OFFICIAL COPY

JUN 26 1991

See Ltr.

Docket Nos. 50-250, 50-251
License Nos. DPR-31, DPR-41

Florida Power and Light Company
ATTN: Mr. J. H. Goldberg
President - Nuclear
P. O. Box 14000
Juno Beach, FL 33408-0420

Gentlemen:

SUBJECT: MEETING SUMMARY - TURKEY POINT

This letter refers to the meeting conducted at the NRC Region II offices in Atlanta, Georgia on June 20, 1991. The purpose of the meeting was to allow the licensee to make a presentation of their current self-assessment. A summary of the presentation is enclosed.

It is our opinion that this meeting was beneficial and provided a better understanding of the licensee's assessment of their performance.

Should you have any questions concerning this letter, please let us know.

Sincerely,
Original Signed by
Luis A. Reyes

Luis A. Reyes, Director
Division of Reactor Projects

Enclosures:
1. List of Attendees
2. Presentation Summary

cc w/encls:

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Nuclear Operations
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Juno Beach, FL 33408

L. W. Pearce, Plant Manager
Turkey Point Nuclear Plant
P. O. Box 029100
Miami, FL 33102

cc w/encls cont'd: (See page 2)

9107160258 910626
PDR ADOCK 05000250
P PDR

MA2
1/1
IE01

cc w/encls cont'd:
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Quality Manager
Turkey Point Nuclear Plant
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Miami, FL 33102

D. Powell, Superintendent -
Plant Licensing
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cc w/encls cont'd: (See page 3)

cc w/encls cont'd:
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County Manager of Metropolitan
Dade County
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Intergovernmental Coordination
and Review
Office of Planning and Budget
Executive Office of the Governor
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bcc w/encls:
R. Auluck, NRR
Document Control Desk
R. Crlenjak, RII

Ross Butcher, Sr. Resident Inspector
U.S. Nuclear Regulatory Commission
P. O. Box 1448
Homestead, FL 33090

RII:DRP	RII:DRP	RII:DRP	RII:	RII:
CCOgle	RCrlenjak	MSinkule	foreschim	
06/24/91	06/26/91	06/25/91	06/26/91	06/ /91

ENCLOSURE 1

LIST OF ATTENDEES

U. S. Nuclear Regulatory Commission

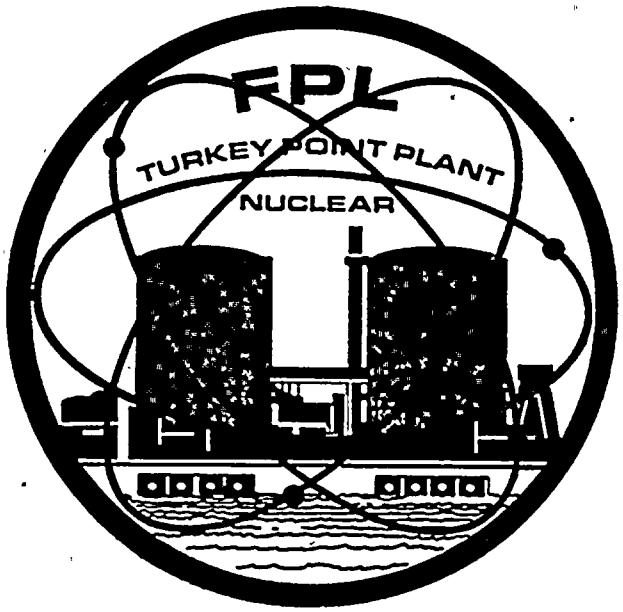
J. L. Milhoan, Deputy Regional Administrator, Region II (RII)
L. A. Reyes, Director, Division of Reactor Projects (DRP), RII
E. W. Merschoff, Deputy Director, DRP, RII
M. V. Sinkule, Chief, Reactor Projects Branch 2, DRP, RII
K. D. Landis, Chief, Technical Support Staff, DRP, RII
R. V. Crlenjak, Chief, Reactor Projects Section 2B, DRP, RII
G. A. Schnebli, Resident Inspector, Turkey Point, DRP, RII
R. C. Butcher, Senior Resident Inspector, Turkey Point, DRP, RII
C. A. Julian, Chief, Engineering Branch, Division of Reactor Safety (DRS), RII
C. R. Ogle, Project Engineer, DRP, RII
F. Jape, Chief, Test Programs Section, DRS, RII
D. M. Collins, Chief, Emergency Preparedness and Radiological Protection Branch, Division of Radiation Safety and Safeguards (DRSS), RII
B. A. Breslau, Chief (Acting), Operational Programs Section, DRS, RII
G. A. Hallstrom, Reactor Inspector, DRS, RII
N. L. Salgado, Reactor Engineer (Intern), Plant Systems Section, DRS, RII
H. N. Berkow, Director, Project Directorate II-2, Office of Nuclear Reactor Regulation (NRR)
R. Auluck, Licensing Project Manager, Turkey Point, NRR

Licensee Attendees:

J. H. Goldberg, President, Nuclear Division
T. F. Plunkett, Vice President, Turkey Point Power Plant
V. A. Kaminskas, Operations Superintendent
M. B. Wayland, Maintenance Superintendent
F. R. Timmons, Site Security Superintendent
S. T. Hale, Engineering Project Manager
L. W. Bladow, Quality Manager
W. H. Bohlke, Vice President, Nuclear Engineering and Licensing
K. N. Harris, Senior Vice President, Nuclear Operations
R. E. Grazio, Director, Nuclear Licensing
J. E. Geiger, Vice President, Nuclear Assurance
D. R. Powell, Licensing Superintendent

ENCLOSURE 2

FLORIDA POWER & LIGHT COMPANY



AUGUST 1990 - JUNE 1991

SELF - ASSESSMENT

PRESENTATION

9107160258

TURKEY POINT SELF-ASSESSMENT

JUNE 20, 1991

1.	INTRODUCTION AND OUTAGE STATUS	T. F. Plunkett
2.	OVERVIEW	T. F. Plunkett
3.	PLANT OPERATIONS/ RADIOLOGICAL CONTROLS/ EMERGENCY PREPAREDNESS/ TRAINING	V. A. Kaminskas
4.	MAINTENANCE/SURVEILLANCE	M. B. Wayland
5.	SECURITY/SAFEGUARDS	F. R. Timmons
6.	ENGINEERING/TECHNICAL SUPPORT	S. T. Hale
7.	SAFETY ASSESSMENT/ QUALITY VERIFICATION	L. W. Bladow
8.	CLOSING REMARKS	J. H. Goldberg

TURKEY POINT DUAL UNIT OUTAGE

MAJOR WORK ITEMS

- Emergency Power System Upgrade
- Security System Upgrade
- Resistance Temperature Detector (RTD) Bypass Loop Elimination
- Intake Cooling Water System Inspection/Repair
- Boric Acid Concentration Reduction
- Anticipated Transient Without Scram Modification
- 4100 Additional Work Tasks

MILESTONE HISTORY TO DATE

		Scheduled	Actual
o Initial Engine Run 4B		11/15/90	11/15/90
o Unit 3/4 Core Offloaded		12/29/91	12/29/91
o DC BUS Outages	4A/4B	04/10/91	04/10/91
	3A/3B	05/23/91	06/07/91
o 4 KV BUS Outage		06/12/91	05/23/91
o 4 "B" Diesel Generator Testing		05/15/91	05/20/91
o 4 "A" Diesel Generator Testing		07/16/91	06/28/91 (Projected)

FUTURE MILESTONES

	Scheduled
o Integrated Safeguards Testing	08/31/91
o Unit 3 Core Reload	09/07/91
o Unit 4 Core Reload	10/10/91
o Unit 3 On Line	10/03/91
o Unit 4 On Line	11/04/91
o Revised Tech Spec Implementation	No Later Than 8/28/91

CHALLENGES

- "4B" EDG Cylinder Cooling Water Manifold

- Loss of Unit 4 Startup Transformer

- Damaged 750 MCM Cable Jacket

OVERVIEW

- **SUSTAINED OVERALL PERFORMANCE IMPROVEMENT IN ALL AREAS CONTINUES**

- **OPERATIONS**

  - Increased Staffing to 6 Shift Operation

  - 1990 Unit 3 Equivalent Availability of 58.9%

    * Includes 119 Day Refueling Outage
    * 178 Day Run Ending by Scheduled Shutdown

  - 1990 Unit 4 Equivalent Availability of 75.6%
    * Highest Availability of the Four FPL Nuclear Units

  - Record Combined Unit Run of 102 Days

    * Ending by Scheduled Shutdown

  - LER Events Continue to Drop

    * From 3.8/month SALP Period Ending in 1989
    * To 3.2/month Last SALP Period
    * To 1.1/month First 10 Months of this Period

  - Computerizing Surveillance Test Program

o **RADIOLOGICAL CONTROLS**

- **RTD Bypass Replacement had Lowest Exposure on Record for this Evolution in U.S.**

- **Projected 137 Personnel Contaminations thru September 30, 1991 (14 Month SALP Period)**

  * **37% Reduction from Last SALP Period (12 Month SALP Period)**

- **Major Reduction in Dose from Spent Resin Transfers Due to Equipment and Procedure Improvements.**

  * **Previous Transfers Totaled 300 - 1100 Millirem**

  * **Recent Transfers Totaled 50 Millirem**

- **Supervisor Performance Improvements Have Been Initiated, Emphasizing Personal Accountability**

- **Improved Radiological Hazards Posting**

- **EMERGENCY PREPAREDNESS**

  - Very Successful Emergency Exercise on November 8, 1990 with Three Strengths Noted by NRC
  - Improved the Task Training for All Emergency Response Organization Positions
  - Enhanced the Technical Support Center (TSC) and Operation Support Center (OSC), Dedicated the Emergency Operations Facility (EOF) and Added New Medical Facility
  - Performed Simulator Training Emphasizing Emergency Preparedness Aspects
  - Improved Relations with External Organizations

- **TRAINING**

  - 93.5% Pass Rate on Requalification Examinations
  - 100% Pass Rate on SRO Examinations
  - Successfully Re-Accredited All Operator Training Programs plus Shift Technical Advisor and Health Physics Programs
  - Significant Test Program Completed for Simulator Validation and Certification
  - Completed Simulator Modifications Incorporating Major Dual Unit Outage Plant Changes

- **MAINTENANCE**

  - Significant Progress is Being Made on the Material Condition Upgrade Plan

    * All Five Blackstart Diesels Completed

    * New Lows Achieved on Control Room Deficiency Tags and Control Room Instruments Out of Service

    * Valve Repacking Program Continues

    * Containment Repainting Efforts

    * Comprehensive Motor Operated Valve (MOV) Maintenance Program is Being Implemented

  - Corrective Maintenance Backlog Was Reduced to 668 on May 21, 1991

  - Equipment Reliability Improvements are Evidenced by the Operating Record

  - Formal Self-Assessment Program Initiated

- **SECURITY**

  - Security System Upgrades are Making Excellent Progress

  - Strong Security Force Performance Noted by Self Assessments and NRC Inspections

  - Sustained Improvement in Security Indicators

  - Security Force Training Improvements Including Major Joint Training Exercises with Local Law Enforcement

o **ENGINEERING/TECHNICAL SUPPORT**

- **Engineering Completed 97% of the Design Change Packages 60 Days or More Before the Start of the Dual Unit Outage**

- **Added Engineering Assurance Program**

- **Significant Procurement Engineering Improvements and Backlog Reduction**

- **Significant Reduction of Drawing Update Backlog**

  * **Completion of Original Safety Related Drawing Update Backlog Still Scheduled for December 1991**

- **System Engineer Involvement in the Dual Unit Outage**

  * **Members of Joint Test Group**

  * **Participation in the Restart Readiness Program**

- **System Engineer Involvement Has Continued the Reduction of LCO Hours**

- **Management Commitments to Prioritize and Reduce Modifications**

- **Completion of Probabilistic Risk Analysis**

o **SAFETY ASSESSMENT/QUALITY VERIFICATION**

- Sustained the Aggressive Self Assessment Program
- Quality Assurance Efforts Resulted in Four Documented Non Cited Violations During this SALP Period
- Enhanced Company Nuclear Review Board (CNRB) Membership and Organization
- Major Licensing Effort to Support Dual Unit Outage

o **MAJOR CHALLENGES**

- Successful Restart and Sustained Operations
- Personal Accountability
- Revised Maintenance Planning and Work Performance
- Procedure Adherence/Attention to Detail
- Controlling Outage Duration
- Continue the Material Condition Upgrade

OPERATIONS

MAJOR ACHIEVEMENTS

- Increased Operations Staffing Allowing Reduction in Overtime and Six Shift Operation
- Improved Operating Record With a Record Combined Unit Run of 102 Days
- Implemented Operator Self-checking

AREAS FOR FURTHER IMPROVEMENT

- Reduction in Significance of Personnel Errors but Rate Has Remained Relatively Constant. Improvement Actions Continue with Emphasis on Having All Operators Utilizing Self-Checking

OTHER AREAS OF CURRENT EFFORT

- Operations and Training Joint Initiatives
- Operations and Outage Planning Improvements Including Early Work Identification and Extensive Pre-Planning
- Pre-Planning of System Readiness for Restart (Operator Training, Valve Alignments, Surveillance Testing, Tech. Spec. Review, Documentation Reviews, etc.)
- Computerized Surveillance Program

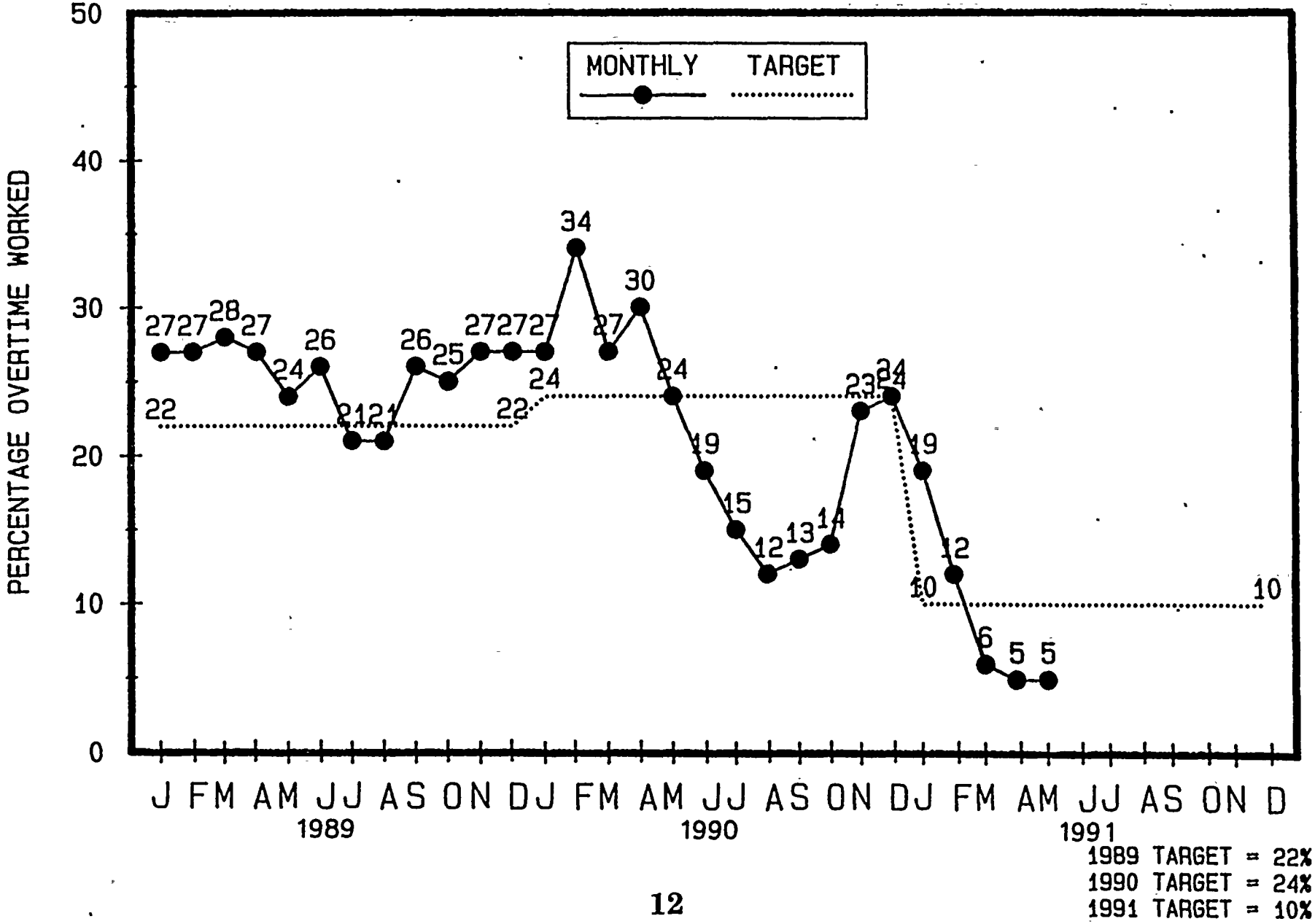
OPERATOR SELF-CHECKING

1. **Stop**
2. **Locate**
3. **Touch**
4. **Verify**
5. **Anticipate**
6. **Manipulate**
7. **Observe**

MONTHLY OVERTIME PERCENTAGES

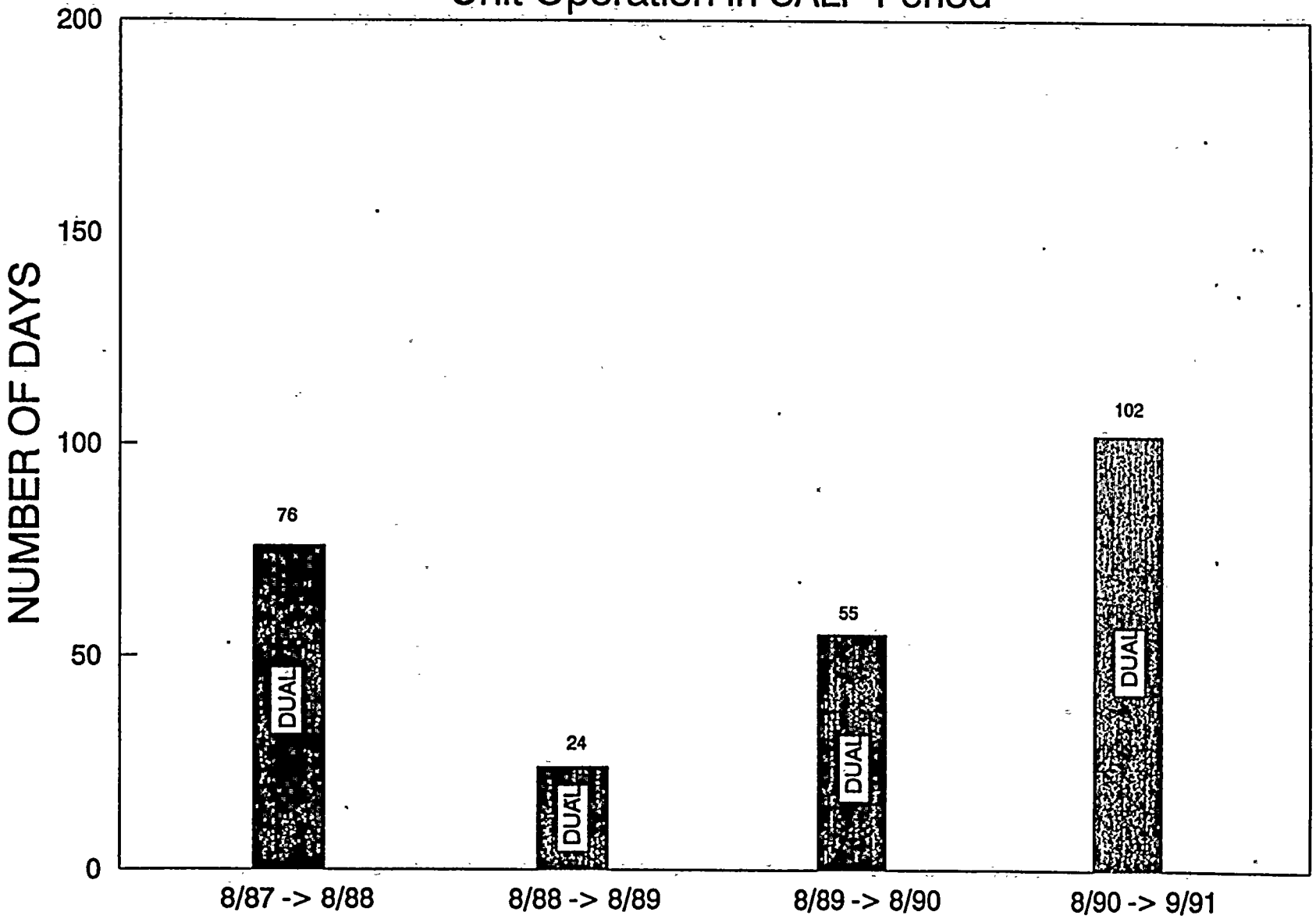
NUCLEAR OPERATIONS

SUPERVISOR - H. H. JOHNSON

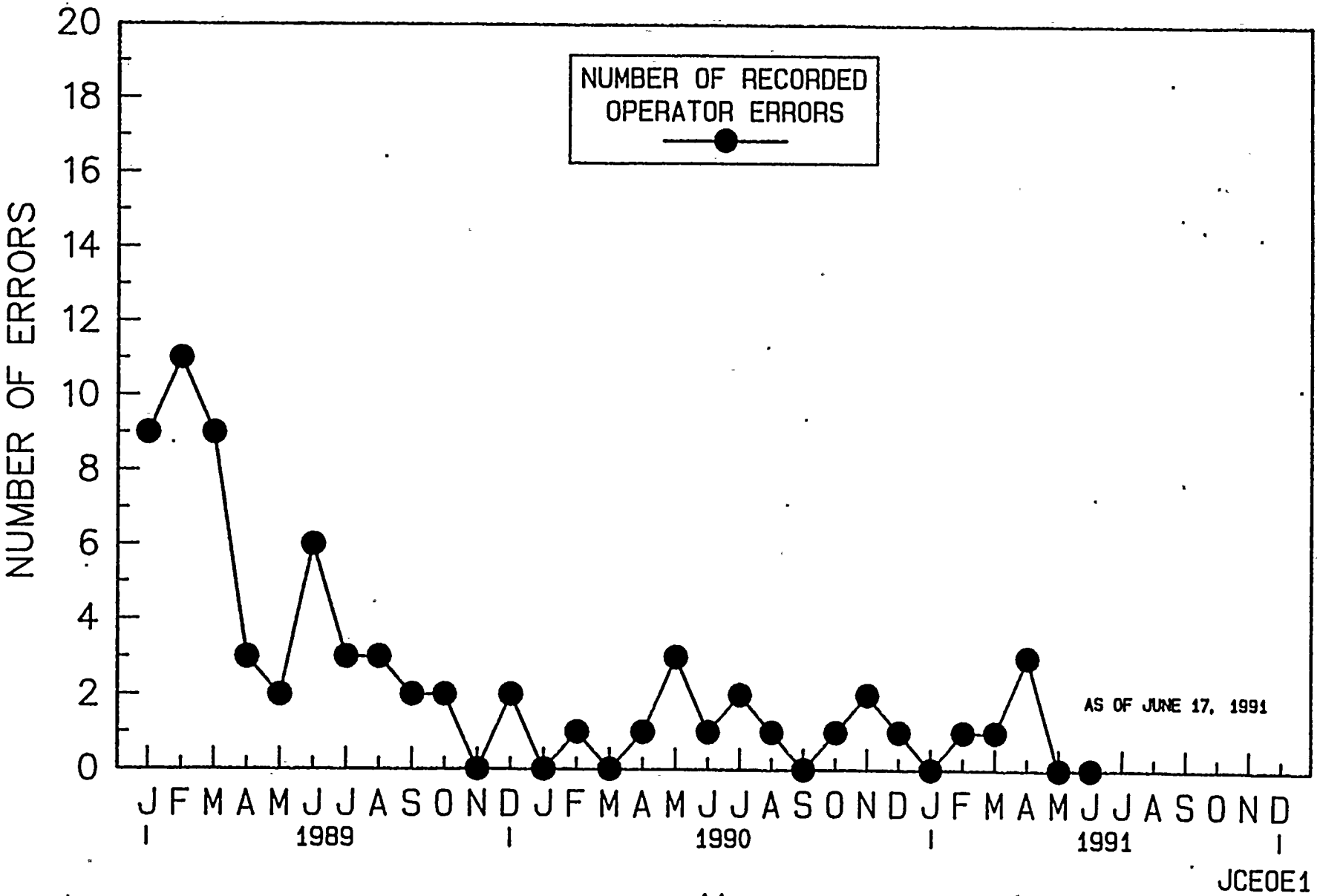


TURKEY POINT UNITS 3 & 4

Unit Operation in SALP Period



TURKEY POINT PLANT
OPERATIONAL ERRORS
OPERATIONS DEPARTMENT EVENTS



RADIOLOGICAL CONTROLS

MAJOR ACHIEVEMENTS

- o RTD Bypass Replacement
- o Reduced Personnel Contaminations
- o Contaminated Floor Space Was Reduced from 9,023 sq. ft. on July 31, 1990 to 6616 sq. ft. Prior to the Start of the Outage. The Goal for the End of 1991 is 6345 sq. ft.
- o Major Reduction in Dose from Spent Resin Transfers
- o Created Computerized Job History Database

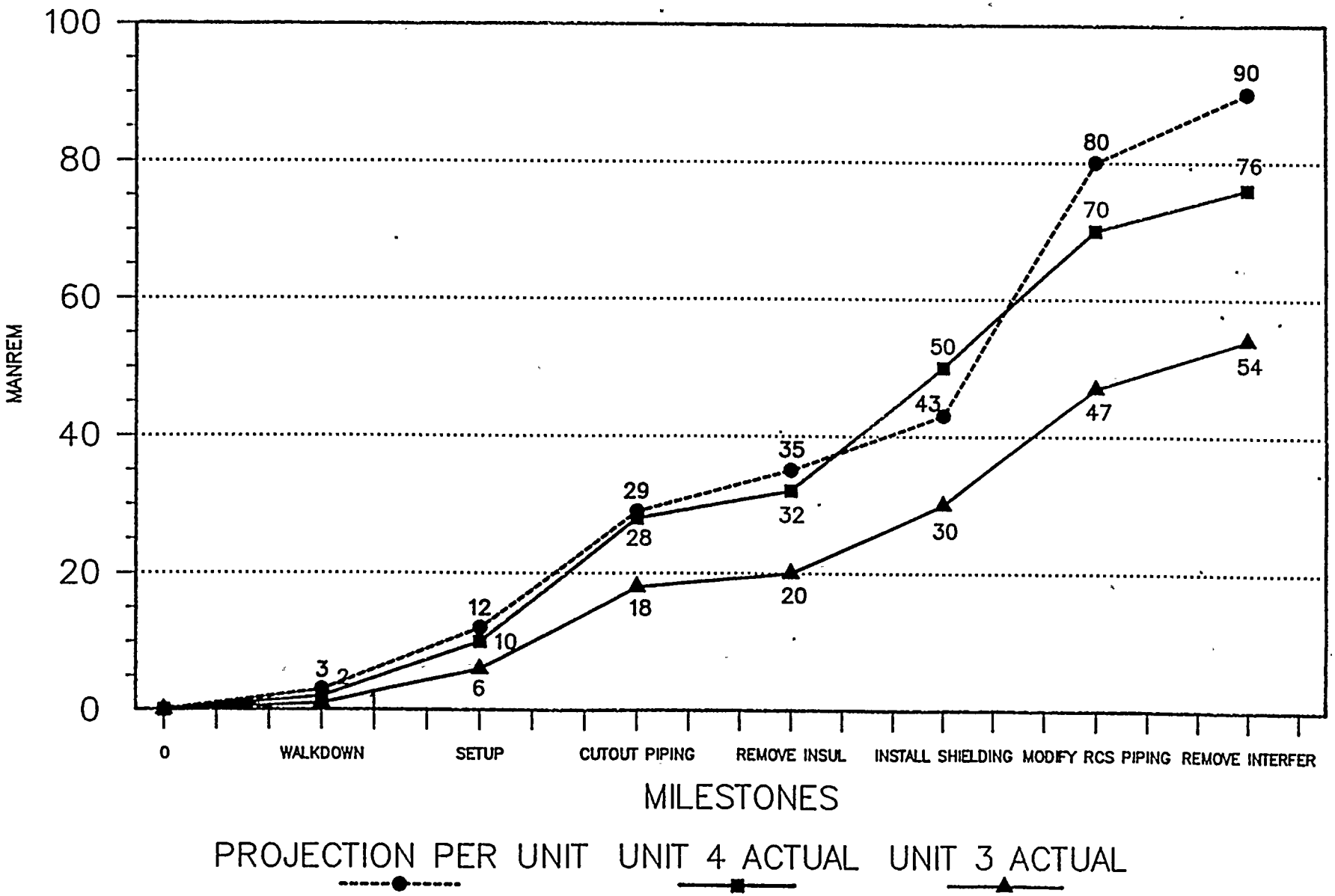
AREAS FOR FURTHER IMPROVEMENT

- o Reduction in Radioactive Material Storage Areas
- o New Procedure for Posting of Radiological Hazards
- o New Procedure for Control of Contaminated Material

OTHER AREAS OF CURRENT EFFORT

- o Supervisor Performance Improvements

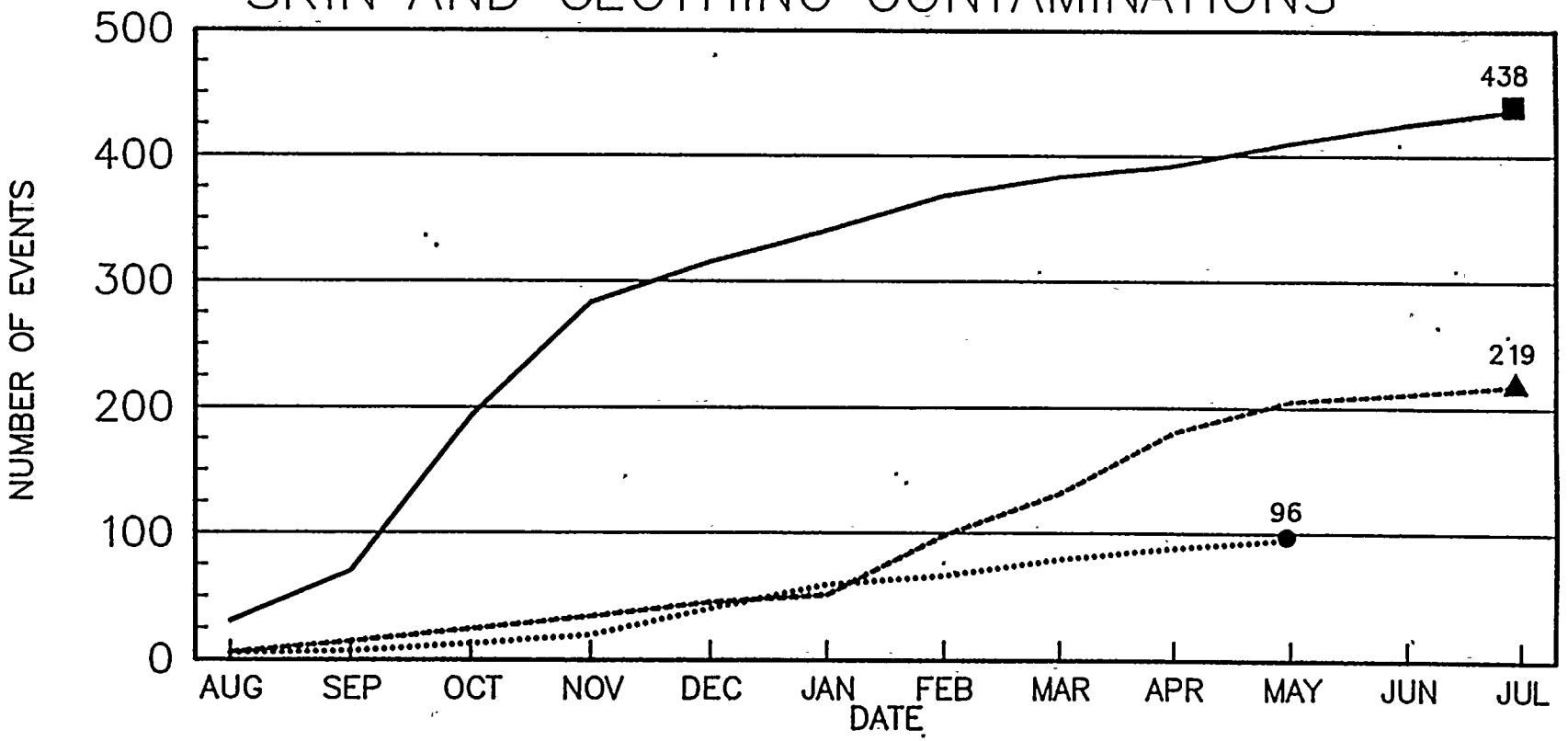
RTD REMOVAL EXPOSURE PERFORMANCE



RTD BY-PASS EXPOSURE RATINGS

	PLANT	EXPOSURE IN REM
1	TURKEY POINT 3	54
2	SALEM 2	56
3	INDIAN POINT 3	74
4	TURKEY POINT 4	76
5	MILLSTONE 3	92
6	H.B. ROBINSON	101
7	V.C. SUMNER	103
8	CATAWBA 2	113
9	SALEM 1	122
10	BEAVER VALLEY 1	146
11	SEQUOYAH 1	151
12	CATAWBA 1	171

