U. S. NUCLEAR REGULATORY COMMISSION

REGION V

Report Nos.	50-206/92-17, 50-361/92-17, and 50-362/92-17
Docket Nos.	50-206, 50-361, 50-362
License Nos.	DPR-13, NPF-10, NPF-15
Licensee:	Southern California Edison Company Irvine Operations Center 23 Parker Street Irvine, California 92718
Facility Name:	San Onofre Units 1, 2, and 3
Meeting At:	Region V Office, Walnut Creek, California
Report Prepared By:	B. J. Olson, Project Inspector
Approved By:	H. Wong, Chief Reactor Projects Section 2

5/19/92
Date Signed

Summary

A management meeting was held on April 30, 1992, to discuss the status of the licensee's program for engineering improvement and to discuss recent plant issues. These discussions included the overspeed of a Unit 2 auxiliary feedwater pump, leakage identified in the Unit 1 refueling water storage tank and two emerging issues dealing with check valve testing and the recent repairs to a reactor coolant pump in Unit 3. The licensee also provided information pertaining to the "Partners for Success" program, steam generator eddy current testing, and the operating status of Unit 1. A copy of the slides used during the licensee's presentation is enclosed.

DETAILS

1. Meeting Attendees

Southern California Edison Company

H. Ray, Senior Vice President, Nuclear
B. Katz, Manager, Nuclear Oversight
J. Reilly, Manager, Nuclear Engineering and Construction
M. Short, Manager, Station Technical
R. Ornelas, Manager, Licensing
L. Cash, Manager, Maintenance
D. Brevig, Supervisor, Onsite Nuclear Licensing
J. Mundis, Site Support Services

San Diego Gas & Electric

B. Lacy

Nuclear Regulatory Commission

J. Martin, Regional Administrator
K. Perkins, Deputy Director, Division of Reactor Safety and Projects
S. Richards, Chief, Reactor Projects Branch
L. Miller, Chief, Reactor Safety Branch
G. Yuhas, Chief, Emergency Preparedness and Radiological Protection Branch
H. Wong, Chief, Reactor Projects Section 2
A. Gody Jr., Acting Chief, Engineering Section
C. Caldwell, Senior Resident Inspector
D. Corporandy, Reactor Inspector
B. Olson, Project Inspector

2. Details

a. Engineering Improvement Program

Mr. Ray initiated Southern California Edison's (SCE) presentation of the engineering improvement program by indicating that the program has been one of their larger areas of work. He turned the presentation over to Mr. Reilly.

Mr. Reilly provided an overview of the engineering improvement program, established in 1988. In addition to improving the quality of design work, one of the program goals was to reduce the reliance on architect/engineering firms. As such, the licensee's nuclear engineering staff grew from 203 in 1988 to 466 in 1992. The majority of the growth occurred in the nuclear engineering design organization, however; the licensee still relied on contract personnel to fill approximately fifty percent of the positions in the design organization.

Mr. Reilly indicated that the experience level of the design engineering organization had increased through the addition of experienced personnel

and through training. Mr. Reilly explained that a job task analysis for design engineers had been performed, and a three phase training program had been developed. The training program provided entry level training, system design engineer training, and supervisory training. The training program will be completed in 1992, one year ahead of schedule.

Independent audits of design packages had shown that the design organization correctly applied codes and standards, complied with procedures, and achieved the design objectives. Mr. Reilly indicated the audits found that improvement could be made in the quality of written documentation and that calculations could be more rigorously performed and documented. Mr. Reilly also provided audit information to show that errors in design packages had decreased. In response to a question by Mr. Martin, Mr. Reilly indicated that the improvements in the design packages were attributed to increased effort in the formulation of the package. Mr. Short added that plant operators now participate more in the development of design changes.

Mr. Reilly described the licensee's root cause analysis of calculation problems associated with NRC Generic Letter (GL) 89-10, "Safety Related Motor Operated Valve Testing and Surveillance." The licensee's review was a result of an NRC inspection which found inconsistencies and errors in GL 89-10 design calculations. Mr. Reilly acknowledged that the errors existed and stated that followup calculations showed there had been sufficient margins in design assumptions to accommodate the calculation errors. The cause of the errors was attributed to deficiencies in supervisory methods and management processes. After the licensee's corrective actions were discussed, Mr. Richards asked if the oversight organization had personnel who could review special calculations, such as those required for GL 89-10. Mr. Katz replied that the oversight organization did have personnel who could review the design calculations.

After Mr. Reilly completed his presentation, Mr. Martin indicated that he had observed a number of changes in the way that SCE performs technical work. He made specific reference to the past practice of using outside engineering firms to develop designs and the new practice of developing the designs in-house. In response to a question by Mr. Martin regarding the affects of the changes in engineering processes and organization, Mr. Ray indicated that SCE has seen that design changes are better integrated than before and that by performing the work in-house, SCE personnel have a better understanding of the plant and plant issues.

b. Turbine Driven Auxiliary Feedwater Pump Overspeed Trip

Mr. Short provided information pertaining to an overspeed trip of the Unit 2 turbine driven auxiliary feedwater pump (TDAFP), which occurred on February 26, 1992. The overspeed trip was induced by water that had collected in the steam line leading to the turbine. The licensee concluded that the water collected in the line due to a steam trap that had become clogged and failed to operate properly.

Mr. Short described the system for providing steam to the turbine and stated that two steam traps are installed to remove water that forms in the piping. In 1990, several pump overspeed trips occurred because one of the steam traps was inadvertently left isolated following an outage. The 1990 trips were the subject of an NRC escalated enforcement action. SCE implemented changes as a result of the 1990 overspeed trips, including checking the steam traps to determine whether they were hot. Mr. Short explained that these checks were made to ensure that the traps were in-service and operating.

After the recent overspeed trip, the licensee determined that although the steam trap was not isolated, an internal strainer was found to be about 75 percent obstructed due to the buildup of scale. Mr. Short indicated that condensate would not drain through the trap as a result of the obstruction. The other steam trap in Unit 2 and the two traps in Unit 3 were inspected and found to be free of obstruction.

Mr. Short explained that the traps were not included in the reliability centered maintenance (RCM) program. Had the traps been in the RCM program, an evaluation of potential failure mechanisms would have been performed, and the potential for strainer clogging might have been discovered. Mr. Short indicated that the traps are now bypassed, and SCE plans to re-design the steam supply to the TDAFP and eliminate the steam traps.

Mr. Ray expressed his disappointment that this event occurred. He indicated that the event should not have happened and that he would not have expected it to happen. Mr. Richards stated that if personnel had been a little more intrusive regarding steam trap operation, then the event might have been prevented. Mr. Ray agreed with Mr. Richards.

c. Refueling Water Storage Tank Leakage

Mr. Reilly discussed the licensee's on-going investigation into leakage observed from the Unit 1 refueling water storage tank (RWST). Evidence of leakage was discovered at nine locations near the tank base. SCE performed an ultrasonic examination of the leak areas, assumed a worst case defect, and performed a stress analysis of the tank. SCE concluded that the RWST was operable. Mr. Reilly stated that the defects are believed to be a result of external corrosion due to the tank being exposed to salt in the air. A remote inspection was performed of the tank's interior, and the inspection indicated that internal defects were not causing the leakage.

