CALVERT CLIFFS NUCLEAR POWER PLANT UNITS 1 & 2
STEAM GENERATOR REPLACEMENT

REPLACEMENT STEAM GENERATOR PROJECT STATUS PRESENTATION TO THE NRC

August 13, 2001

Enclosure 2

Calvert Cliffs Nuclear Power Plant, Inc.

Constellation Nuclear

Calvert Cliffs Nuclear Power Plant Attendees

Name	Title
B. C. Rudell	CCNPP Project Manager
W. C. Holston	CCNPP General Supervisor
M. T. Finley	CCNPP Principal Engineer
C. J. Ludlow	CCNPP Principal Engineer
T. L. Konerth	CCNPP Project Engineer
J. C. Kilpatrick	CCNPP Senior Engineer
G. Tesfaye	CCNPP Senior Engineer
K. J. Connell	SGT RSG Engineering Manager
M. D. Ceraldi	SGT Lead Licensing Engineer
M. B. Baker	FRA ANP, Inc. Sr. Licensing Engineer
J. C. Millman	BWC Senior Project Engineer
S. M. Fluit	BWC Design Engineer

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Meeting Objectives

- Update Fabrication Status
- Update Engineering/Construction Status
- Update of Safety Analysis and Licensing Status
- GL 96-06 Considerations

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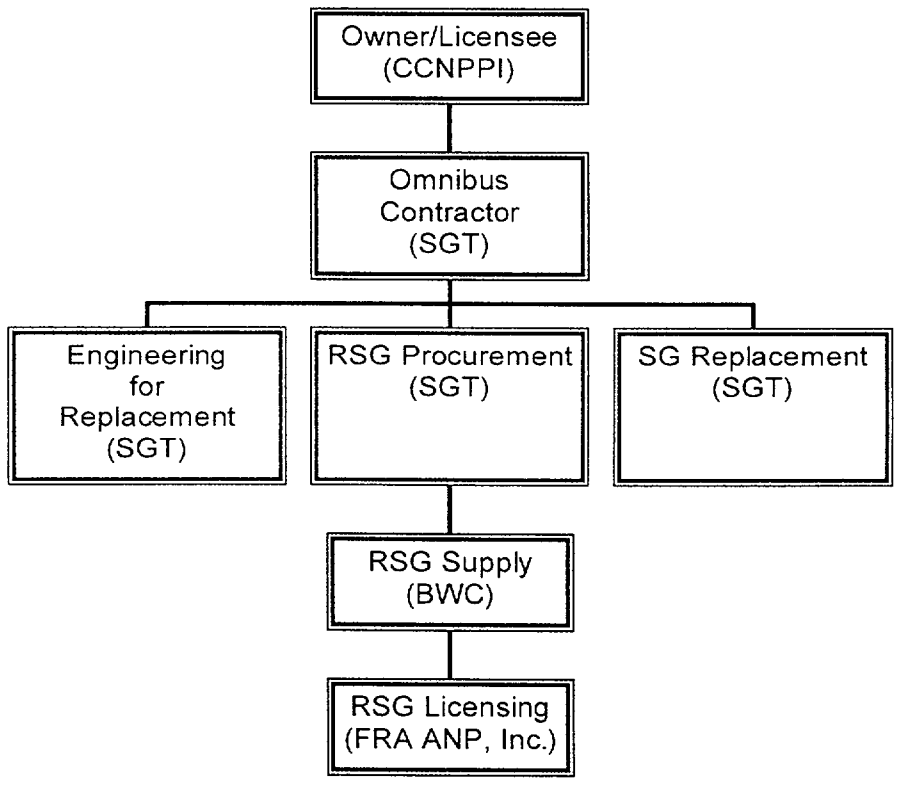
Agenda

❖ Introduction	B. C. Rudell
❖ Fabrication Status	T. L. Konerth
❖ Eng. / Con. Status	T. L. Konerth
❖ RSG Safety Analysis	M. T. Finley
❖ GL 96-06 Considerations	C. J. Ludlow
❖ Licensing Status	G. Tesfaye
❖ Open Discussion	All Attendees
❖ Closing Remarks	B. C. Rudell