TURKEY POINT UNITS 3 AND 4
SKIN AND CLOTHING CONTAMINATIONS

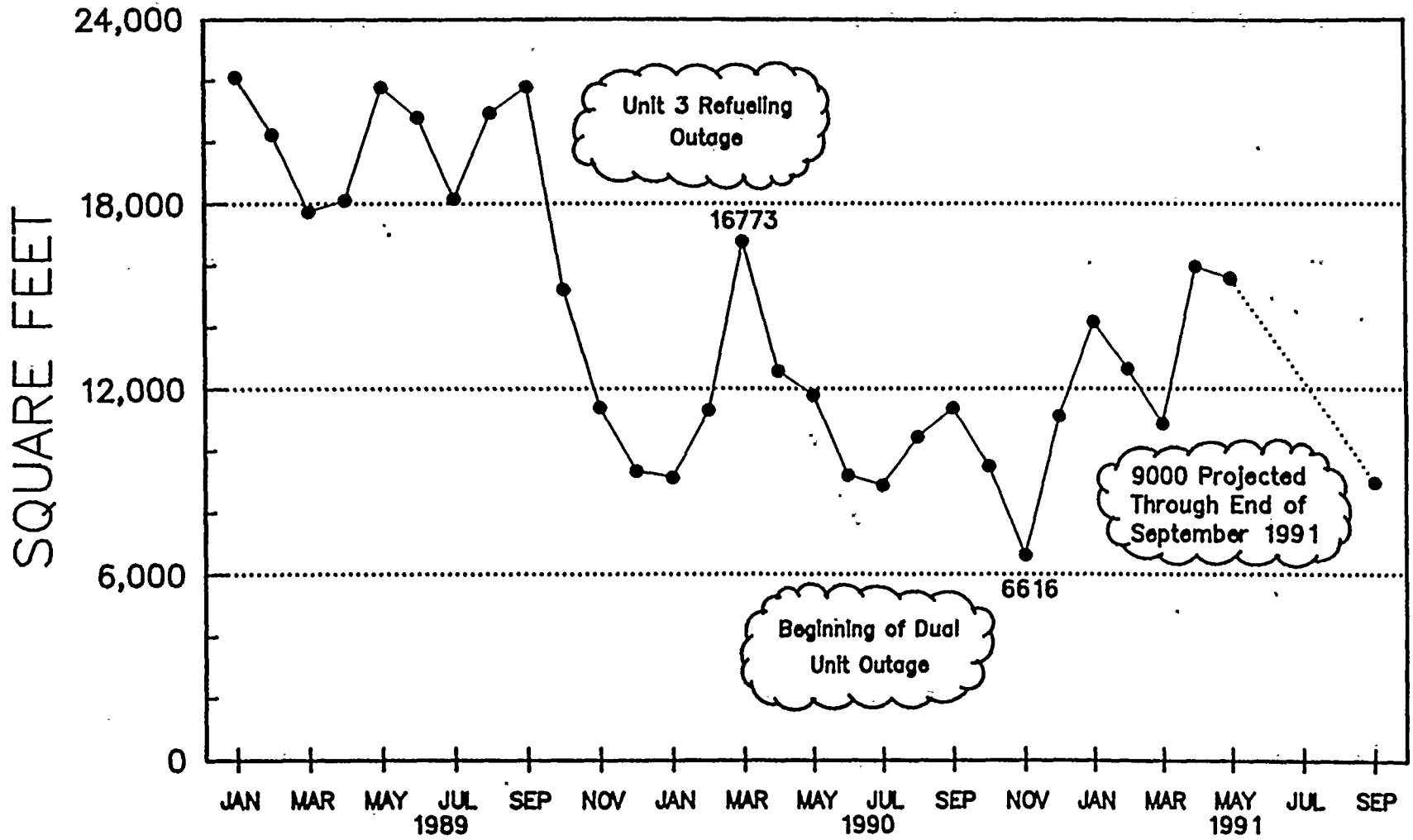


	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
SALP 90/91	5	2	6	7	21	19	7	13	9	7	*11	*11	*11	*11	*140

* Projected number of Events

TURKEY POINT UNITS 3 & 4

CONTAMINATED FLOOR SPACE



Comments: Data Date as of June 1, 1991
Data Managers – 1989 / J. R. Bates
1990 / R. K. Rowe – 1991 / R. M. Brown

EXAMPLE REVIEW SHEET

NAME:_____ NO. IN WORK GROUP:____ DATE:_____ GRADE:____

GRADE KEY:

0 - UNACCEPTABLE
1 - POOR
2 - NEED IMPROVEMENT
3 - STANDARD
4 - GOOD
5 - EXCELLENT

ITEM	DESCRIPTION	COMMENTS	GRADE
1	Training Hours Per Man; Formal/Informal/Ojt	>10 hours = 5 >4 hours = 2 > 8 hours = 4 >2 hours = 1 > 6 hours = 3 <2 hours = 0	
2	Safety Meeting Attendance Only Pre-arranged Absences Acceptable	100% = 5 >90% = 3 <90% = 0	
3	Crew Meeting Attendance; Only Pre-arranged Absences Acceptable	100% = 5 >90% = 3 <90% = 0	
4	Doctor Cases/Lost Time Accidents	0 = 5 > 0 = 0	
5	Casual Absenteeism Days Per Man-month for the Work Crew	0 = 5 >.25 = 0 <.25 = 3	
6	Procedure Non-compliance; Incidents Per Month	0 = 10 > 1 = 0 1 = 5	
7	Action Item Completion	All = 5 >2 late = 0 1 late = 3	
8	Professional Performance; As Determined by Supervisor	Scale of 0 - 5 as determined By supervision.	
		TOTAL	
		AVERAGE GRADE	

JOB SPECIFIC ACCOUNTIBILITIES

9	Supervisor Identified Housekeeping Problems	<5 = 5 7 = 3 9 = 1 6 = 4 8 = 2 10 = 0	
10	Supervisor Identified Posting/ Tagging Problems	0 = 10 >1 = 0 1 = 5	
11	QC - Identified Problems Requiring Corrective Action.	0 = 5 >1 = 0 1 = 3	

EMERGENCY PREPAREDNESS

MAJOR ACHIEVEMENTS

- o November 1990 Emergency Drill Strengths Noted:
  - Emergency Coordinator
  - Improved Communications with the New Radio System
  - TSC Status Boards
- o Improved Task Training for All Emergency Response Organization Positions
- o Simulator Training Emphasizing Emergency Preparedness as Well as Operational Aspects of Off Normal Events
- o Upgraded Emergency Response Facilities and Dedicated Emergency Operations Facility
- o New Medical Facility

AREAS FOR FURTHER IMPROVEMENT

- o Revised Procedures to Strengthen Emergency Coordinator Control of Notification Forms
- o Revised Procedures to Ensure Proper Verification of Current Procedures

OTHER AREAS OF CURRENT EFFORT

- Provided Additional Training to Off Site Support Agencies
- Enhanced Interfaces with State and Local Officials
- Enhanced the Emergency Preparedness Drill Program
  - Unannounced Facility Activation Drills
  - Augmentation Drills
  - Comprehensive Drill and Exercise Critiques and Deficiency Tracking

TRAINING

MAJOR ACHIEVEMENTS

- o **Improved Initial Training and Requalification of Licensed Operators Programs**
  - **Initial SRO License: 100% Pass Rate for the October 1990 and January 1991 Exams (3 of 3 and 22 of 22)**
  - **Requalification Exams: 93.5% Pass Rate on the February - March 1991 Annual Requalification Exams**
  - **Successfully Re-Accredited All Operator Training Programs plus Shift Technical Advisor and Health Physics Programs**
- o **Simulator Certification/Upgrades**
  - **Significant Test Program Completed for Simulator Validation and NRC Certification Applied for**
  - **Completed Simulator Modifications Incorporating Major DUO Plant Modifications**

AREAS FOR FURTHER IMPROVEMENT

- Operator Training Materials Revised to Reflect DUO Plant Changes and Training is in Progress. Plant Management will Observe Operator Pre-start Evaluation and NRC Has Been Invited to Participate

- Performing Revisions in Maintenance and Specialty (M&S) Training Programs Required by DUO Modifications. Training Aids of New Equipment Obtained to Provide Hands On Training for All Affected Disciplines.

OTHER AREAS OF CURRENT EFFORT

- Extensive Work Performed in Preparation for Re-Accreditation of Maintenance and Specialty Training
  - Task List Re-Validation Effort Completed
  - Self-Evaluation Report Submitted to INPO in January 1991
  - INPO Accreditation Team on Site June 24, 1991
- INPO Assist Visit to Review Operator Readiness in July
- Independent Utility Visit to Review Operational Readiness

INITIAL AND UPGRADE LICENSE EXAM RESULTS

During this SALP Period 25 Individuals Took Their License Exams and Passed on the First Attempt (100%)

- **3 of 3 SRO's on One Exam and 22 of 22 SRO's on Another Exam**

Over the Past 3.5 Years 55 of 56 License Candidates Passed Their License Exams on the First Attempt (98.2%)

- **16 of 17 RO's (94%)**
- **39 of 39 SRO's (100%)**

NOTE: According to INPO Data the Average Pass Rate on NRC Exams is 89% for RO's and 89% for SRO's.

LICENSE OPERATOR REQUALIFICATION EXAM RESULTS

During this SALP Period 44 of 47 Individuals Passed Their Requalification Exams on the First Attempt (93.5%)

There Has Been Continued Improvement in Both Crew and Individual Performance Over the Past Three Years

March 1989	March 1990	March 1991
72%	92%	93.5%

MAINTENANCE

MAJOR ACHIEVEMENTS

- o Significant Progress in the Material Condition Upgrade Plan
  - Formal Weekly Management Walkdowns Including the Responsible Area Supervisor Continue to be Effective in Identifying and Resolving Deficiencies
  - All Five Blackstart Diesels have been Overhauled and Upgraded
  - Unit 3 and Unit 4 Containment Spray Pump Rooms and the Water Treatment Plant Acid Tank Area have now been Upgraded
  - During this SALP Period, New Lows have been Achieved on Both Control Room Deficiency Tags (44 as of 11/14/90) and Control Room Instruments Out of Service (28 on 8/6/90). End of 1991 Goals are 40 and 28 (total- both units) and are Achievable
  - Valve Repacking Program Continues With Over 600 Valves Scheduled During the Outage
  - Major Containment Repainting Efforts are Underway in Both Containments
  - INPO Material Condition Assistance Visit

- o A Comprehensive Motor Operated Valve (MOV) Maintenance Program is Being Implemented
  - 68% of All MOV's Overhauled
  - 72% of All Safety-Related MOV's Diagnostically Tested
  - Installation of 4 Train Limit Switches and Replacement of Belleville Spring Packs on Selected Valves to Resolve Industry Concerns
  - Results Indicate Substantial Reliability Improvements
- o Extensive Pre-Outage Planning was Performed by the Maintenance Disciplines
  - Maintenance Responsible for Reactor Disassembly and Reassembly Resulted in Completion of Disassembly Within Schedule and With Exposure Below Previous Actual Lows
  - Maintenance Pre-Outage Planning Group Coordinated Support for 1062 Mechanical, 1275 Electrical and 1221 Instrument & Control Plant Work Orders
  - In Conjunction with the Remainder of the Site Staff, Maintenance has Implemented a Restart Readiness Program

- o **Planned Maintenance Group Assigned Responsibility for Assuring Implementation of Equipment Preservation/Layup Program During the Dual Unit Outage**

- o **Sustained Improvement in Maintenance Personnel Indicators Continues**

  - **Maintenance Department Overtime Has Been Reduced**

  - **No Lost Time Accidents for Maintenance Personnel during this SALP Period. As of June 14, 1991, Turkey Point Personnel Had Established a Record of 324 Days (Greater than 2.0 Million Man-Hours) Without a Lost Time Accident**

- o **Corrective Maintenance Backlog Was Reduced to 668 on May 21, 1991, A Low for this SALP Period and Below the Goal of 700 Previously Established**

AREAS FOR FURTHER IMPROVEMENT

- o Spare Parts Availability
  - During the Period 7/1/90 Through 5/1/91, 10727 New Items Have Been Added to Warehousing Inventory Lists and 9734 Have Been Received
  - For the Same Period, 1510 Dormant or Obsolete Items Have Been Eliminated from Warehousing Inventories
  - Corrective Maintenance PWO's On Hold Awaiting Parts Have Dropped from 179 on June 14, 1990 to 97 as of May 23, 1991, A Decrease of over 45%
  - Spare Parts Below Minimum Stocking Level Increased From 2432 on June 1, 1990 to 3311 on May 1, 1991 - Ongoing Efforts by Stores and Purchasing to Reorder this Material
- o Results of the Equipment Reliability Improvement Efforts and the Material Condition Upgrade Plan Have Been Demonstrated
  - A Record 102 Day Combined Unit Run Ended With the Scheduled Shutdown of Unit 4 for the Dual Unit Outage
  - Unit 3 Operated Continuously for over 178 Days Before Scheduled Shutdown For the Outage
  - Only One Unplanned Shutdown Due to Equipment Failure During the Operating Portion of this SALP Period

OTHER AREAS OF CURRENT EFFORT

- o Continued Emphasis is Being Placed on Addressing I&C Turnover. Resources Previously Added to I&C as a Countermeasure for Turnover Have Allowed the Department to Maintain Their Authorized Complement

- o Maintenance Supervisory Development Has Been Implemented. Key Features Include:

  - The Supervisory Training Program was Initiated in May 1990 and 49 of the original 56 Supervisors Targeted Have Completed the Classroom Training

  - Personal Communication of the Maintenance Superintendent's Expectations for Supervisory Performance on Day One of the Supervisory Training Program

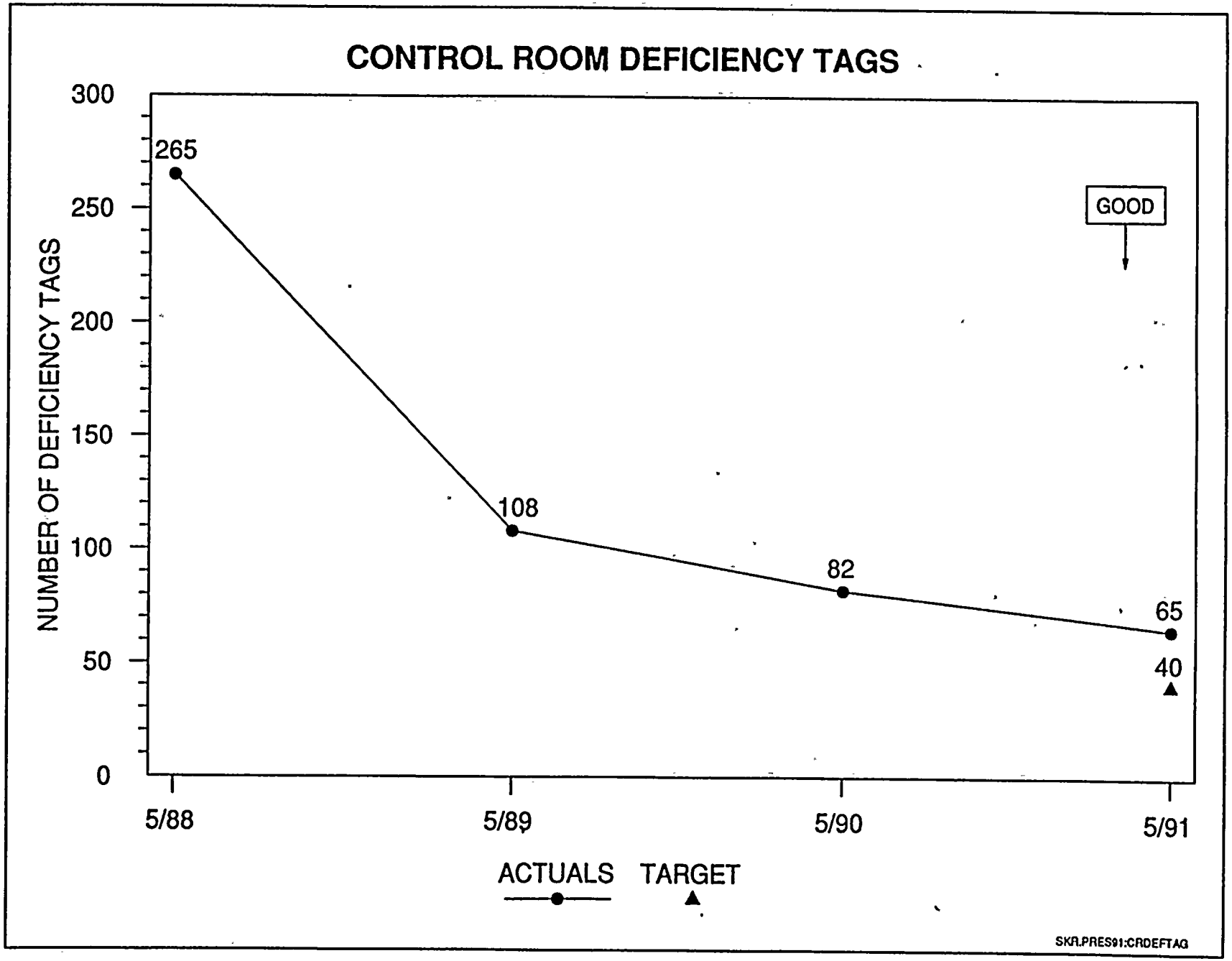
  - Development of Qualification Criteria Which Include Both Classroom and On-the-Job Training

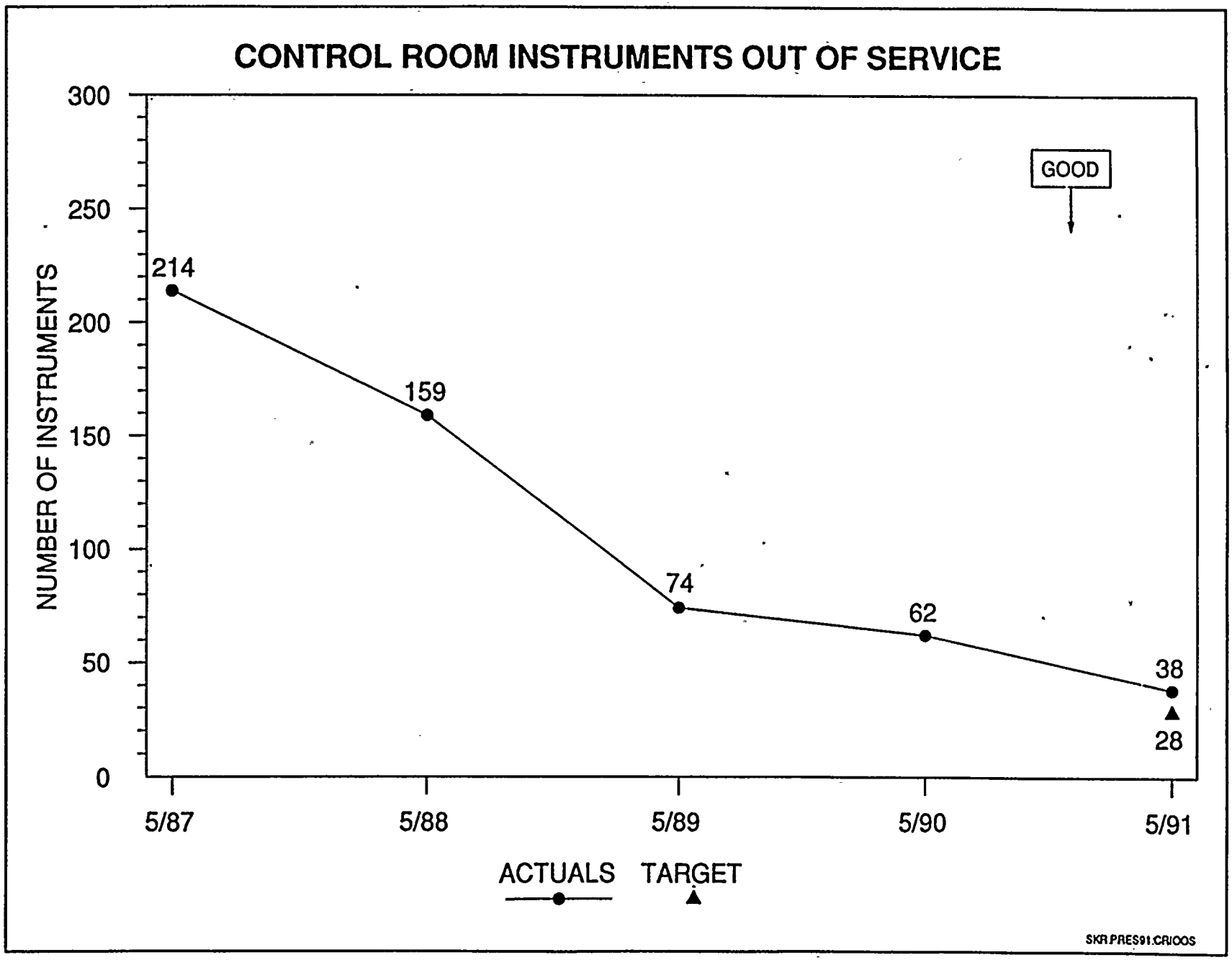
  - Commencing in April 1991, Monthly Performance Monitoring of Maintenance Supervisory Personnel

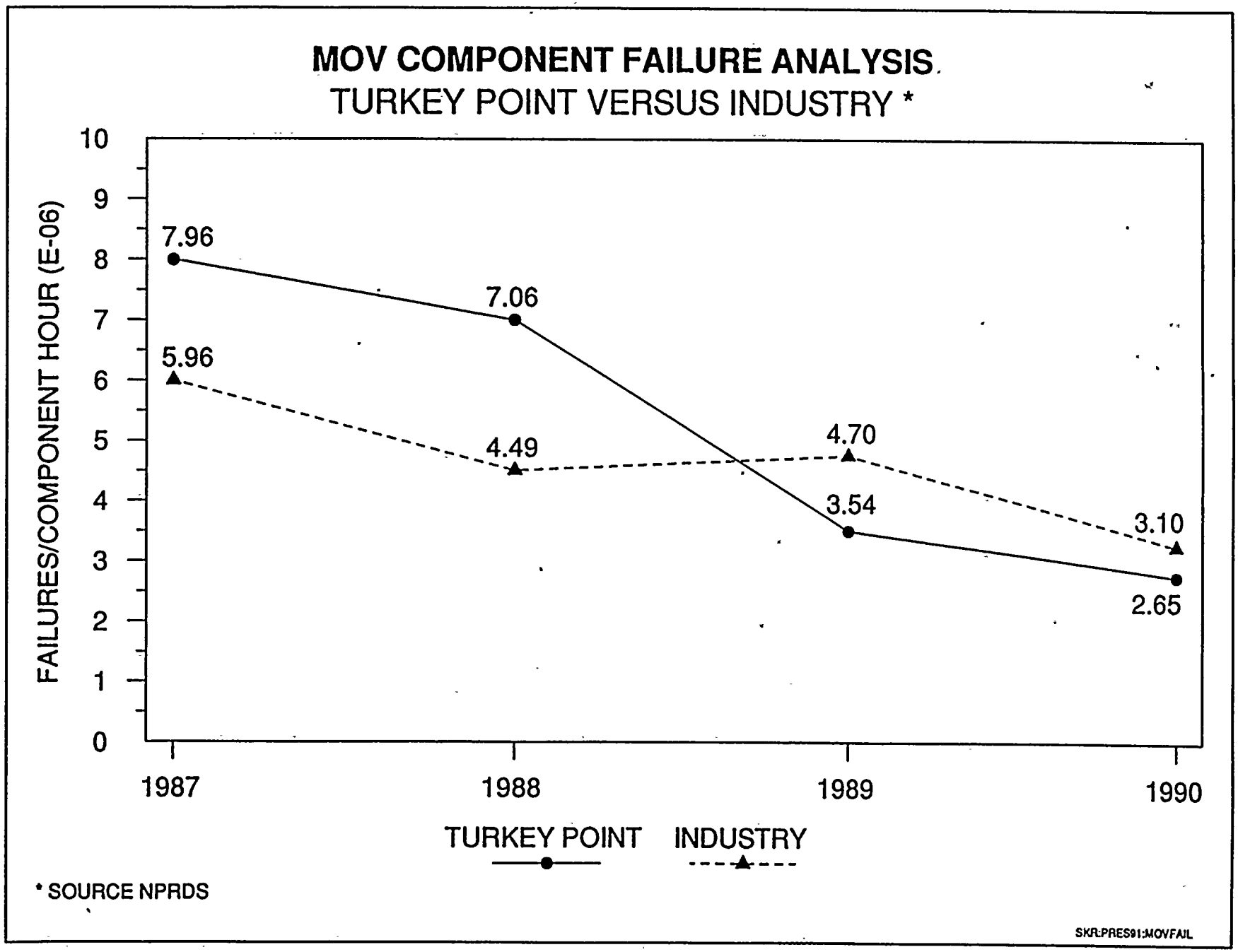
- o Maintenance Program Enhancements

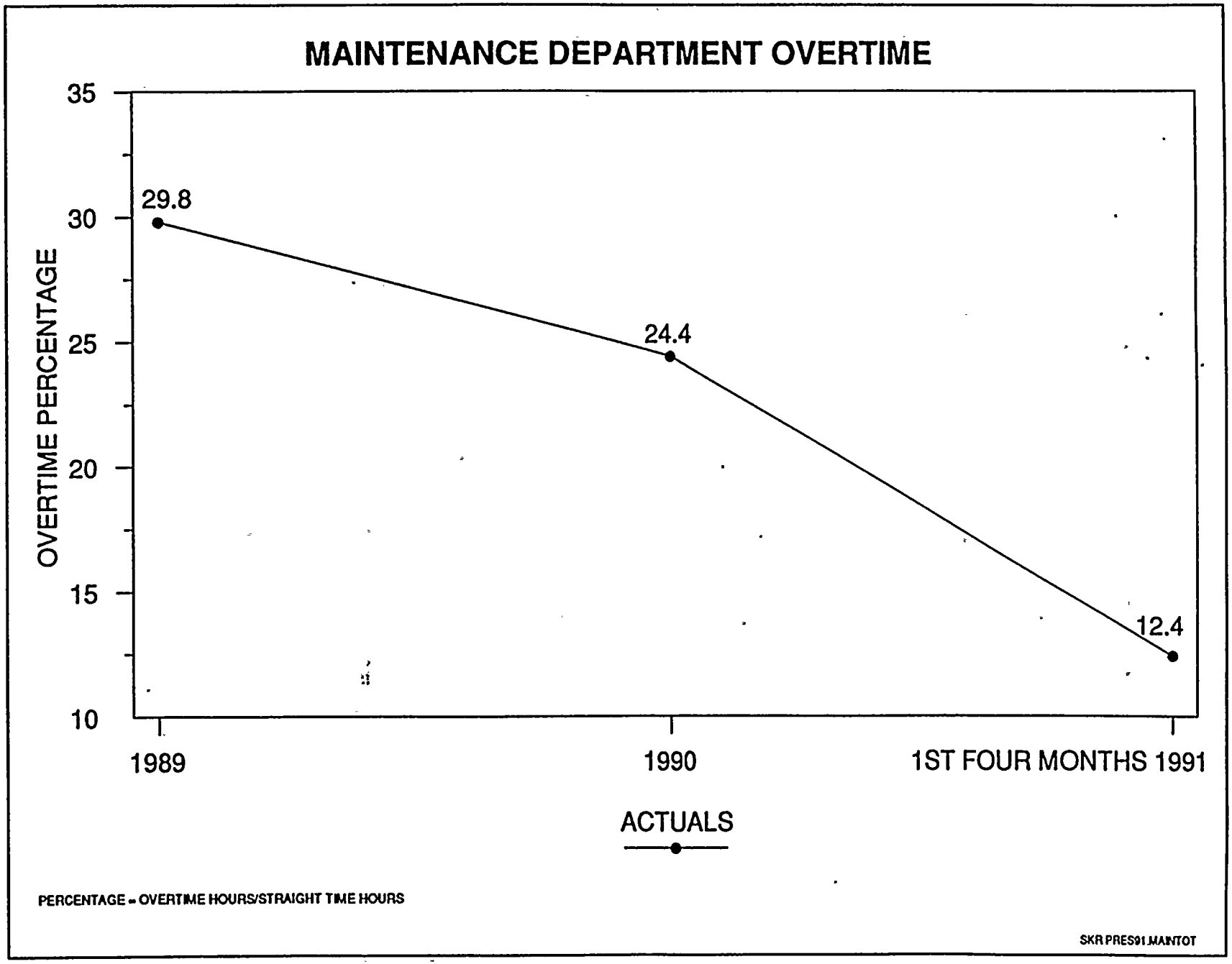
  - Maintenance Program Guide Published

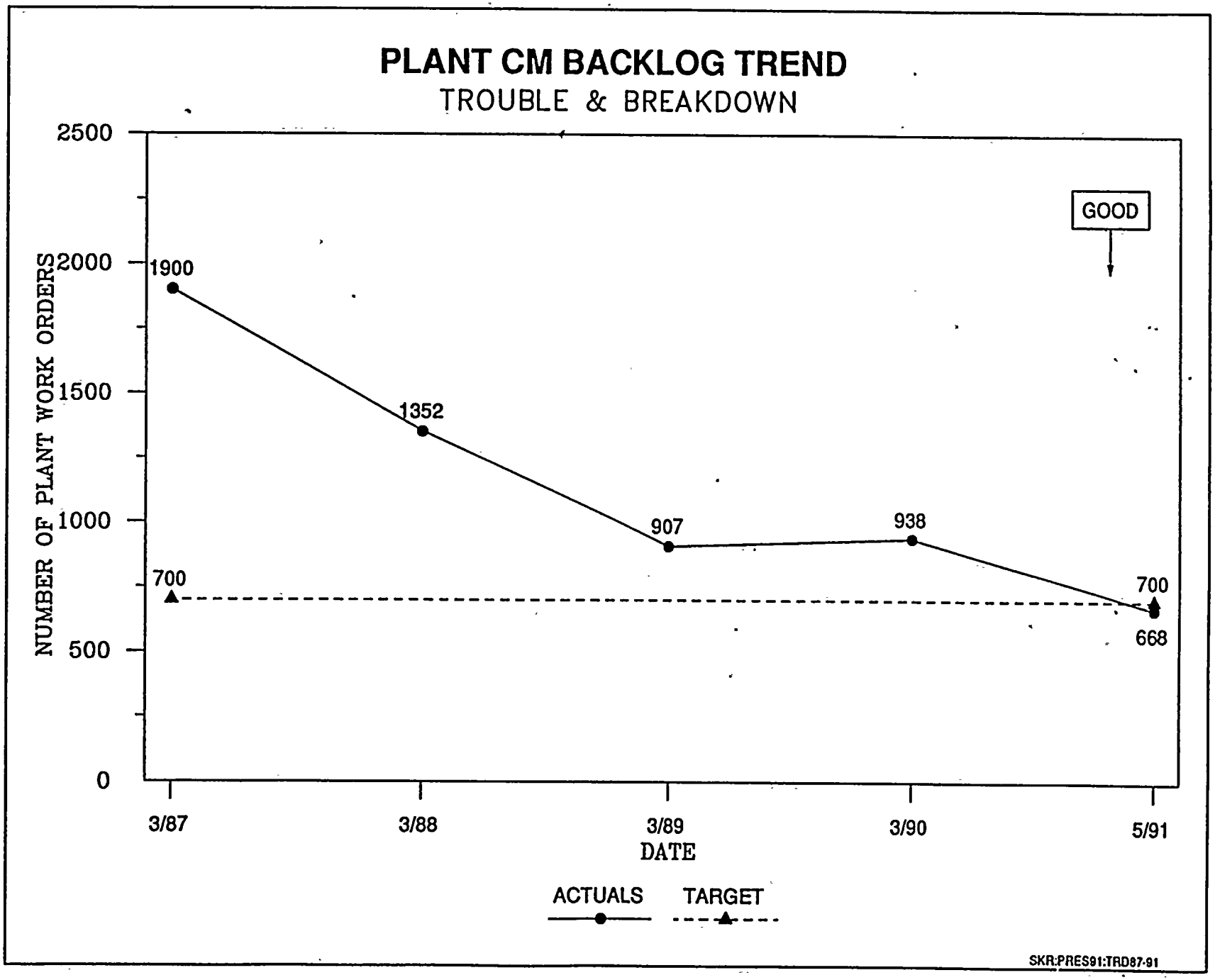
  - Formal Maintenance Self-Assessment Initiated


