U.S. NUCLEAR REGULATORY COMMISSION

REGION V

Report Nos.: 50-275/91-21 and 50-323/91-21

Docket Nos.: 50-275 and 50-323

License Nos.: DPR-80 and DPR-82

Licensee: Pacific Gas and Electric Company
77 Beale Street, Room 1451
San Francisco, California 94106

Facility Name: Diablo Canyon Units 1 and 2

Meeting at: Region V Office, Walnut Creek, California

Report Prepared by: B. J. Olson, Project Inspector

Approved by: P. J. Morrill 7/15/91
P. J. Morrill, Chief Date Signed
Reactor Projects Section 1

Meeting on June 28, 1991 (Report Nos. 50-275/91-21 and 50-323 91-21)

A meeting was held in the Region V Office, Walnut Creek, California to discuss the licensee's Probabilistic Risk Assessment Program.

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DETAILS

1. Meeting Attendees

   a. Licensee Attendees

      J. Shiffer, Senior Vice President and General Manager
      Nuclear Power Generation Business Unit
      W. Fujimoto, Vice President, Nuclear Technical Services
      J. Tompkins, Director, Nuclear Regulatory Affairs
      J. Gisclon, Supervising Nuclear Generation Engineer
      E. Connell, Manager, Nuclear Operations Support
      R. Thierry, Senior Engineer
      J. Liu, Senior Engineer

   b. NRC Attendees

      J. Martin, Regional Administrator
      R. Zimmerman, Director, Division of Reactor Safety
      and Projects
      K. Perkins, Deputy Director, Division of Reactor Safety
      and Projects
      P. Morrill, Chief, Reactor Projects Section I
      D. Acker, Reactor Inspector
      P. Galon, Reactor Inspector
      B. Olson, Project Inspector

2. Details

Mr. Gisclon introduced PG&E personnel and indicated that within the last year a dedicated group had been formed for Probabilistic Risk Assessment (PRA) activities. He turned the discussion over to Mr. Thierry who provided PG&E's experience with PRA.

The Diablo Canyon PRA was developed as part of the Long Term Seismic Program and was started in 1984. A consultant was used to develop the PRA, with PG&E involvement. Completed in 1988, the PRA examines all accident initiating events and provides core damage frequences. The PRA has been reviewed by the NRC and NRC consultants and in June of 1991, the NRC issued the Safety Evaluation Report regarding the PRA.

After Mr. Thierry discussed plant modifications made as a result of the PRA, Mr. Martin asked about the Auxiliary Saltwater System (ASW) and known difficulties in operating ASW cross connect valves. In focusing the discussion on a single system, Mr. Martin asked how closely coupled the PRA is to the plant. Mr. Shiffer also asked if the PRA is following changes to plant procedures. Mr. Thierry and Mr. Liu answered that for ASW, a site specific model is used in PRA calculations, and the model is updated to reflect actual plant conditions.

Mr. Gisclon reviewed plans to develop a Diablo Canyon outage risk assessment based on an actual outage schedule. Mr. Martin indicated that shutdown risk is an area of focus for the NRC, and this effort will help answer questions about when is the best time to perform equipment

maintenance. Mr. Gisclon stated that a 12 week scheduling program is being utilized to minimize equipment unavailibility. The 12 week program was implemented for Unit 2 on January 1, 1991, and will be implemented for Unit 1 after the fourth refueling outage. Mr. Martin commented that the 12 week scheduling program appears to be a good way to consolidate a large number of work items, and the scheduling program can lead to questioning why the preventive maintenance items are scheduled as they are. Mr. Gisclon also reviewed a preliminary matrix of plant equipment importance. The matrix could be used in evaluating the increase in risk associated with taking various equipment out-of-service. PG&E intends to develop the matrix to cover major components in safety related systems. Once the matrix is developed, it could be used to adjust the 12 week maintenance schedule to reduce the relative risk associated with equipment outages.

