes in NI Source Range channels apparently due to door alarm switches on RPS cabinets.**

Steam and Feedwater Rupture Control System (SFRCS)

Prior To Restart

- Provide filtering of steam generator level transmitter signal.
- Modify SFRCS to preclude isolation of main feedwater and main steam on low water level in steam generator.
- Modify SFRCS to isolate only first steam generator for which low pressure is detected.
- Modify SFRCS such that atmospheric vent valves are closed by a full SFRCS trip (actuation) rather than 1/2 trip.
- Modify SFRCS to provide open signals to MS106A and MS107A for all SFRCS actuation conditions.
- Rearrange manual SFRCS actuation switches and provide protection against inadvertent actuation.
- Improve Control Room annunciator indication of which steam generator has been source of SFRCS actuation.

Steam and Feedwater Rupture Control System (SFRCS)

Prior To Restart (Cont'd)

- Relocate reset buttons for startup feedwater valves to the control board.
- Improve temperature control of SFRCS steam generator pressure switch sensing lines.
- Revise labels on manual resets for indicating lights associated with steam generator level instrumentation.
- Provide separate manual reset for "SFRCS Full Trip" alarm.
- Improve SFRCS power supply operation.
 - Install forced cooling to cabinets.
 - Measure power supply loading and estimate useable service life.
- Perform engineering evaluation of and measure response time for replacement amplifier/calibration boards for steam generator level transmitters.

Steam and Feedwater Rupture Control System (SFRCS) (Cont'd)

Long Term

- Remove automatic close signals to AF599 and AF608 and leave valves open to improve overall reliability of AFW System.
- Modify SFRCS to preclude isolating both steam generators if coincident low pressure signals are received for both steam generators.
- Evaluate modifying control circuitry for main steam isolation valves to improve reliability.
- Evaluate several additional changes to SFRCS to improve system reliability and improve decay heat removal capability
- Evaluate additional improvements of Control Room annunciator indication of SFRCS actuation.
- Evaluate removing SFRCS close signals to atmospheric vent valves.
- Establish improved record keeping for SFRCS power supplies and trend to better determine expected service life.
- Monitor, periodically, the 125 Volt DC bus to ensure noise is at acceptably low level.
- Modify steam generator level instrument monitors.

Safety Features Actuation System

Prior To Restart

- **Modify SFAS to avoid ungrounded power supply common problems by installing separate sensor channel power supplies.**
- **Confirm AC and DC contact current in SFAS output relays in within design capability.**
- **Repair/replace surveillance light cards having damaged components or electrical connections.**

Long Term

- **Evaluate alternate surveillance card design.**
- **Evaluate elimination of SFAS closure of main steam isolation valves.**
- **Investigate spurious SFAS incident level 1 trips due to spiking of radiation monitor strings.**
- **Improve human engineering considerations associated with (1) relative location of SFAS manual trips and associated reset pushbuttons, (2) location of reactor coolant pump seal injection, and (3) seal return valve control switches.**

Integrated Control System

Prior To Restart

- Improve main feedwater pump runback control upon unit trip (rapid feedwater reduction circuitry).
- Replace inoperable fuse holders.
- Calibrate selected control modules.
- Perform action plan 16 requirements.
- Modify load balance control for turbine bypass valves.
- Upgrade selected control modules.

Long Term

- Evaluate alternatives to rapid feedwater reduction control scheme.
- Improve preventive maintenance system.
- Improve proportional and integrating module response.
- Provide additional cooling for ICS cabinets.
- Provide monitoring capability for selected ICS parameters (diagnostic).
- Replace power selector switches.
- Improve transfer capability for pressure inputs to ICS for turbine bypass valves.

Security System

Prior To Restart

- Evaluate/modify security requirements to improve operator access.
- Review electrical loads on uninterruptible power supply.
- Revise procedures in event of loss of ventilation to Central Alarm Station.

Long Term

- Perform evaluation of several operational/reliability improvements for security system.