Functional Relationships



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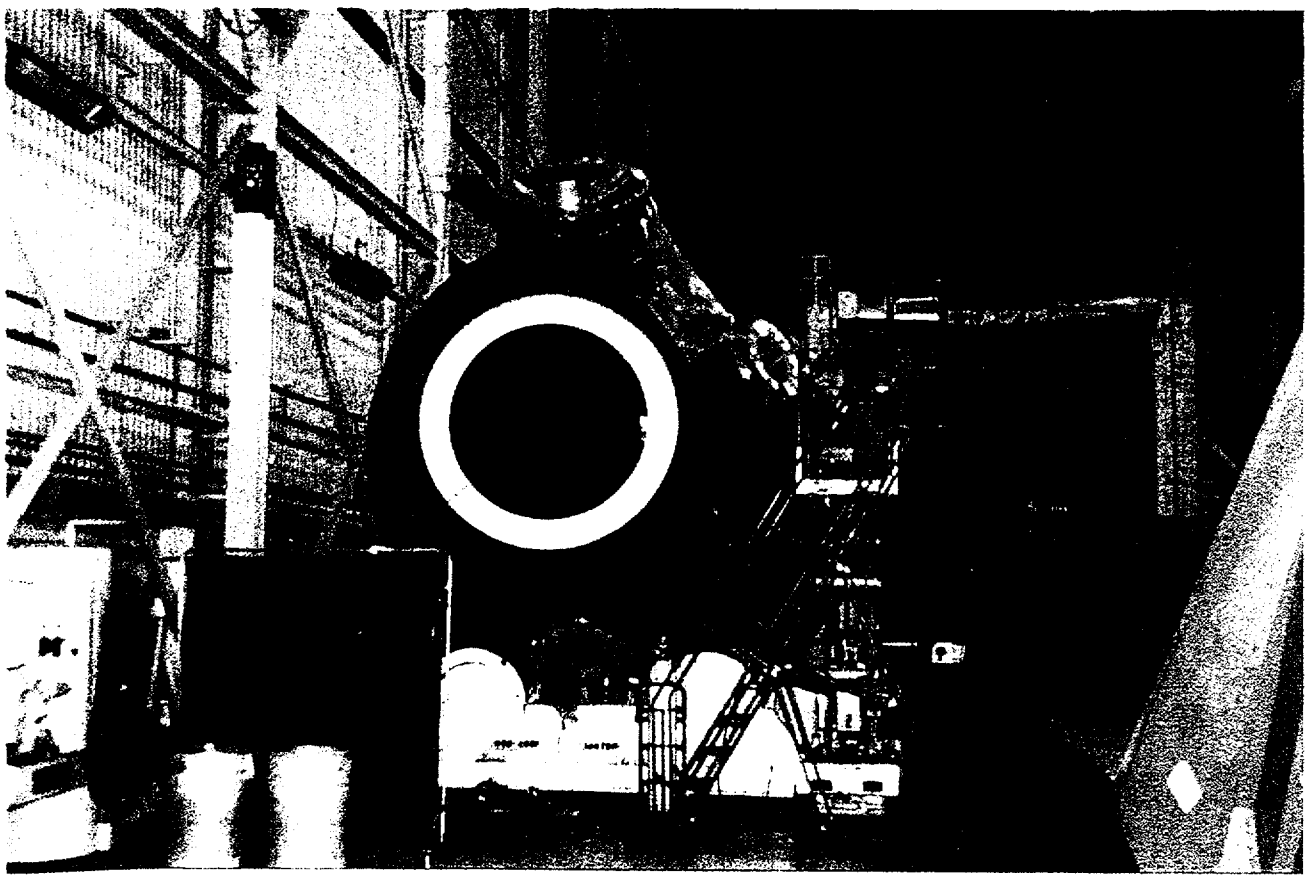
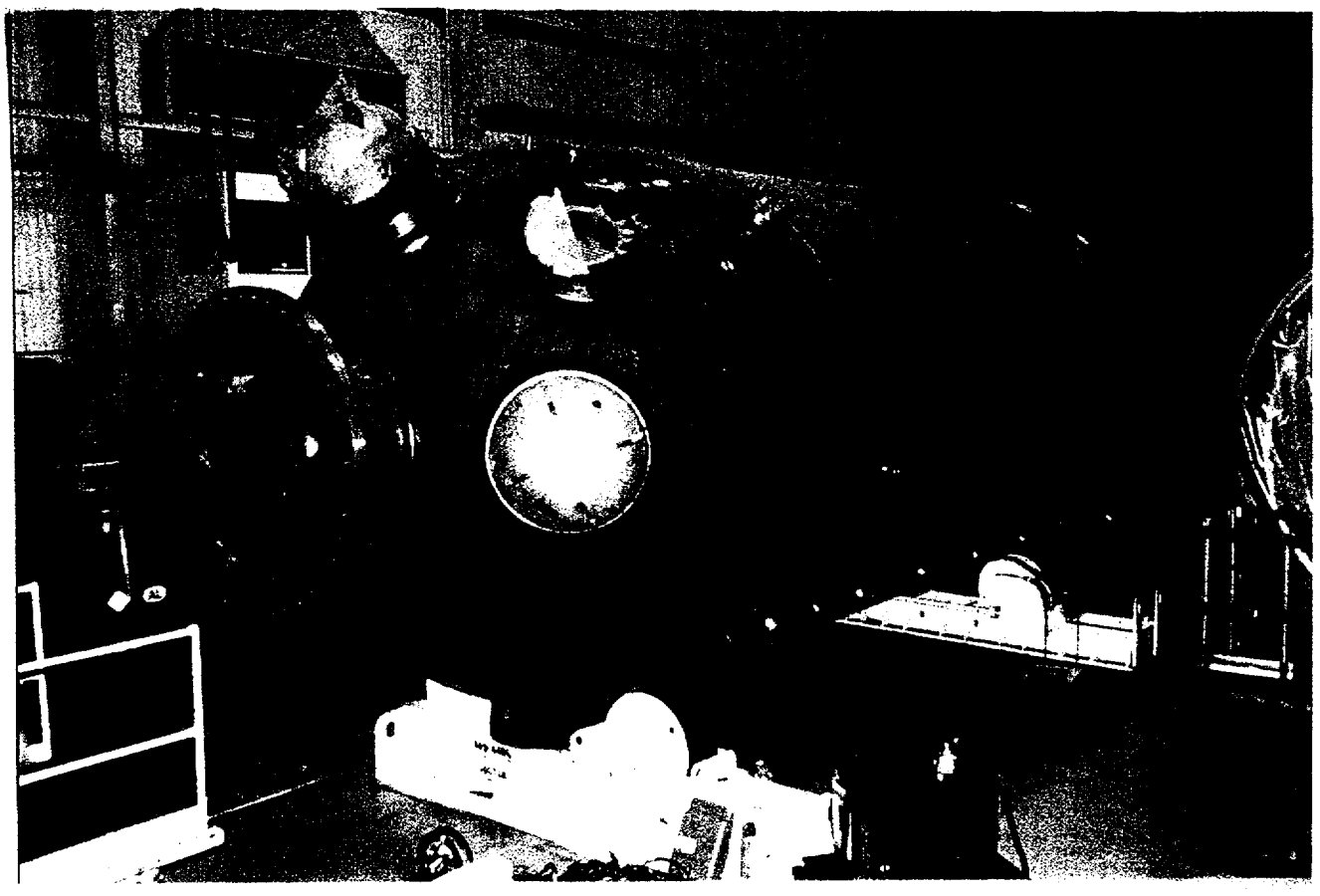
RSG Fabrication Status