Mr. Liu provided information regarding efforts to enhance the PRA. These efforts include improving the understanding of the model used to develop the PRA and updating the model to reflect actual plant conditions. As such, every 18 months, a review is performed of plant activities, and this review is used to update the PRA. Mr. Morrill asked if Unit 2 activities were reviewed since the PRA model was based on Unit 1. Mr. Liu answered that Unit 2 events were also reviewed.

Mr. Perkins asked what were some of the payoffs for having a PRA. Mr. Shiffer indicated that the PRA is used in evaluating continued plant operation when equipment problems exist and was used in deciding to procure a sixth diesel generator. Mr. Fujimoto said that the PRA is a tool in providing a perspective of relative risk. Potential use of the PRA includes developing scenarios for operator training and emergency preparedness drills. Mr. Gisclon added that they want people in the plant to use information from the PRA but first, training will need to be performed. A PRA training program is to be developed in 1991.

Mr. Shiffer said that he encouraged use of PRA but is concerned that a perceived list of limits may develop that conflicts with Technical Specifications. He also stated a concern that the PRA may be used to second guess decisions. Mr. Zimmerman said the PRA should be helpful as one of several tools available to provide input to the decision making process. A key to the practical usefulness of the PRA will depend on the training provided to the PG&E staff regarding the expected application and limitations of the PRA. Mr. Morrill added that while PRA is not exact, it does provide a basis to quantify nuclear safety and compare alternatives. In closing the meeting, Mr. Zimmerman stated that PG&E appeared to be on a positive track with PRA, and the NRC supports their efforts.

PRESENTATION TO THE NRC REGION V
PG&E's Probabilistic Risk Assessment Program

June 28, 1991
8:30-10:30

AGENDA

8:30-8:35	INTRODUCTION
8:35-8:45	PRA ORGANIZATION
8:45-8:55	PG&E's EXPERIENCE WITH PRA
8:55-9:30	CURRENT OBJECTIVES AND ACTIVITIES
9:30-10:30	DISCUSSIONS

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PRA GROUP ORGANIZATION AND OBJECTIVES

- CHANGES
  - Establishment of a Dedicated PRA Group (5 Engineers) with its Supervisor in NS&E
- OBJECTIVES
  - Maintain PRA, Complete IPE
  - Apply Risk-Based Concepts in DCPP Operation

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PG&E's EXPERIENCE WITH PRA

- Full Scope Level 1 PRA
  - Long Term Seismic Program
  - Chapter 6 of the LTSP Final Report
  - Utilized PLG Inc. as PRA Consultant
  - Significant PG&E Involvement
  - PG&E Ownership
- Proven and Comprehensive PRA
  - Detail Review by NRC/BNL
  - SER Issued June 7, 1991

PG&E's EXPERIENCE WITH PRA (cont'd)

- PRA Insights (Plant Improvements)
  - Diesel Fuel Oil Transfer System
  - Centrifugal Charging Pump Backup Cooling
  - 230kV Switchyard Spare Parts
  - Valve Control Switch Replacement
  - 4.16kV Relay Chatter

CURRENT RISK-BASED PROGRAM OBJECTIVES

- Shutdown Risk Management Guidance
- New Applications and Insights
- EPRI Risk Based Technical Specification Program
- Living PRA
- Individual Plant Examination

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SHUTDOWN RISK MANAGEMENT GUIDANCE

- EPRI is Updating its Shutdown PRA of Zion
- Tailored Collaboration Project with EPRI and Westinghouse
- The Project will Use the Zion PRA to Develop a Diablo-Specific Outage Risk Assessment Based on an Outage Schedule
- Products - Utilizing the Risk Assessment, Guidance will be Developed for:
  - Outage Planning Management
  - Outage Change Management
  - Contingency

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NEW APPLICATIONS AND INSIGHTS

- Management Training
- Integrated Scheduling Program
- Plant Equipment Importance
- On-Line Maintenance Sensitivity Studies

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12 WEEK MATRIX SCHEDULING PROGRAM

- Objectives
  - Simplify and Standardize Scheduling
  - Minimize Equipment Unavailability
  - Eliminate Train Conflicts
  - Provide Advance Scheduling
  - Improve Communications

