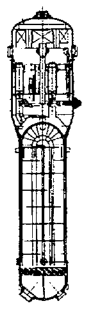
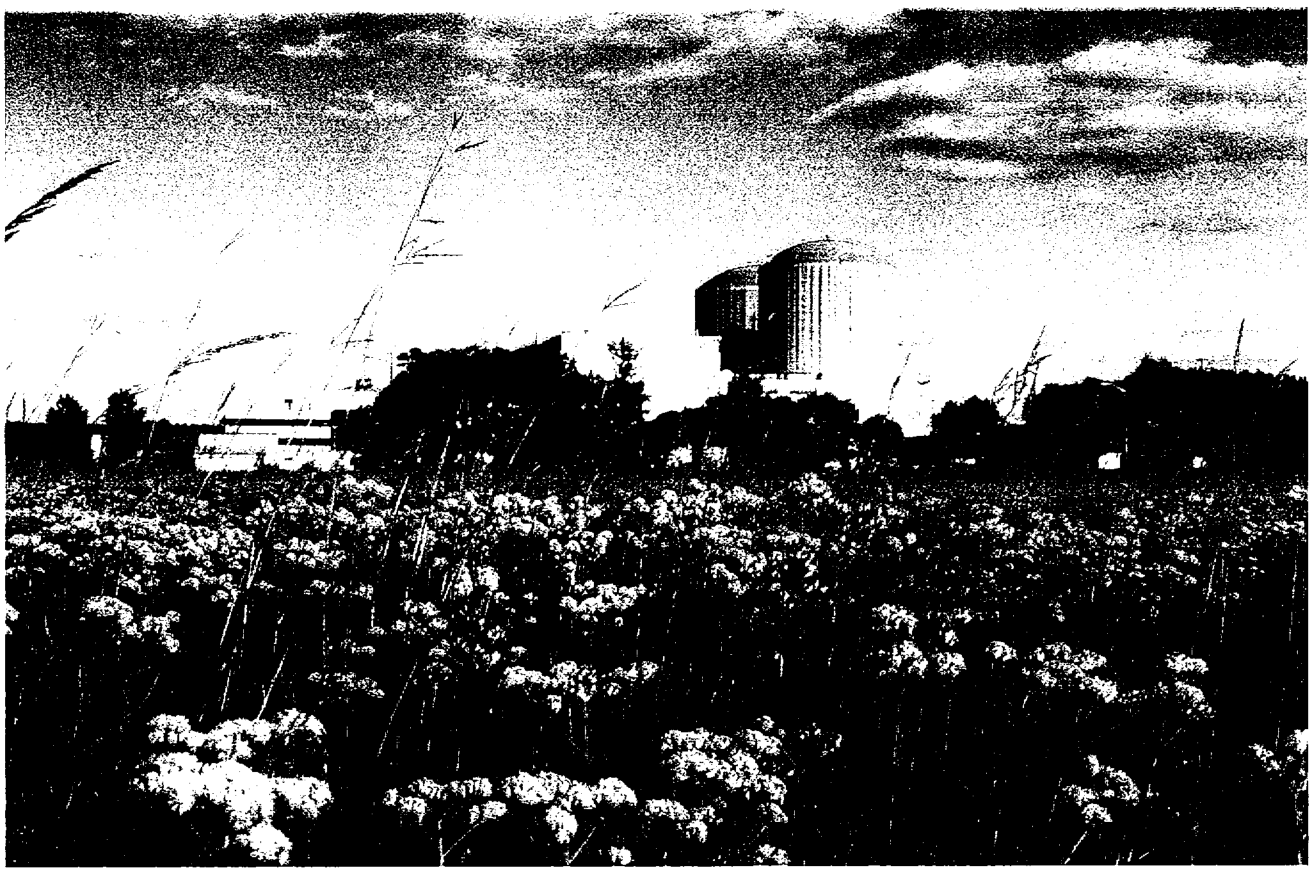


Prairie Island Nuclear Generating Plant
Steam Generator Replacement Project
Unit 1



NRC Presentation
March 19, 2002

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SGR Project Presentation - Attendees
March 19, 2002

- ## Nuclear Management Company

Ken Albrecht – Project Manager
Richard Pearson – Project Engineer, Design
Oley Nelson – Safety Analysis
Scott Marty – Project Engineer, Installation
Terry Higgins – Project Engineer, Licensing
Gene Eckholt – Licensing Supervisor

- ## Framatome ANP

Alain Laux – Project Manager
Jean Paul Billoue – Technical Manager

- ## Framatome ANP Inc.

Mary Beth Baker – Project Manager, Licensing
Scott Beckham – Lead, Accident Analysis

- ## Steam Generating Team (SGT, Ltd)