- NG1 - Final Preparation for Shipment
- NG2 - Final Preparation for Shipment
- NG3 - Installation of Tubing
- NG4 - Installation of Shroud

NG1 - Preparation for Shipment



NG2 - Preparation for Shipment



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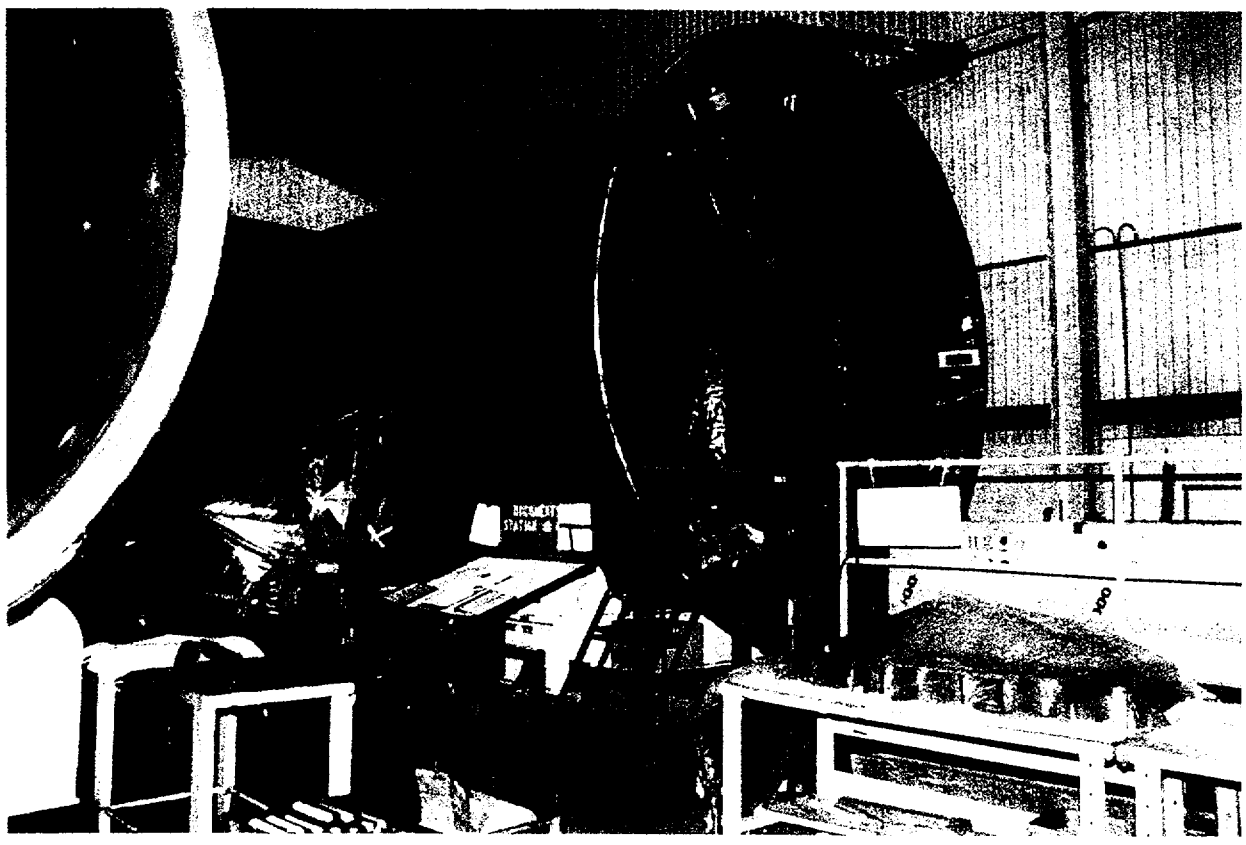
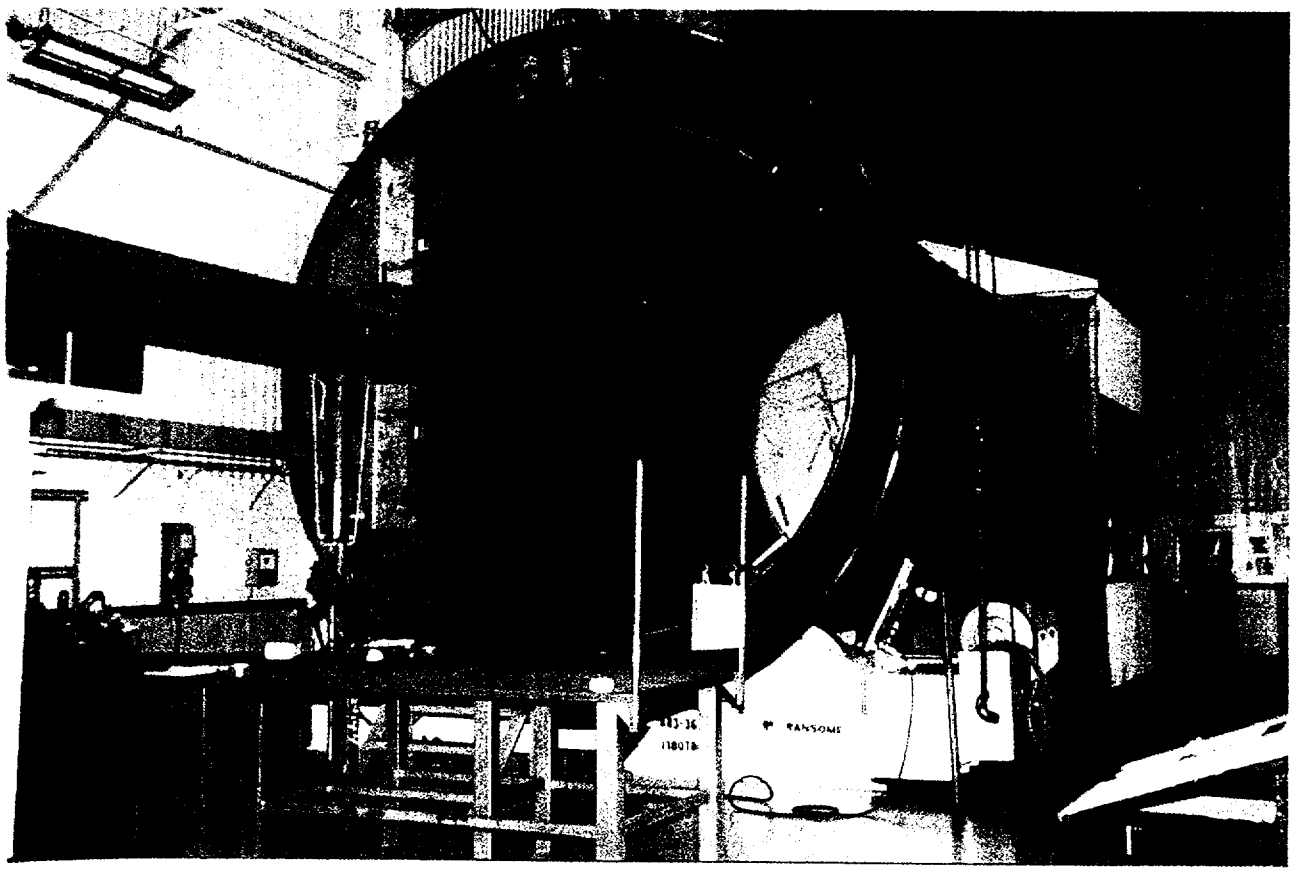
NG3 - Installation of Tubing