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12 WEEK MATRIX SCHEDULING PROGRAM (cont'd)

UNIT 2

WEEK TRAIN BUS	WED.	SAT.
1 A/B H	D/G 2-2 (M-9A) RHRP2 (P-3B)	AFWP 2 (P-5B)
2 B G	CCP2 (P-2B) D/G 2-1 (M-9A)	CSP1 (P-4B)
3 A F	SIP1 (P-1B) D/G 3 (M-9A)	AFWP 3 (P-5B) CCWP1 (P-8B)
4 A/B NON BUS	SIP2 (P-1B) AFWP1 (P-6B)	M-4,5,6A (AUX.)
5 A/B H	CSP2 (P-4B) D/G 2 (M-9A)	SFPP2 (P-11C) AFWP2 (P-5B)
6 B G	RHRP1 (P-3B) D/G 1 (M-9A)	BATP2 (P-14B) CCWP2 (P-8B)
7 A F	D/G 3 (M-9A) CCP1 (P-2B)	BATP1 (P-14B) AFWP3 (P-5B)
8 A/B NON BUS	AFWP1 (P-6B)	M-4,5,6A (FHB)
9 A/B H	D/G 2 (M-9A)	AFWP2 (P-5B)
10 B G	D/G 1 (M-9A) ASWP2 (P-7B)	CHG. PP 3 (P-17B) SFPP1 (P-11B)
11 A F	ASWP1 (P-7B) D/G 3 (M-9A)	AFWP3 (P-5B)
12 A/B NON BUS	AFWP1 (P-6B)	CCWP3 (P-8B) M-4,5,6A (CNTL)

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12 WEEK MATRIX SCHEDULING PROGRAM (cont'd)

- Scheduling Process
  - Corrective and Preventive Maintenance Activities
  - Interdepartmental Interfaces
  - Work Scope/Schedule Approval
  - Work Groups
  - Schedule Modifications
  - Operability of Redundant Equipment

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PLANT EQUIPMENT IMPORTANCE

PRELIMINARY

CONFIGURATION RISK RATIO MATRIX										
COMPONENTS	CH PP 1-1	CH PP 1-2	CH MOV 8801A	CH MOV 8803A	CH MOV 8805A	CH MOV 8801B	CH MOV 8803B	CH MOV 8805B	SI PP 1-1	SI PP 1-2
CH PP 1-1	1.10	1.28	1.10	1.10	1.10	1.28	1.28	1.28	1.20	1.19
CH PP 1-2		1.18	1.28	1.28	1.28	1.18	1.18	1.18	1.27	1.27
CH MOV 8801A			1.10	1.10	1.10	1.28	1.28	1.28	1.20	1.19
CH MOV 8803A				1.10	1.10	1.28	1.28	1.28	1.20	1.19
CH MOV 8805A					1.10	1.28	1.28	1.28	1.20	1.19
CH MOV 8801B						1.18	1.18	1.18	1.27	1.27
CH MOV 8803B							1.18	1.18	1.27	1.27
CH MOV 8805B								1.18	1.27	1.27
SI PP 1-1									1.09	1.19
SI PP 1-2										1.09