Mr. Reilly indicated that SCE is continuing to characterize the size of the defects, although this is difficult because of the limited access to the affected area at the base of the tank. As new information becomes available, the stress analysis of the tank is re-performed. In addition, SCE has submitted a relief request to the NRC for not performing tank repairs as specified in Section XI of the American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code.

The licensee plans to meet with NRC Headquarters personnel at the SONGS site in early May 1992 to discuss this issue.

d. Emerging Issues

Mr. Short briefly discussed two emerging issues. The first issue pertained to testing normally closed check valves located in the auxiliary feedwater (AFW) system. SCE had performed tests, as required by ASME codes, to demonstrate that normally closed AFW check valves would open and pass sufficient flow. Tests had not been performed to demonstrate that the AFW check valves would close against reverse flow because SCE considered that normal operation of the plant showed that the valves would close successfully. When SCE discovered that tests should be performed to demonstrate adequate valve closure, the tests were performed. The test results were satisfactory. SCE is investigating why the closure tests were never performed for the AFW valves.

The second issue pertained to the recent failure of six bolts for a reactor coolant pump baffle plate in Unit 3. In April 1991, SCE discovered that bolts for a reactor coolant pump baffle plate in Unit 2 had lost their preload. SCE corrected the Unit 2 problem by using a special technique to assure adequate preload which involved torquing then loosening the bolt. During the last Unit 3 refueling outage, work had been performed on two reactor coolant pumps. When the baffle plates were reinstalled in the pumps, the bolt installation technique developed from Unit 2 was not used. Mr. Short indicated that the bolt installation technique had been thought not to be necessary because a longer bolt had been used in the Unit 3 pumps. Subsequently, six bolts in one of Unit 3's pumps failed, and the bolts in the other pump were found to have lost their preload. The licensee indicated that these bolts would be reworked prior to unit startup.

e. Partners for Success

Mr. Cash provided a description of this program, which had been implemented for Unit 1. The program teams work planners with maintenance foreman and craft personnel to follow a maintenance activity from planning through completion. Mr. Cash indicated that the program has resulted in improved schedule performance and in a reduction of human errors. SCE plans to implement the program for Units 2 and 3 in 1993.

f. Steam Generator Eddy Current Inspection Program

Mr. Mundis described the eddy current inspection program. At least 20 percent of the steam generator tubes are inspected during each refueling outage. SCE has not observed problems with stress corrosion cracking that have been observed at other plants, notably Trojan. To date, only about 3 percent of the steam generator tubes have been plugged out of a limit of about 11 percent.

g. Unit 1 Status

Mr. Ray stated that a proposed settlement for Unit 1 is before the California Public Utility Commission. He indicated that if the settlement is approved then Unit 1 would not operate beyond October or November 1992. If the settlement is not approved, SCE would seek NRC approval to operate Unit 1 using re-shuffled fuel which is in the spent fuel pool.

h. Closing Remarks

Mr. Martin thanked Mr. Ray and members of his staff for the opportunity to meet and discuss issues of mutual interest. Mr. Ray stated that he also appreciated being able to discuss current issues.