Larry Davis - Project Manager
Mark Ceraldi – Lead Engineer, Licensing

SGR Project Meeting Agenda

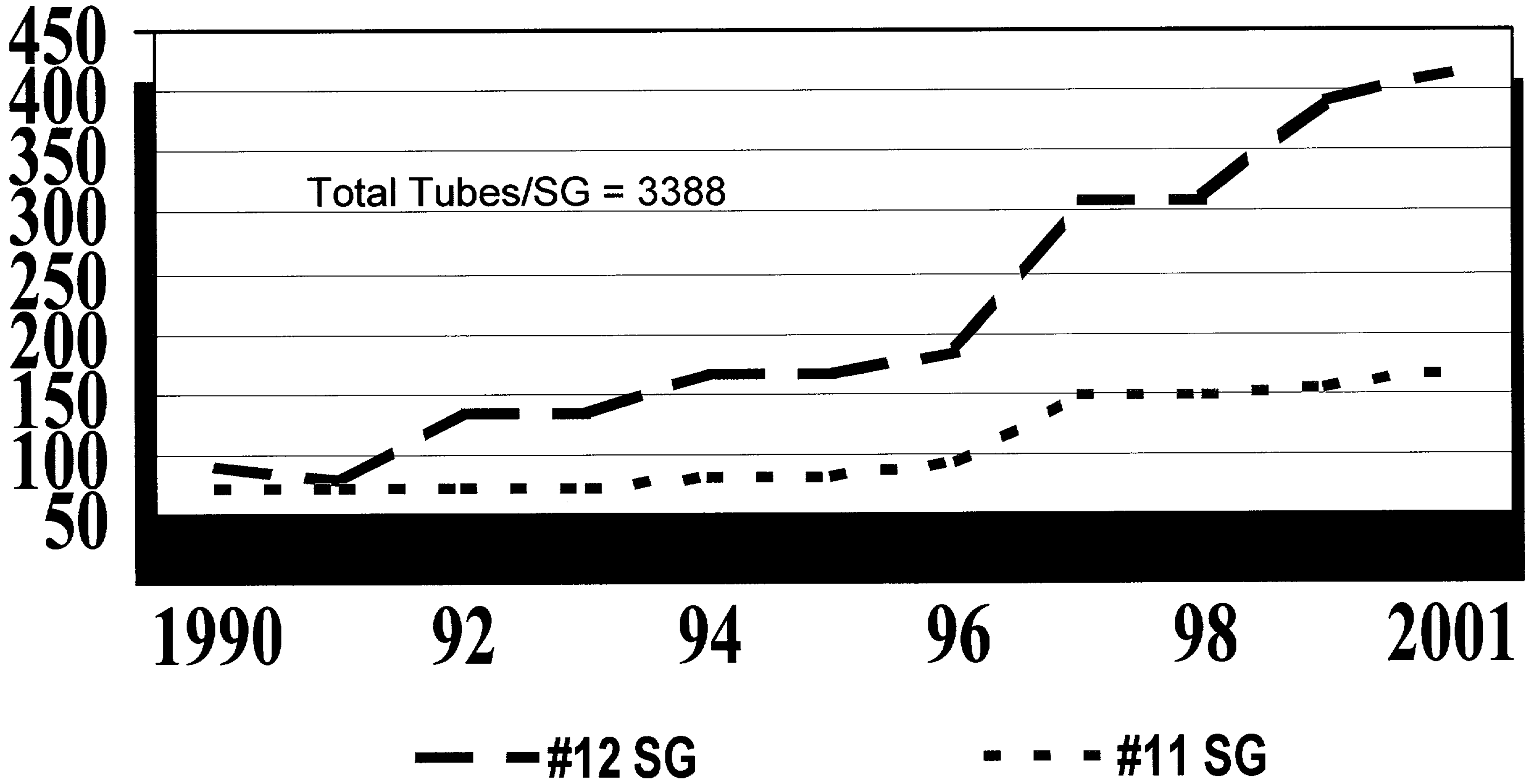
• Project Overview	Ken Albrecht – Project Manager
• Component Design	Richard Pearson – Project Engineer, Design
• Licensing Approach	Oley Nelson – Safety Analysis
• Installation Plan	Scott Marty – Project Engineer, Installation
• Future Meetings	Ken Albrecht – Project Manager

SGR Project Overview

Ken Albrecht

- Condition of Unit 1 SGs
- Justification for Replacement
- Project Participants
- SGR Project Organization
- Project Milestone Schedule

PINGP Unit 1 SG Plugging History
(thru January 2001)



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PINGP Unit 1 SG Status
(thru January 2001)

	#11 SG	#12 SG
Total Tubes Defective	817	1581
Sleeves Installed	0	1076
% Tubes Defective	24%	47%
% Equivalent Plugged	5.05%	12.26% *
*28 sleeves = 1 plug		8.65% Average

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Justification for Replacement

Economic - No Safety Concerns:

- Increasing repair costs
- Potential need for planned mid-cycle inspections, forced outages
- Increasing outage time
- Reduction in plant output
- Replacement energy costs

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Project Participants

RSG Engineering & Fabrication

Framatome-ANP selected as RSG vendor

- Engineering & licensing support – Framatome-ANP
- Major forgings – Japan Steel Works
- Tubing – SANDVIK Steel

Installation Contractor

The Steam Generating Team (SGT, Ltd.)

