



SOUTHERN CALIFORNIA  
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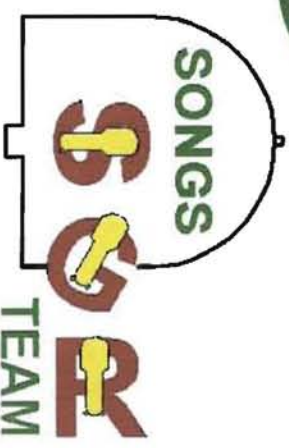
An EDISON INTERNATIONAL<sup>®</sup> Company

# San Onofre Nuclear Generating Station Units 2 & 3

## STEAM GENERATOR REPLACEMENT PROJECT OVERVIEW

*June 7, 2006*

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# Agenda



- Background
- Schedule
- Current Status
- Licensing
- Replacement Steam Generators
- Transportation
- Implementation
- Disposal of Original Steam Generators
- Q&A



# SONGS Background



- **Started SONGS 2 & 3 Construction: 1974**
- **Commercial Operation: August 1983 - Unit 2  
April 1984 - Unit 3**
- **Licensed to Operate: Until 2022**
- **Nuclear Steam System Supplier: Combustion Engineering**
- **Architect/Engineer: Bechtel**
- **Turbine Supplier: English Electric**
- **Unit Output: 1,150 Megawatts each**
- **ABB-CE Steam Generator, Model 3410, two S/G per unit**
- **I-600 MA Tubing**



