

LICENSEE: Arizona Public Service Company <sup>June 1, 2000</sup>

FACILITY: Palo Verde Nuclear Generating Station, Unit 2

SUBJECT: SUMMARY OF THE MAY 24, 2000, MEETING TO DISCUSS STEAM GENERATOR REPLACEMENT AND POWER UPRATE ISSUES

On May 24, 2000, the U.S. Nuclear Regulatory Commission's (NRC's) staff, and the Palo Verde Nuclear Generating Station, Unit 2 licensee, Arizona Public Service Company, met in Rockville, Maryland, to discuss steam generator replacement and power uprate issues planned by the licensee for Palo Verde Unit 2. The licensee plans to replace both Unit 2 steam generators during the Fall 2003 refueling outage with generators being fabricated in Milan, Italy, by Ansaldo. The new steam generators have an improved steam dryer design, have 26 percent more heat transfer area, and use Inconel 690 steel for the tubes. Construction and quality assurance activities were discussed during the meeting, as well as the plans to transport the generators through Mexico to the site. A recent example of the licensee's activities in the quality assurance area was the rejection of almost 3000 steam generator tubes because they were manufactured 1.5 millimeters shorter than the specified length.

The licensee is planning to take advantage of the increased steam generator capacity by requesting NRC approval of a power uprate for Unit 2. The licensing submittals associated with the power uprate proposal would revise the appropriate sections of Chapters 6 and 15 of the Updated Final Safety Analysis Report, and would revise the Technical Specifications. The staff noted that, when using generically approved computer codes to conduct the safety analyses, all conditions placed on the use of these codes should be specifically addressed in the licensee's submittals.

Enclosure 1 is the list of attendees for the meeting, and Enclosure 2 is a copy of the slides presented by the licensee.

It was agreed at the conclusion of the meeting that the staff and the licensee will meet in approximately 6 months to discuss progress on these issues.

/RA/

Mel B. Fields, Project Manager, Section 2  
Project Directorate IV & Decommissioning  
Division of Licensing Project Management  
Office of Nuclear Reactor Regulation

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Docket No. STN 50-529

- Enclosures: 1. List of Meeting Attendees
- 2. Licensee's Meeting Slides

cc w/encls: See next page

Accession No. ML00371

OFC	PDIV-2/PM	PDIV-2/LA	PDIV-2/SC
NAME	MFields:lcc	CJamerson	SDembek
DATE	5-1-00	5/31/00	6/1/00

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LIST OF ATTENDEES

PALO VERDE NUCLEAR GENERATING STATION, UNIT 2

STEAM GENERATOR REPLACEMENT AND POWER UPRATE ISSUES

NRC/APS

MAY 24, 2000

ARIZONA PUBLIC SERVICE COMPANY

David Mauldin  
Carl Churchman  
Paul Clifford  
Richard Bernier  
Mohammad Karbassian  
Kevin Neese  
Ron Pontes  
Larry Joy  
Ted Erikson

WESTINGHOUSE

Bill Gardner  
Richard Bradshaw

BECHTEL

Eric Ocsterle  
Andrew Matyas

McGRAW HILL

Elaine Hiruo

NRC

Dick Wessman  
Mel Fields  
Chu-yu Liang  
Steve Dembek  
Anthony Attard  
John Tsao

**Palo Verde  
Steam Generator Replacement  
And Power Uprate Project**

**Presentation  
To The  
Nuclear Regulatory Commission**

**May 24, 2000**



**Palo Verde Steam Generator  
Replacement And Power Uprate Project**

**Project Update**

**Carl Churchman  
SGR Project Director**



# Objectives

- ◆ **Provide status of SG replacement and power uprate project**
- ◆ **Discuss oversight activities**
- ◆ **Provide details of project management**
- ◆ **Discuss recently identified modifications**
- ◆ **Discuss results of safety analyses**



# Objectives

- ◆ **Review installation plan**
- ◆ **Provide update on licensing activities**
- ◆ **Provide an overview of upcoming activities**
- ◆ **Discuss integrated schedule**



# Agenda

- ◆ Introduction Carl Churchman
- ◆ Project status & oversight Carl Churchman
- ◆ ABB/CE transition Rick Bradshaw
- ◆ Safety Analyses Paul Clifford
- ◆ Configuration management Mo Karbassian
- ◆ Modifications Mo Karbassian
- ◆ Installation plan Ron Pontes
- ◆ Licensing activities Dick Bernier
- ◆ Future activities Carl Churchman



# RSG Fabrication Status

## ◆ Tubing

- Fabrication in progress
- Delivery to be in July and September 2000

## ◆ Tubesheet #1

- Drilling in progress
  - > 75 percent complete



# RSG Fabrication Status

- ◆ **Tubesheet #2**
  - Stub barrel welded to tubesheet
  - Drilling to start mid-June 2000
- ◆ **Lower and intermediate shells**
  - Fabrication in progress for both SGs
- ◆ **Eggcrate supports**
  - Fabrication of templates in progress



# RSG Fabrication Status

- ◆ **Economizer flow distribution plate #1**
  - Drilling in progress
- ◆ **Primary channel heads**
  - Support skirts attached
  - Stainless steel cladding in progress
- ◆ **Primary nozzles**
  - Cold leg: stainless steel cladding in progress
  - Hot leg: Safe ends attached



# RSG Transportation

- ◆ **Status of transportation plan**
- ◆ **Status of permits**
- ◆ **Status of infrastructure improvements**



# Oversight Activities

- ◆ **Audited ABB Chattanooga in May 1999**
  - **Seven findings**
    - **Software control, design control, internal audit program, corrective action program**
- ◆ **Source verification performed in February 2000**
  - **ABB resolved all identified issues and implemented appropriate corrective actions**
  - **Audit findings are closed**



# Oversight Activities

- ◆ **Audited ABB Windsor in August 1999**
  - **Eight findings**
    - **Software control/design control**
    - **Weakness QA audits/auditor training**
    - **Corrective actions**
- ◆ **APS has accepted corrective actions proposed by ABB**
- ◆ **Implementation of corrective actions was verified during week of May 15, 2000**



# Oversight Activities

- ◆ **Audited Ansaldo Milan in June 1999**
  - **Wisconsin Public Service Corp. participated**
    - **Six findings**
      - **Weak and ineffective corrective action**
      - **Non-compliance ANSI Standard**
      - **Procurement control**
      - **Compliance with cleaning spec (WPSC)**
      - **Documentation of witness points**



# Oversight Activities

- ◆ **Audited Ansaldo Genoa in June 1999**
  - **Wisconsin Public Service Corp. participated**
    - **Two findings**
      - **Procurement control**
      - **Corrective action program**



# Oversight Activities

- ◆ **APS and WPSC have accepted corrective actions proposed by Ansaldo**
- ◆ **Ansaldo implementing corrective actions to audit findings**
- ◆ **Ansaldo has appointed a new QA director**
- ◆ **Implementation of corrective actions to be verified in June 2000**



# **Sandvik Oversight Activities**

- ◆ **Ansaldo audited Sandvik in March 2000 with APS in an oversight capacity**
  - **Results generally satisfactory with two minor findings**
    - **Document control**
    - **Records storage temperature controls**
- ◆ **APS/Ansaldo quality team review scheduled for July/August 2000**



# Sandvik Oversight Activities

## ◆ Short tubes

- 2895 tubes fabricated 1.5mm short
- Error related to use of incorrect drawing
- Tubes to be replaced by Sandvik to meet specifications



## **BNFL Acquisition of ABB Nuclear**

- BNFL/Westinghouse announced the acquisition of ABB's Nuclear Businesses Worldwide on May 2, 2000.
- ABB Nuclear Companies will be integrated into and operated as part of Westinghouse.
- In USA: Westinghouse Electric Company  
CE Nuclear Power LLC.
- No changes to the PVNGS RSG Project Team, QA, Technology, or Schedule are anticipated.

# Safety Analyses

- ◆ **UFSAR Chapter 15 Transient Analysis**
  - **CENTS code**
  - **Analytical limits**
  - **Methodology changes**
  - **Sample from uprate submittal**



# Safety Analyses

- ◆ **CENTS will replace CESEC-III as the primary tool for Chapter 15 non-LOCA transient analysis.**
- ◆ **CENTS will be used to predict global changes in RCS pressure during the CEA ejection event. STRIKIN-II will continue to be used to predict local conditions (i.e., fuel enthalpy and DNBR).**



# Safety Analyses

## Initial conditions at full power

Values Include appropriate uncertainties

Power	= 4070 MWt
Inlet temperature	= 548 to 566°F
Pressurizer pressure	= 2100 to 2325 psia
RCS mass flow rate	= 95% to 116% of design
Pressurizer level	= 24% to 59%
SG level	= 4% to 92% NR
Axial power distribution	= -0.20 to +0.20 ASI
MTC	= -0.20 to -4.0 E-4 delta-rho/°F
Primary to secondary leakage	= 720 gpd / SG



# Safety Analyses

## ◆ Methodology changes

- The following methods/assumptions changes will be applied to both the current plant configuration (Units 1/3) and Unit 2 RSG/uprate
  - Dose calculations will assume a decontamination factor of 100 (partition factor of 0.01) for the intact SG
  - Post-trip MSLB will employ a more detailed reactivity calculation, including moderator density feedback in the hot channel
  - More realistic IOSGADV+LOP event analyzed separately from limiting AOO with SF (i.e., LOF from SAFDL)



# Safety Analyses

## ◆ Methodology changes (cont.)

- Single RCP sheared shaft with LOP will assume that, at 60 minutes, the operator either closes the stuck open ADV or re-establishes level in the affected SG
- SGTR+LOP will credit EOP-based isolation of affected SG
- SGTR+LOP+SF will employ calculated flashing (based on local conditions) for leakage into affected SG



# Safety Analyses

- ◆ **Sample from uprate submittal**
  - **Outline and contents of the safety analysis portion of the submittal is based on a composite of the PVNGS UFSAR and the Farley uprate submittal**
  - **Inadvertent opening of a SGADV**
    - **Identification of causes and event description**
    - **Acceptance criteria**



# Safety Analyses

- ◆ **Sample from uprate submittal (cont.)**
  - **Inadvertent opening of a SGADV (cont.)**
    - **Description of analysis**
    - **Input parameters, initial conditions, and assumptions**
    - **Results**
    - **Conclusions**