Project Management

Nuclear Management Company

- Project management & oversight personnel

SGR Project Organization

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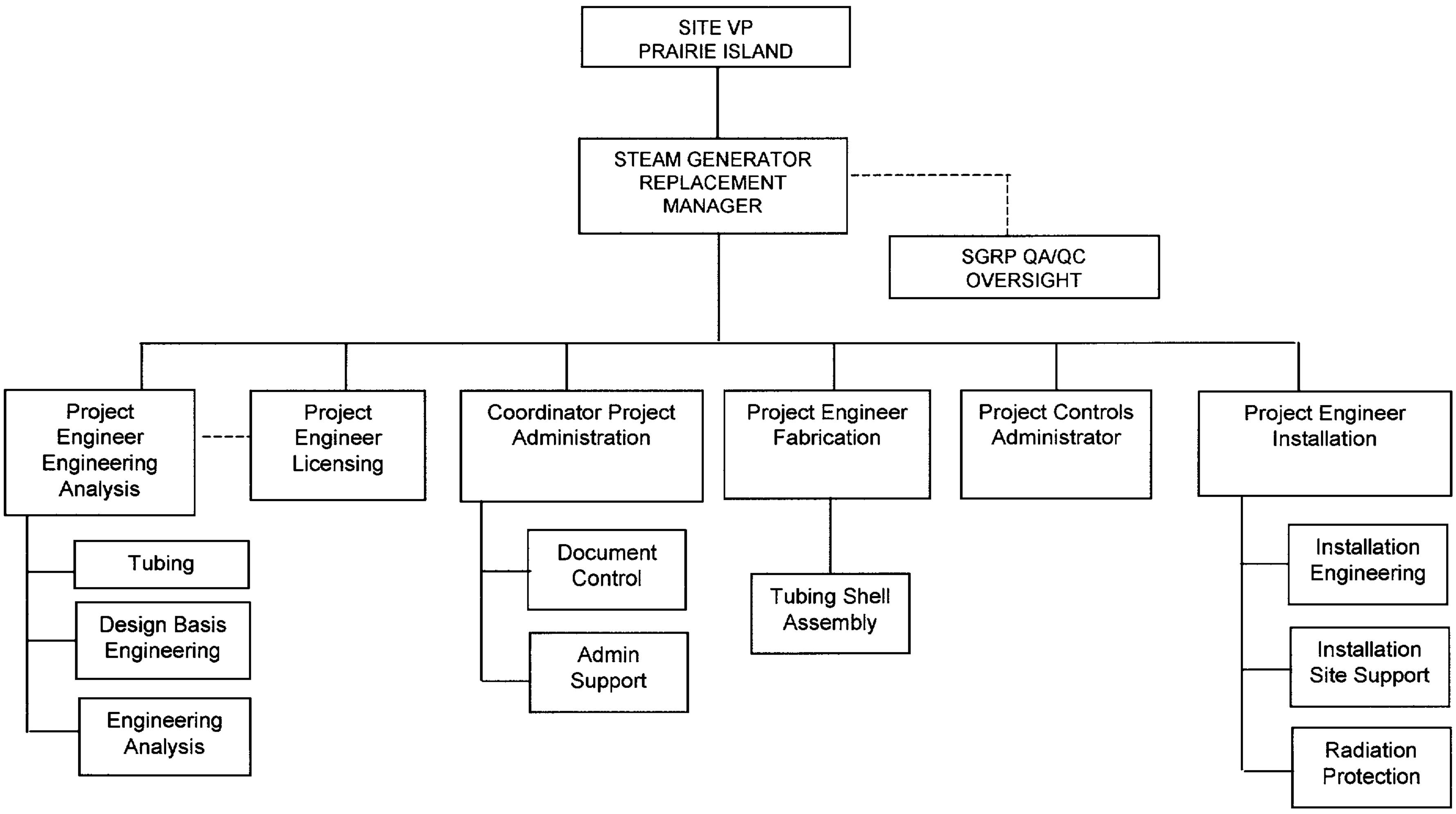

Project Milestone Schedule

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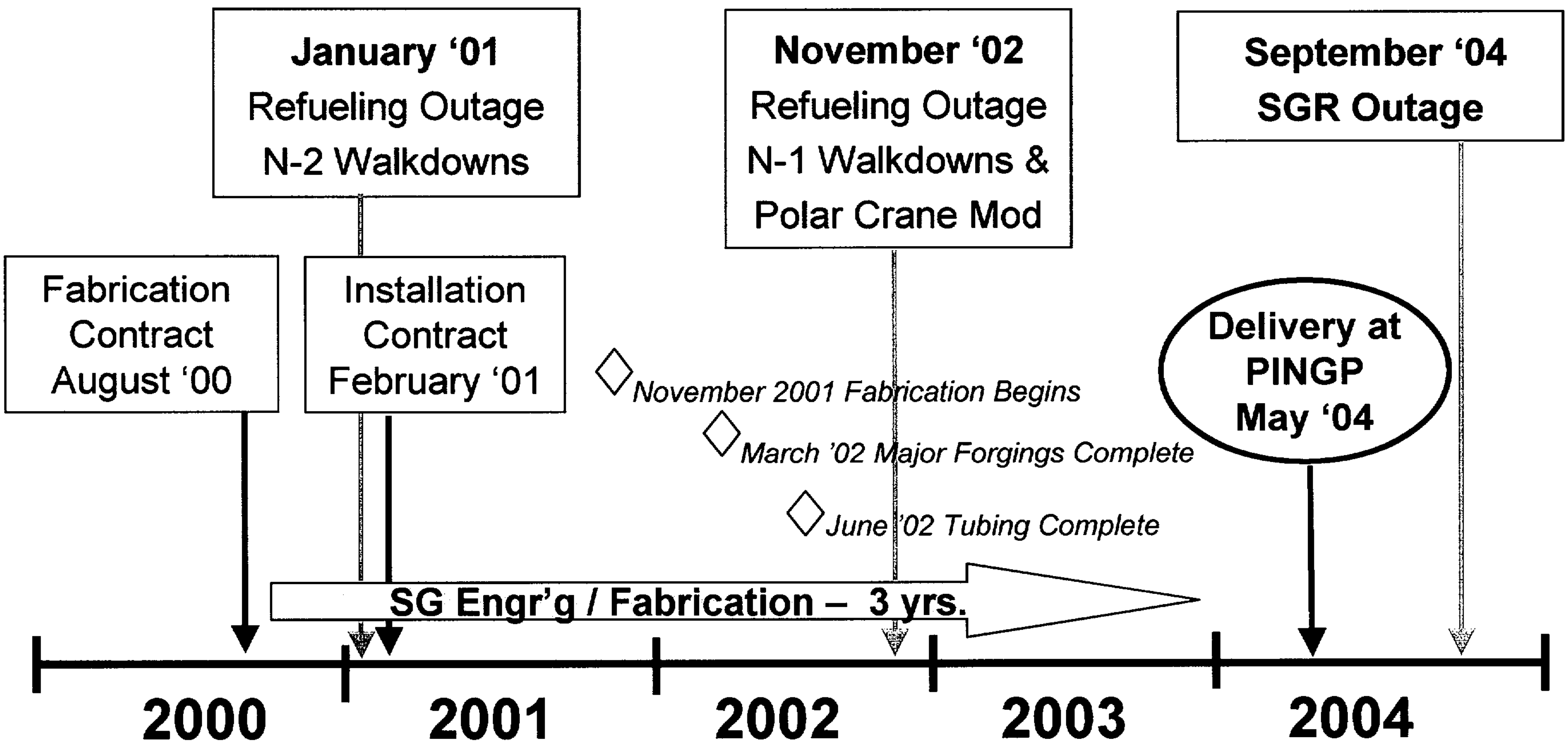