CONTROL ROOM DEFICIENCY TAGS
NUMBER OF DEFICIENCY TAGS
300
250
200
150
100
50
0
265
108
82
65
40
GOOD
5/88
5/89
5/90
5/91
ACTUALS
TARGET
SKR.PRES91:CRDEFTAG


CONTROL ROOM INSTRUMENTS OUT OF SERVICE
NUMBER OF INSTRUMENTS
300
250
200
150
100
50
0
GOOD
214
159
74
62
38
28
5/87
5/88
5/89
5/90
5/91
ACTUALS
TARGET
SKR.PRES91.CRIOOS


MOV COMPONENT FAILURE ANALYSIS
TURKEY POINT VERSUS INDUSTRY *
FAILURES/COMPONENT HOUR (E-06)
10
9
8
7
6
5
4
3
2
1
0
7.96
7.06
3.54
2.65
5.96
4.49
4.70
3.10
1987
1988
1989
1990
TURKEY POINT
INDUSTRY
* SOURCE NPRDS
SKR:PRES91:MOVFAIL


MAINTENANCE DEPARTMENT OVERTIME
35
30
25
20
15
10
OVERTIME PERCENTAGE
29.8
24.4
12.4
1989
1990
1ST FOUR MONTHS 1991
ACTUALS
PERCENTAGE = OVERTIME HOURS/STRAIGHT TIME HOURS
SKR PRES91.MAINTOT


PLANT CM BACKLOG TREND
TROUBLE & BREAKDOWN
NUMBER OF PLANT WORK ORDERS
2500
2000
1500
1000
500
0
GOOD
1900
1352
907
938
700
700
668
3/87
3/88
3/89
3/90
5/91
DATE
ACTUALS
TARGET
SKR:PRES91:TRD87-91

SECURITY

MAJOR ACHIEVEMENTS:

- o **Security System Upgrades are Making Excellent Progress**
  - **Security Department Consolidated into One Location in New Nuclear Entrance Building in September 1990.**
  - **The Following Items Are All Scheduled to be Completed in July 1991:**

    Security Access Control System to be Activated

    New Nuclear Entrance Building to be Fully Operational

    65% of New Perimeter is to be Searched and Activated

    Fossil Units to be Separated from the Nuclear Protected Area

    Totally Operable Uninterruptable Power Supply (UPS) including a Dedicated Security Diesel Generator

- o **Self Assessments and NRC Inspections Indicate Strong Security Force Performance (NRC Report 50/250-251 91-06)**
  - **Evidence of Senior Licensee Management Support for Security Program**

- Isolation Zones Were Kept Free of Obstructions and Security Personnel Were Patrolling and Checking Barriers

- Discussions with Compensatory Post Personnel Indicated Adequate Training and Appropriate Guidance

- Good Radio Communications Discipline was Maintained

o Sustained Improvement in Security Indicators

- Compensatory Post and Overtime are Near Projected Goals. Despite Demands of the Outage, Overtime has Continued to Average 13% per Month, August 1990 through April 1991

- Security Force Turnover Rate has Declined to an Average of 9%, Down from 13% in the Last SALP Period

- Loggable Security Information Reports Have Declined Significantly

  Previous SALP Averaged 47 Per Month (Range of 19 to 77 per Month)

  First Nine Months of this SALP Period Averaged 27 Per Month, a 42% Decline (Range of 13 to 51 per Month)

  Implementation of Division Wide Security Safeguards Program Dramatically Reduced the Number of Safeguards Incidents Since Implementation

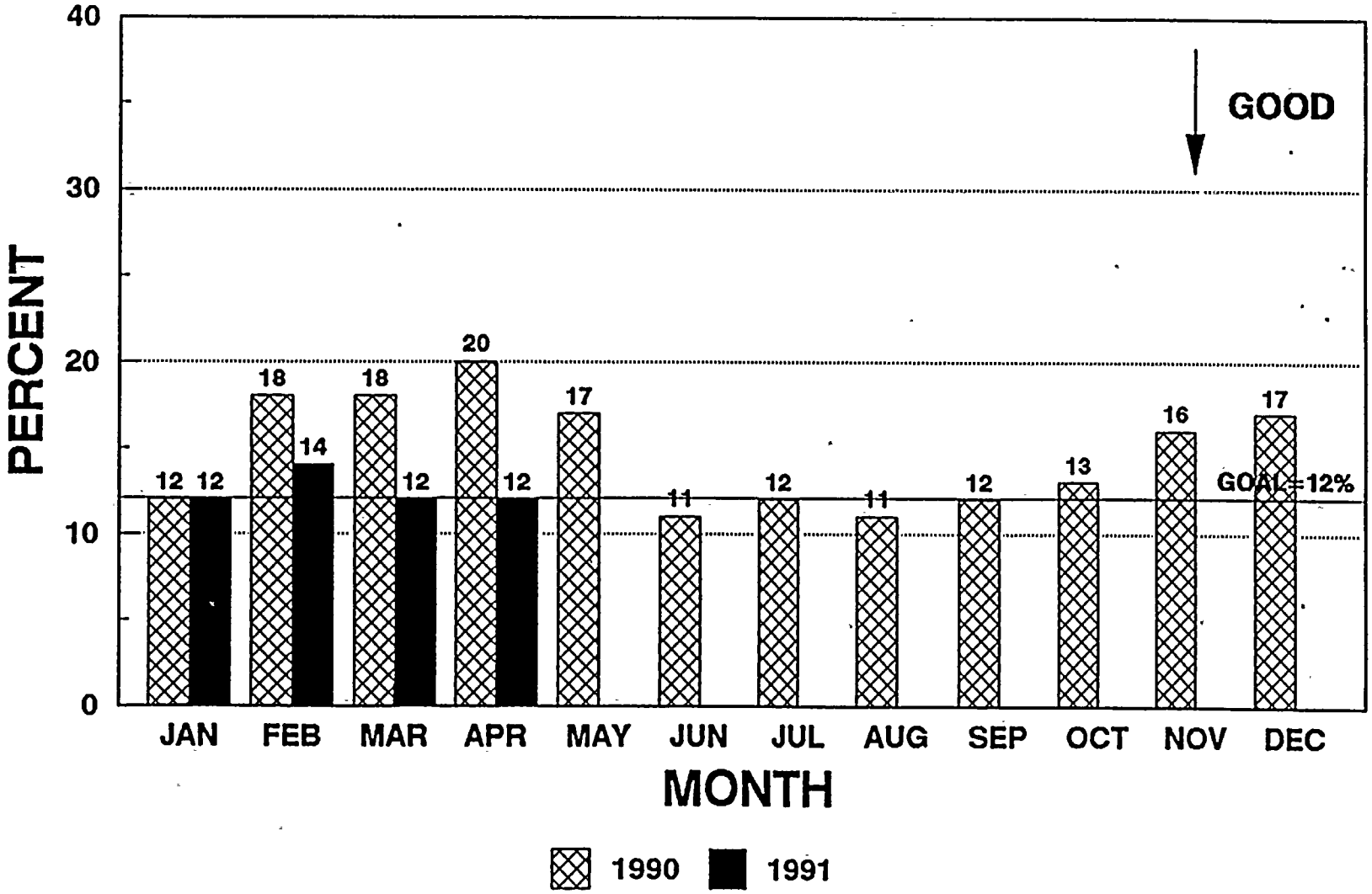
AREAS FOR FURTHER IMPROVEMENT

- o Vital Area Barriers and Remainder of Security Upgrades Scheduled for Completion in Late 1991

OTHER AREAS OF CURRENT EFFORT

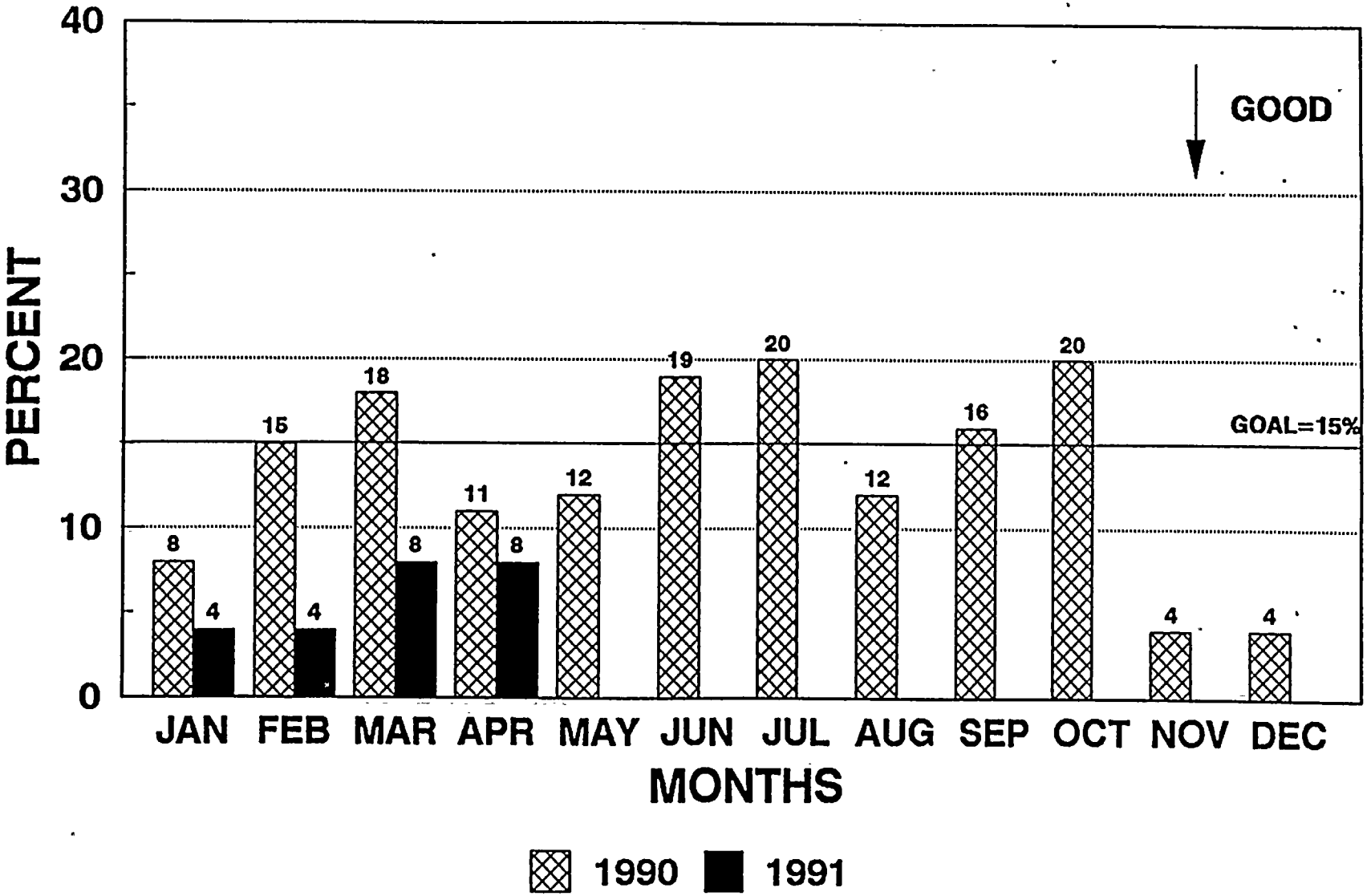
- o Currently Upgrading Security Force Weapons
- o Security Force Training Improvements
  - Enhanced Security Training Facilities in Late 1990 with the Move to the New Security Training Complex
  - Now Use the Dual-a-Tron Target System, Enabling Much Better Simulation of Live Fire Scenarios
  - In November 1990, in Conjunction with Local Law Enforcement Agencies, Performed Largest Security Contingency Drill in History of Commercial Nuclear Power. Eight (8) of the Sixteen (16) Security Contingency Events Were Tested
  - Currently Planning Another Contingency Exercise in August in Preparation for Security Participation in the December 1991 Emergency Plan (Evaluated) Exercise
- o Transition to new Security Contractor April 15, 1991. Transitioned several hundred employees in less than thirty (30) days.

SECURITY FORCE OVERTIME



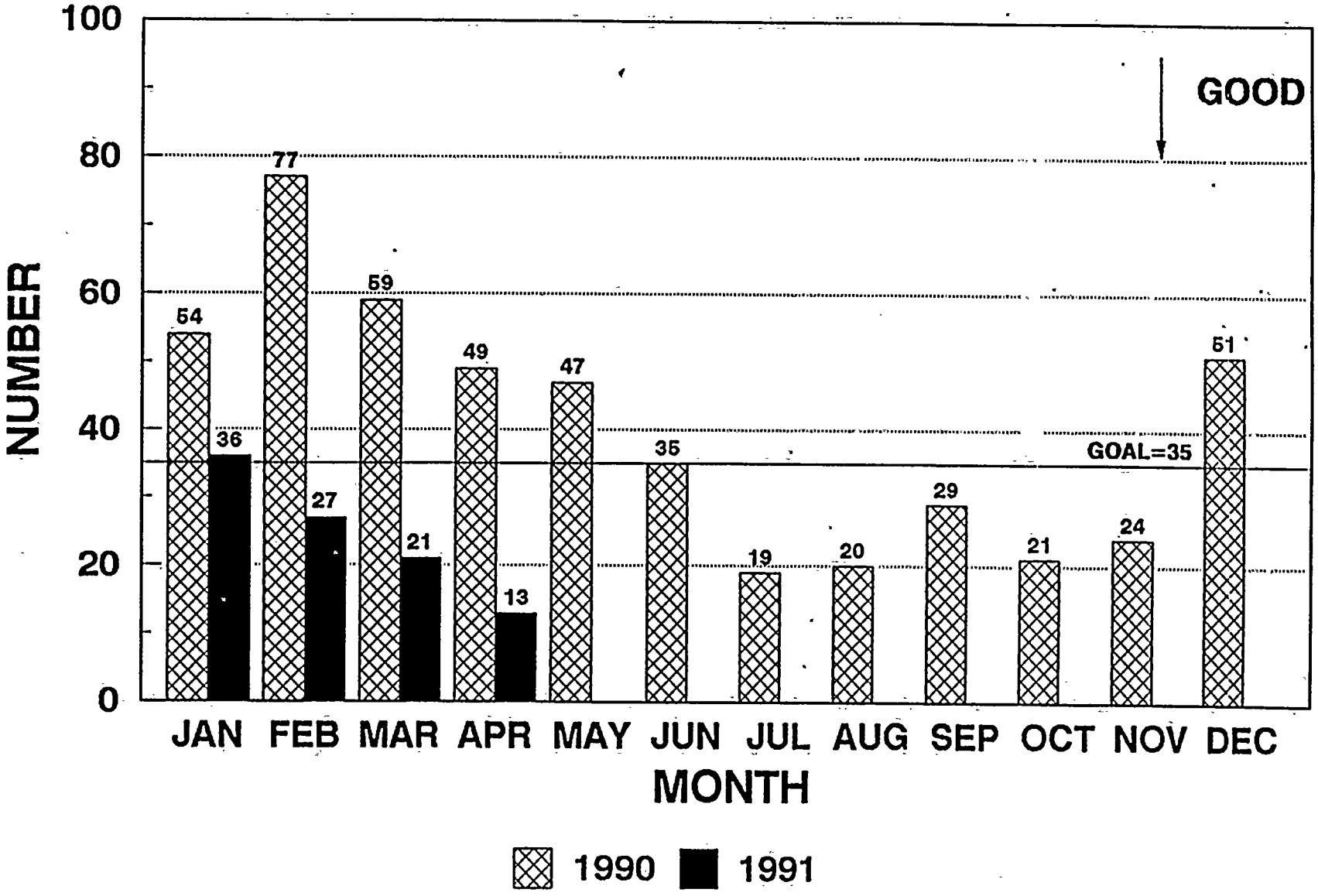
DATA DATE: 4/30/91
INDICATOR MANAGER: F.R.TIMMONS

SECURITY FORCE TURNOVER



NX12/MANNING LEVEL=ANUALIZED PERCENT
DATA DATE: 4/30/91
INDICATOR MANAGER: F.R.TIMMONS

LOGGABLE SECURITY INFO REPORTS



DATA DATE: 4/30/91

INDICATOR MANAGER: F.R.TIMMONS

ENGINEERING/TECHNICAL SUPPORT

MAJOR ACHIEVEMENTS

- o Significant Design Activities
  - Completion of Home Office Design of Emergency Power System (EPS) and Security Enhancement Projects on Schedule to Support the Dual Unit Outage (~ 550,000 Engineering Manhours)
  - On-Site EPS/Security Engineering Support Team (~ 70 Engineers)
  - 97% of Engineering Packages Completed at Least 60 Days Prior to Outage - Over 280 Required for the Outage
- o Procurement Engineering Improvements
  - Significant Reduction in Procurement Technician and Engineering Backlogs
  - Maintaining PWO's Awaiting Parts Under Target
  - Commercial Grade Dedication Process Instituted. Over 400 Packages Issued in the Last Year. ~ 40 Were Generic Packages
- o As Built-Drawing Verification Program
  - Reduction of Backlog from 28,000 in February 1989 to Present Total of Less Than 13,000

- Original Safety Related Backlog Complete by 12/31/91. Balance of Safety Related Drawing Update for Modifications Completed During the Dual Unit Outage Complete by 3/31/92

o Probabilistic Risk Assessment Completed and Will Be Submitted to NRC on Schedule

o Dual Unit Outage System Engineering Activities

- Support of 10 Year ISI Hydrostatic Tests
- Joint Test Group Participation
- Temporary System Modifications
- Startup Test Program Participation
- Participation in Restart Readiness Program

o Conservative Actions During this SALP Period

- Developed 50.59 for the Dual Unit Outage
  * Spent Fuel Pool Cooling Test
  * Pre-Planned Contingencies in the Event of Loss of Offsite Power
- Inspected and Confirmed Design Capability of the Intake Cooling Water System
- Prescribed Multiple Start Test for the Old Diesel Generators

- Revised Stroke Time Criteria for Power Operated Valves Including Trending for Degradation

- Enhanced 10 CFR 50 Appendix J Program

AREAS FOR FURTHER IMPROVEMENT

o Response to Generic Issues

- Issue on IST of ICW/CCW Pumps Expanded to Other Areas

o Fossil/Nuclear Engineering Interface

o Enhanced Component Design Requirements (CDR) Documents

- New Writer's Guides Developed to Improve the Format, Content, and Quality

- 14 CDRs Upgraded, 2 Remaining CDR Upgrades Scheduled for September 1991

- CDR Design Basis Verification on Schedule for Completion 6/30/91

o Integrated Procedure Update Process

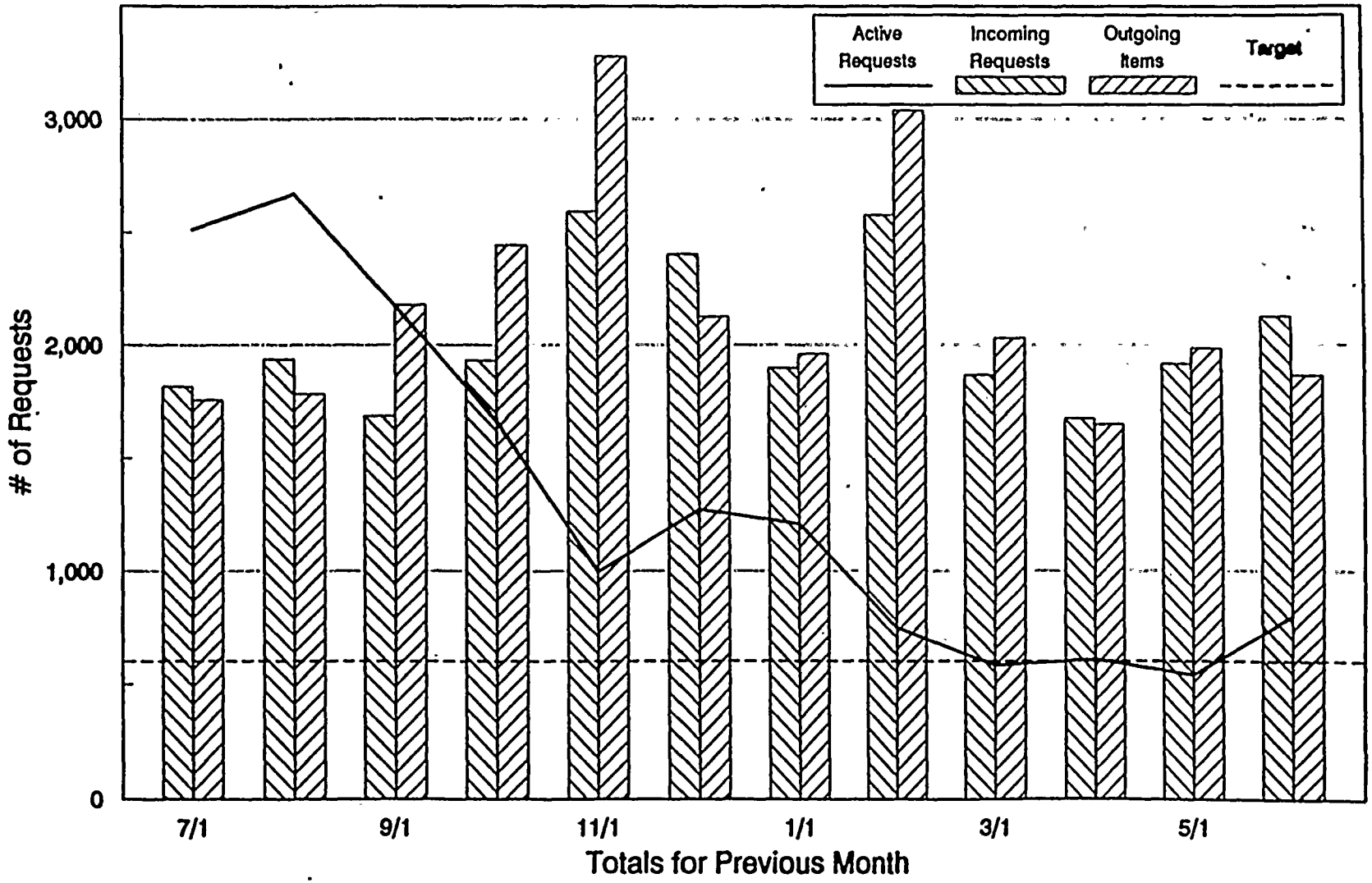
- EOP Maintenance
- Consolidation of Writer's Guides

OTHER AREAS OF CURRENT EFFORT

- o Enhanced Plant Change/Modification (PC/M) Process
  - Closeout Team to Conduct Post-Implementation Review of Outage PC/Ms
  - Implemented Minor Engineering Package
  - Developed Prioritized Modification Lists
- o Engineering Quality
  - Definition
  - In 1988 and 1989 Issues Raised Regarding A/E Oversight, Especially in Area of Calculations
  - Implemented 9 Attribute A/E Report Card
  - Implemented Calculation Program
  - Initiatives to Continue Improvement
    - * Engineering Assurance Program
    - * Dedicated A/E Oversight Group
    - * Production Engineering Group
    - * A/E Independence

Procurement Engineering-Technician Screening Status

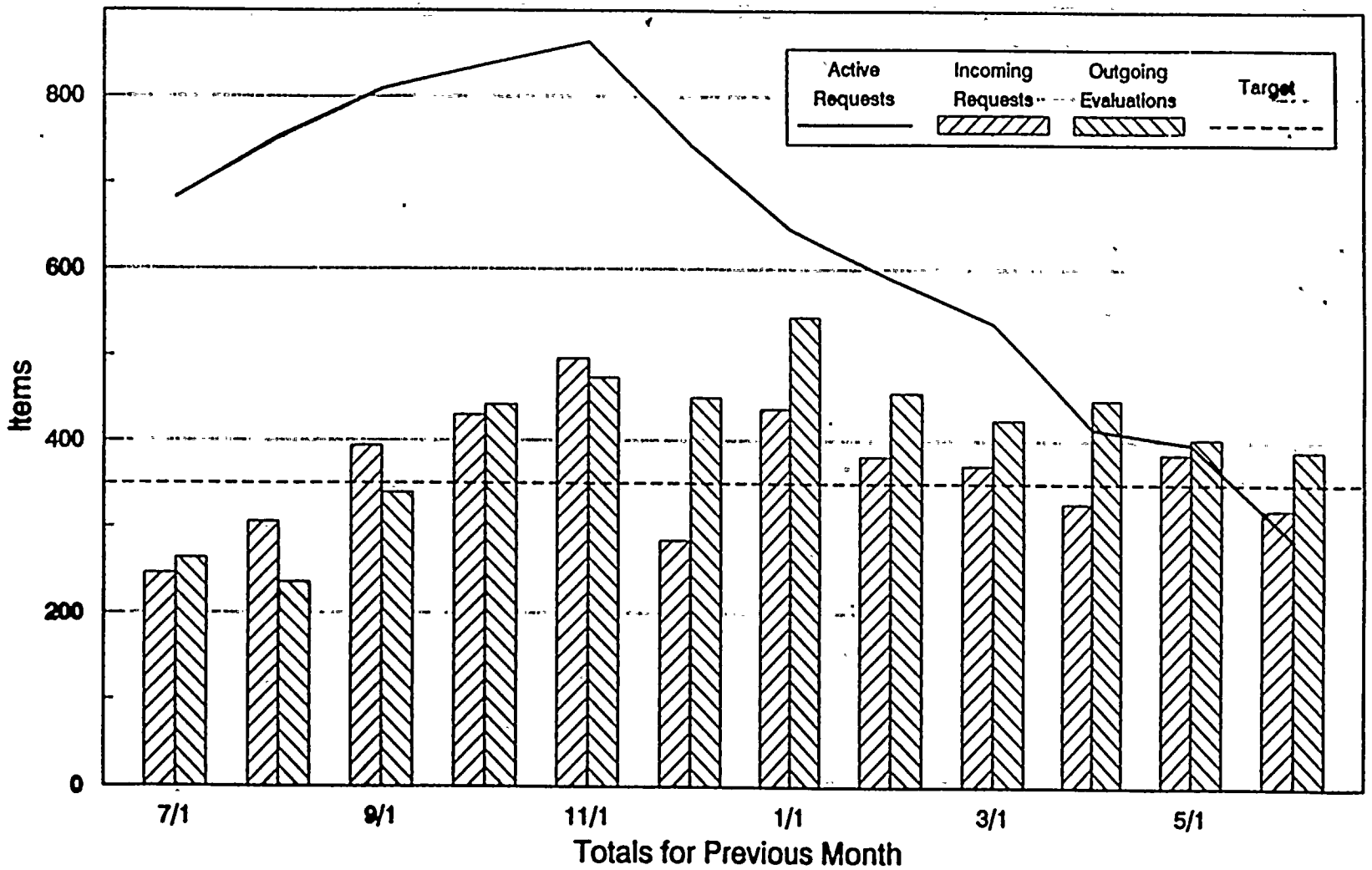
In, Out, & Active Requests as of 6/1/91



Man-hours per Item = 0.9

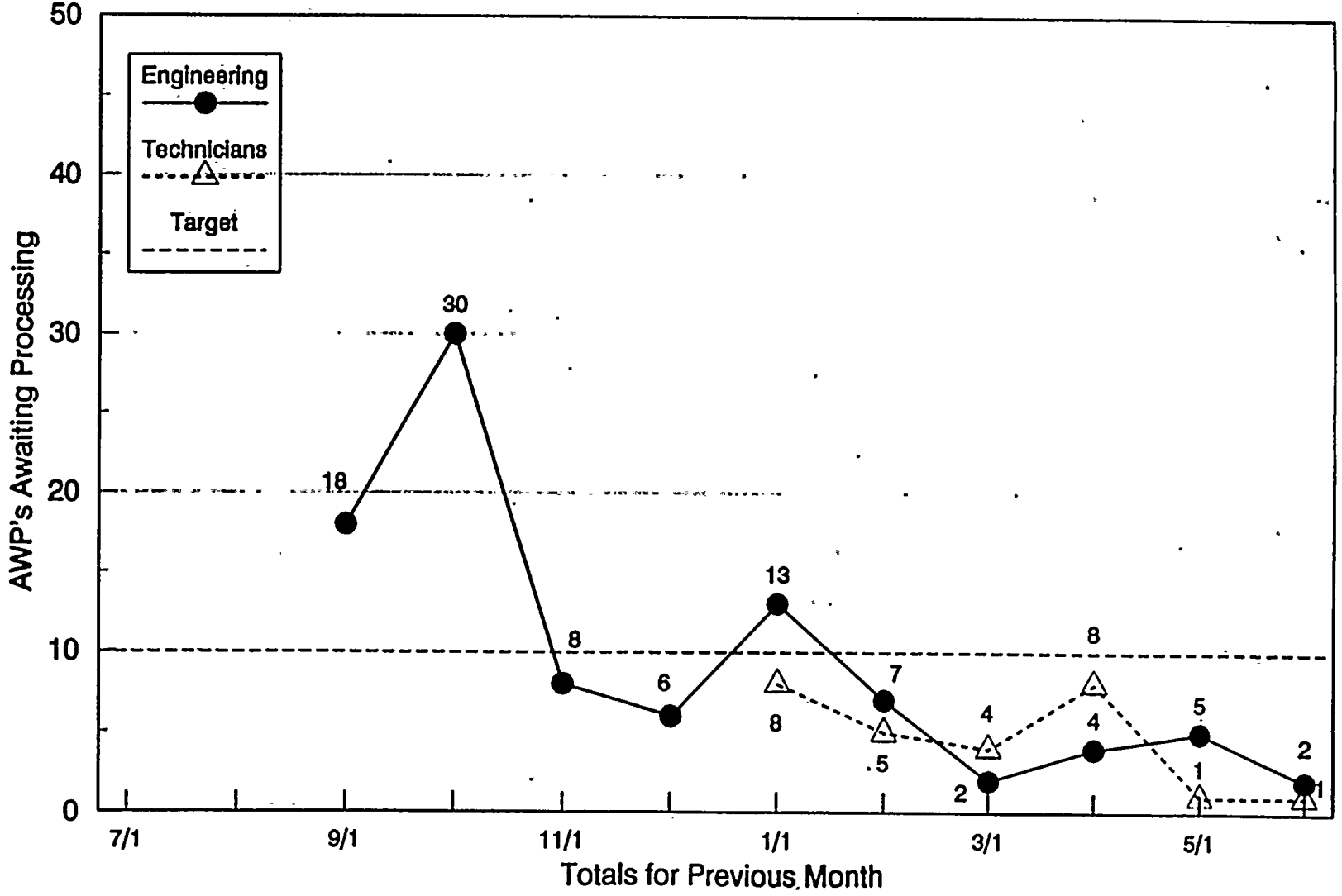
Procurement Engineering - Engineer Review Status