NRC MANAGEMENT MEETING

APRIL 30, 1992

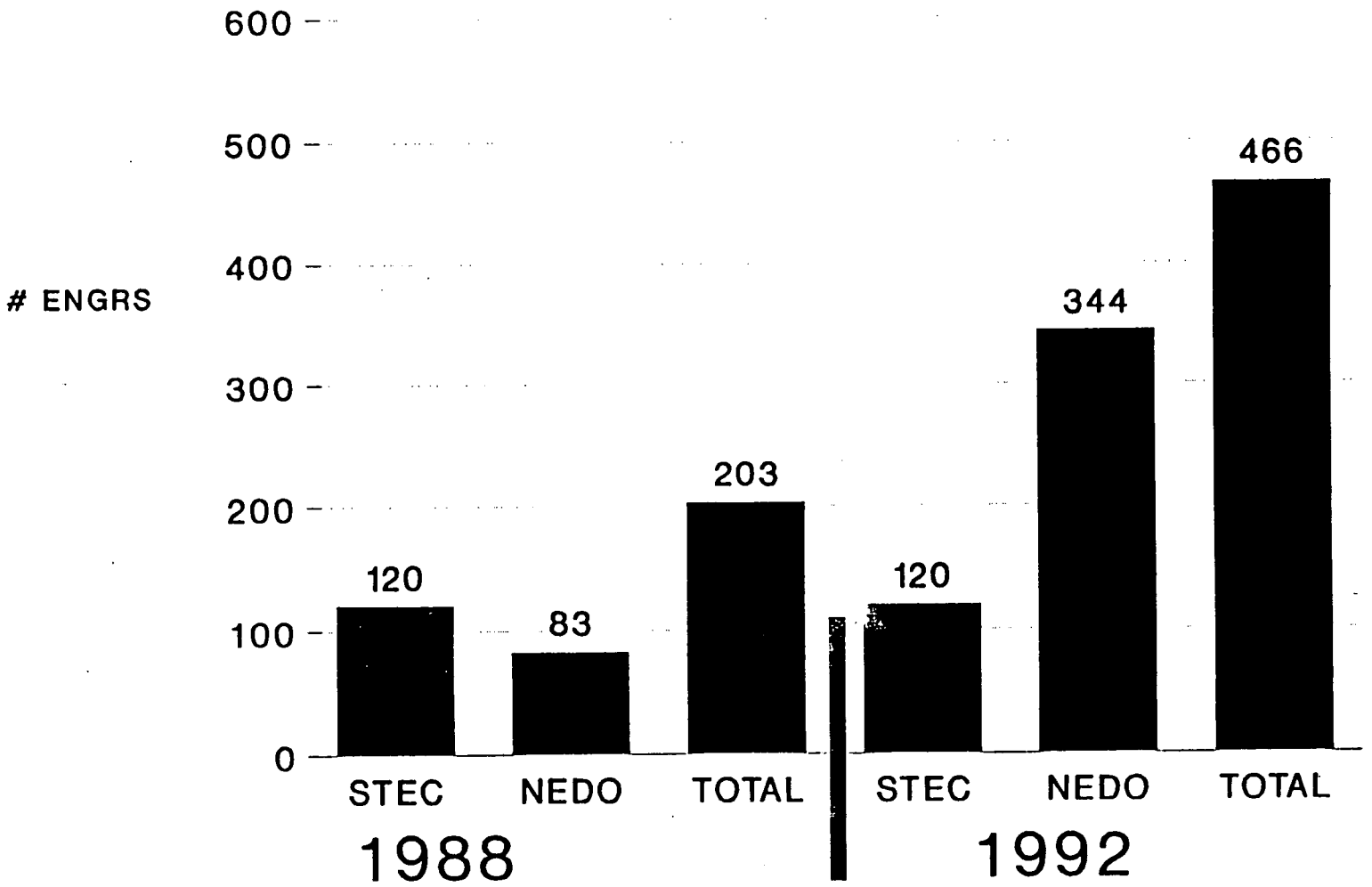
SOUTHERN CALIFORNIA EDISON

Status Report

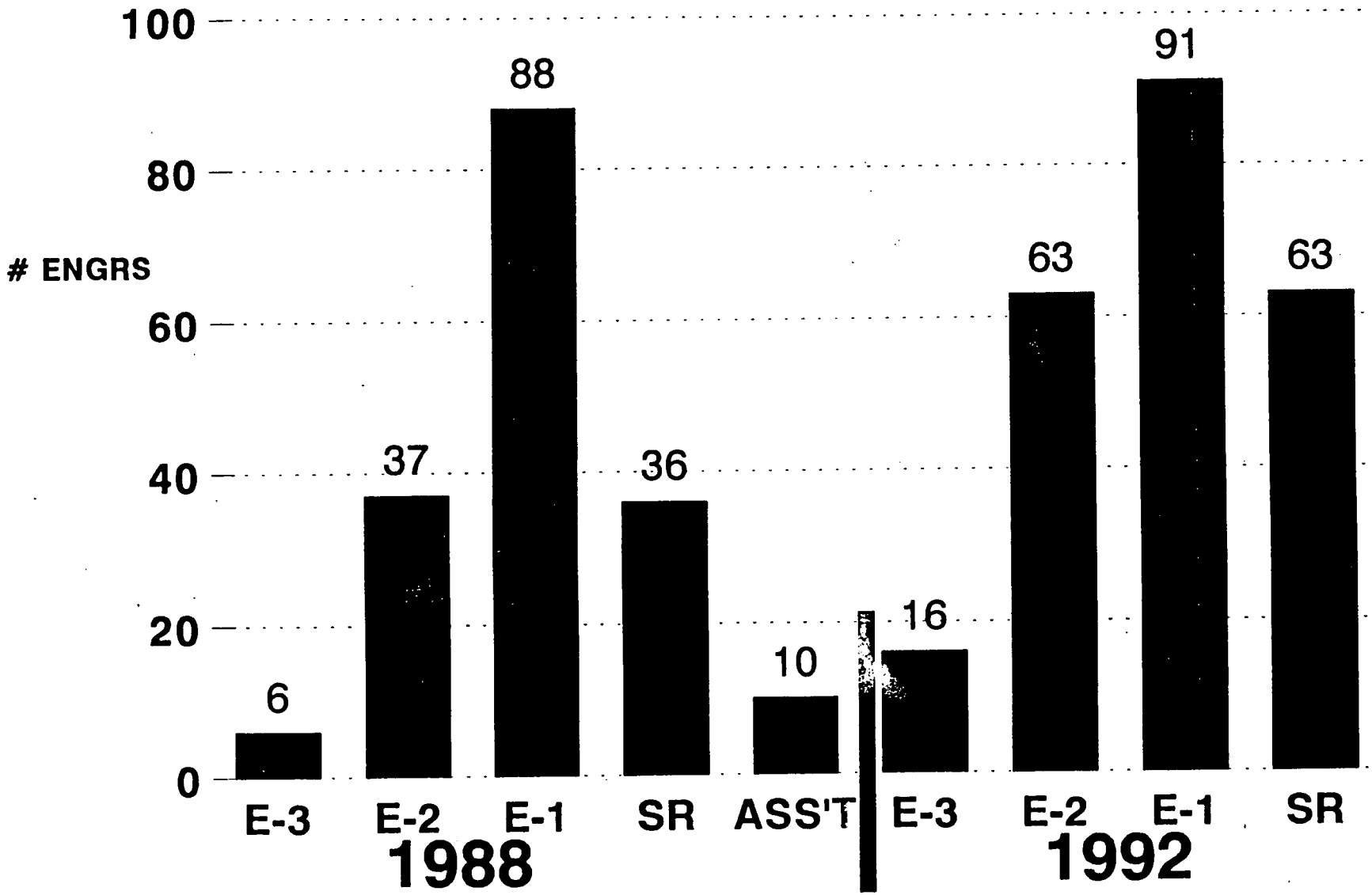
Nuclear Engineering Organization Goals Established 1988 - Five Year Improvement Program

• Improve the Quality of Design	Ongoing
• Make One Organization Accountable for the Design	Complete
• Reduce Reliance on Full Service Contractors (AEs)	Complete
• Questioning Attitude and Attention to Detail	Ongoing
• Provide Experienced, Trained Resources	90% Complete
• Develop a Comprehensive Design Change Process	Complete

TOTAL ENGINEERING STAFF
(SCE + CONTRACTORS)