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Component Design

Richard Pearson

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RSG Component

- RSG Design Philosophy
  - Improved tubing material. Alloy 690 (TT) vs. 600 (MA)
  - Maximum heat transfer surface area
  - Up to 10% plugging at maximum fouling conditions & normal power levels
  - Design accommodates potential power uprate conditions

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RSG Component

- RSG Design Philosophy
  - High efficiency steam moisture removal
  - Water level stability
  - Mitigation of thermal stratification effects
  - Elimination of water hammer risks
  - Mitigation of tube bundle vibration
  - Compatible with existing external interfaces – No major modifications
  - OSG operating experience reflected in design

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RSG Component

- RSG Design Basis
  - Safety Related and Non-Safety Related Design Bases Unchanged

RSG Component

- Two-Piece Design
- ASME Section III Vessel
- Use of Code Cases 2142 and 2143 for Nickel Alloy Welding of Partition Plate

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Framatome-ANP Experience

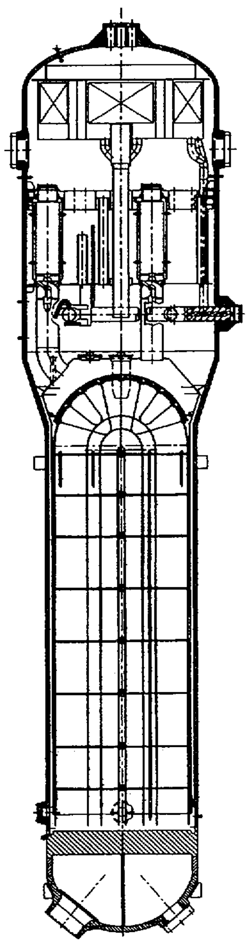
- Supplied 272 Steam Generators Worldwide
- 75 RSGs
  - 19 for Foreign Utilities
  - 56 for EDF
- Facility Capable of Producing 14 SGs per Year
- Maintained N and NPT Stamp Certifications for > 20 Years

EDF Experience

Unit name	C.O. & SGR Dates	SG Tube Mat.	R1-R2 Plugged	PWSCC Roll Trans. % cracked	Plug.d	IGA/SCC @TSP level % cracked	Plug.d	IGA/SCC @ Sludge % cracked	Plug d	OD circ.	Wear - Fatigue	Loose parts	TSP Frag	Def. TS-TSP	Other cause	Total plugged
										Cumulated number of plugged tubes Σ SG						
Dam 1	*79-90*	690TT	0 - 0	0-0-0	0	0-0-0	0	0-0-0	0	0	5-0	0	0	0 - 0	0	5
Dam 3	*80-95*	690TT	0 - 0	0-0-0	0	0-0-0	0	0-0-0	0	0	0 – 0	1	0	0 - 0	2	3
Tri 1	*80-98*	690TT	0 - 0	0-0-0	0	0-0-0	0	0-0-0	0	0	0 – 0	4	0	0 - 0	5	9
Tri 2	*80-97*	690TT	0 - 0	0-0-0	0	0-0-0	0	0-0-0	0	0	0 – 0	0	0	0 - 0	1	1
Tri 3	*81-02*	690TT	0 - 0	0-0-0	0	0-0-0	0	0-0-0	0	0	0 – 0	0	0	0 - 0	-	-
Gra 1	*79-94*	690TT	0 - 0	0-0-0	0	0-0-0	0	0-0-0	0	0	0 – 0	0	0	0 - 0	4	4
Gra 2	*80-96*	690TT	0 - 0	0-0-0	0	0-0-0	0	0-0-0	0	0	0 – 0	4	0	0 - 0	2	6
Gra 4	*81-00*	690TT	0 - 0	0-0-0	0	0-0-0	0	0-0-0	0	0	0 – 0	0	0	0 - 0	2	2
SLB 1	*83-95*	690TT	0 - 0	0-0-0	0	0-0-0	0	0-0-0	0	0	0 - 0	5	0	0 - 0	3	8
Pen 2	Nov-92	690TT	0 - 0	0-0-0-0	0	0-0-0-0	0	0-0-0-0	0	0	13 - 0	8	0	0 - 0	4	24
Gol 2	Mar-94	690TT	0 - 0	0-0-0-0	0	0-0-0-0	0	0-0-0-0	0	0	1-0	10	0	0 - 0	2	13
Cho 1	May-00	690TT	0 - 0	0-0-0-0	0	0-0-0-0	0	0-0-0-0	0	0	0 - 0	0	0	0 - 0	12	12
Cho 2	Sep-00	690TT	0 - 0	0-0-0-0	0	0-0-0-0	0	0-0-0-0	0	0	0 - 0	1	0	0 - 0	2	3
Civ 1	2000	690TT	0 - 0	0-0-0-0	0	0-0-0-0	0	0-0-0-0	0	0	0 - 0	1	0	0 - 1	11	13
Civ 2	2000	690TT	0 - 0	0-0-0-0	0	0-0-0-0	0	0-0-0-0	0	0	0 - 0	0	0	0 - 0	6	6