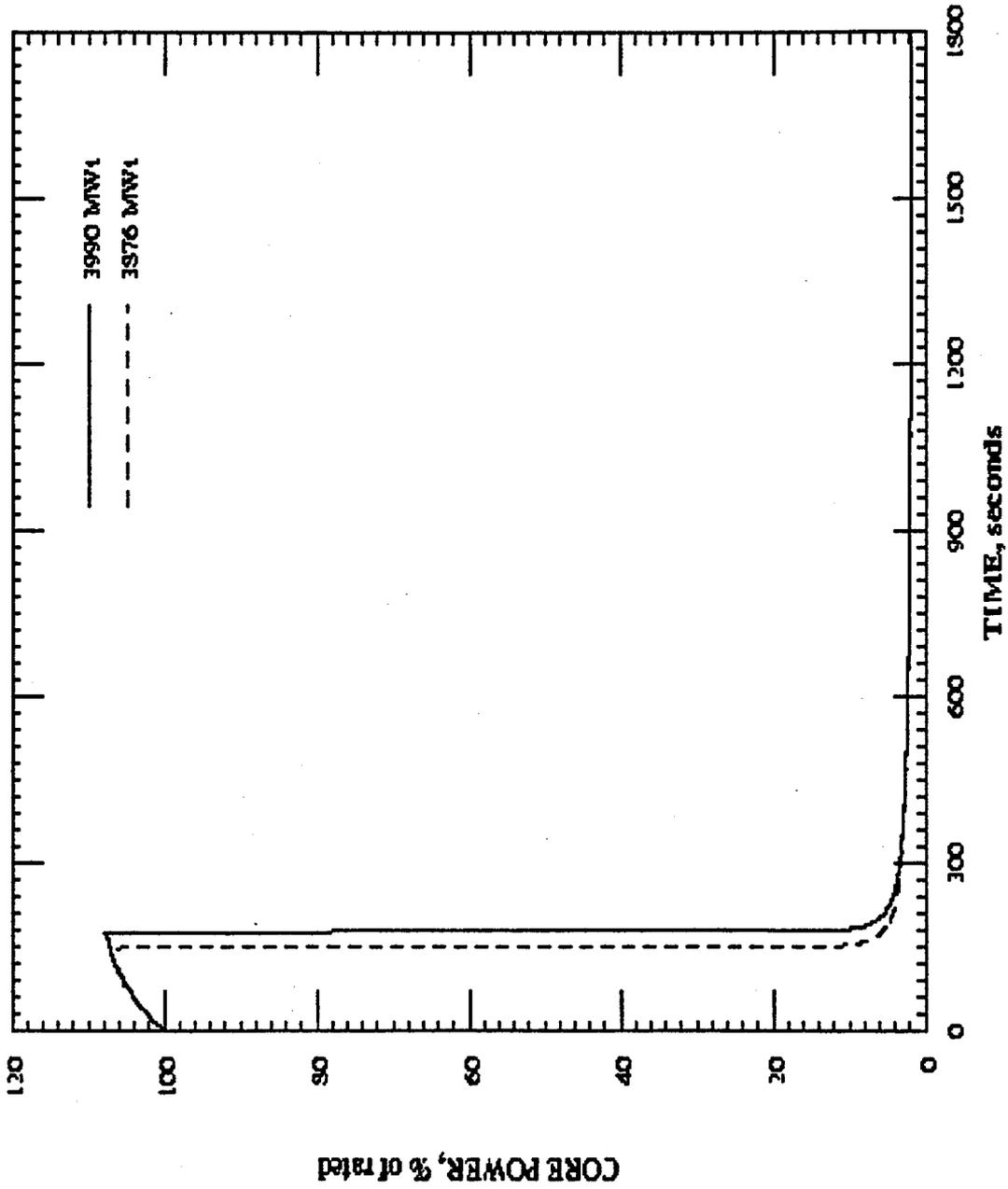
# Safety Analyses

Table 7.3.1.4.5.A: Sequence of Events for IOSGADV+LOP Event

Time (sec)		Event	Value	
3876 MWt	3990 MWt		3876 MWt	3990 MWt
0.00	0.00	Inadvertent opening of SG#1 ADV	---	---
0.00	0.00	Core Power (% RTP)	100	100
0.00	0.00	Hot Channel Minimum DNBR	1.72	1.72
147.9	176.5	SG pressure reaches MSIS/Trip setpoint (psia)	850	915
149.1	177.7	Reactor/Turbine trip Loss of Offsite Power	---	---
149.7	178.3	Scram CEAs begin falling	---	---
151.2	179.7	Minimum DNBR	> SAFDL	> SAFDL
153.5	182.1	MSIVs Closed	---	---
352.7	329.3	SG#2 MSSV Bank 1 Open (psia) Begin Oscillating	1303	1303
463.9	428.3	RCS pressure reaches SIAS setpoint (psia)	1750	1750
919	1005	SG#1 Empties	---	---
1800	1800	Operators manually close SG#1 ADV	---	---
1800	1800	Operators initiate cooldown (min)	30	30

