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

November 7, 1989

MEMORANDUM FOR: Jose A. Calvo, Chief
Technical Specifications Branch
Division of Operational Events Assessment, NRR

THRU: David C. Fischer, Section Leader
Special Projects Section
Technical Specifications Branch

FROM: Millard L. Wohl, Reactor Engineer
Special Projects Section
Technical Specifications Branch

SUBJECT: SUMMARY OF OCTOBER 4, 1989 NRC-INDUSTRY TECHNICAL SPECIFICATIONS IMPROVEMENT PROGRAM MEETING ON RISK-BASED TECHNICAL SPECIFICATIONS

Members of OTSB and our contractors from SAIC and BNL met with personnel from Pacific Gas and Electric Company (PG&E) and Philadelphia Electric Company (PECo) to discuss their continuing risk profile data collection efforts, to discuss utility comments on several items identified at the August 3 working group meeting, and to observe a demonstration of the Plant System Monitor (PSM) presented by the Electric Power Research Institute (EPRI).

PG&E and PECo presented overviews of the types of data they have been able to collect. The data presented by PECo for the Limerick plant showed no time periods when more than one component was removed from service. However, the data presented by PG&E showed several instances where multiple component outages had occurred. The differences in the results shown by the two utilities is perhaps indicative of the different types of information used to generate the data. The PECo data was based on the removal from service of trains of systems found to contribute to plant risk as determined by the Limerick PRA. The types of equipment included in the PG&E data were more extensive and included data for components that may not have been inoperable (but were removed from service) and components that apparently could have been returned to service quickly if needed. The existence of the multiple component outages in one set of data, and the number of such outage combinations, support the desirability of a living-PRA, quasi real-time risk model. The differences in the data collection methods used need to be analyzed to determine whether the data differences are due to plant-specific differences or if the scope of the data collection at each plant was responsible for the data differences. If the differences in the data collection methods and the spectrum of data collected are the reasons for the differences, the definition of the appropriate data to be included in a quasi real-time risk-based set of Technical Specifications will have to be determined in the pilot study.

Additional efforts being pursued to incorporate risk perspectives into Technical Specifications were also discussed at the meeting. PG&E presented (in conjunction with Westinghouse) a proposal to evaluate the concept of flex specs, specific Technical Specifications with pre-planned risk-based alternatives. An SCE consultant outlined a diesel generator Technical Specification evaluation for the San Onofre 2/3 Units. This project is an example of a proposed line item improvement through the use of probabilistic methodology.

The afternoon was reserved for a presentation of the PSM by EPRI. Although directed primarily toward evaluating plant availability, the PSM has several capabilities of interest to the Risk-Based Technical Specification Working Group. Among these is the on-line capability to monitor system, train, and component availability. A routine for evaluating the Technical Specification status of the plant is built into the system. It identifies the applicable LCO conditions in force for the current plant configuration and for projected configurations. On a system by system basis the PSM is able to recalculate the impact on system availabilities of change in component status. The PSM contains models for several systems not normally explicitly modelled in a PRA that may need to be modelled in a Technical Specification model. Additionally, PSM models these systems for all operating modes, not just power operation.

Our next working group meeting is tentatively scheduled for mid-January 1990. By then we should have received input from all participating utilities on the proposed risk-based criteria and the costs associated with the implementation of the pilot program.

Original Signed By

Millard L. Wohl, Reactor Engineer
Special Project Section
Technical Specifications Branch, DOEA/NRR

Enclosures:
1. Plant Risk Data - PECo
2. Plant Configuration Risk - PG&E
3. Equipment Out of Service - PG&E
4. Reliability-Based Tech Spec - PG&E/Westinghouse
5. Diesel Generator TS Improvements - SCE/ERIN
6. PSM - EPRI

DISTRIBUTION:
Please see attached

DOCUMENT NAME: MINS MTG 10/4 RISK-BASES TS

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MLWohl	DCFischer
11/07/89	11/7/89

November 7, 1989

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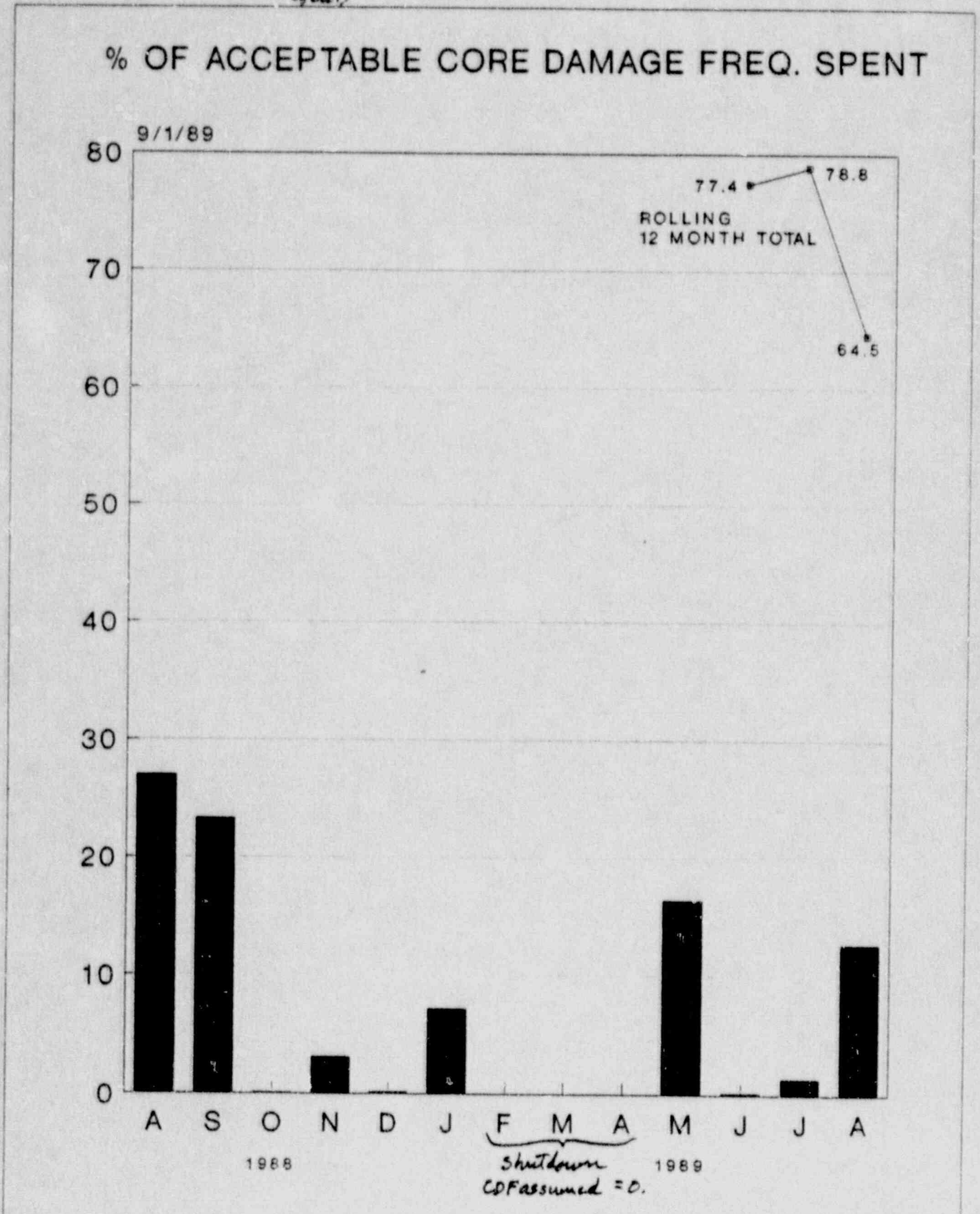
Enclosure 1

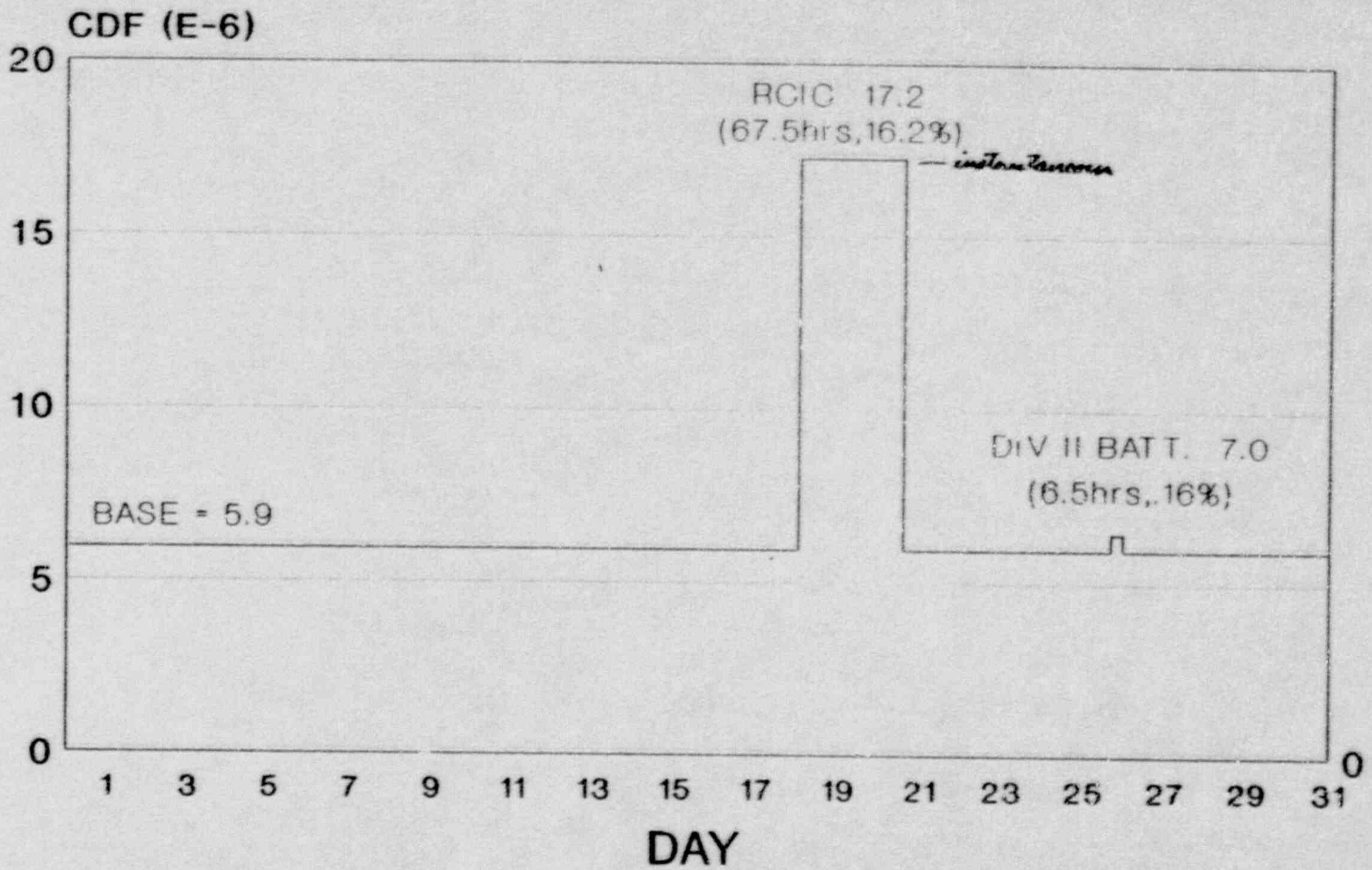
PECo (Limerick #1)