NG4 - Installation of Shroud



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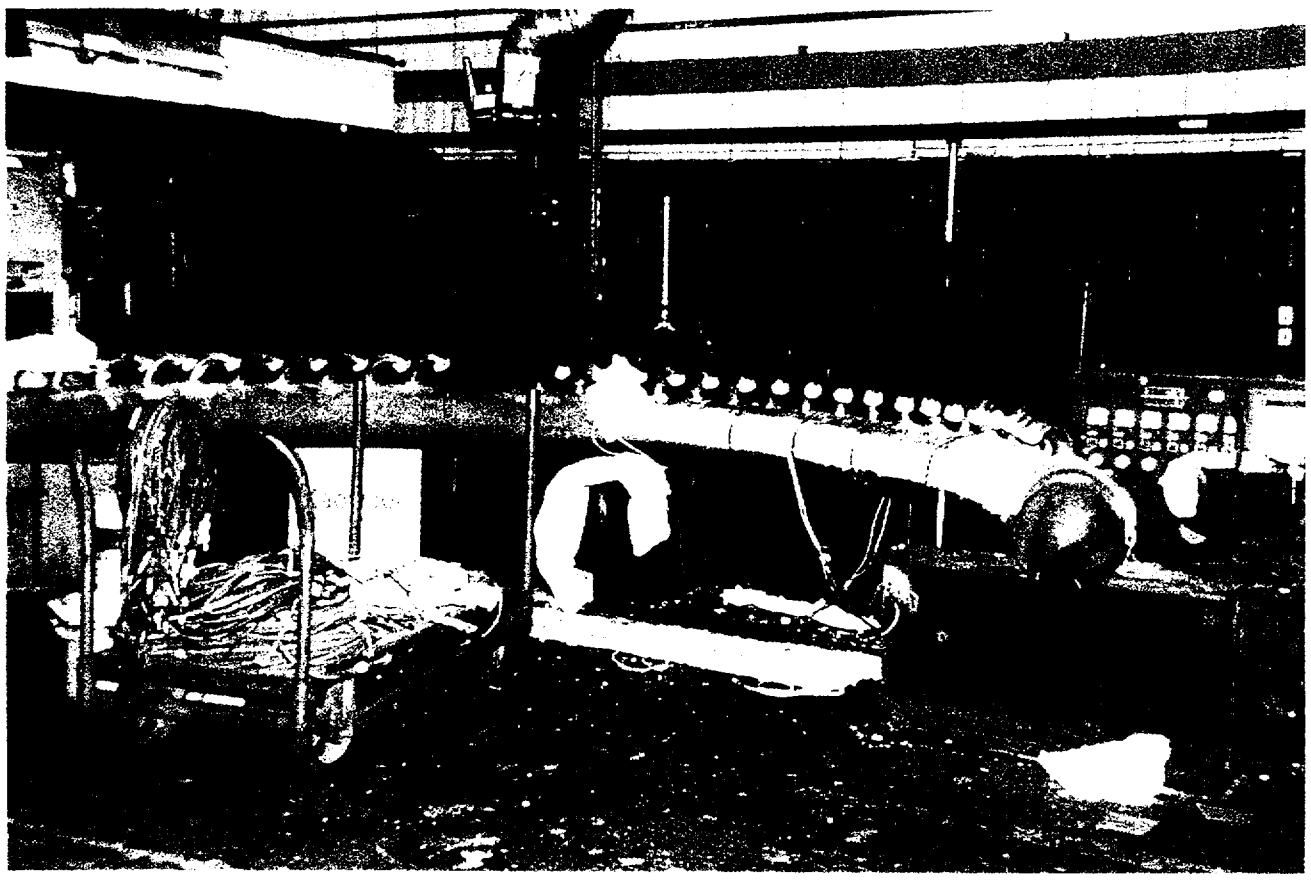
Feed Water Header