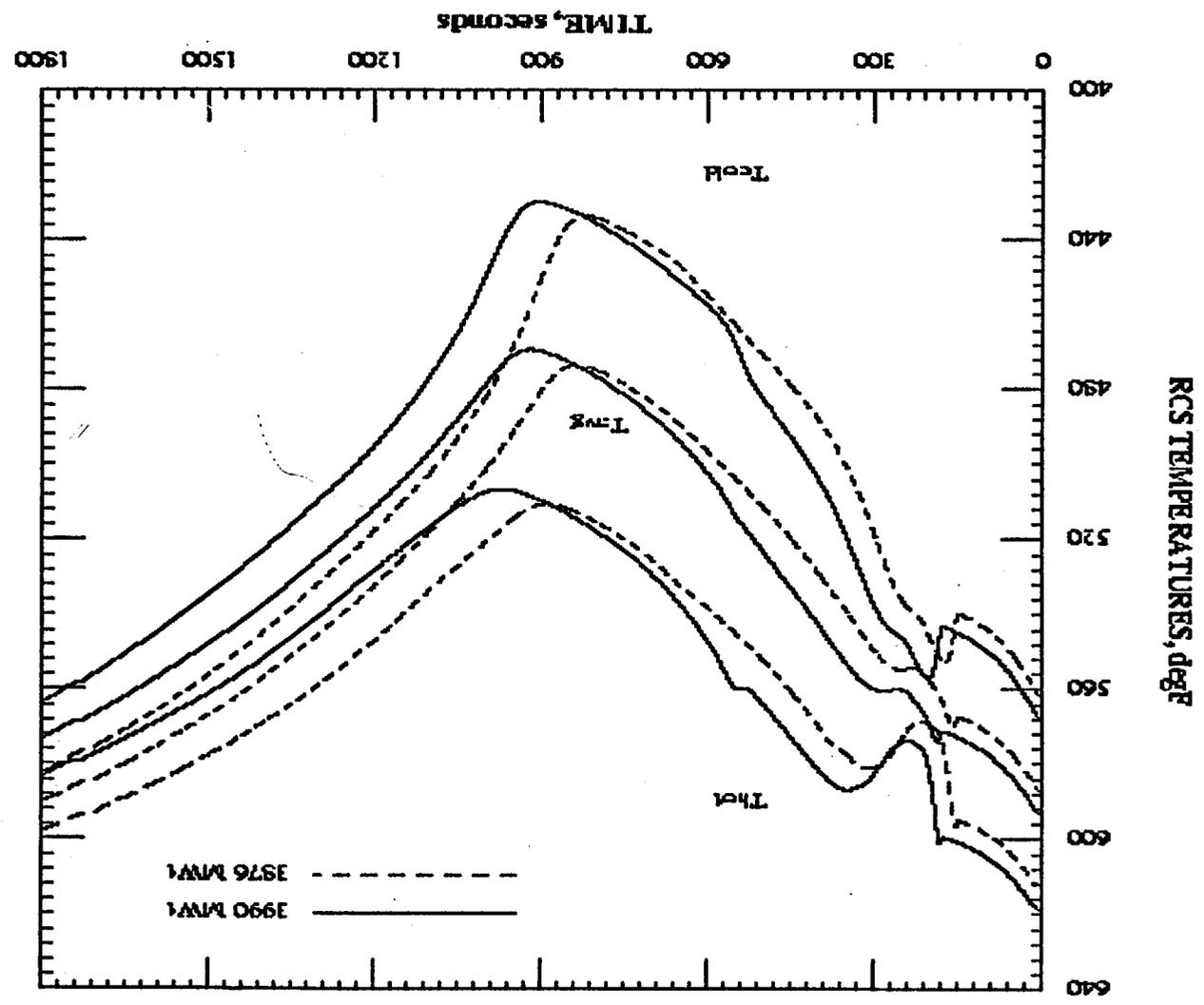


# Safety Analyses



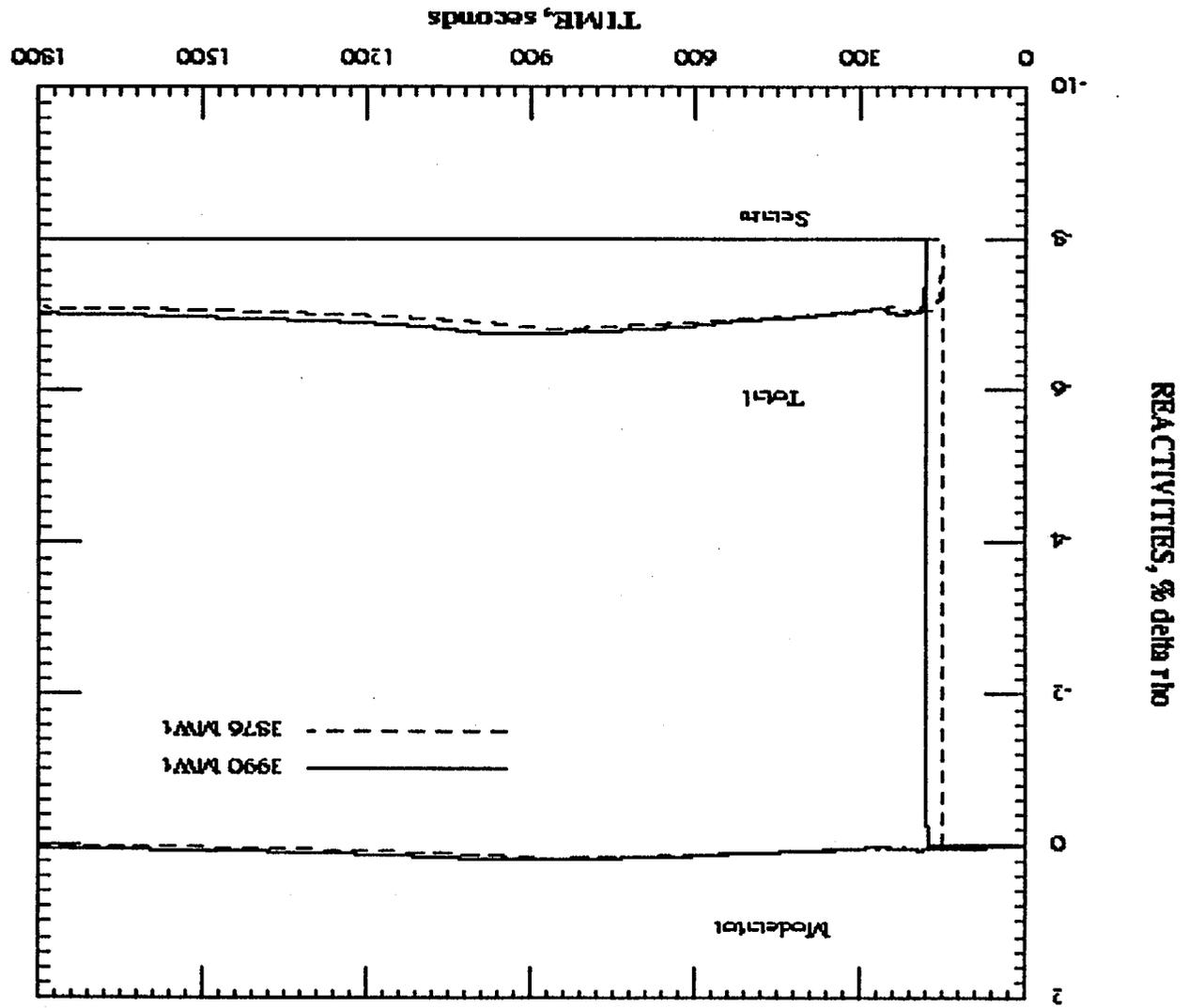


# Safety Analyses

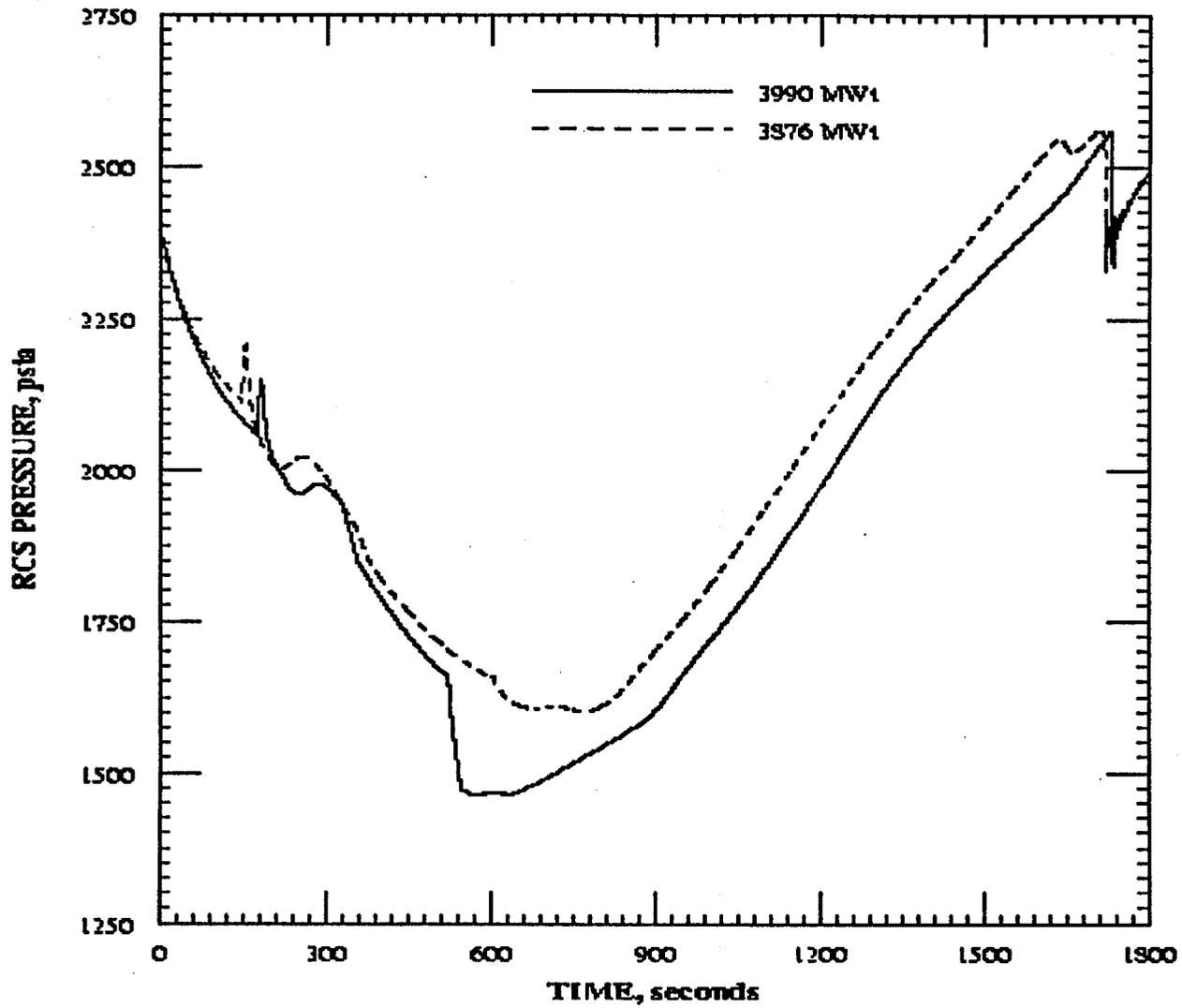




# Safety Analyses



# Safety Analyses



# Major Activities

- ◆ **U2R10 (spring 2002)**
  - **Remove interfering commodities from bioshield wall**
  - **Polar crane preparations (based on U2R9 inspection)**
  - **SG2 auxiliary crane supports**
  - **Modify second containment spray pump impeller**



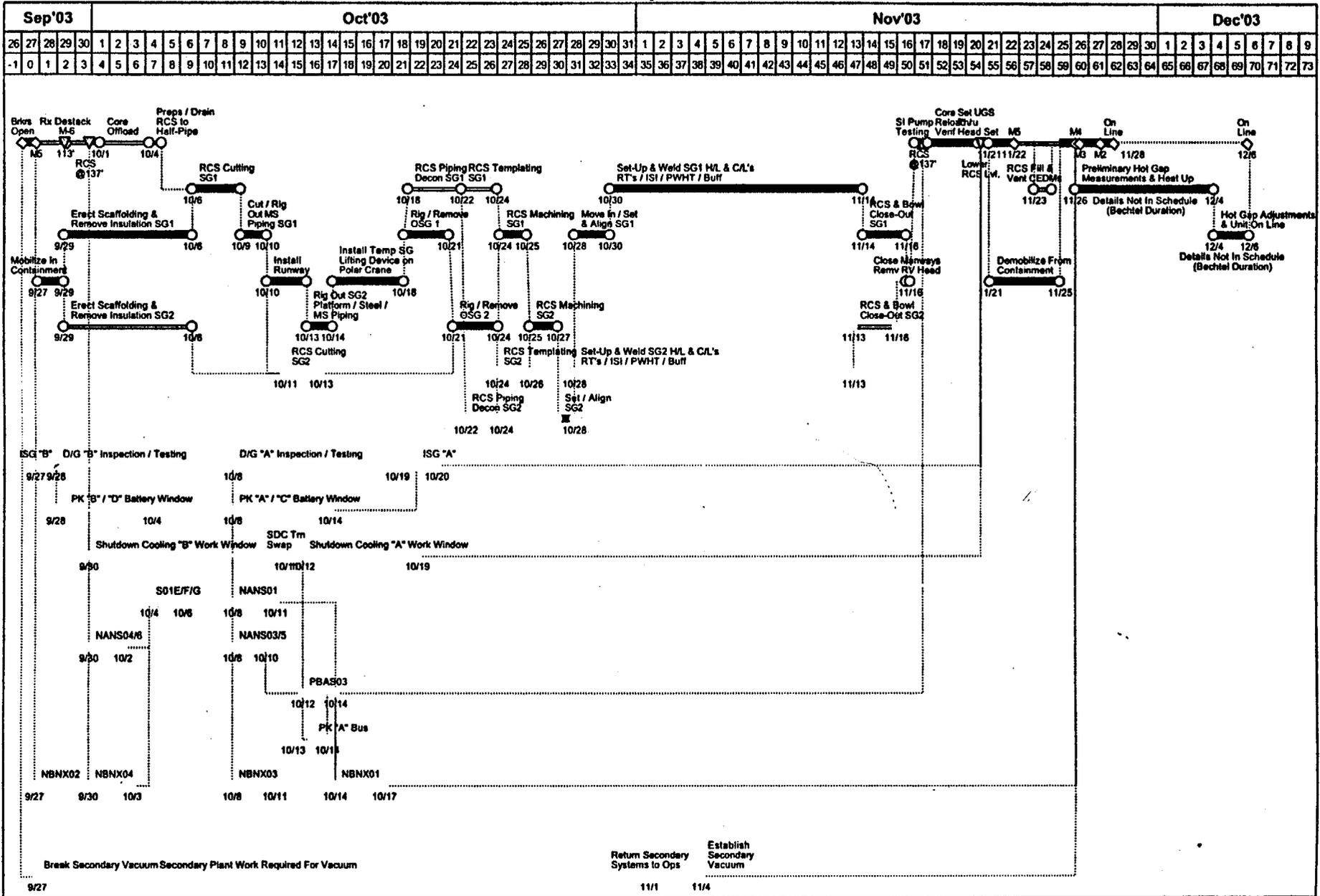
# Major Activities

- ◆ **U2C11 (summer 2002 - fall 2003)**
  - **Craft access facility**
  - **Outside lift system**
  - **Haul route**
  - **RSG preparations**
- ◆ **U2R11 (fall 2003)**
  - **Bioshield wall modifications**
  - **Replace steam generators**