Baseline CDF (goal): 6E-6/yr



LGS SYSTEM UNAVAILABILITIES

MAY 1989



LGS SYSTEM UNAVAILABILITIES

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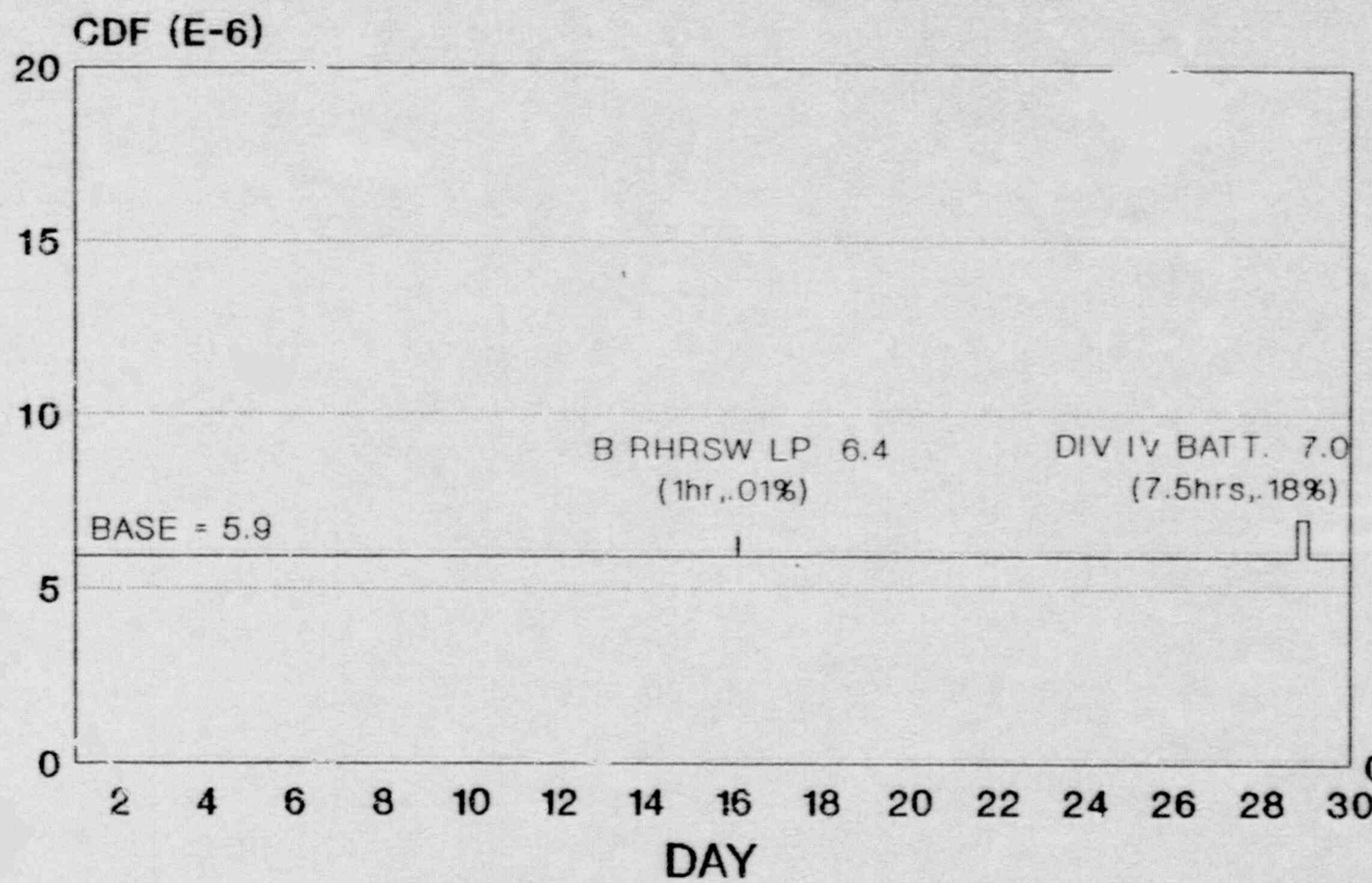

LGS SYSTEM UNAVAILABILITIES

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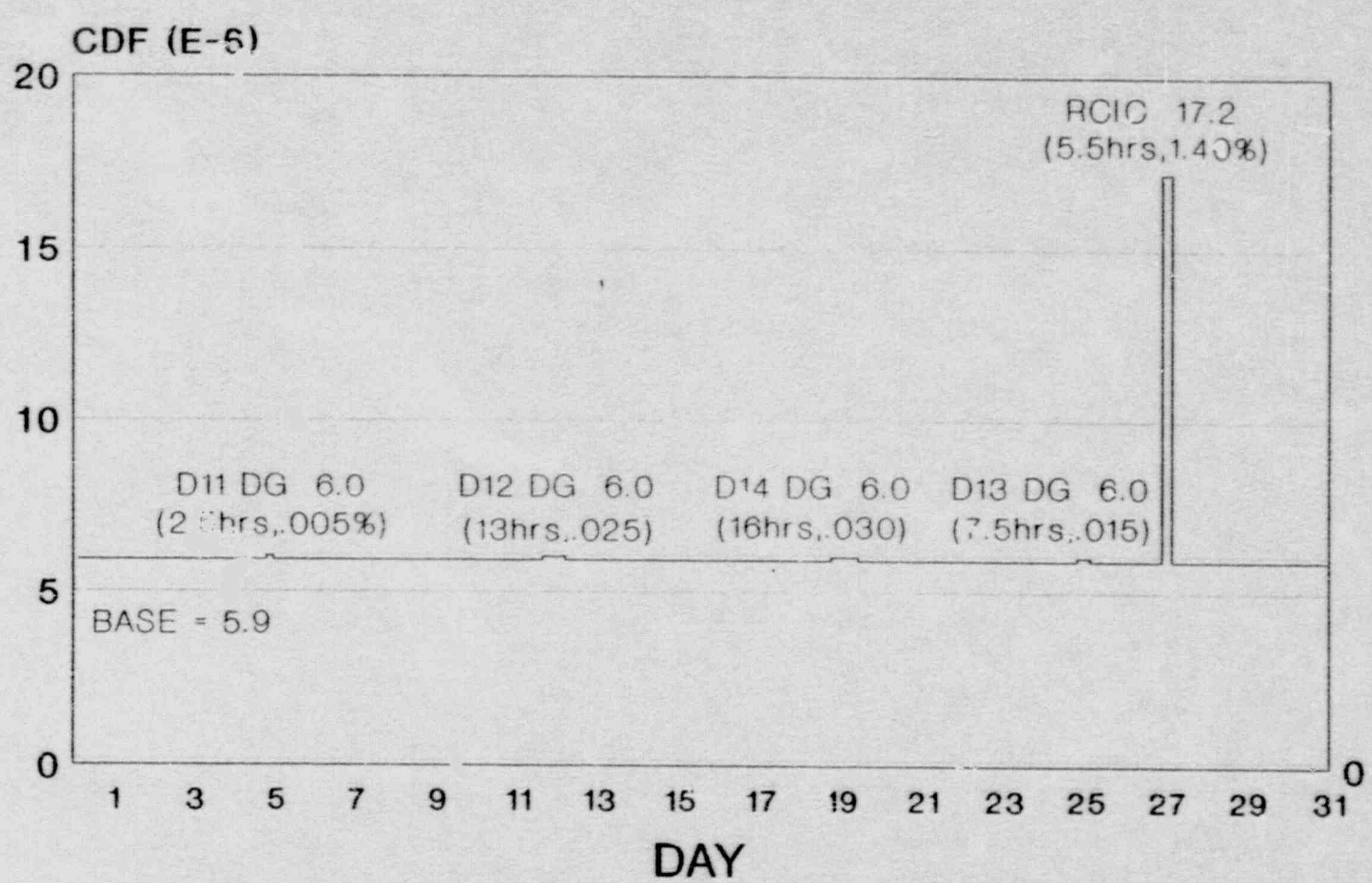
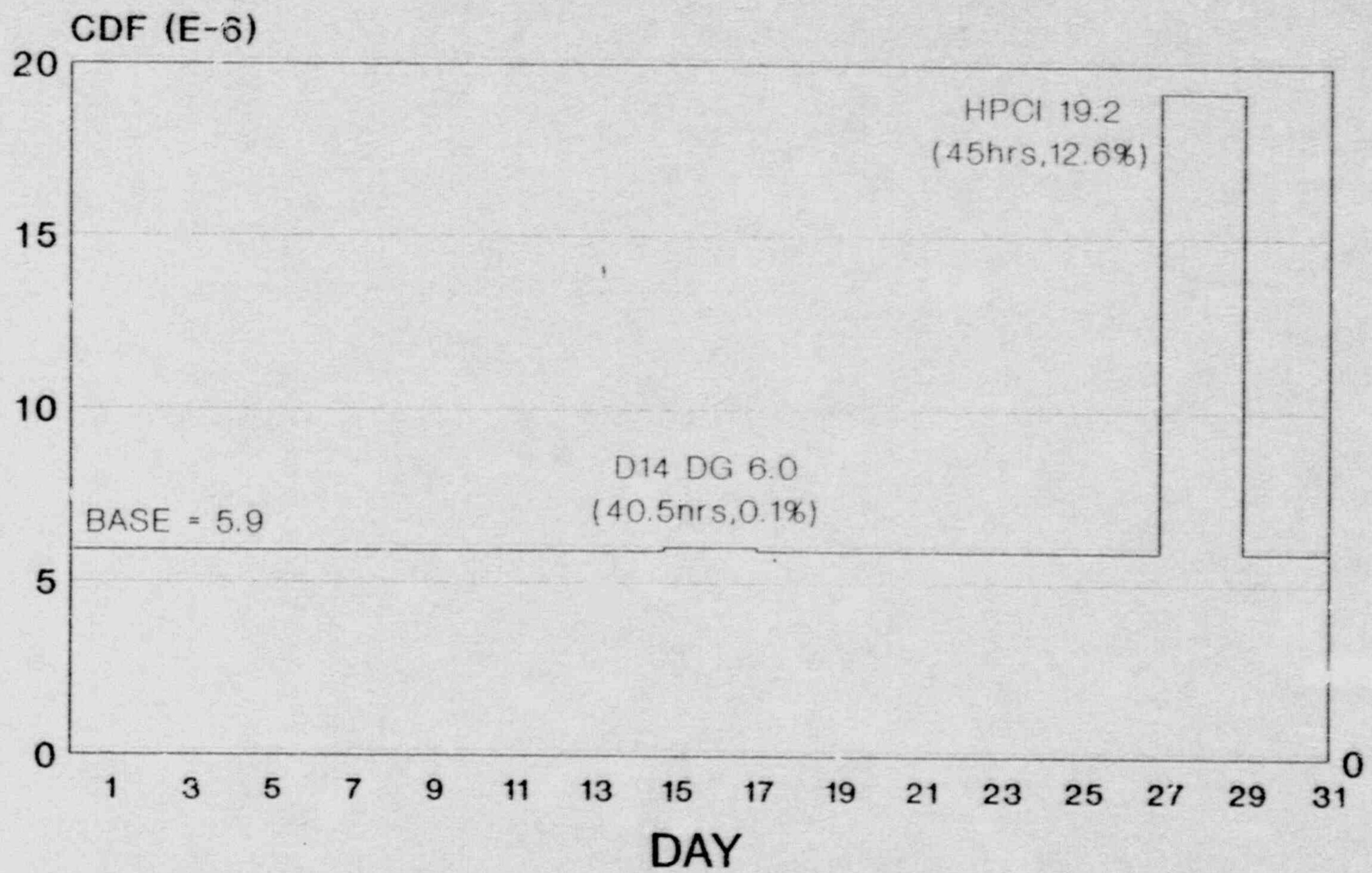
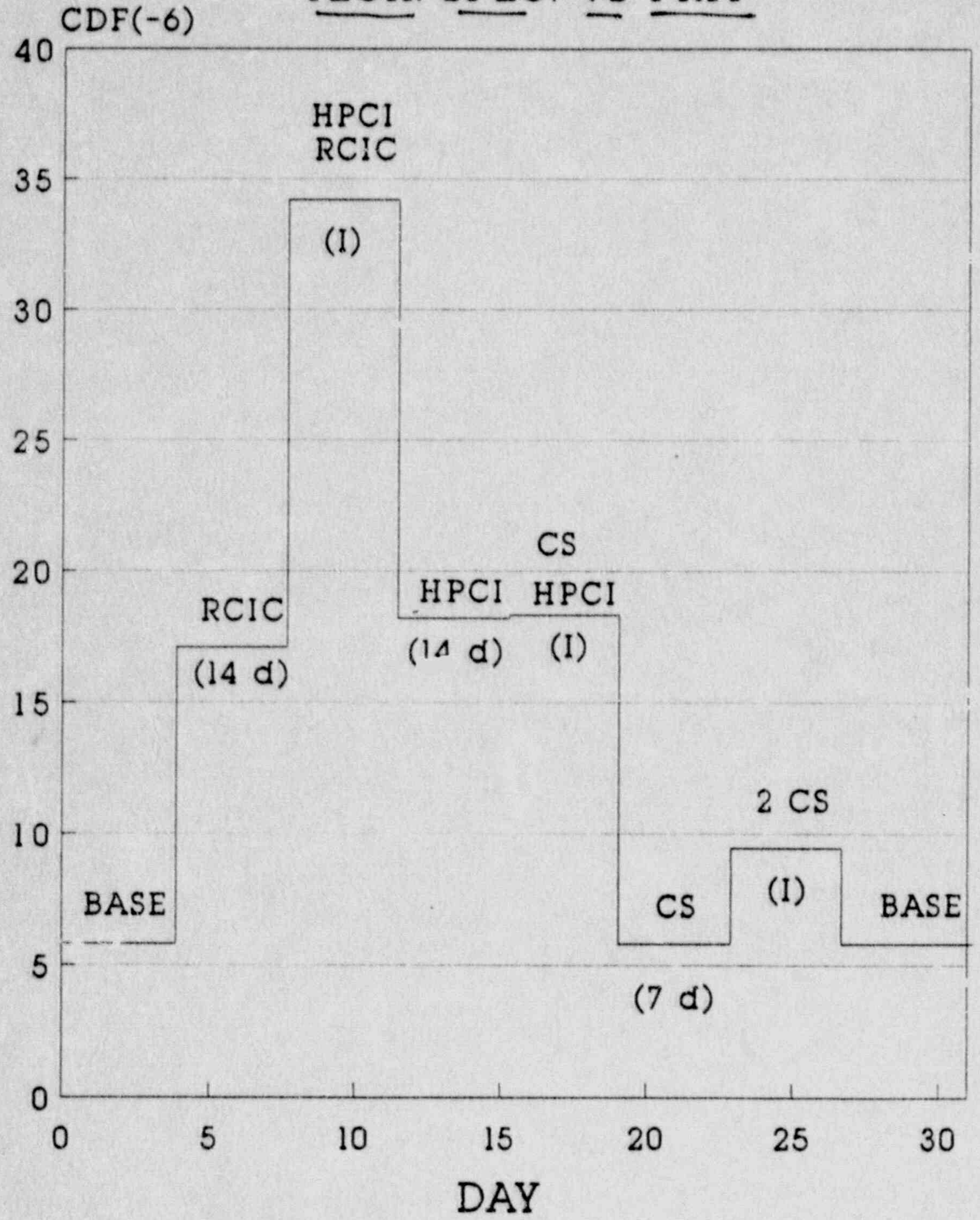