# Unit 2 Tube Plugging Projections

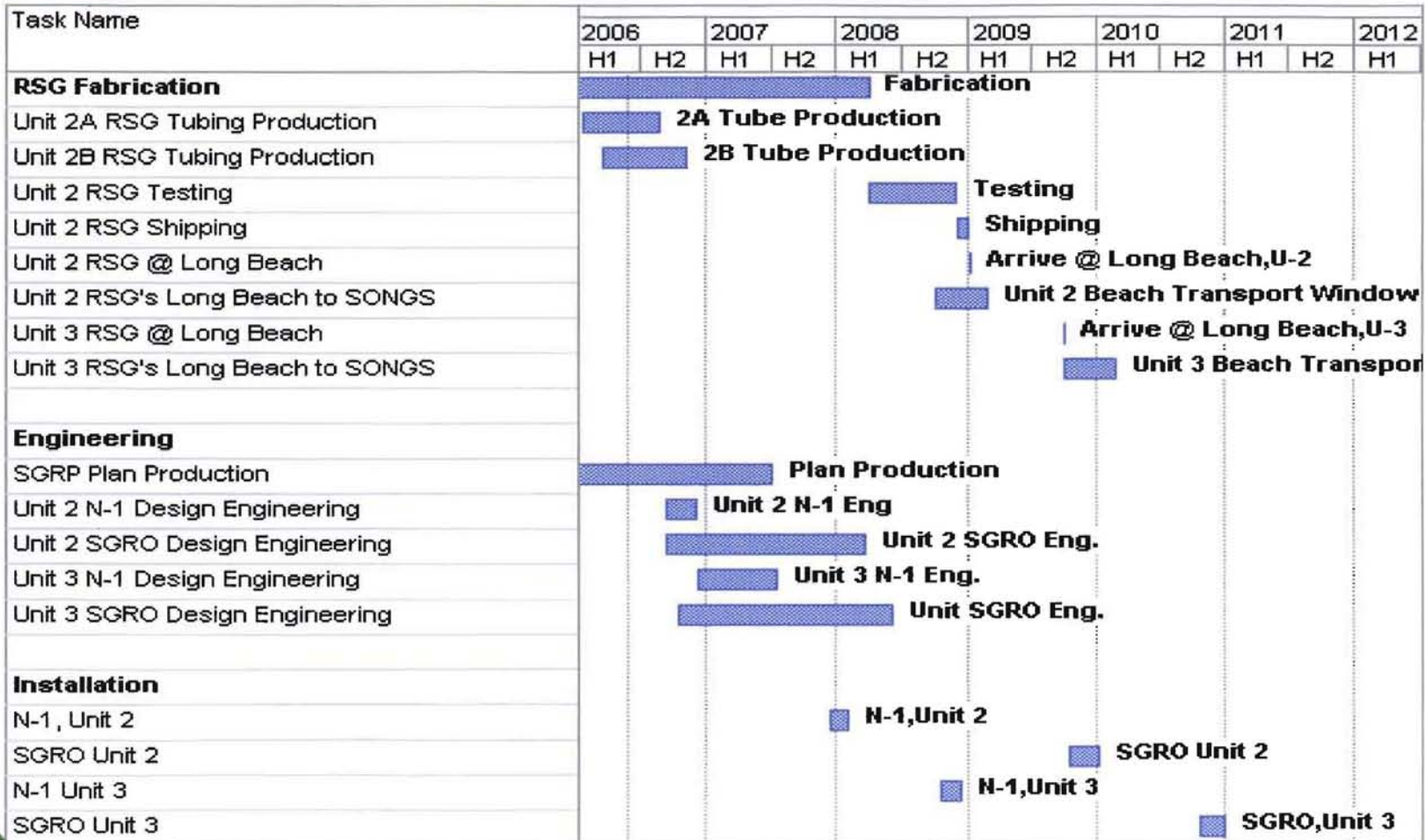


- Current Plugging Values
  - Unit 2: 13.5% Effective Plugging (Includes Sleeves)
  - Unit 3: 7.6% Plugging (No Sleeves)
- SG Inspections Before Cycle 16 Steam Generator Replacement Outage (SGRO)
  - Unit 2: Cycle 15
  - Unit 3: Cycle 14 & 15
- Plugging Limit is 21.4%
- Do Not Expect to Reach Plugging Limit





# Schedule for SONGS Steam Generator Replacement



# Benchmarking



- **Plant Benchmarking**
- **Fabricator Benchmarking**
- **Loan Employees**
- **Future Benchmarking Plans**



Palo Verde RSG Transport

➤ **Recently Completed SGRO**

- Palo Verde 1 & 2
- Beaver Valley 1
- ANO
- Callaway

➤ **Future SGRO**

- Ft. Calhoun
- Watts Bar
- Comanche Peak
- Palo Verde 3



# Current Status



- CPUC Application for Steam Generator Replacement Project (SGRP) Submitted February 2004
- Estimated Cost at \$680m (2004 \$)
- CPUC Decision December 2005
- EIX Board Accepted CPUC Decision March 2006



# Licensing



- Will Be Implemented Under 10CFR 50.59
- No Power Uprate
- Associated Technical Specification Changes
  - Identification 2007