# PVNGS - 2R11 Steam Generator Replacement Outage

## Summary Schedule



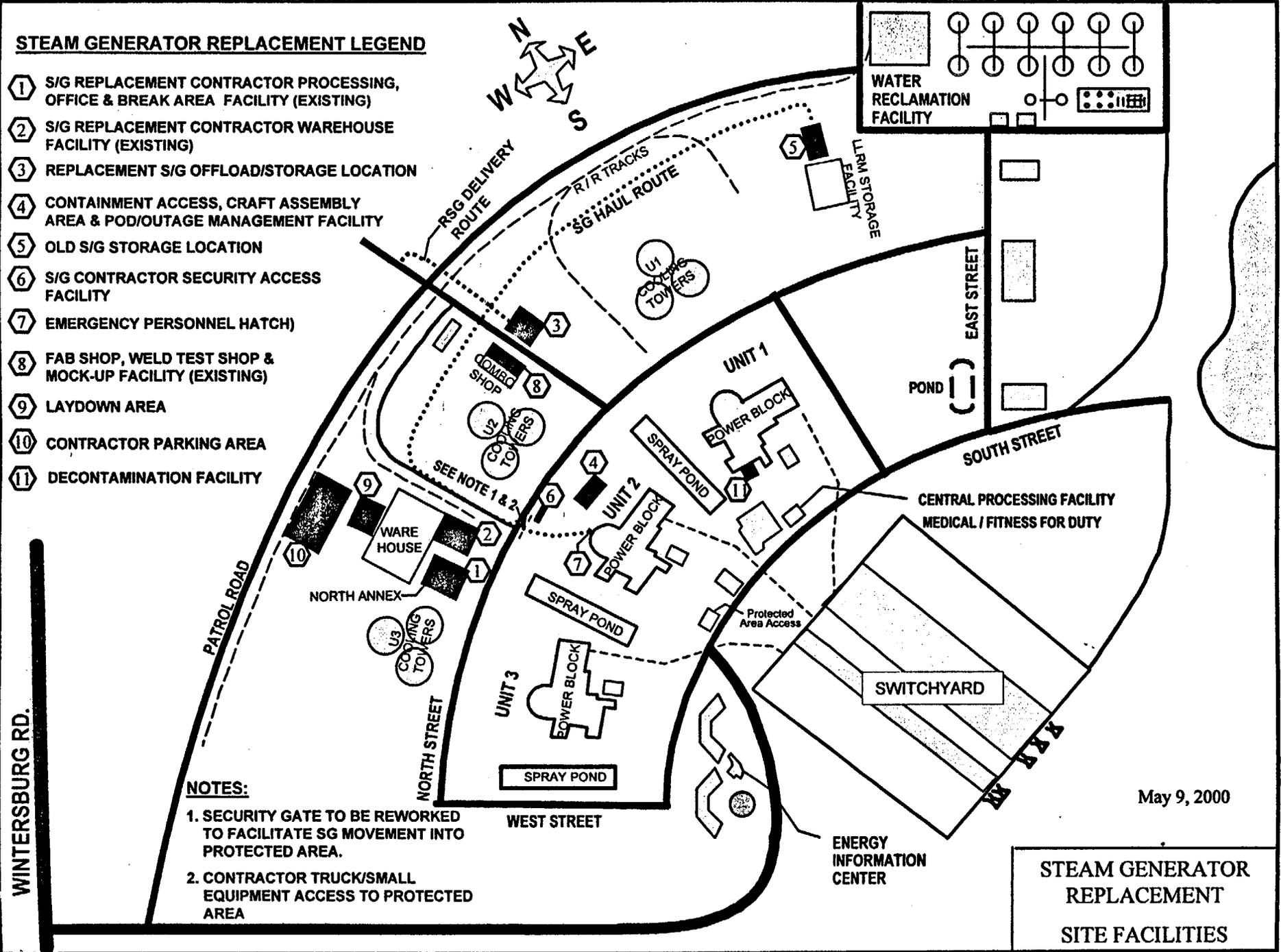
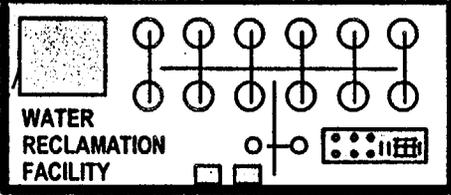
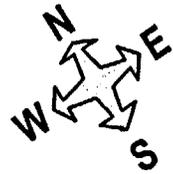
Scheduled Duration
  Critical Path

**STEAM GENERATOR REPLACEMENT LEGEND**

- ① S/G REPLACEMENT CONTRACTOR PROCESSING, OFFICE & BREAK AREA FACILITY (EXISTING)
- ② S/G REPLACEMENT CONTRACTOR WAREHOUSE FACILITY (EXISTING)
- ③ REPLACEMENT S/G OFFLOAD/STORAGE LOCATION
- ④ CONTAINMENT ACCESS, CRAFT ASSEMBLY AREA & POD/OUTAGE MANAGEMENT FACILITY
- ⑤ OLD S/G STORAGE LOCATION
- ⑥ S/G CONTRACTOR SECURITY ACCESS FACILITY
- ⑦ EMERGENCY PERSONNEL HATCH
- ⑧ FAB SHOP, WELD TEST SHOP & MOCK-UP FACILITY (EXISTING)
- ⑨ LAYDOWN AREA
- ⑩ CONTRACTOR PARKING AREA
- ⑪ DECONTAMINATION FACILITY

**NOTES:**

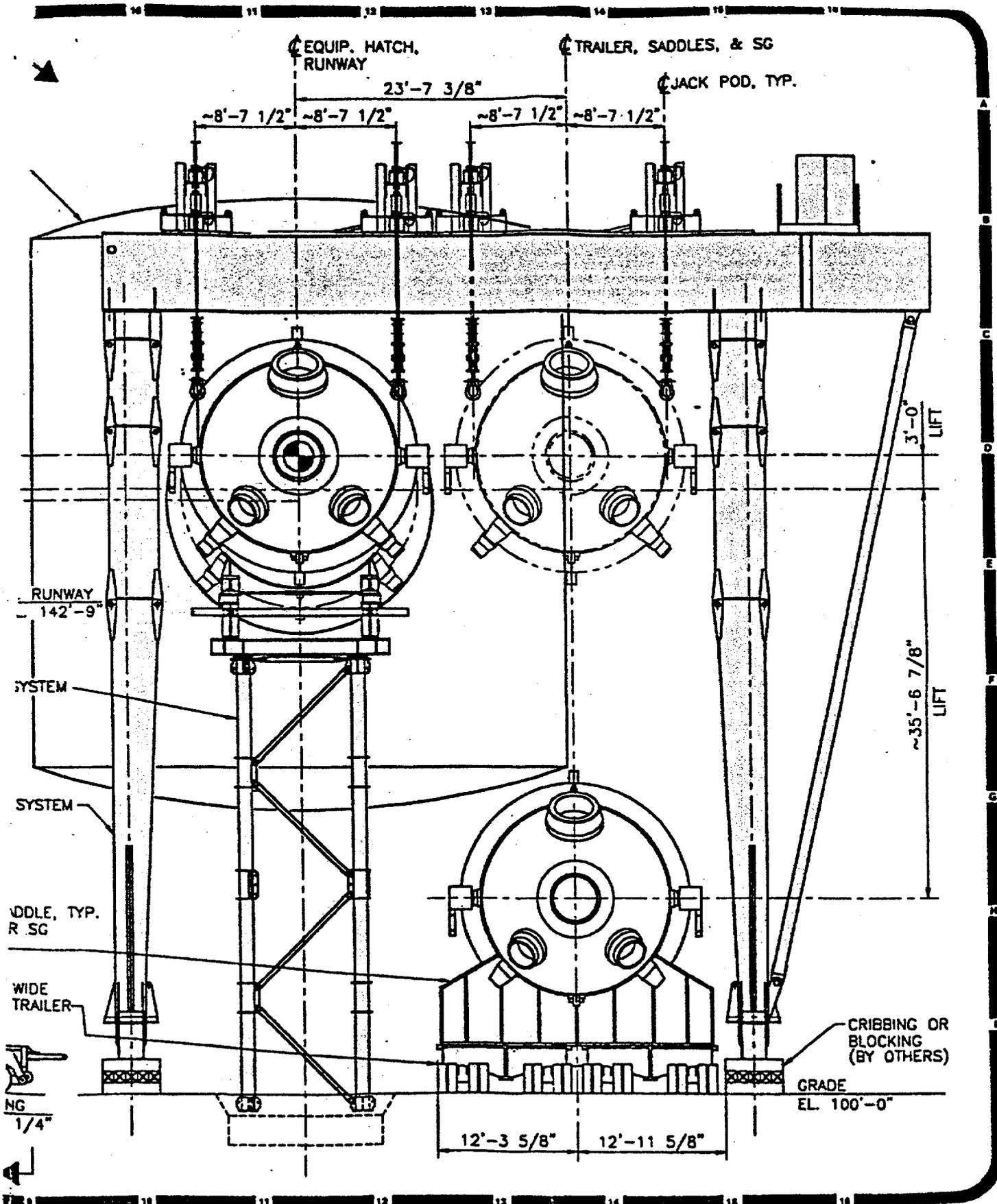
- 1. SECURITY GATE TO BE REWORKED TO FACILITATE SG MOVEMENT INTO PROTECTED AREA.
- 2. CONTRACTOR TRUCK/SMALL EQUIPMENT ACCESS TO PROTECTED AREA



May 9, 2000

**STEAM GENERATOR REPLACEMENT  
SITE FACILITIES**

WINTERSBURG RD.



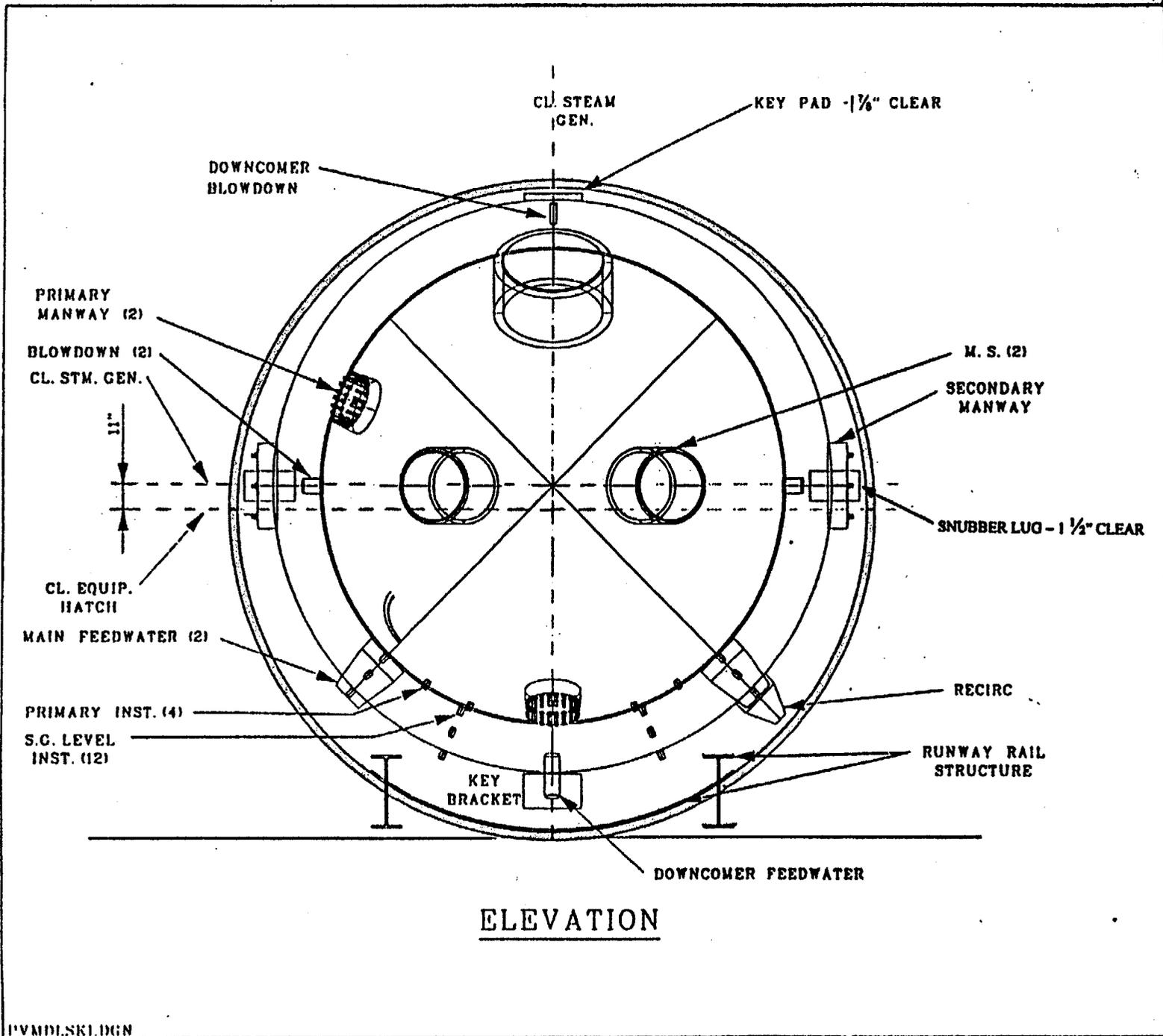
JBLIC SERVICE COMPANY  
 GENERATOR REPLACEMENT  
 VERDE NUCLEAR 2