In, Out & Active Items as of 6/1/91



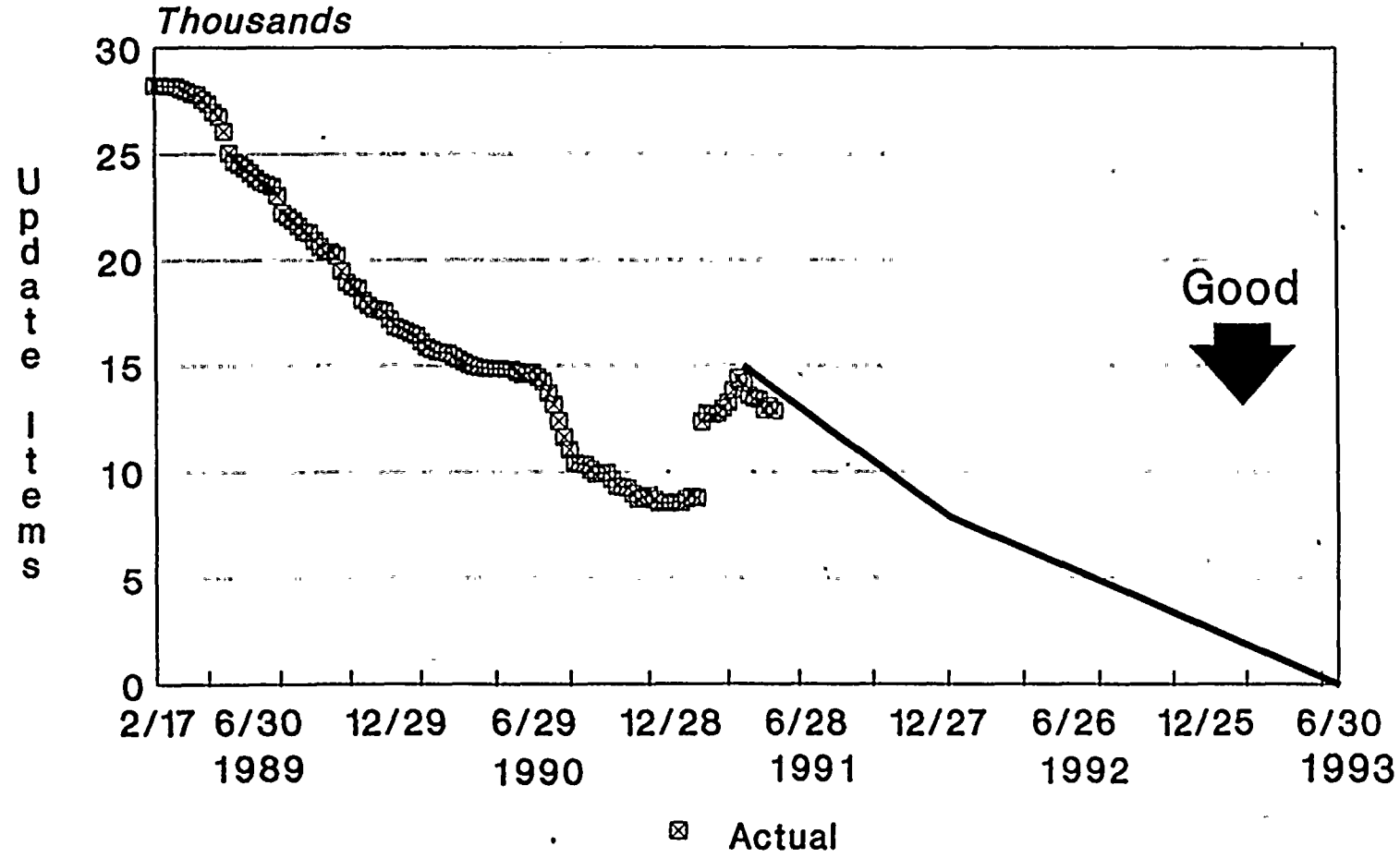
Project Man-hours per item = 12.1
Production Man-hours per item = 7.2

Procurement Engineering - Awaiting Parts PWO's
AWP's In-house Awaiting Processing - 6/1/91



Total Update Backlog

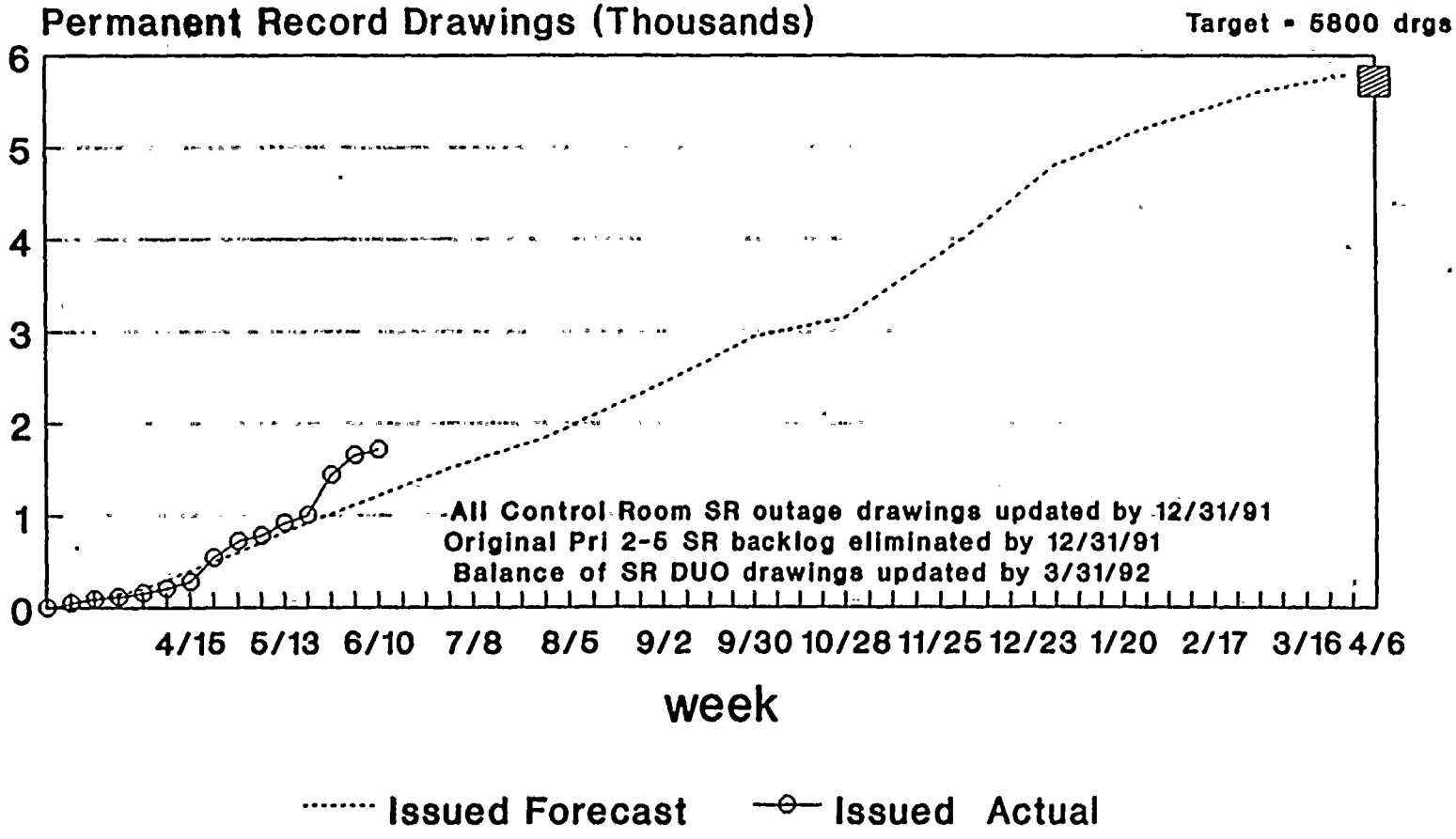
Priorities 2 Thru 5 All Dwgs
Turkey Point Units 3 & 4



Last Update 6/10/91

Q1a

Dual Unit Outage Workoff Curve
Safety Related Priority 2-5 Drawings



All PODs and inst/valve indexes will be updated as part of SATS turnover and as such are not included on this graph

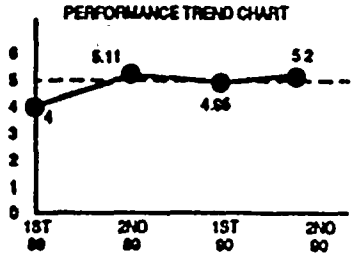
BECHTEL PBG
PERFORMANCE ASSESSMENT FOR TURKEY POINT PLANT
JULY 1990 THROUGH DECEMBER 1990

02/13/91

AREAS OF ASSESSMENT	TRENDS/REMARKS	CURRENT SCORE	PREVIOUS SCORE
INDICATOR ASSESSMENT, ENGINEERING PACKAGE:			
1. IMPLEMENTATION REVIEW COMMENTS PER PACKAGE	AVG. NO. INCORP. COMMENTS PER PKG. WAS 15.07. TARGET = 0.	4.0	4.4
2. NUMBER CRN'S DUE TO ENGINEERING ERROR PER PKG.	CRN'S (ENGR. ERROR) = 13. DATA FROM 6 EP'S. AVG. = 2.2. TARGET = 0.	4.8	6.6
3. PNSC REJECTS PER MONTH	1 REJECTED. 33 PKGS REVIEWED. AVG/MONTH = 0.18. TARGET = 0.	6.7	6.6
4. # OF UNPLANNED ENGINEERING PKG REVS PER CLOSED PKG	3 EP REVISIONS. 6 EP'S. AVG/PKG = 0.5. TARGET = 0.	5.0	6.4
5. CALCULATION DEFICIENCIES	7 DEFICIENCIES. 20 CALCS. AVG. = 0.35. TARGET = 0.	6.3	5.2
6. OUTAGE RELATED PCM DELIVERY	95.6% AVG 60 DAYS PRIOR TO OUTAGE. TARGET = 95%	7.0	N/A
7. AS-BUILDING	4.71 MANHOURS/DWG. CHANGE. 2.5% DRAWINGS ISSUED AFTER 23 DAYS. 0.061% DRAWINGS REWORKED.	5.9	5.6
8 JOB COST VARIANCE	AVG % VARIANCE ORIG. EST/REV. O COST 12.6% ON 26 REV. 0 PACKAGES	2.0	4.0
9 VARIANCE FROM SCHEDULE	DATA INSUFFICIENT TO ASSESS THIS AREA.	N/A	N/A
SURVEY ASSESSMENT:			
1. RESPONSIVENESS	SUBJECTIVE ASSESSMENTS	N/A	4.2
2. ABILITIES	ARE BEING DELETED	N/A	4.0
3. ATTITUDE	STARTING WITH THIS REPORT	N/A	4.3
4. PRICE		N/A	3.1
		AVERAGE 5.2	4.95
		RECALCULATED W/O SURVEY	5.54

SCORE SCALE

POOR	1.	UNSATISFACTORY, UNABLE TO PROVIDE MINIMUM REQUIRED FOR SUCCESSFUL COMPLETION OF PROJECT
	2.	NEEDS SPECIFIC IMPROVEMENT IN SEVERAL AREAS
	3.	NEEDS SPECIFIC IMPROVEMENT IN (1) OR (2) AREAS
SATISFACTORY	4.	FULFILLS THE BASIC REQUIREMENTS OF THE PROJECT
	5.	FULFILLS THE BASIC REQUIREMENTS OF THE PROJECT AND EXCEEDS REQUIREMENTS IN SEVERAL AREAS
	6.	OFTEN EXCEEDS THE BASIC REQUIREMENTS OF THE PROJECT
OUTSTANDING	7.	SIGNIFICANTLY EXCEEDS THE REQUIREMENTS OF THE PROJECT; VERY UNIQUE PERFORMANCE



JOHN B. HOSMER
DIRECTOR OF NUCLEAR ENGINEERING

DATE 2/14/91

BBECPTN

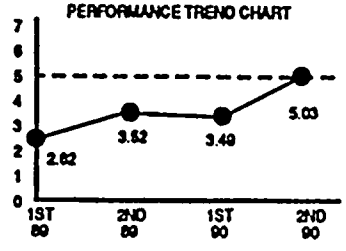
EBASCO STUART
PERFORMANCE ASSESSMENT FOR TURKEY POINT PLANT
JULY 1990 THROUGH DECEMBER 1990

02/14/91

AREAS OF ASSESSMENT	TRENDS/REMARKS	CURRENT SCORE	PREVIOUS SCORE
INDICATOR ASSESSMENT, ENGINEERING PACKAGES:			
1. IMPLEMENTATION REVIEW COMMENTS PER PACKAGE	AVG # INCORP. COMMENTS PER PKG WAS 13.88. TARGET = 0.	4.2	1
2. NUMBER CRN'S DUE TO ENGINEERING ERROR PER PKG	CRN'S(ENGR ERROR)=23. DATA, 7 PKGS. AVG.=3.29. TARGET = 0.	3.7	5.5
3. PNSC REJECTS PER MONTH	1 REJECTED. 27 PKGS REVIEWED AVG. = .17/MONTH. TARGET = 0.	6.7	6.6
4. # OF UNPLANNED ENGINEERING PKG REVS PER CLOSED PKG	30 EP REVISIONS. 7 EP'S. AVG/PKG=4.29. TARGET = 0.	1.0	6
5. CALCULATION DEFICIENCIES	16 DEFICIENCIES. 23 CALC'S. AVG = .70. TARGET = 0.	5.7	2.4
6. OUTAGE RELATED PCM DELIVERY	14 PKGS - AVG # DAYS EARLY/PKG = 73	7.0	N/A
7. AS-BUILDING	DOES NOT APPLY.	N/A	N/A
8. JOB COST VARIANCE	NO REV. 0 ENGR. PKGS. ISSUED THIS REPORT PERIOD	N/A	4.0
9. VARIANCE FROM SCHEDULE	27 DAYS LATE, 23 PKGS. 1.17 DAYS LATE/PKG	6.9	N/A
SURVEY ASSESSMENT:			
1. RESPONSIVENESS	SUBJECTIVE ASSESSMENTS	N/A	2.1
2. ABILITIES	ARE BEING DELETED	N/A	2.3
3. ATTITUDE	STARTING WITH THIS REPORT	N/A	2.7
4. PRICE		N/A	2.3
		AVERAGE 5.03	3.49
		RECALCULATED W/O SURVEY	4.25

SCORE SCALE

POOR	1.	UNSATISFACTORY, UNABLE TO PROVIDE MINIMUM REQUIRED FOR SUCCESSFUL COMPLETION OF PROJECT
	2.	NEEDS SPECIFIC IMPROVEMENT IN SEVERAL AREAS
	3.	NEEDS SPECIFIC IMPROVEMENT IN (1) OR (2) AREAS
SATISFACTORY	4.	FULFILLS THE BASIC REQUIREMENTS OF THE PROJECT
	5.	FULFILLS THE BASIC REQUIREMENTS OF THE PROJECT AND EXCEEDS REQUIREMENTS IN SEVERAL AREAS
	6.	OFTEN EXCEEDS THE BASIC REQUIREMENTS OF THE PROJECT
OUTSTANDING	7.	SIGNIFICANTLY EXCEEDS THE REQUIREMENTS OF THE PROJECT; VERY UNIQUE PERFORMANCE



JOHN B. HOSMER
DIRECTOR OF NUCLEAR ENGINEERING

2/12/91
DATE

B EBAPTN

SAFETY ASSESSMENT/QUALITY VERIFICATION

MAJOR ACHIEVEMENTS

- o Continued Aggressive Self Assessment Program
  - Turkey Point's Emergency Power Enhancements
  - Radiological Emergency Plan
  - Simulator Certification
  - Configuration Management Program
  - Reviewed Turkey Point's Spent Fuel Pool System (SFP)
  - Root Cause Analysis Investigations
- o Significant Reduction in the Length of Time Audit Findings Remain Open
  - Findings Open for More Than 180 Days:

    15 Findings On May 1990
    0 Findings On May 1991
- o Quality Assurance Efforts Resulted in Four Documented Non Cited Violations During this SALP Period
- o Safety Assessment - Enhanced Company Nuclear Review Board
- o Increased Communications With NRC During DUO

- o Reduced Licensee Event Reports (LERs)
  - 14 LERs Reported During this SALP Period:
    - * 11 Required and 3 Voluntary
    - * Compared to 38 LERs Submitted During Last SALP Period

AREAS FOR FURTHER IMPROVEMENT

- o Single Nuclear Division Integrated Audit Plan
- o QC "Outage Team"

OTHER AREAS OF CURRENT EFFORT

- o Security and Outage Hardware Changes Audit
- o Audit of Installation and Testing Phases of SSOMI for Emergency Power Systems Upgrades
- o Dual Unit Outage Licensing Efforts
  - Ten Proposed License Amendments (PLA) Submitted
  - Staffed Bethesda Licensing Office
  - NRC Approved Revised Technical Specifications and Emergency Power System Enhancement PLA
  - Reviewing Revised Technical Specifications for Procedure Compliance and Commitments
- o Operational Readiness Audit

ATTACHMENT 1

p. 1-1 The date of FPL's RAI responses on April 16, 1990, May 2, 1990, and June 4, 1990 were incorrectly referenced as 1989 submittals.

Basis: Typographical error.

p. 2-1 Reference to MCC 4D in first paragraph for the discussion of the existing plant should be MCC D.

Basis: Typographical error.

p. 2-3 Clarification should be provided in the continuation of the last paragraph of the previous page to describe interfaces with the existing plant, i.e., "... bases for the existing design. As a minimum, loads in the existing plant will be physically and electrically separated in accordance with the current FSAR criteria, i.e., circuits associated with redundant components will not be routed in the same raceway. Thus, ..."

Basis: Clarification of previous FPL submittals.

p. 2-3 Clarification should be provided in the first paragraph to state that it is applicable to the new EDG Building only, i.e.,:

1) Preface the paragraph with "In the new EDG Building,"

2) Revise the last sentence tho read: "We find this to be acceptable since these non-Class 1E loads meet the requirements of associated circuits with the exception of identification and seismic qualification, but are physically supported such that their failure should not impact the Class 1E systems."

Basis: Clarification of previous FPL submittals.

.9107020385

p. 2-3 Clarification should be provided in the second paragraph to state that it is applicable to the new EDG Building only and associated circuits, i.e., preface the paragraph with "In the new EDG Building, considering associated circuits as discussed above," and delete "For"

Basis: Clarification of previous FPL submittals.

p. 2-4 The manufacturer's recommendations specify operation at 50% load, not 40%, to clean out the exhaust stacks.

Basis: Discrepancy due to design changes subsequent to FPL submittals.

p. 2-5 Delete "when they are required to replace a non-operable Division A or B component cooling water pump or intake cooling water pump" from the middle paragraph. All three ICW pumps are required to be operable by the technical specifications during power operation.

Basis: Clarification of Turkey Point design.

FIGURE 2-1 The existing 4160V C buses were not replaced by the new 4160V swing buses as implied by this figure. The C buses still exist in their original configuration.

Basis: Clarification of previous FPL submittals.

p. 2-6 The overcurrent protection circuitry for the swing Load Centers prevents a fault from transferring from one division to the other by tripping the feeder breakers from each division on a overcurrent condition. This is not accomplished by a lockout relay as indicated.

Basis: Discrepancy due to design changes subsequent to FPL submittals.

p. 2-7 The existing shared MCC was labeled as D not 4D.

Basis: Typographical error.

p. 2-7 Description of the existing dc bus/battery charger should be revised to read, "In addition, buses 3A and 4B shared a swing 50 kW battery charger and buses 4A and 3B shared a swing 37.5 kW battery charger, both powered from 480V MCC D. This MCC is presently common to both units and is supplied from a unit 3 Division B and a unit 4 Division A 480V load center."

Basis: Clarification of previous FPL submittals.

p. 2-11 Revise the last two sentences of the top paragraph of the page to read, "Thus, although it is not a design basis or a licensing requirement, the values shown assume a simultaneous failure of a unit 3 and unit 4 EDG. The resultant loadings are as follows:

	EDG 3A	EDG 3B	EDG 4A	EDG 4B
Automatic Loads	1954 kW	1984 kW	1405 kW	1405 kW
Manual Loads	250	175	1005	850
Total	2204 kW	2159 kW	2410 kW	2255 kW"

Basis: Clarification of previous FPL submittals.

(The above numbers are conservative with reference to the latest design documents.)

p. 2-12 The emergency and normal stop control logic should be revised as follows:

"A fast stop of the EDG can be initiated by depressing the 'emergency stop' push-button and is effective at all times. The normal stop signal is not effective when the EDG is in its emergency mode of operation."

Basis: Clarification of previous FPL submittals.

p. 2-13 The capability of the diesel oil storage tanks to receive a load of 8,000 gallons should be clarified to state, "The storage tanks together also have the ...."

Basis: Clarification of previous FPL submittals.

p. 2-15 There is no redundancy, per se, in the EDG's cooling system. Each engine does have two pumps, but each pump is dedicated to one side of the engine and each EDG does have three fans only two of which are required under certain ambient air temperatures and EDG loadings.

Basis: Clarification of previous FPL submittals.

p. 2-20 For the Bus LOOP, LOCA and Hi-Hi Containment Pressure (HHCP) test, the worst case loading scenario includes actuation of the containment spray pumps during its normal load block, not after the sequencer has completed its timing as called for in the test description. Thus the sentence, "The containment spray pump sequencer loading relay re-actuates after the sequencer completes its timing" should be deleted.

Basis: Discrepancy due to design changes subsequent to FPL submittals.

p. 2-20 The scenario for the LOOP plus Other Unit LOCA, as described in FPL's Testing Submittal is erroneously described in this SER due to an incorrect reference in the Testing Submittal. The correct scenario is a dual unit LOOP will be imposed after a single unit LOOP with simultaneous LOCA and HHCP conditions have been imposed on one unit, (i.e., a dual unit LOOP is imposed following the Bus LOOP, LOCA and Hi-Hi Containment Pressure test described above.)

Basis: Discrepancy due to design changes subsequent to FPL submittals.

p. 2-20 &2-21 The Bus Independence (p. 2-20) and Method of Testing (p. 2-21) sections describe making "associated" dc power supply buses inoperable. Due to the shared configuration of Turkey Point's dc power system, which was not modified by the EPS Enhancement Project, it is not possible to disable a dc power bus and its "associated" ac power train and successfully test the other trains. Note that the dc system design at Turkey Point is such that each of the four dc buses, labelled as 3A, 3B, 4A and 4B, provide dc power to multiple trains or divisions. The applicable tests, as described by the Licensee, will be performed with only

the dc power for the test train's EDG and sequencer made inoperable. While it is understood that Regulatory Guide 1.41 describes independence tests with the associated dc power supply bus inoperable, this testing configuration is not appropriate for a plant with a shared dc system, such as Turkey Point. Since the significant components modified by the EPS Enhancement Project (i.e., the EDGs and sequencers) will have their dc power disabled, the testing of the modified ac system without disabling the entire "associated" dc power supply bus satisfies the intent of the Regulatory Guide. Because of the existing licensed and unmodified configuration of the dc system, FPL did not commit or describe the performance of these tests with the "associated" dc power supply bus disabled. As such, the references to disabling the associated dc power supply bus should be deleted from this SER.

Basis: Clarification of Turkey Point design.

p. 2-21 The SER as well as the Licensee's testing submittals describes a method of load group independence testing with one load group (i.e., an ac load group) at a time completely disconnected. This test method is based on the guidance provided in Regulatory Guide 1.41. Specifically for the Turkey Point design, a testing configuration of three trains up and one train down was described. An alternative testing configuration, which also satisfies the Regulatory Guide, is one train up and three trains down. Either configuration satisfies the intent of the Regulatory Guide as stated in the Part B. DISCUSSION section that "As a minimum, a suitable test should assure that each redundant on-site power source and its load group can function without any dependence upon any other redundant load group or portion thereof."

In addition either configuration satisfies the items delineated in the Part C. REGULATORY POSITION section of the Regulatory Guide. Specifically, position 1 is satisfied verbatim, without interpretation, as the off-site transmission network will be isolated by direct actuation of the under-voltage sensing relays for all four trains within the on-site system.

While position 2 states in part, "... the on-site electric power system should be functionally tested

successively in the various possible combinations of power sources and load groups with all d-c and on-site a-c power sources for one load group at a time completely disconnected," it is understood that the guidance regarding the disconnection of one power division is based on a "typical" plant which would only be testing two redundant divisions. Therefore, for a "typical" plant, this test configuration would be one division powered and one division de-powered. Thus for the Turkey Point design, which is different from the "typical" design for which the Regulatory Guide was written, it can be seen that either of the above test configurations satisfies position 2.

Position 3 which requires verifying the absence of voltage on the de-powered division(s) is satisfied verbatim, without interpretation, for either test configuration.

Therefore, either test configuration is in compliance with the guidance provided in Regulatory Guide 1.41. Based on the above and after further consideration of the complexity of both test configurations, FPL plans to perform the load group independence test for the configuration of one ac division powered at a time and with the other three ac divisions de-powered. As such, the SER should be revised to reflect this equally acceptable test configuration.

Basis: Discrepancy due to reevaluation of preferred testing methodology subsequent to FPL submittals.

p. 3-1 The cross-tie between the two units is designed for use only during a Station Blackout event and not for LOOP events as stated.

Basis: Clarification of previous FPL submittals.

p. 3-6 FPL's responses to the two sets of NRC's RAIs on the Sequencers should be included as References. These are:

FPL letter to NRC, L-90-277, dated July 23, 1990, "Request for Additional Information on Emergency Power System Enhancement Project."

FPL letter to NRC, L-90-349, dated September 28, 1990, "Emergency Power System Enhancement Project."

Basis: Provide additional references.

p. 4-1 The version of the ASME Section III code is 1983 with Summer 1984 Addenda, not 1989 with Summer 1984 Addenda as indicated.

Basis: Typographical error.

p. 4-2 Reference 3 should be FPL letter, L-90-160, from K.N. Harris, FPL, to NRC, dated May 2, 1990 not 1989 as indicated.

Basis: Typographical error.

p. 5-1 The soil under the foundation mat consists of compacted crushed limerock not liner rock.

Basis: Typographical error.

p. 6-1 The EDG manufacturer's ratings for continuous and short term operation are 2874 and 3162, respectively, not 2865 and 3150, as stated.

Basis: Clarification of previous FPL submittals.

p. 6-1 The capacity of each of the new storage tanks is 42,000 gallons not 38,000 gallons.

Basis: Clarification of previous FPL submittals.

p. 6-1 There are two turbocharger aftercoolers not 12 as stated.

Basis: Clarification of previous FPL submittals.

p. 6-1 The capability of the diesel oil storage tanks to receive a load of 8,000 gallons should be clarified to state, "The storage tanks together also have the ...."

Basis: Clarification of previous FPL submittals.

p. 6-3 Quarterly tests performed in accordance with ASTM D975-1981 are performed on a trimonthly basis not a bi-monthly basis as stated.

Basis: Typographical error in FPL submittal. FPL Letter L-90-196, Response to NRC's Request for Additional Information, page 38 incorrectly stated that quarterly tests were performed bi-monthly.

p. 6-3 The air dryer provided for these systems is a deliquescent type not a refrigerant type.

Basis: Clarification of previous FPL submittals.

p. 6-5 The design of the Diesel Generator Building Ventilation System should be revised as follows:

"The ventilation systems for the EDG control panel rooms and the switchgear rooms will be designed as safety-related and meet seismic Category I requirements. The ventilation systems for the EDG rooms and fuel oil transfer pump rooms are designed as non safety-related and are seismically supported."

Basis: Change concerning diesel generator rooms having safety related ventilation is to maintain consistency with previous FPL submittals. Additional information concerning non safety-related ventilation had not previously been discussed in EPS Licensing Submittals.

p. 6-6 The exceptions for the HVAC penetrations that are not protected by fire damper assemblies are discussed in part D of Section 6.1.3.1.

Basis: Typographical error.

p. 6-8 The discussion of the exceptions for penetration fire protection should be revised to read, "... the exception of HVAC duct penetrations in the exterior walls. This is because a safe shutdown analysis indicated that these exterior walls ...."

Basis: Maintain consistency with previous FPL submittals.

p. 6-10 The discussion of the EER fire area should be revised to read, "The EER is one fire area separated into two fire zones. The area is separated from the rest of the Auxiliary Building by walls (interior) which are three-hour fire rated with all penetrations and doors protected by three-hour fire rated assemblies. The east and west exterior walls are of fire resistent construction and have unprotected HVAC penetrations as described in Section 6.1.3.1(d)." "... the licensee is constructing a room of non-combustible construction to house the spare battery. Although wholly contained within the EER, the spare battery room has a unique fire zone identifier. The mezzanine, open to the EER, is located above the spare battery room and contains the 3A2, 3B2 and D51 battery chargers and the EER/battery room air handling unit."

Basis: Maintain consistency with previous FPL submittals.

p. 6-11 There is no redundancy, per se, in the EDG's cooling system. Each engine does have two pumps, but each pump is dedicated to one side of the engine and each EDG does have three fans only two of which are required under certain ambient air temperatures and EDG loadings.

Basis: Clarification of previous FPL submittals.

p. 7-1 The following clarification should be made regarding the FSAR update for the EPS Enhancement modifications. A draft FSAR update will be provided in mid-1991 to reflect the design changes. In accordance with 10 CFR 50.71, the FSAR will be formally updated in the first annual update following completion of the plant modifications. This formal update is currently scheduled for the 1992 annual update.

Basis: Correction to previous FPL submittal.

L-91-137
Docket Nos. 50-250 and 50-251
EPS Enhancement Project

ATTACHMENT 2

Safety Evaluation Report Mark-Up

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

133

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELATED TO AMENDMENT NO. 138 TO FACILITY OPERATING LICENSE NO. DRP-31

AND AMENDMENT NO. 139 TO FACILITY OPERATING LICENSE NO. DPR-41

FLORIDA POWER AND LIGHT COMPANY

TURKEY POINT UNIT NOS. 3 AND 4

DOCKET NOS. 50-250 AND 50-251

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1.0 BACKGROUND

Turkey Point Units 3 and 4 are reactors of early Westinghouse design which began operation in 1972 and 1973. Over the years, the Florida Power & Light Company (FPL) has been upgrading the design of the plant in a number of areas to improve safety and operational capabilities. One of the most significant improvements to date is the Emergency Power System (EPS) enhancement which is evaluated in this report.