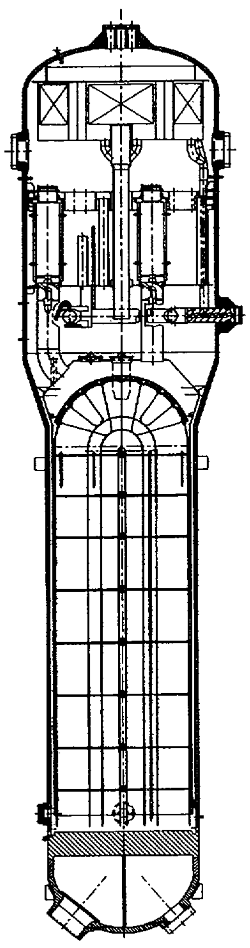
Other causes: plugged tubes for reasons such as magnetic anomalies, rolling anomalies, etc..

Framatome Model 56/19 RSG



- Thermal-hydraulics design provides optimum velocity profile, circulation and water level stability.
- Stainless steel broached tube support plates for straight sections.
- Five sets of AVBs support the U-bend region of tubing to reduce gaps.
- Full tube-to-tubesheet expansion process.
- Improved wrapper support system.

Framatome Model 56/19 RSG



- Enhanced bolting design & graphite gaskets for leaktight access openings.
- Easy access to upper internals and top of tubesheet.
- Clear tube lane & top of tubesheet for sludge management.
- Additional inspection handholes at key locations.
- Steam outlet flow restrictor integral to RSG elliptical head.
- High-efficiency moisture separators utilized.

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RSG Component

- Structural Design
  - ASME Section III
  - Normal/Upset/Faulted Conditions
  - Load Combinations
    - Normal
    - Normal & OBE
    - Normal & DBE
    - Normal & Pipe Rupture
    - Normal & DBE & Pipe Rupture

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RCS Structural Model

- RCS Structural Evaluation
  - OEM (Westinghouse) – Analysis of Record
  - Framatome-ANP, Inc. providing new RCS analysis with RSG
  - Deadweight, thermal expansion & seismic loading
  - Develop loads on components & structures due to pipe breaks
  - Leak-Before-Break (LBB) will be maintained with RSG

RSG/OSG Comparison

	RSG	OSG
Thermal Output (MWt)	825	825
Thot/Tcold/Tave (nominal) (deg F)	590/530/560	590/530/560
Number of Tubes	4868	3388
Tubing OD/ID (in.)	0.75/0.6642	0.875/0.775
Heat Transfer Area (sq. ft.)	61,281	51,500
Performance Coefficient UA (10^6 Btu/hr-F)	81.93	67.52
RCS Flow (best estimate) (10^6 lbm/hr)	38.51	38.39
RCS Pressure (psia)	2250	2250
Steam Flow (10^6 lbm/hr)	3.57	3.54
Full Load Steam Outlet Pressure (design normal operating) (psia)	806.8	750
Maximum Moisture Carryover (%)	0.1	0.25
Operating Weight (lbf)	802,055	801,073
Primary Side Volume (cu ft)	1127	1089
Secondary Side Liquid Mass (lbm)		
Hot Zero Power	159,100	157,123
100% Power	107,100	107,420

SG Program

- Elements Related to RSG Design
  - Assessment of potential degradation mechanisms
  - Inspection
  - Integrity assessment
  - Maintenance and repairs
  - Maintenance of secondary-side integrity
  - Secondary-side water chemistry
  - Foreign material exclusion

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Audit/Surveillance Activities

NMC Supplier QA Program

- Plans & controls audit activities of SGR Project Suppliers
- Monitors compliance with Supplier Quality Programs
  - Procurement & Fabrication activities and schedule
- Performed Framatome-ANP surveillance
- Participated in Framatome-ANP audits of sub-vendors
  - JSW, Sandvik, FOMAS
- Participated in NUPIC audit of Framatome-ANP Inc.
- Performed audit of SGT

PINGP Site QA Audit Group

- Annual Project Team Audit

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Fabrication Oversight

- Sandvik – Purchasers Authorized Representative (PAR) on site at Sandvik Steel
- Framatome – PAR on site at Chalon-Saint Marcel
- Japan Steel Works – visits by Project Team
- Fomas - visits by Project Team
- ANI

Fabrication Status

Framatome ANP Chalon-Saint Marcel

- Expected to receive all major component forgings by end of March, 2002
- Currently the first tubesheet is being drilled

SANDVIK

- Pre-production qualification tubing run complete
- Production tubing run started