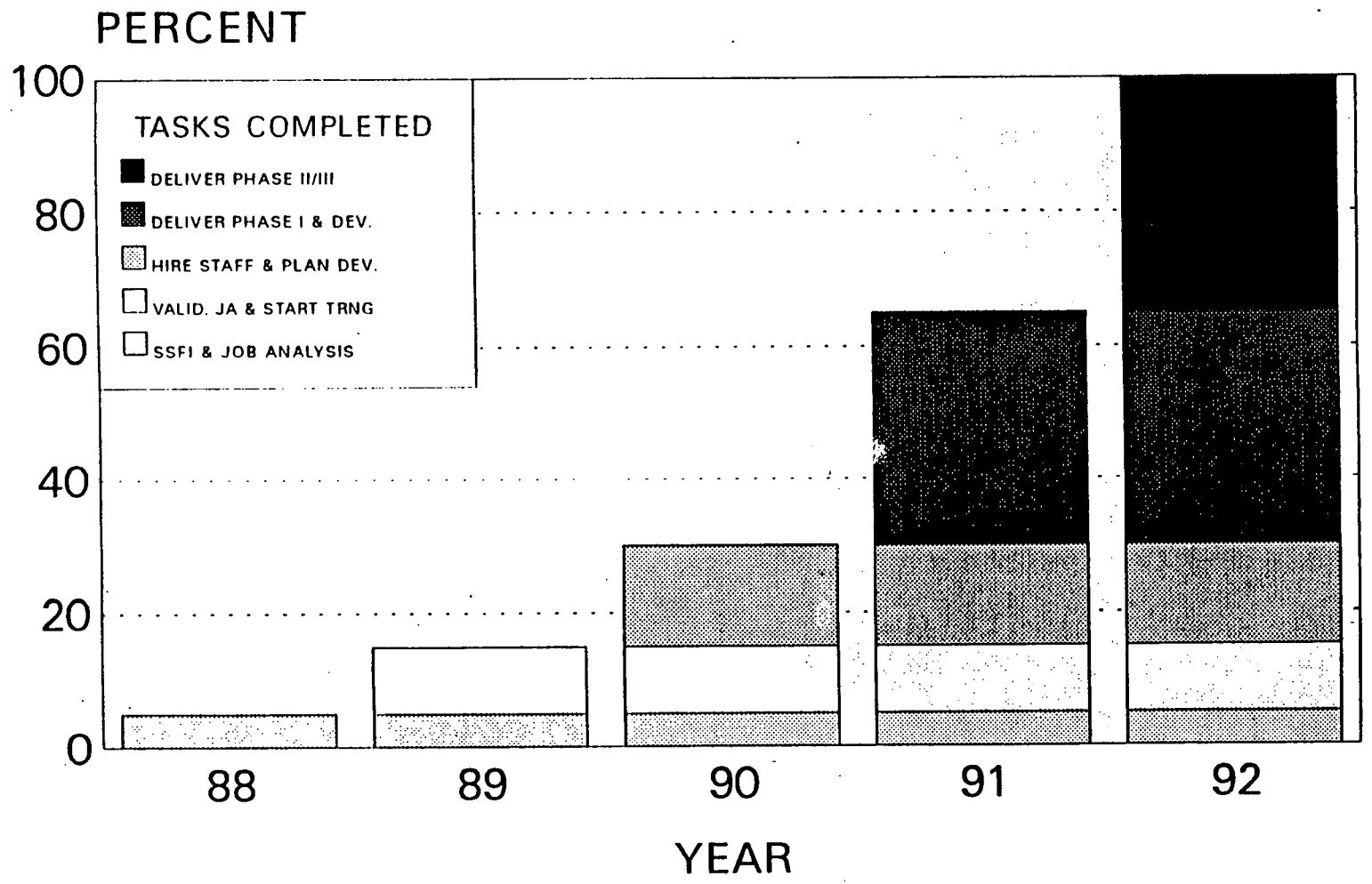


SCE ENGINEERING STAFF
EXPERIENCE



TRAINING PROGRAM DEVELOPMENT

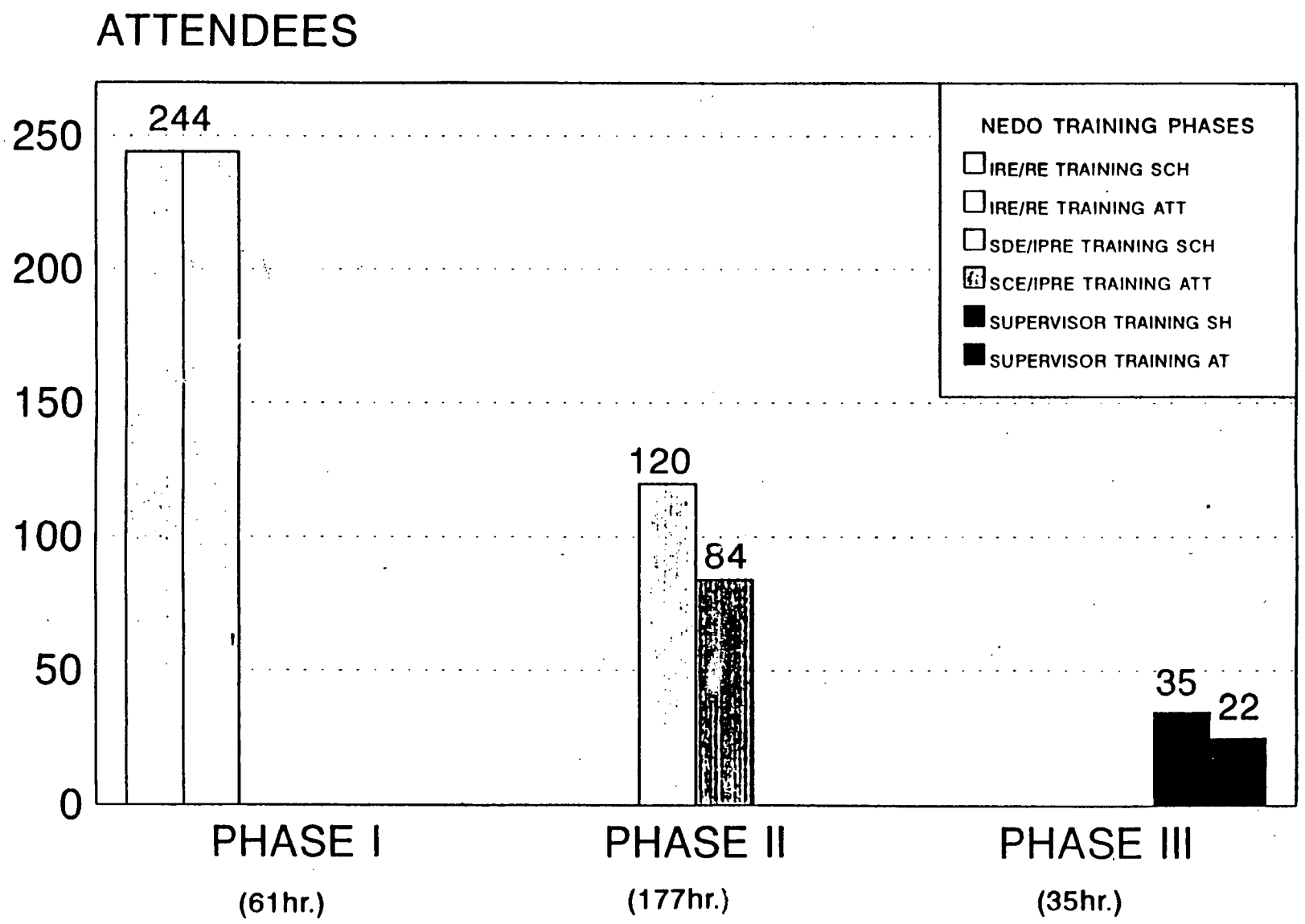
For NEDO Engineers



April 1992

PHASE COMPLETION

AS OF APRIL 1992



ENGINEERING ACCOUNTABILITY

- Increase Supervisor Accountability by Requiring Their Participation in the Design Change and NCR Processes
- Develop the System Design Engineer Concept
- Increase Design Engineering Involvement in Operational Problems

ENGINEER INVOLVEMENT IN OPERATIONS AND MAINTENANCE

	APPROXIMATE RATE	
• NCR	2000/YR	25% NEDO/STEC 75% STEC
• SPR	500/YR	50% NEDO 50% STEC
• FCN	1000/YR	75% NEDO 25% STEC
	2 YRS AGO	25% NEDO 75% STEC

NUCLEAR OVERSIGHT

ASSESSMENT OF SAFETY EVALUATIONS - 10CFR50.59

- Evaluations performed to standards of NSAC125
- In-line review and approval of safety evaluations by Safety Engineering
  - Non-Conformance Reports - ISEG/Root Cause Group
  - Design Changes - Nuclear Safety Group
- Assessment
  - Meets requirements of NSAC125
  - Performed to high quality standards
- Improvements under evaluations:
  - Perform in-line review of safety evaluations for Temporary Field Modifications (TFMs)