Turkey Point Units 3 and 4 currently share an emergency power system which includes two safety-grade emergency diesel generators (EDGs). Consequently, the reliability of the AC supply has always been of concern. To add backup electrical power sources, FPL provided five existing non-safety grade cranking diesel generators which could be manually started and used to power plant shutdown systems if ever needed. These backup diesels will be retained, and are, in fact, a backup power supply to the Standby Feedwater System (which is itself a backup to the Emergency Feedwater System). Another operational problem is that a problem with any one of the shared emergency power system components impacts both Turkey Point Units. This complicates operations and potentially requires shutting down both units at the same time. In addition, care must be exercised in the loading of the emergency diesel generators under accident conditions to keep the electrical loads within the EDG ratings. Under certain circumstances, this can require some manual loading and shedding of non-essential loads.

To alleviate these operational problems and to significantly improve the safety of the Turkey Point Plant, Units 3 and 4, FPL began to study possible plant improvements. Among them was the EPS Enhancement Project. To that effect, in 1986 FPL authorized a detailed design study, the Emergency Power System Enhancement Study, to provide a conceptual design for the EPS improvement option which had been selected based on earlier analyses.

By letter dated June 23, 1988, FPL submitted the description of the EPS Enhancement Project. This letter was supplemented by a letter dated October 19, 1988, in which FPL described further the two new EDGs and their proposed qualification testing. Additional information in response to NRC staff questions was provided in letters dated February 24, 1989, March 20, 1989, April 16, 1989, May 2, 1989, June 4, 1989, July 3, 1990, July 9, 1990, July 12, 1990, July 23, 1990, September 6, 1990 and September 28, 1990. The preoperational EPS testing plan was submitted by letter of April 3, 1989. The safety analysis was submitted by letter dated June 4, 1990. In addition, by letter dated July 2, 1990, FPL requested amendments to the licenses of both Turkey Point Units to modify the Technical Specifications to accommodate changes to the plant made as the result of the EPS Enhancement Project.

The EPS Enhancement Project consists of realigning the existing two EDGs to serve Turkey Point Unit 3 and installing two additional new EDGs (with support systems) to serve Turkey Point Unit 4. In addition, it includes providing a new EDG building, diesel oil storage tanks and transfer pumps, new 4.16 kV switchgear, new 480V load centers, new 480V motor control centers, new 125V DC transfer/distribution panels, new load sequencers, breakers, battery chargers, a spare battery bank, plus lighting distribution panels, transformers, cabling and numerous components necessary for modifying the existing equipment.

After implementation of the EPS Enhancement Project, the AC electrical system will have been separated to the extent practicable. However, complete

electrical separation of the Turkey Point Units is not practical because some plant systems are shared (e.g., high head safety injection and DC electrical system).

The staff has reviewed FPL submittals and has prepared the following Safety Evaluation. The evaluation is divided into sections reflecting reviews by engineering discipline and/or system.

2.0 ELECTRIC POWER SYSTEMS

2.1 INTRODUCTION

Turkey Point units 3 and 4 presently have shared electrical power supplies between the two units. In particular, the two emergency diesel generators (EDGs), a 480V motor control center (MCC) 4D and two of the six battery chargers are shared by the two units. As a result, a problem with an EDG, a battery charger or the 480V MCC 4D impacts both units, complicating operations and possibly requiring the shutdown of both units. In addition, care must be exercised in the loading of the EDGs under certain accident conditions to prevent overloading them. This requires some manual loading and removal of non-essential loads to keep the loads within the EDG ratings.

To reduce the loading on the EDGs and to reduce the number of shared power supply sources, the licensee is proceeding with an Emergency Power System (EPS) Enhancement Project. The project includes a new emergency diesel generator building, two additional new EDGs with all support systems, new 4.16kV switchgear, new 480V load centers, new 480V MCCs, new 125V dc distribution panels, new battery chargers including two additional chargers and new load sequencers. In addition, a new additional battery bank to be used as a spare is being installed.

By letter dated June 23, 1988, the licensee described their EPS Enhancement Project. A supplemental letter dated October 19, 1988, described further the two new EDGs and the proposed qualification testing of them. Additional information in response to NRC staff questions was supplied by letters dated February 24, 1989, and March 20, 1989. The licensee's proposed preoperational testing plan was submitted by a letter dated April 3, 1989. Each of the above documents was revised and transmitted by letter dated June 4, 1990. A formal request for an amendment to the license was transmitted by letter dated July 2, 1990.

2.2 SYSTEM CHANGES

General Description

The existing 2500kW EDGs will be dedicated to Turkey Point unit 3. Two new 2874kW EDGs will be dedicated to unit 4.

For unit 4, a new 4160V swing bus 4D will be added. Similarly a new 4160V swing bus 3D will be provided for unit 3. Two new 480V load centers are being added, 3H for unit 3 and 4H for unit 4.

Three new 480V MCCs 4D, 4J and 4K are being added to unit 4 and one new 480V MCC 3K to unit 3.

The existing 125V dc distribution system consists of four 125V dc buses shared by both units. Each bus has one dedicated battery charger. Presently two battery chargers are shared, one between the 3A and 4B buses and the other between the 3B and 4A buses. Two new battery chargers are to be added and the existing six battery chargers replaced by new ones. Two battery chargers will be assigned to each of the four dc buses, such that each dc bus will have two dedicated chargers.

A new battery bank will be added along with associated cabling, switching and interlocks to permit the new battery to be temporarily substituted for any one of the four existing battery banks. This will permit testing of each battery bank (one at a time) without taking a dc bus out of service. A non-Class 1E battery charger will also be added to maintain a charge on the spare battery bank when it is in the standby alignment.

New load sequencers are provided for 4160V buses 3A, 3B, 4A and 4B to ensure timely automatic loading of essential loads for loss of offsite power supply (LOOP) and/or accident conditions.

General Evaluation

All safety-related electrical equipment and systems of the enhancement project are classified and qualified as 1E. The new EDG building and diesel oil storage building, containing the majority of the new enhancement equipment, is designed and constructed as a seismic Category I structure and is designed to withstand design basis natural phenomena including earthquake (maximum hypothetical earthquake of 0.15g), wind, tornado (including tornado-generated missiles) and flooding. The new equipment housed within this structure thus meets the current General Design Criterion (GDC) 2. New equipment located in the existing plant outside the new structures is also housed in seismic Class I structures and protected against the effects of natural phenomena, and as a minimum meets the criteria specified in the FSAR for compliance with GDC 2.

The new equipment installed in the new building is designed to accommodate the effects of the environmental conditions associated with normal operation, maintenance and testing. It is located in a mild environment and not subject to dynamic or postulated accidents such as pipe whip and jet impingement. Thus, the equipment meets the environmental criteria of GDC 4.

The new equipment located in the auxiliary building is designed, as a minimum, to meet the environmental conditions for the existing equipment located in the same locations, and is evaluated against the existing pipe break criteria in the FSAR. In addition, the location of the new equipment will consider the pipe break criteria presented in NUREG-0800[1], Appendix B, Branch Technical Position ASB 3-1.[6]

The new electrical equipment and cable additions will generally comply with the requirements of Regulatory Guide (RG) 1.6[3] for independence between redundant load groups. They will also meet the single failure criterion specified in RG 1.53.[13] Physical and electrical separation of equipment and cables will generally meet the requirements of RG 1.75[4] within the new EDG building, and in other parts of the plant where practical. Physical separation or protection of redundant electrical equipment to meet the criteria of RG 1.75 were not the

INSERT 1 - see next page

bases for the existing design. Thus, although the additions may not meet current standards throughout the plant, they do in most instances and represent a substantial improvement as compared to the initially licensed facility. Also, imposing current standards on new installation, and not on the existing installation, could result in inconsistencies among equipment or cabling with undesirable human factor implications. For example, the licensee does not intend to uniquely identify "associated" circuits as defined in RG 1.75. Also, although cables would be identified at each end, the licensee does not intend to identify installed cables at five foot intervals as specified in IEEE Standard 384.(5) We find this to be acceptable since such identification of only part of the circuits could mislead contractor or plant personnel working with those circuits that are not so identified.

In the new EDG Building,
Class 1E circuits will comply with the requirements of RG 1.75 such as derating, environmental qualification, flame retardance, splicing restrictions, seismic qualification and raceway fill. Non-Class 1E circuits will also comply with these requirements except that connected non-Class 1E loads will be seismically supported, but not seismically qualified. We find this to be acceptable since these loads will be electrically separated from the Class 1E systems, and physically supported such that their failure should not impact the Class 1E systems.

Replace with INSERT 2 - see next page

non-Class 1E

INSERT 3 - see next page

~~For~~ Class 1E control panels, boards and racks, and non-Class 1E equipment and circuits located within the same control panel, boards or racks are separated in accordance with the criteria of IEEE Standard 384. However, the licensee states that consistent with current plant criteria, wiring within enclosures associated with the dry contacts of relays and control switches for instrumentation and control are routed in the same wireways as the wiring associated with the redundant or non-Class 1E circuits. Once the cables exit the enclosure, control circuits to redundant equipment are routed in separate raceways. The NRC staff questioned the licensee as to what extent such non-separation of divisions would occur in the new switchgear building. The licensee responded that they did not expect it to occur except at the 4160V switchgear associated with the swing buses 3D and 4D. Since these buses can swing between Divisions A and B, it is necessary for both Division A and B control circuits to enter the breaker enclosures associated with swing buses. This will also occur at the 480V load centers 3H and 4H, which will be located in the electrical equipment room (formerly the hot machine shop).

We find the general design of the structures, systems and components of the enhancement project to be equivalent, as a minimum, to that of the existing plant and to meet the criteria of the FSAR. Further, the majority of the systems and components of the enhancement project lie within the new plant structures and generally meet the requirements of current standards, regulatory guides, and general design criteria. The changes and additions of the enhancement project improve safety and operating flexibility by increasing power supply capacity and redundancy. We therefore find the enhancement changes and additions to be acceptable. Specific systems and components are discussed further below.

INSERT 1

As a minimum, loads in the existing plant will be physically and electrically separated in accordance with the current FSAR criteria, i.e., circuits associated with redundant components will not be routed in the same raceway.

INSERT 2

meet the requirements of associated circuits with the exception of identification and seismic qualification, but are

INSERT 3

In the new EDG Building, considering associated circuits as discussed above,

Emergency Diesel Generators

Existing Emergency Diesel Generators

The existing 2500kW (2750kW short time rating) EDGs will be disconnected from the unit 4 buses and dedicated to Unit 3. The re-assignment of these EDGs to unit 3 service will require modifications to the present EDG control scheme to delete the unit 4 control features and to achieve a similarity in the operation between the unit 3 and unit 4 EDGs.

New Emergency Diesel Generators

The new EDGs will be connected to the unit 4 Division A and B 4160V buses using the circuit breakers that are presently used for connecting the existing EDGs to the unit 4 buses. The new EDGs are supplied by Morrison-Knudsen, Inc. Each set consists of a General Motors Electro-Motive Division Model 20-645F4B design, turbo-charged, two-cycle engine which is coupled to a Model #140 Electric Products generator. Each EDG has a continuous rating of 2874kW and a short time rating of 3162kW. The new EDGs are similar to the existing EDGs except for some minor design changes and a change in model number.

Operation at Idle Speed or Light Load

Operation of EDGs at light load for extended periods can result in an accumulation of lube oil in the exhaust system. As a result, the EDGs are designed with an idle start feature which allows the emergency signal to release the EDG to go from an idle speed of 440-560 rpm to rated speed of 900 rpm prior to accepting load. Also, if the engine has been running at light load for about 5 hours, or at idle speed for about 5 days, manufacturer recommendations specify operation at 40 percent load or greater for 30 minutes to clean out the exhaust stacks. In addition, during an extended idle period the air box drains are to be continually or periodically drained to remove oil accumulated in the engine air box.

New EDG Alarms

50

In addition to numerous local indications of EDG conditions, there are two annunciator windows in the control room that are alarmed for EDG conditions that could prevent an EDG from starting or that could indicate less than optimal conditions for the EDG. One of the annunciators would disclose when the master control switch is in the "off" or "local" position, either of which would prevent an automatic start of the EDG. The other annunciator is a common annunciator that would indicate any one or more of a number of abnormal conditions. To determine the specific condition, an operator could go to the local EDG panel, or in some instances could determine the condition based on indicating lights on the main control room panel. An unlit indicating light could indicate that the EDG is not available for an automatic start or that a condition exists that could prevent an EDG from functioning properly. Administrative procedures will ensure that these lights are on and the EDG is available for automatic start.

The following protective relays are provided for the new EDGs:

a. Generator Differential
b. Generator Overcurrent
c. Loss of excitation
d. Reverse Power
e. Underfrequency

All the above protective relays, except the generator differential, are bypassed under emergency operation. The only other signal that will trip the EDG during emergency operation is engine overspeed.

Evaluation

The two new EDGs make it possible to dedicate two EDGs to each unit. This provides additional emergency capacity and redundancy and therefore improves reliability and operational flexibility. The protective and alarm functions of the EDGs should limit degradation of the EDGs consistent with IEEE Standard 308.[9] Provisions for operation at idle speed and at light load will allow the EDGs to be running while disconnected from the grid such that a grid fault will not simultaneously impact both the offsite power source and the emergency backup source. The bypass of all protective relays during emergency operation except for overspeed and generator differential overcurrent should prevent these protective devices from interfering with the operation of the EDGs when they are most needed, consistent with Branch Technical Position (BTP) EICSB 17.[7]

New 4160V Swing Bus

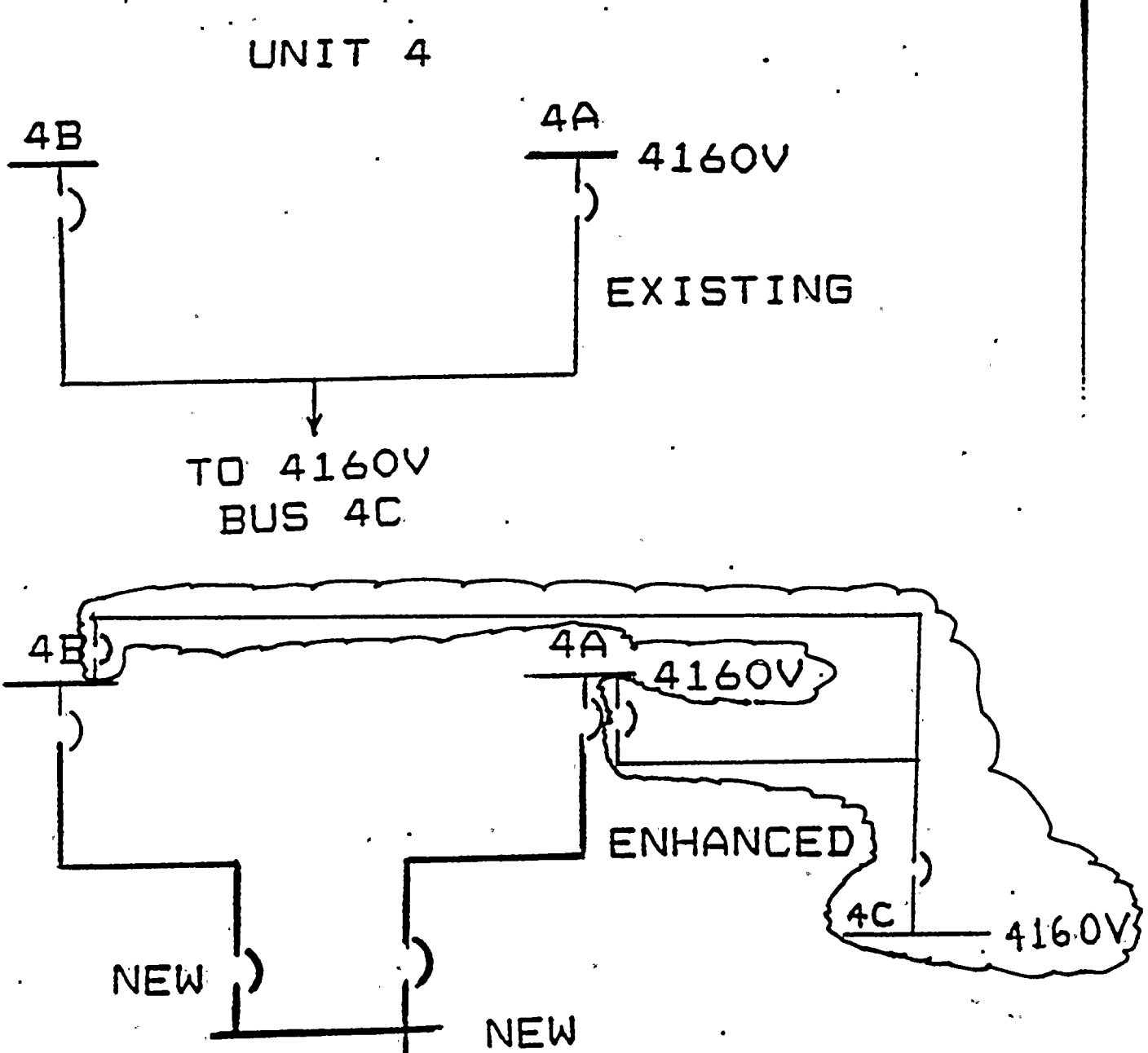
For unit 4, a new 4160V swing bus 4D will be connected to existing buses 4A and 4B. Similarly, a new 4160V swing bus 3D will be added to Unit 3 (see Figure 2-1). The swing buses power installed spare loads (i.e., component cooling water [CCW] or intake cooling water [ICW] pumps). ~~when they are required to replace a non-operable Division A or B component cooling water pump or intake cooling water pump.~~ The breaker cubicles in switchgear 3A/4A and 3B/4B previously supplying CCW 3C/4C and ICW 3C/4C pump motors will be reassigned as the power feeds to 4160V buses 3D/4D.

Each of the two tie lines to the 4160V swing buses have two breakers. Interlocks allow only one tie line to be closed at a time, thus maintaining separation between the two divisions. Both breakers of the alternate tie line are in the open position. Each breaker is provided with overcurrent protection and can be closed/tripped with a local control switch or from the control room.

For faults on the 4160V swing bus, a lockout relay will be activated by the overcurrent protection circuitry to prevent a fault on the swing bus from being transferred from one safety division to the other.

For a station blackout scenario, a new crosstie between buses 3D and 4D will be provided, including new tie breakers, one on bus 3D and one on bus 4D, to permit a manual crosstie between generating units 3 and 4. These tie breakers

FIGURE 2-1
4160V ADDITIONS



will normally be open. The control circuitry includes permissives and interlocks to prevent inadvertent closure of the crosstie breakers. When the required permissives are satisfied, administratively controlled key-lock operated control switches (one for each unit) in the control room will permit closure of the tie breakers. Breaker indicating lights are provided in the control room.

Evaluation

We find that the new 4160V swing buses contribute to improved safety by allowing transfer of safety equipment from an inoperable bus to an operable bus. Interlocks are provided to assure separation of the two Divisions A and B, and a breaker lock-out scheme is provided to prevent transferring a fault on the swing bus from one division to the other. The transfer is made manually and position indication is provided in the control room. These conditions are consistent with staff positions, in particular RG 1.6, and are therefore considered to be acceptable. Similarly, the use of two normally open administratively controlled crosstie breakers between units 3 and 4 is consistent with RG 1.155.(14)

New 480V Load Center Swing Buses

For unit 4, a new 480V load center swing Bus 4H powered by existing 480V load centers 4C or 4D is being added. Similarly for Unit 3, a new 480V load center swing Bus 3H powered by existing 480V load centers 3C or 3D is being added. Each of the two tie lines to the 480V swing buses have two breakers (See Figure 2-2). The breakers will have position indication in the main control room. Each swing load center can be aligned to either Train A or Train B of its associated unit. For each 480V load center, if the bus to which it is connected loses power, automatic circuit breaker operation connects the bus to the other power source if power is available there. The breakers have interlock logic to prevent simultaneous connection of the swing bus to Divisions A and B.

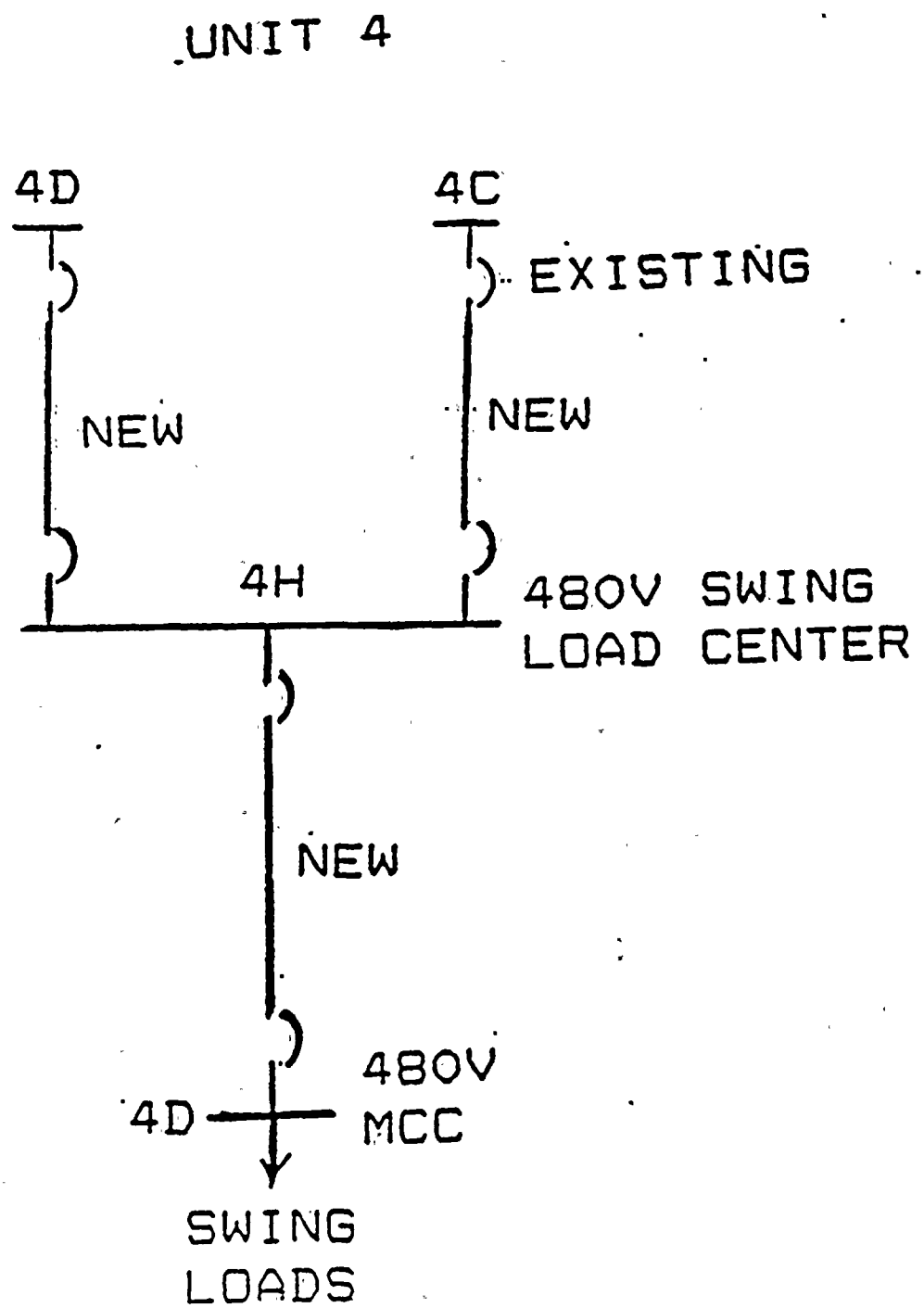
For faults on the 480V swing bus, ~~a lockout relay will be activated by~~ the overcurrent protection circuitry will prevent a fault on the swing bus from being transferred from one safety division to the other.

Evaluation

RG 1.6 discourages the automatic transfer of safety loads from one power source to another. It is preferred that there is sufficient redundancy in the loads that an automatic transfer is not required. However, such redundancy does not always exist at older plants. As compared to the existing situation at Turkey Point, the addition of the 480V swing bus improves reliability by quickly re-energizing needed safety loads upon loss of power from the primary source. The automatic transfer should occur rarely and the interlock arrangement will prevent the inadvertent connection of two 480V trains. We therefore find the 480V swing bus addition to be acceptable.

FIGURE 2-2

480V ADDITIONS



New 480V MCCs

For unit 4, three new 480V MCCs 4D, 4J and 4K will be powered respectively by a new 480V load center swing bus 4H and by existing 480V load center Buses 4A and 4D. For unit 3, a new 480V MCC 3K will be powered from existing load center 3D. Existing MCC D will be relabeled 3D and powered by a new 480V load center swing Bus 3H. New MCC 4J will power the new EDG 4A fans and auxiliaries, 4K the new EDG 4B fans and auxiliaries, and 4D the existing unit 4 swing loads (See Figure 2-2). New MCC 3K will power the EDG 3B auxiliaries which are presently powered by MCC 4B. Existing MCC 3A will continue to power the EDG 3A auxiliaries. The existing shared MCC 4D will be relabeled 3D, connected to the new swing load center 3H, and used to power existing unit 3 swing loads.

The circuit breakers at the 480V load centers supplying the 480V MCCs can be closed/opened with a pushbutton located at the load center or can be opened manually. Each breaker is provided with overcurrent protection. The circuit breakers at the 480V MCCs receiving power from the 480V load centers are maintained in the closed position and are opened only for maintenance purposes. Each breaker can be opened/closed at the MCC. The function of the new 480V breakers is the same as the existing breakers.

Evaluation

The additional MCCs allow a greater dispersion of loads among the MCCs such that the impact of the loss of an MCC or a load center bus has less impact. This improves safety and allows greater surveillance and maintenance flexibility. Separation between electrical divisions or trains is not compromised by the new MCCs. We therefore find them to be acceptable.

D.C. System

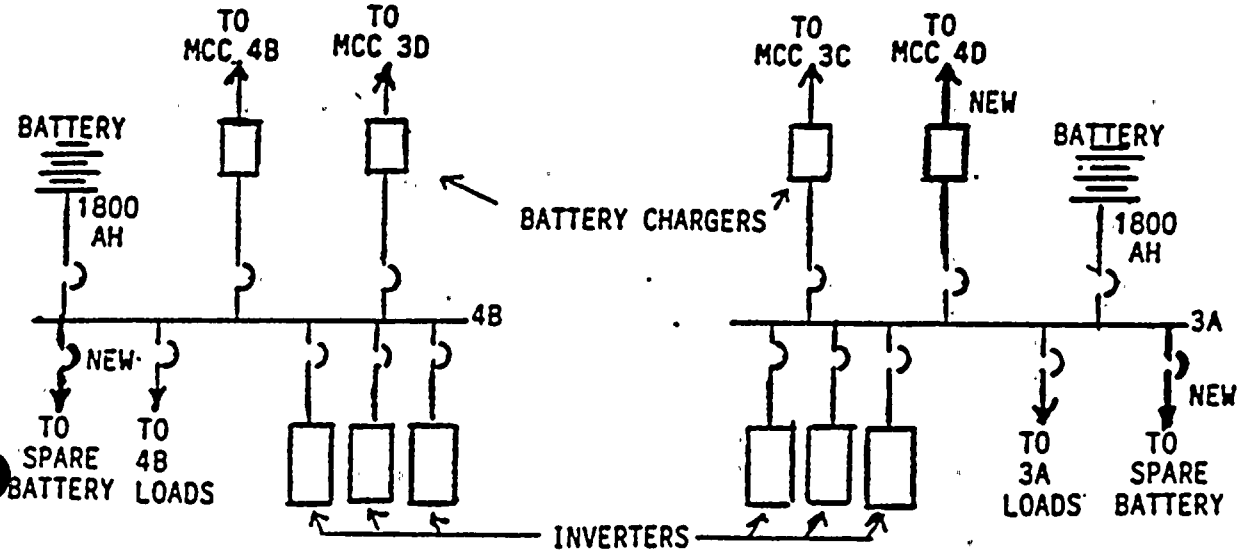
The present system has four 125V dc buses, which we here refer to as 3A, 3B, 4A and 4B. Although the four existing dc buses are shared by both units, most of the dc loads for a given unit and division are powered from its associated dc bus (i.e., Unit 3, Division A loads are powered from dc bus 3A, etc.). Buses 3A and 4B each have an 1800 ampere-hour battery and a 50kW static battery charger. Buses 3B and 4A each have a 1200 ampere-hour battery and a 37.5kW static battery charger. Each of these battery chargers is powered from a 480V MCC of its respective Unit and Division. ~~In addition, bus 3A has a 50kW battery charger and bus 4A has a 37.5kW battery charger powered from 480V MCC 4D. This MCC is presently common to both units and is supplied from a unit 3 or unit 4 (Division A) 480V load center.~~

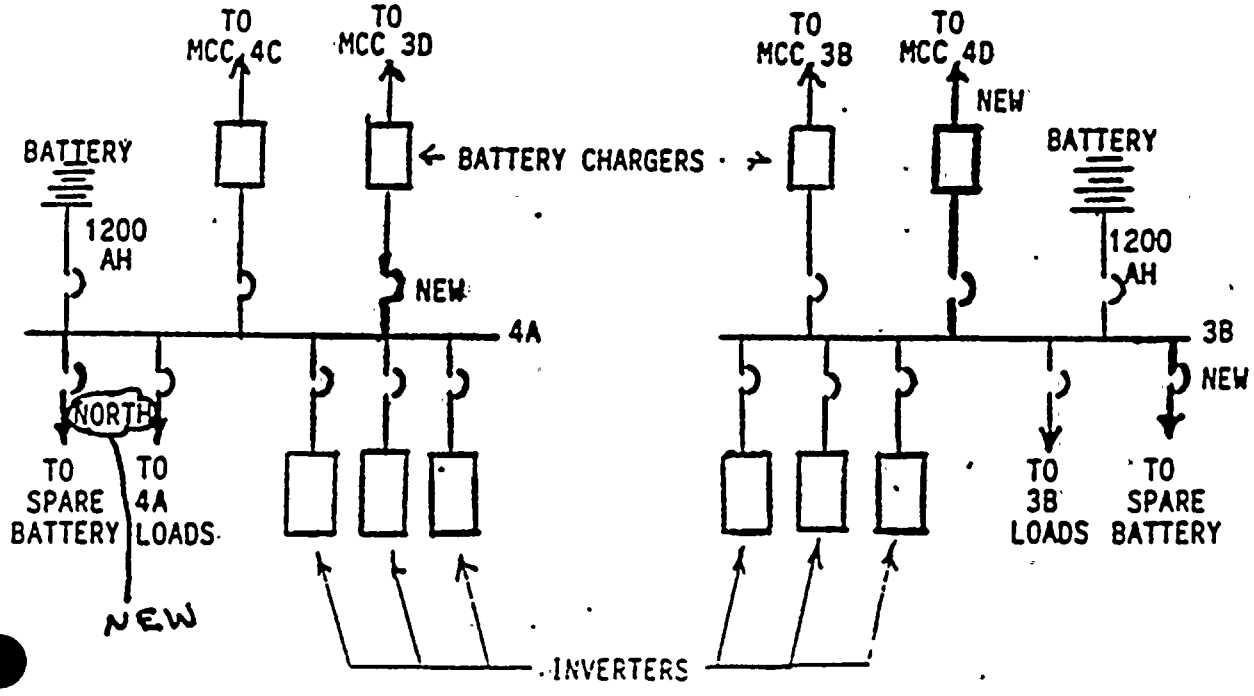
The existing six battery chargers are being replaced and two new battery chargers are being added such that each dc bus will have two full capacity chargers. One of the chargers on each dc bus will be powered from a motor control center from the same unit and division (i.e., the battery charger to dc bus 3A will be powered from a unit 3, Division A MCC, etc.). The second battery charger on each dc bus will be powered from the swing MCC from the other unit (i.e., the second battery charger to dc bus 3A will be powered from MCC 4D, etc.) After the system changes, each 125V dc bus will have two battery chargers; one supplied from each unit (See Figure 2-3).