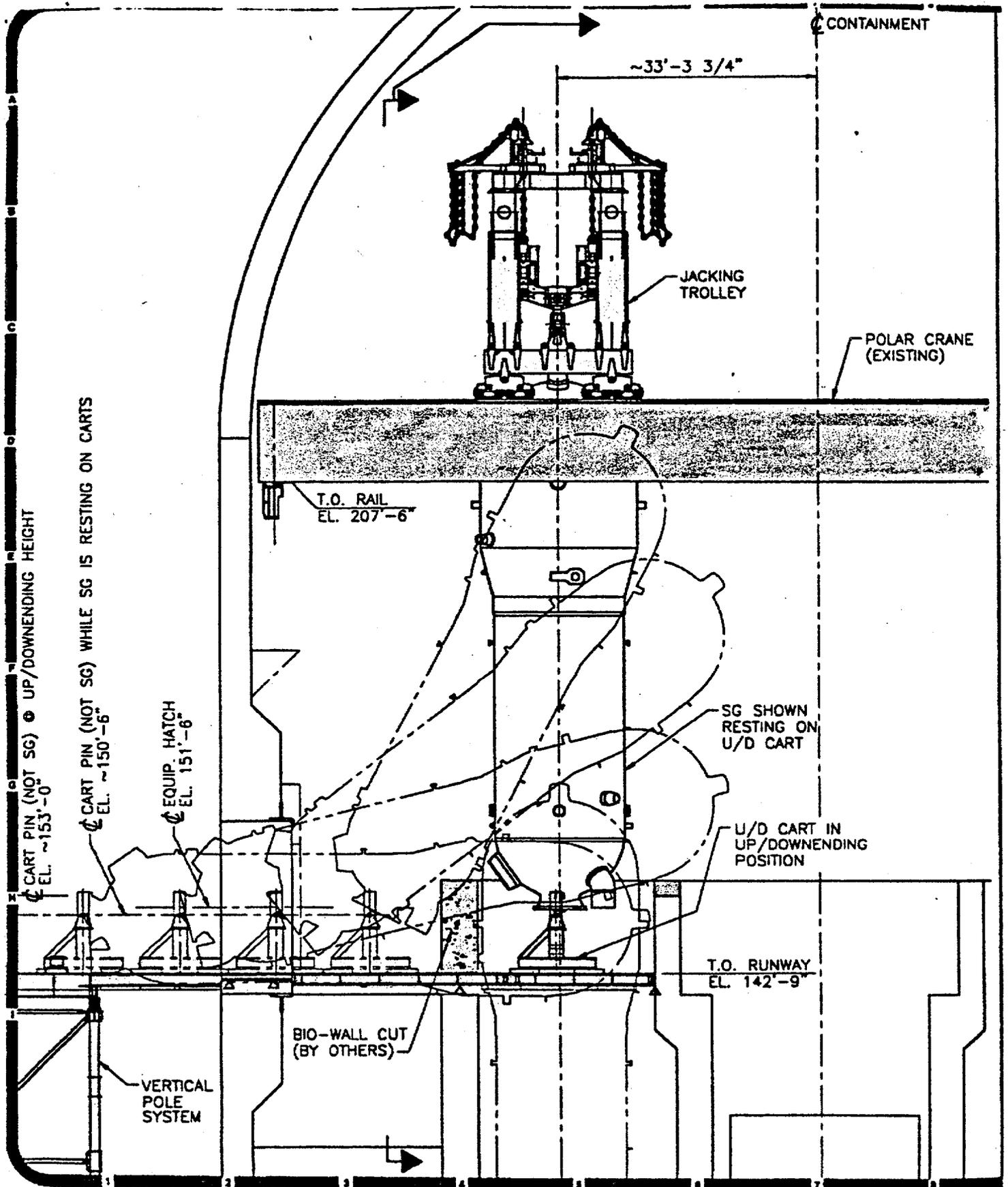
GENERAL ARRANGEMENT  
 HANDLING SGs  
 OUTSIDE CONTAINMENT  
 SKETCH 05.04-4

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# Licensing Activities

- ◆ **APS had planned a two phase submittal in August 2000 and February 2001**
- ◆ **APS will combine into one submittal in June 2001**
- ◆ **Request approval in June 2002**
- ◆ **U2C12 fuel design to commence in September 2002 based on SER from NRC**



# Potential Technical Specification Changes

- ◆ **Definition of rated thermal power**
- ◆ **Low SG pressure reactor trip setpoint**
- ◆ **Low SG pressure MSIS setpoint**
- ◆ **Peak containment pressure**
- ◆ **Operating range for cold leg temperature at 100 percent power**