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Engineering Status

- **Unit 1 Engineering Service Package Supplements** **28**
  Completed **28**

- **Unit 2 Engineering Service Package Supplements** **28**
  Completed **5**

- **Common Engineering Service Package Supplements** **6**
  Completed **5**

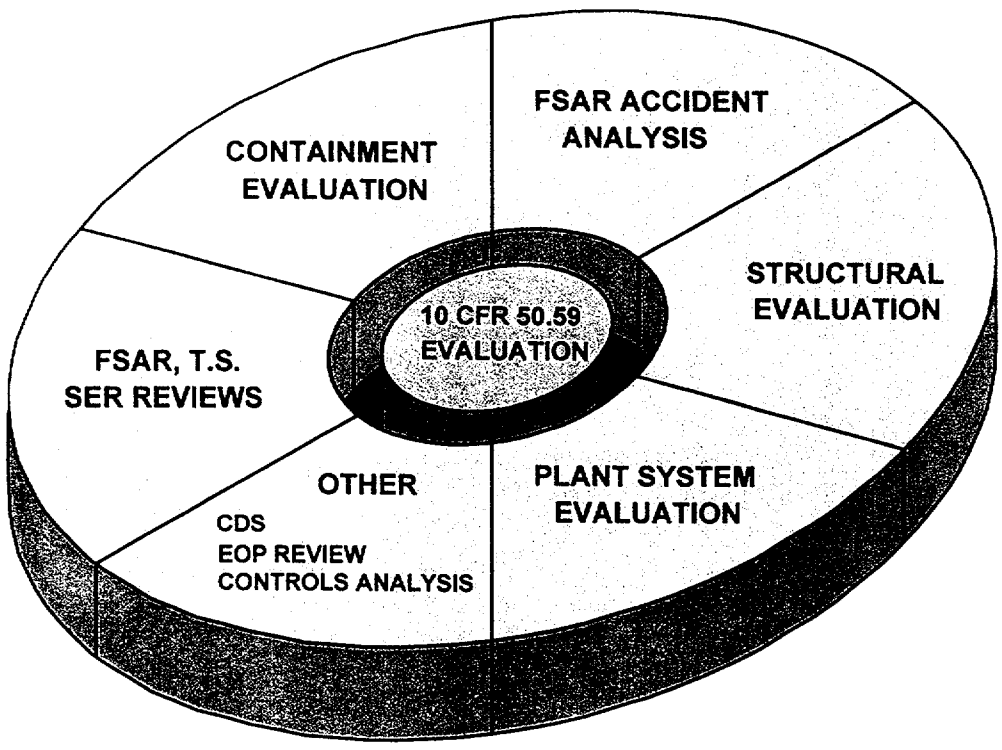
Construction Status

- Temporary warehouse construction August 2001
- OSGSF completion October 2001
- RUBB Buildings August 2001
- Unit 1 RSGs arrive September 2001
- Unit 2 RSGs arrive August 2002

RSG Safety Analysis

- **Background**
  - RSG designed similar to OSG
  - Most significant design/operating changes:
    - RSG tubing Alloy 690 with reduced wall thickness
    - UA 4% above zero plugged tube UA for OSG
    - Secondary steam pressure increases 50 psi (25 psi above current safety analysis assumption)
    - RCS flow increases (back to zero plugged tube value)
    - Integral flow restrictor (1.9 ft^2) installed
  - Primary and secondary inventory very similar by design

RSG Safety Analysis 10CFR50.59 Scope



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RSG Safety Analysis

- **Review Process**
  - **Review each accident and identify:**
    - the acceptance criteria
    - the critical parameters that affect the approach to the acceptance criteria
  - **Compare the OSG and RSG characteristics**
  - **Could use of the RSG adversely affect the approach to an acceptance criterion?**
    - No. . .UFSAR remains bounding
    - Yes. . .Additional Evaluation or analysis required
  - **Are all acceptance criteria met?**
    - Yes. . .Document Evaluation or analysis in UFSAR
    - No. . .NRC prior approval required
  - **All documents reviewed / approved by SGT & CCNPP**