In addition, buses 3A and 4B shared a swing 50 kW battery charger and buses 4A and 3B shared a swing 37.5 kW battery charger, both powered from 480V MCC D. This MCC is presently common to both units and is supplied from a Unit 3 division B and a Unit 4 division A 480V load center.

FIGURE 2-3

125 DC BUSES





Presently, 125V dc buses 3A and 4B have a normally open tie between them which may be temporarily closed when testing either battery*. A new Class 1E spare battery will be added with provisions for connecting to each 125V dc bus. Non-automatic circuit breakers with kirk key locks will prevent the spare battery from being connected to more than one 125V dc bus at a time (see Figure 2-4). The spare battery will be used to power a 125V dc bus while the normal dedicated battery is being tested and recharged (e.g., for the performance discharge or battery capacity tests). The spare battery will first be paralleled with the normal battery using the key-locked breaker. Then, the normal battery will be disconnected from the 125V Class 1E bus and connected to the test load (see Figure 2-4).

The spare battery charger is non-Class 1E. However, it will only be used to maintain the charge on the spare battery or to recharge one of the normal station batteries after a discharge test. During these times the battery being charged would not be connected to the Class 1E 125V dc bus, nor would the 125V dc bus depend on the battery that is being charged.

The licensee has indicated that the cables from the 125V Class 1E buses to the spare battery bus are relatively long (adding approximately 100 feet for the worst case). This will expose the Class 1E 125V dc bus to possible additional cable faults when a breaker feeding the cable from the Class 1E 125V dc bus is closed. Although the cable meets Class 1E requirements and is protected within conduits or cable trays within the building structures, the staff believes that provisions should be implemented to maintain the breakers in the open position during normal conditions and to limit the time that the spare battery is connected to a 125V Class 1E bus. The licensee has indicated that the breakers to the spare battery will normally be open and controlled by administrative procedures, and that the spare battery would only be used during times when a normal battery is not available, e.g., when one is being tested and re-charged following a capacity or performance discharge test.

Battery Chargers

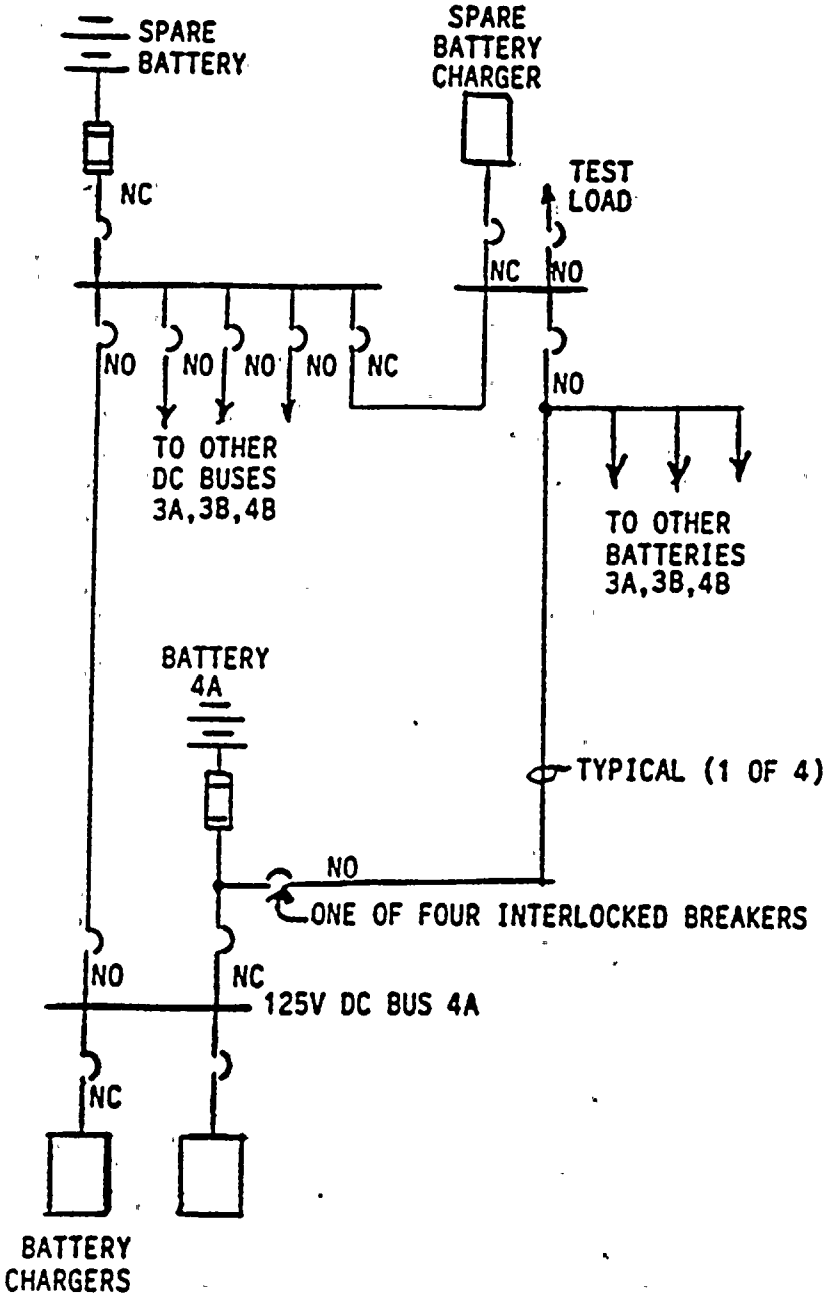
Two new battery chargers will be added and the six existing chargers replaced. Six of the chargers will use existing circuit breakers. Each battery charger is equipped with an automatic load limiting feature which prevents the output from exceeding 115% of rated output amperes. An alarm is provided whenever the charger goes into a current limiting condition. In event of failure of the load limiting feature, backup protection will trip the charger off line and provide annunciation of this condition.

The dc system is protected against overvoltage from the new battery charger by an overvoltage relay connected internally across the output terminals. Actuation of the relay will trip the charger off the line and provide an alarm.

*However, current practice is to connect 125V dc Bus 3A or Bus 4B to the existing C-bus batteries, and not to each other, whenever battery testing is required.

FIGURE 2-4

SPARE BATTERY CONNECTIONS



Battery Loads

The system enhancement will increase the loading on the 125V dc batteries. Battery sizing calculations have been revised to show that the batteries are adequate for the worst accident loading condition.

Evaluation

Sharing of the dc system between units is not consistent with RG 1.81[15]. However, the licensing of Turkey Point preceded RG 1.81. The addition of the two battery chargers, the replacement of the existing six battery chargers, and the reconnection of two battery chargers so that each dc bus has a battery charger from each unit should improve the reliability and increase the operating flexibility of the present dc system. The existing batteries have been shown to be adequate for an accident on one unit and shutdown of the other unit, for a worst case single failure. We therefore find the proposed changes to the 125V dc system to be acceptable.

Control Room and Other Plant

The enhancement project involves the relocation of several loads to different buses, as well as the installation of the cables and circuits for the new EDGs, battery chargers, switchgear, etc. Therefore, there will be new safety instrumentation and controls installed in the control room, and cabling will be routed through other parts of the plant.

Control Room

Each of the existing Control Consoles 3C02 and 4C02 have control/indication for both EDG A and EDG B. Console 3C02 will be relabeled for EDG 3A and EDG 3B. Control Console 4C02 will be relabeled and rewired for new EDG 4A and EDG 4B. All new safety instrumentation and controls installed in the control room for the enhancement project will be qualified 1E, and control room modifications will comply with NUREG-0700, "Guidelines For Control Room Design Review."[2] The control room modifications will be performed during a dual outage to avoid operational transients which might otherwise occur.

Other Plant

The licensee states that the enhancement project will affect virtually all power block areas within the existing plant with the exception of the reactor buildings. Interconnecting raceway containing safety-related power, control, indication and alarm circuits will be routed between areas through the existing plant. Circuits to redundant equipment within the existing plant are routed in separately located raceway in accordance with the updated FSAR Amendment 6, to provide divisional separation/isolation and to ensure that any physical damage affecting one circuit will not affect its duplicate.

Evaluation

The control room instrumentation and controls are classified and qualified as 1E, and the modification will comply with NUREG-0700. Cables and circuits routed through the existing plant will provide divisional/isolation in accordance with the plant FSAR. Although the separation criteria do not meet all present day criteria such as RG 1.75 in all cases, the existing plant criteria are maintained or exceeded. We therefore conclude that the enhancement changes will result in an increase in overall plant safety and are therefore acceptable.

2.3 EMERGENCY LOADING OF EDGS

Automatic startup and loading of the EDGs consist essentially of five steps:

1. Detection of loss of preferred power supply
2. Clearing of (opening of breakers to) emergency buses
3. Disconnection of non-safety loads from the buses used for the emergency power application
4. Startup of the EDGs
5. Loading of the EDGs

Loss Of Preferred Power Supply

The existing scheme of loss-of-power detection is used. Each 4160V bus has voltage monitoring relays that monitor phase-to-phase voltage at the buses. When there is a loss of voltage at a 4160V bus, the relays will initiate the undervoltage actuation system. This initiates the bus stripping function of relays which opens all bus supply and feeder breakers, energizes the bus isolation relays, and starts the associated EDG. The 4160V swing bus (for each unit) is considered as an extension to the bus to which it is connected in the bus tripping logic used for loss of normal power supply.

In the emergency mode of operation, the EDG achieves operating speed and voltage within 15 seconds, and the trip functions of all protective devices, with the exception of the overspeed and generator differential relays, are bypassed. When the frequency and voltage of the EDG reach acceptable limits and the associated bus clear signal is present, the EDG breaker is automatically closed to the dead bus. The automatic load sequencer starts and begins to sequentially close the breakers to the equipment required for safe shutdown of the plant 15.5 seconds after the loss of voltage, provided the EDG breaker is closed.

Accident Loading
Accident Loading Following Loss Of Preferred Power

If a safety injection signal (SIS) occurs following loss of preferred power, actuation of the SIS resets the timing contacts of the sequencer to the zero time condition and sheds all loads from the EDG while keeping the EDG breaker closed. The sequencer, operating in the LOCA/LOOP mode, sequences on the loads needed to

, although it is not a design basis or a licensing requirement,

mitigate the accident. For loss of normal power supply on both units, and a SIS on unit 3, the licensee presented a load analysis showing the loading on each EDG, assuming failure of the other divisional EDG. That is, the loading shown on EDG 3A assumes failure of EDG 3B; and the loading shown on EDG 3B assumes failure of EDG 3A. Similarly, the loading shown on EDG 4A assumes failure of EDG 4B, and the loading shown on EDG 4B assumes failure of EDG 4A. Thus the values shown assume a simultaneous failure of a unit 3 and unit 4 EDG. The resultant loadings are as follows:

	EDG 3A	EDG 3B	EDG 4A	EDG 4B
Automatic Loads	2029kW	2059kW	1413kW	1710kW
Manual Loads	175	100	1005	850
Total	2204kW	2159kW	2410kW	2255kW

For loss of preferred power supply on both units and a SIS on unit 4, the maximum loading was calculated as follows:

EDG 3A	EDG 3B	EDG 4A	EDG 4B
2314kW	2204kW	2260kW	2185kW

The loadings are well within the 2500kW continuous rating of the EDGs 3A and 3B, and the 2874kW continuous rating of EDGs 4A and 4B.

Accident Loading Without Loss Of Preferred Power

For an SIS on either unit, without loss of preferred power supply, the associated unit load sequencer automatically starts equipment required for mitigation of the accident in a predetermined sequential order. All EDGs (both units) are started automatically in the emergency mode and remain in the emergency mode until they obtain normal operating speed. They continue to operate unloaded and disconnected from the bus. If a loss of preferred power then occurs, the sequence of events described above under "Loss of Preferred Power Supply" occurs, except that the EDG(s) are already at operating speed.

Manual Loading Of The EDG

In the normal (test) mode, the diesel is started manually, either from the local panel or main control board by operating the normal (idle) start/stop selector switch or the rapid start pushbutton or the emergency start/stop selector switches. During the normal start-up period the diesel operates at a predetermined idle speed (450 rpm) to allow an orderly warm up. After warm up, the diesel accelerates to rated speed (900 rpm). A bus undervoltage signal or SIS will take precedence over the manual mode of operation as long as the key-operated auto start bypass switch has not been activated at the local control panel with the master switch in the "local" position. After the EDG obtains normal speed, it can be manually synchronized and connected to the bus. It can then be manually loaded while operating in parallel with the normal power supply. For manual shutdown, the load on the EDG is reduced to a preset minimum and the breaker opened via the control switch. This initiates a normal shutdown. For a normal shutdown,

the EDG will continue to operate for a period of time at a predetermined idle speed to allow the heat to dissipate in an orderly manner.

A fast stop of the EDG can be initiated by depressing the "emergency stop" push-button and is effective at all times. The ~~stop or fast stop~~ signals are not effective when the EDG is in its emergency mode of operation. A rapid start function is provided for a fast start test of the diesel. The period of engine warmup, at idle speed, is eliminated. However, all machine electrical and mechanical protective features are enforced in contrast to an emergency start where only the overspeed and generator differential protection features are present.

Evaluation

GDC 17 requires that provisions shall be included to minimize the probability of losing electric power from any of the remaining supplies as a result of, or coincident with, the loss of power generated by the nuclear unit, the loss of power from the transmission network, or the loss of power from the onsite electric power supplies. We find the planned method of EDG starting and loading for such events to be consistent with GDC 17. The continuous rating of each EDG exceeds by a substantial margin the largest emergency load projected on ~~the~~ any EDG for an emergency condition consisting of a loss of the preferred power supply, a safety injection signal on one unit, a shutdown requirement on the other unit, and a loss of one EDG on ~~each~~ either unit. We find this to be consistent with GDC-17.

Generic Letter (GL) 84-15[8] describes staff guidelines for improving EDG reliability by reducing the number of fast starts. The licensee's method of manual starting, loading, and shutdown of the EDGs is consistent with GL 84-15. Branch Technical Position (BTP) EICSB 17 states that the design of standby diesel generator systems should retain only the overspeed and generator differential trips, with other trips bypassed under accident conditions. The EDG design is consistent with BTP EICSB 17.

2.4 EDG AUXILIARY SYSTEMS

The Division A EDG auxiliaries receive their power supply from Division A MCCs, and the Division B EDGs receive their power supply from Division B MCCs. This prevents the loss of power in one load group from causing loss of equipment function in another load group, consistent with IEEE Standard 308.[9] The auxiliary systems for the new EDGs have pressure, differential pressure, temperature and other instrumentation as required for indication, control and alarms for all modes of operation. Abnormal conditions are alarmed locally and in the main control room by common annunciator "Diesel Generator 4A Trouble" for EDG 4A and "Diesel Generator 4B Trouble" for EDG 4B. Required operator action following alarm indication will be specified in off-normal operating procedures. These actions will be consistent with manufacturers's guidelines. System components will be tested by the manufacturer, and after installation before plant startup. Testing will be performed to verify operability per Technical Specification requirements and in accordance with manufacturer recommendations and applicable codes and standards.

Diesel Oil Storage And Transfer System

For each new EDG, there is a new diesel oil storage tank and transfer system consisting of a new diesel oil storage tank, a transfer pump, a day tank, piping, valves, instrumentation and control.

Diesel Oil Storage Tank

Each storage tank has a capacity of 42,000 gallons, and the Technical Specification requirement of 34,700 gallons is sufficient to operate the EDG for 7 days at continuous loading. The storage tanks, together also have the capability of receiving a diesel oil load of 8,000 gallons from a transport vehicle while the tank inventory is maintained above that required by Technical Specifications. The two tanks are connected via a cross-connected line which can be used to move fuel from one tank to the other if necessary. The storage tanks are made of steel-lined concrete, fabricated in accordance with the requirements of ASME Code Section VIII and meet seismic Category I requirements. The tanks are enclosed in a seismic Category I building designed with missile protection capability. The building is also designed to retain the entire contents of a tank failure.

The licensee has considered and discussed provisions to prevent and actions to overcome such possibilities as damage to the storage tank fill or vent lines due to tornado missiles, growth of algae in the storage tank, corrosion in the piping and tank, protection of the fuel oil system from ignition sources, and the need for replenishment of fuel oil for a prolonged period of EDG operation.

Diesel Oil Transfer Pumps

Each diesel oil transfer pump has enough capacity to supply the diesel oil for two EDGs at continuous load rating. Each pump is powered from its associated EDG. It starts and stops automatically on low and high level signals from its associated day tank. The transfer pump is designed to meet the requirements of ASME Code Section III for Class 3 components and meets seismic Category I. The new (for Unit 4) and the existing (for Unit 3) discharge lines are interconnected for added flexibility.

Piping And Valves

The system piping external to the engine skid is designed to meet the ASME Code Section III for Class 3 components and seismic Category I requirements. The engine mounted piping, as a minimum, is designed to meet the stresses specified by ANSI B31.1 Power Piping and to accommodate the mechanical, pressure, thermal and seismic loads.

Fuel Oil Day Tank

The day tank has enough fuel to support about 3 hours of EDG operation. The tank has fuel oil transfer pump auto-start and auto-stop levels, a low level alarm, a 1-hour alarm and a high level alarm. The tank is located to take

into consideration fire safety, required maintenance, fuel oil head pressure, seismic loadings, tornado missiles, and possible sabotage.

Diesel Engine Starting System

Each EDG will have two redundant starting systems consisting of two air compressors (one diesel and one motor driven), four air receivers, four air start motors, piping, valves and instrumentation. Two air receivers and two air motors form one of two redundant sets of 100% capacity cranking for the diesel engine. The air receivers have capacity for cranking the cold diesel engine five times without the need for recharging. A deliquescent-type air dryer will be installed between the air compressors and the air receivers.

Diesel Engine Cooling Water System

Two engine-driven centrifugal pumps circulate water through a closed loop system including a radiator, expansion tank and electric motor-driven cooling fans. An electric immersion heater controlled by temperature switches is provided for recirculating hot water, by convection, through the oil cooler for standby heating.

The cooling system is designed to maintain a top tank temperature of 190°F at 110% rated load with radiator cooling air at 122°F. A piping connection failure could result in loss of cooling system fluid and eventually force the affected EDG out of service. However, this is unlikely to happen because the system normally operates at relatively low pressure and temperature (less than 30 psig and 190°F) and is designed for all normal and postulated loads including thermal and seismic conditions. Also, should such a failure happen, alarms and indication would normally alert operators so that appropriate action could be taken.

During non-emergency operation, automatic shutdown of the diesel would occur before temperature became excessive.

The licensee has considered and discussed provisions to prevent and actions to overcome such possibilities as long-term corrosion or organic fouling, and adequate cooling system water inventory. An expansion tank is provided for water expansion during temperature change. An air venting system is provided to insure that air is not entrapped in the radiator or water lines.

Diesel Engine Lubrication System

The engine lubrication system consists of three subsystems: the scavenging oil system, the main lubricating system and the piston cooling system. Each subsystem has its own positive displacement pump driven from the accessories gear train at the front of the engine.

In addition to the three lube oil systems, electric motor-driven external lube oil pumps run continuously to supply oil to the turbocharger bearings for proper lubrication during emergency starts and coasting down.

Evaluation

The diesel generator auxiliary systems are powered by MCCs within the same division as the diesel generator, thus maintaining divisional separation. The diesel oil storage and transfer system has sufficient capacity to supply the diesel for 7 days and provision for adding fuel to the tank if required. This assures adequate fuel availability for extended periods. The 7-day storage provision is consistent with RG 1.108. Each transfer pump has sufficient capacity to supply two diesels, thus providing adequate supply to the day tanks with one transfer pump inoperable. There is 100% redundancy in the air starting system and com-pressed air for five starting attempts. This provides adequate starting capacity. ~~There is redundancy in the cooling fans and the circulating water pumps of the engine cooling system.~~ External lube oil pumps continuously supply lube oil to the turbocharger bearings and engine oil is kept warm during standby conditions thus reducing wear, consistent with Generic Letter 84-15, for fast emergency or surveillance starts. Surveillance instrumentation for indication, control and alarm is provided to monitor, control, and maintain the auxiliary systems con-sistent with IEEE Standard 387-1977.[12] We conclude that the design features of the auxiliary systems are of the type that provide for adequate and reliable operation consistent with GDC-17.

2.5 QUALIFICATION OF EDGS

Requirements

RG 1.9[11] endorses, with minor exceptions, IEEE Standard 387-1977 for qualification testing of EDGs. IEEE Standard 387-1977 specifies a 300 valid start and load test as an ac-ceptable method of qualification. IEEE Standard 387-1977 also states that other methods with proper justification may be found equivalent for demonstrating an acceptable level of reliability. It is noted that the qualification testing is aimed at proving initial reliability, and not the effect of aging. IEEE Standard 387-1977 states that the effect of aging may be established by previous operating experience and a program of preventive maintenance, inspection and replacement to be conducted throughout the operating life of the plant.

Qualification Tests For New EDGs

The licensee proposed a 30 valid start and load test rather than a 300 start and load test. The justification for this is that the new EDGs are similar, and better, than other EDGs that have undergone the 300 start and load test. The existing EDGs at Turkey Point are 20 cylinder, 645 cubic inches per cylinder, 900 rpm General Motors Model EMD-20-645E4. General Motors has phased out the Model 645E4 and replaced it with the current Model 645F4B. The current model has a higher rated brake horsepower (BHP), higher break mean effective pressure (BMEP) and a higher compression ratio as follows:

	900 RPM	
	EMD-645E4	EMD-645F4B
BHP	3600	4000
BMEP	123	136
Compression Ratio	14.5:1	16:1

In addition, the later model has improvements in the materials used and has a 12 row turbocharger aftercooler as compared to the 10 rows used in the previous model.

Because of the higher stresses encountered in the "F" series as compared to the "E" series, the NRC staff made a visit to the vendor's facility in LaGrange, Illinois to see the vendor's construction and testing facilities and to obtain information pertaining to the stress analysis and results. The staff concluded that the stress margins were conservative.

In addition to the 30 start and load qualification test in accordance with IEEE Standard 387-1984 (equivalent to IEEE Standard 387-1977), the following tests will be performed:

1. Load Capability Test in accordance with Paragraph 7.2.1 of IEEE 387-1984 (equivalent to Paragraph 6.3.1 of IEEE 387-1977).

2. Two 10% Margin Tests in accordance with Paragraph 7.2.3 of IEEE 387-1984 (equivalent to Paragraph 6.3.3 of IEEE 387-1977).

3. Onsite preoperational tests consisting of 69 in-situ start and load tests in accordance with Paragraph C.2.a(9) of RG 1.108.

Evaluation

A letter dated August 10, 1989 (G. E. Edison to J. Goldberg), stated that the staff had reviewed the 30 start and load qualification test and found it to be acceptable.

The load capability, 10% margin, and preoperational tests are in accordance with the applicable standards[12] and regulatory guides.[10] We therefore find them to be acceptable.

2.6 TESTING OF SYSTEM ADDITIONS AND CHANGES

By submittal dated April 3, 1989, the licensee described their proposed testing plan for the enhancement project. The initial submittal was updated by Revision 1 submitted on June 4, 1990. The test plan would consist primarily of three stages. The first stage would be the inspection and testing of the individual components and subsystems. The second stage would be the onsite testing of EDGs for various system conditions. The third stage would be the integrated testing of the systems to assure the adequacy, redundancy and independence of load groups.

Inspection and Testing of Individual Components and Subsystems

EDG Components and Subsystems

The new EDG components will be visually checked and functionally tested individually, including the pumps, motors, fans, compressors, valves, and instrumentation associated with the fuel oil transfer system, the cooling water system, the air starting system, the lube oil system and the ventilation systems.

The lube oil and prelube system will be tested first using each of the four motor-driven pumps without running the EDG and then again using the shaft-driven pumps while the EDG is running. Without running the EDG, the EDG is simulated in the local control panel so that all EDG start and trip functions can be tested. Emergency start signals will be tested for various plant conditions, with each combination of normal/isolate, local/remote switch positions, and auto-start bypass switch positions. The temperature switches, level switches, and pressure switches will be checked for functionality. Each alarm point will be actuated and verified to annunciate at the local control panel. The EDG emergency stops/trips will be tested including overspeed, generator differential on each phase, and the emergency stop pushbutton.

Other Electrical Components and Systems

The circuit breakers for the new ac switchgear will be locally and remotely tested for closing and tripping with the circuit breakers racked in or racked out in test. The proper operation of the interlocks, annunciators and indicators will be checked. The bus voltage monitoring equipment and bus undervoltage detection circuitry will be tested. The molded case circuit breakers at the new 480V MCCs will be checked for functionality. The new battery chargers will be tested to ensure proper operation.

The new emergency bus loading sequencers will be both automatically and manually tested using test selector switches to demonstrate proper function. All output/blocking and lockout relay signals will be monitored to demonstrate correct operation. Time delays will be verified by recording output signals including signal duration.

EDG Onsite Testing

Each new EDG will be tested locally and again from the control room.

Local Tests

With the master control switch set to local, the following tests will be conducted.

Air Start System

The capability of the air system to start the EDG on the fifth try after four unsuccessful starts will be verified. For this test, with the air compressor control switches to "off" and the four air receivers bled down to where the low pressure alarm actuates, the EDG will be subjected to four unsuccessful start attempts and then be rapidly started on the fifth attempt.

Hot Overspeed Trip

Temperatures are allowed to stabilize to hot engine conditions with the EDG loaded to greater than 50% load. Then, the hot engine overspeed trip setpoint is verified.

EDG Reliability Test

Each EDG is subjected to at least 35 consecutive valid tests without failure in accordance with R.G. 1.108[10] position C.2.(a)(9). The EDG is started, synchronized to the grid and loaded to greater than 50% load for at least 1 hour. Each start must come to the required frequency and voltage within specified limits and times.

Normal Start And Load Test

Each EDG is subjected to a normal start test (60-second idle start period) and then auto-released to allow the EDG to accelerate to 900 rpm. Speed and voltage values are verified to within specified limits. After synchronization to the grid, the EDG is slowly loaded to 100% and the engine parameters allowed to stabilize.

Full Load Rejection Test

After stabilizing at 100% load, the EDG output breaker is opened. The EDG must not trip on overspeed and frequency and voltage transients must not exceed specified limits.

Twenty-four Hour Run

The EDG is normally started, synchronized to the grid and slowly loaded to 110% load. After 2 hours at 110% load, the load is reduced to 100% load and operated for 22 additional hours. A complete set of data is taken after the third hour and every hour thereafter. After 24 hours, the load is gradually reduced and the EDG placed in normal shutdown. This test also verifies that the cooling system functions within acceptable limits.

Tests From Main Control Room

The EDG will be tested similarly to the local tests except from the main control room.

Tests Similar to Local Tests

The following tests will be made from the control room. These tests are similar to the local tests discussed above.

- Emergency Start, Bypass of Non-Vital Trips
- Idle Start With Normal Shutdown
- Rapid Start With Normal Shutdown
- Emergency Stop

Other Tests

A test will be made to verify that the control room EDG controls are disabled when the master control switch is in the "local" position and the two isolation switches on the local EDG panel are in the "isolate" position. The control room alarms will also be verified.

With the master control switch in the "local" position, and the keylocked "auto-start" bypass switch in bypass, it is verified that the control room EDG starts are disabled, including all emergency auto-start signals. The EDG control room alarms are also verified.

Evaluation

The initial inspection and testing of the components and equipment associated with the enhancement project includes tests to confirm circuit continuity, absence of improper grounds and proper functioning of equipment, including EDG components and subsystems, battery chargers, load sequencers, circuit breakers, indication, alarms, controls and interlocks. These tests will disclose most of the problems with individual components or subsystems prior to more extensive integrated system testing. Also, in some cases, the integrated system testing may not disclose all the problems with individual components. We therefore find the initial inspection and testing of the individual components and subsystems to be desirable and consistent with staff positions pertaining to safety system quality and reliability.

EDG Integrated Testing

The high head safety injection (HHSI) pumps at Turkey Point are shared by the two units. To meet the single failure criterion for an SIS, one of the EDGs of the opposite unit and an associated HHSI pump must be operable.

Several integrated tests will be made to assure proper sequencing of the EDGs and loads for various combinations of loss of offsite power (LOOP) and/or a loss of coolant accident (LOCA) requiring a safety injection.

Loss of Offsite Power (LOOP)

A LOOP will be simulated for each unit. These tests will demonstrate the required opening of the bus feeder breakers, bus stripping of all loads, clearing of all loads and feeds, start-up of the associated EDGs, EDG breaker closure and sequential loading of the buses. The complete event sequence will be recorded for later data processing and analysis.

LOOP Then LOCA

Tests will be conducted to demonstrate proper sequence of events for a LOOP followed by LOCA on each unit. These tests will demonstrate the sequence of events discussed above for LOOP only. Then, the SIS would result in stripping of the loads and the sequential starting of the safety loads.

LOCA With EDG In Parallel With Offsite Source

This test will simulate a condition after a LOOP has cleared and the EDG has synchronized to the offsite source such that the EDG will be in parallel with the offsite source when the LOCA signal is simulated. The test data will confirm the immediate tripping of the EDG breaker with the machine continuing to run at rated speed.

LOCA

Tests will be conducted for a LOCA on each unit with offsite power available. These tests should demonstrate the starting of all four EDGs, breaker closure for all four HHSI pumps, and the sequencing on of the additional required safety loads by the sequencers of the affected unit.

LOCA Then LOOP

A LOOP is simulated following the LOCA and the associated loading of the buses. Loads are stripped, the EDG breakers closed and the loads re-sequenced onto the buses.

Bus LOOP, LOCA and Hi-Hi Containment Pressure (HHCP)

Each EDG is auto-started by individual bus LOOP with simultaneous LOCA and HHCP (associated train) signals. ~~The containment spray pump sequencer loading relay re-actuates after the sequencer completes its timing.~~

LOOP Plus Other Unit LOCA

A LOOP is imposed on one unit and a simultaneous LOCA on the other unit. For the unit with the LOCA, the load sequencing begins immediately whereas for the unit with the LOOP, the load sequencing is delayed until the EDGs are connected to the buses.

Bus Independence

Safety-related ac buses will be tested in various combinations to show that each bus is independent of every other safety-related ac bus, considering swing loads where applicable. This will be accomplished by making each EDG inoperable, and then conducting tests on the other buses to assure that no redundant loads or power supplies are impacted by the inoperable bus. For example, each EDG's associated dc power ~~supply bus~~ will be made inoperable and the other EDGs then verified to auto-start on LOOP.

Other EDG Tests

Other EDG tests will be conducted to demonstrate that the EDGs can:

a. Reject the largest load and restart it while maintaining specified voltage and frequency limits,

A LOOP is imposed on one unit following a LOCA on the other unit and the associated loading of the HHSI pumps. Loads are stripped, the EDG breakers closed and LOOP loads plus the HHSI pumps re-sequenced onto the buses.

b. Synchronize to the grid, transfer its emergency loads to the grid, and be returned to a standby condition.

c. Respond to the design accident load while the EDG is at full load temperature.

EDG Testing Criteria

The licensee indicates that the testing discussed above will meet the redundancy, independence and capability requirements of IEEE 387-1984 and RGs 1.6, 1.9, and 1.108. Also, EDG voltages and frequencies for the various EDG starting and loading conditions will fall within the limits specified by these guides and standards.