LGS SYSTEM UNAVAILABILITIES
AUGUST 1989



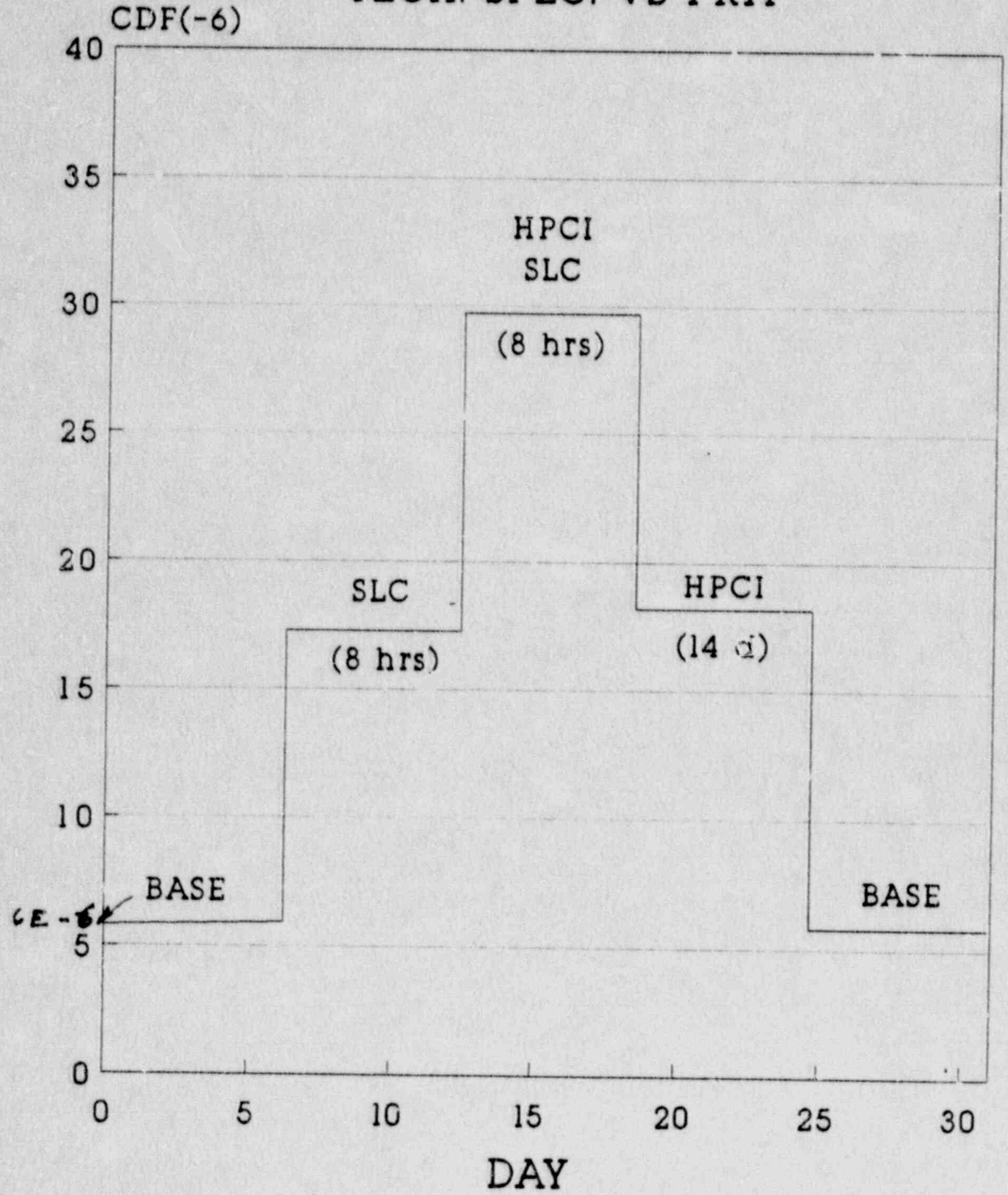
UNAVAILABILITIES

TECH. SPEC. VS PRA



UNAVAILABILITIES

TECH. SPEC. VS PRA



PG&E

Enclosure 1

PACIFIC GAS AND ELECTRIC COMPANY

PRELIMINARY EVALUATIONS

OF

PLANT CONFIGURATION RISK

R. L. THIERRY

GOAL OF TECH SPEC

RISK ASSESSMENT PROGRAM

- REVIEW PLANT CONFIGURATION TO DETERMINE (BY A PLANT SPECIFIC PRA) THE IMPACT OF EQUIPMENT STATUS CHANGE ON RISK

RISK BASED TECHNICAL SPECIFICATION PILOT PROGRAM

- MANPOWER REQUIREMENTS
- RISK CRITERIA
- APPLICATIONS:
  - SUBTLETIES
  - LIMITATIONS
  - CONSERVATIVE ASSUMPTIONS
  - PLANT CONFIGURATIONS
- SUMMARY

MANPOWER REQUIREMENTS:

- DAILY PLANT CONFIGURATION DATA COLLECTION
- SCREENING BASED ON PRA INPUT
- RESEARCH CONFIGURATION DETAILS
  - SURVEILLANCE TEST
  - ACTION REQUEST
  - CLEARANCE REQUEST
- PRA MODEL IMPACTS
  - BOUNDARY CONDITIONS
  - DEPENDENCIES
  - SUCCESS CRITERIA
  - QUANTIFICATION
- MINIMUM MANPOWER
  - 1.5 DEDICATED ENGINEERS
  - PLANT KNOWLEDGE
  - PRA KNOWLEDGE
  - COMPUTER MODEL
  - REVIEW
  - OPERATIONS INVOLVEMENT

RISK CRITERIA:

- PLANT SPECIFIC - preferred by PG&E
  - MODELING DETAIL
  - MODELING ASSUMPTIONS/CONSERVATISMS
- CURRENTLY ALLOWED BY TECH. SPECS.
  - DIFFERENT CONFIGURATIONS
  - ACTUAL PLANT EXPERIENCE
  - POSTULATED CONFIGURATIONS
- CORE DAMAGE FREQUENCY
  - MITIGATING SYSTEMS
  - CONTAINMENT SYSTEMS
- IPE
  - LEVEL II RISK MEASURE
- OFFSITE CONSEQUENCE ANALYSIS
  - CONTROVERSIAL

APPLICATIONS:

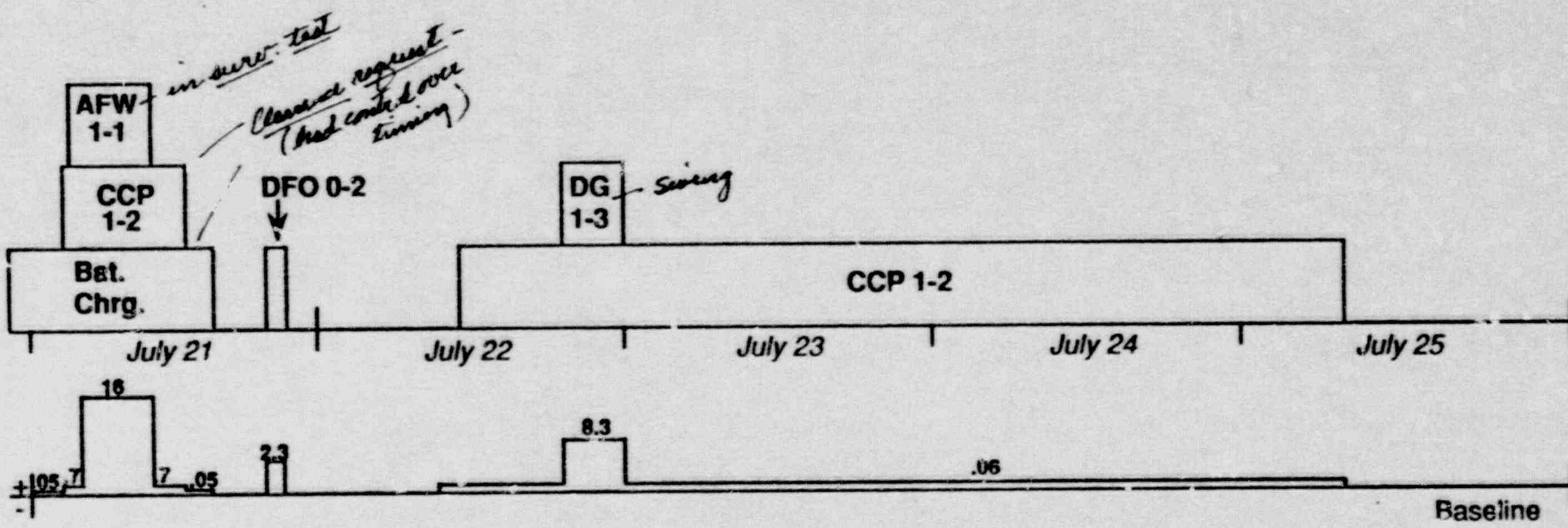
- SUBTLETIES
  - UNIT 1 vs. UNIT 2
  - MULTIPLE UNIT IMPACTS
- LIMITATIONS
  - ACTUAL EQUIPMENT UNAVAILABILITY
  - NOT IN PRA MODEL
  - EXISTING BOUNDARY CONDITIONS
  - NEW BOUNDARY CONDITIONS
  - RE-EVALUATE SYSTEM ANALYSIS
- CONSERVATIVE ASSUMPTIONS
- PLANT CONFIGURATIONS
  - UNIT 1 AND UNIT 2
  - ONE MONTH OF DATA
  - DELTA RISK
  - BASELINE RISK