Control Room Normal and Emergency Ventilation Systems

Prior To Restart

- **Modify overall control scheme for water-cooled and air-cooled condensing modes of Emergency Ventilation System (EVS).**
- **Manually adjust Service Water System cooling flow to water-cooled EVS condenser to accommodate seasonal changes.**
- **Replace refrigerant solenoid control valves and install additional stop and check valves to facilitate refrigerant control for EVS.**
- **Increase cooling capacity of EVS.**
- **Improve air distribution across cooling coils.**
- **Install/repair gaskets on Control Room door and security room door to limit air leakage.**
- **Calibrate control and indicating instrumentation.**

Control Room Normal and Emergency Ventilation Systems

Long Term

- Install flow modulating control valve in service water cooling path for EVS.
- Further increase cooling capacity of EVS.
- Limit use of manual switches on local control panels associated with EVS.
- Perform air flow balance of normal ventilation system.
- Review overall adequacy of normal ventilation system.
- Develop improved preventive maintenance procedures for entire system including dampers and actuators.
- Inspect and refurbish air handling duct work and associated insulation, filters and differential pressure units to improve cleanliness conditions in control room.
- Improve operator indications and control regarding normal and EVS operation.
- Clean and repair humidification system. Evaluate alternate designs.
- Evaluate causes of failures of chlorine detectors and station vent air particulate monitors.

Station Air and Instrument Air Systems

Prior To Restart

- Isolate and repair leakage in Station Air and Instrument Air systems to maximum practical extent.
- Perform required station air compressor preventive maintenance.
- Test setpoints of control valves used to maintain instrument air header pressure in the event of station air system failure.
- Revise procedures and testing to identify the temporary diesel air compressor as the backup air supply.
- Provide improved reliability of diesel air compressor during inclement weather.
- Procedurally blow down drains from SA28 to remove accumulated moisture in station air system.
- Provide filtering of air supply through SA2010 to minimize debris accumulation.

Station Air and Instrument Air Systems (Cont'd)

Long Term

- Perform engineering study of Station Air and Instrument Air systems to evaluate several areas for improving overall reliability (e.g., required emergency air compressor size; isolable vs. non-isolable loads; need for 100/100 psig regulators; leak isolation flexibility).
- Install moisture trap on SA28 to improve draining.
- Segregate air intake and diesel exhaust for diesel air compressor.
- Modify Station Air and Instrument Air systems to prevent dumping system air to atmosphere when the dryers are bypassed.
- Increase frequency of dewpoint check on instrument air receiver to detect unacceptable moisture leakage from station air headers to instrument air headers; install permanent air dryer around IA408.
- Evaluate providing capability to start station air compressor 1-2 from Control Room.
- Install flow meter to permit trending of air system degradation.

Station Fire Protection

Prior To Restart

- **Provide audible fire alarm in Control Room.**

Long Term

- **Maintain fire alarm location backup on security computers.**
- **Revise circuitry for ionization smoke detectors to avoid spurious alarms.**
- **Evaluate improving testing and maintenance accessibility of several smoke detectors and temperature switches.**
- **Resolve operational problem with ionization smoke detector installed above control rod drive breakers.**
- **Complete fire protection enhancement program on schedule consistent with Appendix R commitments.**
- **Provide time delay for diesel fire pump start to minimize unnecessary starts while the electric fire pump brings up system pressure.**
- **Resolve power supply problems with Viking fire panels.**
- **Modify fire alarm display in Control Room so that both panel number and zone number are provided.**

Component Cooling Water System

Prior To Restart

- Functionally test CCW pump room ventilation fans.
- Repair or replace nitrogen regulator for CCW surge tank.

Long Term

- Add CCW room ventilation fan periodic test.
- Implement alternate pressure control for CCW surge tank.
- Fix small oil leaks on CCW pumps.