INDEPENDENT SAFETY EVALUATION GROUPS

ASSESSMENT OF NCRs

UNIT 2 CYCLE 6

- Reviewed Approximately 300 NCRs
- Accepted Approximately 285 NCRs on First Submittal
- Found Few if Any Significant Safety Concerns
- Significant Increase in Quality Over Past Few Years

ANALYSIS UPGRADE

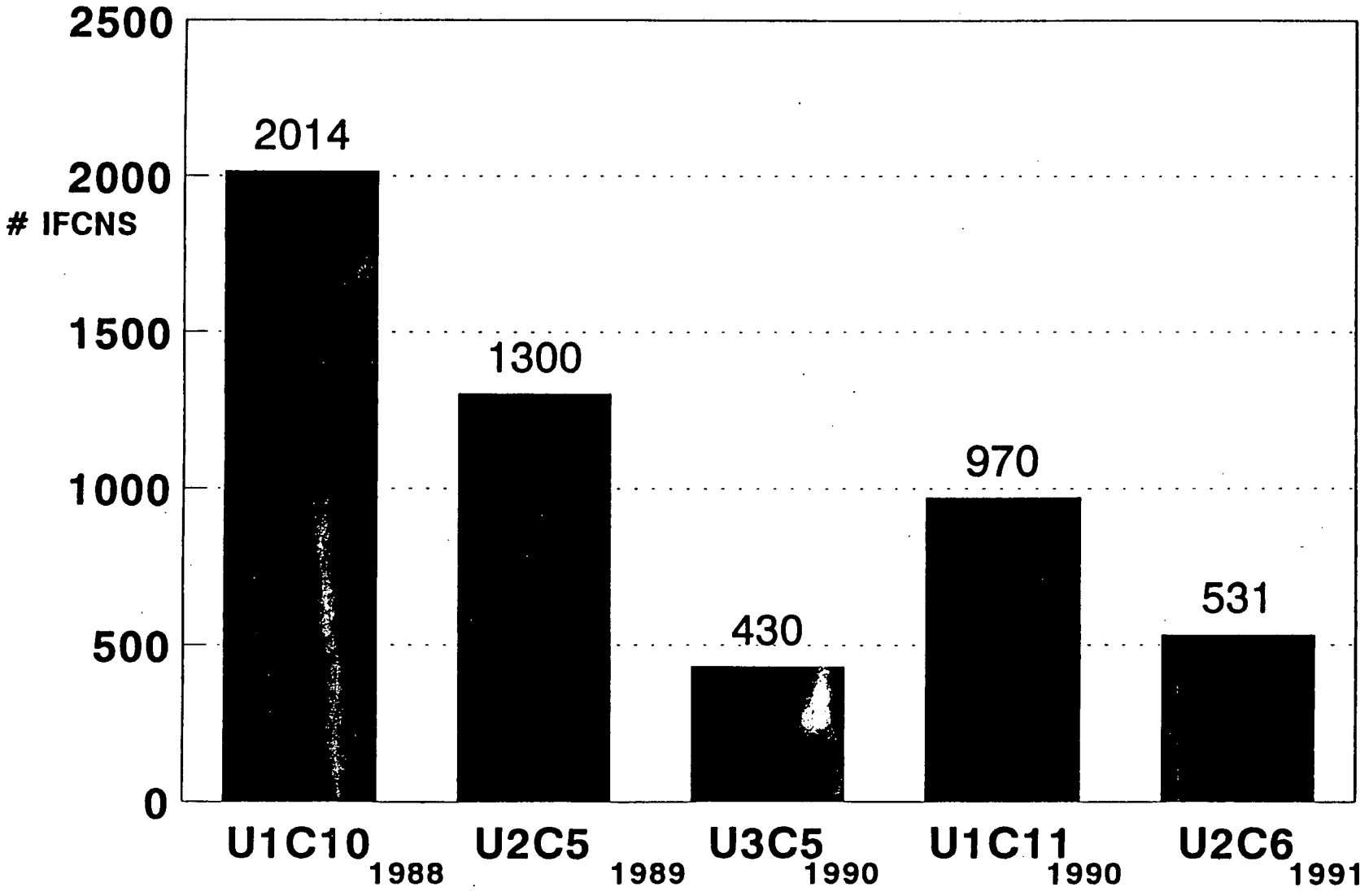
- Mechanical/Civil - 11 Computer Codes Added to Lib.
  - Thermal Analysis
  - 1 & 2 Phase Flow Analysis
  - ASME Class 1, 2 & 3 Stress Analysis
  - Finite Element Analysis
  - Fracture Mechanics Analysis
- Electrical - 4 Computer Codes Added to Lib.
  - Protection Coordination of Power Distr.
  - Transient Analysis of 3 Phase Power Distr.
  - Computer Aided Electrical Design
- Nuclear Safety Analysis - 6 Computer Codes Added to Lib.
  - Containment/Enclosure P/T Analysis
  - Dose Analysis

THIRD PARTY AUDITS OF DCP'S
BY
CYGNA, UNITED ENGINEERS & UNITED ENERGY SERVICES

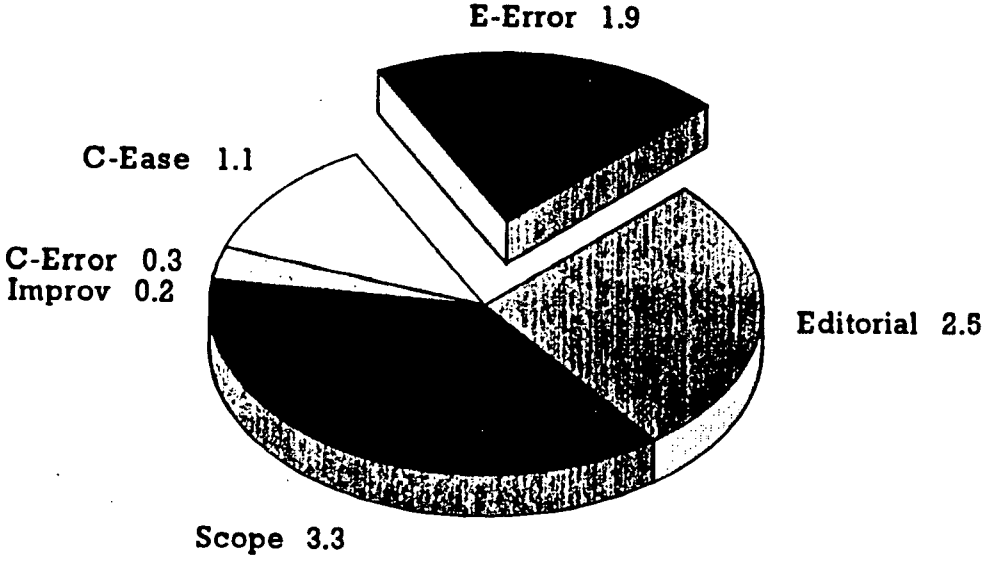
Summary of Findings

- 13 audits have been performed to date
- Good procedural compliance
- Codes and standards are being correctly applied
- Major improvement in the 50.59 evaluations since 1989
- Designs achieved objectives and would perform intended function
- Areas noted for further improvement:
  Quality of written documentation
  Calculations need to be more rigorously performed and documented