PLANT CONFIGURATION NOMENCLATURE

CCP	CENTRIFUGAL CHARGING PUMP
DG	DIESEL GENERATOR
SSPS	SOLID STATE PROTECTION SYSTEM
PAMS	POST ACCIDENT MONITORING SYSTEM
DFO	DIESEL FUEL OIL
ASW	AUXILIARY SALTWATER
SI	SAFETY INJECTION
CFCU	CONTAINMENT FAN COOLER UNITS
RVLIS	REACTOR VESSEL LEVEL INSTRUMENTATION SYSTEM
SFB	START-UP FEEDER BREAKER
FP	FIRE PUMP
FCV	FLOW CONTROL VALVE
PCV	PRESSURE CONTROL VALVE
PORV	POWER OPERATED RELIEF VALVE
AFW	AUXILIARY FEEDWATER
RHR	RESIDUAL HEAT REMOVAL
LCV	LEVEL CONTROL VALVE
PDP	POSITIVE DISPLACEMENT PUMP

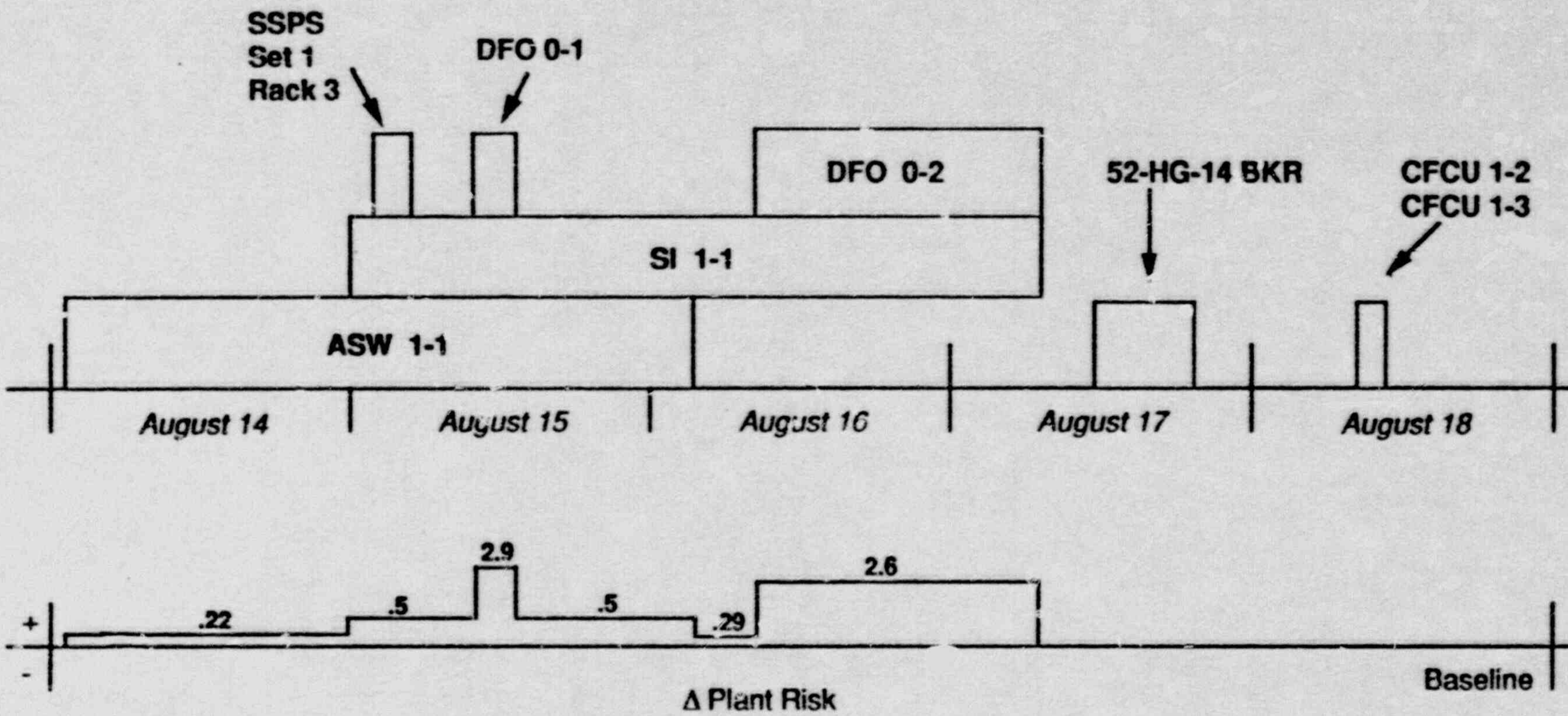