Calvert Cliffs RSG Safety Analysis Matrix

Accident	UFSAR Chapter	Effect of RSG	Disposition
CEA Withdrawal	14.2	• UA ↑ beneficial • RCS flow ↑ beneficial • Core physics unaffected	Evaluation
Boron Dilution	14.3	• RCS inventory very similar • Boron worth unaffected	Evaluation
Excessive Load	14.4	• Steam flow increase is less than 3% • Steam flow remains less than analysis of record since 5% margin was available • RCS flow ↑ beneficial	Evaluation
Loss of Load	14.5	• UA ↑ beneficial for primary pressure, adverse for secondary pressure • Analysis for peak secondary pressure performed • RSG design pressure ↑ 15 psi • Result is less than 110% of design pressure	Analysis
Loss of Feedwater Flow	14.6	• Secondary inventory very similar • Decay and sensible heat very similar • Significant margin in analysis of record low level trip	Evaluation
Excess Feedwater Heat Removal	14.7	• Feedwater conditions unaffected • RCS flow ↑ beneficial	Evaluation
RCS Depressurization	14.8	• PORV and pressurizer unaffected • RCS flow ↑ beneficial	Evaluation
Loss of Coolant Flow	14.9	• RCP coastdown less rapid with fewer plugged tubes • RCS flow ↑ beneficial	Evaluation
Loss of AC Power	14.10	• Decay and sensible heat very similar • Secondary inventory very similar	Evaluation
CEA Drop	14.11	• Core physics unaffected • RCS flow ↑ beneficial	Evaluation
Asymmetric SG	14.12	• UA ↑ has small effect on core temperature tilt • RCS flow ↑ beneficial	Evaluation
CEA Ejection	14.13	• Core physics unaffected • RCS flow ↑ beneficial	Evaluation
SLB – IC	14.14	• Integral flow restrictor beneficial (break area ↓) • Secondary inventory very similar	Evaluation
SLB – OC	14.14	• UA ↑ and secondary pressure increase adverse • Significant margin in break size in analysis of record • RCS flow ↑ beneficial • Secondary inventory very similar – dose unaffected	Analysis
SGTR	14.15	• Tube ID ↑ is adverse • Shortest tube length ↑ is beneficial • Secondary pressure ↑ is beneficial • Ruptured tube flow is bounded • Adequate overfill volume	Evaluation
Seized Rotor	14.16	• RCS flow distribution and step change unaffected • RCS flow ↑ beneficial • UA ↑ beneficial	Evaluation
LOCA	14.17	• Primary inventory very similar • UA ↑ is beneficial • Decreased tube plugging is beneficial	Evaluation
Fuel Handling Inc.	14.18	• Unaffected	Evaluation
Turb. Overspeed	14.19	• Unaffected	Evaluation
Containment Resp. – LOCA	14.20	• Primary inventory very similar • RCS flow ↑ beneficial since Tave ↓	Evaluation
Containment Resp. – MSLB	14.20	• Smaller break with dry steam adverse • Peak pressure less than design • Temperature spike short with redundant spray	Analysis
Hydrogen Accum	14.21	• Unaffected	Evaluation
Waste Gas Inc.	14.22	• Primary inventory very similar	Evaluation
Waste Evap Inc.	14.23	• Unaffected	Evaluation
MHA	14.24	• Unaffected	Evaluation
Excess Charging	14.25	• Pressurizer and charging pumps unaffected • Primary inventory very similar	Evaluation
Feedline Break	14.26	• Secondary inventory very similar • UA ↑ is beneficial • Significant margin in break uncovery assumption in analysis of record	Evaluation

RSG Safety Analysis

❖ EVENTS ANALYZED

- ➢ Loss of Load
- ➢ MSLB Outside Containment (Pre-trip)
- ➢ MSLB Containment Response

RSG Safety Analysis

❖ Loss of Load

- ➢ Increased UA beneficial for primary pressure, adverse for secondary pressure
- ➢ Analysis required for maximum secondary pressure case
- ➢ RSG design pressure is 15 psi greater
- ➢ Result of analysis is peak secondary pressure is less than 110% of design pressure

RSG Safety Analysis

- **MSLB Outside Containment (Pre-trip)**
  - ➢ Increased UA and higher secondary pressure are more adverse
  - ➢ Increased RCS flow is beneficial
  - ➢ Comparative analysis of peak power was performed
  - ➢ Peak power increases slightly for same break
  - ➢ Significant margin in analysis of record break size
  - ➢ Secondary inventory is similar so dose is unaffected

RSG Safety Analysis

❖ MSLB Containment Response

- ➢ Integral flow restrictor reduces break size and causes dry steam blowdown
- ➢ Current licensing basis is 20% moisture carryover
- ➢ Reanalysis performed with zero moisture carryover
- ➢ Peak pressure less than design
- ➢ Temperature spike short with redundant spray
- ➢ No issues for NRC prior approval identified