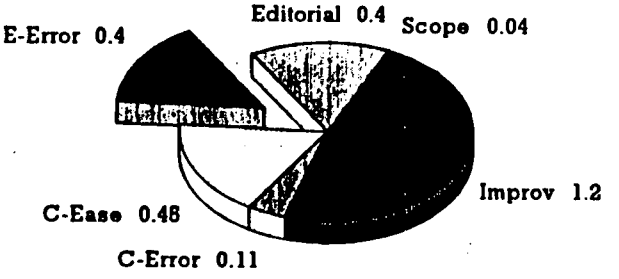
NUMBER OF FIELD CHANGES
PER REFUEL OUTAGE



REVIEW OF DCP CHANGE CAUSES
UNIT 1

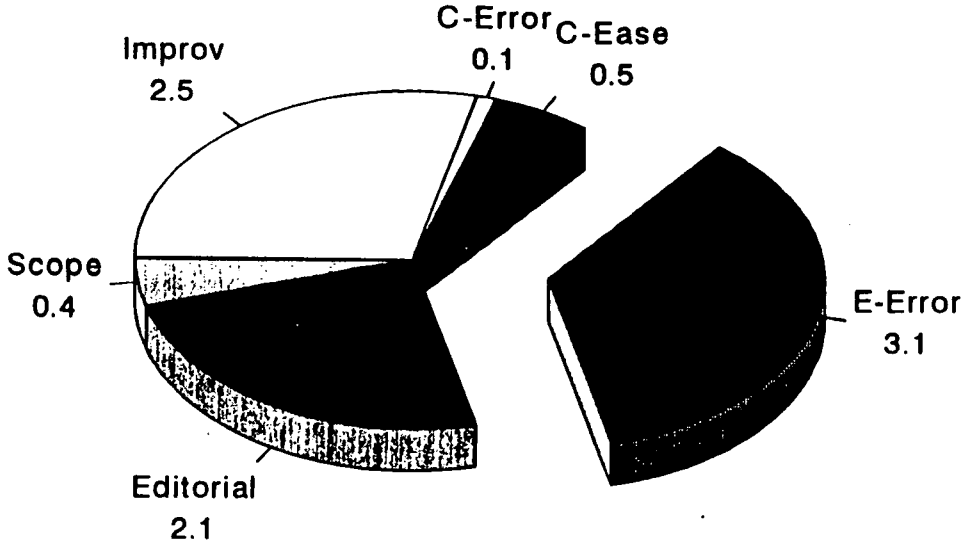


U1C10 - 1988

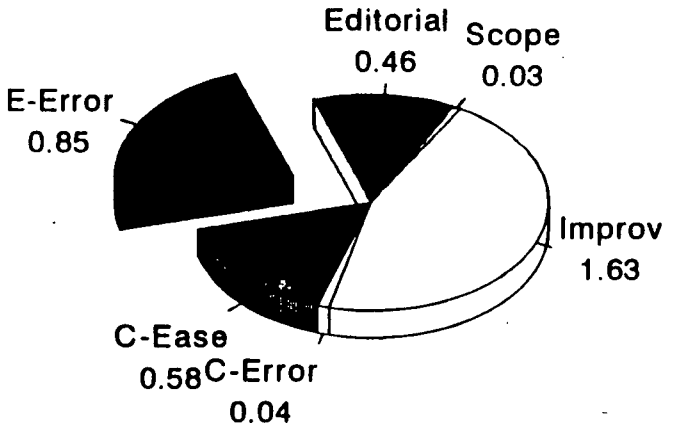


U1C11 - 1990

REVIEW OF DCP CHANGE CAUSES
UNIT 2



U2C5 - 1989



U2C6 - 1991

ENGINEERING DESIGN STANDARDS

SCOPE

The completed set will contain 104 Standards, consisting of 95 Component Standards and 9 Topical Standards. Scheduled completion is the end of 1993.

- Total Standards 104
- Prepared 19
- Issued 10
- In Progress 68

Encompass all engineering disciplines:

- Electrical Engineering
- Mechanical Engineering
- Civil/Structural/Architectural Engineering
- Controls and Instrumentation Engineering
- Nuclear Engineering

ENGINEERING DESIGN STANDARDS

OBJECTIVE

Provide an organized series of manuals which provide practical guidance to an engineer or designer on issues that must be considered in the design process.

- Improve technical performance of the individual and the organization.
- Expand the knowledge base of the organization.
- Improve the efficiency and the productivity of the individual and the organization.

BASIS

The content of the standards is based on the following:

- Current industry practice.
- Technically proven methodologies and practices.
- Standarization where appropriate.
- Focused on the unique requirements of a nuclear plant and specifically SONGS.
- Focused on retrofit as compared to new construction.

ENGINEERING DESIGN STANDARDS

CONTENT

In addition to general topics, each standard considers the following:

- Operation
- Maintenance
- Surveillance
- Testing
- Economic
- Construction
- Analytical Methodologies
- Calculational Examples
- Interface
- Procurement

USE OF SFA STANDARD

In July 1991, Edison prepared and issued a Topical Design Standard on Single Failure Analysis.

RESULTS

- Potential safety enhancements for the containment isolation function of SIS and Recir System identified.
- Topical Design Basis Document on Single Failure identified other similar opportunities for safety enhancements of plant systems.
- Updating the UFSAR Failure Modes and Effects Tables will result in improved documentation of plant compliance with NRC safety criteria.

GENERIC LETTER 89-10
OPPORTUNITIES FOR IMPROVEMENTS

- Initial problem identification
- Effect of results on engineering product
  - 6% non-conservative
  - Sufficient margin to accommodate non-conservatisms
- Root Cause Categories
  - Supervisory Methods Breakdown
    - Assessment of nature of work
    - Allocation of experienced engineers
    - Inappropriate work tools
    - Review process ineffective
  - Management Processes Breakdown
    - Identification of scope and its complexity
    - Timely resolution or organizational issues

CORRECTIVE ACTION

- Reassignment of supervisor.
- Detailed review of additional calculations (8).
- Reviewing management process that initiates/controls work for complex tasks that are not project controlled.
- Enhancement of supervisory training/selection.
- Direction on use of engineering tools.
- Engineering guidelines for 89.10 work.
- Calculations will be redone.
- Reemphasis to supervisors/engineers on management's expectations.
- Better in process monitoring.