# Replacement Steam Generators (RSG) Fabrication

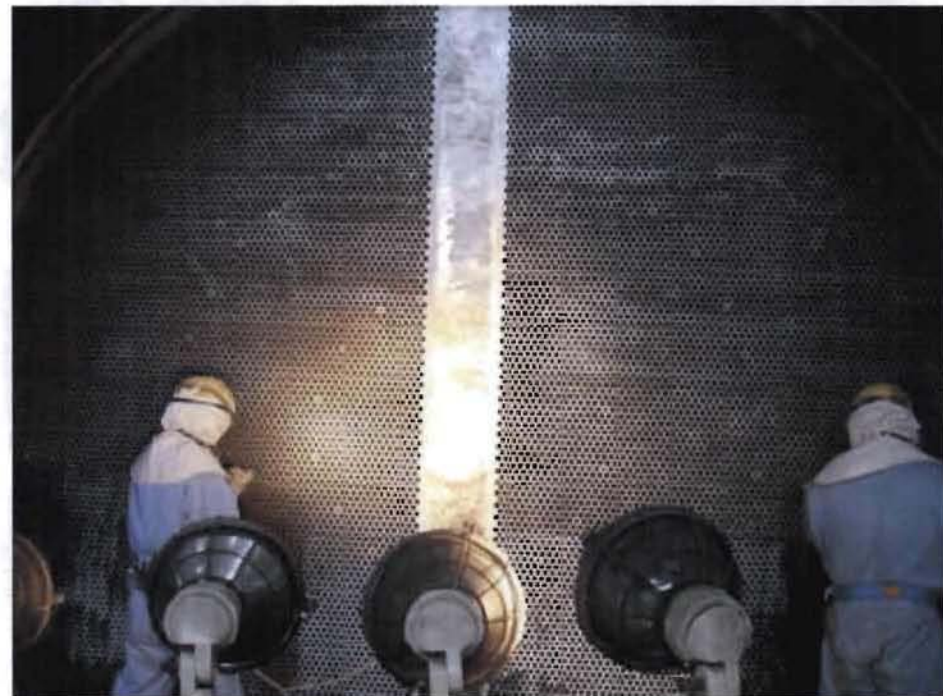


Mitsubishi Heavy Industries Kobe, Japan

- Contract Award September 28, 2004



2A Primary



2A Secondary

RSG 2ATube Sheet



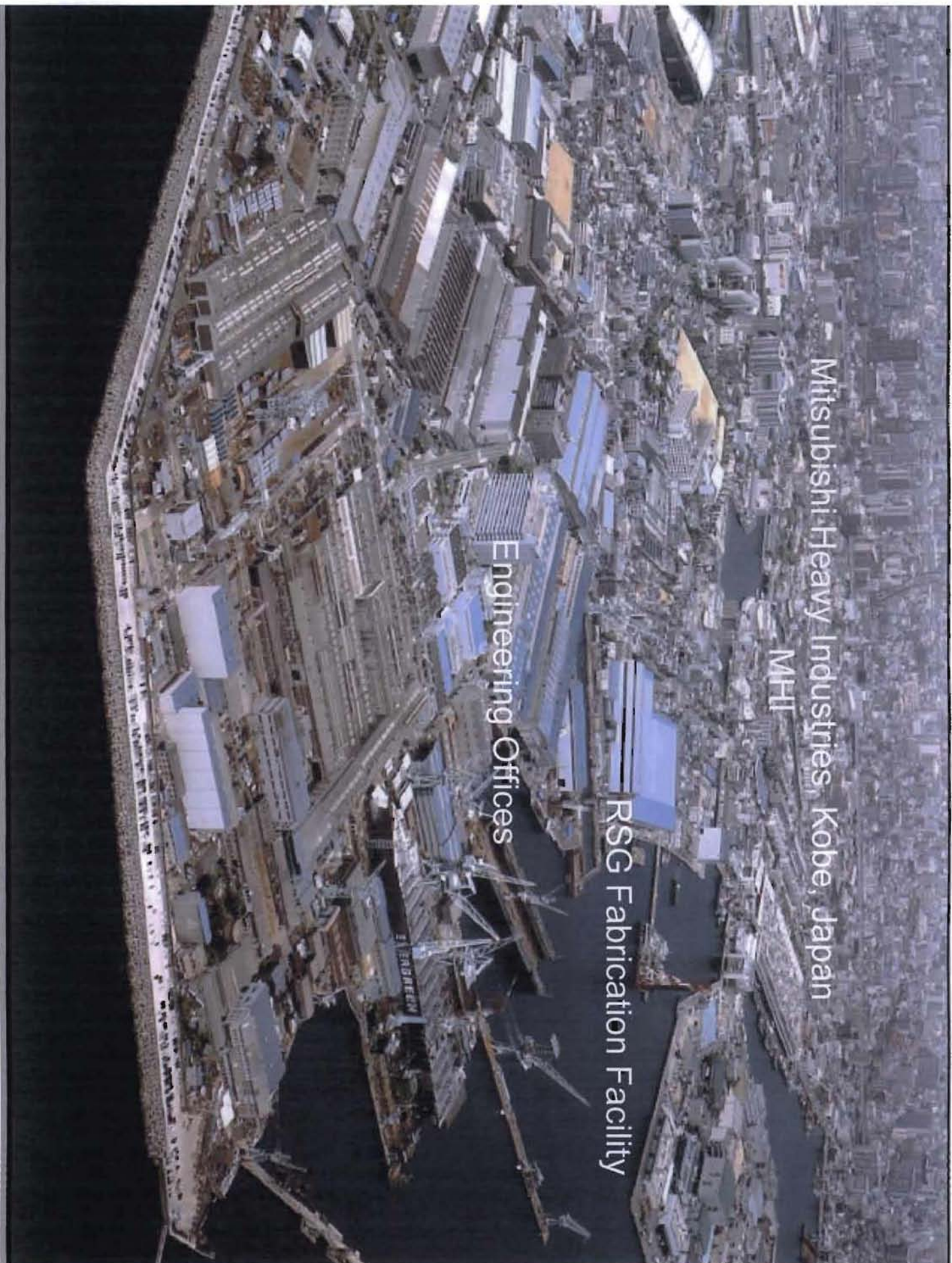


Mitsubishi-Heavy Industries, Kobe, Japan

MHI

RSG Fabrication Facility

Engineering Offices





# Oversight



- Design Reviews
- Technical Meetings (SONGS, Kobe)
- SCE Resident Personnel @ Kobe
- Special Engineering Visits
- Readiness Reviews
- Independent Inspections
- Audits

## SONGS 2B Channel Head



# Some Key Design Improvements



- Larger Surface Area
- Alloy 690 Thermally Treated Tubing
- Improved AVB Design
- Integral Steam Nozzle
- Improved Material for Tube Supports
- Forged Shell