RSG Safety Analysis

- **Containment Integrity**
  - **Peak pressure below LOCA pressure.**
  - **Containment wall stays below design temperature.**

RSG Safety Analysis

❖ Equipment Qualification (10 CFR 50.49)

- ➢ Temperature spike (app. 400 F) of short duration (Approximately 2 min.)
- ➢ Redundant sprays initiate at approximately 65 seconds.
- ➢ Layer of condensate remains on all components.
  - → Saturation temperature increases above surface temperature in less than 5 seconds, forming a layer of condensate on equipment
  - → All EQ equipment is located in areas of low velocity or in the path of cool flow (w/e of Iodine Removal Unit). Therefore, a layer of condensate will remain on equipment.
  - → Only 8 percent of condensate is revaporized.
- ➢ Due to layer of condensate, surface temperatures remain below dew point temperature.
- ➢ Peak Pressure is 46.6 psig (partial pressure 41.1 psia). Peak temperature is 269 F.
- ➢ Method of evaluation is consistent with NUREG 0588
- ➢ LOCA continues to govern EQ envelope.
- ➢ Existing EQ profile remains bounding.

RSG Safety Analysis

- "... DEPARTURE FROM A METHOD OF EVALUATION DESCRIBED IN THE UFSAR...?"
  - Concerning RELAP5/MOD2 B&W
    - No, per NEI 96-07 (4.3.8) code has been reviewed by NRC and approved for use on all plants with recirculating steam generators.
  - Concerning CONTEMPT
    - No, NUREG 0588 calls out "CONTEMPT-LT or equivalent" and CONTEMPT is equivalent to CONTEMPT-LT
    - No, per NEI 96-07 (4.3.8) benchmark showed results that are "...essentially the same as, or more conservative than... " those produced by COPATTA (an approved code).

GL 96-06 Considerations

- **Concerns**
  - **Overpressurization**
  - **Two-phase flow**
  - **Waterhammer**

GL 96-06 Considerations

❖ Where We Are Today

- ➢ Overpressurization - meets full design
- ➢ Two-phase flow - meets full design
- ➢ Waterhammer - Operable for LOOP/LOCA
  - → ~15 seconds to boil higher elevation CAC's
  - → CAC completely voided
  - → Final waterhammer evaluation pending NRC approval of EPRI TBR (TR-113594)/UM (TR-113954)

GL 96-06 Considerations

- **Re-evaluation Required**
  - **Higher delta T and superheated condition impacts heat transfer:**
    - **Re-Evaluate pressure in fluid filled isolated lines**
    - **Re-Evaluate two phase flow under MSLB**
    - **Re-Evaluate waterhammer under LOOP/MSLB**

GL 96-06 Considerations

- **Waterhammer Analysis**
  - Use EPRI technical guidance in TBR/UM
  - Waiting for NRC to endorse TBR/UM
  - 12 months to complete Waterhammer analysis using TBR/UM
  - Fuel cycle to implement any modifications

GL 96-06 Considerations

- **2002 Outage Startup**
  - **Meet full design for overpressurization**
  - **Meet full design for two-phase flow**
  - **Revised operability for SRW waterhammer**
    - **Based upon TBR/UN guidance**

Licensing Status

- Draft Licensing Report — July 1999
- Licensing Report — May 2000
- RSG 50.90 Submittal — Dec 20, 2000
- RSG 50.59 Evaluation — Sep 2001
- Updated Licensing Report (Unit 1) — April 2002
- Updated Licensing Report (Unit 2) — April 2003

Licensing Status

❖Activities Requiring Prior NRC Review and Approval

- ➢Technical Specification Revisions (Pending)
- ➢ASME Code Relief Requests (One more request scheduled to be submitted by mid September)
- ➢Exemption Request from the Requirements of 10 CFR 50, Appendix J for Containment Leakage Rate Testing (Scheduled to be submitted by end of Oct.)
- ➢No other items requiring NRC review are anticipated

CCNPP-NRC Meeting Schedule

- Project overview meeting (July 29,1998)✓
- SG Fabrication QA/QC review and project status meeting (April 28, 1999) ✓
- Replacement SG safety analysis review meeting (November 15, 1999) ✓
- Replacement SG safety analysis review meeting (November 1, 2000) ✓
- Project Update Meeting (August 13, 2001) ✓
- Pre-installation meeting Unit 1 (Winter 2002)
- Post installation meeting Unit 1(Fall 2002)
- Pre-installation meeting Unit 2 (Winter 2003)
- Post Installation meeting Unit 2 (Fall 2003)
- Other meetings as needed