SAN ONOFRE UNITS 2 & 3

TURBINE DRIVEN AUXILIARY FEEDWATER PUMP

WATER INDUCED OVERSPEED TRIP

February 26, 1992

RECENT HISTORY

- FALL 1990 - OVERSPEED TRIPS DUE TO WATER INTRUSION
  - TRAP SO2-F207 ISOLATED
  - ASSOCIATED STEAM SUPPLY 2HV-8201 NORMALLY CLOSED
  - CONDENSATION BUILDUP BEHIND 2HV-8201
  - PROCEDURES DID NOT CONTROL PRE-TEST POSITION OF 2HV-8201

- FALL 1991 - CHECK VALVE DAMAGE OBSERVED
  - TRACED TO STEAM LINE WARMUP PROCEDURE (9/90)--2MU1258 OPENED PRIOR TO STEAM LINE BLOWDOWN
  - CHANGED POSITIONS OF 8201 & 8200 FOR SO2--MINIMIZE DELTA P THAT ACCELERATES WATER SLUG

OVERSPEED EVENT 2/26/92

FINDINGS

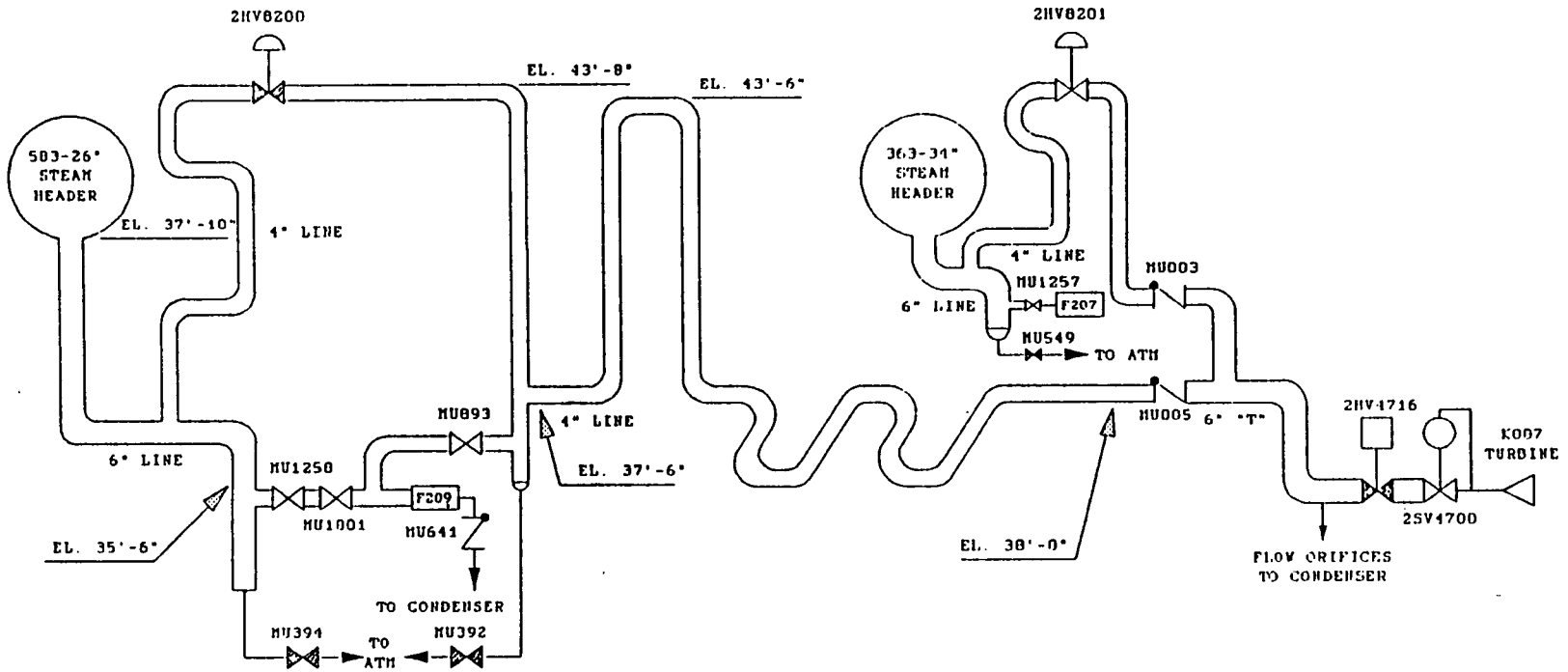
- REALIGNMENT OF 8200/8201
  - IST 4 DAYS LATER
- ROUTINE IST ON 2/26
  - TRAP OPERATION CHECKED BY OPERATOR
  - PROCEDURE MODIFICATIONS MADE FOLLOWING '90 EVENT TEST SYSTEM IN AS-FOUND CONFIGURATION (No steam line blowdown)
  - OVERSPEED TRIP FROM OBVIOUS WATER INTRUSION
- TRAP F-209
  - MARGINALLY LOW INLET TEMPERATURE
- STEAM SYSTEM TRAPS NOT YET REVIEWED BY RELIABILITY CENTERED MAINTENANCE (RCM) PROGRAM
- NO DAMAGE TO STEAM LINE COMPONENTS AND TURBINE
  - SCRATCH PLATES SHOWED NO SIGNIFICANT MOTION
  - DISASSEMBLY AND INSPECTION OF CHECK VALVES

OVERSPEED EVENT 2/26/92

CONCLUSIONS

- TRAP F209 DEGRADED OPERATION
  - TRAP INSPECTION - STRAINER CLOGGED
- QUALITATIVE OPERATOR MONITORING NOT CAPABLE OF DETECTING DEGRADED PERFORMANCE
- RCM PROGRAM WOULD HAVE IDENTIFIED TRAP PERFORMANCE REQUIREMENTS

SCHEMATIC OF AUXILIARY FEEDWATER PUMP STEAM SUPPLY PIPING



LEGEND:

OPEN VALVE

CLOSED VALVE

NOT TO SCALE

FOR ILLUSTRATIVE PURPOSES ONLY

OVERSPEED EVENT 2/26/92

CORRECTIVE ACTIONS

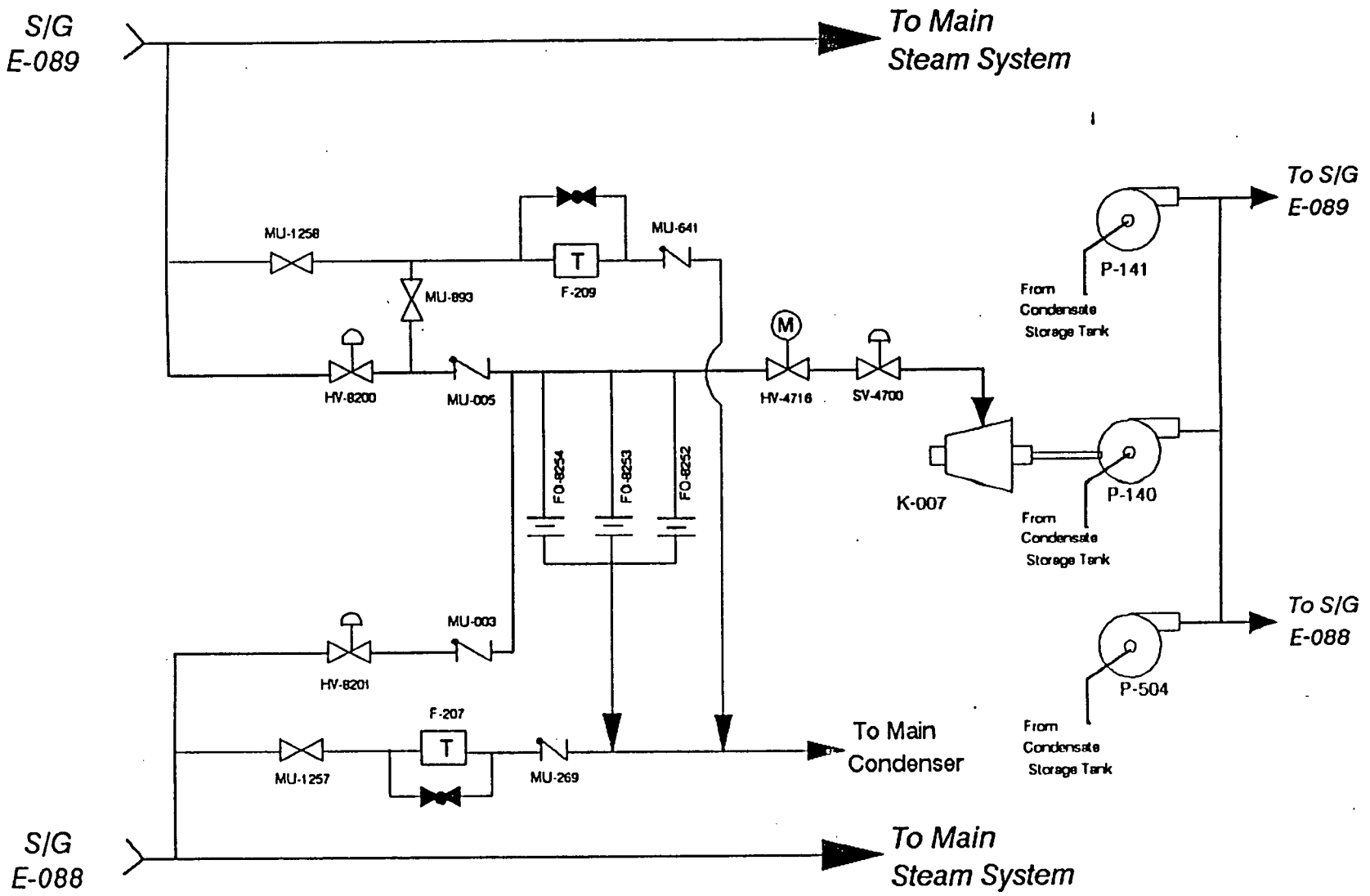
- UNIT_2/3 TRAPS F207 and F209 TRAPS OPERATING IN BYPASS UNTIL PLANT MODIFICATIONS IMPLEMENTED

- INSPECTION OF SO3 STEAM SUPPLY TRAPS

- RESTORED ALIGNMENT OF 8200/8201

- QUANTITATIVE ACCEPTANCE CRITERIA FOR TRAP PERFORMANCE

- RE-DESIGN OF STEAM SUPPLY AND OVERSPEED TRIP SETTING PLANNED FOR NEXT REFUELING OUTAGE.


S/G
E-089
To Main
Steam System
MU-1258
MU-641
T
F-209
MU-893
HV-8200
MU-005
HV-4716
SV-4700
M
To S/G
E-089
P-141
From
Condensate
Storage Tank
K-007
P-140
From
Condensate
Storage Tank
FO-8254
FO-8253
FO-8252
MU-003
HV-8201
To S/G
E-088
P-504
From
Condensate
Storage Tank
F-207
T
MU-1257
MU-269
To Main
Condenser
S/G
E-088
To Main
Steam System

UNIT 1

RWST

INVESTIGATION

INITIAL RWST INVESTIGATION

- Visual Inspection External by STEC and NEDO Engineers
- External UT of Excessible Area Around Defect
- Developed a Non-Code Repair to Eliminate Tank Weapage
- Order of Magnitude Stress Analysis Done on Tank Defect Location
- Review Corrosion Mechanism With Onsite Metallurgist
  - Concluded That Corrosion From Outside
- Completed Initial Operability Assessment
- Initiated Discussion with NRC

CONFIRMATION RWST INVESTIGATION

- Best Effort Defect Characterization
- Obtained Independent Corrosion Expertise and TK Vendor Expertise
- Performed Detail Stress Analysis of Tank
- Internal Video Inspection
- Based Upon Internal Inspection Performed Detailed External UT of Tank
- Historical Records Search
- Multiple Discussions with NRC Staff

Conclusions to Date:

- Initial Evaluation Remains Valid
  - Tank Structurally Operable
  - Submitted Relief Request to NRR for Weapage Condition

STEAM GENERATOR EDDY CURRENT TESTING PROGRAM

Refueling Outage Interval Inspections

- 20% of tubes (plus "batwing" region and previous >20% through-wall indications) inspected with bobbin coil probe
- 100 tubes/steam generator inspected with profilometry
- All indications evaluated regardless of amplitude
- "3rd Party" review of all data (experienced analysts)
- Eddy current signals are "clean" (i.e., very little interference with interpretation)

Experienced Steam Generator Engineers

- Supervisor - 15 years of steam generator experience
- Senior Engineer - Level III in eddy current testing
  - 10 years of steam generator experience
- Well developed network of peer/industry contacts
  - Keep abreast of experience at other plants

PARTNERS FOR SUCCESS

- **GOAL**: Create a Spirit of Teamwork and Accomplishment through Commitment, Ownership, Empowerment, and Accountability

- Key Elements of the Program

  - Planner and Foreman Partnership
  - Craftsmen a Part of the Team
  - Managing Human Effectiveness Training
  - Frequent Meetings with Management

HISTORY OF THE PROGRAM

- Why was it needed?
  - Personnel Errors
  - High Turnover Rate
  - Personnel Contaminations
  - Poor Schedule Performance
  - Grievance Activity

- Partners for Success Implemented Unit 1 July 1991

RESULTS ACHIEVED

- Improved Communication between Management and the Work Force
- Better Quality Work Plans
- Reduced Human Errors
- Improved Schedule Performance
- Reduced Maintenance Order Backlog

FUTURE OF THE PARTNERS PROGRAM

- Implement the Program in SONGS Unit 2/3 Maintenance

  - Reorganization and Relocation of Planners

  - Train Unit-2/3 Maintenance Manager and Maintenance Superintendents

  - Form Teams and Train Supervisors and Planners

  - Train Craftsmen and Include in Teams

  - Include Other Organizations