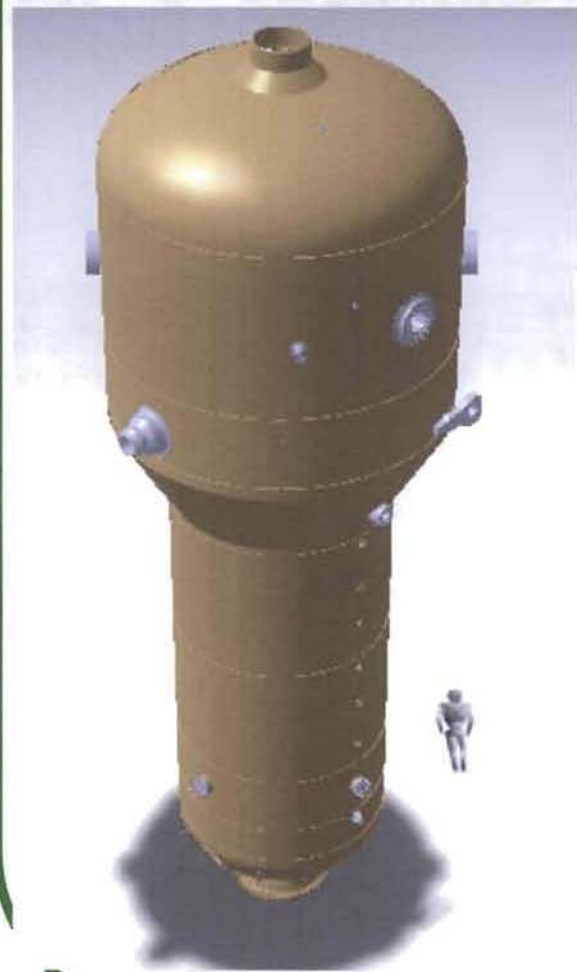


**S/G 3A Lower and Middle Shell  
S/G 2A Balance Ring, Extension  
Ring, & Tubesheet**





# Replacement Steam Generators



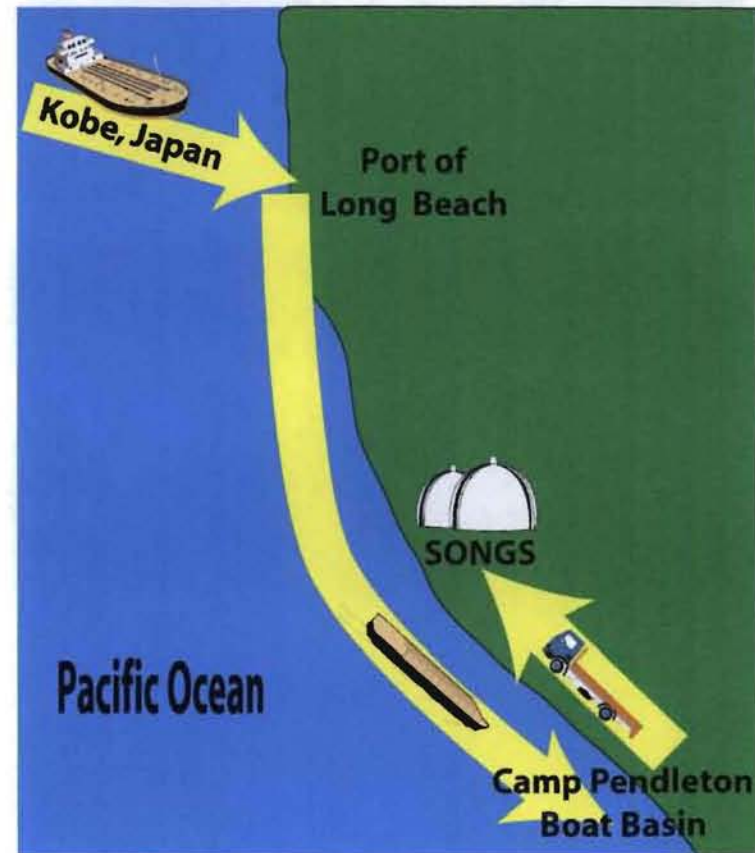
	Original	RSG
Weight	620 tons	643.6 Tons
Height	65'6"	65'6"
Upper Section Diameter	22 feet	22 feet
Tubes	9,350 per SG	9,727 per SG
	$\frac{3}{4}$ inch diameter	



# RSG Transportation to SONGS



- Heavy Lift Cargo Ship from Japan to Port of Long Beach
- Ocean Barge from Long Beach to Camp Pendleton
- Heavy Transport Vehicle from Camp Pendleton to SONGS



# Key Implementation Considerations

## Compact Site/Space Limitations





# Key Implementation Considerations Containment Penetration



- 28' x 28' Opening
- 33.5' Above Ground Level
- Over Equipment Hatch
- 4 ft Thick, Reinforced Wall
- 100 Cubic Yards Concrete
- Approximately 50  
Tendons Will Be Removed