Evaluation

Regulatory Guides 1.6, 1.9 and 1.108; and IEEE Standard 387-1984 specify extensive testing of EDGs to demonstrate that they can automatically and rapidly start, accept all required safety loads and run for extended periods while maintaining acceptable voltage, frequency and temperature conditions. To meet the guidance of the regulatory guides and the IEEE Standard, the EDGs should: (1) be highly reliable, (2) be able to automatically and rapidly start and/or load from any credible initial condition, whether cold or hot, with or without a LOOP, with or without a LOCA, and with both a LOOP and LOCA, (3) accept or reject the largest safety load while maintaining acceptable voltage and frequency limits, (4) be capable of being controlled locally or from the main control room, (5) be able to start and operate simultaneously or independently of each other, and (6) be able to automatically synchronize, transfer load to the grid, and/or come off the grid. In addition, they should have the capability of being started and loaded slowly. During emergency operation, the normal trips should be bypassed.

Our review of the licensee's proposed testing plan indicates that it is sufficiently comprehensive to test the above features in accordance with the guidance, and should disclose any significant shortcomings of the EDG systems, including the control, indication or alarm systems. We therefore find the proposed testing plan to be acceptable.

Other Independence Testing

In addition to the independence testing of the EDGs, the onsite electric power system will be functionally tested to assure independence among load groups.

Method of Testing

Various possible combinations of power sources and load groups will be tested ~~with all dc and onsite ac power sources~~ ac for one load group at a time completely disconnected. Prior to the test(s), the onsite system will be separated from the offsite system by direct actuation of the undervoltage-sensing relays. Each test will include the injection of simulated accident signal, startup of the onsite power source(s) and load group(s) under test, sequencing of the loads, and functional performance of the loads. During each test, the dc and onsite fully powered from its associated EDG. The remaining three ac trains will be

ac buses and related loads not under test will be monitored to verify absence of voltage at these buses and loads.

Evaluation

The proposed method of testing for independence between load groups conforms to RG 1.41[16] and will disclose any errors in design or installation that could defeat the electrical independence between load groups. We therefore find the proposed testing plan to be acceptable.

2.7 SUMMARY AND CONCLUSION

The present Turkey Point Units 3 and 4 have shared EDGs as well as other shared systems and equipment. To improve onsite capability, reliability and operating flexibility, the licensee is adding two new EDGs in a new building and other systems and equipment including new load sequencers, battery chargers, 4160V swing buses, 480V load control swing buses, and 480V MCCs.

We have reviewed the proposed design and proposed testing of the new equipment and systems against NRC general design criteria, regulatory guides and other standards. The design of the present plant preceded many of the present-day standards and does not meet these standards in all respects. It would not be practical for all the new electric power sources and associated cabling that is located in the existing plant to fully conform to present day standards. Full compliance would require extensive redesign and rework of numerous existing structures including ductbanks, raceways and electrical enclosures throughout the plant. Also, in the interest of maintaining consistency between the present and the new equipment and facilities, deviations from current standards exist in some instances even in the new building. However, in all instances the standards of the Turkey Point FSAR are met, and in most instances the current NRC standards are met.

Our review of the new equipment and facilities indicates that the current NRC standards are met to the extent practical, and to the extent desirable in maintaining consistency with the present plant design. We find that the additions being made substantially improve plant capability, reliability and operating flexibility, thus enhancing safety. We also find that the proposed preoperation testing will disclose any problems or inadequacies associated with the equipment and systems being added or changed, or any undesirable interactions between redundant systems or load groups. We therefore find the proposed changes and additions, and the proposed preoperational testing plan to be acceptable.

The detailed calculations associated with the new changes and additions, such as circuit breaker coordination, circuit breaker adequacy, battery adequacy, and voltage drop, should be maintained at the Turkey Point site or Florida Power and Light corporate headquarters for possible NRC audit. The licensee has stated that these calculations are being updated in accordance with the latest design changes, and will be available for NRC audit.

2.8 REFERENCES

1. NUREG-0800, U.S. Nuclear Regulatory Commission Standard Review Plan

2. NUREG-0700, "Guidelines for Control Room Design Reviews"

3. Regulatory Guide 1.6, "Independence Between Redundant Standby (Onsite) Power Sources and Between Their Distribution Systems"

4. Regulatory Guide 1.75, "Physical Independence of Electrical Systems"

5. IEEE Standard 384, "Standard Criteria for Independence of Class 1E Equipment and Circuits"

6. Branch Technical Position ASB 3-1, "General Information Required for Consideration of the Effects of a Piping System Break Outside Containment"

7. Branch Technical Position EICSB 17, "Diesel Generator Protective Trip Bypasses"

8. Generic Letter 84-15, "Testing of Emergency Diesel Generators, Technical Specification Changes"

9. IEEE Standard 308, "IEEE Standard Criteria for Class 1E Power Systems for Nuclear Generating Stations"

10. Regulatory Guide 1.108, "Periodic Testing of Diesel Generator Units Used As Onsite Electric Power Systems at Nuclear Power Plants"

11. Regulatory Guide 1.9, "Selection, Design, and Qualification of Diesel Generator Units Used as Standby (Onsite) Electric Power Systems at Nuclear Power Plants"

12. IEEE Standards 387-1977 and 387-1984, "IEEE Standard Criteria for Diesel-Generator Units Applied as Standby Power Supplies for Nuclear Power Generating Stations"

13. Regulatory Guide 1.53, "Application of the Single-Failure Criterion to Nuclear Power Plant Protection Systems"

14. Regulatory Guide 1.155, "Station Blackout"

15. Regulatory Guide 1.81, "Shared Emergency and Shutdown Electric Systems for Multi-Unit Nuclear Power Plants"

16. Regulatory Guide 1.41, "Preoperational Testing of Redundant On-Site Electric Power Systems to Verify Proper Load Group Assignments"

3.0 INSTRUMENTATION AND CONTROL

By letters dated June 23, 1988, April 3, 1989, June 4, 1990, and July 2, 1990 Florida Power and Light Company (FPL) submitted descriptions of the proposed enhancements to the Turkey Point Units 3 & 4 Emergency Power System (EPS) (References 1, 2, 3 and 4).

The Turkey Point 3 & 4 EPS enhancement includes the installation of four new computer-based load sequencers, one for each of the four Class 1E electrical busses. The licensee states that these new load sequencers will duplicate the functions of the old load sequencers, with some improvements to the sequence timing for loading of safety equipment. The load sequencers utilize Allen-Bradley, commercial-grade programmable logic controllers (PLCs) to execute the control functions and provide continuous monitoring of the load sequencer functions.

The use of commercial-grade PLCs and the use of software for emergency applications requires assurance that these PLCs are qualified as Class 1E, and will provide for the safe operation of the plant. This assurance was requested from the licensee.

3.1 EVALUATION

NRC staff reviewed the licensee's documentation (References 1, 2, 3 and 4) and requested additional information to clarify several design details.

The load sequencer system consists of redundant trains of load sequencers, each train dedicated to an Emergency Diesel Generator (EDG). A cross-tie connects the emergency power supplies in the two nuclear plants to ensure availability of an EDG during a loss of offsite power (LOOP). Additionally, the licensee has provided battery back-up capabilities, and key lock manual access to the load sequencers. This degree of redundancy is acceptable.

The licensee has committed to follow the Verification and Validation (V&V) program in IEEE Standard 1012-1986, "IEEE Standard for Software Verification and Validation Plans," and the guidelines in Regulatory Guide 1.152 (Reference 5), which endorses ANSI/IEEE-ANS-7.4.3.2-1982, "American National Standard, Application Criteria for Programmable Digital Computer Systems in Safety Systems of Nuclear Power Generating Stations" (Reference 6). Additionally, the contractor responsible for developing and installing the load sequencer, United Controls, Inc. (UCI), will perform a V&V of the PLCs and the load sequencer logic, and submit the results to FPL. The staff finds this commitment acceptable.

The verification phase of the licensee's V&V plan addresses verification of hardware requirements, software requirements, software design, software implementation, and hardware/software integration. System validation will consist of preparation and independent verification of test procedures, execution of the tests, and documentation with independent verification of the test results.

The documentation describing the results of the PLC and load sequencer logic testing will be provided to the licensee after shipment of the load sequencers from UCI. Additionally, the licensee will verify the testing of the integrated system by UCI to ensure its compliance with the licensee's requirements for a Class 1E load sequencer system.

The licensee will qualify the PLCs as Class 1E through dedication of the commercial-grade equipment. The licensee states that their commercial dedication procedures are based upon the guidance provided in a report issued by the Electric Power Research Institute (EPRI), EPRI NP-5652, "Guideline for the Utilization of Commercial Grade Items in Nuclear Safety Related Applications (NCIG-07)" (Reference 7). The staff will audit the results of the commercial-grade equipment dedication to ensure that the licensee addresses Criteria III, IV, and VII of Appendix B to 10 CFR Part 50, and adequately considers the guidance provided in Generic Letter (GL) 89-02, "Actions to Improve the Detection of Counterfeit and Fraudulently Marketed Products," which endorses EPRI NP-5652, in terms of engineering involvement in the procurement process and product acceptance.

The staff requested that the licensee provide a discussion of the acceptance criteria for checking control cabinet instruments and logic. The licensee states that the control cabinet instruments and all logic functions will be initially tested under the guidelines of the above-mentioned V&V program. The tests to be performed will address the following loss-of-offsite power (LOOP) and loss-of-coolant accident (LOCA) scenarios:

1. LOOP
2. LOOP with simultaneous LOCA in the same train
3. LOOP followed sometime later by a LOCA in the same train
4. LOOP with simultaneous LOCA in the other unit
5. LOOP followed sometime later by a LOCA in the other unit
6. LOCA in the same train
7. LOCA in the other unit
8. HI-HI containment pressure concurrent or less than 13 seconds after a LOCA or LOOP/LOCA
9. HI-HI containment pressure later than 13 seconds after a LOCA or LOOP/LOCA.

One of the purposes of these tests is to ensure that there are no common mode failures between the redundant trains of load sequencers. The licensee states

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that the PLC functions will be tested during the integrated preoperational test phase to verify the PLC properly strips and clears its bus, the EDG is started, the EDG breaker closes, and the load sequencer timing intervals for loading the buses is within the load sequencer design specifications. The tests will be conducted for the following plant conditions:

1. LOOP
2. LOOP followed by LOCA
3. LOCA with EDG Loaded in Parallel with Offsite Power
4. LOCA
5. LOCA followed by LOOP
6. Bus LOOP, LOCA, and HI-HI Containment Pressure
7. LOOP plus Other Unit LOCA

The licensee states that, in addition to the regularly scheduled EDG startup and bus loading tests, the load sequencer function will be tested "continuously" using an automatic self-test mode that provides continuous surveillance of sequencer operation, from its input signals through the logic and counter states, relay drivers, and continuity through the relay coils. The time to complete the automatic tests for the above scenarios is 179 seconds, with a 1-second interval between each test. During the test cycle, the sequencer is receptive to operational signals. The load sequencer requires 0.3 second to change from test mode into operating mode and begin loading buses.

The licensee further states that, in addition to the above tests, during preoperational testing, power will be removed from the PLC and all programmable functions will be verified to function per design requirements upon restoration of power to the PLCs.

A watchdog timer is built into the load sequencer system, such that a loss of load sequencer function is annunciated. The watchdog timer monitors the proper functioning of software events that occur periodically. The licensee states that the operating procedures are being revised to incorporate manual actions to respond to an annunciated problem and to bypass a failed load sequencer to allow bus stripping, starting the EDG, and loading onto the EDG the equipment necessary for safe plant shutdown.

The load sequencers contain an on-board battery back-up capable of retaining all stored program data through a continuous power outage for 12 months. The expected life of this battery is approximately 3 years. The licensee will replace the battery every refueling outage. Additionally, low battery voltage is detected by the load sequencer processor and annunciated as a sequencer trouble alarm in the control room.

In addition to the battery back-up capability described above, the licensee states that, in the event of a failure of the load sequencer system, an operator can remove power from the load sequencer through a key-lock switch located at the PLC cabinet. The operator can then manually load the required buses. Because the time required to manually load the required buses upon failure of the load sequencer has not changed from the previous design, the staff finds the manual override provisions to be acceptable. Using RG 1.47

(Reference 8) as a guideline, the staff will audit the licensee's method of providing the control room operators with load sequencer bypass indications and inoperable status indications.

The PLC vendor, Allen-Bradley, will perform a NEMA Noise Susceptibility test in accordance with NEMA ICS 2, Part 2-230, and NEMA ICS 3, Part 3-304.42. This test subjects the equipment to electrical noise that is commonly produced by electrical contacts interrupting inductive loads. Additionally, a Surge Transient Test is performed by Allen-Bradley in accordance with IEEE 472-1974 (ANSI C37.90a-1974). This test subjects the equipment to the type of electrical spikes that are generated by switching relays. The licensee must have available for audit verification that the electromagnetic environment qualification at the plant is enveloped by the vendor's tests.

The staff reviewed the potential for load sequencer system damage caused by lightning strikes. For lightning strikes and switching surges occurring on the transmission system and in the switchyard, system design (e.g., ground wires and station grounding, lightning arresters, surge protectors) limits the magnitude of surges propagating into the plant. These surges are further attenuated by cabling and equipment (e.g., transformers, buses, battery chargers, inverters) between the outdoor station and the PLCs. Additionally, the PLCs are designed and tested in accordance with IEEE Standard 472-1974 to withstand any credible surges that propagate to the 120 V ac and dc buses which serve as the power source for the PLCs. Based on the above factors, the staff concludes that there is reasonable assurance that lightning strikes and switching surges emanating from the outdoor station would not disable the PLCs.

The licensee states that Allen-Bradley performs two tests; a Radiated Electromagnetic Susceptibility test in accordance with SAMA Standard PMC 33.1-1978 and IEC Standard 801-3, Edition 1, 1984; and a Conducted Electromagnetic Susceptibility test for line-connected equipment in accordance with MIL-STD-461/462, tests CS01, CS02, and CS06 for Class A3 equipment. The tests subject the PLCs to frequencies of 20 MHz to 1 GHz, with a field strength of 10 V/m. This range of frequencies envelopes typical radio frequencies for portable two-way radios, which have field strengths less than 10 V/m. The staff will verify that the eletromagnetic environment qualifications at the plant are enveloped by the vendor's test during the site audit.

The licensee states that the only non-1E system interfacing with the PLC is the plant annunciator system, which will be isolated from the PLC with a coil-to-contact isolation relay. This form of isolation is acceptable. The staff will verify that the non-1E control room annunciators are isolated during the site audit of the load sequencer implementation.

The licensee states that the software portion of the load sequencer will be controlled using the existing FPL Quality Assurance program. Revisions to the load sequencer after installation will require, as a minimum, an engineering evaluation and 10 CFR 50.59 evaluation. The staff will verify that the configuration control for software changes is consistent with the V&V program.

3.2 CONCLUSION

Based on the above evaluation, the staff finds the instrumentation and control systems aspects of the Turkey Point Units 3 & 4 load sequencer system to be acceptable. The licensee has committed to a detailed V&V program, augmented by extensive testing of both the hardware and software. The V&V program follows the guidelines in IEEE Standard 1012-1986, "IEEE Standard for Software Verification and Validation Plans," and Regulatory Guide 1.152, which endorses ANSI/IEEE-ANS-7.4.3.2-1982.

The staff will audit the licensee's implementation of the load sequencer hardware and software design. The purpose of these audits is to confirm that the licensee has:

1. Assessed the functional equivalence and improvement of the upgrade relative to the original design basis,

2. Assessed the vendor's design (Functional Requirements and Specifications) and Verification and Validation processes,

3. Confirmed that the design functional requirements have been satisfactorily translated into the software configuration,

4. Assessed their own development of the design modification with respect to the design basis,

5. Implemented and followed their configuration management process for the new design,

6. Isolated the non-Class 1E systems from the Class 1E portion of the load sequencers,

7. Dedicated the load sequencer commercial grade components,

8. Verified that the electromagnetic environment qualification at the plant is enveloped by the vendor's tests, and

9. Provided the control room operators with load sequencer bypass indications and inoperable state indications.

Based on the above evaluation, we find the licensee's load sequencer system and the commitment to a V&V program to be acceptable.

3.3 REFERENCES

1. FPL letter to NRC, L-88-269, dated June 23, 1988, "Emergency Power System (EPS) Enhancement Project."

2. FPL letter to NRC, L-89-124, dated April 3, 1989, "Emergency Power System Enhancement Project, Supplement No. 1: Testing."

3. FPL letter to NRC, L-90-196, dated June 4, 1990, "Revised EPS Enhancement Report, Testing Report, Responses to the January 6, 1989, NRC Request for Additional Information, and FPL Safety Analysis for the Enhancement EPS configuration."

4. FPL letter to NRC, L-90-68, dated July 2, 1990, "Proposed License Amendment [for] Emergency Power System (EPS) Enhancement Project."

5. IEEE Std 1012-1986, "IEEE Standard for Software Verification and Validation Plans."

6. ANSI/IEEE-ANS-7.4.3.2-1982, "American National Standard, Application Criteria for Programmable Digital Computer Systems in Safety Systems of Nuclear Power Generating Stations."

7. EPRI NP-5652, "Guideline for the Utilization of Commercial Grade Items in Nuclear Safety Related Applications (NCIG-07)," Electric Power Research Institute, June 1988.

8. Regulatory Guide 1.47, "Safety System Status Monitoring for Nuclear Power Plants," U.S. Nuclear Regulatory Commission, May 1973.

9. FPL letter to NRC, L-90-277, dated July 23, 1990, "Request for Additional Information on Emergency Power System Enhancement Project."

10. FPL letter to NRC, L-90-349, dated September 28, 1990, "Emergency Power System Enhancement Project."

4.0 MECHANICAL ENGINEERING

4.1 EVALUATION

In References 1 and 5 the licensee provided a report describing in detail the proposed enhancement project, including Section 5.2, "Description of Mechanical Equipment," which describes the classification and rules which form the basis of the design of various safety-related mechanical systems and components, which are required to start and maintain diesel engine operation. These Category I systems consist of the starting air system, the air intake system, the exhaust system, the cooling water system, and the lube oil and the fuel oil systems. The demineralized water system and the service air system are considered as non-safety related. All safety-related systems are comprised of skid and off-skid piping and components. The skid piping and components are provided by the EDG manufacturer (General Motors) while the off-skid piping and components are provided by FP&L.

The classification of various systems associated with EDGs is stated in NRC Standard Review Plan Section 3.2.2 "System Quality Group Classification." All EDG safety-related systems are classified as Quality Group C, which requires the design to be based on ASME Section III Class 3 rules. The classification of the various systems by FP&L was provided in Reference 2. The licensee has based the design and fabrication of off-skid piping and components on ASME Section III Class 3 (1989 with Summer 1984 Addenda), and on ANSI B31.1, 1986. Components such as silencers and radiators were designed to ANSI B31.1 since such components are not commercially available as designed to ASME Section III. The exhaust system was designed to ANSI B31.1 for reasons of high temperature material compatibility with skid piping and the silencers. The diesel oil storage tank was designed to ASME Section VIII Rules, as permitted by Regulatory Guide 1.137 (1979). All skid piping and components provided by the EDG manufacturer were designed to ANSI B31.1 except for the surge tank, which was designed to ASME Section VIII. These are the EDG supplier's standard design and fabrication codes since he has no ASME-approved quality system, including appropriate stamping. Likewise, although the off-skid piping and components are designed to ASME Section III, they are installed to ANSI B31.1 requirements for a similar reason, namely, since Turkey Point Units 3 and 4 are not ASME Section III plants they lack an ASME approved quality system including appropriate stamping. However, the licensee has performed a comparison (Reference 2) between ASME Section III and ANSI B31.1, 1986 installation requirements and has demonstrated that these requirements are essentially equivalent. Furthermore, the licensee also stated that the installations are in accordance with 10 CFR Part 50 Appendix B quality assurance requirements. We have reviewed the licensee submittals and find these acceptable.

In addition to the issues on quality classification, the licensee has also committed (Reference 3) to adopt the acceptance criteria for piping vibration during start-up as stated in ASME OM-1987 with Addenda OMa-1988 (Reference 4). The licensee has also stated that Section XI IWD-2500 inservice inspection requirements will be applied to all off-skid piping systems. On-skid piping and components will be inspected according to the manufacturer's requirements. We find these commitments acceptable.

4.2 CONCLUSION

We find the design, fabrication, installation and testing of the mechanical systems associated with the new EDGs at Turkey Point Units 3 and 4 acceptable.

4.3 REFERENCES

1. Letter (L-88-269) dated June 23, 1988, W. F. Conway, FP&L, to NRC.

2. Letters of July 3 and July 12, 1990, from K. N. Harris, FP&L, to NRC.

3. Letter of May 2, 1990, from K. N. Harris, FP&L, to NRC.

4. ASME OM-1987 with Addenda OMa-1988, Operation and Maintenance of Nuclear Power Plants, Part 3, "Requirements for Preoperational and Initial Start Up Vibration Testing of Nuclear Power Plant Piping Systems."

5. Letter (L-90-196) dated June 4, 1990, K. N. Harris, FP&L, to NRC.

(L-90-160)

5.0 STRUCTURAL AND GEOSCIENCES

The proposed Emergency Power System Enhancement Project (Reference 1) includes separation of existing emergency diesel generators, the installation of two new emergency diesel generators, with all support systems and the construction of a new diesel generator building (DGB) and, a diesel oil storage building (DOSB).

The new diesel generator building (DGB) is a Seismic Category I building located northeast of the Unit 3 containment structure. The building is two stories high with the diesel generators located on the lower floor, and the auxiliaries such as air start skids, control panels, motor control centers, distribution centers, etc., located on the upper floor. The diesel oil storage building (DOSB) is attached to but separated from the DGB by means of a 26-inch thick reinforced concrete wall.

5.1 EVALUATION

The proposed DGB is a Seismic Category I reinforced concrete structure which encloses the diesel generators and auxiliary equipment. The building is approximately 55 feet wide, 56 feet long and 51 feet high, with the top of the roof at elevation 61.00 feet. The building is partitioned by a reinforced concrete wall, such that the two diesel generators are separated by a 3-hour rated fire barrier. Each division of the building has two floors: the ground floor, approximately at elevation 18.00 feet, and the second floor, approximately at 42.00 feet. The second floor is partly reinforced concrete and partly structural steel with grating.

The DOSB is also a Seismic Category I reinforced concrete structure, connected to the DGB and shares a 26-inch thick reinforced concrete common wall with the DGB. The building is 29 feet wide, 38 feet long and 39 feet high, with the top of the roof at elevation 49.00 feet. The DOSB is also partitioned by a reinforced concrete wall so that the two diesel oil storage tanks (DOST) are separated by a 3-hour rated fire barrier. Each division of the building encloses a steel-lined concrete DOST.

Both the buildings share a common foundation mat. The bottom of the reinforced concrete foundation mat is at elevation 10.00 feet. The grade level elevation varies from 17.00 feet to 18.00 feet. The soil under the foundation mat consists of compacted crushed liner rock fill underlaid by limestone formation. The average bearing capacity of the soil is 70 ksf. The allowable bearing pressure for normal loadings is 6 ksf and for accident and extreme environmental loading is 10 ksf. These values indicate a substantial margin over the failure bearing pressures and are acceptable.

Seismic Loading

The DGB and the DOSB have been represented as a single building to determine the seismic loading. The building dynamic analysis model consists of a lumped mass cantilever with the appropriate soil springs. The seismic input was based

on the Updated Final Safety Analysis Report (UFSAR), Appendix 5A (Reference 2). The zero period ground acceleration (ZPGA) for the Safe Shutdown Earthquake (SSE) is 0.15g, and that for the Operating Basis Earthquake (OBE) is 0.05g. The ZPGA in the vertical direction is two-thirds of the horizontal. The corresponding Design Response Spectra were developed in accordance with the provisions of Regulatory Guide 1.60, "Design Response Spectra for Seismic Design of Nuclear Power Plants." The damping values are considered following the provisions of Regulatory Guide 1.61, "Damping Values for Seismic Design of Nuclear Power Plants." The structure was designed using the response spectra analysis. The combination of modes was performed using the provisions of Regulatory Guide 1.92, "Combining Modal Response and Spatial Components in Seismic Response Analysis" (Reference 3).

The floor response spectra were developed using a synthetic time-history that would envelope the corresponding response spectra and in accordance with the provisions of Regulatory Guide 1.122, "Development of Floor Design Response Spectra for Seismic Design of Floor Supported Equipment or Components." Thus the seismic design loads on the structure were determined using the acceptable criteria.

Wind and Tornado Loadings

The wind loading on the structure was determined using the straight wind velocity of 125 miles per hour (mph). For the site, the 100 year wind was determined as 120 mph. The wind loading on the building was determined using the acceptable criteria in NRC Standard Review Plan (SRP) Section 3.3.1.

Tornado wind velocities and differential pressure drop were determined as recommended in RG 1.76, "Design Basis Tornado for Nuclear Power Plants." The equivalent static loading was determined using the provisions of Reference 4. The licensee has also indicated that the exterior walls of the buildings are designed to withstand a spectrum of tornado generated missiles specified in SRP Section 3.5.1.

The wind and tornado loading criteria used in the design of the structures (DGB and DOSB) are thus acceptable.

Protection Against Flood

The new EDG building is protected from flooding by barriers designed in accordance with RG 1.102, "Flood Protection." The maximum flood and wave run-up elevations are in accordance with those specified in the FSAR. This is acceptable.

Load Combinations and Acceptance Criteria

Load combinations used for design of the structure are in accordance with the provisions of SRP Section 3.8.4. The structural acceptance criteria are also in accordance with SRP Section 3.8.4.

For the design of the foundation mat and walls affected by the diesel oil storage tanks, each of the tanks is considered full or empty, depending upon the situations which constitute the most adverse loading. However, for seismic

load combinations, the minimum oil volume of each tank is considered to be 34,000 gallons and the maximum volume in each tank is considered to be 42,000 gallons. The proposed Technical Specification (Section 3.8.1.1.4) for Turkey Point Unit 4 requires a minimum oil volume of 34,700 gallons. Continuous operation of an emergency diesel generator for 7 days during a loss-of-offsite power requires 34,000 gallons of oil. Thus, this deviation from the normal design procedure is acceptable.

5.2 CONCLUSION

On the basis of the evaluation of the licensee submittals, meetings with the licensee and subsequent teleconferences, the staff concludes that the criteria for design and construction of the proposed new structures, associated with the Emergency Power System Enhancement Project, conforms with the provisions of the latest version of the applicable Standard Review Plan sections and hence are acceptable.

5.3 REFERENCES

1. Letter (L-88-269) dated June 23, 1988, W. F. Conway, FP&L, to NRC.

2. Letter (L-90-140) dated April 16, 1990, K. N. Harris, FP&L, to NRC.

3. Letter (L-90-196) dated June 4, 1990, K. N. Harris, FP&L to NRC.

4. ANSI A58.1, "Minimum Design Loads for Buildings and Other Structures."

6.0 PLANT SYSTEMS

6.1 EVALUATION

6.1.1 Emergency Diesel Generators

As part of the EPS enhancement project, the two existing EDGs are aligned as the emergency AC power supplies for Unit 3, and the two new EDGs are aligned as the emergency AC power supplies for Unit 4. Each new EDG consists of a diesel engine manufactured by General Motors Electro-Motive Division (EMD) and a generator manufactured by NEI Peebles Electric Products, Inc. The complete EDG assembly is supplied by Morrison-Knudsen Company and has a continuous rating of 2865 KW and a short time rating of 3150 KW. Each of the new EDGs, which is similar to the existing EDGs except for some minor design changes, has 20 cylinders and a turbocharger with 12 rows of aftercoolers. In addition, each EDG has the following auxiliary systems which are evaluated below: (1) diesel oil storage and transfer system, (2) emergency diesel engine starting system (3) diesel engine cooling water system, (4) diesel engine lubrication system, and (5) diesel engine combustion air intake and exhaust system.

2874
3162
two

Diesel Oil Storage and Transfer System (DOSTS)

For each new EDG, there is a new diesel oil storage and transfer system which consists of a new diesel oil storage tank, a transfer pump, a day tank, and the associated piping, valves, instrumentation and control to permit operation of the EDG at engineered safety feature load requirements for a minimum of 7 days without replenishment of fuel.

In a response to the staff's request for additional information, dated March 20, 1989, the licensee stated that the new diesel oil storage and transfer system will be designed in accordance with Regulatory Guide 1.9, "Selection, Design, and Qualification of Diesel Generator Units used as Standby (Onsite) Electric Power Systems at Nuclear Power Plants," and ANSI Standard N195-1976, "Fuel Oil System for Standby Diesel Generators," as endorsed by Regulatory Guide 1.137, "Diesel Generator Fuel Oil Systems." In addition, the system will meet the guidance of Standard Review Plan (SRP) Section 9.5.4, "Emergency Diesel Engine Fuel Oil Storage."

Specific design standards for system components include the following:

- Design Oil Storage Tanks

  Each storage tank has a capacity of 38,000 gallons, sufficient to operate the EDG for 7 days at continuous loading. The storage tank

42,000
tanks, together

also has the capability of receiving a diesel oil load of 8,000 gallons from a transport vehicle while the tank inventory is maintained above that required by Technical Specifications. The storage tanks are steel-lined concrete fabricated in accordance with the requirements of ASME Code Section VIII and meet seismic Category I requirements. The tanks are enclosed in a seismic Category I building designed with missile protection capability. The building is also designed to retain the entire contents of a tank failure.

Sample connections to the tanks will be provided in accordance with ASTM-D270, "Sampling Petroleum and Petroleum Products." Connections to non-safety related piping will be provided with ASME Section III, Class 3, isolation valves.

The licensee has considered and discussed provisions to prevent, and actions to overcome, such possibilities as damage to the storage tank fill or vent lines due to tornado missiles, growth of algae in the storage tank, corrosion in the piping and tank, protection of the fuel oil system from ignition sources, and the need for replenishment of fuel oil for a prolonged period of EDG operation.

- Diesel Oil Transfer Pumps

Each diesel oil transfer pump has enough capacity to supply the diesel oil for two EDGs at continuous load rating. The discharge lines are interconnected so that one pump can supply either or both EDGs. Each pump is powered from its associated EDG. It starts and stops automatically on low and high level signals from its associated day tank. The transfer pump is designed to meet the requirements of ASME Code Section III for Class 3 components and meets seismic Category I requirements. In-service testing capability for these pumps will be provided in accordance with ASME Section XI.

- Piping and Valves

The system piping external to the engine start skid is designed to meet the ASME Code Section III for Class 3 components and seismic Category I requirements. The engine mounted piping, as a minimum, is designed to meet the stresses specified by ANSI B31.1, "Power Piping," and to accommodate the mechanical, pressure, thermal and seismic loads.

- Fuel Oil Day Tank

The day tank has enough fuel to support about 3 hours of EDG operation. The tank has fuel oil transfer pump auto-start and auto-stop levels, a critical low level alarm, 1-hour alarm and a high level alarm. The tank is located to take into consideration fire safety, required maintenance, fuel oil head pressure, seismic loadings, tornado missiles, and possible sabotage.

The licensee also indicated that the quality and reliability of the fuel oil supply is assured per existing procedures. For particulate testing, the program follows the requirements of ASTM-2276, "Particulate Contaminents in Aviation Turbine Fuels." The remainder of the fuel oil testing follows the requirements of ASTM D975-1981, "Standard Specification for Diesel Fuel Oils." All monthly tests are completed every 31 days and all quarterly tests are performed on a bi-monthly basis. Every 18 months, the fuel oil is also tested per manufacturer standards, which includes all requirements of ASTM D975-1981 plus testing for chlorides.

Based on its review, the staff concludes that the design of the new diesel oil storage and transfer system for Turkey Points, Units 3 and 4 enhanced emergency power system conforms to the guidelines of RG 1.9, RG 1.137 and SRP Section 9.5.4, and, therefore, is acceptable.