UNIT 1 CONFIGURATION RISK

Configuration vs. Risk - Unit 1



Δ Plant Risk

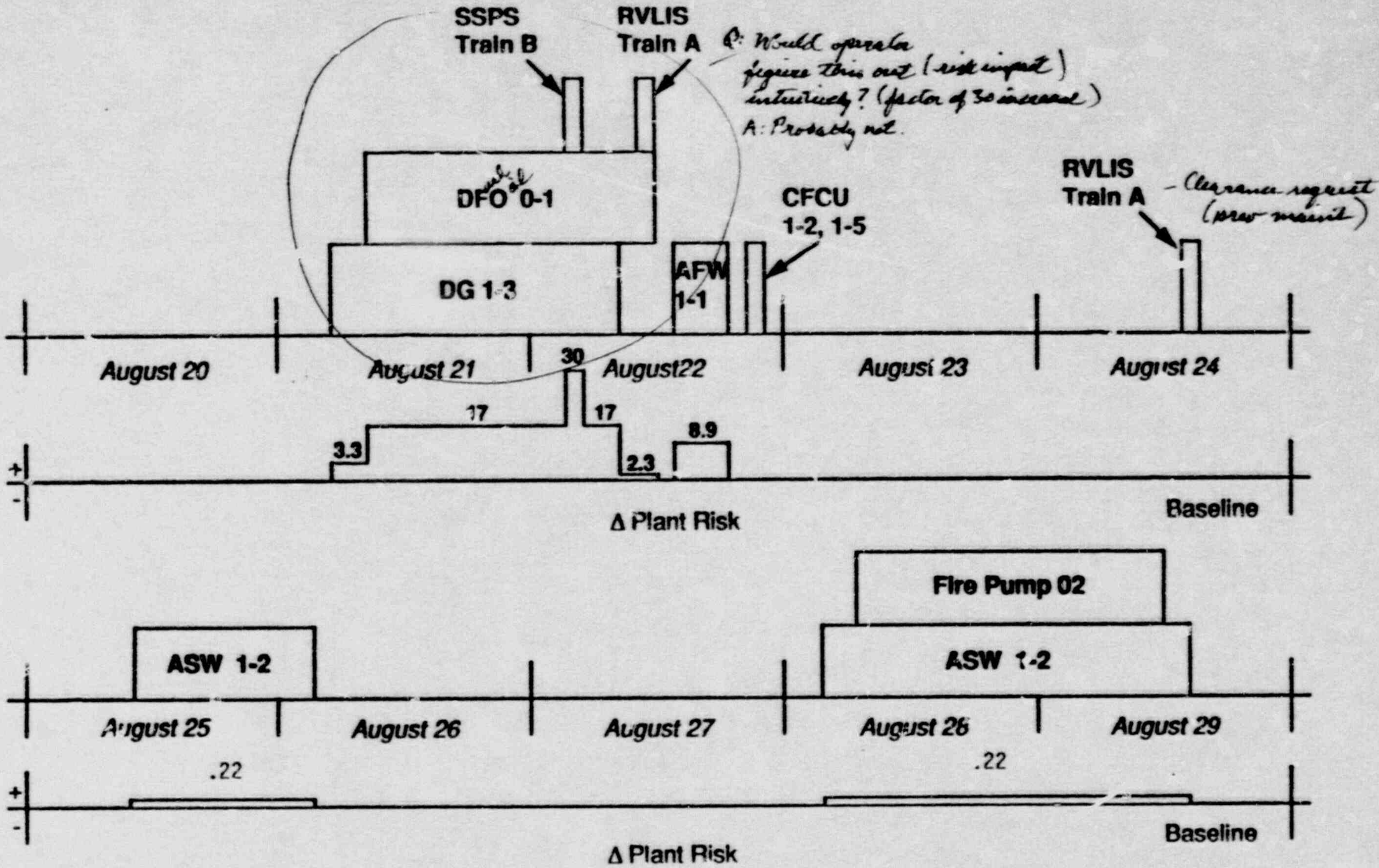
Configuration vs. Risk - Unit 1



Pacific Gas and Electric Company

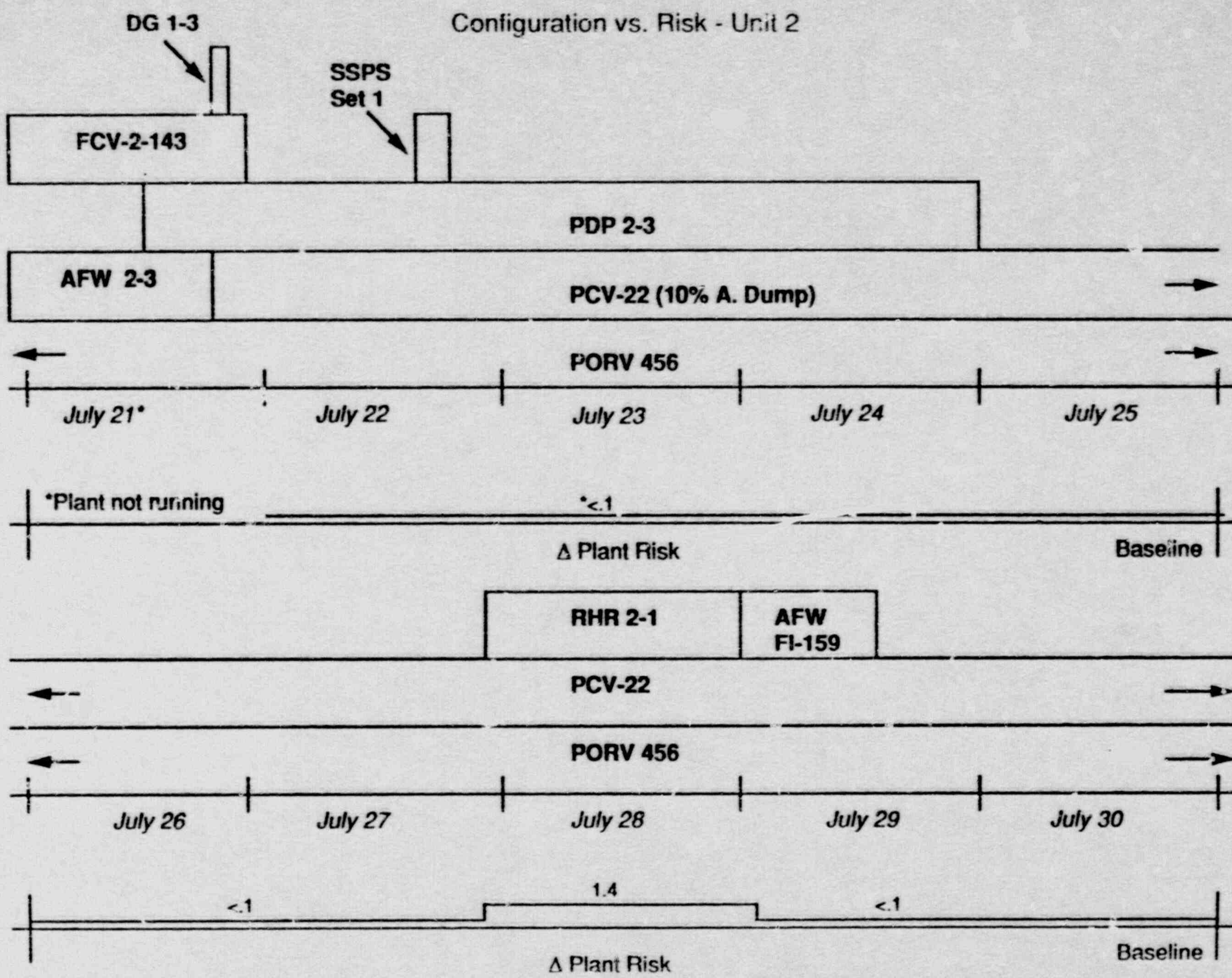
Pacific Gas and Electric Company

Configuration vs. Risk - Unit 1



UNIT 2 CONFIGURATION RISK

Configuration vs. Risk - Unit 2



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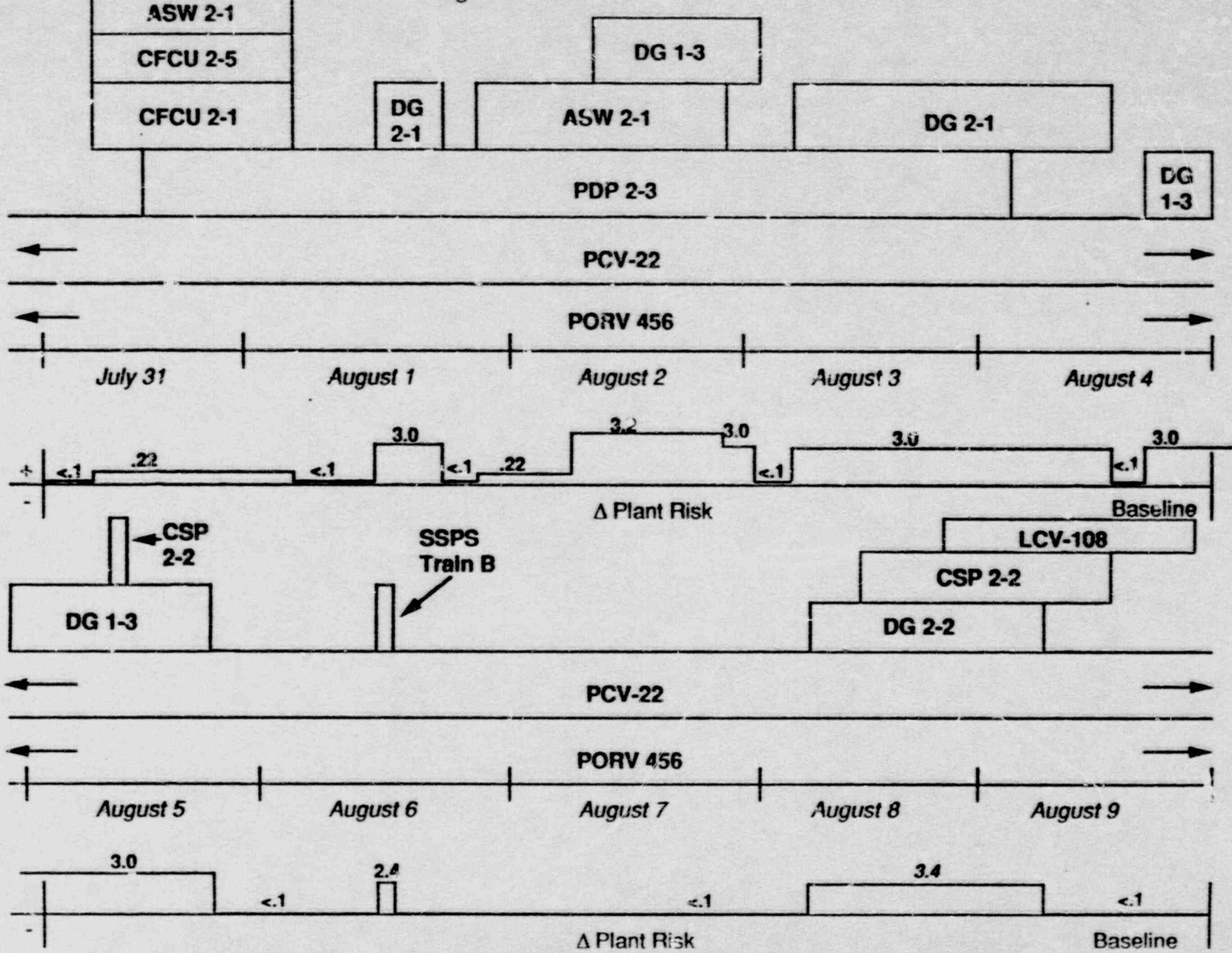
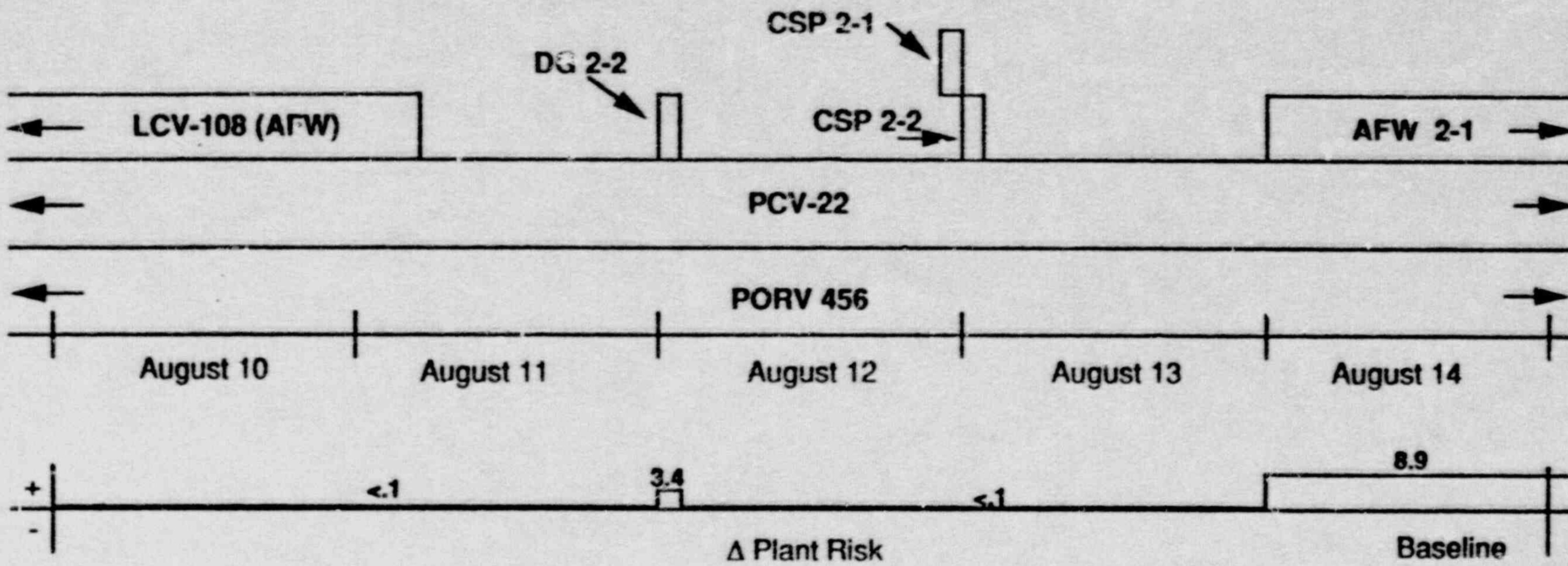
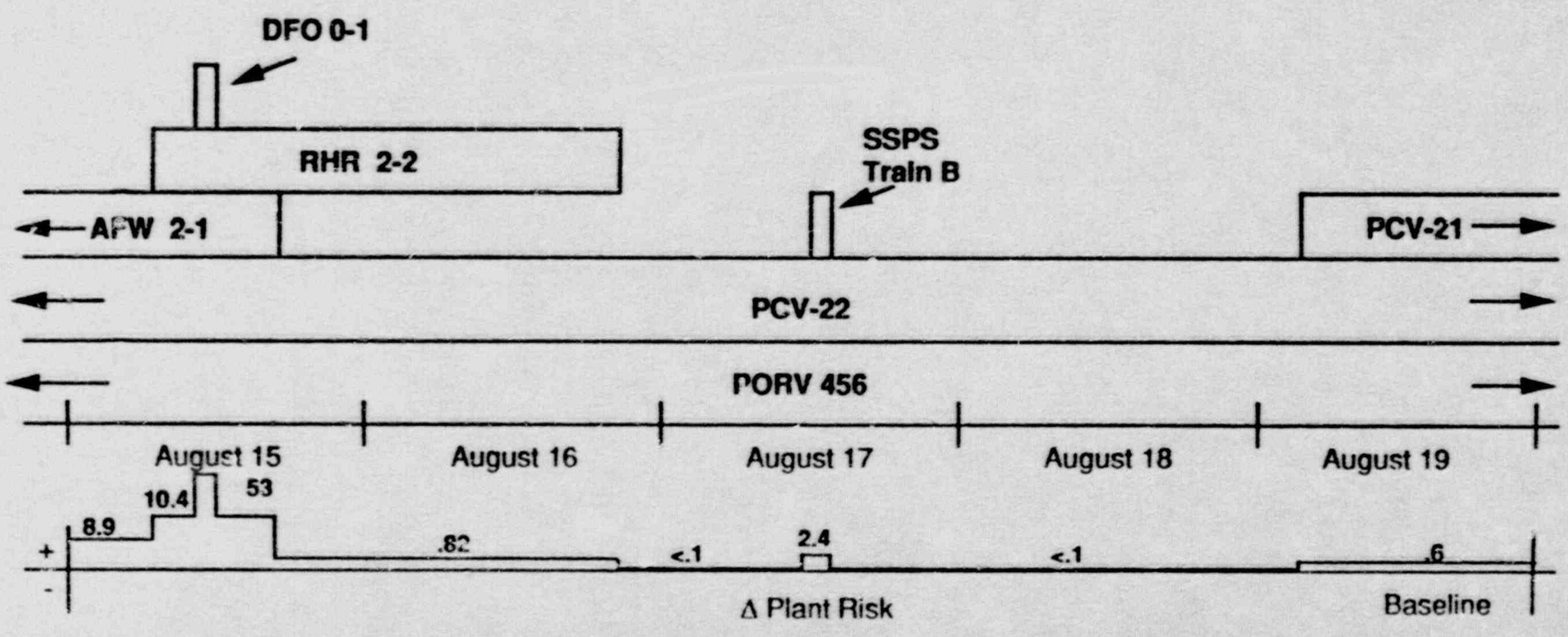
Configuration vs. Risk - Unit 2