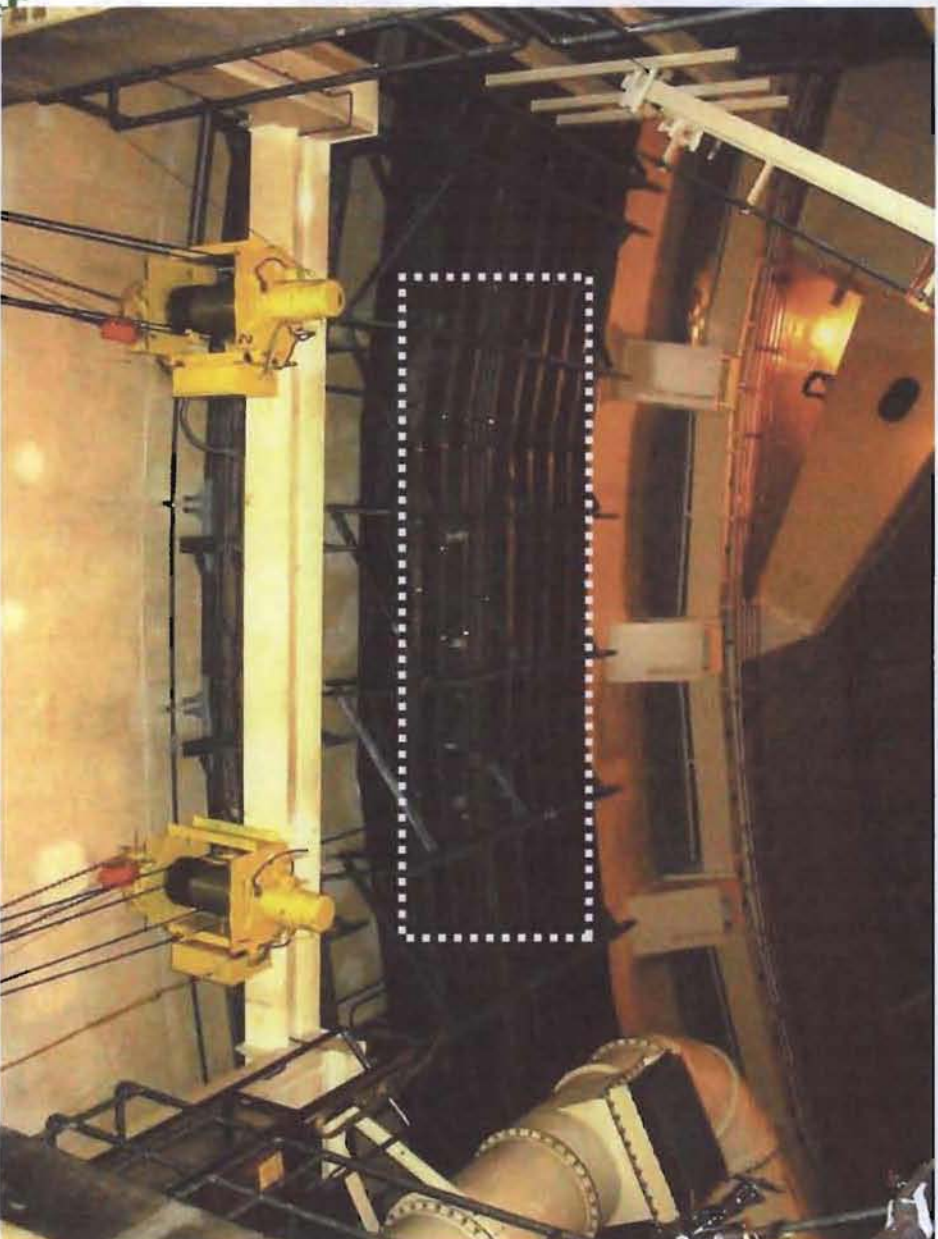
# Key Implementation Considerations Containment Tendon Design