Service Water System

Prior To Restart

- **Modify ventilation for service water pump rooms.**
- **Perform ultrasonic test of selected portions of piping and fittings.**
- **Resolve service water flow through containment air coolers.**

Long Term

- **Periodically ultrasonically test selected portions of Service Water System.**
- **Review service water pump shaft performance post-modification.**
- **Evaluate apparent increased head and flow on service water pump 3-1.**
- **Evaluate tube corrosion / erosion performance in ECCS room coolers.**
- **Modify containment air cooler valves to improve stroke time.**
- **Inspect tubes in component cooling water heat exchangers.**
- **Improve temperature control for Component Cooling Water System.**

Auxiliary Feedwater System

Prior To Restart

- Install air operated steam admission valve near each auxiliary feedwater pump turbine (AFPT); resolve associated high energy line break items.
- Ensure operability of steam traps on AFPT steam supply lines and periodically reconfirm operability.
- Revise AFW pump automatic suction transfer setpoints for switching from condensate storage tank to service water.
- Resolve overpressurization problem for discharge piping from AFW pumps.
- Install PGG governor on AFPT #1, as currently on AFPT #2; revise low speed stops to accommodate changes in governor operation time.
- Evaluate coincident AFW and MFP feed to steam generators.
- Confirm AFW pump discharge valves will open for maximum credible differential pressure.

Auxiliary Feedwater System

Prior To Restart (Cont'd)

- Remove individual suction strainers to AFW pumps and enlarge mesh on common strainer from condensate storage tank.
- Remove control power from suction valves FW786 and FW790 to preclude spurious closure.
- Increase time delay on suction pressure switch actuation which isolates steam supply to AFPTs.
- Implement improvements to AFPT overspeed trip mechanism.
- Calibrate AFW pump flow instrumentation.
- Implement controls to preclude steam binding of AFW pumps (NRC IE Bulletin 85-01)
- Install pressure switches to detect main steam line breaks upstream of MS106, MS106A, MS107, MS107A.

Auxiliary Feedwater System (Cont'd)

Long Term

- Investigate means of monitoring for condensate in AFPT steam supply lines.
- Improve steam generator level control capability when using AFW pumps.
- Evaluate leaving AF3870 and AF3872 open during plant operation to further improve AFW System reliability.
- Evaluate potential for contamination from Service Water System to AFW pump suction.
- Improve operability of manual mechanical overspeed trip on AFPTs.
- Improve access to AFW pump #1 room.
- Inspect internals of AFW pump and turbine during next refueling outage.
- Provide accurate means of monitoring AFW pump recirculation flow.
- Improve AFW pump rooms ventilation control.
- Improve Control Room board control, indication and reset layout.

Main Steam System

Prior To Restart

- Refurbish and check setpoints for all main steam safety valves (MSSV's).
- Install lift stop collars on "R" orifice MSSV's.
- Install lateral snubber on "A" main steam header.
- Recalibrate atmospheric vent valve controls.
- Administratively require plant shutdown if both 1050 psig setpoint MSSV's on a header are inoperable.
- Test smaller inlet bore size for MSSV's.
- Establish leak rate for testing of main steam non-return valves.

Long Term

- Install MSSV monitoring system.
- Improve mechanical design of main steam isolation valve position switches.
- Investigate increased noise and general vibration with full arc admission to main turbine.

Steam Generator System

Prior To Restart

- Provide engineering analysis regarding acceptability of having exceeded procedural pressure/temperature limits during testing.

Long Term

- Improve reliability and accuracy of steam generator shell thermocouple temperature readings.
- Evaluate modifications to condenser steam jet air ejector radiation monitors.

Main Feedwater System

Prior To Restart

- Investigate and correct cause of power supply failures for main feedwater pump turbine (MFPT) control system.
- Improve reliability of MFPT low pressure drainage header pumps.
- Evaluate via testing ability for automatic vs. manual control of main feedwater pumps between 15% and 45% plant power.
- Minimize potential for overfeeding steam generators after reactor trip by modifying interlocks between startup valve and main feedwater block valve.
- Improve reliability of MFPT oil system by installing accumulator.
- Resolve apparent vibration problem on MFPT 1-1 pump end bearing (instrument problem).

Main Feedwater System (Cont'd)

Long Term

- **Perform overall reliability study of main feedwater system and associated support systems.**
- **Evaluate modifications to high pressure drain system to minimize flashing and vibration.**
- **Repair or replace level indicating sight glasses on high pressure feedwater heaters.**
- **Correct variance among MFPT turbine speed indicators.**
- **Improve reliability of MFPT turning gear system.**
- **Improve flow control during feedwater cleanup operations performed prior to each reactor plant startup.**

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