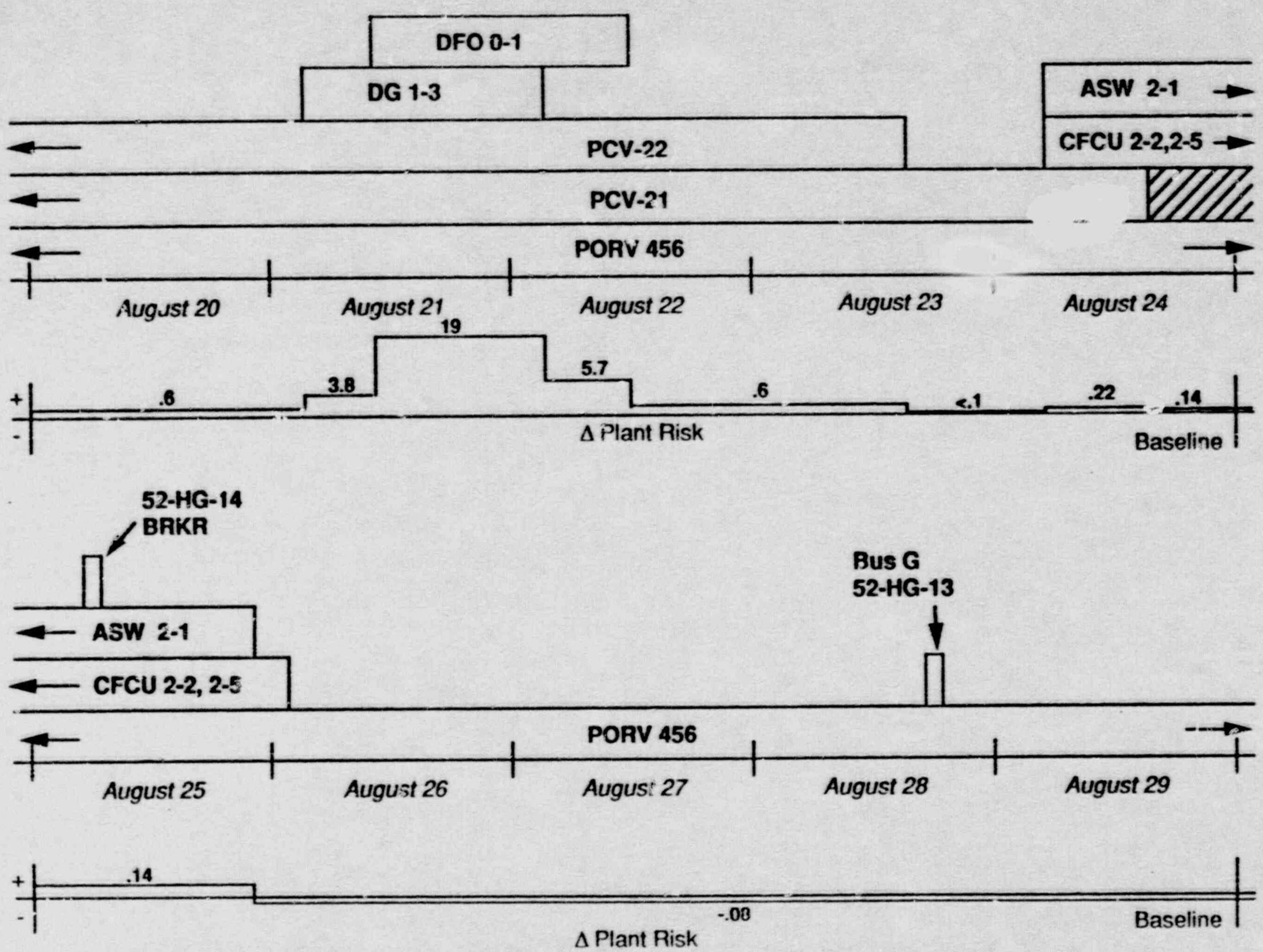
Configuration vs. Risk - Unit 2





Pacific Gas and Electric Company

Configuration vs. Risk - Unit 2



SUMMARY:

- RESULTS TO DATE
  - APPROXIMATELY 3 MONTHS OF DATA
  - INTERESTING CONFIGURATIONS
  - UNDERSTANDING OF LIMITATIONS

- FUTURE WORK
  - MORE DETAILED INVESTIGATION
  - REDUCE CONSERVATISMS
  - SEQUENCE INTERPRETATION
  - DETERMINE BASE LINE
  - DEFINE RISK CRITERIA
  - PLANT OPERATIONS INVOLVEMENT

PG&E

Enclosure I

EQUIPMENT TAKEN OUT OF SERVICE, BUT NOT USED IN STUDY, ON UNIT 1

FCV 662/663
FHB VENT
KINEMETRICS SEISMIC
RO-10C - TEST OF RC INVENTORY
S.G. CH 544, 534
VALVE 9356, A, B (RCS SAMPLE)
RE - 25, 26, 71, 72, 29, 58, 59, 11, 12, 14, 142
FCV 662/663 (CONTAINMENT PRESSURE RELIEF)
RCS FLOW 415, 416, 426
N-42, 44
PREZ. CH 456
ANI-20, 19 CHLORINE DETECTOR
CONTAINMENT PRESSURE CH 934, 936, 937
PAR-400 CH 3M (SEISMIC INSTRUMENTATION)
RCS TEMP 441, 421, 431
RCS PRE 935
CSP 1-1 EXH DUCT
AUX. BLDG. VENT SUPPLY & FAN
FR-20, 12 (LIQUID RADWASTE)
PRZ-LEVEL 461
S.G. LEVEL 518, 528, 519, 527, 537
ACCUM. LEVEL 951, 952, 953
AFD NON-AXIAL FLUX DIFFERENCE MONITOR
N1-42
PRI MET FACILITY
TRIAXIAL PEAK ACCID
PRZ. PRES. 457, 474
SCMM, ACCIDENT MONITOR INSTRUMENT.
CONDUIT SUPPORT
LT-942 - CONTAINMENT SYS. LEVEL
CEL CONTAINMENT HYDROGEN MONITOR
SNUBBER 24-47

EQUIPMENT TAKEN OUT OF SERVICE, BUT NOT USED IN STUDY, ON UNIT 2

FHV - SYS
RCS-2-80291, VALVE
RE-14B, A, 11, 12, 58, 59, 28B
CEL-83, 82, 20
R-10C - TEST OF REACTOR INVENTORY
N-41, 43, 32, 31, 36, 35, 42
PRZ - LEVEL 459, 455, 461
PRZ PRES. 456, 455
LT-40
ROD POSITION DEV. 474
RCS FLOW 414, 424, 434, 416, 426
RCS TEMP. 411, 431
FT-542
S.G. - LEVEL 529, 539, 519, 549, 528, 538,
548, 518, 547, 537, 527, 517
S.G. FLOW 542, 540
FV-53 (STEAM GENERATOR BLOWDOWN)
ANR 75/76 (OXYGEN MONITOR)
PORV CHS 456, 405, 423
N-42, 44
SCMM - ACCIDENT MONITOR INSTRUMENT
CONT. PRES. - 936
QPTR ALARM (QUADRANT POWER TILT RATIO)
ROD POS. DEV. MON.
VENTILATION PANEL
FUEL HAND BLDG. E-G EXHAUST
ANI - 19, 20
FCV 143
RIL MONITOR
VALVE 8149, R.C. SAMPLE
AUX. BLDG. FAN
FR - 53, 12
RM - 23

UNIT 1

Reason for equipment being taken out of service:

July 21, 1989:

AFW 1-1	STP
CCP 1-2	CR
Bat Charg	CR
DFO XFer P .0-2	Opp Action

July 22, 1989:

D.G. 1-3	STP
CCP 1-2	AR

July 23, 1989:

CCP 1-2	AR

July 24, 1989:

CCP 1-2	AR

July 25, 1989:

CCP 1-2	AR

August 14, 1989:

ASW p 1-1	CR

August 15, 1989:

SSPS	
ASW p 1-1	CR
SIP 1-1	CR
DFO Xfer p 0-1	STP
	STP

August 16, 1989:

SIP 1-1	CR
ASW 1-1	CR
DFO p 0-2	STP

August 17, 1989:

SIP 1-1	CR
DFO p 0-2	STP
52-HG-14 Breaker	CR

August 18, 1989:

CFCU 1-2, 1-3	STP

UNIT 1 (continued)

Reason for equipment being taken out of service:

August 20, 1989:

SSPS	STP

August 21, 1989:

DFO p 0-1	CR - Rantz Procedure
DG 1-3	CR

August 22, 1989:

DFO p 0-1	OP Required Action
DG 1-3	CR
AFW p 1-1	CR
SSPS	STP
RVLIS	CR
CFCU 1-2, 1-5	STP

August 23, 1989:

August 24, 1989;

RVLIS	CR

August 25, 1989:

SFB	CR
ASW 1-2	AR

August 26, 1989:

ASW 1-2	AR

August 27, 1989:

SSPS	STP

August 28, 1989:

FP p 0-2 - Fire Pings	CR (PM.)
ASW p 0-2	CR

August 29, 1989:

FP 0-2	CR (PM.)
ASW p 0-2	CR

UNIT 2

Equipment Out of Service

July 21, 1989:

PCV 2-3 (1)	AR
DG 1-3	STP
AFW p 2-3	AR
PORV 4 5 6 (2)	AR
PDP 2-3	CO

July 22, 1989:

PDP 2-3	CO
SSPS	STP

July 23, 1989:

PDP 2-3	CO

July 24, 1989:

PDP 2-3	CO

July 25, 1989:

July 26, 1989:

SSPS	STP

July 27, 1989:

RHR 2-1	CR

July 28, 1989:

RHR	CO

July 29, 1989:

AFW	AR

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(1) PCV is out for July 21, 1989 to August 23, 1989
(2) PORV is out the entire time of the study

UNIT 2 (continued)

Equipment Out of Service

July 30, 1989:

SSPS	STP

July 31, 1989:

ASW 2-1	CR
CFCU 2-1	CR
CFCU 2-5	CR
PDP	AR

August 1, 1989:

DG 2-1	CR

August 2, 1989:

ASW 2-1	AR
PDP 2-3	AR
DG 1-3	CR

August 3, 1989:

PDP 2-3	AR
DG 1-3	CR
DG 2-1	CR

August 4, 1989:

PDP 2-3	AR
DG 1-3	Not Stated
DG 2-1	CR

August 5, 1989:

CSP 2-2	STP
DG 1-3	Not Stated

August 6, 1989:

SSPS	STP

August 7, 1989:

Equipment Out of Service

August 8, 1989:	
DG 2-2	CR
CSP 2-2	CR
August 9, 1989:	
LCV 108 (AFW)	STP
CSP 2-2	CR
DG 2-2	CR
August 10, 1989:	
LCV 108 (AFW)	CR
August 11, 1989:	
DG 2-2	STP
August 12, 1989:	
CSP 2-1	STP
August 13, 1989:	
CSP 2-2	STP
SSPS	STP
August 14, 1989:	
AFW p 2-1	CR
August 15, 1989:	
AFW p 2-1	CR
RHR p 2-2	CR
DFO XFer	STP
August 16, 1989:	
RHR p 2-2	CR
August 17, 1989:	
SSPS	STP

UNIT 2 (continued)

Equipment Out of Service

August 18, 1989:

August 19, 1989:

PCV 2-1	CR

August 20, 1989:

PCV 22	AR
PCV 21	CR
SSPS	STP

August 21, 1989:

PCV 21	CR
PCV 22	AR
DG 1-3	CR
DFO p 0-1	CR

August 22, 1989:

PCV 21	CR
PCV 22	AR

August 23, 1989:

PCV 21	CR
PCV 22	AR

August 24, 1989:

ASW p 2-1	CR
CFCU 2-2, 2-5	CR

August 25, 1989:

ASW p 2-1	CR
CFCU 2-2, 2-5	CR

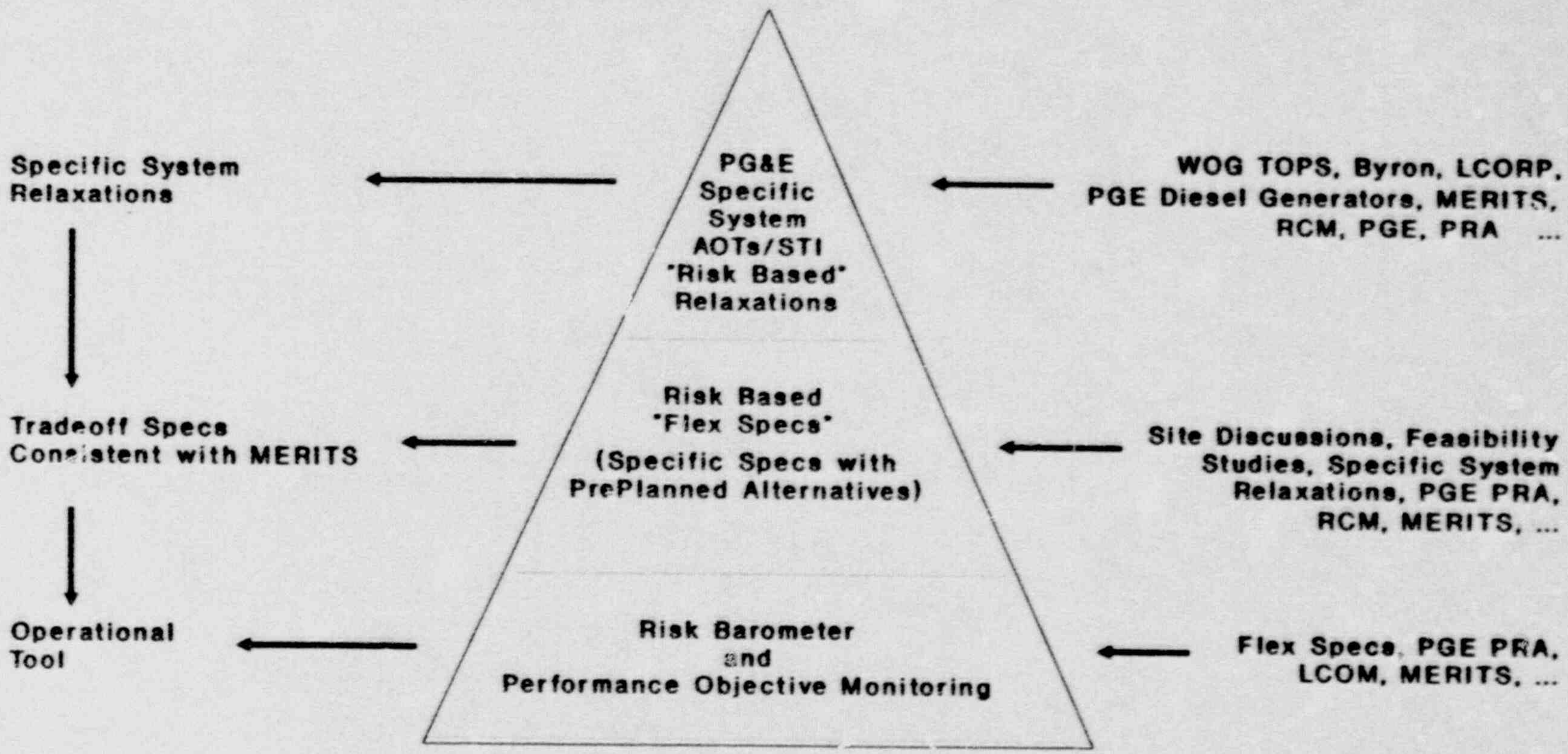
August 26, 1989:

UNIT 2 (continued)

Equipment Out of Service

August 27, 1989:	
SSPS	STP
August 28, 1989:	
4 KV Bus	CR

Reliability Based Tech Specs Program Attributes



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Enclosure

POTENTIAL DIESEL GENERATOR TECHNICAL SPECIFICATION IMPROVEMENTS AT SONGS UNITS 2/3

OCTOBER 4, 1989

AGENDA

- Purpose
- Status of Related NRC Programs
- Current Technical Specification Requirements
- Potential Areas of Improvement In Existing Technical Specifications

PURPOSE

Identify Potential Improvements To The SONGS 2/3 Emergency Diesel Generator Technical Specifications Which:

- Could Be Recommended To The NRC For Consideration Under Their Technical Specification !mprovement Program
- Can Be Justified Based On Reliability/Risk Arguments
- Would Result In A Net Benefit To The Plant

NRC PROGRAMS RELATED TO EDG TECHNICAL SPECIFICATIONS

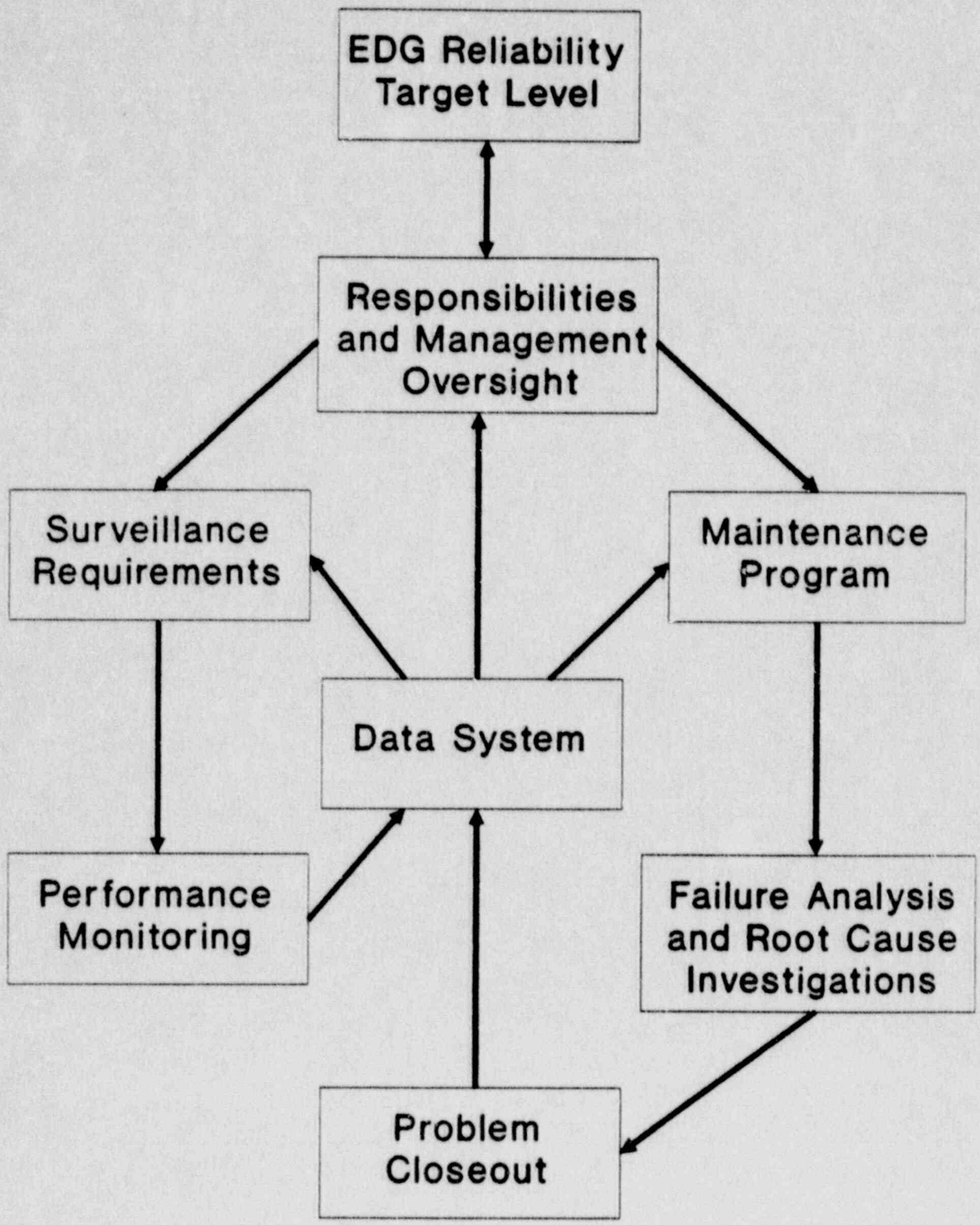
<u>EDG Reliability Programs</u>

- NUREG Published Describing An Acceptable EDG Reliability Program (NUREG/CR-5078)

- Draft Reg. Guide 1.9 Issued

- NUMARC 87-00 Appendix D Published Describing Industry's EDG Reliability Program

- Final Resolution of EDG Reliability Program Underway Within NRC



NRC Concept For An EDG Reliability Program

CURRENT SONGS 2/3 DIESEL GENERATOR TECHNICAL SPECIFICATION REQUIREMENTS

SECTION	REQUIREMENTS
3.8.1.1	Limiting Conditions For Operation - Establishes Allowed Outage Times (AOTs)
4.8.1.1.1	Offsite Power Surveillance Testing
4.8.1.1.2.a-c	Diesel Surveillance Testing (STIs)
4.8.1.1.2.d	18 Month Testing/ Surveillance
4.8.1.2.d.1	Diesel Teardown
4.8.1.2.d.2-14	18 Month Load Sequencing/ Testing
4.8.1.2.e	Diesel Dependency Test
4.8.1.2.f	Fuel Oil System Surveillance
4.8.1.1.3	Reporting Requirements

POTENTIAL AREAS OF IMPROVEMENT

18 MONTH DIESEL TEARDOWN

Current Requirement

At least once every operating cycle subject the diesel to an inspection in accordance with procedures prepared in conjunction with its manufacturer's recommendations for this class of standby service.

Alternative

In Conjunction With The Diesel Manufacturer:

- Develop a Comprehensive Condition Monitoring Program for Monthly Testing Based on RCM Analysis

- Develop a Comprehensive Periodic Predictive Maintenance Program

POTENTIAL AREAS OF IMPROVEMENT (CONT'D)

ALLOWED OUTAGE TIMES

Current AOTs

Single Diesel	72 hrs.
Two Diesels	2 hrs.
One Diesel And Turbine AFW Pump	2 hrs.

Alternative

- Establish Risk-Based AOTs on Basis of Bus Availability Using PRA Models
- Preliminary Analyses Indicate That AOTs for Diesel Configuration Are Consistent With NRC Approach
- However, Cross-Connection Between Units Has Major Impact on Risk-Based AOTs

SUMMARY OF RISK-BASED AOTs BASED ON NRC METHODOLOGY WITH SIMPLE MODEL

	Existing AOT	No Cross-Connect Risk-Based AOT	Cross-Connected Risk-Based AOT
One Diesel Inoperable	72 hrs.	79 hrs.	91 days (2190 hrs.)
Two Diesels Inoperable	2 hrs.	1.8 hrs.	91 hrs.
One Diesel and Steam Driven AFW Pump Inoperable	2 hrs.	4.8 hrs.	238 hrs. (10 days)

POTENTIAL AREAS OF IMPROVEMENT (CONT'D)

SURVEILLANCE TEST INTERVALS

Current Requirements

Monthly Testing of Diesels Unless 2 Failures Occur In Past 20 Demands, Then Weekly Testing Is Required

Alternative

- Implement NUMARC 87-00 Appendix D Graded Response Program
- Implement Data-Oriented Technical Specification

POTENTIAL AREAS OF IMPROVEMENT (CONT'D)

18 MONTH TESTS

Current Requirements

Every 18 Months Perform A Series of Tests To Demonstrate Diesel Performance Under Accident Conditions

Alternative

- Change to Once Every Operating Cycle

Enclosure 6

EPRI (Boyer Chu)

EPRI/NPD

Plant Status Monitor

RAPID/PSM SOFTWARE
WITH PILOT DEMONSTRATION

Prepared
by
Boyer B. Chu

PRESENT AT RISK-BASED TECH SPEC MEETING

DATE: Oct. 4, 1989
PLACE: Philadelphia, PA

ST/SP

BBC/Sept. '89 p1

EPRI/NPD

RAPID/PSM PRESENTATION

- BACKGROUND
- FUNCTIONS
- STATUS
- LESSONS LEARNED
- DEMONSTRATION

ST/SP

BBC/Sept. '89 p2

EPRI/NPD

RAPID/PSM CONCEPT -- Risk Management

- Utilize SRA & Modern Computer Technology to Assist the Management of Plant O&M Activities
- Develop an Integrated Plant Equipment Status Database for Assessing Dynamic Plant Safety and Production Reliability
- Provide a Framework to Perform Plant Risk Management

ST/SP

EPRI/NPD

RAPID/PSM DEVELOPMENT
Scope & Background

- Proof of Principle Study -- Evaluate Technical Feasibility

  1. Technical Approaches

     - Selected an aux-feed system with 130 Components
     - Developed models by GO and Fault Tree approaches
     - Computerized system Tech Spec and other procedures
     - Correlate Tech Spec with system model outputs
     - Develop PC software to perform Tech Spec monitoring

  2. Results

     - Demonstrated feasibility of using SRA to monitor
     - Determined to select GO modeling for risk management
     - Identified potential technical issues and concerns

ST/SP

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RAPID/PSM DEVELOPMENT
Scope & Background (con't)