Rancho  
Seco  
Tendon  
Validation  
Test



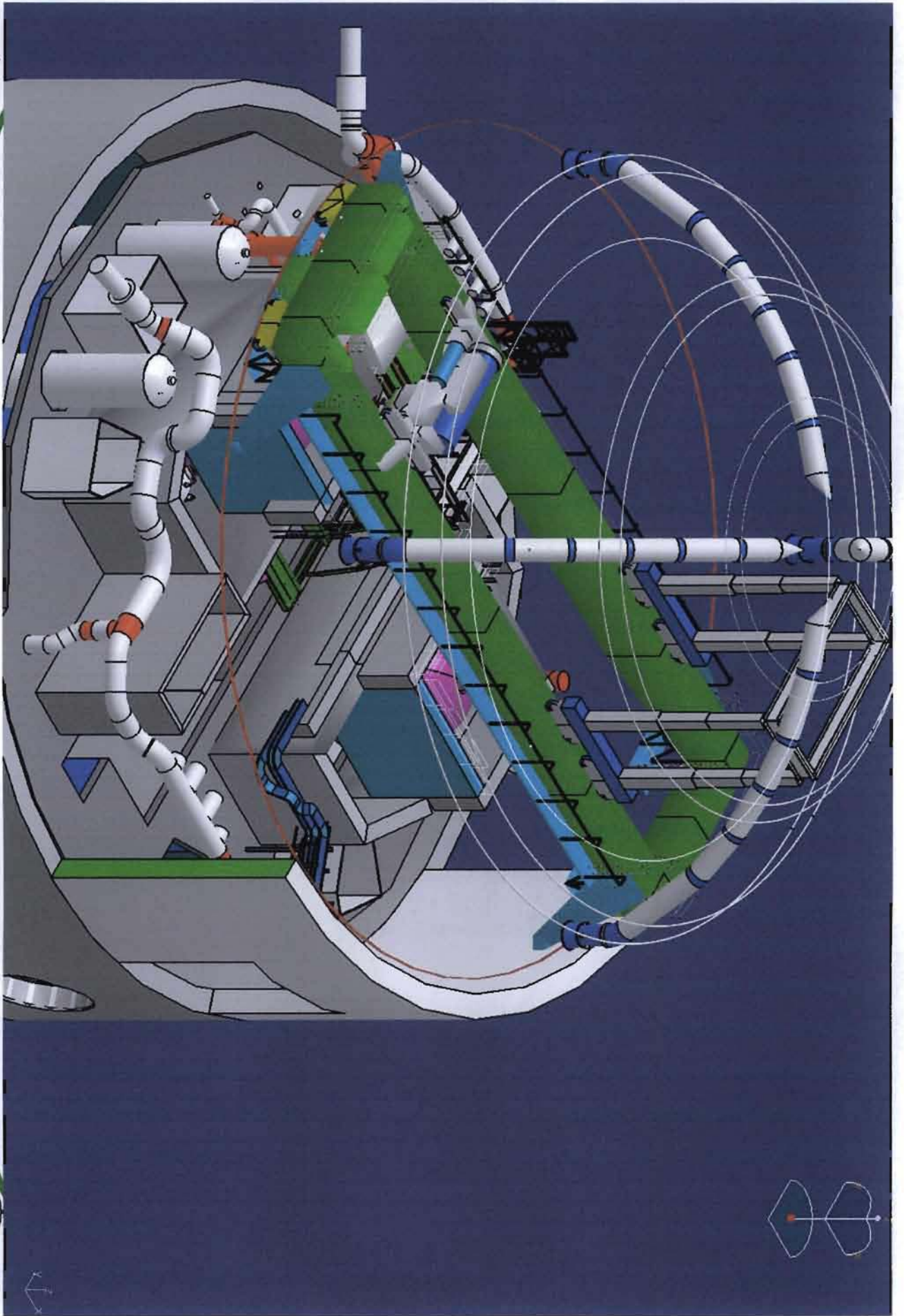
# Key Implementation Considerations Containment Interferences



Cable Trays  
Affected by  
Containment  
Breach







# Key Implementation Considerations Installation Contractor



Bechtel  
Awarded Installation  
Contract  
December 2005

Original SONGS AE

Current Maintenance  
Contractor for  
SONGS

Significant SGR  
Experience

Equipment hatch during a normal refueling outage

Early Project  
Involvement





# Original Steam Generator Disposal



- Disposal of OSG's Offsite Is Required Due to SONGS Compact Site
  - OSG's Large Size Requires Segmentation to Facilitate Shipping
  - Disposal at Energy Solutions, LLC, (formerly Envirocare of Utah, LLC ) Planned





# Q & A