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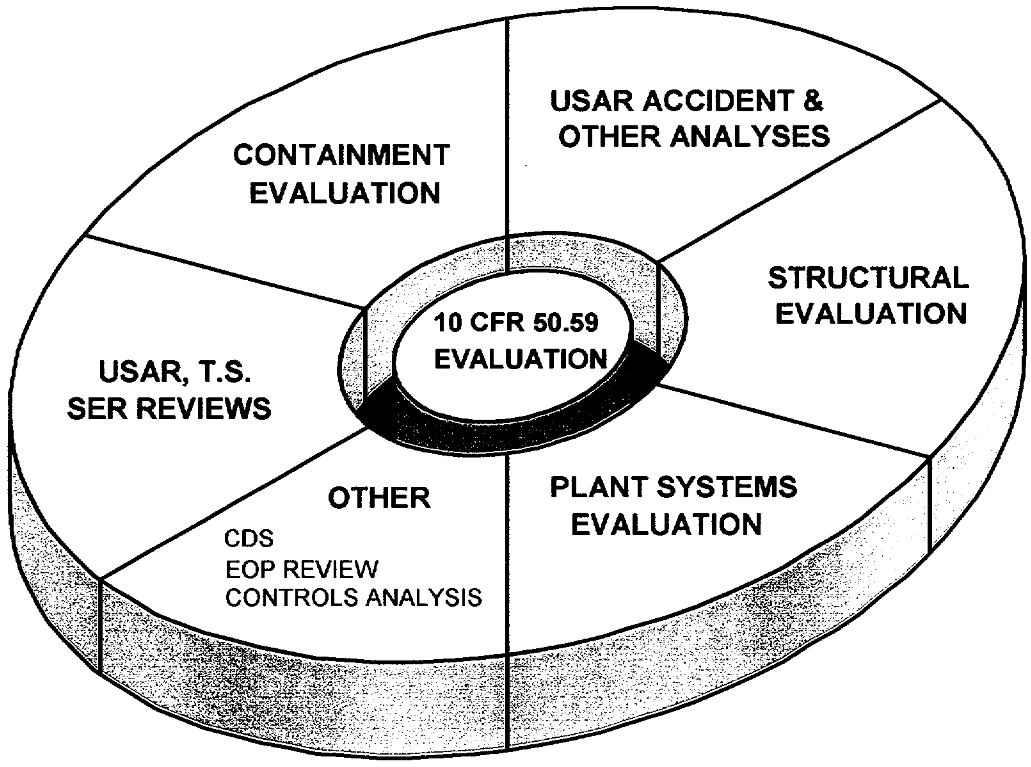
Licensing Approach

Oley Nelson

10CFR50.59 Scope



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USAR Accidents & Other Analyses

- Licensing Basis
- Evaluation Process
- Chapter 14 Transients & Accidents
- Potential NRC Reviews

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USAR Chapter 14 Licensing Basis

- PINGP Licensed in 1974
- Not SRP plant
- Approved to conduct safety analysis 1983

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Holder of Analysis of Record

- NMC
  - All Chapter 14 Analyses

except,

- Westinghouse
  - LOCA (PCT)
  - Long Term Core Cooling

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Safety Evaluation Process

- Identify key SG parameters
- Compare the OSG and RSG parameters
- Assess RSG impact
  - USAR remains bounding, or
  - Analyze using NRC-approved methodology

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Key Design Parameter Comparison

- Small increase in secondary operating pressure
- Small increase in RCS volume
- Smaller SG tube ID
- Higher tube bundle heat transfer rate

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Accident Evaluations
Impact on Fuel Criteria

- Reactivity coefficients are not affected
- Power distributions are not affected
- Rod Worth is not affected
- Min RCS Flow will not change
- USAR Transients Bound RSG – except MSLB

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Accident Evaluations
Impact on Primary Pressure

- Cooldown events
  - Not an issue

- Heatup events
  - UA ⇑ benefit
  - USAR Transients bound RSG

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Accident Evaluations Impact on Secondary Pressure

- Cooldown events
  - Not an issue

- Heatup events
  - UA ⇑ adverse impact
  - Reanalyze limiting events

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Accident Evaluations
Impact on Containment Analysis

- MSLB
  - UA ⇑ adverse impact
  - Secondary mass approximately same
  - Reanalyze event

- LOCA
  - Volume ↑ adverse impact
  - Reanalyze event

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Accident Evaluations
Impact on Dose

- Number of failed pins not affected
- TS activity limits not affected
- Smaller Tube ID beneficial for SGTR

RCCA Withdrawal at Power – Secondary System Pressure

- UA ⇑ transfers more energy
- Expect SG Safeties to limit pressure

Loss of External Electric Load - Secondary System Pressure

- UA ⇑ transfers more energy
- Expect SG Safeties to limit pressure

MSLB - Core Response

- UA ⇑ - larger cooldown
- Modeling tube uncover - benefit
- May not need to perform sub-channel analysis

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MSLB - Containment Response

- UA ⇑ transfers energy at a higher rate

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LOCA – Containment Response

- Small increase in RCS Volume

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Codes Used for Reanalysis

- LOCA & Non-LOCA Transient Analysis:
  - RELAP5/MOD2 – B&W
- LOCA and SLB Containment Response
  - CONTEMPT

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Potential NRC Reviews

Submit at least 1 year prior to SGR Outage:

- Revised SG surveillance requirements for Unit 1
- Revised TS analysis methodology list for Unit 1
- ASME Code Case relief

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Core and Coolant Boundary Protection

Accident	USAR	Effect of RSG	Disposition
RCCA Withdrawal – Subcritical	14.4.1	Doppler & rod worth unaffected UA ⇑ - beneficial (if any impact) for DNBR	E
RCCA Withdrawal– At Power (DNB, primary pressure)	14.4.2	Doppler & rod worth unaffected UA ⇑ - beneficial (if any impact) for DNBR UA ⇑ - beneficial for primary pressure	E
RCCA Withdrawal– At Power (secondary pressure)	14.4.2	UA ⇑ - analyze secondary pressure	A
RCCA Misalignment – Static & Dropped	14.4.3	Static power distribution unaffected Doppler & rod worth unaffected UA ⇑ - beneficial (if any impact) for DNBR	E
Chemical Volume & Control Malfunction	14.4.3	RCS volume ↑ - beneficial	E
Startup of Inactive RC Loop	14.4.5	Bounded by other transients	E
FW System Malfunction – Heat Removal	14.4.6	FW conditions unaffected Secondary pressure ↑ - beneficial	E