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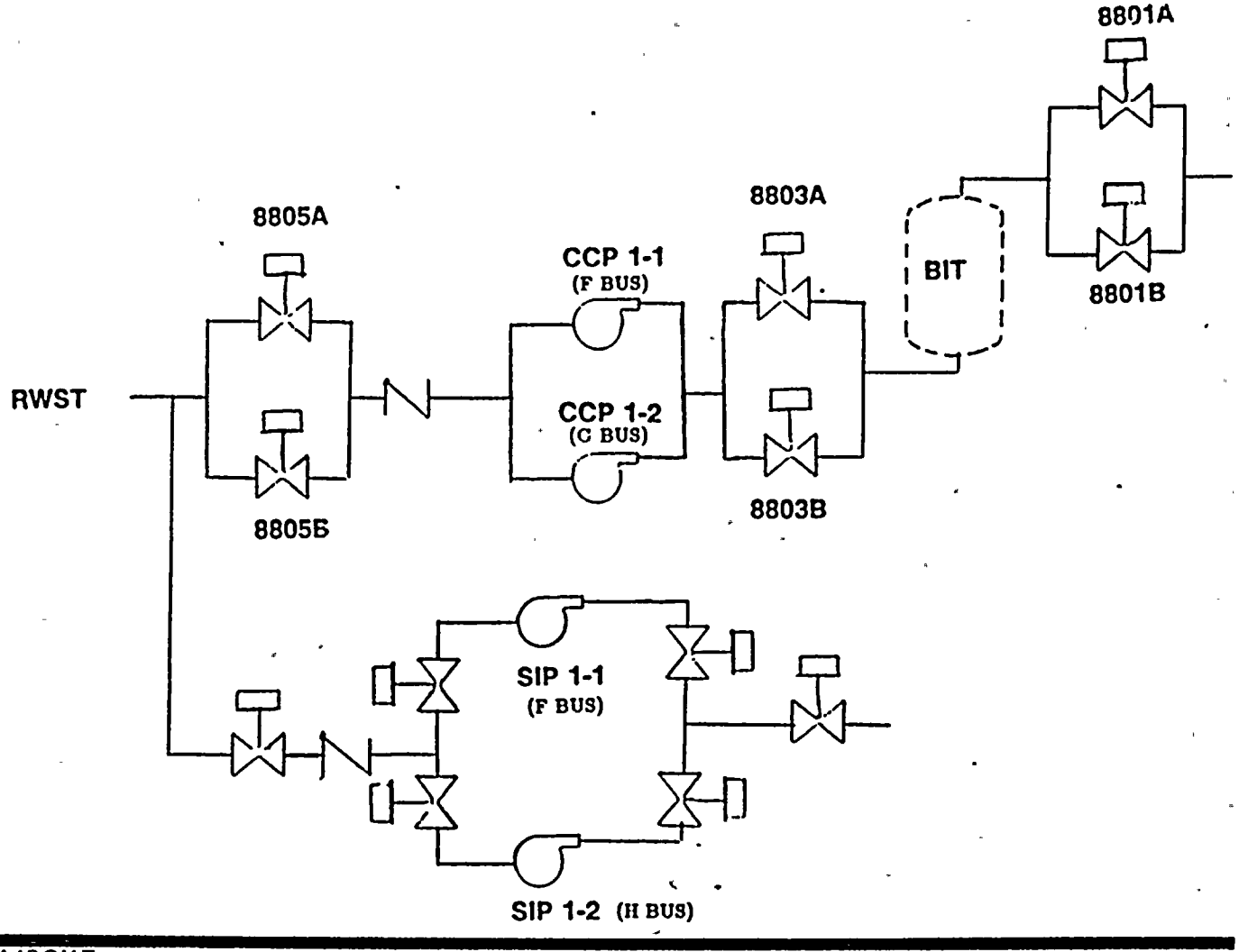
SIMPLIFIED SYSTEM SCHEMATIC



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ON-LINE MAINTENANCE SENSITIVITY STUDIES

Increase in DCPP Core Damage Frequency Due to Equipment Unavailability
Baseline CDF with No System Unavailability = 7.38e-5 /yr
May 21, 1991