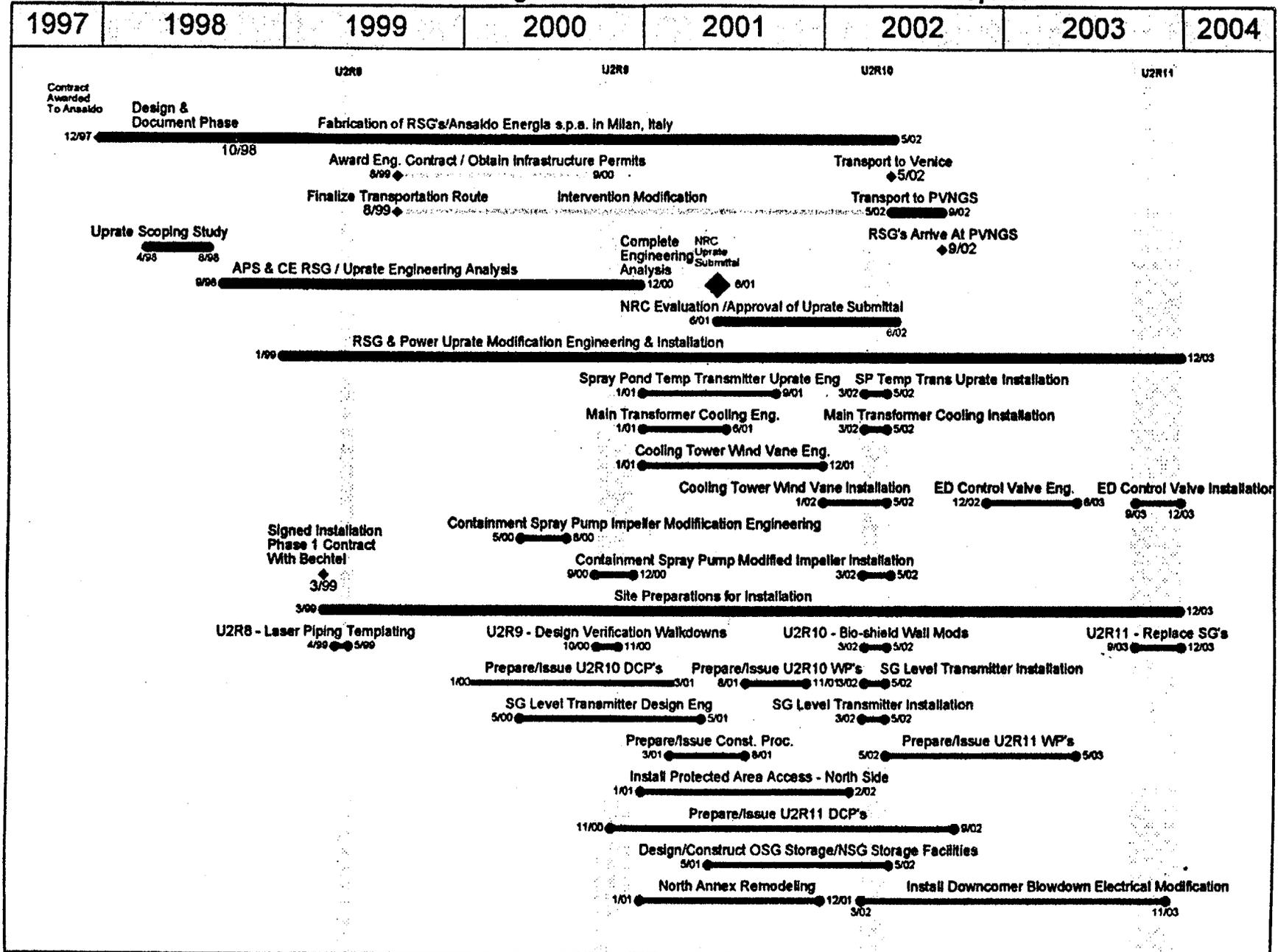


# Test Program

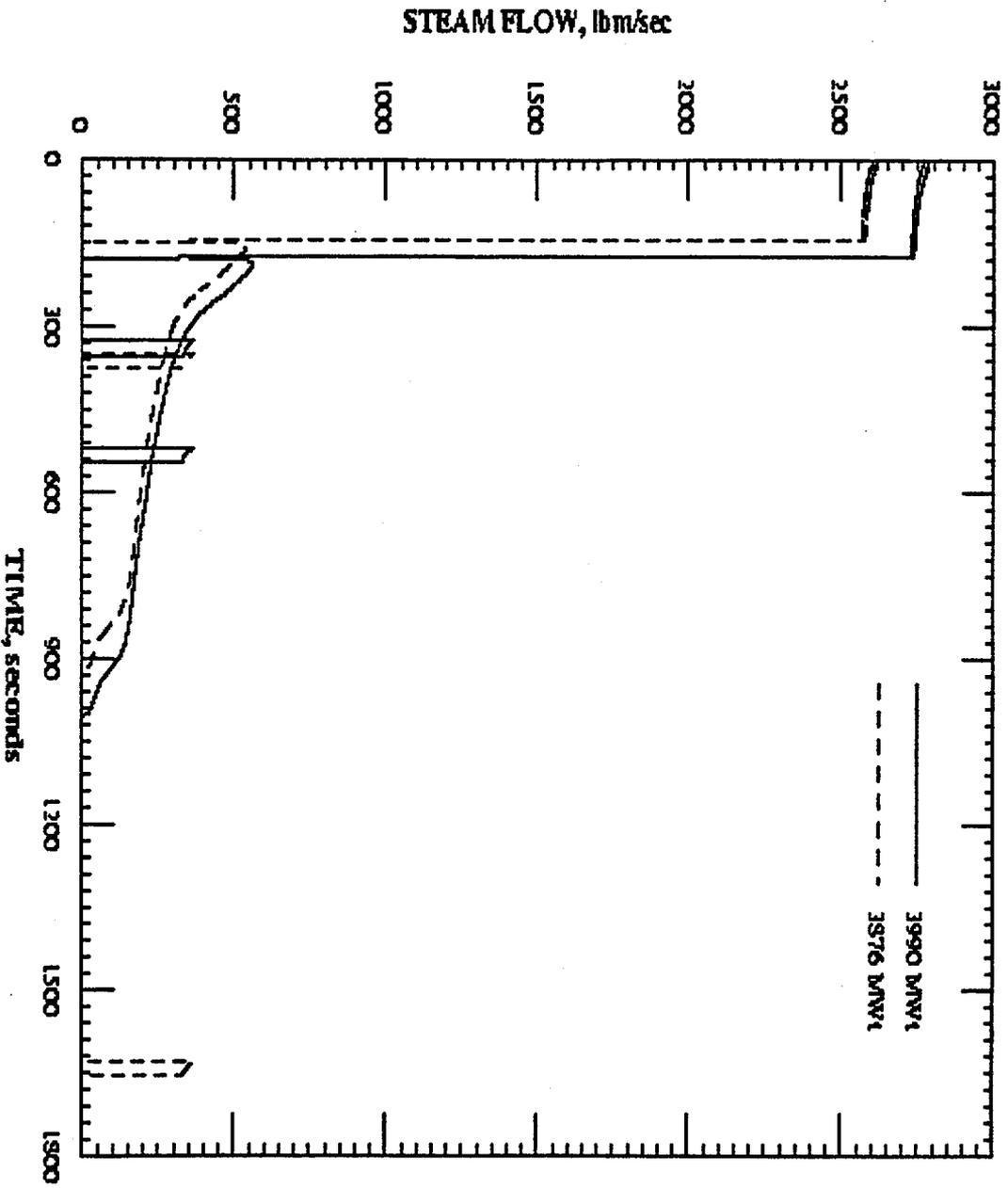
- ◆ **Review UFSAR Chapter 14 for applicable testing**
- ◆ **Use existing Surveillance Test Procedures as applicable**
- ◆ **Test program and results to be described in start-up test report in accordance with the PVNGS TRM**