USAR Chapter 14

Core and Coolant Boundary Protection

Accident	USAR	Effect of RSG	Disposition
Excessive Load Increase	14.4.7	Steam load increase unaffected	E
Loss of RC Flow - Coastdown	14.4.8	RC ΔP ↓ - beneficial	E
Loss of RC Flow – Locked Rotor	14.4.8	UA ⇑ - beneficial for primary pressure Secondary pressure bounded by other transients Power distribution unaffected	E
Loss of External Electrical Load (DNB, primary pressure)	14.4.9	UA ⇑ - beneficial for primary pressure UA ⇑ - beneficial (If any impact) for DNBR	E
Loss of External Electrical Load (secondary pressure)	14.4.9	UA ⇑ - analyze secondary pressure	A
Loss of Normal Feedwater	14.4.10	liquid mass ↑ at low level trip - beneficial	E
Loss of Offsite Power	14.4.11	Considered as part of LNFW, 14.4.10	E

USAR Chapter 14

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Standby Safety Features Analysis

Accident	USAR	Effect of RSG	Disposition
Fuel Handling	14.5.1	Unaffected by RSG	E
Accidental Release – Liquid	14.5.2	Not analyzed in USAR	N/A
Accidental Release – Gas	14.5.3	Unaffected by RSG	E
Steam Generator Tube Rupture	14.5.4	Tube ID ↓ beneficial for dose SG available volume ↓ vs. Tube ID ⇓ - benefit for overfill	E
Steam Pipe Rupture (SLB)	14.5.5	UA ⇑ - analyze for core response	A
SLB Containment Response	14.5.5	UA ⇑ - analyze	A
SLB Dose	14.5.5	Different steam release to RHR cut-in	E
RCCA Ejection	14.5.6	UA ⇑ - beneficial for primary pressure Doppler & Rod worth unaffected	E

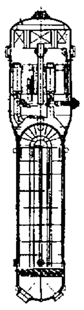
USAR Chapter 14

Reactor Coolant Pipe Rupture Analysis

Accident	USAR	Effect of RSG	Disposition
Large Break LOCA - PCT	14.6	Tube flow resistance ↓ - beneficial Tube plugging limit ↓ - beneficial	E
Large Break LOCA - Containment	App. K	Primary inventory delta < 1.5%	A
Small Break LOCA - PCT	14.7	Natural circulation ↑ beneficial UA ⇑ beneficial for ECCS flows	E
Anticipated Transient Without Scram	14.8	Beneficial and/or no effect	E

Installation Plan

Scott Marty



Installation Contractor

SGT, Ltd.

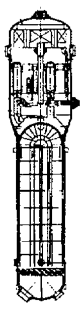
Washington Group International, Inc. /
Duke Engineering & Services, Inc.
Company

Completed or In Progress

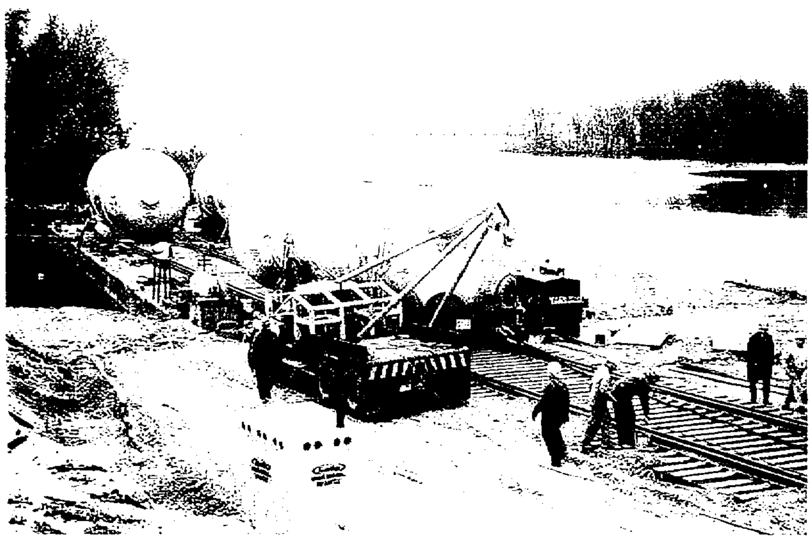
- Point Beach Units 1 & 2
- DC Cook Unit 2
- St. Lucie Unit 1
- Indian Point 2
- Calvert Cliffs Unit 1

Future

- Calvert Cliffs Unit 2
- Oconee Units 1, 2 & 3
- Callaway

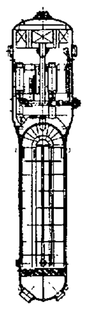


Arrival at PINGP – May 2004



OSG Arrival circa 1968

- RSGs arrive by barge in May 2004. Average date for first tow over last 30 years is March 19th. Latest date was May 11, 2001 due to spring floods
- Off load using a rubber tired, multi-axle, self propelled modular transporter



Steam Generator Removal/Replacement

Unit 1 Equipment Hatch
Shield Blocks

- Two piece replacement through the existing equipment hatch with new lower assembly and new steam dome
- One cut per RCS nozzle with narrow groove automatic welding of RCS
- Removal / Replacement methods similar to OSG Installation
  - Two piece construction with field weld at the transition cone upper girth joint
  - SG upper & lower assembly transported through the equipment hatch and up-ended
  - SG assembly load handling with existing 230t capacity polar crane. Engineered Lifts will be utilized with maximum expected load < 250t