- Initial R&D Demonstration Phase -- Full Scale Study

  1. Technical Approach

     - Modeled the entire plant including 6 operation modes
     - Computerized all applicable Tech Spec and procedures
     - Modeled multiple levels of plant power production
     - Identified computer softwares and hardware

  2. Results

     - Developed software architecture design
     - Developed distributive GO evaluation scheme
     - Resolved technical issues identified previously
     - Implemented QA/QC and documentation control

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RAPID/PSM DEVELOPMENT
Scope & Background (Con't)

- Current Production Phase - Validation, Training and Applications

  1. Technical Approach

     - Added an automated tagging system to enhance acceptability
     - Updated all models, procedure, Tech. Spec revisions
     - Increased level of detail for several systems GO models
     - Tested and optimized software efficiency
     - Trained operators and assisted in the latest refueling outage

  2. Results

     - Complete software validation and verification
     - Prepare production release RAPID/PSM software
     - Complete RAPID/PSM documentation

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RAPID/PSM TECHNICAL ELEMENTS

- Use GO-based System Reliability Modeling Technique
- Use Relational Database Management System
- Use Modularized Software Development Approach
- Apply Human Factor in Design Software/Human Interface
- Practice QA/QC to Document Software Development and Testing
- Operate on IBM Mainframe or PS2/70 PC Computer

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PSM -- Software Functionalities

- Monitor System/Train/Component Operability Status
- Provide Tech Spec Compliance Tracking and Advice
- Identify and Resolve LCO Conflicts
- Perform Dynamic Power-Production Reliability Evaluation
- Evaluate Impact of Out-Of-Service Equipments to Unavailability
- Evaluate "What if" for Proposed Actions
- Automate Preparation, Control and Tracking of Equipment Tags
- Assess Equipment Maintenance and Repair Priority
- Use Computerized P&ID to Input Equipment Status Changes and Display System Status

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TAGS – Software Functionalities

- Prepare Component Tags and Worksheet:
  - Standard and staggered tags
  - Hold-tags and pre-staged tags
- Generate Reports and Shift Logs, e.g., tags listed by specified person, component in off-normal position, et al.
- Prepare Tagging Boundary Line-up and Changes
- Interface with PSM for Tech Spec Compliance Evaluation
- Interface with Plant Information Management System, Optionally

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RAPID/PSM IDENTIFIED USES

- Enhance Technical Specification and Procedure Compliance
- Maintain Plant Status and System Configuration Control
- Assist in Shift Turnovers - i.e. operator awareness of equipment status and changes
- Optimize and Prioritize Scheduling and Maintenance Activities
- Assist Plant Operational Safety and Productivity Management
- Improving Administrative Control of Component Status

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RAPID/PSM IDENTIFIED USERS

• Operations	Monitor Plant Status and Control
• Maintenance	Planning, Prioritization, Scheduling and Tagging
• Licensing	LCOs, LERs, Tech. Spec. Compliance
• Plant Engineering	Safety and Engineering Analysis
• Plant Material	Spare Parts and Inventory Control
• Tech. Functions	Determination of Tech Spec Compliance
• Site Safety Review	Performance Monitor

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RAPID/PSM PLANT SPECIFIC MODELING

A Practical Example

- 46 Systems GO Models and 5Plant Operation Modes
- 10 to 400 GO Operators in each Model per System
- Approximately 8000 Components Included in the Database
- GO Plant Model Linked up to 600 Input and 340 Output Signals
- Average Computer Execution Time Required for Each Run:
    - Tech Spec & Status 2mins
    - Tech Spec & Probability 5mins

on IBM 3090 Mainframe Computer

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RAPID/PSM PROCESS SCHEME

A SUMMARY

Success States

- One ~~Set~~ of Models for both Plant Status and Reliability Applications
- GO Models Signals Used for Cross Referencing Procedural Requirements
- Many Component Modeled in Multiple States
- Many Systems Modeled in Detail to Fulfill the O&M Practical Needs
- Model Segmentation for enhancing Numerical Efficiency
- Use 0 and 1 Input for Monitoring System Operability and Plant Status
- Probability Evaluation by GO Distributive Process
- Use of Relational Database Manager to Administer Data Flow
- Data Included Models, Signals, Tech Spec & Procedural Requirements

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RAPID/PSM MENU

AN EXAMPLE OF MAIN MENU

PSM - YOURPLANT

PLANT MODE

TODAYS DATE

CURRENT
RUN

MAIN MENU

DEC12-86

1 DISPLAY CURRENT COMPONENT STATUS
2 DISPLAY CURRENT POWER LEVEL CALCULATIONS
3 REVIEW / CHANGE PLANT STATUS
4 REVIEW TECH SPEC STATUS FOR CURRENT CONFIGURATION
5 REVIEW PLANT HEALTH MESSAGES FOR CURRENT CONFIGURATION

0 QUIT PSM

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RAPID/PSM MENU

AN EXAMPLE OF SUB- MENU
(LEVEL 1)

```
PSM - YOURPLANT
                              MAIN MENU
    PLANT MODE
                                                      TODAYS DATE
                           REVIEW TECH SPEC
    CURRENT               STATUS FOR CURRENT           DEC12-86
      RUN                   CONFIGURATION

        1  DISPLAY SYSTEM STATUS FOR TECH SPEC SYSTEMS
        2  DISPLAY TECH SPEC ACTION STATEMENTS
        3  DISPLAY ACTION STATEMENTS TIMER BY SYSTEM
        4  DISPLAY PLANT ACTION STATEMENT TIMER

        R  RETURN TO MAIN MENU
```

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RAPID/PSM OUTPUT

AN EXAMPLE OF LISTED SYSTEM S
EFFECTED BY TECH SPECs
(LEVEL 2)

```
                           REVIEW TECH SPEC
                          STATUS FOR CURRENT
    PLANT MODE              CONFIGURATION
                                                      TODAYS DATE
                          SYSTEMS IMPACTED
    CURRENT                  IN CURRENT                DEC12-06
      RUN                   CONFIGURATION

  1  RPS
  2  RECIRC
  3  CWFD
  4  N2
  5  HPWED
  6  PRICNT
  7  ALL

       ENTER THE NUMBER OF ONE OF THE ABOVE IMPACTED SYSTEMS
         FOR TECH SPEC STATUS MESSAGES, OR R TO RETURN TO PREVIOUS MENU
```

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RAPID/PSM OUTPUT

AN EXAMPLE OF TECH SPEC SYSTEM
(LEVEL 3)

TECHNICAL SPECIFICATION STATUS
FOR CURRENT CONFIGURATION

SYSTEM: NITROGEN INERTING

STATUS: TORUS VENT VALVE V-28-47 IS INOPERABLE-CLOSED. IF THE TORUS MUST BE VENTED THROUGH THE STANDBY GAS TREATMENT SYSTEM, VIA V-28-47, THE FILTERS MAY BE DAMAGED.

THE DRYWELL OXYGEN SAMPLE SYSTEM IS INOPERABLE.
THE TORUS OXYGEN SAMPLE SYSTEM IS INOPERABLE.
ONE OR BOTH OF THE REACTOR BUILDING TO TORUS VACUUM BREAKERS ARE INOPERABLE-OPEN.
THE N2 INERTING FUNCTION IS INOPERABLE.
THE N2 MAKEUP FUNCTION IS INOPERABLE.
THE AIR PURGING FLOW PATH IS INOPERABLE.
ONE OR MORE N2 SYSTEM AIR OPERATED VALVES ARE INOPERABLE-CLOSED.

PRESS ENTER TO CONTINUE.....

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AN EXAMPLE OF SYSTEM UNAVAILABILITY CHANGE
(LEVEL 3)

TECHNICAL SPECIFICATION STATUS
FOR CURRENT CONFIGURATION

SYSTEM: NITROGEN INERING

UNAVAILABILITY RESULTS: N2 UNAVAILABLE

	UNAVAILABILITY	RATIO
CURRENT	1.0000	8.57
BASE	0.1168	1.00

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AN EXAMPLE OF TECH SPEC SUB-SYSTEM IN EFFECT (LEVEL 4)

TECHNICAL SPECIFICATION STATUS
FOR CURRENT CONFIGURATION

SYSTEM: NITROGEN INERTING

STATUS: THE N2 MAKEUP FUNCTION INOPERABLE.

ACTION STATEMENT:

AS THE N2 INERTING SYSTEM IS INOPERABLE, THE CONTAINMENT ATMOSPHERE MAY NOT BE INERTED IF NECESSARY. IF THE CONTAINMENT HAS NOT BEEN INERTED, PLACE THE REACTOR IN THE COLD SHUTDOWN CONDITION WITHIN 30 HOURS.

REFERENCE: 3.0.A & 3.5.A.6

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RAPID/PSM OUTPUT

AN EXAMPLE OF TECH SPEC SUB-SYSTEM IN EFECT (LEVEL 4) CON'T

TECHNICAL SPECIFICATION STATUS
FOR CURRENT CONFIGURATION

SYSTEM: NITROGEN INERTING

STATUS: THE N2 MAKEUP FUNCTION INOPERABLE.

ACTION STATEMENT:

AS THE MAKEUP CAPABILITY OF THE N2 SYSTEM IS INOPERABLE, IT MAY NOT BE POSSIBLE TO MAINTAIN THE REQUIRED PRESSURE AND OXYGEN CONCENTRATION WITHIN THE CONTAINMENT. IF THE REQUIREMENTS OF TECHNICAL SPECIFICATION 3.5.A.6 IS NOT MET, PLACE THE REACTOR IN THE COLD SHUTDOWN CONDITION WITHIN 30 HOURS.

REFERENCE: 3.0.A & 3.5.A.6

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RAPID/PSM R&D RESOURCES

EXPANDED

- Software Development Phase:
  1. EPRI contractors -- 16 man-years
  2. Host utility site -- 4 man years
     - Mechanical engineer with SRO (100%)
     - Electrical engineer (25%)
     - Ex-Group shift supervisor with SRO (25%)
     - Software system analyst (50%)
  3. Contractor cost sharing -- 2 man-years
  4. Host utility mainframe computer usages

- Production Demonstration Phase:
  1. EPRI contractor -- .5 man-years
  2. Host utility site -- 1 man-year

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RAPID/PSM BENEFITS AND LIMITATIONS

- Overall Benefits:
  - Enhance tech. spec. compliances
  - Enhance power production
  - Reduce outage duration
  - Reduce O&M staff work load and costs
  - Enhance administrative control
  - Enhance consistency and availability of plant data

- Limitations:
  - Require significant resources and commitment
  - Need strong administrative control
  - Require constant and accurate database maintenance
  - Require large computer Resources

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RAPID/PSM IMPLEMENTATION RESOURCES

ESTIMATED REQUIREMENT

- Development at a Plant with PRA/IPE:
  - Modeling Effort — 2 man-years
  - Computerized Documentation — 2 manyears
  - Site Review — 2 man-years
  - Testing and Training — 1 man-year
- Implementation Phase:
  - Computer System Engineer — 0.5 man-year
  - Plant Engineering Staff — 2 man years
  - Training Staff — 0.5 man-year
- Production Phase:
  - Software Maintenance — 0.5 man-year
  - Site Maintenance — 1 man-year

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RAPID/PSM

A SOFTWARE DEVELOPED FOR PROVIDING A FRAMEWORK
TO PERFORM RISK MANAGEMENT OF NUCLEAR POWER PLANT:

- Characterize Plant by Dynamic SRA Models
- Contain Latest Plant Configuration Information
- Contain All Procedural Requirements
- Contain On-going and PlannedPlant O&M Activities

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RAPID/PSM SOFTWARE PILOT DEMONSTRATION

SOFTWARE NAME:	EPRI's PSM OF RAPID/PSM
HARDWARE:	IBM PS2/MODEL 70 (3M RAM)
DATABASE NAME:	XQL RELATION
P&ID SOFTWARE:	AUTOCAD
PLANT DATABASE:	A BWR PLANT/FULL SCALE

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Enclosure 7

NRC/Industry Risk-Based Tech. Spec. Meeting 10-4-89

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