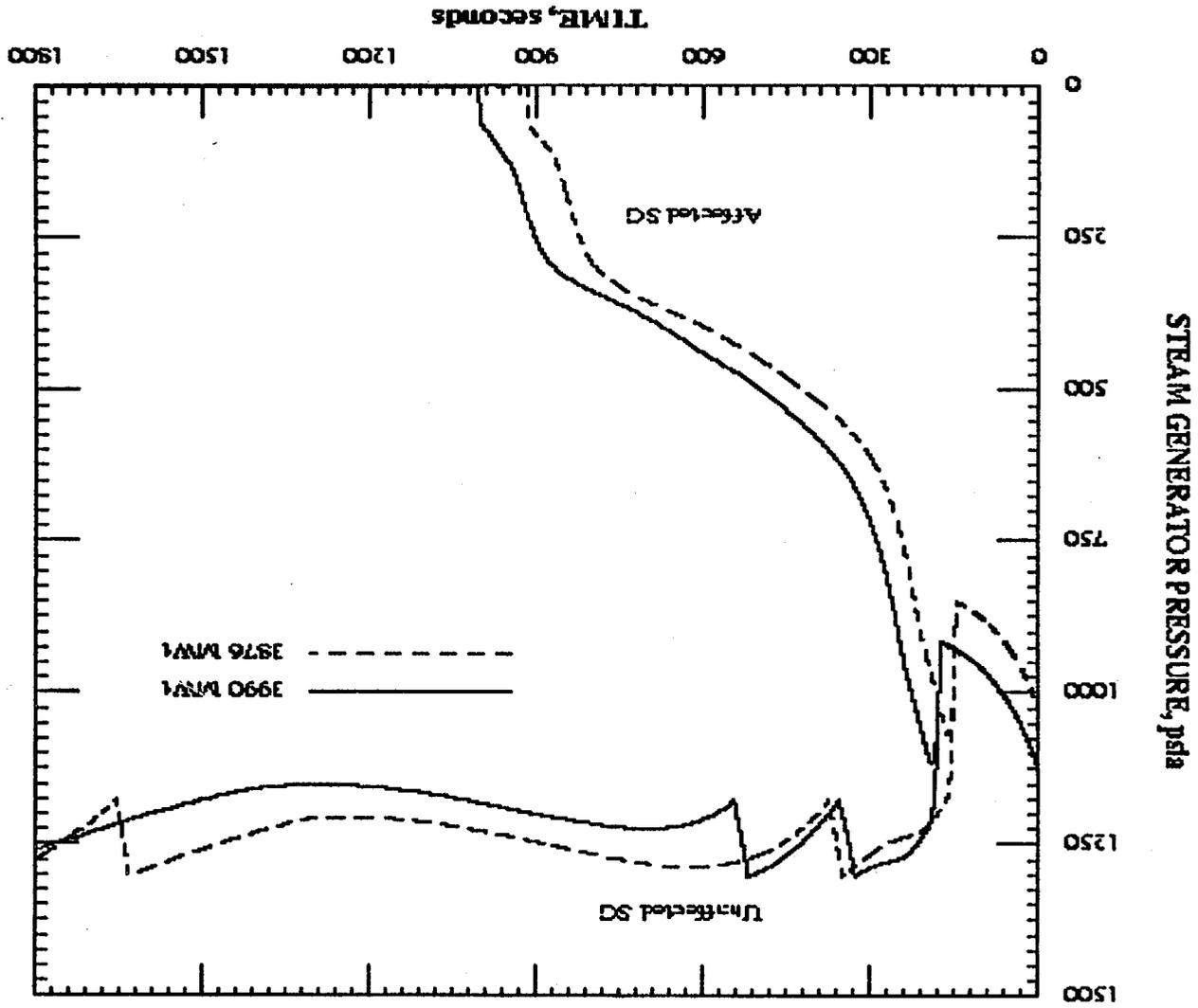


# PVNGS Unit 2 SGRP / Integrated Level One Schedule for RSG & Power Uprate



# Safety Analyses

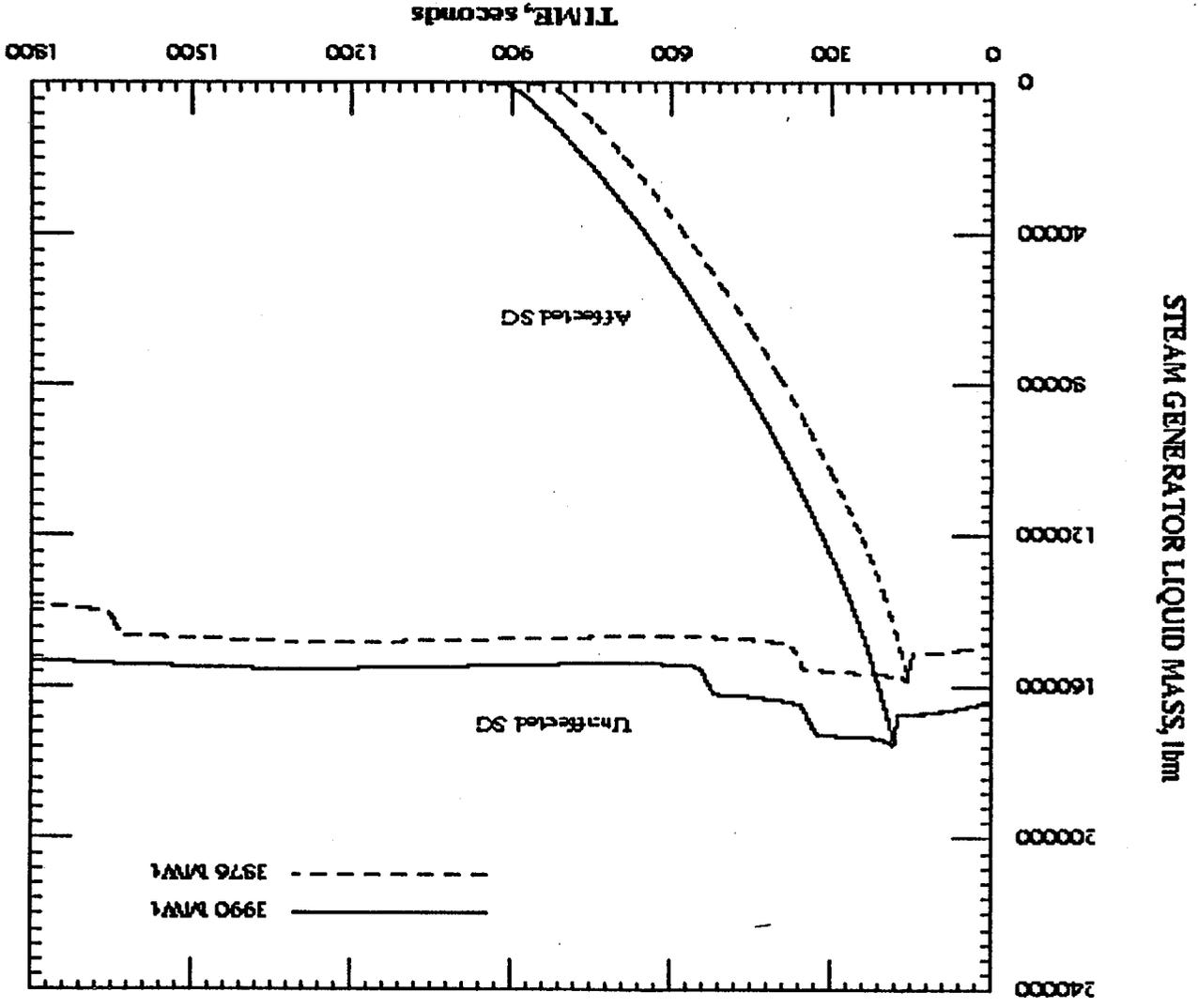




# Safety Analyses



# Safety Analyses

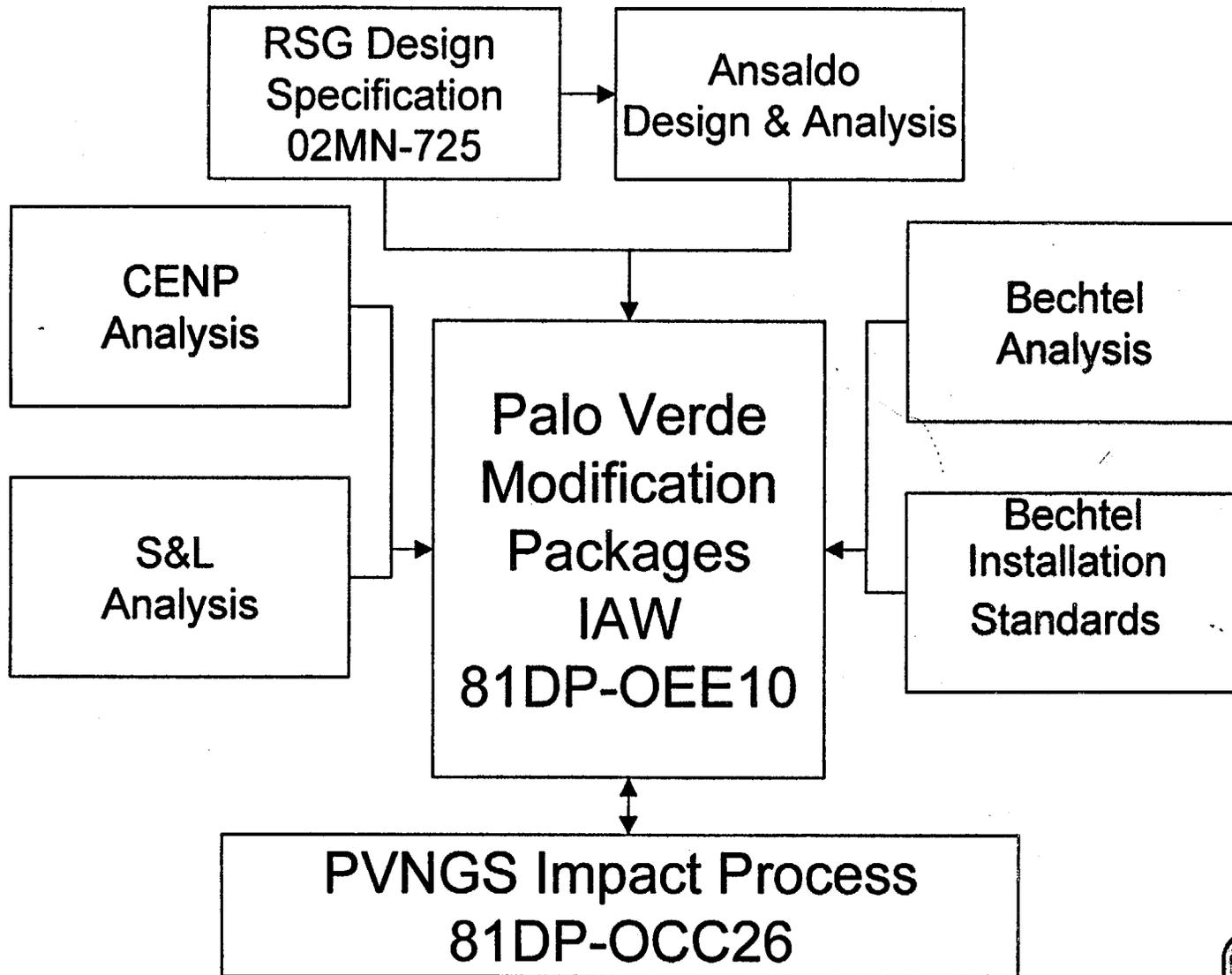


# Safety Analyses

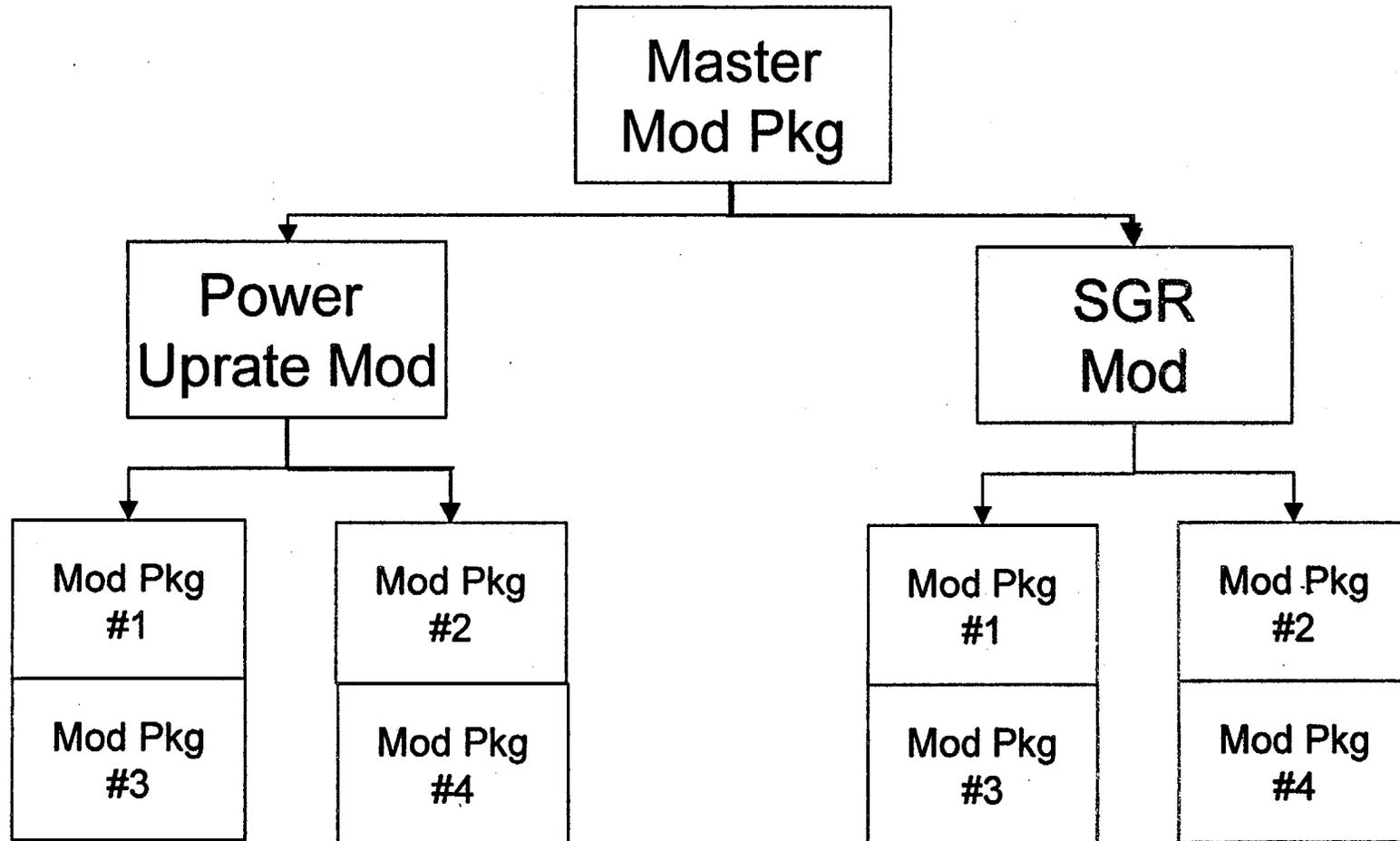
- ◆ **Sample from uprate submittal (cont.)**
  - **Conclusion**
    - **For the IOSGADV+LOP event, all of the acceptance criteria are met. The peak primary and secondary pressures remain below 110 percent of design at all times, thus ensuring the integrity of the RCS and main steam systems. The minimum hot channel DNBR remains above the SAFDL, thus ensuring fuel cladding integrity. Offsite radiological consequences remain within a small fraction of 10 CFR 100 guidelines.**