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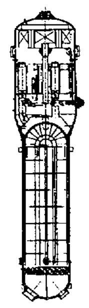
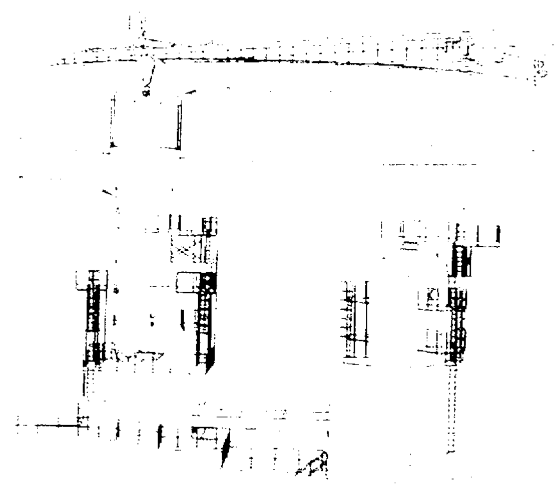


Steam Generator Removal/Replacement



- Minimal piping changes: Blowdown piping re-route due to RSG nozzle relocation for thermal hydraulic considerations
- Additional wide range water level taps
- Girth weld joint optimized for OD welding. Automatic weld process is being considered
- No concrete removal is anticipated

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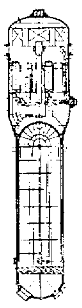
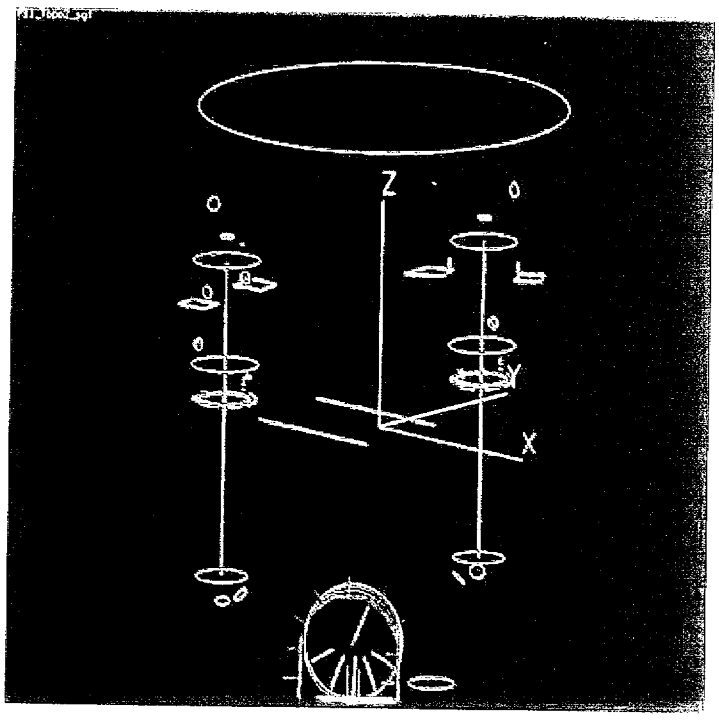
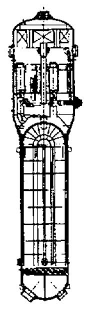


2001 Unit 1 [N-2] Outage

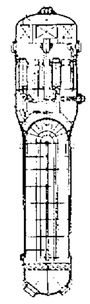


- Polar Crane Inspections
- Photogrammetry Measurements
  - As-built dimensions of primary and secondary nozzles and support pads to verify RSG Design
  - Rigging constraints: Polar Crane, Equipment Hatch and Vault Walls
- Laser scanning of equipment chase for input to rigging studies
- Walkdowns to obtain input information for design and construction and formulate conceptual plans
- Primary weld joint UT measurements



2002 Unit 1 [N-1] Outage

- Polar Crane
  - Modifications per Whiting Corporation to restore crane to 230t capacity
  - Re-rope crane per Whiting Inspection Services recommendation
- Additional Laser scanning of equipment chase with equipment hatch open for input to rigging studies
- Walkdowns to verify conceptual installation plans and design change packages

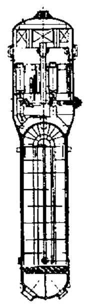


Radiation Protection - ALARA

- OSG Lower Assembly
  - Water level will be controlled to provide shielding during removal
  - Shield plates will be installed over all openings
- Shielding
  - RCS pipe ends. Pipe end decon is being evaluated
  - RTD bypass manifold
  - Other locations
- Mock-up Training
  - Channel head entry / work
  - RCS pipe work

Post Installation Testing

- RCS and SG support thermal monitoring program to verify RCS thermal expansion
- RSG Secondary side post installation testing in accordance with ASME Section III to support vessel ASME "N" stamping
- RCS Primary side post installation testing in accordance with ASME Section XI
- Secondary side piping and nozzle welds post installation testing in accordance with ASME Section XI



Current Status

- Preliminary Rigging Studies: Inside and Outside Containment. 3-D modeling of equipment chase
- Meetings with RSG Fabricator to resolve interface issues related to RSG design and installation
- Installation Contractor is developing project specific procedures
- Collecting and Evaluating Industry SGR Lessons Learned
  - Participated in Kewaunee SGRO
  - Ongoing visits to Calvert Cliffs
  - SGT database of Lessons Learned
- Interface with Plant Outage Planning

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Suggested Future Meetings

Ken Albrecht – Project Manager

• Fall 2002	Fabrication
• Spring 2003	Licensing & Fabrication Update
• Spring 2004	Pre-Installation
• Others if needed	