SYSTEM	0.5% TRAIN UNAVAILABILITY	Increase in CDF[1]	DCPRA UNAVAILABILITY[2] (UPDATE 1)	Increase in CDF[1]	UNAVAILABILITY AS REPORTED TO INPO[3] (1990 - U-1 and U-2 average)	Increase in CDF[1]
Auxiliary Feedwater System[4]	Each of 3 trains unavailable 0.5%. CDF = 7.55e-5 /yr	2.3%	Turbine-driven pump train unavailable 2.8%. Motor-driven pump train unavailable 1.4%. CDF = 7.96e-5 /yr	7.8%	Each of 3 trains unavailable 1.9% CDF = 8.01e-5 /yr	8.5%
Diesel Generator System	Each diesel generator unavailable 0.5%. CDF = 7.49e-5 /yr	1.5%	Each diesel generator unavailable 1.4%. CDF = 7.7e-5 /yr	4.4%	Each diesel generator unavailable 3.5%. CDF = 8.18e-5 /yr	11%
Safety Injection System	Each centrifugal charging, SI, and RHR pump train unavailable 0.5%. CDF = 7.40e-5 /yr	0.27%	Centrifugal charging pump unavailable 1.3%. SI pump unavailable 0.77%. Valves unavailable 0.05%. RHR pump train unavailable 0.83%. CDF = 7.42e-5 /yr	0.54%	Each train unavailable 1.15%. CDF = 7.42e-5 /yr	0.54%

Notes:

1. The percentage increase in the baseline CDF is shown. The baseline CDF was calculated using the DCPRA model with no system unavailability. All systems were assumed to be available all the time. The change in CDF is determined by varying the unavailability of one system at a time. The baseline CDF includes the contributions of all 28 internal initiating events, 8 fire/smoke scenarios, and 3 flood scenarios. Excluded from the baseline CDF are contributions from seismic events, control room/cable spreading room fires, and other external initiating events.

2. The system unavailability used in the DCPRA includes outages due to maintenance and testing. Generic maintenance data is updated for use in the DCPRA with DCPP-1 operating experience data (November 1984 - December 1989)

3. DCPRA maintenance data is not directly comparable to INPO unavailability indicators. The DCPRA values only include maintenance data which affects PRA models. The INPO calculation for failures assumes 1/2 of the time since the last test. INPO calculations also double count when multiple components are out of service on a single train.

4. The Auxiliary Feedwater System contributes the most to CDF in the DCPRA.

ALL VALUES GIVEN IN THIS TABLE ARE PRELIMINARY

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EPRI RISK-BASED TECHNICAL SPECIFICATION PROGRAM

- Program Elements
  - Assess Utility Interest
  - Develop Risk-Based Methods
  - Interactive Risk Advisor
- Motivation
  - Improve Plant Availability and Maintain Safety
  - EPRI Study on Forced Outages (Preliminary)

    15% Due to Tech Spec Compliance
    75% Addressable by Risk Based Approaches

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EPRI RISK-BASED TECHNICAL SPECIFICATION PROGRAM (cont'd)

- Effect of Increased AOTs on Unavailability
  - Change from 72 Hours to 7 Days
  - Maintenance Frequency Unchanged
  - Maintenance Duration Increase

    Pumps - 15%
    Heat Exchangers - 5%
    Valves - 6%
    Dependent on Maintenance Philosophy
- Effect on Core Damage Risk

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EPRI RISK-BASED TECHNICAL SPECIFICATION PROGRAM (cont'd)

- Application to DCPP
  - Assess AOT Extensions for:

    Auxiliary Saltwater
    Component Cooling Water
    Charging
    Safety Injection
    Residual Heat Removal
    Auxiliary Feedwater

  - Auxiliary Feedwater Shutdown Requirement
  - Auxiliary Saltwater "Flex Spec"

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LIVING PRA

- PRA Model Maintenance Activities
  - Incorporate Design, Procedure, and Technical Specification Changes
  - Maintenance Data Update
  - Component Failure Rate Update
  - Initiating Event Frequency Update
  - Enhancement Activities

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INDIVIDUAL PLANT EXAMINATION

- Submit Combined Level 1 and 2 IPE Reports by April 15, 1992

- IPE Level 2 Work
  - Level 1-2 Interface Refinement
  - Unit 1 and 2 Containment Walkdowns
  - Containment Ultimate Strength Analysis
  - Containment Event Tree (CET)
  - Quantification
  - Uncertainty and Sensitivity Analysis

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CONCLUSION

- Proven and Comprehensive PRA
- Commitment to a Dedicated PRA Organization and Program
- Integrating Risk-Based Concepts into Maintenance and Outage Scheduling Activities

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