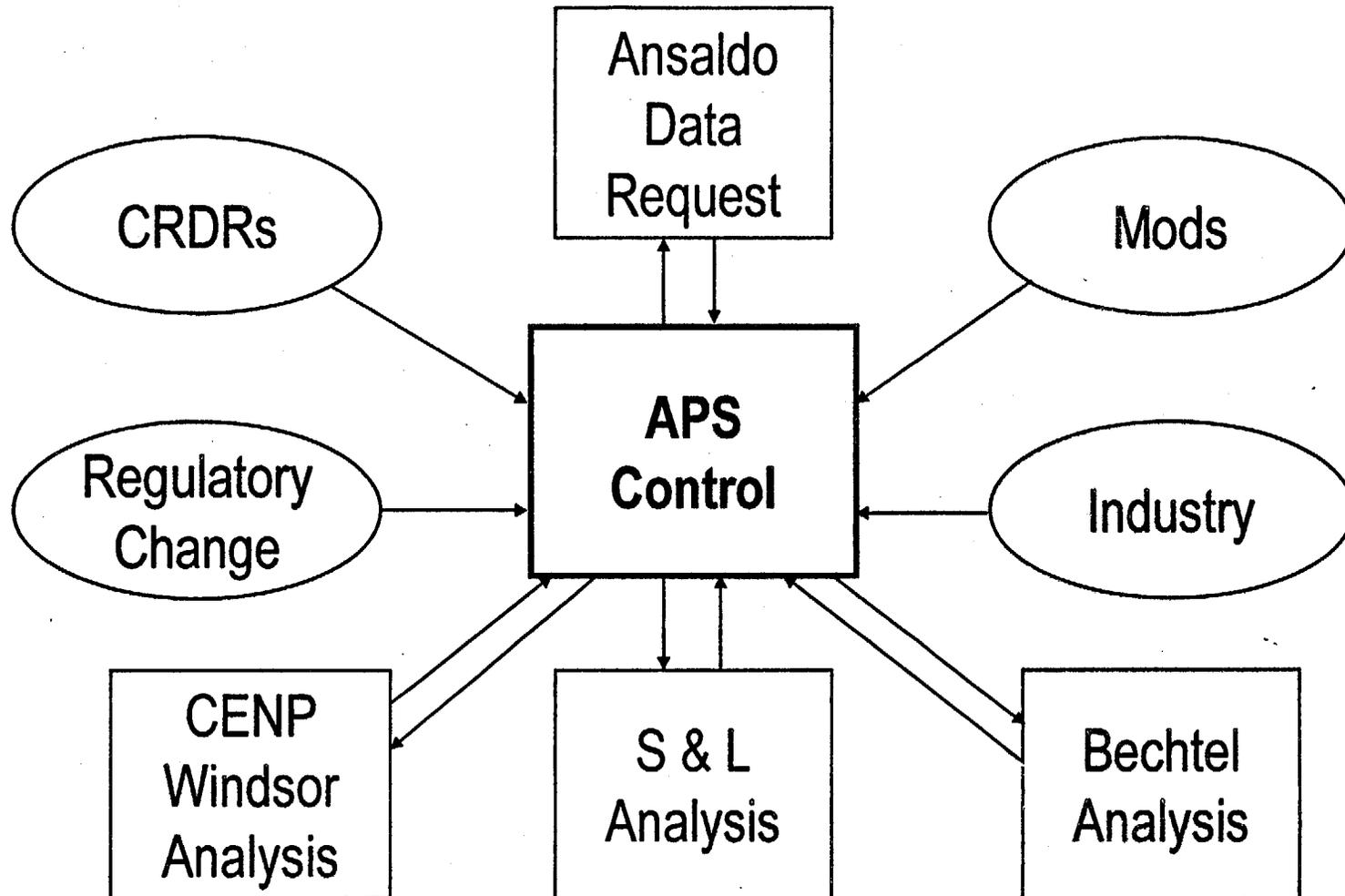
# Configuration Management



# Configuration Management



# Control Of Design Inputs



# Containment Spray Modification

- ◆ Increase in calculated containment peak pressure has decreased pump head margin
- ◆ Pumps would be marginally acceptable
- ◆ Approximately 8 PSID margin is desired at test flow rate

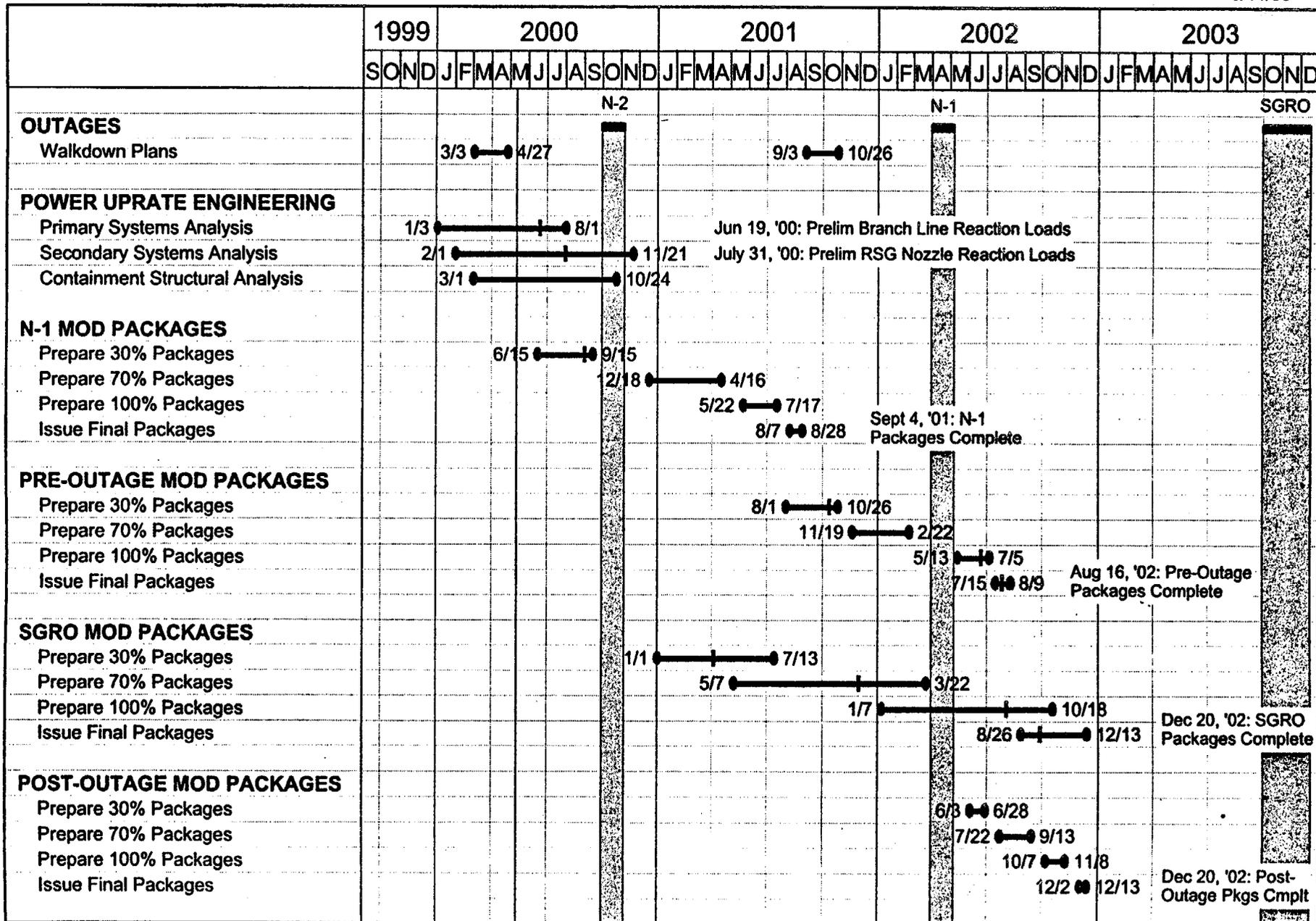


# Containment Spray Modification

- ◆ **Alternate flow rate instrument with less uncertainty will be used to regain ~4 PSID**
- ◆ **Modifying pump impeller profile will regain the remaining desired margin**
  - **Vendor guidance will be used**
  - **One pump to be done in 2R9**
  - **One pump to be done in 2R10**

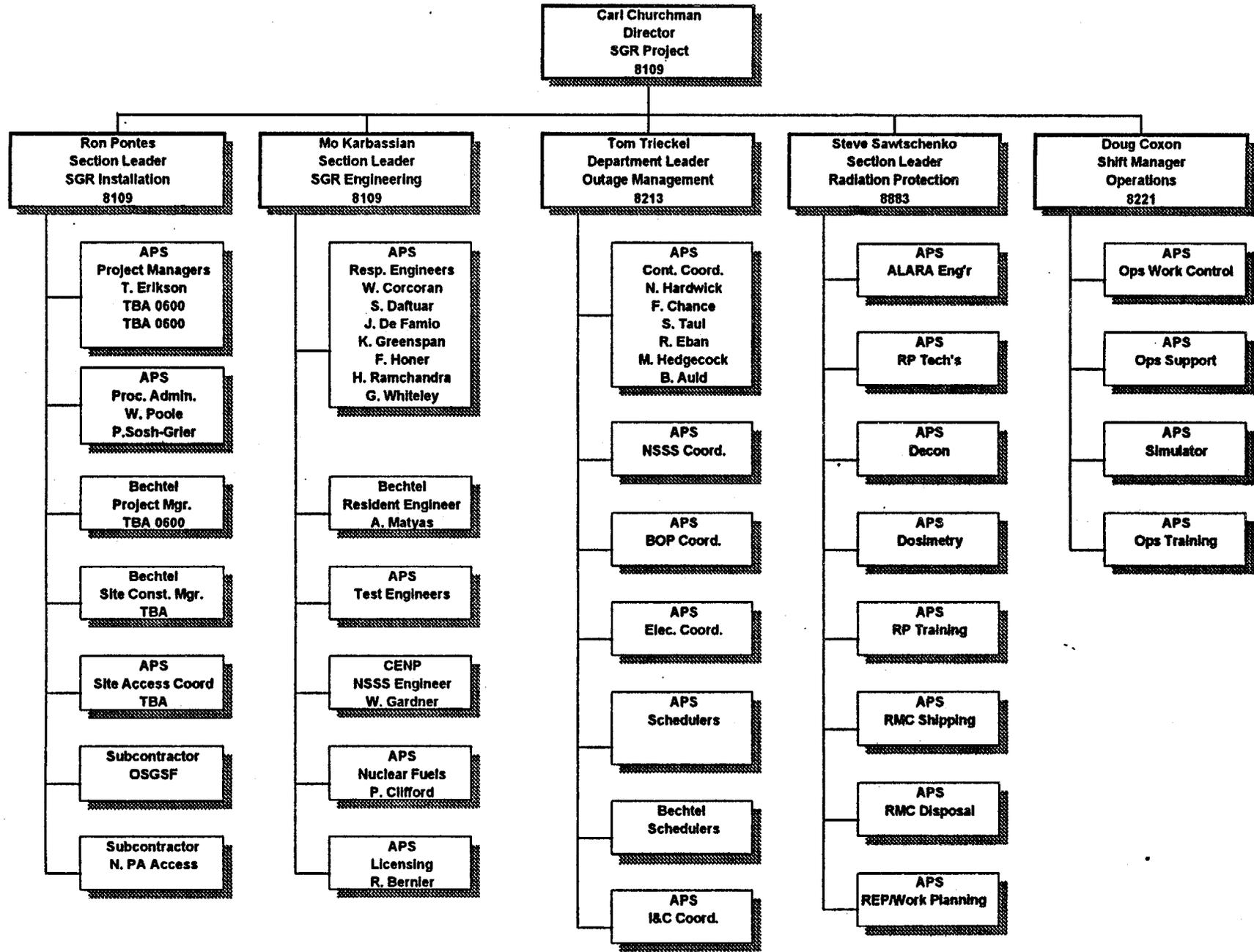


# Bechtel Engineering Schedule Palo Verde Unit 2 SGRP



# **RSG Installation Plan**

# SGR Implementation Phase - Functional Organization



# Major Activities

- ◆ **U2R9 (fall 2000)**
  - **Laser templating of piping in containment**
  - **Design walkdowns in containment**
  - **Polar crane inspections**
  - **Modify one containment spray pump impeller**
- ◆ **U2C10 (winter 2000 - spring 2002)**
  - **Personnel access and north side sally port**