Emergency Diesel Engine Starting System

Each EDG will have two redundant starting systems consisting of two air compressors (one diesel and one motor driven), four air receivers, four air start motors, piping, valves and instrumentation. Two air receivers and two air motors form one of two redundant sets of 100% cranking capacity for the diesel engine. The air receivers have capacity for cranking the cold diesel engine five times without recharging. A refrigerant type air dryer will be installed between the air compressors and the air receivers to preclude fouling of the air start valves by moisture carry-over. A dew point of less than 40°F and a maximum particulate size of 1 micron have been specified as minimum air quality requirements for the air dryer package. In addition, the air receivers, system piping up to the diesel engine skid, valves and instruments will be made of stainless steel to prevent the generation of rust particles.

The diesel engine air starting system is provided with pressure indication at the compressor discharge, on each set of the two air receivers, at the headers supplying the engine air motors, and a pressure switch for each set of the two air receivers to provide a low pressure alarm in the control room. In addition, the air receivers will be monitored for moisture buildup with water detection devices.

Based on its review, the staff concludes that the design of the emergency diesel engine starting system is in accordance with the guidelines described in SRP Section 9.5.6, "Emergency Diesel Engine Starting System," and therefore, is acceptable.

Emergency Diesel Engine Cooling Water System

The design function of an emergency diesel engine cooling water system is to maintain the temperature of its associated diesel engine within a safe operating range under all load conditions and to maintain the engine coolant preheated during standby conditions to improve starting reliability. The system, which is a closed-loop system, consists of an expansion tank,

circulating pumps, three-way thermostatic control valve, water to air heat exchanger (radiator), three electric, direct-coupled, motor-driven cooling fans, standby immersion heater, piping, valves and the required instrumentation.

During operation of the diesel engine, two engine-driven centrifugal pumps circulate water through the closed-loop system. The heat generated is rejected to the environment by means of the radiator. Temperature regulation of the diesel engine coolant is accomplished automatically through the action of a temperature sensing three-way thermostatic valve. When the diesel engine is idle, the engine coolant is heated to a predetermined temperature by the immersion heater and continuously circulated through the engine by natural convection.

The licensee stated that the diesel engine cooling water system will be designed in accordance with RG 1.9. The system, except for the engine skid piping, the surge tank and radiator, will be designed to ASME Section III for Class 3 components and will meet Seismic Category I requirements. The engine mounted piping, as a minimum, will be designed to ANSI B31.1 and meet Seismic Category I requirements. The radiators and surge tank will be designed in accordance with the requirements of ASME Case Section VIII and will meet Seismic Category I requirements. The licensee has discussed how the design of the emergency diesel engine cooling water system will meet the guidelines of SRP Section 9.5.5, "Emergency Diesel Engine Cooling Water System."

Based on its review, the staff concludes that the design of the emergency diesel cooling water system, which conforms to the guidelines of RG 1.9 and SRP Section 9.5.5, is acceptable.

Diesel Engine Lubrication System

The diesel engine lubrication system, which is an integral part of the diesel engine, is a combination of three subsystems. Each subsystem has its own positive displacement pump, driven from the accessories gear train at the front of the engine. The three subsystems are: (1) the scavenging oil system, (2) the main lube oil system, and (3) the piston cooling oil system. The scavenging oil system supplies the main lube oil pump and piston cooling oil pump with cooled and filtered oil. The main lube oil system supplies oil to the various moving parts of the diesel engine including all main bearings and camshaft bearings. The piston cooling oil system supplies lube oil for piston cooling and lubrication of the piston pin bearing surfaces.

The licensee stated that the diesel engine lubrication system will be designed in accordance with RG 1.9. All engine lube oil piping will be designed to ANSI B31.1 and will meet Seismic Category I requirements. In addition, the licensee has discussed how the design of the diesel engine lubrication system will meet the guidelines of SRP Section 9.5.7, "Emergency Diesel Engine Lubrication System."

Based on its review, the staff concludes that the design of the diesel engine lubrication system conforms to the guidelines of RG 1.9 and SRP Section 9.5.7, and therefore, is acceptable.

Diesel Engine Combustion Air Intake and Exhaust System

The design function of the diesel engine combustion air intake and exhaust system is to supply filtered air for combustion to the diesel engine and to dispose of the diesel engine exhaust to atmosphere. The system is designed in accordance with RG 1.9. The exhaust piping is designed in accordance with ANSI B31.1 and is seismically supported. In addition, the licensee has discussed how the design of the diesel engine combustion air intake and exhaust system will meet the guidelines of SRP Section 9.5.8, "Emergency Diesel Engine Combustion Air Intake and Exhaust System."

Based on its review, the staff concludes that the design of the diesel engine combustion air intake and exhaust system conforms to the guidelines of RG 1.9 and SRP Section 9.5.8, and therefore, is acceptable.

6.1.2 Diesel Generator Building Ventilation System

The diesel generator building ventilation system is required and designed to maintain a suitable ambient temperature range in the areas serviced. For the diesel generator room ventilation, combustion and cooling intake air enters the EDG building through the air intake intrusion barrier on the north side. The air travels through the air compressor room and into the diesel generator room. Some of the air goes into the diesel engine as combustion air, and the remainder is exhausted out the south wall through the diesel engine cooling water radiators. Each EDG control panel room is equipped with a dedicated ventilation system. A single active failure resulting in a loss of one ventilation system will not affect the performance capability of the other ventilation system. For each switchgear room, a dedicated ventilation system consisting of redundant fans is provided. Therefore, a single active failure will not result in the loss of both fans to either switchgear room.

The ventilation systems for the ~~diesel generator rooms~~, EDG control panel rooms, and switchgear rooms will be designed (in a) safety-related ~~way~~ and meet seismic Category I requirements. (as)

Based on its review, the staff concludes that the design of the diesel generator building ventilation system conforms to the guidelines as described in SRP Section 9.4.5, "Engineered Safety Feature Ventilation System," and therefore, is acceptable.

6.1.3 Fire Protection

The staff has reviewed the licensee's proposed fire protection modifications associated with the emergency power enhancement project. These proposed fire protection modifications were reviewed against the guidance of BTP ASB 9.5-1, Appendix A and the requirements of 10 CFR Part 50, Appendix R, Sections III.G, III.J, and III.L. Our review included an evaluation of the licensee's proposed fire protection features (i.e., additional automatic fire suppression and detection systems, manual fire suppression capabilities and passive fire protection features); fire protection methodology for assuring safe shutdown capability; proposed modifications and procedure changes to assure alternate shutdown capability; and proposed changes to fire protection administrative

The ventilation systems for the EDG rooms and fuel oil transfer pump rooms are designed as non safety-related and are seismically supported.

controls resulting from the electrical system upgrade design. The evaluation of the licensee's proposed changes to their existing fire protection program and the additional fire protection features resulting from the electrical system modifications has been reviewed under the following three major areas:

(1) General Plant Fire Protection Features

(2) Fire Detection and Suppression Capability

(3) Fire Protection Features for Specific Plant Areas

6.1.3.1 General Plant Fire Protection Features

(a) Building Design

The licensee has indicated that, generally, the wall assemblies which separate the new EDG building and the electrical equipment room (EER) from the remainder of the facility will have a fire resistive rating of 3 hours. In addition, the licensee indicated that redundant trains of safe shutdown systems located inside the EDG and EER are separated from each other so that both trains are not damaged by a single fire. Door assemblies installed in fire barrier walls within the new EDG and EER structures are fire rated for 3 hours. In addition, the exterior doors of these structures are fire rated for 3 hours.

Mechanical and electrical penetrations through fire barriers will be appropriately protected. HVAC penetrations, except as identified in Section ~~6.1.3.3~~ part D of this, through fire barriers will be protected by fire damper assemblies. These dampers will have an equivalent fire rating to that of the fire barrier. Conduit and piping penetrations through fire barriers will be sealed to prevent fire and smoke propagation. The penetration sealant material will have a fire rating equivalent to that of the fire barrier.

The licensee has indicated that personnel access and escape routes are provided in each fire area and fire exit routes are clearly marked.

The staff, based on its review, finds that the licensee's proposed EDG building and EER passive fire protection features are acceptable and that they meet the guidance provided in BTP ASB 9.5-1, Appendix A.

(b) Safe Shutdown Capability

As a result of the electrical power system upgrade modifications, the licensee has committed to perform an analysis and revise the essential equipment list, essential cable list, and safe shutdown analysis to reflect the effects of the electrical upgrade modifications on equipment necessary for post-fire safe shutdown of the plant. In addition, for fire zones containing redundant safe shutdown equipment or cabling, the licensee will verify that adequate fire protection measures or alternative shutdown capability exists in accordance with 10 CFR Part 50, Appendix R, Sections III.G and III.L.

The licensee also committed to perform an associated circuit analysis. This analysis will ensure that the emergency power system upgrade modifications will

not adversely affect safe shutdown capability resulting from fire induced hot shorts, shorts to ground, or spurious signals causing equipment maloperations. The licensee, in order to ensure that safe shutdown capability is not affected by associated circuits, will verify the following:

1. Coordinated fuse/breaker circuit protection is provided such that the power supply to any of the required safe shutdown loads is not affected by a fire involving a non-safe shutdown load;

2. High/low pressure interfaces are protected against fire-induced spurious operations;

3. All raceways passing through fire barriers are adequately sealed, as required, to ensure that fire does not propagate inside the raceway enclosure itself; and

4. Potential fire-induced spurious equipment actuations are provided with adequate circuit protection or have been analyzed and the appropriate manual actions to be taken during post-fire conditions to ensure safe shutdown capability are incorporated into shutdown procedures.

As a result of a safe shutdown analysis, the electrical equipment room will change from a train "A" shutdown train area to a train "B" shutdown train area and the appropriate fire protection features will be installed to protect safe shutdown circuits as required.

The staff finds the licensee's safe shutdown methodology and their proposed fire protection features for maintaining one safe shutdown train free from fire damage to comply with the performance criteria of 10 CFR Part 50, Appendix R, Section III.G and are, therefore, acceptable.

(c) Alternate Shutdown Capability

The licensee addressed alternative shutdown (ASD) capability by identifying areas of the plant for which a fire would require ASD (cable spreading room, electrical cable chase, control room, control room roof, mechanical equipment room, and the north-south breezeway). The addition of the new EDGs will affect their alignment to the Unit 3 and 4 ASD panels. As a result of the overall enhancement project, changes affecting ASD will be necessary due to the realignment of electrical power distribution to some equipment. These changes include provisions for 1-hour fire barrier protection for cabling to certain equipment (normal containment cooler fans circuits, boric acid transfer pump power and control circuits, and new EDG train "B" circuits located in outdoor raceway) and provisions for normal/isolate transfer switches which will mitigate spurious operation of safety-related equipment (e.g., charging pumps) during an ASD fire.

Specific detailed changes will be made to the procedures to address modifications which affect equipment relied upon for safe shutdown in the event of a fire that requires the evacuation of the control room. Examples include:

- Revision of procedures from reading EDG B volts and watts (dual meter) on each ASD panel to reading volts and watts for EDG 3B on the Unit 3 ASD panel and EDG 4B on the Unit 4 ASD panel;

- Addition of transfer/isolate switches;

- Addition and deletion of actions required due to the new electrical system; and

- Fire zone and fire area additions and modifications.

Based on this information, the staff concludes that the alternate shutdown capability of the plant will be adequately maintained and that these proposed changes meet the requirements of 10 CFR Part 50, Appendix R, Sections III.G, and III.L, and are, therefore, acceptable.

(d) Ventilation

For the new diesel generator building, the licensee is providing protection for grade level exterior wall ventilation openings from the effects of a postulated exposure fire by adding external fire barriers. This prevents an exposure fire from affecting both units. The licensee states that the potential for exposure fires extending to above-grade ventilation openings is too insignificant, due to height above-grade and the outdoor nature of the space, to warrant additional fire protection. The staff finds this acceptable.

In the new electrical equipment room, the licensee has provided protection for all penetrations and doors in the fire areas with the exception of HVAC duct penetrations in the exterior ~~(west)~~ walls. This is because a safe shutdown analysis indicated that the exterior wall does not serve to separate redundant safe shutdown circuits. The staff finds this acceptable.

these walls do

(e) Lighting and Communication

The licensee has stated that a fixed self-contained lighting system consisting of sealed beam units with minimum 8-hour battery power are provided in accordance with 10 CFR Part 50, Appendix R, Section III.J. The existing alternate shutdown communication system is extended to include the new EDG building.

This information provides the staff with reasonable assurance that adequate emergency lighting and communication are available, and are, therefore, acceptable.

6.1.3.2 Fire Detection and Suppression Capability

(a) Fire Detection

The licensee stated that fire detection is provided for all accessible areas in the EDG buildings and EER. The licensee stated that the design of the proposed fire detection system and the application and the spacing of the fire detectors will be in compliance with National Fire Protection Association (NFPA) standards 72D and 72E, respectively, and give an audible and visual alarm and annunciation in the main control room. EDG building fire protection panels

include the feature of supervising the alarm circuits while in standby; i.e., instrumentation monitoring (1) the removal of a detector from the detector circuit, (2) an open circuit in the detector circuit, (3) an open circuit in the main control room annunciator circuit, (4) an open or shorted condition on the audible circuit line, (5) the removal of a supervised system module, (6) the loss of main power, and (7) a ground fault on any detector circuit, audible signal circuit or dc power line within the system.

Based on the above, the staff concludes that the fire detection system meets the guidelines of BTP ASB 9.5-1, Appendix A, and is, therefore, acceptable.

(b) Water Sprinkler and Hose Standpipe Systems

The licensee has committed to install pre-action sprinkler protection in each EDG room. These sprinkler systems are independent and capable of being manually actuated. The piping integrity for each system is supervised by nitrogen and upon the loss of nitrogen pressure or system integrity, an alarm will be generated. This alarm will be annunciated in the control room. Each pre-action sprinkler system will be automatically actuated by a signal from a separate, dedicated fire detection system which utilizes thermal rate compensated fire detectors. In addition, the licensee has committed to install wet pipe sprinkler protection in the diesel fuel oil transfer pump rooms. The actuation of either of these systems will be alarmed and annunciated both locally in the EDG building and in the control room. The fire suppression system piping material, design, and installation will be in accordance with NFPA 13 and is seismically designed and supported.

In order to support manual fire suppression capability to the EDG building, the licensee will install a hose cabinet at fire hydrant HY18. This hydrant is located within 100 feet of the EDG building. The proposed hose cabinet at HY18 will be appropriately equipped with sufficient hose, nozzles, adapters, hydrant and hose wrenches, etc. to readily provide an effective hose stream to any location in the EDG building. In addition, the licensee, following the guidance of NFPA 24, will install a standpipe and hose station/cabinet with the appropriate equipment just outside the EDG access doors on the north side of the building.

The staff has reviewed the design criteria and bases for the water suppression systems and concludes that these systems meet the guidelines of BTP ASB 9.5-1, Appendix A, and are, therefore, acceptable.

(c) Portable Extinguishers

As a result of the electrical system modifications, additional portable fire extinguishers, in accordance with NFPA 10, will be provided in the EDG building, EER, and areas adjacent to the EER. The staff finds this acceptable.

6.1.3.3 Fire Protection Features for Specific Plant Areas

(a) Switchgear Rooms and EDG Control Panel Rooms

Switchgear and EDG control panel rooms are separated from each other and their respective EDG by 3-hour-rated barriers. Fire detection (smoke detectors) has

been provided for these rooms, tied into the local EDG building fire detection panels which will alarm/annunciate in the main control room at the existing main fire alarm panel.

Based on its evaluation, the staff concludes that the fire protection for the switchgear and EDG control panel rooms meets the guidelines of BTP ASB 9.5-1, Appendix A, and is, therefore, acceptable.

(b) Diesel Generator Areas/Diesel Fuel-Oil Storage Areas/Diesel Oil Transfer Pump Areas

The redundant diesel generators and associated auxiliary equipment are separated from each other by a 3-hour-rated fire barrier. In addition, the diesel oil storage and transfer pump area is also partitioned by a reinforced concrete wall such that the two diesel oil storage tanks (DOST) and their associated oil transfer pumps are separated from each other and other areas in the EDG building by 3-hour-rated fire barriers.

The licensee has committed to install automatic fire suppression capability in the EDG rooms and the diesel oil transfer pump rooms. Each EDG room is protected by a pre-action sprinkler system, and wet pipe sprinkler protection will be provided in the diesel oil transfer pump rooms. Manual fire suppression capability in the form of portable fire extinguishers and hose stations is appropriately provided for the EDG building. In addition, the licensee will provide fire detection capabilities for all the accessible areas in the EDG building.

The staff, based on its evaluation, finds that the fire protection for the diesel generator areas and oil storage and transfer areas meets the guidelines of BTP ASB 9.5-1, Appendix A, and is, therefore, acceptable.

Replace with Insert A - see next page

(c) Electrical Equipment Room (EER) in the Auxiliary Building

of non-combustible construction

The EER is separated into two fire zones by 3-hour fire barriers with all penetrations and doors protected by 3-hour fire rated assemblies. The exterior walls of the EER, which separate redundant safe shutdown trains, will be 3-hour fire rated and all associated penetrations will be appropriately fire-rated. Interior to the EER structure, at the east end, the licensee is constructing a ~~3-hour fire rated~~ room to house the spare station battery. The mezzanine, open to the EER, is located above the spare battery room and contains the 3A2, ~~and~~ 3B2, and D51 battery chargers and the EER/battery room air handling unit.

Insert B see next page

In order to preclude hydrogen accumulation, during battery charging and discharge periods, inside the battery room and the EER, the licensee is designing the air conditioning and ventilation system to establish a continuous flow of air from the EER to the battery room. This air flow will be established by having the ventilation supply air, under a slightly positive pressure, enter the EER and exhaust out through the battery room. The battery room exhaust capability is designed to maintain the hydrogen concentration limit below 2% by volume in accordance with Regulatory Guide 1.128. The battery room exhaust is connected to the plant air exhaust system which is capable of being manually loaded on the EDG.

INSERT A

The EER is one fire area separated into two fire zones. The area is separated from the rest of the plant by walls which are three-hour fire rated with all penetrations and doors protected by three-hour fire rated assemblies. The east and west exterior walls are of fire resistant construction and have unprotected HVAC penetrations as described in section 6.1.3.1(d).

INSERT B

Although wholly contained within the EER, the spare battery room has a unique fire zone identifier.

Portable fire extinguishers will be installed in the area and a standpipe hose station is provided in the auxiliary building hallway which is adjacent to this area. Smoke detectors will be installed throughout the EER and battery room which will alarm/annunciate in the main control room at the existing main fire alarm panel.

Based on its evaluation, the staff finds that the fire protection for the new EER and spare battery room in the auxiliary building meets the guidelines of BTP ASB 9.5-1, Appendix A, and is, therefore, acceptable.

6.2 CONCLUSION

The diesel generator auxiliary systems are powered by motor control centers within the same division as the diesel generator, thus maintaining divisional separation. The diesel oil storage and transfer system has sufficient capacity to supply diesel fuel for 7 days. The system has a provision for adding fuel to the tank, if required. This should assure adequate fuel availability for extended periods. Each transfer pump has sufficient capacity to supply two diesels, thus providing adequate supply to the day tanks with one transfer pump inoperable. There is 100% redundancy in the air starting system and compressed air for five starting attempts. This should provide adequate starting capacity. ~~There is redundancy in the cooling fans and the circulating water pumps of the engine cooling system.~~ External lube oil pumps continuously supply lube oil to the turbocharger bearings and engine oil is kept warm during standby conditions, thus reducing wear consistent with Generic Letter 84-15, for fast emergency or surveillance starts. Surveillance instrumentation for indication, control and alarm is provided to monitor, control and maintain the auxiliary systems consistent with IEEE Standard 387-1977. The staff concludes that the design features of the auxiliary systems are of the type that should provide for adequate and reliable operation consistent with GDC-17.

Redundant trains of systems required for safe shutdown are separated from each other in the EDG building by 3-hour fire barriers, so that both trains are not subject to the same fire hazard. In addition, automatic fixed water fire suppression is provided in the EDG rooms and the diesel fuel oil transfer pump rooms. The EER structure is separated into two fire zones by 3-hour fire barriers. The ventilation provided for the spare battery room located in the EER structure will be designed to ensure that the exhaust capability will limit hydrogen concentration to levels below 2% by volume. Manual fire suppression capability in the form of fire hose stations is provided for the EDG building and will be accessible to the EER. Portable fire extinguishers will be appropriately located in the EER and the EDG building. Emergency lighting and communication, consistent with existing guidelines, will be provided to support safe shutdown operations. Fire detection capability, with adequate provisions made for supervision of detection alarm circuits is provided for the EDG building and the EER. To assure that post-fire shutdown capability of the plant complies with the requirements of 10 CFR Part 50, Appendix R, the licensee has committed to perform an analysis, revise their essential equipment and cable lists, and, as required, provide the required fire protection features to assure that one train of systems necessary to achieve and maintain safe shutdown conditions is free from fire damage. The staff concludes that the

licensee's proposed fire protection features for the EDG building and the EER are in conformance with GDC 3 and 5; with BTP ASB 9.5-1, Appendix A, and applicable industry standards.

A draft FSAR update will be provided in mid-1991 to reflect the design changes. In accordance with 10 CFR 50.71, the FSAR will be formally updated in the first annual update following the completion of the plant modifications. This formal update is currently expected to be included in the 1992 annual update.

7.0 TECHNICAL SPECIFICATIONS

Turkey Point Units 3 and 4 initially operated with custom Technical Specifications (CTS) issued with operating licenses in 1972 and 1973 and amended from time to time over the years. In September 1984, Florida Power and Light Company (FPL) committed to the development of a fully revised and reformatted set of Turkey Point Technical Specifications based on the Standard Technical Specifications (STS) for Westinghouse-designed plants. In August 1990, license Amendment Nos. 137 and 132 were issued approving Revised Technical Specifications (RTS) for Turkey Point Units 3 and 4 that are, except for the electrical power systems, consistent with the STS. Amendments 137 and 132 also approved an interim electrical power systems chapter of the RTS that maintains a degree of safety which is equivalent to or greater than that of the electrical power systems chapter of the CTS. Thus, the interim electrical power systems chapter of the RTS was appropriate for the current Turkey Point electrical design, but was not completely upgraded to be consistent with the STS.

In its amendment application dated July 2, 1990, FPL proposed TS for the EPS enhancement project to bring the electric power systems TS in conformance with STS appropriate to the Turkey Point design.

Following a series of technical meetings between NRC staff and FPL representatives, NRC issued the Proof and Review version of the Enhanced Electrical TS (EETS) on May 4, 1990. By letter L-90-174 dated May 9, 1990, FPL commented on the Proof and Review version of the EETS. NRC staff also provided additional comments on the Proof and Review version of the EETS. Resolutions of the issues raised by those comments were included in the final draft issued on June 15, 1990 by letter to Mr. J. H. Goldberg (FPL) from Dr. Gordon E. Edison (NRC). On July 2, 1990, FPL submitted its request for amendment based on the Final Draft EETS. The resulting EETS are the same as the Final Draft EETS except for minor corrections. In the July 2, 1990 letter, FPL certified that the EETS are consistent with the Emergency Power System Enhancement Design Report, Supplement 0, Revision 1, and Supplement 2 to the Emergency Power Systems Enhancement Report (Safety Analysis), Revision 0, both of which were attached to an FPL submittal (letter L-90-196) dated June 4, 1990. FPL also certified that the EETS will be consistent with the as-built condition of the plant at the completion of the dual-unit outage to upgrade the emergency power systems. The FSAR will be updated in mid-1991 to reflect the design changes. FPL also stated that the EETS are consistent with the emergency power systems configurations and equipment out-of-service conditions that were evaluated in the design verification failure modes and effects analyses.

7.1 EVALUATION

Since 1974, new operating licenses have included Technical Specifications (TS) in a standard format as Appendix "A". These standard format TS are based on a set of model TS called the Standard Technical Specifications. These STS are based on the design and design basis safety analyses of a typical plant and

are adjusted to account for differences between the plant's actual design and safety analyses and those of the typical plant. The actual plant design and design basis safety analyses are described in the licensee's FSAR. The NRC reviews the FSAR and issues a Safety Evaluation Report (SER) explaining the acceptability of the plant design and safety analyses. Therefore, the SER provides the NRC's basis for granting the plant's operating license. At the same time, the SER provides the NRC's basis for approving the plant's TS which are part of the license and based on the FSAR.

This process has been repeated for about 60 plant operating licenses since 1974. Therefore, the acceptability of the STS, as modified to account for differences associated with a particular plant, has been well established by the staff, as reflected in about 60 SERs. In addition, since 1974 nuclear power plants have amassed hundreds of reactor-years of experience using STS. The STS have been adjusted over the years because experience has identified areas which needed or could benefit from improvement. Also, changes in plant design since 1974 have resulted in changes in the "typical" plant design reflected by the STS. Many parts of the STS have also been examined using probabilistic risk assessment (PRA) as a tool. Except for rare instances which were corrected, PRA showed that the STS are conservative in terms of safety.

Following are two examples of how the STS are applied generically to an actual plant design. In the first example, LCO 3.0.3 provides a schedule for shutting down the plant when the safety function capability of a system becomes inoperable. The schedule allows time periods for taking the plant to cold shutdown. These time periods are intended to shut down the plant as quickly and as safely as possible because of the lost safety function. At the same time, the time periods are long enough to allow the plant to be shut down in a controlled and orderly manner. This reduces the potential for transients that could challenge safety systems. Also, this schedule allows the plant cooldown rate to be maintained well within the maximum limits, which minimizes the thermal stresses on the primary coolant system. These time periods are based on the experience from thousands of plant shutdowns. This LCO is applied to almost all plants with STS.

A second example of the direct application of STS to an actual plant is the allowance of up to 72 hours to provide the licensee an opportunity to repair a system and return it to service without shutting down the plant. In the typical design, many safety systems have two redundant trains of equipment, each train being individually capable of performing the safety function. These redundant systems provide "single failure" protection--if one train fails the other train is completely capable of performing the safety function. In the STS, if one of these trains is inoperable, the plant is allowed to continue to operate without beginning a shutdown for 72 hours. During this time, "single failure" protection has been lost for the safety system; however, the operable train still provides full capability if an accident occurs. The risk of an accident occurring during the 72 hours is low, and the combined risk of an accident occurring within 72 hours and the operable train failing is even lower. On the other hand, a plant shutdown, no matter how careful, involves some risk of initiating a transient or challenging safety systems. The NRC concluded that the allowed limit of 72 hours provides the appropriate balance of safety. This allowed limit is applied unrevised to almost all dual train safety systems for plants with STS.

Turkey Point was not licensed with STS; however, the TS were derived from analyses in the Final Safety Analysis Report. The SER which supported issuance of the operating license for Turkey Point supported the acceptability of the plant design, design basis safety analyses, and TS. The EETS approved by this Safety Evaluation are the plant-specific application of the STS to the Turkey Point emergency electrical design in the same manner described above - for new operating licenses. Therefore, this Safety Evaluation relies on the original SER for Turkey Point as amended over the years and on the collective SERs for plants licensed with STS since 1974.

The development of the EETS consisted of modifications to the STS to account for electrical design differences and the constraints identified in FPL's letter of September 26, 1986. Specifically, action times and surveillance frequencies in the STS were considered acceptable for comparable design features, even though certain RTS included more restrictive requirements.

On the basis that much of the STS has been retained without changes, and that when modified, it has been consistent with the general guidance of the STS, and with reliance on the licensee's certification, we conclude that the EETS is an acceptable TS for Turkey Point Units 3 and 4.

Finally, NRC programs to improve nuclear reactor safety by improved TS are ongoing. As improvements are identified and found to be acceptable for a class of plants, incorporation of such improvements is achieved in individual plants by license amendments. Such opportunities will continue to be available for Turkey Point.

Acceptability of the EETS was determined by evaluating the acceptability of differences from the STS. In the SER for Amendments 137 and 132, five categories were used to help evaluate differences from the STS. That scheme was used here. All changes (except for simple editorial changes such as renumbering the INDEX to make it consistent with new page numbering) fell into one category, EETS like STS except for design differences. That is, some modification of the STS was needed to accommodate design differences. This tailoring is a common step in applying STS in the development of TS for operating licenses. The approach for those TS and for the EETS has been to modify the STS only as necessary to accommodate the design differences, which reflect the current licensing basis. We conclude on the basis of our review and the licensee's certification that the accommodation of the design differences in each of the EETS has been consistent with STS format and guidance.

The following table lists all the Limiting Conditions of Operation (LCOs) that were changed by the EETS. If only editorial and minor corrections were made to the STS to arrive at the EETS, it is so noted. However, if significant design differences forced some tailoring of the STS, then that design difference is listed.

ETS	Title	Design Difference
----	INDEX	Editorial/Minor Corrections only.
3/4.1.2.3	Charging Pumps - Operating	A third charging pump for each unit (3C or 4C) is powered from a swing load center 3H or 4H.
3/4.3.2	Engineered Safety Feature Actuation System Instrumentation	No response time instrumentation, different setpoint methodology, and different functional units and number of channels
3/4.3.3.4	Fire Detection Instrumentation	Editorial/Minor Corrections only.
3/4.5.2	ECCS Subsystems - Tavg Greater than or Equal to 350 degrees F.	Shared High Pressure Safety Injection Pumps and centrifugal charging pumps not used for safety injection.
3/4.5.3	ECCS Subsystems - Tavg Less than or Equal to 350 degrees F.	Safety injection is by RHR system only.
3/4.5.4	Refueling Water Storage Tank	Two tanks with various flow path alignments.
3/4.7.8.2	Spray and/or Sprinkler Systems	System shared by two units.
3/4.8.1.1	A.C. Sources - Operating	Cross-unit sharing of emergency diesel generators. Second offsite circuit is not immediately available.
3/4.8.1.2	A.C. Sources - Shutdown	Credit for alternate offsite circuit. Tailored list of diesel generator auxiliaries.

FETS	Title	Design Difference
3/4.8.2.1	D.C. Sources - Operating	All four DC busses must be energized when one or more units are in MODES 1,2,3, or 4. Eight battery chargers, two per DC bus. Only one required per DC bus. One battery bank per DC bus, plus spare battery D-52 which can be substituted for any one of the other four battery banks.
3/4.8.2.2	D.C. Sources - Shutdown	Three DC busses must be energized when both units are shutdown. One battery charger required for each of the three DC busses. One battery bank required for each of the three DC busses, plus spare battery D-52 which can be substituted for any one of the three battery banks.

FETS	Title	Design Difference
3/4.8.3.1	Onsite Power Distribution-Operating	Shared AC system - Unit 3 and 4 loads powered from common AC busses, load centers, and motor control centers. Swing load centers and motor control centers provide flexible distribution system. Shared DC system - Unit 3 and 4 loads powered from common DC busses. With one or more units operating, all four DC busses must be energized. Flexible electrical distribution system in which battery chargers can be powered from multiple sources because of swing Motor Control Centers (MCCs).

FSTS	Title	Design Difference
3/4.8.3.2	Onsite Power Distribution-Shutdown	Shared AC system - Unit 3 and 4 loads powered from common AC busses, load centers, and motor control centers. Swing load centers and motor control centers provide flexible distribution system. Shared DC system - Unit 3 and 4 loads powered from common DC busses. With both units shutdown, three, DC busses must be energized. Flexible electrical distribution system in which battery chargers can be powered from multiple sources because of swing Motor Control Centers (MCCs).

7.2 CONCLUSION

On the basis of the evaluation of the licensee's submittals, several meetings with the licensee, and subsequent teleconferences, the staff concludes that the EETS are acceptable. The EETS are in accordance with the requirements of 10 CFR 50.36. The design changes resulting from the EPS enhancement project have been appropriately accounted for in the EETS, and FPL's commitment to develop electrical TS based on the STS has been fulfilled.